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Pediatric Gastroenterology, Hepatology and Nutrition
Annual Meeting
October 17 - 19, 2019

Chicago, IL

Scientific Abstracts

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POSTER SESSION I
Thursday, October 16, 2019
5:00pm – 7:00pm

ENDOSCOPY/QI/EDUCATION

2 ***FOREIGN BODY INGESTION IN PEDIATRIC PATIENTS IN ABU DHABI CITY.*** *Nafea Alyasi*, *David Rawat*, *Huda AlGhafli*. *Pediatric Gastroenterology*, *Sheikh Khalifa Medical City*, *Dubai*, *United Arab Emirates*
BACKGROUND: Foreign body ingestion is common in pediatric patients globally, the immediate risk ranges from negligible to life threatening risk.
AIM: To review our experience of Foreign body Ingestions in pediatric population in Sheikh Khalifa Medical City in Abu Dhabi.
METHODS: We retrospectively audited all children presenting to the emergency department of outpatient clinic with a diagnosis of foreign body in the alimentary tract from the period from January 2016 Until September 2018, we excluded patients above 17 years old and food related foreign bodies from our study.
RESULTS: the total of 258 cases were identified, the mean age is 6 years, Males are slightly more 54% than females 46%, The incidence is increasing over the years , 81 Cases in 2016, 89 Cases in 2017 & 88 Cases in 2018, the average number of cases per week were 1.5 in 2016, 1.7 in 2017 and 2.2 in 2018. The most common ingested FB were Coins 52% followed by button batteries 16%. None of the ingested coins caused any complications while 12% of the ingested button batteries were complicated with esophageal erosions and 3% with mediastinitis requiring prolonged intensive care unit stay. There were two cases of multiple magnet ingestions of which both were complicated by intestinal obstruction requiring surgical intervention.
CONCLUSION: foreign body Ingestions a common pediatric problem in the UAE, and can lead to serious health consequences. Improving public awareness and change in legislations to prevent the increasing number of ingested foreign bodies due to the increasing presence of hazardous materials among children.

3 ***INCIDENCE OF SIGNIFICANT MEDICAL CO-MORBIDITIES IN CHILDREN UNDERGOING UPPER AND LOWER ENDOSCOPY.*** *Swati Antala*, *Bridget Whitehead*, *Lee Bass. Pediatrics*, *Ann & Robert H. Lurie Children's Hospital of Chicago*, *Chicago*, *IL*
Background: Upper and lower endoscopy in children is a safe and well-tolerated procedure. However, children with concurrent medical comorbidities may be at higher risk for complications from anesthesia or endoscopy [1]. Defining these comorbidities is essential for risk stratification in order to safely perform endoscopic procedures on medically complex children. We assessed comorbid conditions in patients undergoing endoscopy over a 6-month period at our institution.

Methods: Endoscopic procedures performed at the Ann & Robert H. Lurie Children's Hospital of Chicago from November 1, 2018 to May 1, 2019 were reviewed using endoscopic reporting software (ProvationMD). All endoscopies were performed in the operating room with general anesthesia. Primary indications as well as complications for each procedure were recorded. Major comorbidities which could have an impact on the risk of an endoscopic procedure were noted based on the following system-based categories: Cardiac, Endocrine, Genetic, Hematologic, Liver, Neurologic, Oncologic, Pulmonary, Renal, and Rheumatologic.

Results: Over a 6-month period, 1,010 total endoscopic procedures were performed at the Ann & Robert H. Lurie Children's Hospital of Chicago. Of these, 705 were upper endoscopies and 305 were lower endoscopies. In 700 cases there were no recorded comorbidities. Significant co-morbidities that could impact the risk of complications from anesthesia or endoscopy were noted in 211 procedures. Pulmonary comorbidities were the most common and were noted in 19.9% of these procedures. Incidence of other categories of comorbidities as a percentage were as follows: Neurologic 12.3%, Rheumatologic 10.9%, Cardiac 10.4%, Genetic 9%, Oncologic 9%, Liver 8.5%, Renal 8.5%, Endocrine 6.2%, and Hematologic 6.2%. Patients with comorbidities were more likely to be inpatient at the time of endoscopy. In patients with medical comorbidities the most frequent reported indications for procedures included abdominal pain, dysphagia or feeding difficulties, gastroesophageal reflux disease, GI bleed, nausea or vomiting, and weight loss. The most common indications for endoscopy varied within each category of comorbidities. No major endoscopic complications occurred in any of the patients with co-morbidities during the reporting period.

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Conclusion:A significant proportion of endoscopies are performed on pediatric patients with medical comorbidities with pulmonary, neurologic and cardiac among the most common. While some indications are common across all comorbidity categories, others are more specific to a major comorbidity category. Pediatric gastroenterologists should be aware of potential comorbidities and relevant indications in order to safely perform endoscopic procedures on these children.

1. Lightdale, J.R., et al., *Pediatric Endoscopy and High-risk Patients: A Clinical Report From the NASPGHAN Endoscopy Committee.*J Pediatr Gastroenterol Nutr, 2019. **68**(4): p. 595-606.

4 ***IMPROVING UTILIZATION OF PROACTIVE ANTI-TNF THERAPEUTIC DRUG MONITORING: A QUALITY IMPROVEMENT INITIATIVE.*** *Scheherzade Aslam*, *Joseph Abraham*, *Gia Bradley*. *Pediatrics*, *Herman & Walter Samuelson Children's Hospital at Sinai*, *Baltimore*, *MD*

Background: Anti-tumor necrosis factor (TNF) therapies such as infliximab and adalimumab have a well-established role in the treatment of moderate-to-severe inflammatory bowel disease (IBD). Unfortunately, one-fourth of IBD patients never show a response to anti-TNF medications, and of those who respond, 20-50% have a secondary loss of response. Mechanisms underlying secondary loss of response include inadequate drug levels from rapid clearance or high immunogenicity leading to anti-drug antibody formation. Therapeutic drug monitoring (TDM) for anti-TNF therapy has been used to ensure the presence of an adequate serum drug level in order to minimize antibody formation and maintain remission. Traditionally, TDM is used in a reactive fashion, such as upon relapse. However, it has been shown that proactive TDM leads to increased drug durability, decreased need for IBD-related surgery and hospitalization, and lower risk of antibody formation. Clinicians are now embracing early TDM in the post-induction phase prior to signs of relapse. We describe a quality improvement (QI) project to maximize utilization of proactive TDM specifically for Pediatric IBD patients treated with infliximab at our community-based center.

Objective: To increase utilization of proactive TDM for infliximab via provider education and implementation of a power plan in the electronic medical record (EMR).

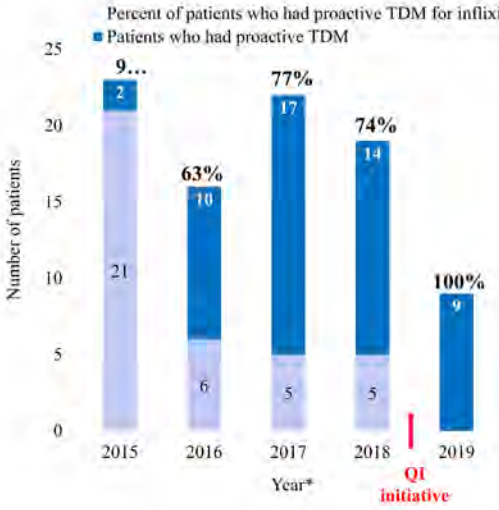
Methods: We defined proactive TDM for infliximab as an infliximab trough level and an anti-infliximab antibody level obtained prior to the first maintenance infusion. We retrospectively reviewed the medical records of all Pediatric IBD patients (ages 0 - 22 years) who started infliximab therapy at our Pediatric GI clinic from January 2015 to November 2018 to assess the utilization of proactive TDM prior to implementation of our QI initiative. Our project was started in November 2018 with provider education via an oral presentation and laminated paper flyers within the Pediatric GI clinics. A second facet of the QI program was initiated in February 2019 when a power plan for the first maintenance infliximab infusion was made available in the EMR. In this power plan, the TDM labs are auto-checked to be drawn with other routine labs just prior to the infliximab infusion. Prospective data regarding the use of TDM in our Pediatric IBD patients on infliximab therapy has been collected since November 2018. Baseline data prior to implementation of QI was compared to prospective data to evaluate changes in the utilization of TDM.

Results: From January 2015 to November 2018, prior to implementation of the QI initiative, the average proportion of patients who had proactive TDM was 54% with an increasing trend observed in usage of TDM. In 2015, 23 patients started infliximab therapy, and 2/23 of these patients had proactive TDM (9%). In 2016, 16 patients started infliximab therapy, and 10/16 had proactive TDM (62%). In 2017, 22 patients started infliximab therapy, and 17/22 had proactive TDM (77%). In 2018 (until November), 19 patients started infliximab therapy, and 14/19 had proactive TDM (74%). In the post-QI implementation phase, 9 patients have started infliximab therapy, and 9/9 have had proactive TDM (100%). Although these data are preliminary, the post-implementation phase is ongoing. The difference observed to date in the proportions of patients who received proactive TDM in the pre-implementation and post-implementation periods is statistically significant (Two-sided Fisher's Exact Test p-value = 0.0091).

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Conclusion: After increasing provider awareness and streamlining lab orders in the EMR, we have seen improvement in utilization of proactive TDM for infliximab in the early phase of this QI initiative. Future efforts should be aimed at expanding the utilization of proactive TDM to other biologic therapies and assessing outcomes of therapy optimization based on results of proactive TDM alone, such as in absence of signs and symptoms of relapse.

Proportion of Proactive TDM for Infliximab Among Pediatric IBD Patients by Year



*Years 2015 to November 2018 represent the pre-QI period. The year 2019 represents the post-QI phase and includes the period between November and December 2018.

5 *SURVEY OF PEDIATRIC RESIDENTS' PREPAREDNESS TO EVALUATE AND INITIALLY MANAGE SUSPECTED NON-ALCOHOLIC FATTY LIVER DISEASE IN CHILDREN.* *Namrata Patel[1,2], Nour Asfour[3], Ruba Azzam[2]. [1]Pediatric Gastroenterology, Hepatology and Nutrition, University of California- San Francisco, San Francisco, CA; [2]Pediatric Gastroenterology, Hepatology and Nutrition, University of Chicago, Chicago, IL; [3]Public Health, Brown University, Providence, RI*

Background: Non-Alcoholic Fatty Liver Disease (NAFLD) is reported to be the most common pediatric liver disease. Little information is available on the adherence of pediatric residents to the published guidelines for the evaluation and management of NAFLD written by the North American Society of Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN).

Objectives: The goals of the study are to assess the consistency of screening of obese and overweight children for NAFLD by pediatric and medicine/pediatric residents, who have finished intern year, at their continuity clinics, and to determine the residents' extent of training, knowledge, comfort, and competence in NAFLD care.

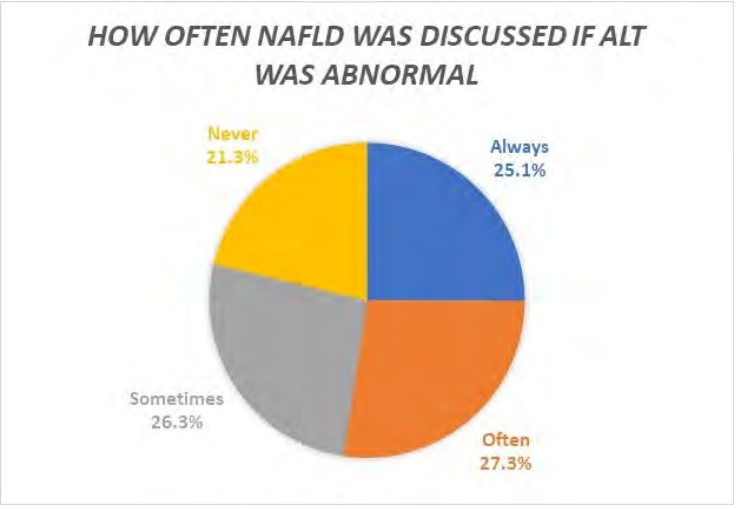
Methods: This is an electronic survey study developed using REDCap to assess the adherence of the pediatric residents to the published guidelines for NAFLD diagnosis. Surveys were emailed to the accredited Pediatric Residency Programs in the United States. Program directors and coordinators were requested to forward the survey to their senior pediatric and, if applicable, medicine/pediatrics residents. The survey consists of 7 sections that address the participants' demographics, residents' screening process of overweight and obese pediatric patients for NAFLD, evaluation process for NAFLD, decision making after some evaluation tests have been performed, anticipatory guidance residents provide to overweight/obese patients and their families, residents' perceived indications for referral to the pediatric gastroenterology/hepatology clinic, and the extent of education residents receive on NAFLD as well as their training, knowledge, comfort, and perceived competence in areas of pediatrics obesity and NAFLD care.

Results: Pediatric residents were exposed to obese and overweight children, but, regardless of their training level, they inconsistently screened for, initiated evaluation of, or provided counselling on NAFLD in these patients. Residents

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perceived that they received inadequate training on NAFLD care with 85.1% reporting not feeling comfortable with their training on NAFLD. Knowledge was identified as their biggest barrier.
Conclusion: Educational interventions should be implemented by pediatric residency programs to enhance educational core curricula for early detection and management of NAFLD, an emerging public health problem.
Barriers to NAFLD care, ranked (1(not at all) to 4(significant))

	Total	PGY-2	PGY-3
Training	2.92+/- 0.781	2.89 +/- 0.762	2.94 +/- 0.795
Knowledge	2.94 +/- 0.792	2.93 +/- 0.824	2.96 +/- 0.772
Competency	2.71 +/- 0.795	2.73 +/- 0.753	2.69 +/- 0.824
Comfort	2.40 +/- 0.856	2.46 +/- 0.823	2.36 +/- 0.878



7 *ENDOSCOPIST, PATIENT AND PROCEDURE CHARACERISTICS PREDICT FLUOROSCOPY UTILIZATION DURING PEDIATRIC ERCP.* *Monique Barakat[1,2], Roberto Gugig[2], William Berquist*
[1]Division of Gastroenterology & Hepatology, Stanford University Medical Center, Cupertino, CA; [2]Division of Gastroenterology & Hepatology, Lucille Packard Children's Hospital at Stanford, Stanford, CA
Background: Endoscopic retrograde cholangiopancreatography (ERCP) is important for diagnosis and management of pediatric pancreaticobiliary disorders. Fluoroscopy utilized during ERCP and the associated ionizing radiation exposure is associated with both deterministic and stochastic effects. Limiting exposure to ionizing radiation is potentially most important in pediatrics, as detrimental effects of ionizing radiation may be amplified in rapidly dividing cells and over the likely long post-procedure lifetime following a childhood ERCP. Patient, procedure, endoscopist and facility characteristics have been shown to influence ERCP fluoroscopy utilization and procedure outcomes in adults, however the extent to which this is true in pediatrics remains under-studied and there are minimal data regarding fluoroscopy utilization in pediatric ERCP.

Methods: We retrospectively analyzed ERCPs performed on patients <18 years of age at our tertiary care children's hospital from 2002-2017 using the medical record system and radiation exposure database. Procedure complexity was graded using the Stanford Fluoroscopy Complexity Score and the American Society of Gastrointestinal Endoscopy Complexity scale. High volume endoscopists (HVE) were defined as performing >100 ERCPs/year (pediatric + adult) and low volume endoscopists (LVE) as <100. Statistical analysis was performed using T-test, Fisher's exact test and generalized linear/multivariate models and corrected for multiple comparisons.

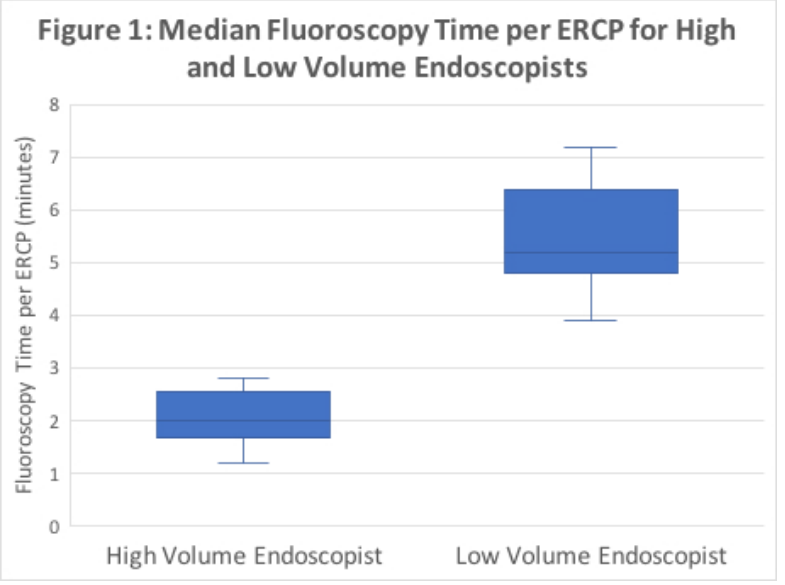
Results: 385 ERCPs performed on 321 patients by one of 5 endoscopists at the children's hospital were included. The mean patient age was 13.4 years (+/- 4.2 years), 77% were index ERCPs (native ampullas) and 81% were performed with therapeutic intent (87% for biliary indication and 13% for pancreatic indication). Fluoroscopy times varied dramatically

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between procedures and providers. Median fluoroscopy time was 4.85 (+/- 2.68) minutes. Endoscopist annual ERCP volume was the strongest predictor of fluoroscopy time ($p<0.001$, Figure 1).

Procedure-specific predictors of increased fluoroscopy time included pancreatic indication, biliary or pancreatic duct stricture and patient age <4 years or >16 years ($p<0.01$ for each). Lower fluoroscopy time was predicted by a procedure performed in a patient who had previously undergone ERCP (non-native ampulla, $p<0.01$). ERCP complexity rating based on the American Society of Gastrointestinal Endoscopy (ASGE) complexity scale did not predict fluoroscopy time, however the Stanford Fluoroscopy Complexity Score correlated with fluoroscopy time. Annual ERCP volume at our children's hospital increased but fluoroscopy times during ERCP did not vary significantly over time.

Conclusions: Radiation exposure is higher than desirable for pediatric ERCP and varies with endoscopist, patient and procedure-specific factors. HVE perform ERCP with lower fluoroscopy time relative to LVE even though HVE procedure complexity was higher. The Stanford Fluoroscopy Complexity Score predicted fluoroscopy time for pediatric ERCP, but the adult-derived ASGE ERCP complexity scale did not. Development of pediatric-specific ERCP complexity scales including factors such as patient size/age and indications/interventions more consistent with those encountered in pediatrics could be beneficial.
Further study to determine the annual ERCP volume that defines a high volume therapeutic endoscopist in pediatrics and whether this number differs from adult therapeutic endoscopy would be of interest. The variation in fluoroscopy utilization amongst endoscopists based on volume attests to the potential for decreasing fluoroscopy utilization in pediatric ERCP with endoscopist education surrounding measures that minimize radiation exposure (avoidance of continuous fluoroscopy, use of collimation, low magnification) to reduce fluoroscopy exposure to patients and providers. Documentation and analysis of more specific radiation dose measures (dose area product, total radiation dose) would also be beneficial and informative. These steps toward cultivating a lower radiation pediatric ERCP environment are crucial for improving quality and safety of pediatric endoscopic pancreaticobiliary interventions.



8 ***EVOLUTION OF PEDIATRIC ERCP INDICATIONS, UTILIZATION AND OUTCOMES: A NATIONWIDE POPULATION-LEVEL ANALYSIS.*** *Monique Barakat[1,2], George Cholankeril[1], Roberto Gugig[2], William Berquist[2] .*
[1]Division of Gastroenterology & Hepatology, Stanford University Medical Center, Cupertino, CA; [2]Division of Gastroenterology & Hepatology, Lucille Packard Children's Hospital at Stanford, Stanford, CA
Background: Endoscopic retrograde cholangiopancreatography (ERCP) is important for diagnosis and management of biliary and pancreatic disorders in pediatrics, however utilization and outcomes studies of pediatric ERCP to date largely comprise single center experiences and self-reported procedure outcomes in multi-center databases. We conducted the present all-capture population level study of pediatric ERCP procedures performed in the US, free from endoscopist, single-center or region-level bias to evaluate the overall frequency with which ERCPs are performed for pediatric patients in the US and analyze trends in utilization and outcomes over time.

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Methods: Using the National Inpatient Sample (NIS), a nationally representative databases developed by the Agency for Healthcare Research and Quality,we identified all pediatric hospitalizations (<20 years) where ERCP procedures were performed in the US from 2005-2014. To assess readmissions related to ERCP procedures, we utilized the National Readmission Database (NRD) from 2010-2014. ICD-9-CM procedure codes were used to identify hospitalizations where ERCP was performed, primary cause for hospitalization and co-morbidities. Multivariate logistic regression analyses were performed to determine significant predictors ($P< 0.05$) of 30-day readmission.

Results: From 2005-2014 (NIS), 11,060 hospitalized pediatric patients underwent ERCP. Patient and hospital characteristics are shown in Table 1. The annual procedures volume peaked in 2010 (n=1224) and has steadily declined from 2011 through 2014. The majority of patients were female (n=8859, 81%), between 14-20 years of age (n=9342, 84%), and White (n=4230, 45%). Regionally within the US, the South and West comprised of nearly two-thirds of ERCP procedures (n=7072, 65%). Therapeutic ERCP consisted of 85% of ERCP procedures and the leading indications for undergoing ERCP were gallbladder and biliary disease (n=5350, 48%), and acute/chronic pancreatitis (n=3218, 29%).

From 2010-2014, 13% of patients were readmitted within 30-days. Analysis of re-admission diagnoses reveals that a substantial proportion of patients re-admitted were admitted with diagnoses consistent with ERCP-associated adverse events (pancreatitis, bleeding, infection). Compared to females, males had a higher proportion that were readmitted within 30-days (18% vs 12%, $P< 0.001$). Among the four age groups, those aged 5-9 had the highest percentage readmitted within 30-days (31%, $P< 0.001$). In our multivariate regression analyses, history of liver transplant (OR 2.01, 95% CI: 1.79-2.25, $P< 0.001$) ages between 0-4 years (OR 1.95, 95% CI: 1.93-1.97, $P< 0.001$), male gender (OR 1.17, 95% CI: 1.16-1.18, $P< 0.001$) and obesity (OR 1.10, 95% CI: 1.07-1.14, $P< 0.001$) were associated with increased odds for 30-day readmission after undergoing ERCP during initial hospitalization.

Conclusion: Our data demonstrate that rates of diagnostic pediatric ERCP are higher than those in the adult population, perhaps reflecting under-utilization of endoscopic ultrasound in pediatrics. The indications for pediatric ERCP attest to the rising prevalence of pediatric gallstone disease. In the 30 days following ERCP, 13% of patients were re-admitted with diagnoses consistent with ERCP-associated adverse events. Patient characteristics (history of liver transplant, age <4 years, obesity and male gender) predicted readmission following ERCP. Limitations of this study include inherent limitations of population level administrative database studies and its focus on hospitalized patients, however most pediatric ERCPs are currently performed on an inpatient basis. Our results represent the most comprehensive study of nationwide and regional trends in age-specific volumes and outcomes following ERCP in the pediatric population to date and provide insights regarding patient characteristics and comorbidities associated with post-ERCP re-admission.

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Pediatric ERCP Characteristics 2005-2014	
Total Procedures	11060
Gender, n (%)	
Male	2077 (18.99%)
Female	8859 (81.01%)
Age (years), n (%)	
0-4	494 (4.47%)
5-9	472 (4.27%)
10-13	752 (6.8%)
14-20	9342 (84.47%)
Race/Ethnicity, n (%)	
White	4230 (44.66%)
Black	1202 (12.69%)
Hispanic	3323 (35.08%)
Asian	163 (1.72%)
Other	554 (5.85%)
Comorbidities, n (%)	
Obesity	1508 (13.63%)
Diabetes	138 (1.25%)
History of Liver Transplant	62 (0.56%)
ERCP Urgency, n (%)	
Elective	1516 (13.73%)
Emergent	9525 (86.27%)
Hospital Region, n (%)	
Northeast	1713 (15.71%)
Midwest	2117 (19.42%)
South	3723 (34.15%)
West	3349 (30.72%)
Type of Hospital n, (%)	
Rural	560 (5.09%)
Urban	3772 (34.28%)
Urban Teaching	6673 (60.64%)
Median Hospital Charge [IQR]	34856 (22454 – 54893)
In-Hospital Mortality n, (%)	12 (0.11%)

11 ***IMPROVING INFLUENZA VACCINATION RATE IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE ON ADALIMUMAB: A QUALITY IMPROVEMENT PROJECT.*** *Natalie Bhesania, Lori Mahajan, Madelyn Cohen, Barbara Kaplan. Pediatric Gastroenterology, Cleveland Clinic Children's Hospital, Cleveland, OH*

Background: Influenza is a vaccine preventable illness in patients with inflammatory bowel disease (IBD) on biologic therapy. Numerous societies including NASPGHAN, ESPGHAN, and ACG recommend special effort should be made to vaccinate children receiving immunosuppressive therapy. Prior studies have shown less than 28% of patients with IBD who are immunosuppressed are vaccinated against influenza. Prior efforts in our department have reached immunization rates in our Infliximab patients with IBD of greater than 90%. Patients on Adalimumab at home however have a potential for a lower annual influenza vaccination rate.

Objectives: The purpose of this quality improvement project was to determine the annual baseline influenza immunization rate for patients receiving Adalimumab for treatment of IBD. If the influenza rate in our practice was found to be <90% our goal was to improve the vaccination rate by 10% with each PDSA cycle during the 2017-2018 and 2018-2019 influenza seasons until the ultimate goal of >90% of patients with IBD on Adalimumab was reached. Although this was a lofty goal, it was set based on the Advisory Committee of Immunization Practice (ACIP) recommendations

Methods: We retrospectively evaluated charts from the prior 3 years in patients receiving Adalimumab for management of IBD. We then identified patients with IBD receiving Adalimumab therapy that were not vaccinated against influenza during the 2017-2018 influenza season. Three prospective interventions were applied to this cohort. The first two interventions involved contacting the patient and providing information describing influenza infection, the importance of the influenza vaccine, and how to receive the vaccination. This was initially done by mailing an informative letter followed by phone calls to patients. The third intervention involved personal e-mail messages to the gastroenterology providers within our department, serving as a reminder to discuss the topic during clinic appointments. Patients were asked to inform their gastroenterologist of vaccination administration via phone call or EMR message. During the 2018-2019 influenza season

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two prospective interventions were performed. The first intervention involved mailing the informative letter and the second intervention involved a formal presentation involving all of the faculty within the department serving as another reminder to discuss vaccination with patients in clinic.

Results: Influenza vaccination rates from the three prior years ranged from 33-37%. A total of 45 patients with IBD on Adalimumab were identified during the 2017-2018 influenza season and 13% had received the influenza vaccine prior to the first intervention. Upon review of influenza immunization rates 6 weeks after each intervention the rates improved to 40%, 60% and 66% after the first, second and third interventions respectively.

During the 2018-2019 influenza season we initiated our interventions earlier in order to capture more patients. We identified 81 patients on Adalimumab during this season which was significantly higher than the year prior secondary to newly diagnosed IBD and changes in maintenance medication. After the first intervention the immunization rate was 58% and following the second intervention at the end of the influenza season 66% were immunized. Of note, 12% declined the immunization.

Conclusions: Responsibility of vaccination is shared between the primary care provider and the gastroenterologist. With planned quality improvement interventions providing education and specific recommendations, this project was able to improve the annual influenza vaccination rate from an average of 34% in prior years to 66% during the 2017-2018 and 2018-2019 influenza seasons. Influenza vaccination rates remain sub-optimal in patients with IBD on Adalimumab.

13 ***DIAGNOSIS TO TREATMENT OF INFLAMMATORY BOWEL DISEASE.*** *Daniella Caudle[1], Elizabeth Yarger[3], Loura Yvonne Abernathy[3], Kelly Sandberg[2] .[1]Medical Student, Boonshoft School of Medicine, Dayton, OH; [2]Gastroenterology, Dayton Children's Hospital, Dayton, OH; [3]Dayton Children's Hospital, Dayton, OH*

Background & Objective: Inflammatory Bowel Disease (IBD) is a debilitating, chronic, illness with many who are diagnosed in adolescence or as young adults. Prompt treatment can alleviate symptoms and adverse effects, especially for younger patients. Large variation in the time from diagnosis to first definitive treatment dose existed at our center and a quality improvement project was started to address this variation.

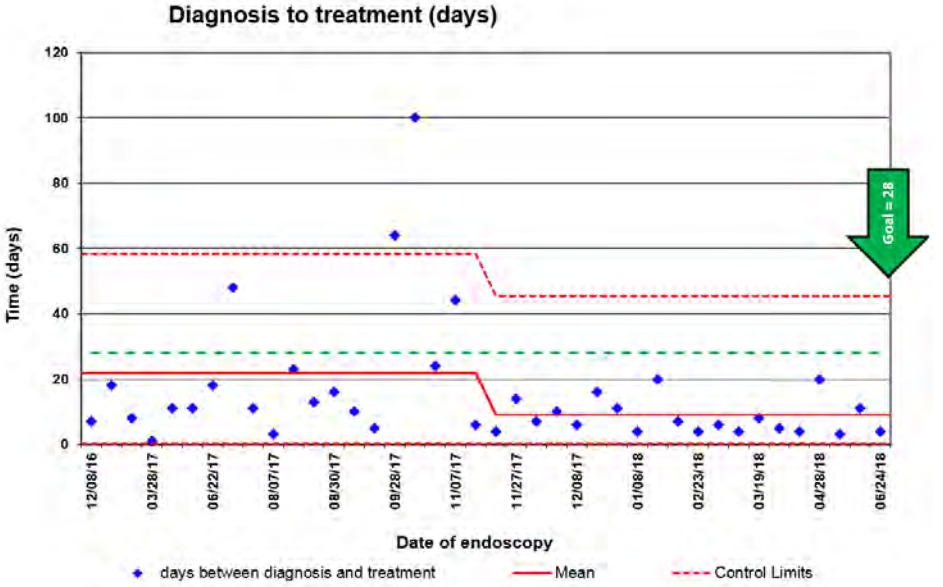
Methods: We reviewed charts from March 31, 2017 and 6 months prior with a first data point collection of December 2016 to establish a baseline. The first diagnosis, based on endoscopy with concern for IBD, was on 12/08/2016. Prospective data collection continued and was displayed in run charts. We reviewed outliers and categorized for display in a pareto chart. We established goals as follows, all starting with diagnosis based off endoscopy with concern for IBD: 7 days for follow-up appointment scheduled, 10 days for results to be communicated, 14 days for the follow-up appointment, 21 days for the patient to be registered in the IBD registry and for necessary small bowel imaging to be ordered and performed, and 28 days between diagnosis and definitive treatment. We defined definitive treatment as first maintenance dose of medication.

Results: Forty patients were evaluated in a control chart analyzing the time from endoscopy date diagnosis to treatment. The hospital has met or is exceeding all goals except for registering patients into the IBD registry, although it has improved. Overall, improvement in days between endoscopy and first dose of definitive treatment occurred with no more outliers over the twenty-eight-day goal occurring after the date of 11/07/2017. Mean diagnosis to treatment days decreased from 22.05 days at the beginning of the project to 9.08 days. This was sustained over 7 months.

Reasons for delay were analyzed as a Pareto Chart. Reasons for Delay included medically necessary reasons for delay (which included infections and need for vaccinations), patient preference (which may have included the patient or patient family not wanting a biologic), Insurance (need for prior authorization), conflicts in scheduling, lack of a PCP, or delay in further workup. These reasons of delay were analyzed to try and determine interventions to minimize delays.

Conclusions: Using quality improvement methods, we decreased the delay in the start of maintenance therapy for IBD patients by slightly over 13 days. Ongoing work includes further standardization and population management interventions.

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14 ***NONINVASIVE METHODS TO PREDICT ESOPHAGEAL VARICES IN MEXICAN CHILDREN.*** *Lissa De la Vega[1], Sean Trauernicht[1], America Miranda[2], Salvador Villalpando[1]. [1]Gastroenterology and Nutrition, Hospital Infantil de México Federico Gómez, Mexico City, Mexico City, Mexico; [2]Medical Investigation Unit, Hospital Infantil de Mexico Federico Gomez, Mexico City, Mexico City, Mexico*

Esophageal varices are present in 90% of children with portal hypertension, variceal bleeding increases morbidity and mortality. Upper digestive endoscopy provides treatment while the diagnostic evaluation is performed, but requires trained personnel, is expensive and in Mexico is only available in specialized centers. Non invasive methods (Clinical prediction rule (CPR) <114 and risk score (RS) >-1.2) to predict the presence of esophageal varices have been described, allowing timely reference. However, their utility has not been evaluated in mexican children. The study aimed to evaluate the role of noninvasive parameters in our population. *Methods*: cross sectional diagnostic test study. *Sample:* 71 subjects, diagnosis of portal hypertension, <18 years. Excluded: any kind of variceal treatment, active variceal bleeding, surgical portosystemic shunt, previous liver transplant or malignancie. *Analysed variables:* CPR: [(0.75 * platelets / spleen z-score + 5) + (2.5 * albumin)]and RS: [14.2 – 7.1 x $\log^{10}$platelets] + [4.2 x $\log^{10}$total bilirubin]. *Statistical analysis:* Mann- Whitney U test to compare CPR and RS between groups with and without esophageal varices. Logistic regression model; sensitivity, specificity and predictive values was evaluated. *Results:*To identify esophageal varices RPC (<114) and SR (>-1.2) showed a sensitivity and specificity of 91.4%, 30.8% and 81%, 30.8% respectively. To identify large esophageal varices, RPC (<114) and SR (>-1.2) showed a sensitivity and specificity of 90.6%, 7.9% and 78.1%, 15.4% respectively.The logistic regression model showed that children with CPR <114 were 5.8 times more likely to have varices (p= <0.05). *Conclusion:*The Clinical Prediction Rule showed better results for diagnosis of esophageal varices and could be helpful in identifying children with portal hypertension who may be eligible for endoscopy.

	Sen % CI (95%)	Spe % CI (95%)	PPV % CI (95%)	NPV% CI (95%)
Presence of esophageal varices				
CPR <114	91.4 (81.0 - 97.1)	30.8 (9.09 - 61.4)	85.5 (74.2 - 93.1)	44.4 (13.7 - 78.8)
RS ≥-1.2	81 (68.6 - 90.1)	30.8 (9.09 - 61.4)	83.9 (71.7 - 92.4)	26.7 (7.79 - 55.1)
Presence of large esophageal varices				
CPR <114	90.6 (75 - 98.0)	7.69 (0.94 - 25.1)	54.7 (40.4 - 68.4)	40.0 (5.27 - 85.3)
RS ≥-1.2	78.1 (60 - 90.7)	15.4 (4.36 - 34.9)	53.2 (38.1 - 67.9)	36.4 (10.9 - 69.2)

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	OR	CI 95%
Presence of esophageal varices		
CPR <114*	**5.80**	**1.24 - 27.9**
RS ≥-1.2	2.08	0.53 - 8.1
Presence of large esophageal varices		
CPR <114	0.40	0.03 - 4.1
RS ≥-1.2	0.48	0.11 - 2.11

*p= <0.05.

15 ***TRANSIENT END TIDAL CO_2 ELEVATION DURING PEDIATRIC UPPER ENDOSCOPY WITH CO_2 INSUFFLATION: IS IT TRUE SYSTEMIC HYPERCAPNIA?*** *Chinenye Dike[1], Riad Rahhal[1], Sarah Titler[2], Warren Bishop[1]. [1]Pediatric Gastroenterology, University of Iowa, Coralville, IA; [2]Pediatric Anesthesiology, University of Iowa, Iowa City, IA*

Background: Luminal inflation is essential for adequate visualization and endoscope advancement during endoscopic procedures. Although air has long been the standard insufflation agent, many adult centers now use CO_2 routinely because many adult studies have demonstrated safety and better tolerance of CO_2 when compared to air for a wide range of procedures. A recent survey of pediatric fellow trainees showed that many pediatric centers now use CO_2 for all endoscopic procedures despite the limited number of published studies of its use in children. Most of these centers use nasal or oral capnography for monitoring end-tidal CO_2 ($EtCO_2$) levels. At the University of Iowa, we have demonstrated that use of CO_2 during upper endoscopy in non-intubated children is associated with a significant increase in the incidence of transient elevations of $EtCO_2$. Because elevations of the $EtCO_2$ were not seen in procedures involving only colonoscopy, and because the airway was not protected by endotracheal intubation in these patients, we suspected that eructation of insufflated gas was responsible, but could not rule out systemic absorption of CO_2. Although elevations of $EtCO_2$ were not accompanied by clinical adverse events, the occurrence of these raised concerns of possible CO_2 inhalation and absorption. We investigated this by concurrently measuring both $EtCO_2$ and transcutaneous pCO_2.

Aim: To determine if the elevations in end tidal CO_2 levels seen in non-intubated children undergoing upper endoscopy using CO_2 is associated with elevated systemic pCO_2levels.

Hypothesis: Transient elevations in $EtCO_2$ level observed during upper endoscopy in non–intubated children is associated with elevated systemic CO_2 levels.

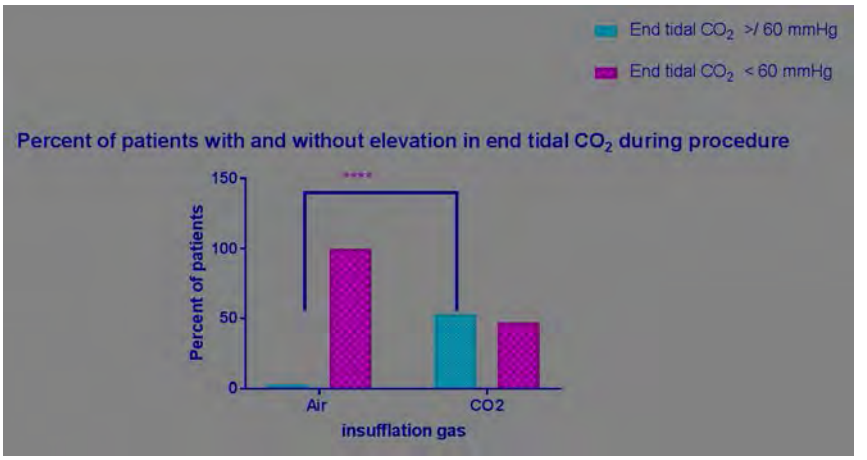
Methods: This was a double-blinded, prospective, randomized clinical trial. Children were randomized 1:1 to receive either CO_2 or air for endoscopic insufflation. End-tidal CO_2 and transcutaneous CO_2 levels were recorded each minute by the anesthesia software, along with other vital signs. $EtCO_2$ was sampled with a CO_2-sampling nasal cannula and transcutaneous CO_2 (TCO_2) was monitored using the Radiometer TCM device. Data was entered into REDCap and analyzed using graph pad prism.

Results: 59 patients were enrolled; 30 patients were randomized to the CO_2 group and 29 patients to the air group. There was no difference between groups with respect to demographics and ASA status. All the patients underwent a procedure involving upper endoscopy. As observed in our previous study, the proportion of patients experiencing one or more transiently elevated $EtCO_2$ levels was significantly higher in the CO_2 group when compared to the air group. Preliminary analysis revealed that the percent of patients with any $EtCO_2$ measurement ≥60 mmHg was 53% in the CO_2 group vs. 0% in those receiving air ($p < 0.0001$). This was in contrast to those experiencing elevations of transcutaneous CO_2 levels (TCO_2), which did not differ between groups. The percent of patients with any measurement of TCO_2 ≥60 mmHg was 34.5% (CO_2) vs. 27% (air) (p=0.28). There were no adverse events reported in both groups.

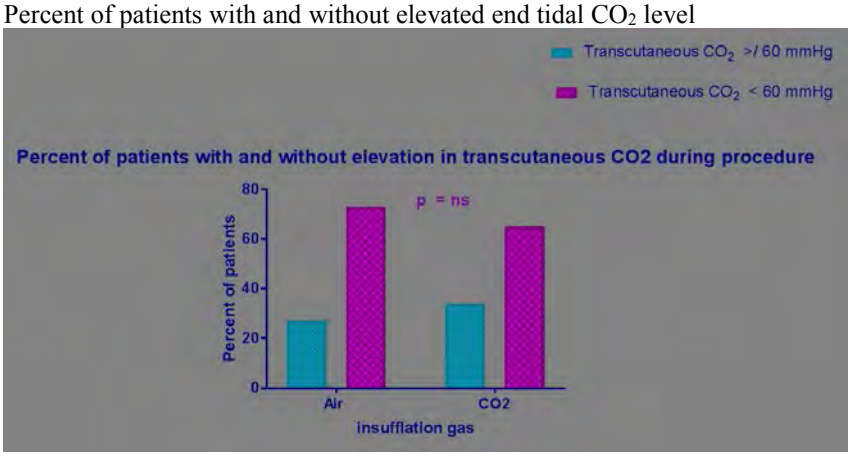
Conclusion: This study suggests that the observed transient elevations in $EtCO_2$ seen during upper endoscopy in non-intubated children receiving CO_2 for insufflation are most likely measurements of eructated CO_2 reaching the end-tidal sampling port. We conclude that there is no evidence of excessive absorption of CO_2 in children undergoing upper endoscopy with CO_2 insufflation. The detection of eructated CO_2 may nevertheless indicate a potential hazard when CO2 is

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used during upper endoscopy unless the airway is protected with endotracheal intubation.



Percent of patients with and without elevated end tidal CO_2 level



Percent of patients with and without an elevation in transcutaneous CO_2 level

16 ***FREQUENT VARIATION AND VALUE IN PEDIATRIC COLONOSCOPY.*** *Emily Duner[1], Jay Hochman[2], Janet Figueroa[3], Jeffery Lewis[2]. [1]Northwestern University, Evanston, IL; [2]GI Care for Kids, Atlanta, GA; [3]Biostatistics, Emory University, Atlanta, GA*

Objectives: Our aim was to determine the variation in diagnostic yield and baseline values for ileal intubation and complications at our outpatient pediatric endoscopy center.

Methods: We performed a retrospective chart review of sequential pediatric patients who underwent a colonoscopy that was completed by June 2018. Findings were classified as either endoscopically abnormal (EA) based on gross abnormalities in the appearance of the mucosa or as isolated histologically abnormal (IHA); the overall diagnostic yield was the combination of EA and IHA.

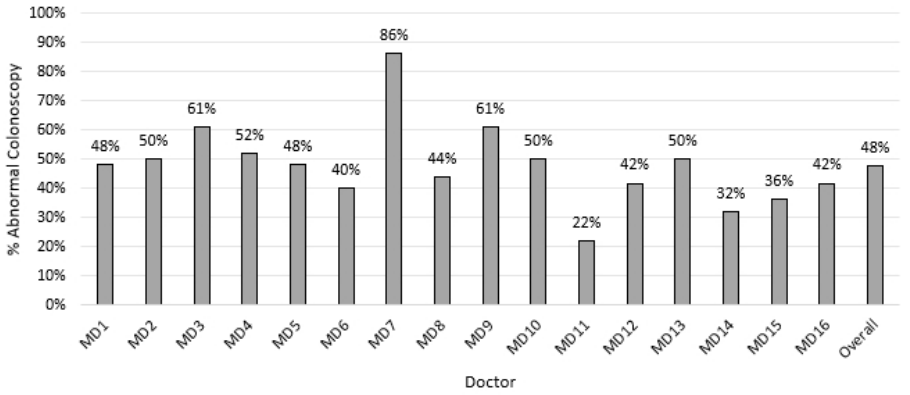
Results: In total, 374 charts were reviewed. This study found a high variability in diagnostic yield among the 16 clinicians ranging from as low as 22% to as high as 86% (p=.11) with an overall diagnostic yield of 48% for colonoscopy. Abnormal calprotectin and abnormal blood tests were associated with higher diagnostic yields of 83% and 65% respectively compared with symptoms like abdominal pain, diarrhea, and rectal bleeding which had respective yields of 39%, 43%, and 61%. Ileal intubation rates averaged 90% (range 62-100%, p=.06). In patients with a normal colon, there were 21 (6%) patients with a EA ileum and an additional 16 (4%) with a IHA ileum. Prep quality was rated excellent, good, or average in 97%. In addition, there was a low rate of serious complications (1 of 374).

Conclusions: This study highlights the individual variability in diagnostic yield and ileal intubation rates in a busy pediatric gastroenterology private practice. Quality metric goals for pediatric endoscopy could include ileal intubation rates

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of >90% and diagnostic yields of > 40%.

Figure 4. Colonoscopy Diagnostic Yield by Doctor



The diagnostic yield for colonoscopy varied considerably among the 16 individual physicians. The diagnostic yield was a summary of both endoscopically abnormal and isolated histologically-abnormal.

17 ***SURVIVAL BENEFIT FOR INDIVIDUALS WITH CONSTITUTIONAL MISMATCH REPAIR DEFICIENCY SYNDROME WHO UNDERGO SURVEILLANCE PROTOCOL. A REPORT FROM THE INTERNATIONAL REPLICATION REPAIR CONSORTIUM.*** *Carol Durno[1,2], Ayse Ercan[5], Melissa Edwards[5], Melyssa Aronson[4], Anita Villani[3], Eric Bouffet[3,5], Steven Erdman[7], Isabelle Scheers[6], Annika Bronsema[8], Uri Tabori[3,.5] [1]Division of Gastroenterology/Hepatology and Nutrition, The Hospital for Sick Children, Toronto, ON, Canada; [2]Department of Surgery, The Zane Cohen Center, Mount Sinai Hospital, Toronto, ON, Canada; [3]Divison of Hematology and Oncology, The Hospital for Sick Children, Toronto, ON, Canada; [4]The Zane Cohen Center, Mount Sinai Hospital, Toronto, ON, Canada; [5]The Arthur and Sonia Labatt Brain Tumour Research Centre, The Hospital for Sick Children, Toronto, ON, Canada; [6]Cliniques Universitaires St Luc, Brussels, Belgium; [7]Nationwide Children's Hospital, Columbus, OH; [8]Medical Center Hamburg-Eppendorf (UKE), Hamburg, Germany*

Background: Constitutional mismatch repair deficiency syndrome (CMMRD) is a severe cancer predisposition syndrome causing intestinal polyposis and a high risk of early onset gastrointestinal, brain, and hematological cancers. International guidelines for surveillance exist but no study has systematically evaluated the efficacy of this protocol.

Aim: Our aim was to determine if surveillance affects outcome. The primary outcome measure was overall survival. The secondary outcome measure was detection of new cancers.

Methods: Patients referred to the International Replication Repair Consortium undergo genetic testing to confirm CMMRD. All individuals were diagnosed with CMMRD through diagnostic criteria by the genetic counsellor at the consortium. A surveillance protocol consisting of frequent biochemical, endoscopic and imaging studies was recommended and initiated internationally on Jan 1, 2012. Protocol included upper endoscopy, colonoscopy, video capsule endoscopy and/or magnetic resonance enterography, and brain MRI. Whole-body MRI was recommended as of Jan 1, 2018. Surveillance questionnaire was sent to the responsible physician with diagnostic fields completed by the registry coordinator as a double check of reliability. Survival analyses was completed using an as-treated approach.

Results: Cancer and surveillance data was collected from 64 (50%) of 127 CMMRD individuals registered in the Consortium from 41 countries. There were 114 tumours reported in 60 patients including 55 brain, 28 gastrointestinal (GI), 17 hematological and 14 other malignancies. Surveillance data was available on 110 cancers; 16 were incidental cancers, 68 were symptomatic and 26 were discovered through surveillance. Surveillance identified 13 GI cancers, 11 brain, and 2 hematological malignancies. The gastrointestinal cancers included 5 colorectal, 7 small bowel, and one gastric. Four patients were unaffected. Five-year overall survival was 95% for tumors discovered by surveillance, compared to 43% for symptomatic tumors (p=0.001). Overall survival for gastrointestinal tumors identified by surveillance was 100% (n=13) compared to 79% (n=19) for symptomatic lesions (p=0.1). Similarly, 5-year survival was 83+/-15% and 32+/-7% for

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surveillance and non-surveillance of brain tumors (p=0.03). Median age at diagnosis of gastrointestinal cancer was 14.6 years (range 9.0 - 50.6 years).
Conclusion: These data support a survival benefit in CMMRD patients undergoing a surveillance protocol.

18 ***NORMAL DIGESTIVE ENDOSCOPY IN CHILDREN: SERIAL BIOPSIES IMPACT ON CLINICAL MANAGEMENT.*** *Paula Elia[1,2], Francisco Milanesi[3], Vitor Cunha[3] ,[1]Digestive Endoscopy, Instituto Fernandes Figueira - Fiocruz, Rio de Janeiro, Rio de Janeiro, Brazil; [2]Digestive Endoscopy, Hospital Estadual da Criança, Rio de Janeiro, Rio de Janeiro, Brazil; [3]Pediatric Surgery, Instituto Fernandes Figueira - Fiocruz, Rio de Janeiro, Rio de Janeiro, Brazil*
Introduction: ESGE/ESPGHAN guidelines published in 2016 suggests routine tissue sampling even in the absence of visible endoscopic abnormalities in all children undergoing EGD. There has long been controversy whether this practice increases the cost of endoscopy and adverse events.
Aim: The aim of this study was to evaluate the impact of routine biopsy in children with normal EGD or normal colonoscopy in a pediatric hospital in Rio de Janeiro, Brazil.
Methods: A retrospective longitudinal study was carried out on children who were submitted to pediatric EGD between January 2012 to October 2016 in a Pediatric Hospital in Rio de Janeiro, Brazil. The data collected were age, sex, EGD indication, endoscopic and histological findings. The patient demographics were collected from medical and endoscopy reports. All EGD were performed by the same endoscopist. Multiple biopsies were taken in all organs in all children with normal EGD, such as esophagus (4 biopsies from proximal, 4 from mid and 4 from distal), stomach (2 biopsies from antrum and 2 from body), and duodenum (at least 2 biopsies). In children suspected of celiac disease,
at least 1 biopsy specimen was obtained from the duodenal bulb, and 4 from the second or third portion of duodenum. In colonoscopy, at least two biopsies were obtained from ileum, rectum, and each colonic segment.
Results: Ninety-two infants, children and adolescents aged 0-18 years with normal endoscopic examination were included in this study, 69 with normal EGD and 23 with normal colonoscopy. Forty seven patients were male (51%) and the most common age group was schooling in
47.8% of patients. The most common indication for EGD was abdominal pain in 43 patients (62.3%), and for colonoscopy was intestinal bleeding in 11 patients (47.8%).Our study did not reveal significant histological changes in the majority of children with normal EGD (89.9%), and none of the patients with normal colonoscopy. A total of 5 patients with normal EGD (7.2%) had histologic evidence of *H. pylori* infection, 2 patients had histologic diagnosis of celiac disease (2.9%) and none had eosinophilic esophagitis or inflammatory bowel disease. There were no endoscopic or anesthetic complications during the exams.
Conclusion: Our results support that routine biopsy should be encouraged during EGD and colonoscopy, irrespective of the appearance of the mucosa. Biopsies allowed the diagnosis and treatment of unsuspected celiac disease in two children that would have been misdiagnosed. We were also able to diagnose *H pylori* infection in 5 children with normal EGD. Although there was no peptic ulcer disease in these patients, *H. pylori* treatment should be considered, particularly in children with first-degree relatives with history of gastric cancer.

19 ***SHALL WE SIMULATE? EXPLORING INTEGRATION OF SIMULATION-BASED ENDOSCOPY TRAINING AND ASSESSMENT IN NORTH AMERICAN PEDIATRIC GASTROENTEROLOGY FELLOWSHIP TRAINING PROGRAMS.*** *Aayush Gabrani[1], Iona Monteiro[1], Catharine Walsh[2]. [1]Pediatrics, Rutgers New Jersey Medical School, Newark, NJ; [2]Paediatrics, Hospital for Sick Children, Toronto, ON, Canada*
Objective: There is increasing evidence to support integration of endoscopy simulation into training and recent training guidelines have encouraged its uptake. However, limited data exists regarding its use in pediatric gastroenterology (GI) training. We aimed to explore the current landscape of endoscopic simulation-based training and assessment in pediatric GI fellowship programs across North America.

Design: GI fellowship program directors (PDs) from the United States (US) and Canada were surveyed from August to November 2018. The pre-tested, electronic survey comprised 3 sections: program demographics; details of current simulation-based training; and PDs' perceptions of endoscopy simulation. Responses were analyzed using descriptive statistics.

Results: Forty-three of 71 (61%) PDs responded (6 Canadian, 37 US). Programs were predominantly academic (95%) and enrolled 1.87 ± 1.01 fellows/year. Twenty-four programs (56%) reported using simulation for endoscopy training, while 8 (19%) used simulation for non-procedural education. Only 2 programs (5%) used endoscopy simulation for assessment purposes. Other forms of endoscopic skills assessment used included: (1) procedure numbers (84%); (2) clinical parameters, such as ileal intubation rate (63%); (3) EPA assessment forms (30%); and (4) direct observation procedural

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assessment tools (60%), including the GiECAT$_{kids}$ tool (23%).

Of those programs using simulation (n=24), upper endoscopy and colonoscopy were trained most frequently, and mechanical simulators were used most commonly (Table 1). Eight programs (33%) required simulation training prior to clinical performance. While 10 programs (42%) provided protected training time, only 2 (8%) tracked hours. Three programs (12.5%) reported having an organized curriculum and 6 (25%) train their endoscopic trainers. Cost, time constraints and lack of standardized curricula were perceived as key barriers to integration (Table 2). Most PDs reported a need for endoscopy simulation to train both technical and non-technical skills; however, they felt simulation cannot replace clinical experience.

Conclusion: Pediatric GI fellowship PDs recognize the importance of endoscopy simulation; however, only 56% report using it. Perceived barriers indicate the need for inexpensive portable simulators to teach and assess simple endoscopic skills and the need for development and validation of a pediatric simulation curriculum and short, feasible, simulation-based learning modules targeting specific skills to promote uptake across programs

Table 1: Details of endoscopic simulation-based training (N = 24 programs)

Characteristic	Number of programs (%)
Procedure(s) trained	
Upper endoscopy	22 (91.7%)
Colonoscopy	20 (83.3%)
Polypectomy	11 (45.8%)
Foreign body removal	8 (33.3%)
Endoscopic non-technical skills	3 (12.5%)
Liver biopsy	1 (4.2%)
Paracentesis	1 (4.2%)
Trainee level(s) trained	
PGY4	24 (100.0%)
PGY5	9 (37.5%)
PGY6	8 (33.3%)
PGY7 and above (advanced fellows)	1 (4.2%)
Type of simulator(s)	
Virtual reality (VR)	10 (41.7%)
GI Mentor/Symbionix	5 (20.8%)
EndoVR (CAE Healthcare/ AccuTouch)	1 (4.2%)
Don't know	3 (12.5%)
Other	1 (4.2%)
Mechanical	17 (70.8%)
Colonoscopy training model (e.g. Koken, Erlanger)	3 (12.5%)
Upper GI trainer	3 (12.5%)
Don't know	9 (37.5%)
Other	3 (12.5%)
Ex-vivo	2 (8.3%)
Live animal	1 (4.2%)
Hybrid simulation (simulated patient paired with simulator)	4 (16.7%)
Don't know	7 (29.2%)
Other	10 (41.7%)
Location(s) of simulator(s)	
Endoscopy unit	2 (8.3%)
Division (outside of endoscopy unit)	5 (20.8%)
Simulation center - inside hospital	12 (50.0%)
Simulation center - outside hospital	7 (29.2%)
Other	2 (8.3%)
Instructor(s)	
Unsupervised	11 (45.8%)
Pediatric gastroenterologist	20 (83.3%)
Adult gastroenterologist	3 (12.5%)
Nurse	1 (4.2%)

PGY: Postgraduate year

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Table 2: Perceived barriers to use of simulation among fellowship programs

Barriers	Programs with simulation (N=24)	Programs without simulation (N=19)
Cost/budget constraints	12 (50.0%)	13 (68.4%)
Fellow time constraints	10 (41.7%)	2 (10.5%)
Faculty time constraints	15 (62.5%)	3 (15.8%)
Lack of faculty training	7 (27.2%)	5 (26.3%)
Complicated set-up	1 (4.2%)	1(5.3%)
Lack of curriculum	12 (50.0%)	6(31.6%)
Accessibility	6 (25.0%)	7 (36.8%)
Not validated	6 (25.0%)	3 (15.8%)
Do not mimic real life	8 (33.3%)	5 (26.3%)
Unable to assess skills improvement	4 (67.7%)	1 (5.3%)
Not useful/ ineffective	0	2 (10.5%)
Small program	N/A	6 (31.6%)
High clinical case load	N/A	6 (31.6%)
Adult endoscopy rotation	N/A	4 (21.0%)
Other	2 (8.3%)	1 (5.3%)

20 ***VITAMIN D MONITORING IN PEDIATRIC IBD PATIENTS: IMPROVING PATIENT CARE AND VALUE.***

Kriston Ganguli, *Kathryn Czepiel*, *Esther Israel. Pediatric Gastroenterology*, *MassGeneral Hospital for Children*, *Boston*, *MA*

In this prospective quality improvement project, the Division of Pediatric Gastroenterology and Nutrition implemented a protocol to improve appropriate, seasonal monitoring of 25-OH-vitamin D levels in pediatric patients diagnosed with IBD in the outpatient setting.

Vitamin D deficiency has been linked to increased disease activity with more frequent relapses and failure of response to treatment in patients with IBD. Additionally, the role of vitamin D has been established in supporting bone health, which is compromised in many patients with IBD given the inflammatory state, altered nutritional intake and steroid exposure. These results argue for the potential use of vitamin D as a reasonable adjunctive therapy in IBD management for those patients who are deficient.

Due to fluctuations in parallel with sun exposure, the optimal time to measure 25-OH-vitamin D in the northeastern United States is when the level is at its nadir, which usually occurs in the late winter and early spring. The 2012 NASPGHAN recommendations on Health Supervision in the Management of Children and Adolescents with IBD recommended checking serum 25-OH-vitamin D levels at least once annually in the spring. Using a quality incentive bonus framework, our goal was to increase the number of patients with IBD who had their annual 25-OH-vitamin D levels measured between the months of December and May, while also decreasing the number of patients with IBD who had their vitamin D levels measured between June and August. Exclusion criteria during the summer months included patients with a 25-OH-vitamin D <30 ng/mL during the winter or spring prior to the summer encounter, as repeat levels after a course of vitamin D supplementation were considered clinically indicated.

Improvement efforts included the following: (1) sharing quarterly results with the providers, (2) enlisting the infusion nurse to add vitamin D level ordering during the appropriate months when patients presented for infusions, (3) regular presentations of data during weekly morning conference and (4) addition of vitamin D screening to our division's pre-visit planning process.

Data on the frequency of collection were reported to the Quality and Safety Team on a quarterly schedule over a multi-year study period. With an initial aim of measuring 25-OH-vitamin D in >60% of pediatric patients with IBD, monitoring during the winter and early spring improved from a baseline of 50% to 84.7% in the first year, which declined over the following three years to 71%. Monitoring during the summer decreased from a baseline of 16.2% to 3.7% over the same multi-year study period. The annual targets after the initial study period remained the same throughout the wintertime screening interval (>70%); however, targets were narrowed for the summertime screening based on prior performance and success (from <14.6% to <11.4%). See Figure 1.

In addition to the clinical benefit of improved screening practices, there were cost saving outcomes associated with the summer cycles of the protocol. Given the complexity of payment structures, the reimbursement rate of 25-OH-vitamin D

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levels ranges from $36.55-$85.00 per test. During the summer months from 2015-2017, we had on average 219 outpatient IBD patient encounters per month. With a 12.5% reduction in obtaining 25-OH-vitamin D levels during these encounters, we can conservatively estimate that this saved $987-$2295/month in total healthcare dollars.

Fig 1. Summary of Baseline Performance, Changing Targets and Performance

Year	Winter Target	Winter Result	Summer Target	Summer Result
2014 (Baseline)		50%		16.2%
2015	>60%	84.7%	<14.6%	11.4%
2016	>70%	74%	<14.6%	6.6%
2017	>70%	71%	<11.4%	3.7%
2018	>70%	71%		

21 ***THE EFFECTS OF CAPNOGRAPHY DURING SEDATION IN UPPER PEDIATRIC GASTROINTESTINAL ENDOSCOPIC PROCEDURES.*** *Nelgin Gerenli[1], Ebru Tarikci-Kilic[2]. [1]Pediatric Gastroenterology, Health Sciences University, Umraniye Training Hospital, Istanbul, Turkey; [2]Anesthesiology and Perioperative Care, Health Sciences University, Umraniye Training Hospital, Istanbul, Turkey*

Objective: The microstream capnograph is a device used to monitor pulse oxymeter (SpO2), end-tidal carbon dioxide (ETCO2), and integral pulmoner index (IPI) values via a nasal sample line on spontaneously breathing patient. Evidence up to date suggests using capnography is a more sensitive measure of ventilation than standard modalities.
We aimed to determine if adding capnography to standard monitoring during sedation of children undergoing esophagogastroduodenoscopy detects respiratory depression before hypoxemia occurs.
Methods: We enrolled 100 children aged 1-10 years undergoing esophagogastroduodenoscopy receiving sedation in pediatric endoscopy department. Exclusion criteria included intubation, preceding hypoxemia, abnormal ETCO2 values, astma and airway diseases. All the children received standard monitoring and capnography but randomization was performed to whether staff could view the capnography monitor (study group) or blind to the monitor (control group). American Society of Anesthesiologists classification, age, weight, indication for sedation, were recorded. Primary outcome was the rate of oxygen desaturation <90%.
Results: Fifty children were randomized to each group. The rate of hypoventilation and episode of oxygen desaturation per minute was significantly higher among controls. There were fewer and timely interventions in the study group compared with the control group. Interventions applied not in time with hypoventilation were associated with oxygen desaturation < 90%. All episodes of hypoventilation were due to hypopnea. Medication, gender, duration of sedation were not significantly associated with this outcome.
Conclusion: Hypoventilation is frequent during sedation of pediatric patients undergoing esophagogastroduodenoscopy. Capnography monitoring provides fewer exact timely interventions for apnea and hypoventilation improve the quality of care during sedation. We strongly recommend the use of capnography monitoring.
Keywords: Endoscopic procedures, End-tidal carbon dioxide, Capnography, Hypopnea, Hypoventilation

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Figure1: The distribution of ETCO2 at 1st second

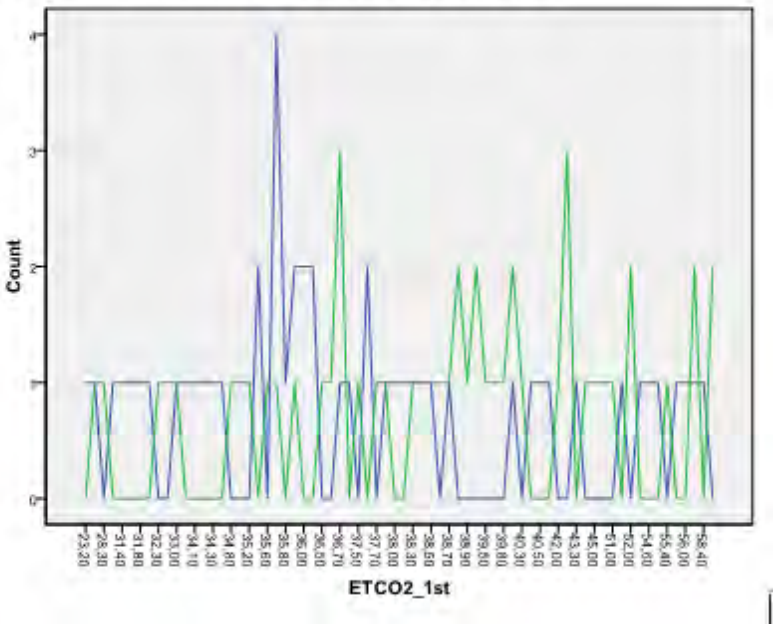
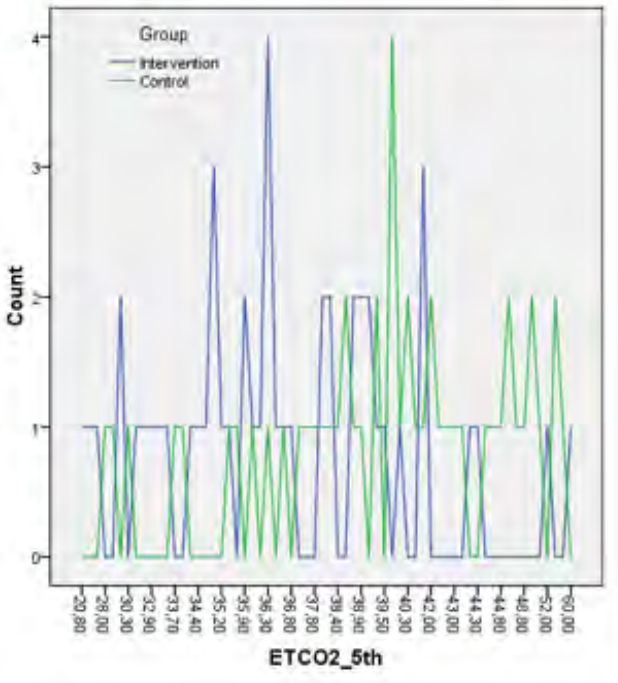


Figure 2: The distribution of ETCO2 at 5th second



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22 ***NASPGHAN NUTRITION UNIVERSITY (N2U): A SURVEY OF ITS EFFICACY AS CONTINUING NUTRITION EDUCATION FOR NASPGHAN MEMBERS.*** *Praveen Goday[1], Lauren Fiechtner[2], Catherine Larson-Nath[5], Nisha Mangalat[3], Ann Scheimann[4], Timothy Sentogo[6], Justine Turner[7]. [1]Pediatrics, Medical College of Wisconsin, Brookfield, WI; [2]Pediatrics, Massachusetts General Hospital, Boston, MA; [3]Pediatrics, St. Louis University, St. Louis, MO; [4]Pediatrics, John's Hopkins University, Baltimore, MD; [5]Pediatrics, University of Minnesota, Minneapolis, MN; [6]Pediatrics, University of Chicago, Chicago, IL; [7]Pediatrics, University of Alberta, Edmonton, AB, Canada*

Background: NASPGHAN Nutrition University (N2U) has become a staple of nutrition education provided to NASPGHAN members. Through N2U we have hoped to improve nutrition knowledge acquisition and dissemination in the attendees. The N2U course has been offered annually by the NASPGHAN Foundation with the support of an educational grant from Nutricia. Attendees have included third-year pediatric gastroenterology fellows, pediatric gastroenterologists, registered dietitians and nurse practitioners. We conducted a survey of all past attendees to determine information on their comfort with nutrition support as learned from N2U and to determine potential dissemination of the knowledge learnt.

We hypothesized that N2U attendees would feel confident in the management of the frequent nutrition problems that they encounter and that they would have disseminated the information learned at N2U. .

Methods: A 20-item web-based survey, developed by members of the NASPGHAN Nutrition Committee, was sent to the 300 NASPGHAN members who have attended N2U (2012-2019). Survey questions addressed topics regarding the frequency with which various nutrition problems are encountered by respondents as well as the individual's confidence in managing these problems. Both closed and open-ended responses were included in the survey instrument. The survey opened in May 2019 and will close October 2019; and to maximize response rates, reminders will be sent out on a monthly basis. This study does not involve human study subjects and was therefore not reviewed by our local institutional review board.

Results: At this point in time, 48 members have responded to the survey: 41 (85.4%) from the US, 5 (10.4%) from Canada, and 2 (4.2%) from Mexico. Thirty-eight of the respondents were physicians (79.2%), 9 were dietitians (18.8%) and one was a nurse practitioner (2.1%). Only 53.1% of physician respondents indicated receiving training in nutrition in their GI fellowship.

A majority of respondents were confident in the nutrition management of most conditions surveyed (strongly agreed or agreed) (Table 1). Respondents expressed highest confidence in management of general pediatric malnutrition and nutritional problems in inflammatory bowel disease. The only conditions where respondents felt less confident in the nutrition management were cardiac disease (50%) and cystic fibrosis (37.5%).

A majority of respondents felt confident interpreting laboratory markers of protein-energy malnutrition or micronutrient nutriture (75%) and anthropometric measurements, like skinfolds and muscle circumferences (56.3%). However, only 35.4% felt confident interpreting dual energy X-ray absorptiometry for assessment of bone mass and body composition.

Since the survey was administered shortly after N2U 2019, we analyzed data about dissemination of knowledge from participants up to 2018. In this group, 34 /37 (91.9%) between 2012-2018 disseminated their knowledge gained at N2U: 73% gave grand rounds or other educational lectures, 35.1% developed a nutritional educational curriculum, 48.7% used the knowledge to develop clinical practice guidelines/policies and 29.7% used other methodologies for dissemination.

Conclusions: In conclusion, N2U respondents indicated a high level of confidence in managing nutrition issues in a variety of conditions commonly encountered by the pediatric gastroenterologist. Only half of the physicians indicated receiving training in their fellowship making N2U the primary method for formalized nutrition education in this group. Nearly all of the participants disseminated their knowledge obtained at N2U as well. Most medical schools, residencies and fellowships lack formal nutrition education, N2U has filled this gap for our NASPGHAN members and appears to support ongoing nutrition education to improve patient care beyond the course itself.

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Table 1

	Frequency of seeing patients (either daily or weekly)	Feel confident in managing nutrition issues in these conditions (either strongly agree or agree)
Malnutrition	70.8%	81.3%
Allergic GI disease (eosinophilic gastroenteritis, eosinophilic esophagitis, FPIES, etc.)	63.8%	74.5%
Feeding disorders	62.5%	72.9%
Inflammatory bowel disease	60.4%	87.5%
Obesity	58.3%	64.6%
Short bowel syndrome	35.4%	64.6%
Liver disease	29.8%	63.8%
Critical illness	16.7%	54.2%
Cystic fibrosis	12.3%	37.5%
Cardiac disease	6.3%	50%

24 ***BUTTON BATTERY "TIME TO REMOVAL": 10-YEAR EXPERIENCE AT A SINGLE TERTIARY REFERRAL MEDICAL CENTER.*** *Elizabeth Sinclair[1], Matthew Santore[2], Cary Sauer[1], Erica Riedesel[3]*
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Background: Button battery ingestions with esophageal impaction have dramatically increased in our area over the past 10 years, mirroring national data from the National Capital Poison Control Center. National guidelines on initial evaluation and clinical management of button battery were introduced in 2015 by NASPGHAN. The guidelines recommend removal of esophageal batteries within 2 hours of ingestion. Removal of gastric batteries are recommended if patient is symptomatic, multiple batteries or a magnet are also ingested, or < 5 years old and battery > 2cm. Our institution is a large referral center which serves many rural facilities in multiple states and removal within 2 hours is often not feasible.

Objectives: Systematic review of "time to removal" of esophageal button batteries at our facility. Assessment of EGD performed for button batteries in the stomach from 2017-2018. Identify barriers and challenges to timely removal

Design/Methods: Retrospective chart review button battery ingestions from 2009-2018.

Results: A total of 204 patients presented with ingested button battery at our institution from 2009-2018; 44 in the esophagus, 117 in the stomach, and 47 in the bowel. Battery diameter > 20mm was highly associated with esophageal impaction. All esophageal button batteries were endoscopically removed by pediatric GI or pediatric Surgery.

Of the 44 cases, 3 were removed within 2 hours, 12 within 4 hours, and 16 within 6 hours (Figure 1). Significant barriers to timely removal included misidentification, lack of parental suspicion, and need for transfer (Figure 2a-c). In at least 6 cases, the referring facility misidentified the button battery as a coin or token. At least two cases reported the PCP instructing parents to wait for the foreign body to pass prior to being seen or getting X-rays. 15 batteries were found without parental suspicion of foreign body (FB) ingestion. 41 of the esophageal button batteries were referred from an outside ED, urgent care, or primary care office.

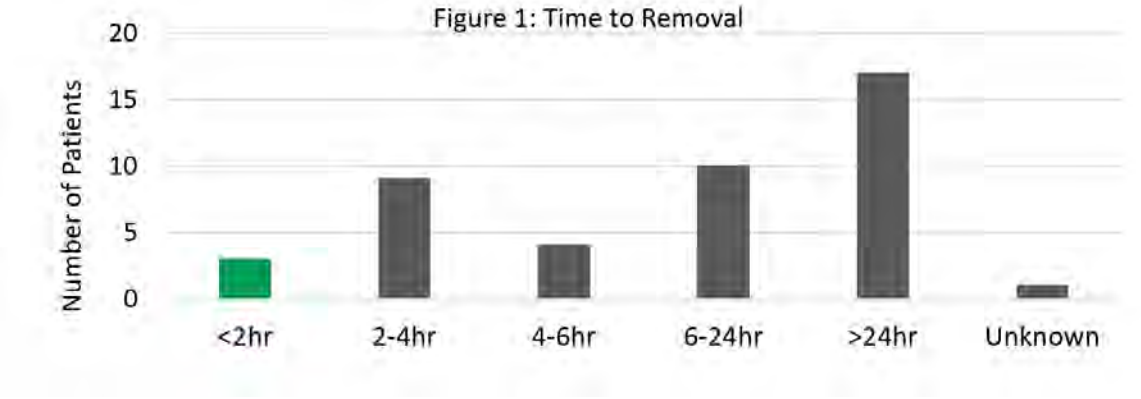
Of 35 cases of gastric button batteries from 2017-2018, 13 underwent endoscopy, 7 met criteria and underwent EGD, 6 did not meet criteria but had EGD (5/6 were <5 years), and 3 patients met criteria for EGD but did not undergo EGD.

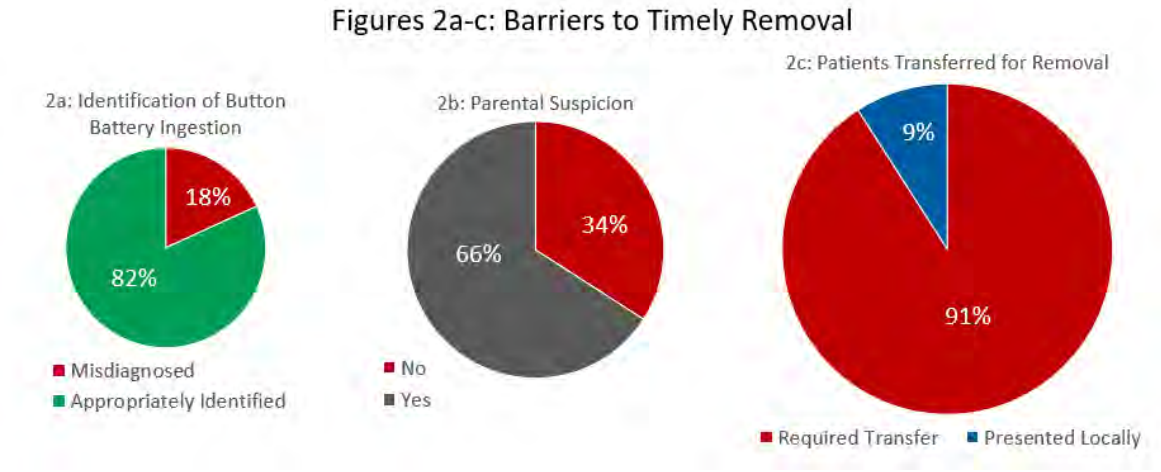
Conclusion: Only 5% of esophageal button batteries were removed within the prescribed 2 hours. 70% of patients with gastric button battery ingestion underwent EGD according to NASPGHAN guidelines. Six patients underwent EGD despite not strictly falling under the guidelines, most often due to young age. Challenges to meeting NASPHGAN guidelines include lack of parental suspicion of FB ingestion, misinformation regarding appropriate diagnosis and treatment, and misidentification of ingested FB as a coin or token. Additionally, our institution is a large referral center which serves many

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rural facilities in multiple states and transfer to a tertiary medical center has the potential to delay battery removal.

Further education of parents, general pediatricians, community urgent care, emergency department providers, and radiologists may significantly improve early diagnosis. Emerging data suggests administration of honey or sucralfate suspension prior to esophageal battery removal may prevent injury and National Capital Poison Center now recommends its use in select cases. This intervention may provide mucosal protection in patients who cannot be taken to endoscopic removal immediately, however further investigation is needed.





EOE/GERD/AERODIGESTIVE

26 ***APPLICATION OF THE PEDIATRIC FEEDING DISORDER DIAGNOSTIC CRITERIA (BASED UPON THE WORLD HEALTH ORGANIZATION INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY, AND HEALTH) TO IMPROVE UNDERSTANDING OF THE COMPLEX AERODIGESTIVE PATIENT.*** *Erin Alexander[1], Molissa Hager[1], Beth Ruechel[1], Laura Steinauer[2], Andrea Armellino[3], Rayna Grothe[1]. [1]Pediatric Gastroenterology and Nutrition, Mayo Clinic, Rochester, MN; [2]Pharmacy, Mayo Clinic, Rochester, MN; [3]Endocrinology, Diabetes, and Nutrition, Mayo Clinic, Rochester, MN*

Introduction: The new consensus definition of Pediatric Feeding Disorder (PFD) is defined as impaired oral intake that is not age appropriate, and is associated with medical, nutritional, feeding skill and/or psychosocial dysfunction.[1] A consensus statement on the structure and function of pediatric aerodigestive programs recognized the high prevalence of feeding and swallowing disorders in aerodigestive patients.[2] Additionally, the aerodigestive consensus statement listed clinical swallowing evaluations, fiberoptic endoscopic evaluations of swallow (FEES), videofluroscopic swallow studies (VFSS), and direct feeding therapy as essential components of an aerodigestive program. Thus, there is a potential that

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utilizing the consensus definition of PFD in any pediatric aerodigestive patient may enhance clinical care and aid in determining specific subtypes which may respond to specific therapeutic and prognostic interventions.
Objective: The objective of the study was to determine how the consensus definition of PFD can be applied to the initial evaluation and treatment recommendations for pediatric aerodigestive patients.
Methods: This is a retrospective study that was approved by the Mayo Clinic Institutional Review Board. Medical records of 25 patients enrolled in the Mayo Clinic Children's Center Aerodigestive Program were reviewed for documentation of dysfunction within the four specific domains of PFD (medical, nutritional, feeding skill level and psychosocial). The medical dysfunction domain for PFD, defined as the presence of aspiration or cardiopulmonary compromise, was recorded. To assess the nutrition domain, Z scores for growth were recorded, as well as the need for enteral feeding. To document dysfunctional feeding skill level, the use of modified feeding strategies (i.e. thickened feeds and use of specialized feeding equipment) and episodes of gagging and/or coughing with feeds were recorded. The psychosocial dysfunction domain was determined by recording developmental delay and behavioral health issues. The aerodigestive evaluation, consisting of esophagogastroduodenoscopy (EGD), pH impedance probe, microlaryngoscopy and bronchoscopy (MLB), FEES, and VFSS was reviewed. Z scores for height and weight were also assessed 6 to 12 months after aerodigestive intake.
Results: Fifty-six percent of the patients (n=14) were female. The age range of patients was 0-7 years, with a mean age of 1.84 years. Dysfunction in all 4 PFD domains was observed in 32% of the patients (n=8). Dysfunction in 3 domains was observed in 48% (n=12). Dysfunction in 2 domains was observed in 16% (n=4). Dysfunction in 1 domain was observed in 4% (n=1). The PFD domain with the highest incidence was medical dysfunction, at 96% of the patients (n=24). Feeding dysfunction was observed in 76% (n=19). Psychosocial dysfunction was observed in 76% (n=19). Nutritional dysfunction was observed in 60% (n=15). The aerodigestive workup revealed 84% of the patients (n=21) had an abnormality of the airway, 72% (n=18) had bronchitis, and 12% (n=3) had esophagitis. Aspiration and/or penetration on FEES and VFSS was observed in 40% of patients (n=10). There was no association with esophagitis and aspiration/penetration, but there was an association of bronchitis with aspiration/penetration (p= 0.0054). At the conclusion of the aerodigestive evaluation, 64% of the patients (n=16) had disordered feeding mentioned on the problem list, and 48% (n=12) had documented recommendation to alter feeding method. Improved Z score for weights was seen in 76% of patients (n=19) 6 to 12 months post aerodigestive evaluation. The mean change in Z score for weight was +0.62 (p =0.0004).
Conclusion: In this study cohort of 25 aerodigestive patients, at least one dysfunctional domain for PFD was met by all 25 with the majority of patients having dysfunction in 3 or greater domains. The most commonly identified PFD domain in this population was medical dysfunction. Aerodigestive patients have a high incidence of PFD, and utilizing the consensus definition of PFD at intake may enhance clinical evaluation and interventions to improve outcomes.

[1] Pediatric Feeding Disorder-Consensus Definition and Conceptual Framework: JPGN 2019:68: 124-129.

[2] Structure and Functions of Pediatric Aerodigestive Programs: A Consensus Statement. Pediatrics 2018 Mar; 141(3):e20171701

27 *EOSINOPHILIC GASTROINTESTINAL DISEASE IS COMMON FOLLOWING INTESTINAL TRANSPLANTATION.*

Brandon Arnold[1,3], Lin Fei[4], Huayiu Zang[4], Adam Magier[2], Vincent Mukkada[1,3], Samuel Kocoshis[1,3], Patricia Fulkerson[2,3]. [1]Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Division of Allergy and Immunology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Department of Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Division of Biostatistics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Background and Aims: The incidence of eosinophilic gastrointestinal disease (EGID) has been reported to be higher following solid organ transplantation than in the general population. We reviewed incidence of EGID following single organ intestinal transplant or multi-visceral transplants at our institution.

Methods: We completed a retrospective chart review on twenty-six patients who were followed at our center after intestinal or multi-visceral transplant between 2003-2016. Patients receiving organ transplant prior to age of 18 and followed for at least 1 year from transplant at our institution were included. Histological criteria (> 15 eosinophils in the esophagus, >30 in the stomach, and >60-100 depending on location in the colon) were used for EGID diagnoses. Eosinophil infiltration of the native gastrointestinal (GI) tract only was included and not the allograft. Comparisons were done using Fisher's exact test and Mann-Whitney two-tailed test.

Results: Of the 26 individuals followed for minimum of a year after intestinal or multi-visceral transplant, 15 (15/26, 58%) individuals were subsequently diagnosed with EGID. Twelve patients (12/26, 46%) were diagnosed with eosinophilic esophagitis (EoE), one of whom also had eosinophilic gastritis (EG). One patient had EG and eosinophilic colitis (EC) and

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one each with EC or EG. The mean age at diagnosis of EGID was 7.56 ±5.10 years and developed on average 5.20 ±3.59 years from transplant. There was no significant difference between age at time of transplant in the EGID vs non-EGID (2.35 ±2.91 vs 4.08 ±5.07) cohorts. All (15/15) patients who developed EGID were on tacrolimus at the time of the EGID diagnosis. Five (5/15, 33%) EGID patients developed IgE-mediated food allergies post-transplant, as well as 2 (2/11, 18%) in the non-EGID group. Three patients (3/15, 20%) were diagnosed with PTLD prior to EGID diagnosis, while no (0/11) PTLD diagnoses occurred in the non-EGID group. Rejection occurred at a greater frequency in the EGID group than the non-EGID group in patients with data prior to diagnosis (13/14, 93% vs 7/11, 64%). Mean time from first rejection episode to developing EGID was 3.74 ±2.74 years. Grade of rejection experienced had no correlation with the future development of EGID. All patients responded to standard treatments, most frequently topical steroids. Eleven (11/13, 85%) EGID patients we have diet records for were taking at least a partial PO ad lib diet at time of diagnosis, one each of PO formula and formula by G-Tube. All 11 patients who did not develop EGID advanced to a PO ad lib diet after transplant. No statistically significant correlation was found to exist between number of admissions for intravenous antibiotics and developing EGID.

Conclusion: The prevalence of EGID disorders in intestinal transplants is much higher than the general population and other single solid organ transplants Close screening for EGID development following intestinal transplant is warranted.

	EGID (n=15)	Non-EGID (n=11)	P-value
Mean age at transplant (yr) (SD)	2.35 (2.91)	4.08 (5.07)	.2835
Median age at transplant (yr) (IQR)	0.97 (0.73-3.12)	1.46 (0.46-16.02)	.6098
Male	6(40%)	7(47%)	.4283
ATG Induction	13(87%)	9(82%)	.7350
PTLD	3(20%)	0(0%)	.2385
ACR prior to EGID	13(87%)	8(73%)	.6196
GVHD	4(27%)	1(9%)	.3562
Food Allergies post tx	5(33%)	2(18%)	.6576
Peak AEC post tx	1.24 (0.89)	1.63(1.56)	.4397
Gastroschisis	2(13%)	3(27%)	.6196
Necrotizing Enterocolitis	3(20%)	1(18%)	1.00
Intestinal atresia	1(7%)	3(27%)	.2789
Malrotation	2(13%)	0(0%)	.4923
Volvulus	3(20%)	4(36%)	.4065
Megacystitis/Microcolon	4(27%)	0(0%)	.1134
Hypoperistalsis (Pseudo-obstruction)	4(27%)	0(0%)	.1134
Aganglionosis	0(0%)	2(18%)	.1692
Other	2(13%)	3(27%)	.6196

Patient #	Sex	PreTx Diagnosis	Age at Tx (yr)	Age at EGID dx	Time to EGID dx	Symptoms	Location	Eos	Visual
1	M	Intestinal atresia	0.73	2.98	2.25	Diarrhea	Esophagus	46	Furrows
2	M	Other	3.12	5.01	1.89	Diarrhea	Esophagus	29	Ulcers
3	F	MMIH	1.72	5.35	3.63	Weight loss	Esophagus	74	Normal
4	M	NEC	0.73	5.21	4.47	Diarrhea	Esophagus	60	Furrows
5	F	MMIH	3.31	10.01	6.71	Dysphagia	Esophagus	15	Ulcers
6	M	Malro/Volvulus	0.68	6.34	5.68	Abd Pain	Esophagus	36	Furrows
7	F	Gastroschisis	0.84	1.44	0.60	PTLD/Ulcers	Stomach/Colon	31	N/A
8	F	NEC	1.29	4.29	3.00	Elevated LFTs	Stomach	>30	-
9	F	MMIH	0.53	4.01	3.48	Elevated LFTs	Esophagus	20	No report
10	F	MMIH	0.85	3.84	2.99	Abd Pain	Esophagus	43	Exudates
11	M	Volvulus	0.97	7.12	6.15	Diarrhea	Esophagus	83	Furrows
12	M	Malro/Volvulus	0.80	10.42	9.62	Dysphagia	Esophagus	24	Normal
13	F	NEC	1.47	13.44	11.97	Rejection concern	Esophagus	74	No report
14	F	Hypoperistalsis	10.26	13.52	3.26	Abd Pain	Colon	>60	N/A
15	F	Gastroschisis	8.04	20.41	12.37	Abd Pain	Esophagus	40	No report

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28 ***INVESTIGATING PREDICTORS OF EOSINOPHILIC ESOPHAGITIS IN CHILDREN WITH ESOPHAGEAL DYSFUNCTION UNDERGOING INITIAL ENDOSCOPY.*** *Paroma Bose[1], Eric Albright[3], Muhammad Idrees[3], Anthony Perkins[4], Cindy Sawyers[1], Sandeep Gupta[2], Emily Hon[1]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, Riley Hospital for Children/ Indiana University School of Medicine, Indianapolis, IN; [2]Pediatric Gastroenterology, Hepatology, and Nutrition, Children's Hospital of Illinois/University of Illinois College of Medicine, Peoria, IL; [3]Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis, IN; [4]Biostatistics, Indiana University School of Medicine, Indianapolis, IN*

Background: Eosinophilic esophagitis (EoE) is a clinicopathologic disease that requires endoscopy for evaluation. At this time, we do not have non-invasive methods to differentiate between EoE and non-EoE causes of esophageal dysfunction. The Pediatric Eosinophilic Esophagitis Symptom Score version 2 (PEESSv2.0) is an EoE-specific validated outcome metric for use by children and parents/caregivers, but its use has not been explored outside of EoE.

Objectives: Our primary aim was to determine if demographics, clinical history, or PEESSv2.0 scores can differentiate between EoE and non-EoE patients in children undergoing initial endoscopy for esophageal dysfunction.

Methods: A prospective cohort study of pediatric patients was conducted at our center after IRB approval. Children ages 1-18 undergoing initial endoscopy for esophageal dysfunction were enrolled. Demographics, clinical history, and child self-report and parent-proxy report PEESSv2.0 symptom scores were collected at the time of endoscopy. Esophageal biopsies were reviewed by two blinded pathologists. EoE was defined as ≥ 15 eos/hpf seen in any level of the esophagus on biopsy with symptoms of esophageal dysfunction. Non-EoE was defined as < 15 eos/hpf.

Results: 72 children were enrolled in the study from 2015 to 2018 [58% (42/72) males; mean age 9.4 years; age range 1-17 years]. 56% (40/72) had ≥ 15 eos/hpf on esophageal biopsy and met criteria for EoE. 43% (31/72) had < 15 eos/hpf and were labeled non-EoE. Children with EoE trended towards being older than non-EoE patients (mean age 10.4 vs 8.3 years, p=0.070). Children with EoE were more likely to be male than non-EoE patients (70% vs 45.2%; p=0.051). Presence of personal or family history of atopy did not differ between these groups. Non-EoE children and their parents had higher (worse) mean PEESSv2.0 total scores than those with EoE (p=0.001 for child-report and p=0.049 for parent-proxy). Child and parent-proxy PEESSv2.0 dysphagia subdomain scores did not differ between EoE and non-EoE groups.

Conclusions: Children with EoE tended to be older and of male gender than non-EoE patients. Personal or family history of atopy did not increase likelihood of diagnosing EoE. Interestingly, the total PEESSv2.0 scores were worse in non-EoE group compared to EoE group. We plan to explore this unexpected finding by analyzing PEESSv2.0 subdomains and compare PEESSv2.0 with other EoE outcome metrics. These data may help stratify likelihood of EoE prior to subjecting a child to initial endoscopy.

29 ***PPI RESPONSE IN CHILDREN WITH EOSINOPHILIC ESOPHAGITIS: A PROSPECTIVE STUDY.*** *Paroma Bose[1], Eric Albright[3], Muhammad Idrees[3], Anthony Perkins[4], Cindy Sawyers[1], Sandeep Gupta[2], Emily Hon[1] [1]Pediatric Gastroenterology, Hepatology, and Nutrition, Riley Hospital for Children/ Indiana University School of Medicine, Indianapolis, IN; [2]Pediatric Gastroenterology, Hepatology, and Nutrition, Children's Hospital of Illinois/University of Illinois College of Medicine, Peoria, IL; [3]Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis, IN; [4]Biostatistics, Indiana University School of Medicine, Indianapolis, IN*

Background: Proton pump inhibitors (PPIs) are one of the main treatment options for eosinophilic esophagitis (EoE). High-dose PPI (HDPPI) response rates are 23-63% in pediatric studies which are largely retrospective.

Objectives: Our primary aim was to determine PPI response rate in children with EoE. Our secondary aim was to determine any clinical, endoscopic, or histologic characteristics that impact this PPI response.

Methods: A prospective cohort study of children was conducted at our center after IRB approval. Demographics, clinical history, child self-report and parent-proxy Pediatric Eosinophilic Esophagitis Symptom Scores version 2 (PEESSv2.0), EoE endoscopic reference scores (EREFS), and histologic scores were collected at endoscopies before and after a minimum of 8 weeks of HDPPI therapy. Esophageal biopsies were reviewed by two blinded pathologists. EoE was defined as ≥ 15 eosinophils/high powered field (eos/hpf) seen in any level of the esophagus on initial endoscopy with symptoms of esophageal dysfunction. Children with < 15 eos/hpf on repeat endoscopy were classified as having PPI-responsive (PPI-R) EoE. Children with ≥ 15 eos/hpf were classified as having PPI-nonresponsive (PPI-NR) EoE. The PEESSv2.0 was examined as a total score and a score of the dysphagia subdomain.

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Results: 72 children were enrolled in the study from 2015 to 2018 [58% (42/72) males; mean age 9.4 years; age range 1-17 years]. 40 children (56%) met criteria for EoE, and 25 of these patients had endoscopies before and after HDPPI therapy. 11 refused HDPPI, and 4 were lost to follow-up. 32% (8/25) of children had PPI-R EoE. Baseline characteristics (demographics, clinical history, child and parent-proxy PEESSv2.0 total scores, parent-proxy dysphagia subdomain scores, EREFS, and histology scores) were similar between PPI-R and PPI-NR EoE patients, except that baseline child dysphagia subdomain scores were higher (worse) in PPI-NR EoE patients compared to PPI-R EoE patients (17.8 vs 11.0, p=0.012). Parent-proxy PEESSv2.0 scores improved in both the PPI-R and PPI-NR EoE groups after HDPPI (28.1 to 15.4, p=0.046; 34.8 to 17.5, p=0.005). Child PEESSv2.0 total scores, and parent-proxy and child dysphagia subdomain scores improved significantly in the PPI-NR group after HDPPI (33.2 to 19.1, p=0.006; 18.9 to 8.9, p=0.004; 17.8 to 9.2, p<0.001). EREFS improved significantly in both PPI-R and PPI-NR EoE groups (p<0.001 and p=0.030), but had greater improvement in the PPI-R group compared to the PPI-NR group (p=0.017). Children in the PPI-R group had more improvement in histologic parameters of degranulation and basal cell hyperplasia compared to the PPI-NR group (p=0.016 and p=0.008).

Conclusions: 32% of children with EoE responded histologically to HDPPI therapy in this prospective study. There were no specific clinical characteristics that predicted who would respond to PPI therapy. As anticipated, endoscopic and histologic features of EoE improved more in the PPI-R group, although some endoscopic improvement was noted in the PPI-NR group as well. We did not expect to find that child and parent-proxy reported symptom scores would improve significantly in the PPI-NR group. The value of these symptom scores, along with other patient-reported outcomes (PROs), and their role in EoE management should be further studied.

30 ***MAST CELLS IN ADDITION TO EOSINOPHILS ARE ELEVATED AT BASELINE IN PATIENTS WITH EOSINOPHILIC GASTRITIS AND/OR GASTROENTERITIS.*** *Evan Dellon[3], Kathryn Peterson[2], Robert Genta[4], Joseph Murray[5], Nirmala Gonsalves[6], Mirna Chehade[7], Marc Rothenberg[8], Paneez Khoury[9], Adam Bledsoe[5], Camilla Shaw[1], Henrik Rasmussen[1], Bhupinder Singh[1], Alan Chang[1], Bradford Youngblood[1], Ikuo Hirano[6]*
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BACKGROUND: Accumulation and activation of eosinophils have been implicated in the pathogenesis of eosinophilic esophagitis (EoE), gastritis (EG), gastroenteritis (EGE), and colitis. Collectively termed eosinophilic gastrointestinal disorders (EGIDs), these conditions decrease quality of life due to debilitating symptoms like dysphagia, abdominal pain, nausea, and diarrhea. While the pathogenesis of EGIDs is primarily thought to be driven by eosinophils (eos), mast cells (MCs) have been shown to be elevated in EoE. The role of MCs in other EGIDs, has yet to be established.

AIM: To quantify the extent of eos and MC infiltration in gastric and duodenal biopsies from symptomatic patients with prior diagnosis or suspected EG/EGE at the time of screening for a Phase 2 randomized, placebo-controlled study of AK002, an anti-Siglec-8 antibody.

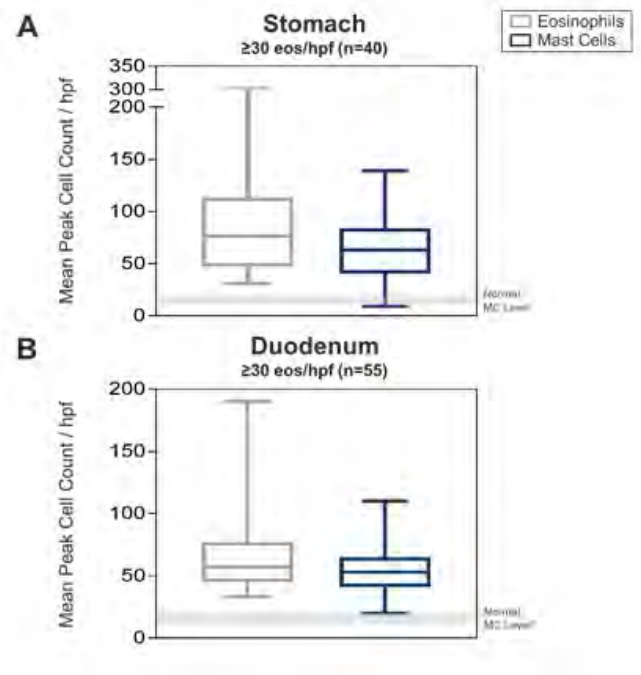
METHODS: To undergo screening endoscopy, patients were required to report an average symptom score ≥3 (on a 0-10 scale) for abdominal pain, nausea, and/or diarrhea on a daily patient-reported outcome questionnaire for at least 2 weeks and have no other known cause for GI symptoms. During the endoscopy, multiple biopsies were systematically taken from the stomach and duodenum, and evaluated by a single central pathologist. Eosinophil counts (eos/HPF; HPF area=0.237 mm^2) were assessed on H&E slides. To quantify MCs, tryptase immunohistochemistry was performed. Entry criteria for the randomized study was ≥30 eos/HPF in 5 HPFs in the stomach for EG and ≥30 eos/HPF in 3 HPFs in the duodenum for EGE.

RESULTS: To date, 88 patients underwent endoscopy with biopsy based upon meeting the active symptom threshold, and 65 met these criteria for EG/EGE based upon tissue eos count. Almost all patients (64/65; 98%) who met these criteria for EG/EGE also had elevated MC counts in the stomach and/or duodenum when compared to the normal range of reported MC numbers (12-20 MC/HPF). In patients with isolated EG or overlapping EG/EGE, the median peak gastric eos counts were 77 eos/HPF in 5 HPFs and the median peak gastric MC counts were 63 MC/HPF in 5 HPFs (Figure 1A). In patients with isolated EGE or overlapping EG/EGE, median peak duodenal eos counts were 57 eos/HPF in 3 HPFs, and median peak duodenal MC counts were 53 MC/HPF in 3 HPFs (Figure 1B).

CONCLUSIONS: This data from the screening phase of the largest randomized EG/EGE study to date, we found that in addition to GI eosinophilia, MC counts were elevated in gastric and duodenal tissue in symptomatic patients with isolated

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EG or EGE and in patients with overlapping EG and EGE. These data suggest a pathogenic role for both MCs and eos in EGIDs and that treatments for EGIDs may need to target both cell types for optimal effect.



31 ***BASELINE CHARACTERIZATION OF ADOLESCENT AND ADULT PATIENTS WITH EOSINOPHILIC ESOPHAGITIS (EOE) USING THE EOE HISTOLOGY SCORING SYSTEM: ANALYSES FROM A RANDOMIZED, PLACEBO-CONTROLLED TRIAL.*** *Margaret Collins[1], Evan Dellon[2], Ikuo Hirano[3], David Katzka[4], Vincent Mukkada[5], James Williams[6], Lan Lan[6], Nirav Desai[6]. [1]Department of Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Center for Esophageal Diseases and Swallowing, Division of Gastroenterology and Hepatology, Department of Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC; [3]Division of Gastroenterology and Hepatology, Northwestern University Feinberg School of Medicine, Chicago, IL; [4]Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN; [5]Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH; [6]Shire, a Takeda company, Lexington, MA*

Introduction: Differences in symptoms between adolescent and adult patients with eosinophilic esophagitis (EoE) have been documented; however, little is known about how these populations differ in terms of their histopathologic presentation. Furthermore, it is becoming clear that EoE disease activity cannot be measured by peak eosinophil count alone, and that a more complete assessment is required. The aim of this analysis was to compare the baseline histology of adolescents and adults with EoE using the EoE Histology Scoring System (EoE HSS).

Methods: Baseline data from a 12-week, phase 2, randomized, placebo-controlled trial of budesonide oral suspension in patients with EoE (MPI 101-06; NCT01642212) were analyzed. Patients were eligible for inclusion if they were aged 11–40 years and had EoE with dysphagia. Esophageal biopsies from patients were examined, and mean individual EoE HSS grade and stage scores were calculated at baseline for each histopathologic feature for all patients (irrespective of treatment allocation). The EoE HSS examines 8 histopathologic features: eosinophilic inflammation (EI); basal zone hyperplasia (BZH); eosinophilic abscess (EA); eosinophilic surface layering (SL); dilated intercellular spaces (DIS); surface epithelial alteration (SEA); dyskeratotic epithelial cells (DEC); and lamina propria fibrosis (LPF). Grade scores assess the severity of each feature, whereas stage scores assess how much of the tissue (<33%, 33–66%, or >66%) is affected. Features were scored for grade and stage (0–3 points for each feature; higher scores represented increased severity or extent). Data were stratified by patient age: adolescents, 11–17 years; adults, 18–40 years.

Results: In total, 93 patients were enrolled. Of these, 87 patients were included for analysis (adolescents, n=33; adults,

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n=54); 57 of whom had an evaluable lamina propria (adolescents, n=23; adults, n=34). The proportion of patients with each feature at baseline was similar between adolescents and adults, with the exception of SL (adolescents, 66.7% [22/33]; adults, 48.1% [26/54]; **Figure**). At baseline, the most severe features (grade and stage) were EI, BZH, DIS and LPF for both adolescents and adults (**Table**). At baseline, mean (standard deviation) EoE HSS individual feature scores for grade and stage were similar between adolescents and adults, with the exception of grade scores for DIS (2.3 [0.9] vs 2.7 [0.5]; p=0.013) and stage score for DIS and SL (2.2 [0.9] vs 2.8 [0.5]; p<0.001; 0.5 [0.7] vs 0.3 [0.4]; p=0.028, respectively) (**Table**).

Discussion: The most severe histopathologic features at baseline for both adolescents and adults with EoE were EI, BZH, DIS, and LPF; however, grade and stage scores for DIS were higher in adult patients, whereas stage scores for SL and presence of this feature at baseline were higher in adolescents with EoE. This suggests that the EoE HSS is widely adaptable across age groups and could become an essential tool to measure EoE disease activity in different patient populations. Future studies using the EoE HSS may help to elucidate pathophysiologic changes in the progression of EoE over time.

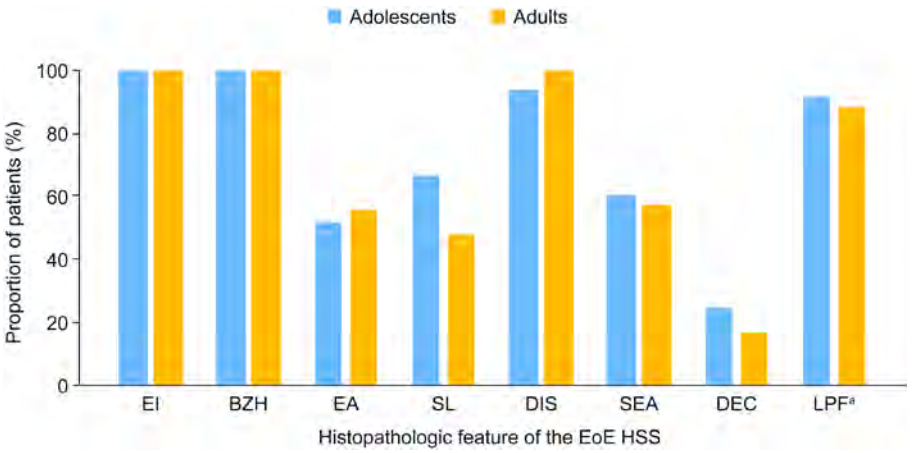


FIGURE. Proportions of patients with each histopathologic feature at baseline for all patients, stratified by age (adolescents [aged 11–17 years], n=33; adults [aged 18–40 years], n=54).
[a]Adolescents, n=23; adults, n=34.
BZH, basal zone hyperplasia; DEC, dyskeratotic epithelial cells; DIS, dilated intercellular spaces; EA, eosinophilic abscess; EI, eosinophilic inflammation; EoE HSS, Eosinophilic Esophagitis Histology Scoring System; LPF, lamina propria fibrosis; SEA, surface epithelial alteration; SL, eosinophilic surface layering.

	Mean grade (severity) score			Mean stage (extent) score		
EoE HSS individual feature score	**Adolescents (aged 11–17 years)**	**Adults (aged 18–40 years)**	***p* value**	**Adolescents (aged 11–17 years)**	**Adults (aged 18–40 years)**	***p* value**
Eosinophilic inflammation (EI)	2.5 (0.5)	2.5 (0.5)	0.740	2.2 (0.8)	2.1 (0.8)	0.464
Basal zone hyperplasia (BZH)	2.3 (0.8)	2.3 (0.7)	0.622	2.4 (0.7)	2.5 (0.7)	0.593
Eosinophilic abscess (EA)	0.5 (0.6)	0.5 (0.7)	0.990	0.4 (0.4)	0.3 (0.4)	0.622
Eosinophilic surface layering (SL)	0.6 (0.7)	0.4 (0.6)	0.217	0.5 (0.7)	0.3 (0.4)	0.028
Dilated intercellular spaces (DIS)	2.3 (0.9)	2.7 (0.5)	0.013	2.2 (0.9)	2.8 (0.5)	<0.001
Surface epithelial alteration (SEA)	0.9 (1.1)	0.8 (1.0)	0.598	0.7 (0.8)	0.5 (0.5)	0.201
Dyskeratotic epithelial cells (DEC)	0.1 (0.3)	0.1 (0.2)	0.339	0.1 (0.3)	0.1 (0.2)	0.261
Lamina propria fibrosis[a] (LPF)	2.1 (0.9)	2.0 (1.0)	0.802	2.6 (0.9)	2.4 (1.0)	0.434

TABLE. Mean (SD) EoE HSS grade and stage individual feature scores at baseline for all patients, stratified by age (adolescents, n=33; adults, n=54).
p values are based on a pooled two-sample t-test.

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[a]Adolescents, n=23; adults, n=34.
EoE HSS, Eosinophilic Esophagitis Histology Scoring System; SD, standard deviation.

32 ***EOSINOPHILIC ESOPHAGITIS AND PPI USE IN A RACIALLY DIVERSE COHORT.*** *Caitlin Cutler[1], Seema Khan[1], Hemant Sharma[1], Sohel Rana[2]. [1]Children's National Medical Center, Washington, DC; [2]Children's National Medical Center, Washington, DC*

Background: Eosinophilic Esophagitis (EoE) is a clinicopathalogic condition of chronic immune-mediated inflammation of the esophagus. It is the leading cause of dysphagia and food impaction in both children and adults. Given the causative role of food allergens and environmental triggers, elimination diets and topical corticosteroids (TCS) are two common treatments. A revised treatment algorithm also proposes an important role for Proton Pump Inhibitor (PPI) in the induction of clinical and histological remission of EoE; however data is limited and low quality in pediatrics. At Children's National Health Center (CNHC) approximately 50% of patients are of non-Caucasian ethnicity, creating a unique opportunity to study the presentation and outcomes of a diverse population.

Methods: A retrospective cohort study evaluating clinical and histological response to PPI in patients with a confirmed diagnosis of EoE (at least 15 eos/hpf on esophageal biopsy). We included those patients who had PPI as monotherapy or subsequent to prior failed therapy (dietary, TCS) to allow for a separate evaluation. Histology <15 eos/hpf was considered "response" and <5 eos/hpf considered "remission." Treatment outcomes were then compared between Caucasian and non-Caucasian patients. Additionally, we analyzed if concurrent atopy was predictive of a PPI response. We used Mann–Whitney U test for continuous data, and Chi-square, Fisher's or Fisher's exact tests for categorical data.

Results: Prior to scope 1, 61 (49%) patients out of 124 did not use PPI. Out of these 61 patients, 46 then used PPI in a subsequent scope. Among these, 11 patients (24%) had response/remission. Average PPI dose was 1.2 mg/kg/day, with Lansoprazole being the most commonly prescribed followed by Omeprazole. Analysis of demographics showed 70% male, 30% female, 40% Caucasian, 46% African-American, and 15% of other race. Average age at onset of symptoms was 0.6 years old in the response/remission group and 2.3 years old in the non-response group (P=0.09), with average at diagnosis 2.2 years old and 3.1 years old respectively (P=0.22). However, this difference was not shown to be statistically significant. There was also no statistical significance between remission/response and non-response with gender (P=0.31) or race (P=0.65). Lastly, history of atopy (IGE food allergy, allergic rhinitis, asthma, and eczema) was compared between the response/remission and non-response groups. IGE food allergy was present in 64% of the response/remission group and 40% of the non-response group (P=0.170). Allergic rhinitis was present in 73% of the response/remission group and 40% of the non-response group (P=0.058). Asthma was present in 64% of the response/remission group and 26% of the non-response group (P=0.021). Eczema was present in 73% of the response/remission group and 26% of the non-response group (P=0.005). History of any atopy was present in 100% of the remission/response group and 69% of the non-responders, which was statistically significant (P=0.033).

Conclusion: Treatment with PPI was not sufficient to induce histological response/remission. Limitations include suboptimal PPI dosing and medication adherence. We speculate that the low PPI response in this cohort as compared to published reports of higher response rates may be due to an ethnically diverse (non-Caucasian majority) cohort and epigenetic factors, an interesting focus for future study. Consistent with the work of others, a high rate of atopic disorders was observed among PPI responders. Overall, further studies with lager sample sizes are needed to assess the role of PPI in treatment of EoE and the influence of race and atopy.

33 ***ACID SUPPRESSION DOES NOT IMPROVE LARYNGOMALACIA OUTCOMES.*** *Daniel Duncan[2,1], Kara Larson[2,4], Reza Rahbar[3,4], Rachel Rosen[2,1]. [1]Gastroenterology, Boston Children's Hospital, Boston, MA; [2]Aerodigestive Center, Boston Children's Hospital, Boston, MA; [3]Center for Airway Disorders, Boston Children's Hospital, Boston, MA; [4]Otolaryngology, Boston Children's Hospital, Boston, MA*

Background: Infants with laryngomalacia are often treated with acid suppression medications due to concerns about reflux contributing to disease severity. It is not known if this approach improves outcomes or if practice patterns have changed with increasing recognition of the risk of acid suppression medications. The aim of this study was to determine if acid suppression use has changed over time, if acid suppression use is associated with increased need for supraglottoplasty, and if swallowing dysfunction remains common in infants with laryngomalacia.

Methods: We reviewed the records of all children under 1 year who had a diagnosis of laryngomalacia at Boston Children's Hospital between 2015 and 2017 to determine subject characteristics and acid suppression use including proton pump inhibitors (PPI) and H2 receptor antagonists (H2RA). Charts for a subgroup of the most recent 100 subjects from 2017 were reviewed in detail to determine laryngomalacia severity, videofluoroscopic swallow study (VFSS) results,

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hospitalization risk, and proportion requiring supraglottplasty. Proportions were compared with Fisher's exact test and continuous variables were compared with t-tests.

Results: 982 subjects with a mean age of 65.2±2.3 days were seen with a diagnosis of laryngomalacia. The use of acid suppression remained constant over time, with the proportion of PPI use decreasing while H2 antagonist use increased (Table 1). Patient characteristics for the 100 patient subgroup are shown in Table 2. Of the 100 patients, 19% required supraglottoplasty at 5.6±1.1 months. 30% of subjects treated with any acid suppression underwent supraglottoplasty compared to only 8% of those not treated with acid suppression (OR 4.688, 95% CI 1.431-15.359, p=0.01). Subjects with moderate to severe laryngomalacia who were treated with acid suppression had significantly increased odds of supraglottoplasty (OR 48.0, 95% CI 2.47-932.85, p=0.009). There was no significant difference in hospitalization risk for subjects that were treated with acid suppression (p=0.497). 29% of the 100 subjects had VFSS at 4.8±0.6 months and of these 79% showed aspiration or laryngeal penetration. The proportion with abnormal VFSS did not vary by laryngomalacia severity (p=1.0). Subjects with abnormal VFSS were more likely to undergo supraglottoplasty compared to those not diagnosed with oropharyngeal dysphagia (48% vs 10%, p<0.001). Patients with abnormal VFSS were more likely to receive acid suppression than patients who did not have a VFSS or had a normal VFSS (p=0.029).

Conclusions: PPI use has decreased but overall acid suppression use has remained constant from 2015 to 2017, perhaps due to increased use of H2RA instead of PPIs. Acid suppression use does not appear to reduce the risk of progression to supraglottoplasty or reduce risk of aspiration.

Table 1: Acid Suppression Use Between 2015 and 2017

Year	2015	2016	2017	P-value
PPI	29% (96)	22% (80)	20% (56)	0.009
H2RA	25% (82)	26% (96)	30% (87)	0.248
Any Acid Suppression	43% (142)	39% (142)	40% (115)	0.46
Total Subject Number	327	369	286	

Table 2: Laryngomalacia Characteristics for 2017 Sub-group

		Total	Supraglottoplasty Required	No Supraglottoplasty	P-value
Mild Disease	Acid Suppression	46% (24)	8% (2)	92% (22)	1.0
	No Acid Suppression	54% (28)	11% (3)	89% (25)	
Moderate to Severe Disease	Acid Suppression	56% (9)	89% (8)	11% (1)	0.009
	No Acid Suppression	44% (7)	14% (1)	86% (6)	
All Subjects	Acid Suppression	49% (49)	30% (15)	70% (34)	0.01
	No Acid Suppression	51% (51)	8% (4)	92% (47)	

34 ***UTILITY OF BIOMARKERS IN PEDIATRIC EOSINOPHILIC ESOPHAGITIS FOR DIAGNOSIS AND EVALUATION OF RESPONSE TO TREATMENT.*** *Sonia Fernandez- Fernandez[1], Carolina Gutierrez-Junquera[2], Jose Antonio Cañas[3], Maria Luz Cilleruelo[2], Belen Borrell[1], Ana Isabel Rayo[1], Victoria Del Pozo[3], Enriqueta Román[2].*
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Background : The integrity of the esophageal epithelial barrier is impaired in patients with Eosinophilic Esophagitis, with a low production of associated proteins such as filaggrin (FLG). The later of Th2 hypersensitivity response, with the release of several proinflammatory cytokines, promote the secretion of CCL26 (Eotaxin-3), the recruitment of eosinophils and

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finally an increase of fibrosis and angiogenesis. The knowledge of the physiopathology of the disease, allows the determination of different biomarkers that could predict the esophageal inflammatory state.
Objective: The aim of our study is to analyze the expression of certain biomarkers in esophageal mucosa and in serum in: 1) Patients with EoE and controls; 2) Patients with EoE before and after treatment with proton pump inhibitors (PPIs).

Method: This is a prospective observational case-control study that includes children between 1-18 years with EoE and controls from two different Universitary Hospitals.
To quantify possible biomarkers in serum samples protein and lipid mediators, such IL5, IL13, IL33, IL-1B, IFN, TSLP, POSTN were analyzed by Luminex and Elisa assays. Gene expression assay by mRNA extraction of 12 different cytokines and growth factors : FLG, POSTN, TSLP, IL-5, IL-13, CCL26 (Eotaxin -3), CCR3, MAPK1, TGF-β1, EGF,VEGF. was performed in esophageal tissue samples

Results: 43 patients with EoE and 45 controls were included. The percentage of males was higher among the cases (83.7% vs 57%), without any differences about age (10.8 ± 2.9 / 10.3±3.2 years) or personal history of atopy (65% EoE / 55% controls). Peripheral eosinophilia was significantly higher in EoE than in controls (0.77 ± 0.48 / 0.33 ± 0.43 (eos / µl)) ($p < 0.01$) with a significant decrease after histological remission with PPIs (0.77 ± 0.48 / 0.42 ± 0.3 (eos / µl)) ($p < 0.05$). Of the 24 cytokines and other protein and lipid mediators determined in serum, there was only a significant increase in IL-1B cytokine, which returns to normal levels after remission with PPIs.
Regarding gene expression in esophageal biopsies, we found in EoE samples a significant increase in the levels of mRNA of POSTN, TSLP, IL-5, IL-13, CCL26, CCR3, MAPK1, TGF-β1, VEGF and SOCS3 ($p < 0.001$) genes and a downregulation of FLG ($p < 0.001$) gene compared to controls.
The gene expression of proinflamatory cytokines decreased significantly in EoE patients after histological remission with PPIs ($p < 0.05$-0.01) but FLG expression increased.
We observed an significant increase of proinflammatory cytokines, but also of FLG ($p < 0.05$) in EoE in remission with PPIs compared to healthy controls, (therefore, with normal esophageal histology in both cases)

Conclusions: Our findings support the anti-inflammatory and epithelial barrier protection effect of PPIs in EoE. However, patients with histological remission after PPIs do not reach the cytokine profile of the normal esophagus, confirming the underlying chronic inflammatory activity. Although we found an increased expression of the proinflammatory cytokine IL-B in serum of EoE patients versus controls, this cytokine is not so clearly related with EoE pathogenesis and further studies are needed to corroborate this finding. The expression of IL-1B in serum perhaps is not a consistent finding in relation with this disease and more studies are needed to corroborate or not this finding.

35 *USE OF UNSEDATED TRANSNSASAL ESOPHAGOSCOPY TO MONITOR DIETARY MANAGEMENT OF EOSINOPHILIC ESOPHAGITIS IN CHILDREN.*

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Introduction: Eosinophilic esophagitis (EoE) impacts 1 in 2000 children and adults in the United States. It affects quality of life and encumbers an estimated annual health expenditure of over$350,000,000. Traditionally, dietary management has included food elimination diets, followed by serial reintroduction and evaluation via sedated esophagoscopy of potentially non-trigger foods. The time course for eosinophilia with reintroduction of foods is uncertain and usually takes greater than 30 weeks for reintroduction of 5 foods[1]. Recently pediatric unsedated transnasal esophaogoscopy with biopsy (TNE) has been introduced as a successful lower-cost and safer alternative for evaluation[2]. To reduce costs and determine a faster time to achieve a stable treatment regimen, we hypothesized that TNE could be used to demonstrate mucosal relapse would occur prior to 6-weeks.

Methods: In this pilot study, we performed a single-site IRB approved study enrolling subjects with EoE who were 1) 8-22 years of age; 2) in histological remission; 3) on a 4-food or less dietary elimination therapy; and 4) whose primary physician was performing dietary food introduction(s). Two and 4 weeks after prescribed food introduction, subjects underwent TNE[2]. Subjects were able to choose sedated esophagoscopy with biopsy versus TNE at 6 weeks post food introduction. Biopsies (4 distal/4 proximal) were evaluated for eosinophil count, esophageal surface area (also baseline

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sedated esophagoscopy), and lamina propria (LP) presence. Subjects completed a baseline intake questionnaire and TNE satisfaction, diet adherence, and EoE symptom questionnaires at each endoscopic assessment. Time of TNE duration was also recorded (insertion to withdrawal).

Results: To date, four subjects qualified and were enrolled in the study. Subjects were challenged with dairy (n=1), soy (n=2), and egg (n=1). Esophageal eosinophilia (eos >15 hpf) returned in 1 soy subject and 1 dairy subject at week 2. The subject challenged with soy went into remission at week 4 but relapsed at week 6. The other persisted through week 4 and 6. Two additional subjects developed active EoE at week 4 (soy and egg) and continued at week 6. Amongst all patients (n=4), average peak esophageal eosinophil (eos) counts per high power field (hpf) were 3.5/hpf (SD 4.5, Range 0-10), 23/hpf (SD 29.5, Range 0-66) and 55/hpf (SD 68, Range 2-155) and 76/hpf (SD 105 Range 16-233) at weeks 0, 2, 4, and 6, respectively. Average peak mast cell (CD117) count per hpf were 18/hpf (SD 20.7, Range 4-49), 17/hpf (SD 18.8, Range 5-45), and 35/hpf (SD 27.9 Range 13-73) at 2, 4 and 6 weeks respectively. Baseline mast cells counts were not available. The eosinophil and mast cell levels over time are shown in Figure 1. LP was procured in 3 of 4 subjects' endoscopies. Difference between total average surface area of biopsies obtained during baseline sedated esophagoscopy (7.3 mm^2 SD 3.61 n=4) and TNE (10.5 mm^2 SD=3.69 n=12) was not significantly different (p=0.17). No significant adverse events were recorded. All subjects tolerated TNE and chose TNE for their 6-week endoscopy. Average time for TNE duration was 290 seconds (SD 50.4, Range 227-360).

Conclusion: Histological relapse following allergen challenge in pediatric patients with EoE occurs as early as 2-6 weeks. Early histological relapse evaluated by TNE provides a potential opportunity for a more rapid, safe, and cost-effective medical decision when treating this emerging rare disease.

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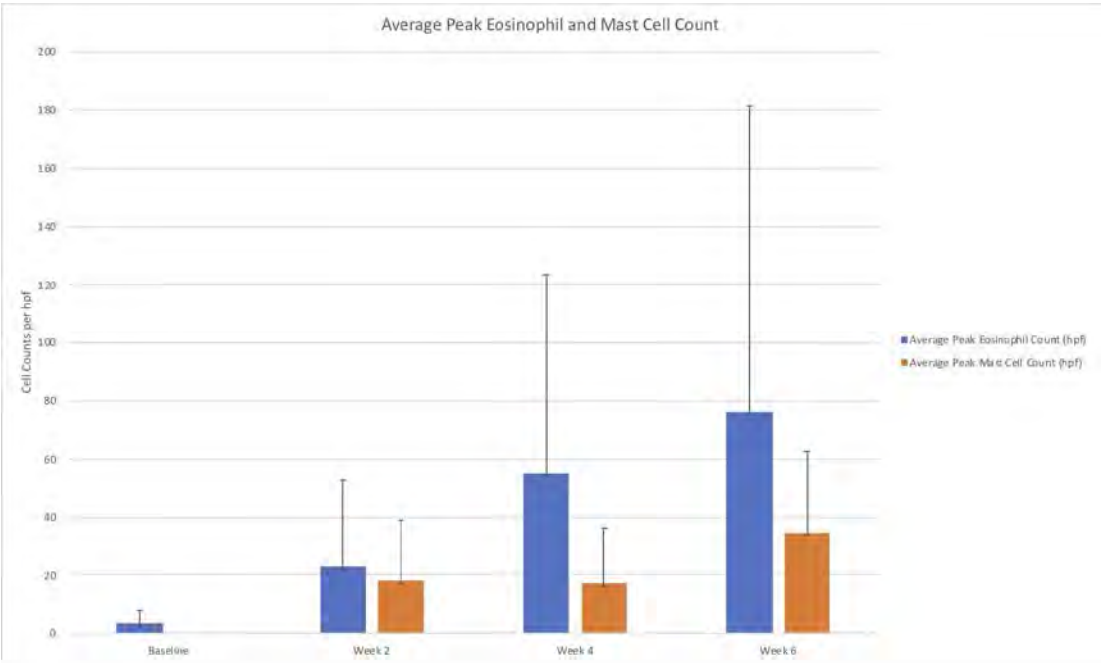


Figure 1

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36 ***MUTATION OF TGFBR1 IN NONHEMATOPOIETIC CELLS DRIVES EOSINOPHILIC INFLAMMATION IN THE ESOPHAGUS.*** *Anthony Guerrerio[1], Karen Lakey[2], Jessica Kinard[2], Jenny Li[2], Ajinkya Limkar[2], Helene Rosenberg[2], Pamela Frischmeyer-Guerrerio[2]. [1]Pediatrics, Johns Hopkins University School of Medicine, Baltimore, MD; [2]NIAID, NIH, Bethesda, MD*

Eosinophilic esophagitis is a chronic disease characterized by tissue-restricted eosinophilia, epithelial basal cell hyperplasia, and esophageal dysfunction. Genetic studies have identified variants that correlate with an increased likelihood to develop eosinophilic esophagitis. Among the top ten variants, nearly all occur in genes expressed by epithelial cells, and approximately one-third encode proteins involved in the transforming growth factor beta (TGFβ) signaling pathway. We demonstrate that mice engineered to have an autosomal dominant loss-of-function mutation in the kinase domain of Tgfbr1 spontaneously develop disease that clinically, immunologically, histologically, and transcriptionally recapitulates human eosinophilic esophagitis endotype 2. We further show that T-cells are not required for the development of esophageal eosinophilia, and, by creating bone-marrow chimeras, that altered TGFβ signaling in non-hematopoietic cells is necessary and sufficient to cause disease. By electron microscopy, transelectrical resistance, and molecular diffusion studies, we can demonstrate no evidence that the development of disease is due to impaired barrier function. Further, Tgfbr1 mutation impairs esophageal epithelial cell homeostasis resulting in tissue-restricted increases in proteins that act directly, indirectly, and synergistically to drive accumulation and activation of eosinophils, mast cells, and type 2 innate lymphoid cells. Lastly, esophageal enteroids, grown from esophageal stem cells derived from Tgfbr1 mice, show increased expression of proteins upregulated in human eosinophilic esophagitis, and the media from the cultured enteroids has potent eosinophil chemoattractant activity in migration assays. These data suggest new ways to approach the prevention and treatment of eosinophilic esophagitis.

37 ***EFFECTS OF PEDIATRIC EOSINOPHILIC ESOPHAGITIS AND ITS TREATMENT ON BONE HEALTH: A RETROSPECTIVE REVIEW.*** *Anna Henderson[1], Soofia Khan[1], Lindsey Hornung[2], Vincent Mukkada[1], Heidi Kalkwarf[1]. [1]Gastroenterology, Cincinnati Children's, Cincinnati, OH; [2]Biostatistics and Epidemiology, Cincinnati Children's Hospital, Cincinnati, OH*

Objectives: We aimed to determine whether patients with eosinophilic esophagitis (EoE) have lower bone mineral density (BMD) than expected and if bone deficits are more pronounced in subgroups of patients according to co-morbidities (atopic disease and joint hypermobility) or treatments (dietary restriction, medication exposure).

Methods: Retrospective chart review was performed to obtain relevant clinical data, including length of diagnosis, comorbidities, and methods of treatment for patients of ages 3 to 21 years with EoE with a lumbar spine DXA scan between January 1, 2014 and December 31, 2017. BMD Z-scores and height-for-age adjusted z-scores were computed to account for age, sex and race.

Results: 269 patients met study criteria. Overall, BMD Z-scores were slightly lower than expected for age, sex, and race (-0.55, 95% CI [-0.68, -0.42], $P < 0.0001$). BMD Z-scores were lowest among those with a history of proton pump inhibitor (PPI) use and following an elimination diet. Swallowed steroids, combined steroid exposure, and EoE disease duration and activity were not associated with BMD Z-score.

Conclusions: Pediatric EoE patients have a slightly lower BMD Z-score compared to their peers of similar age, sex, and race. The biggest risk factors included historical PPI use and a restrictive elimination diet. Swallowed steroid use was not a risk factor for lower BMD. Prospective studies are needed to further assess these effects according to PPI and steroid dosages. This data will be useful in terms of helping select therapies and providing appropriate anticipatory guidance for patients with EoE.

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Table 1. Patient characteristics, dietary, and medication exposures and the association with bone mineral density Z-score

Characteristic	N	Median (IQR) Or frequency (%)	BMD Z-score (Estimate ± SE)	P-value
Age at DXA (y)	269	10.1 (6.5, 13.2)	-0.03 ± 0.01	***0.03****
Sex	269			***0.04****
Male		204 (76%)	-0.29 ± 0.14	
Female		65 (24%)	Ref	
Race	259			0.73
White/Caucasian		237 (92%)	-0.08 ± 0.23	
Other		22 (8%)	Ref	
Ethnicity	267			0.68
Hispanic		12 (4%)	0.12 ± 0.29	
Non-Hispanic		255 (96%)	Ref	
BMI Z-score	269	0.1 (-0.7, 0.7)	0.24 ± 0.05	***<0.0001****
Height-for-age Z-score	269	-0.2 (-0.8, 0.5)	0.27 ± 0.05	***<0.0001****
Age at EoE diagnosis (y)	231	5.9 (2.4-9.5)	0.02 ± 0.02	0.15*
EoE disease history				
Disease activity:	258			0.80
Inactive (<15 Eos/HPF)		120 (47%)	Ref	
Active (>15 Eos/HPF)		138 (53%)	-0.03 ± 0.12	
EoE duration before DXA (y)	257	3.0 (1.3-5.7)	-0.03 ± 0.02	***0.20****
Disease burden				
Disease activity (active)			-0.06 ± 0.13	0.63
EoE duration before DXA (y)			-0.02 ± 0.02	0.30
Comorbid disease history				
Asthma	269	136 (51%)	0.02 ± 0.12	0.85
Eczema	269	150 (56%)	-0.03 ± 0.12	0.82
Allergic Rhinitis	269	201 (75%)	-0.18 ± 0.14	***0.20****
IgE mediated food allergy	269	134 (50%)	-0.24 ± 0.12	***0.0495****
Hypermobility	269	44 (16%)	-0.32 ± 0.17	***0.05****
FGID	269	26 (10%)	0.05 ± 0.20	0.81
Mitochondrial disorder	269	7 (3%)	-0.68 ± 0.38	***0.07****
Medication exposures				
Proton pump inhibitor				
Ever	269	251 (93%)	-0.57 ± 0.24	***0.02****
Within 1 year prior to DXA	259	198 (76%)	-0.02 ± 0.15	0.87
At time of DXA	269	173 (64%)	-0.08 ± 0.13	0.52
Swallowed corticosteroid				
Ever	269	202 (75%)	0.02 ± 0.14	0.86
Within 1 year prior to DXA	264	160 (61%)	-0.03 ± 0.12	0.78
At time of DXA	269	125 (46%)	-0.14 ± 0.12	0.26
Cumulative duration estimate (months)	186	13.5 (5.0-31.4)	-0.11 ± 0.13†	0.42
Oral systemic corticosteroid				
Ever	269	66 (25%)	-0.10 ± 0.14	0.50
Within 1 year prior to DXA	269	32 (12%)	-0.08 ± 0.19	0.69
Inhaled corticosteroid use:				
Ever	269	77 (29%)	0.001 ± 0.13	0.99
Within 1 year prior to DXA	269	60 (22%)	-0.04 ± 0.15	0.78
Nasal/topical corticosteroid				
Ever	269	89 (33%)	-0.20 ± 0.13	***0.11****
Within 1 year prior to DXA	269	57 (21%)	-0.11 ± 0.15	0.47
Combined inhaled + swallowed steroid use				
Inhaled ever			0.002 ± 0.13	0.99
Swallowed steroids ever			0.02 ± 0.14	0.88
Dietary exposures				
Elimination diet (5 or 6 food):				
Ever	269	142 (53%)	-0.26 ± 0.12	***0.03****
Within 1 year prior to DXA	263	93 (35%)	-0.03 ± 0.13	0.80
At time of DXA	269	78 (29%)	0.07 ± 0.13	0.61
Excluded dairy separate from elimination diet				
Ever	269	128 (48%)	-0.16 ± 0.12	0.19*
Within 1 year prior to DXA	267	96 (36%)	-0.10 ± 0.13	0.46
At time of DXA	269	76 (28%)	-0.12 ± 0.13	0.37
Elemental diet use:				
Ever	269	103 (38%)	-0.16 ± 0.13	0.22
Within 1 year prior to DXA	261	82 (31%)	-0.15 ± 0.14	0.27
At time of DXA	269	76 (28%)	-0.13 ± 0.14	0.34
Serum 25-(OH) Vitamin D (ng/dL)	245	33 (26-39)	-0.01 ± 0.01	0.32

HPF – high powered field; IQR, interquartile range, 25th, 75th percentiles.
* Regression models were adjusted for HAZ and BMI Z-scores.
† Estimate ± standard error is based off of the $\log_{10}$ transformed cumulative duration

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Table 2: Final Multivariable BMDZ Model

	Spine BMD Z-score N=231	
	Estimate ± Standard Error	P-value
Age EoE diagnosis (years)	-0.04 ± 0.02	0.007
BMI Z-score	0.23 ± 0.05	<0.0001
HAZ	0.27 ± 0.06	<0.0001
IgE mediated food allergy	-0.28 ± 0.13	0.04
Proton pump inhibitor ever	-0.65 ± 0.28	0.02
Elimination diet ever (5FED or 6FED)	-0.27 ± 0.14	0.045

38 ***MONITORING EOSINOPHILIC ESOPHAGITIS DISEASE ACTIVITY WITH BLOOD EOSINOPHIL PROGENITOR LEVELS .*** *Anna Henderson[1], Adam Magier[2], Justin Schwartz[2], Lisa Martin[4], Margaret Collins[3], Philip Putnam[1], Vincent Mukkada[1], J Abonia[2], Marc Rothenberg[2], Patricia Fulkerson[2]. [1]Gastroenterology, Cincinnati Children's , Cincinnati, OH; [2]Allergy and Immunology, Cincinnati Children's Hospital, Cincinnati, OH; [3]Pathology and Laboratory Medicine, Cincinnati Children's Hospital, Cincinnati, OH; [4]Human Genetics, Cincinnati Children's Hospital, Cincinnati, OH*

Objectives: A minimally invasive biomarker to monitor disease activity is one of the greatest unmet clinical needs of the pediatric eosinophilic esophagitis (EoE) population. We aimed to determine whether circulating eosinophil progenitors (EoPs) could be used as a biomarker to identify pediatric patients with active EoE.

Methods: In a prospective observational study, peripheral blood samples, symptom history, and laboratory data were collected from pediatric patients undergoing endoscopy for evaluation of EoE on dietary therapy at Cincinnati Children's Hospital Medical Center. Peripheral blood EoP level was determined by flow cytometry.

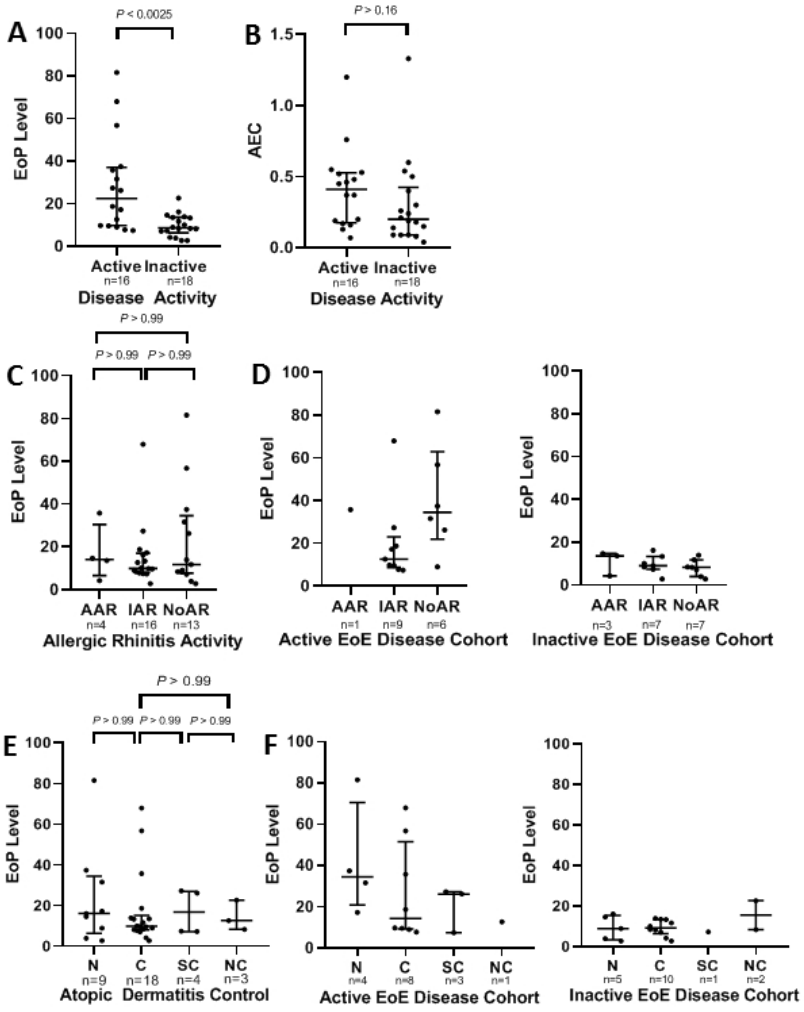
Results: Thirty-four children with active (n = 16) and inactive (n = 18) EoE were included in the analysis. EoP levels in the peripheral blood were three-fold higher in patients with active EoE than inactive EoE ($P < 0.0025$). Blood absolute eosinophil count (AEC) did not distinguish between active and inactive EoE ($P = 0.16$). A cut-off EoP level ≥ 17 accurately detected active disease in 79% of patients with 94.4% specificity and 62.5% sensitivity (AUC 0.81; $P < 0.0024$). Antihistamine use lowered the threshold EoP level to detect active EoE.

Conclusions: This pilot study suggests that blood EoP levels may be used as a biomarker to detect active EoE disease in patients undergoing food trials and potentially reduce the need for repeated endoscopies. Larger prospective studies are needed to investigate the effects of antihistamines and swallowed steroids on EoP mobilization into the peripheral blood as

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well as longitudinal studies to assess the performance of the assay in individual patients over time.

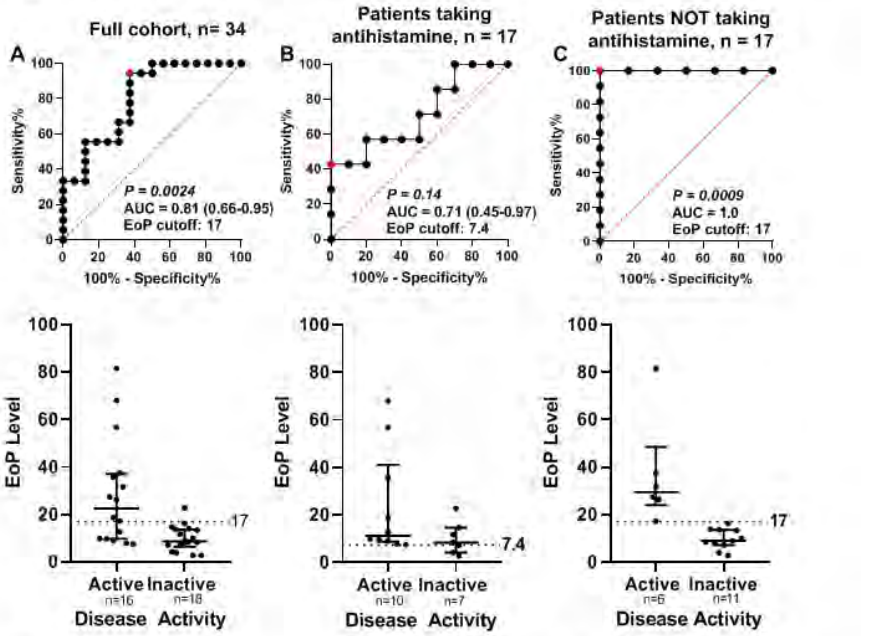
Figure 1. Blood EoP levels by EoE disease activity, AEC, and atopic control.



(A) EoP levels vs EoE disease activity **(B)** AEC vs EoE disease activity
EoP levels do not vary by (C) allergic rhinitis disease activity within the full cohort **(D)** allergic rhinitis disease activity within active and inactive EoE disease cohorts **(E)** atopic dermatitis control in full cohort and **(F)** atopic dermatitis control within active and inactive EoE disease cohorts; *AEC,* absolute eosinophil count. *AAR,* active allergic rhinitis. *IAR,* inactive allergic rhinitis. *NoAR,* No history of allergic rhinitis. *N,* no history of atopic dermatitis; *C,* controlled atopic dermatitis; *SC,* somewhat controlled atopic dermatitis; *NC,* not controlled atopic dermatitis. Data are expressed as median and interquartile range and significance determined by Mann-Whitney for pairwise comparisons and Kruskal-Wallis for multiple comparisons. Circles represent individual samples. ***All P values not shown, P > 0.99***

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Figure 2. EoP level cut-off values for EoE disease activity



(A) ROC curve with cut-off >17 to detect active disease with AUC 0.81 (0.66 -0.95) and $P < 0.0024$. (B) ROC curve with cut-off >7.4 to detect active disease in patients currently taking an antihistamine with AUC 0.71 (0.45 – 0.97) and $P > 0.14$. (C) ROC curve with cut off >17 to detect active disease in patients *not* taking an antihistamine with AUC 1.0 and $P < 0.0009$. ROC curves calculated to optimize both sensitivity and specificity. Dotted line: EoP cut-off to detect active disease in the corresponding cohort

39 ***DIFFERENCES IN PRACTICE PATTERNS BETWEEN MULTIDISCIPLENARY AERODIGESTIVE GASTROENTEROLOGISTS AND GENERAL GASTROENTEROLOGISTS.*** *Rachel Rosen[1], Joel Friedlander[3], Benjamin Gold[2], Vrinda Bhardwaj[4], Dana Williams[5], Diana Lerner[7], Dominique Levesque[6], Hayat Mousa[8], Eric Chiou[9], Christophe Faure[10], Daniel Duncan[1], Philip Putnam[12], Margot Lurie[1], Jeremy Prager[3], Melanie Greifer[11]*
[1]Gastroenterology, Boston Children's Hospital, Wellesley, MA; [2]Emory University, Atlanta, GA; [3]Children's Hospital Colorado, Aurora, CO; [4]Children's Hospital of LA, Los Angeles, CA; [5]Phoenix Children's Hospital, Phoenix, AZ; [6]McGill University Health Systems, Montreal, QC, Canada; [7]Medical College of Wisconsin, Milwaukee, WI; [8]CSD-Rady Children's Hospital, San Diego, CA; [9]Texas Children's Hospital, Houston, TX; [10]Montreal Children's Hospital, Montreal, QC, Canada; [11]New York University, New York, NY; [12]Cincinnati Children's Hospital , Cincinnati, OH

Background: Aerodigestive programs have grown in number nationally in all regions of the United States. While studies have documented clear benefits to multidisciplinary aerodigestive care including reduced anesthesia time and reduced clinic time for patients, there is no data on differences in clinical practice patterns of aerodigestive gastroenterologists compared to general gastroenterologists. The goal of this Knowledge Attitudes and Practice Style (KAPS) study was to compare practice patterns between these two types of gastroenterologists using short clinical vignettes.

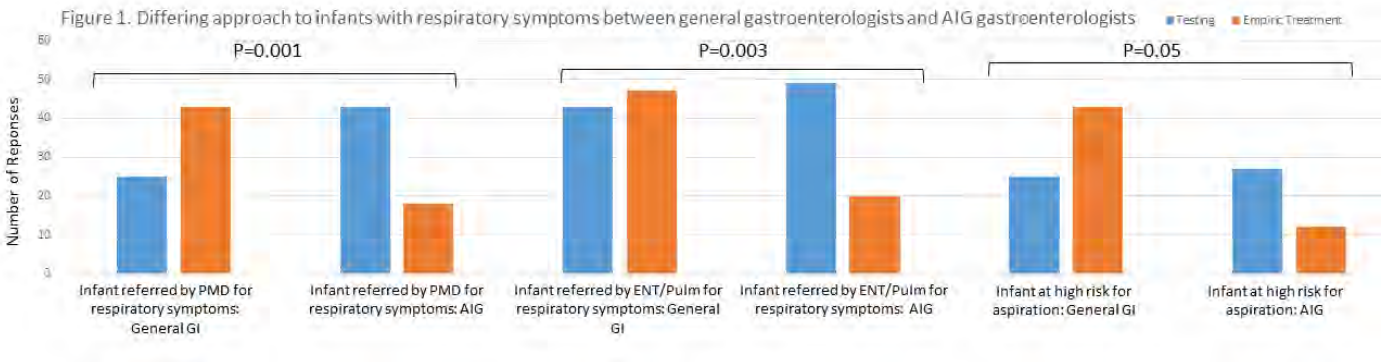
Methods: A 14 item KAPS questionnaire was emailed to: 1) a large gastroenterology division composed of generalists and subspecialists and 2) the NASPGHAN aerodigestive interest group (AIG). Questions consisted of brief clinical vignettes and short answer questions about the diagnosis and management of infants and children presenting with feeding difficulties and/or respiratory symptoms typically seen in aerodigestive patients. The aim of the questions was to determine variations in practice patterns and thereby identify areas for future quality research. There were 6 vignettes focused on the diagnosis and management of patients with respiratory symptoms and there were 4 focused on the diagnosis and management of possible gastroesophageal reflux disease (GERD). There were an additional 4 questions focused on general practice styles. Responses to the questions were compared between these two groups. Proportions were compared using Chi Squared analysis.

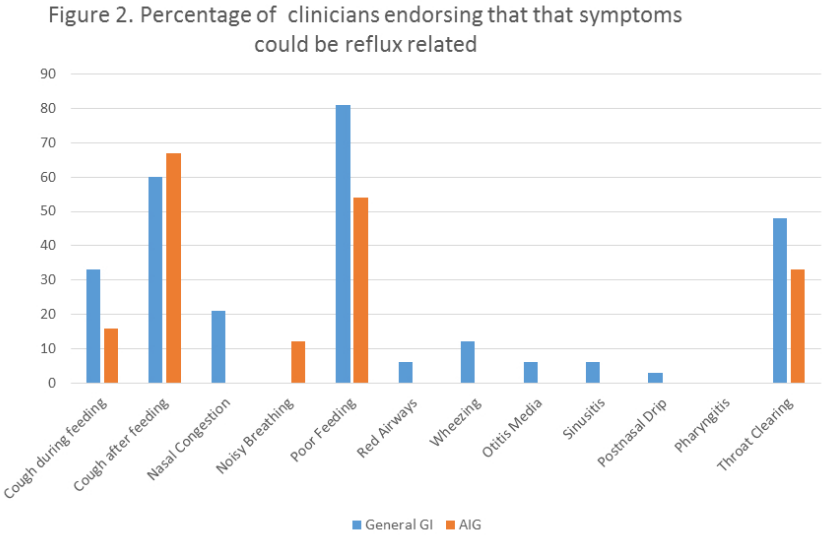
Results: 57 participants completed the questionnaire, 33 from the large GI division and 24 from the AIG. In vignettes where the sole presenting symptoms were respiratory, there were significant differences in the management approach; general gastroenterologists opted for higher rates of empiric therapy compared to AIG gastroenterologists who opted for testing at significantly higher rates than empiric therapy (Figure 1). These differences in management were more striking for vignettes involving respiratory symptoms when compared to vignettes with isolated gastroesophageal reflux/feeding

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symptoms (p=0.04-0.9). For both general GI and AIG groups, acid suppression use (H2 antagonists or proton pump inhibitors) was low with less than 20% of respondents in either group recommending acid suppression as first line therapy for respiratory symptoms. For vignettes involving more typical GERD symptoms such as feeding difficulties and poor weight gain, rates of acid suppression use were higher though still less than 34% of respondents in either group recommended acid suppression use as first line therapy. Both general and AIG gastroenterologists followed the GERD guidelines with alternative interventions (e.g thickening of feeds, change to hypoallergenic formula) chosen at higher rates than medication use and, importantly, there were no overall differences in acid suppression use between general GI and AIG gastroenterologists (p>0.1). Finally, extraesophageal signs and symptoms such as noisy breathing, sinusitis, otitis media, and red airways were rarely attributed to GERD by either general or AIG physicians as shown in Figure 2.

Conclusions: For patients with respiratory symptoms, there are significant differences in practice patterns comparing AIG and general gastroenterologists with AIG practitioners recommending early testing over empiric therapy at higher rates. Additional studies are needed to determine the differences in clinical outcomes as well as cost effectiveness comparing the different approaches.





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FUNCTIONAL/MOTILITY

41 ***PREDICTORS OF HOSPITALIZATION FOR CHILDREN WITH CYCLIC VOMITING SYNDROME.*** *Zeyad Abdulkader*, *Neetu Bali*, *Karla Vaz*, *Desalegn Yacob*, *Carlo Di Lorenzo*, *Peter Lu. Gastroenterology* , *Nationwide Children's Hospital* , *Columbus*, *OH*

Background: Cyclic vomiting syndrome (CVS) involves acute episodes of intense nausea and vomiting lasting hours to days. Although most patients are managed on an outpatient basis, patients with severe symptoms can require multiple emergency department (ED) visits and hospitalizations, leading to significant resource utilization and associated healthcare costs. Factors associated with an increased likelihood of hospitalization for CVS are poorly understood. Our aim is to evaluate for an association between patient-, episode- and ED care-related variables and hospitalization.

Methods: We retrospectively reviewed children with CVS seen at our institution between 2015 and 2018. We included patients who met the Rome IV diagnostic criteria for CVS. CVS-related ED visits that led to discharge were compared to those that led to hospitalization. We compared patient demographics and modifiable variables associated with pre-ED and ED care between the two groups, including use of prophylactic and abortive drugs, duration of symptoms prior to ED presentation, ED wait time before IV fluid and antiemetic administration and serum electrolyte levels.

Results: We identified 219 patient charts with an ICD-10 diagnosis of CVS (G43.A1/0), of which 142 (64.8%) met the inclusion criteria. The remaining 77 charts did not fulfill the ROME IV diagnostic criteria for CVS and were excluded. Included patients were 53% female and had a median age of 11 years (range 4-17). Thirty-five (24.6%) patients had presented to the ED a total of 149 times. Of the 149 ED visits, 93 (62.4%) led to hospitalization. Seventy-four percent of younger patients (<12 years) presenting to the ED were hospitalized compared to 40% of older patients (≥ 12 years) [OR 4.21; p= <0.0001]. Seventy eight percent of male patients compared to 51.7% of female patients presenting to the ED were hospitalized [OR 3.38; p= <0.0013]. Eighty percent (80.3%) of patients who presented >24 hours after onset of symptoms were hospitalized, compared to 48.8% of patients who presented <24 hours after onset of symptoms [OR 3.91; p = 0.0009; controlled for age group and gender]. On average, patients who were hospitalized had a 2.8 hour wait before receiving their first IV anti-emetic dose, compared to a 2.1 hour wait for those who were discharged [OR 1.8; p = 0.0066; controlled for age group, gender and time to presentation]. Wait time until patients received their first IV fluid bolus was similar between the 2 groups (2.6 hours for patients hospitalized vs. 2.3 hours for patients discharged [OR 1.32; p = 0.19]). Serum electrolyte levels, use of prophylactic medications, use of a pre-ED rescue drug and total volume of IV fluid boluses received were similar between hospitalized and discharged patients.

Conclusions: In our sample, a quarter of all children with CVS had presented to the ED and nearly two thirds of these ED visits led to hospitalization. Hospitalization was significantly more likely if patients were young and/or male. We found that patients with a delayed presentation to the ED were almost 4 times more likely to be hospitalized than those presenting early. Similarly, patients' likelihood for hospitalization significantly increased the longer it took for them to receive their first IV anti-emetic medication after arriving to the ED. These findings suggest that early intervention, both patient-driven (pre-ED) and provider-driven thereafter, is key to successfully managing severe CVS episodes and mitigating the need for hospitalization.

42 ***TRENDS AND COST OF HOSPITALIZATION FOR PEDIATRIC CYCLIC VOMITING SYNDROME: 2008-2018.*** *Zeyad Abdulkader*, *Neetu Bali*, *Karla Vaz*, *Desalegn Yacob*, *Carlo Di Lorenzo*, *Peter Lu*
Gastroenterology , *Nationwide Children's Hospital*, *Columbus*, *OH*

Background: Cyclic Vomiting Syndrome (CVS) is a highly debilitating disorder that can affect patients of all ages. Children with severe symptoms often require multiple inpatient hospitalizations to manage episodes, leading to significant resource utilization and associated healthcare costs. Our aim was to evaluate the trends and cost of inpatient hospitalization for children and adolescents with CVS over the past decade.

Method: Using the Pediatric Health Information System (PHIS) database, we selected and analyzed all hospitalizations where the primary diagnoses included ICD-10 code G43.A- /'CVS'. Prior to ICD-10, however, clinicians and researchers captured CVS diagnoses primarily using ICD-9 code 536.2/ 'Persistent Vomiting' (PV). Therefore, to account for CVS patients diagnosed prior to the advent of ICD-10 in 2015, hospitalizations where the primary diagnoses included ICD-9 code 536.2/PV were also selected and analyzed. We recorded hospitalization dates and regions, demographic information, charges, costs and length of stay (LOS). Hospital costs were based upon each hospital's ratio of cost to charges and were adjusted for hospital location using the Centers for Medicare and Medicaid Services wage/price index.

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Results: Between 2015 to 2018, 726 patients (61.4% female) were hospitalized for CVS (G43.A-) a total of 1458 times. The number of unique patients and unique hospitalizations was similar across all 3 years, with an average of 242 patients and 486 hospitalizations per year. In contrast, the number of unique patients and unique hospitalizations captured with ICD-9 code 536.2/PV steadily increased from 444 patients and 579 hospitalizations in 2008 to 657 patients and 907 hospitalizations in 2014 ($p<0.001$). The overall mean cost per hospitalization for CVS (using ICD-10 code G43.A-) during our study period was $11,305, with no significant year-to-year differences. However, cost analyses of all hospitalization data (G43.A- and 536.2/PV combined) showed an average year-to-year increase of 4.7% in the mean cost per hospitalization between 2008 ($8,494) and 2018 ($12,111) ($p <0.0001$). Analyzed individually, there were no significant differences in the mean total hospitalization cost per year between hospitalizations captured using code 536.2 versus G43.A- ($7,281,186 for 536.2 vs. $5,482,783 for G43.A-; p= 0.1382). Patient-level cost analyses of hospitalizations between 2015-2018 (G43.A-) showed that higher costs were associated with both young, and male, patients ($42,205 in males vs. $32,089 in females [$p <0.001$]; $47,616 in patients <6 years vs. $35,209 in patients > 6 years; [$p <0.001$]). Younger patients were also found to have a longer median LOS (4.0 in age <6 years vs 3.0 in age >6 years; $p <0.001$), whereas male patients had a shorter median LOS (2.5 in males vs 3.0 in females; $p <0.001$). Regional cost and trend analyses showed that the number of unique patients, unique hospitalizations and mean total hospitalization costs incurred during the study period (2008-2018) were highest in the South (1235 patients, 2013 hospitalizations; cost: $23,141,840) and lowest in the Northeast (436 patients; 921 hospitalizations; cost $9,643,070). The overall mean year-to-year percent increase in costs was 11% in the Midwest, 7.2% in the South, 3.4% in the Northwest and 2.5% in the West.

Conclusion: Mean costs per hospitalization and mean total hospitalization costs per year for cyclical vomiting episodes have steadily and significantly increased over the past decade. Patient-level cost analyses showed that both young age (<6 years old) and male gender were significantly associated with higher hospitalization costs. While Southern hospitals incurred the highest costs overall (owing to their high volume of CVS patients and hospitalizations), hospitals in the Midwest saw the highest average year-to-year percent increases in costs over the last decade. Continued long-term monitoring of CVS-related costs, and of modifiable variables that may impact them, is warranted.

43 ***HIRSCHSPRUNG DISEASE: EVALUATION AND TREATMENT OF THE POST PULL THROUGH SURGERY PATIENT WHO IS NOT DOING WELL.*** *Hira Ahmad[1], Desalegn Yacob[1,2], Devin Halleran[1], Alessandra Gasior[1], Richard Wood[1], Carlo Di Lorenzo[2], Marc Levitt[1]. [1]Center for Colorectal and Pelvic Reconstruction, Nationwide Children's Hospital, Columbus, OH; [2]Division of Gastroenterology, Nationwide Children's Hospital, Columbus, OH*

Background: Ideally, after operative intervention, a child born with Hirschsprung disease (HD) should thrive, be fecally continent, avoid recurrent episodes of abdominal distention and enterocolitis. However, there is a small group of patients that do not do well following their pull-through procedure. The purpose of this study is to summarize our experience with the evaluation and management of the symptomatic patient post pull-through operation for HD.

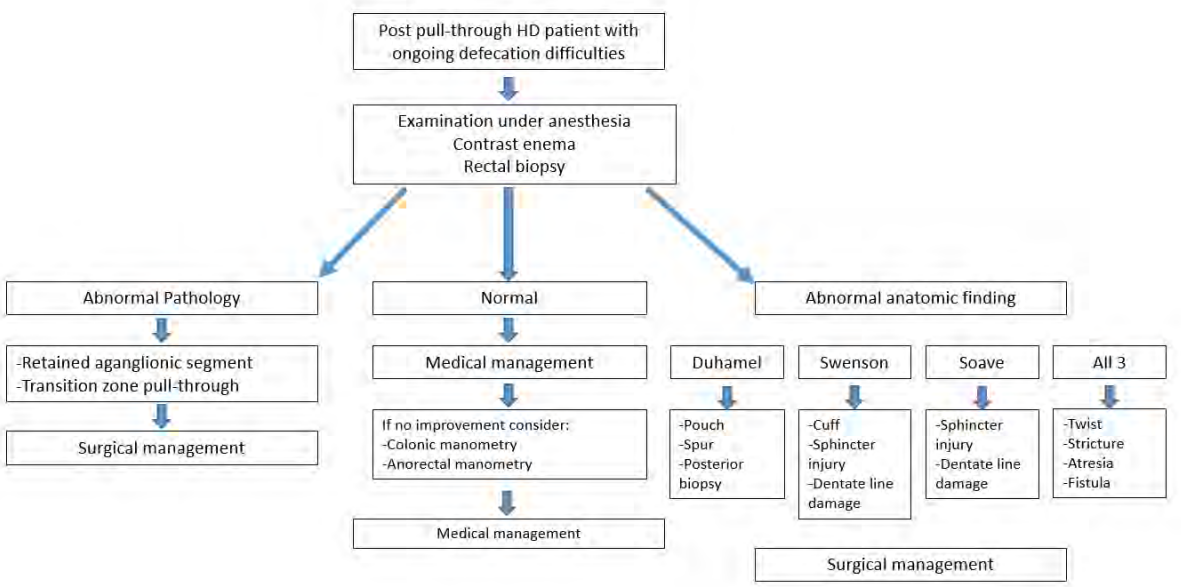
Methods: We reviewed patients referred to our Center (2014-2016) with obstructive symptoms following their pull-through surgery performed elsewhere.

Results: Sixty-two patients were identified and the average age at the time of our intervention was 5.58 years (range 0.5-15 years). Obstructive symptoms included recurrent episodes of enterocolitis [n=34 (54.8%)], failure to thrive (FTT) [n=13 (20.9%)], severe constipation unresponsive to laxatives [n=16 (25.8%)], and inability to wean off of irrigations [n=2 (3%)]. Causes of obstructive symptoms after a pull-through surgery included transition zone, restrictive Soave cuff, stricture, obstructive Duhamel pouch and twisted pull-through (table 1.) Fifty-one (82%) of the patients had a reoperation with 29 (54%) having transanal approach only, 15 (28%) transanal plus laparotomy, 4 (7%) posterior sagittal and 3 (4%) laparoscopically. The remaining 11 (18%) patients with obstructive symptoms had no identifiable anatomic or pathologic abnormality and were treated with Botulinum toxin injection, and their symptoms improved including in cases of enterocolitis.

Conclusions: Children diagnosed with Hirschsprung disease who are not doing well after their initial operation can be categorized in two distinct groups: those who are incontinent and those with obstructive symptoms of fecal impaction, abdominal distention and/or enterocolitis. It is important to have a clear diagnostic approach based on a comprehensive protocol. Both these patient groups can be systematically treated with a combination of bowel management, dietary changes, and laxatives. However, when a specific etiology is identified as the cause of the problem the appropriate intervention that is primarily operative is unavoidable in order to effectively address the problem. These procedures may consist of removing a transition zone, a Soave cuff, a stricture, a Duhamel pouch or correcting a twisted pull-through. Causes of obstruction after HD pull-through requiring reoperations

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	Number of patients	%
Transition zone	18	35.2
Soave cuff	17	33.3
Stricture	10	19.6
Duhamel pouch	3	5.8
Twisted pull-through	3	5.8



44 ***TRENDS IN HOSPITAL ADMISSIONS FOR CYCLIC VOMITING ASSOCIATED WITH CANNABIS USE.***

Jessica Deas, *Sabina Ali. Gastroenterology*, *UCSF Benioff Children's Hospital Oakland*, *Oakland*, *CA*

BACKGROUND: Marijuana is the most commonly used illicit substance in the United States, and adolescents and young adults have some of the highest rates of use. In 1996, California became the first state to legalize the use and sale of marijuana for medicinal purposes. In 2016, voters approved Prop. 64, legalizing the recreational use of marijuana in the state starting Jan. 1, 2018.

Cannabinoid hyperemesis syndrome (CHS) is a functional gastrointestinal disorder described in the adult Rome IV criteria. CHS is characterized by recurrent episodes of nausea and vomiting resembling cyclic vomiting syndrome (CVS) and is associated with chronic cannabis use. Symptom resolution following sustained cessation of cannabis use is the only reliable criterion distinguishing CHS from CVS. Pathologic bathing behavior (symptom relief with hot showers or baths) has been described in both syndromes.

We hypothesized that admissions for cyclic vomiting associated with marijuana use among adolescents and young adults to our children's hospital increased in the years following liberalization of medical marijuana and most recently with the legalization of recreational marijuana in California.

METHODS: Retrospective chart review of hospital admissions for cyclic vomiting associated with marijuana use among children and young adults aged 10 – 21 years from 1/1/2009 through 12/31/2018 at UCSF Benioff Children's Hospital Oakland. Eligible admissions were retrieved via computer algorithm, searching for ICD-9 or ICD-10 codes for CHS, CVS, or other functional vomiting. Of the records retrieved, those which documented marijuana use (any report of recent use or positive drug screen) were included. Records which reflected an obvious pathophysiologic etiology for nausea and vomiting (e.g. cancer undergoing chemotherapy) were excluded.

RESULTS: 62 hospital admissions for cyclic vomiting associated with marijuana use during the study period were

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identified (Table 1). Annual rate of admissions ranged from 0 in 2012 to a maximum of 21 in 2018. The number of unique patients admitted ranged from 0 in 2012 to 8 in 2018 (Fig. 1). 58% of admitted patients were female, the average age was 17.3 years, and the majority were non-white (40% African-American and 45% other). 28% of patients reported daily marijuana use and 19% reported using marijuana more than once per day. Reasons reported for use included nausea, appetite stimulation, anxiety, and sleep. Additional clinical symptoms at presentation included abdominal pain in 60% of patients, diarrhea in 16%, chest pain in 15%, and weight loss in 11%.

CONCLUSIONS:

Admissions for cyclic vomiting associated with cannabis use among teens and young adults at our pediatric center increased following legalization of recreational marijuana. To our knowledge, this is the first study assessing the impact of cannabis legalization on hyperemesis hospitalizations in the pediatric population. Limitations of our study include single center experience, reliance on self-reported substance use data, and limited availability of dose data. Further investigation is needed to elucidate the pathophysiology of both cyclic vomiting and cannabinoid hyperemesis syndromes and to address effective treatment strategies.

Table 1. Patient and admission characteristics

Characteristic	Value
Age (y), mean ± SD	17.3 ± 1.6
Sex	
Female, % (n)	58% (36)
Male	42% (26)
Race	
Black or African American	40% (25)
White or Caucasian	10% (6)
Other	45% (28)
Multiracial	5% (3)
Alcohol use	
Yes	15% (9)
No	68% (42)
Unknown	18% (11)
Tobacco Use	
Yes	15% (9)
No	77% (48)
Unknown	8% (5)
Length of stay (d), median (range)	3 (0-18)
Number of admissions per patient, median (range)	1 (1-13)
Procedure performed during admission	
EGD	21% (13)
EGD and colonoscopy	3% (2)
None	76% (47)

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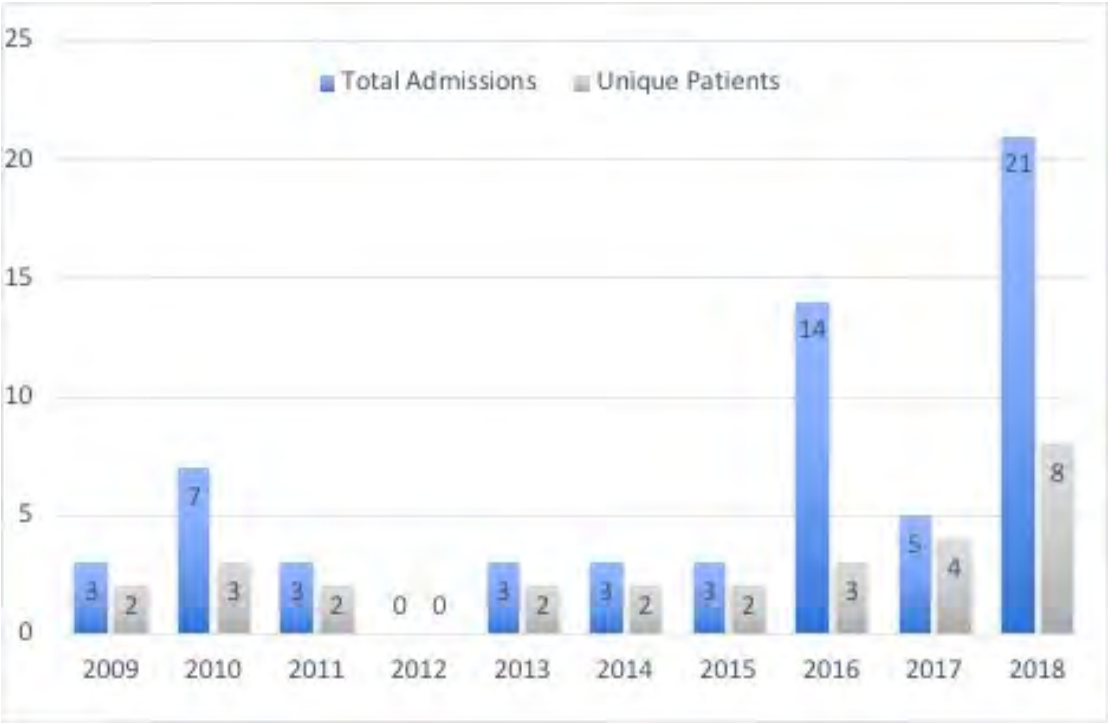


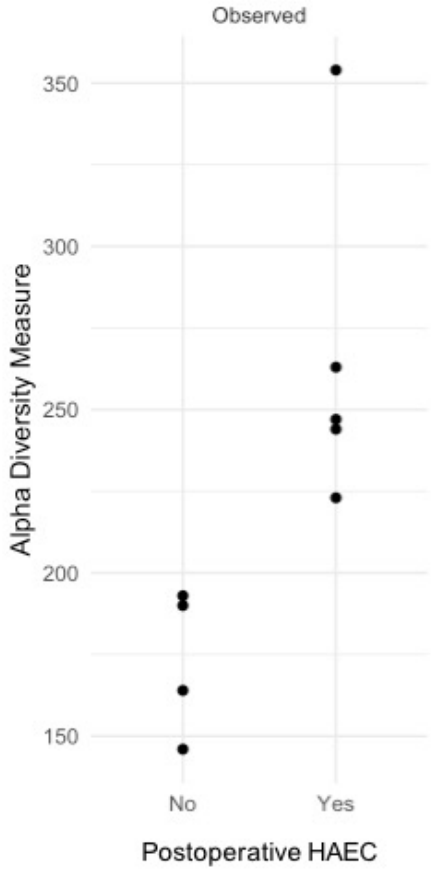
Figure 1. Annual rate of admissions for cyclic vomiting associated with cannabis use

45 ***CHARACTERIZATION OF COLON TISSUE MICROBIOTA IN HIRSCHSPRUNG'S DISEASE PATIENTS WITH AND WITHOUT ENTEROCOLITIS: A PILOT STUDY.*** *Ricardo Arbizu[1], David Collins[2], J. Antonio Quiros[1], Robert Wilson[3], Alexander Alekseyenko[2]. [1]Pediatric Gastroenterology, Medical University of South Carolina, Charleston, SC; [2]South Carolina Clinical and Translational Research Institute, Medical University of South Carolina, Charleston, SC; [3]Department of Pathology and Laboratory Medicine, Medical University of South Carolina, Charleston, SC*

Background: Patients with Hirschsprung's disease (HSCR) are at increased risk of developing Hirschsprung's associated enterocolitis (HAEC). HAEC is characterized by inflammation of the intestinal crypts and epithelial mucosa of the bowel proximal to the involved segment. Possible bacterial translocation across the intestinal wall in combination with specific variations of the intestinal microbiota have been hypothesized as a contributing mechanism in the development of HAEC. Previous studies have reported microbiota variations by gene sequence analysis of fecal samples, but whether these changes are present in colon tissue of patients with HSCR is unknown. Therefore, this pilot study aimed to investigate the microbiota composition of colon tissue of HSCR patients with and without a history of postoperative HAEC. **Methods:** A retrospective chart review was performed to identify patients with HSCR who were diagnosed, treated, and whose tissue specimens are biobanked at our institution. Archived formalin-fixed paraffin-embedded (FFPE) colon tissue that was obtained at the time of surgery was analyzed. Paraffin was removed using Deparaffinization Solution from Qiagen followed by enzyme digestion and incubation. Genomic DNA was extracted from lysates using QIAamp® DNA FFPE Tissue Kit on the QIAcube® robotic workstation. Quality and purity of extracts were determined using the QIAxpert system®. Bacteria 16S rDNA was sequenced utilizing the 16S protocol from Illumina®. Variable regions V3 and V4 of bacterial 16S rDNA were amplified by PCR. Fastq files were made for analysis. Clinical data values are reported as means and standard deviations. Alpha diversity measurements are compared using two-sample Welch t-tests. Beta diversity is compared using robust distance-based multivariate analysis W_d^*test. Univariate analysis at the taxon level is performed with Mann-Whitney rank sum test on the relative abundances and Welch t-test on centered log-ration transformed abundances with false discovery rate adjustment for multiple comparison. **Results:** 9 colon tissue samples were analyzed. The age at presentation and diagnosis was 5.6±8.14 and 9.8±8.09 days respectively. Eight patients had short-segment disease and 1 had long segment disease. The age at the time of surgical correction was 77.6±86.09 days. Five patients had a history of postoperative HAEC and the age at first episode was 133.8±137.66 days. The sequence diversity richness within samples (observed alpha diversity) was significantly higher in the HAEC group compared to the HSCR group (p=0.01) (Fig. 1). Although clustering of microbial communities by HAEC status is visible in principal coordinates analysis plot (beta diversity), the effect is not statistically significant (p=0.266). Taxonomic analysis revealed trends in the colon tissue

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microbiota composition between the groups but did not produce any significant results after multiple comparison correction. At the phylum level the HAEC group demonstrated an increased relative abundance of *Bacteroidetes, Cyanobacteria* and *Firmicutes* and an increased relative abundance of *Fusobacteria, Actinobacteria* and *Proteobacteria* in the HSCR group. At the genus level, we observed an increased relative abundance of *Dolosigranulum* and *Bacteroides* in the HAEC group and an increased relative abundance of *Propionibacterium* and *Delftia* in the HSCR group. **Conclusion:** Our data provides pilot support to the hypothesis that the microbiota composition in colon tissue differs between HSCR patients who develop postoperative HAEC and those free of this complication. These differences suggest a potential contributor in the pathogenesis of HAEC and that there may be identifiable bacterial community variations in HSCR that puts patients at risk for developing HAEC. Our approach is feasible and provides a basis for future prospective studies to determine a causative role of specific microbiota communities in patients with HSCR and as practical translatable predictors of HAEC.



46 ***THE NOT SO RARE ABSENT RAIR (RECTOANAL INHIBITORY REFLEX): A REVIEW OF 1072 ANORECTAL MANOMETRY STUDIES.*** *Desiree Baaleman[1,2], Monica Malamisura[1,3], Hira Ahmad[4], Marc Benninga[2], Neetu Bali[1,4], Karla Vaz[1,4], Desalegn Yacob[1,4], Carlo Di Lorenzo[1,4], Peter Lu[1,4]. [1]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]Department of Pediatric Gastroenterology and Nutrition, Emma Children's Hospital/Amsterdam University Medical Center, Amsterdam, Netherlands; [3]Digestive Endoscopy and Surgery Unit, Bambino Gesù Children's Hospital IRCCS, Rome, Italy; [4]Center for Colorectal and Pelvic Reconstruction, Nationwide Children's Hospital, Columbus, OH*

Background: Anorectal manometry (ARM) testing involves assessment of the neuromuscular function of the anus and rectum using a manometric catheter. The primary indication of ARM is evaluation of the recto-anal inhibitory reflex (RAIR) to identify patients with Hirschsprung's disease (HD). However, the significance of an absent RAIR beyond screening for HD in the era of high-resolution ARM has not yet been well described. Our objective is therefore to describe

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the significance of an absent RAIR during ARM testing.

Methods: We performed a retrospective review of all high-resolution ARM studies performed in children ≤18 years of age at our institution between 2012 and 2019. A designated physician with expertise in manometry interpretation reviewed each ARM study and identified all studies demonstrating an absent RAIR. For studies in which the second assessment differed from the original report, another physician performed a third assessment. We recorded demographic information, medical history, surgical history and diagnostic testing, including rectal biopsy results when available. Among children with an absent RAIR, we compared those diagnosed with HD to those diagnosed with internal anal sphincter achalasia (IASA).

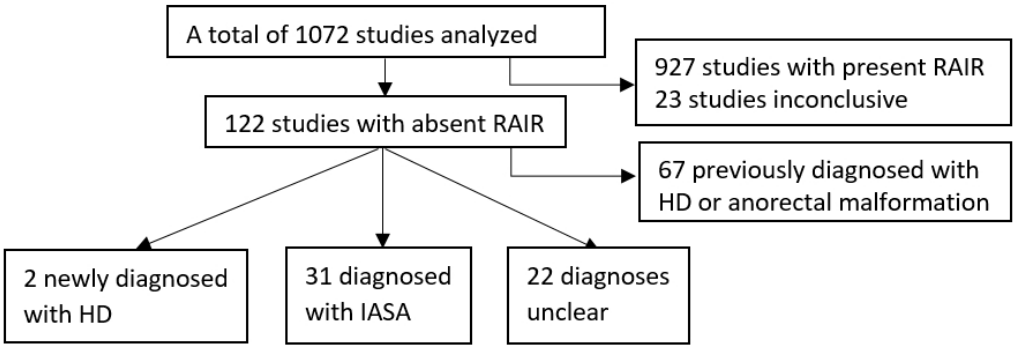
Results: We reviewed ARM studies from 1072 patients (50% female, median age 7 years at ARM, IQR 4-11 years). As shown in **Figure 1**, 122 children (11%) had an absent RAIR on ARM. Of these children, 57/122 (47%) had been previously diagnosed with HD and 10/122 (8%) had previously been diagnosed with an anorectal malformation. All children with those previous diagnoses had undergone colorectal surgeries. Of children with HD or anorectal malformations, 60/67 (90%) were diagnosed in their first year of life. Of the 55/122 (45%) children without a prior diagnosis, 33/55 (60%) underwent rectal biopsy and 2 patients were newly diagnosed with HD. The first patient was a 9-month-old infant with severe constipation and infrequent bowel movements. The second patient was an 18 year old with autism spectrum disorder. The other 31 patients had a normal rectal biopsy and were diagnosed with IASA. 22/55 (40%) patients did not have rectal biopsies available (either biopsies had not been completed, were to be performed at another institution, or there was difficulty interpreting their study) and their diagnosis remained unclear. As shown in **Table 1**, children with HD and IASA differed in mean age of diagnosis and in presence of constipation and the usage of laxatives at the time of ARM. It is important to note that at time of the ARM, 57/59 patients diagnosed with HD previously underwent surgery, which could explain these differences in complaints and medical treatment at time of the ARM.

Conclusion: In this large retrospective study, approximately half of children with an absent RAIR were diagnosed with HD. However, only 2 of these children were new diagnoses. All children with HD and most children with IASA had experienced defecatory dysfunction since infancy. This would support a lower index of suspicion for HD and IASA in children who do not have defecatory dysfunction during infancy.

Table 1. Comparison of children with an absent RAIR diagnosed with Hirschsprung's disease (HD) and internal anal sphincter achalasia (IASA) at time of ARM.

	HD (N=59)	IASA (n=31)	p-value
Male	43 (73%)	17 (55%)	0.10
Trisomy 21	7 (12%)	2 (6%)	0.71
Developmental delay	5 (8%)	5 (16%)	0.30
Behavioral disorders	6 (10%)	6 (19%)	0.33
Autism	3 (5%)	4 (13%)	0.23
Median age at diagnosis (in years)	0 (IQR 0)	6 (IQR 7)	<0.01
Fecal incontinence	47 (80%)	16 (53%)	0.16
Constipation	31 (53%)	30 (97%)	<0.01
Not using any medication	16 (27%)	3 (10%)	0.62
Laxatives	23 (39%)	26 (84%)	<0.01
Rectal suppositories	7 (12%)	5 (16%)	0.75
Rectal enemas	4 (7%)	0 (0%)	0.29
Antegrade continence enemas	5 (8%)	0 (0%)	0.16
Loperamide	9 (15%)	1 (3%)	0.16

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47 ***CHARACTERIZING AN OUTPATIENT SAMPLE OF PEDIATRIC PATIENTS WITH RUMINATION SYNDROME OVER A 5-YEAR PERIOD.*** *Kari Baber[1,2], Kelly Rodriguez[1,2], Alain Benitez[2], Svetlana Ostapenko[3], Ritu Verma[4]. [1]Department of Child and Adolescent Psychiatry and Behavioral Sciences, The Children's Hospital of Philadelphia, Philadelphia, PA; [2]Department of Pediatrics/Division of Gastroenterology, Hepatology & Nutrition, The Children's Hospital of Philadelphia, Philadelphia, PA; [3]Department of Biomedical and Health Informatics, The Children's Hospital of Philadelphia, Philadelphia, PA; [4]Pediatric Gastroenterology, Hepatology & Nutrition, The University of Chicago Medicine, Chicago, IL*

Background: Rumination syndrome is a functional gastrointestinal disorder described clinically as repeated, effortless regurgitation of food shortly after eating. Rumination syndrome is a rare phenomenon in pediatric community samples, with reported prevalence ranging from 0% (Lewis et al., 2016; Robin et al., 2018) to 5% (Rajindrajith et al 2012). We are not aware of any published prevalence estimates in specialty care practices.

Although the existing treatment literature is small, behavioral treatment of rumination syndrome (including coaching in diaphragmatic breathing with or with biofeedback) is currently considered best practice (Halland et al., 2018). The small number of studies evaluating outpatient treatment of pediatric rumination syndrome indicate robust treatment effects following even brief treatment (e.g., an average of 3 visits; Chial et al. 2003; Barba et al., 2015).

Diaphragmatic breathing can be taught by many different types of health care professionals (e.g., nurses, physician assistants, physicians, occupational therapists). Many clinical, pediatric or health psychologists learn how to teach diaphragmatic breathing as part of their applied training; therefore, in our center, patients with rumination often are referred to see a GI psychologist for training in diaphragmatic breathing. The aim of the present study was to describe demographic characteristics and access to behavioral treatment of rumination (i.e., treatment by a GI psychologist) in an outpatient pediatric gastroenterology clinic.

Methods: Retrospective data were extracted from the electronic medical record for patients with a diagnosis of rumination during an outpatient pediatric gastroenterology visit at Children's Hospital of Philadelphia in the past 5 years (January 2013-January 2018). Data were extracted under an IRB-approved protocol. Extracted data included demographic information, diagnostic information from outpatient gastroenterology (GI) encounters and completion of integrated psychology (GI Psychology) outpatient visits.

Results: Over the five year study period, 109 patients (46% female) carried a diagnosis of rumination. The yearly incidence for rumination diagnosis varied (range = 3 per year to 23 per year). 44 patients (40%) were seen by a GI psychologist. Of the patients seen by a GI psychologist, 59% were female, with an average age of 10.7 years (range 2.4 – 20.1 years old). 65 patients (60%) with a diagnosis of rumination were never seen by a GI psychologist. Of these, 37% were female and the average age was 9.6 years (age 1 month to 20.1 years old). Female patients diagnosed with rumination were significantly more likely than male patients diagnosed with rumination to have seen a GI psychologist ($X^2 = 5.19$, $p < .05$).

Conclusions: Rumination syndrome was observed in more than 100 patients seen for outpatient care at our tertiary care pediatric hospital within a 5 year period. Fewer than half of patients with a diagnosis of rumination were seen by a GI psychologist. Unlike in other functional GI disorders, which are disproportionately diagnosed in females, the number of male and female patients diagnosed with rumination was relatively equal. However, female patients were significantly more likely than male patients to be seen by a GI psychologist. These findings have implications for clinical outcomes among

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this patient population, as the best practice treatment (behavioral treatment with or without diaphragmatic breathing) is typically provided by GI psychologists in our center. Our findings also suggest the potential utility of more widely disseminated training in the teaching and coaching of diaphragmatic breathing for rumination syndrome.

49 ***LUBIPROSTONE HAS PROKINETIC EFFECT DEMONSTRATED ON COLONIC MANOMETRY.*** *Amani Bajunayd*, *John Desbiens*, *Lindsay Clarke*, *Anil Darbari. Pediatric Gastroenterology*, *Children's National Medical Center*, *Washington*,

Lubiprostone is a prostone that activates the chloride channel protein-2 in the gastrointestinal epithelium, promoting intestinal secretion of chloride ions and fluids, there by making the stool soft and leading to bowel movements. It is used widely for chronic idiopathic constipation and irritable bowel syndrome with constipation, in adults and more recently in children. In-vitro and animal studies have suggested that lubiprostone could cuase conentration dependent contractions of gastric and uterine muscles, which could suggest that lubiprostone may also have a prokinetic effect on gut motility. There is no study demonstrating colonic promotility effect utilizing colonic manometry in children.

Colonic manometry studies were performed in 114 children (M:F 39:75), aged 8 - 21 year (mean 16.3yr) utilizing solid state catheters (Unisensor, Laborie USA) with 10 channels spaced 5 cm apart (Figure). The catheters were placed directly during colonoscopy. During the 24-hour colonic manometry protocols, motor responses with high amplitude propagating clusters (HAPCs) were noted compared to baseline during sleep overnight followed by wake response, and compared in response to meal, oral and rectal 10 mg bisacodyl, and to 8 mcg and 24 mcg oral doses of lubiprostone. The effects of medications were compared using unpaired T-test. The p-values for pairwise group comparisons were adjusted using Bonferroni adjustments.

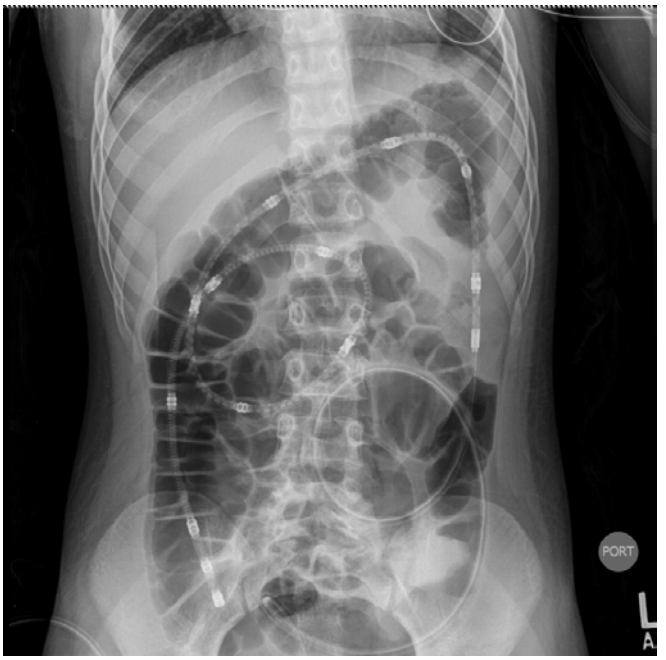
The motility index (MI) and HAPC amplitudes are reported in Table 1. The motility index (mmHg/s) and amplitude of propagating pressure wave during HAPC following oral doses of lubiprostone at 8 mcg and 24 mcg oral doses, and those following oral bisacodyl at 10 mg dose, appear to be similar with no statistical difference than those with rectal administration of 10 mg bisacodyl ($p>0.05$). The frequency (/24hr) and velocity (cm/s) were also similar with these medications (data not shown here). Compared to the baseline, 24 mcg oral dose of lubiprostone led to an increase of MI by 26%.

Lubiprostone appears to have prokinetic effect on colonic motor activity as demonstrated by increase in amplitude of contractions of high amplitude propagating clusters and an increase in motility index, at least comparable to rectal bisacodyl, which is often used as a standard testing for stimulants during colonic manometry studies.

Comparison of MI and Amplitude during Colonic Manometry

Drugs	Mean Amplitude	Motility Index	
Bisacodyl 10 mg PR	54.65 +/- 3.1	5.23 +/- 0.3	
Bisacodyl 10 mg PO	47.95 +/- 6.5	7.9 +/- 2.1	
Lubiprostone 8 mcg PO	57.89 +/- 4.1	6.6 +/- 0.9	
Lubiprostone 24 mcg PO	61.2 +/- 4.3	8.1 +/- 1.1	

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51 ***CHARACTERIZATION OF ANORECTAL MANOMETRY OF CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD).*** *Corey Baker[1], Casey Silvernale[2], Claire Zar-Kessler[1]*
[1]Pediatric Gastroenterology and Nutrition, MassGeneral Hospital for Children, Belmont, MA. [2]Gastroenterology, MassGeneral Hospital, Boston, MA

Purpose: Attention-deficit hyperactivity disorder (ADHD) is a neurologic disorder characterized by hyperactivity and/or inattentiveness. Previous studies have suggested that patients with ADHD report more flatulence and less frequent bowel movements than those without ADHD. We therefore aimed to analyze the GI manifestations in our pediatric ADHD population focusing on symptomatology, associated diagnoses, and relationship to anorectal manometry characteristics.

Methods: This is a retrospective analysis of a prospective study of pediatric patients aged 6-19 years seen at our institution for evaluation of refractory constipation and fecal incontinence with high resolution anorectal manometry (ARM) between 2016-2018. Patients sedated for the procedure or with anorectal malformations were excluded. Prior to the ARM, patients filled out questionnaires assessing presenting symptoms, sensory disorders and for family confirmation of the ADHD diagnosis. A separate ADHD questionnaire identified patients with Inattentive, Hyperactive, or Combined types of ADHD. Manometry was performed and interpreted by the same provider prior to review of questionnaire results.

Results: A total of 62 patients (16 with ADHD, 46 without ADHD) (75 patients evaluated, 13 excluded) filled out questionnaires and had a non-sedated anorectal manometry. ADHD patients more often presented with fecal incontinence than those without (33%, 11% p=0.049), more frequently had multiple stools per day (57%, 9% p=<0.0001) and an additional diagnosis of a sensory integration disorder (SID) (14%, 1.6% p=0.02). ADHD patients more frequently reported sensitivities to food texture (38%, 13% p=0.01), clothing texture (33%, 1% p=0.001), and sounds (43%, 8% p=0.0002) (Picture). There was no difference in maximum resting or squeezing anal sphincter pressure between patients in these two groups nor each individual sub-type of ADHD. Sensation thresholds of the sub-types showed that patients with combined inattentive and hyperactivity had a higher first sensation threshold than those without ADHD (184 mL, ADHD n=5, 92.6 mL, nl, n=87, p=0.025). Although not statistically different, ADHD patients (including all subtypes) had smaller sensation differential between the first and urge sensations compared to normal patients (31 mL, 45.6 mL p=0.25).

Discussion: This is the first study to characterize anorectal manometry findings in pediatric patients with ADHD. This suggests that patients with ADHD present more frequently with fecal incontinence and those with the combined subtypes may have an increased initial sensation threshold. This may be due to an enlarged rectum from chronic constipation. The increased presence of SID and other sensitivities in ADHD patients suggests that issues with processing responses to sensory input may also be a contributing factor, however further studies are required.

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52 ***CLINICAL CHARACTERISTICS, TRENDS AND OUTCOMES IN PEDIATRIC OUTCOMES IN PEDIATRIC CYCLIC VOMITING SYNDROME IN THE UNITED STATES.*** *Corey Baker[1], Adeyinka Adejumo[3], Braden Kuo[2], Claire Zar-Kessler[1]. [1]Pediatric Gastroenterology and Nutrition, MassGeneral Hospital for Children, Belmont, MA; [2]Gastroenterology, MassGeneral Hospital, Boston, MA; [3]Internal Medicine, North Shore Medical Center, Salem, MA*

Introduction: Cyclic Vomiting Syndrome (CVS) is an idiopathic disorder characterized by recurrent, stereotypical bouts of vomiting with intervening periods of normal health. Outpatient epidemiological studies have previously been reported, however, similar studies have not yet been conducted in the pediatric inpatient setting. The Kid's Inpatient Database (KID), part of the Healthcare Cost and Utilization Project (HCUP), is a set of pediatric hospital inpatient databases where inpatient data is based on discharge abstracts created by hospitals for billing. Using this database, we sought to analyze the characteristics, clinical and financial burden of this diagnosis in the inpatient pediatric population.

Methods: This is a cross-sectional analysis using the KID database where pediatric patients in the United States (greater than 1 year and less than 18 years of age) between the years of 1997-2012 were identified as being hospitalized for CVS using the ICD-9 code 536.2. Using a multivariate logistic regression model, we analyzed patient demographics, costs and length of stay, as well as identifying trends of these CVS hospitalizations during this 15-year period.

Results: From 1997 to 2012, there was 9650 pediatric patients reported in KID who were admitted with the diagnosis of cyclic vomiting syndrome, 56.1% were female. The average cost per hospitalization has increased from $7392.58 to $18358 (p=<0.0001) as well as the total yearly cost from $17,545,991 to $47,398,491 (p=<0.0001). The frequency of CVS hospitalization per 10,000 patients has slightly increased from 19.7 to 23.3 (p=0.1253), as well as the average length of stay has from 2.8 days to 3.0 days (p=0.2088). Using adjusted odds ratios, females had increased odds of being admitted with this diagnosis compared to males, aOR 1.31 (p =<0.0001), however there was no difference between age groups, ethnicities, insurance type, type of hospital (size and academic standing) or the geographical region of hospitalization. Compared to healthy controls, CVS patients had increased odds of having additional diagnoses of gastroparesis (aOR 27.18, p =<0.0001), GERD (aOR 18.85, p =<0.0001), dysautonomia (aOR 9.83, p =0.0006), migraines (aOR 6.48, p =<0.0001), Irritable Bowel Syndrome (aOR 6.28, p =<0.0001), anxiety (aOR 3.39, p =<0.0001), and use cannabis (aOR 1.85, p =0.0009).

Discussion: This is the first study of its kind to characterize pediatric hospitalizations for cyclic vomiting syndrome in the United States. Importantly, we show that this diagnosis has an increasing financial burden in the inpatient setting has despite no statistical change in length of stay and hospital admission rates. This may suggest that more interventions a and a larger investigation is being done during these hospitalizations however further studies are necessary to identify contributing factors.

53 ***EVALUATING AND DEFINING FOLLICULAR HYPERPLASIA IN THE APPENDIX OF CHILDREN WITH CHRONIC RIGHT LOWER QUADRANT ABDOMINAL PAIN AND ITS CLINICOPATHOLOGIC IMPLICATIONS.*** *Jessica Barry[1], Catherine Forse[3], Thomas Plesec[3], Sarah Worley[4], Federico Seifarth[2], Lori Mahajan[1]. [1]Pediatric Gastroenterology, Cleveland Clinic, Cleveland, OH; [2]Pediatric Surgery, Kalispell Regional Healthcare, Kalispell, MT; [3]Anatomic Pathology, Cleveland Clinic, Cleveland, OH; [4]Quantitative Health Sciences, Cleveland Clinic, Cleveland, OH*

Introduction: Several studies suggest that appendectomy can improve chronic abdominal pain in children despite the absence of histological features of acute/ interval appendicitis. The purpose of this study was to compare the appendixes from children who responded to appendectomy for chronic pain to age-matched controls in order to identify defining histological features. In particular, this study focused on evaluating appendiceal lymphoid hyperplasia as there is no specific definition in the literature.

Design: The appendixes of 30 children who had chronic abdominal pain and were symptom-free post-surgery were compared to 16 children who underwent surgery with subsequent appendectomy in the absence of symptoms of chronic abdominal pain or appendicitis. In collaboration with a GI pathologist, appendiceal specimens were reviewed for the degree of lymphoid hyperplasia determined by histologic measurement of the number of germinal centers (GCs) per 5 mm and the greatest diameter of 5 consecutive GCs. Study groups were compared on GC size using the two sample t-test, and on GC adjusting for age using two-methods: 1) paired t-test on subjects matched by year of age, and 2) ANCOVA regression model for GC by group, age, and group-age interaction. All tests were two-tailed and performed at a significance level of 0.05. SAS 9.4 software (SAS Institute, Cary, NC) was used for all analyses. The performance of counting the number of GCs/ 5 mm for identifying lymphoid hyperplasia was evaluated by calculating the sensitivity (Sn), specificity (Sp), positive predictive value (PPV) and negative predictive value (NPV).

Results: Qualitatively, there were no significant differences observed in inflammation or fibrosis of appendiceal specimens between the two cohorts. Children with chronic pain had significantly more GCs/ 5 mm than age-matched controls (mean difference: 3.3, P<0.001 (95% CI)). There was no significant difference in the average size of individual GCs. Using a

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cutoff of ≥ 9 GCs/ 5 mm as an assessment for follicular hyperplasia had a Sn of 80%, Sp of 73.3%, PPV of 85.7% and NPV of 64.7%.

Conclusion: Appendiceal follicular hyperplasia (FH) ≥ 9 GCs/ 5 mm on histology is significantly associated with resolution of chronic abdominal pain in children post-appendectomy. Pediatric gastroenterologists should be aware that this unique clinicopathologic correlation exists when reviewing the appendix pathology of children with chronic abdominal pain who have undergone subsequent appendectomy. These findings support the hypothesis that a histologic difference exists among appendiceal specimens of children with chronic abdominal pain who symptomatically improved post-appendectomy.

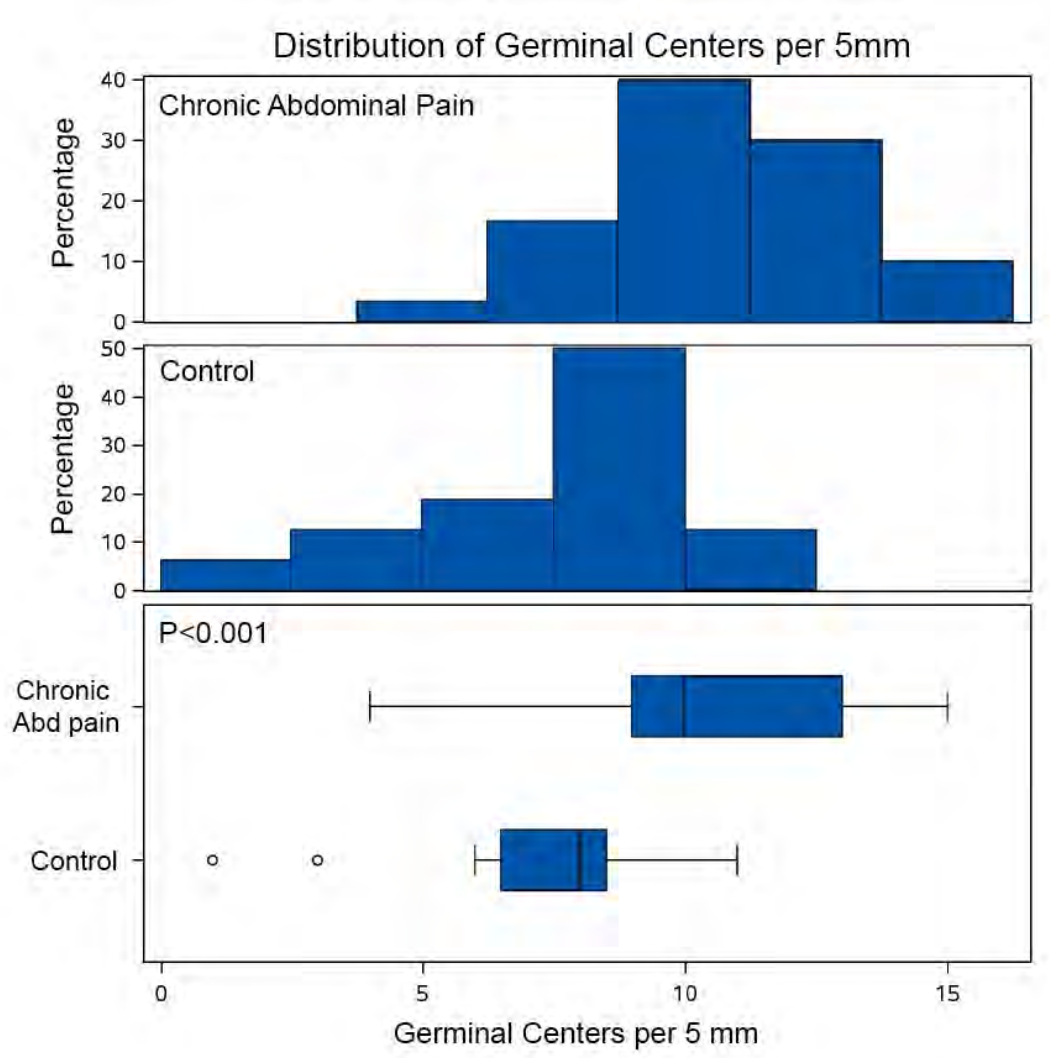


Figure 1. Germinal center distribution histograms (top and middle) and box plot (bottom) demonstrate that there are significantly more germinal centers per 5 mm in the appendixes of children with chronic abdominal pain compared to children without chronic abdominal pain (P<0.001).

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54 ***IDENTIFICATION OF BILE ACID DIARRHEA IN ADOLESCENTS WITH DIARRHEA PREDOMINANT IRRITABLE BOWEL SYNDROME.*** *Beate Beinvogl[1], Louai Manini[2], Michael Camilleri[3], Leslie Donato[4], Absah Imad[2], Elizabeth Burch[1], Neil Schechter[5], Samuel Nurko[1]. [1]Pediatric Gastroenterology, Center for Motility and Functional Gastrointestinal Disorders, Boston Children's Hospital, Boston, MA; [2]Division of Pediatric Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN; [3]Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN; [4]Laboratory Medicine and Pathology, Mayo Clinic, Rochester, MN; [5]Department of Anesthesiology, Critical Care and Pain Medicine, Boston Children's Hospital, Boston, MA*

Background: Bile acid diarrhea (BAD) is responsible for 30% of diarrhea predominant irritable bowel syndrome (IBS-D) and 30-50% of chronic diarrhea in adult patients. BAD results from excess fecal bile salts. Selenium homotaurocholic acid test (^{75}SeHCAT) is the gold standard for diagnosing BAD, but it involves ionizing radiation and is not available in USA. Thus, 48 hour fecal bile acids (48FBA) measurement has been validated for the diagnosis of BAD, but is technically cumbersome and not widely available. 7α-Hydroxy-4-cholesten-3-one (C4) is a downstream product of CYP7A1, rate limiting enzyme in BA production, and fasting serum C4 has been shown to correlate with bile acid (BA) production from the liver. Fibroblast growth factor 19 (FGF-19) is released from ileal enterocytes into portal circulation in response to BA reuptake leading to down regulation of BA synthesis in the liver.

Hypotheses: In adolescents, serum C4 is directly correlated with 48FBA and can differentiate between healthy subjects and patients with IBS-D. FGF-19 is inversely correlated with serum C4.

Aims: To study the relationships between serum markers (C4 and FGF-19) and 48FBA and to compare serum C4 and FGF-19 between healthy controls (HC) and IBS-D patients.

Methods: Healthy adolescent controls (HC) and subjects with IBS-D were recruited. Diagnosis of IBS-D made according to ROME IV criteria. Patients with other gastrointestinal diseases, history of abdominal / intestinal surgery or recent courses of antibiotics were excluded. Participants had measurements of fasting serum samples for C4 and FGF-19, 48 hours fecal collection for bile acids, and filled a 14 day bowel diary.

Results: Twenty-nine HC and 23 IBS-D patients were recruited, 34% females {29.6 % in HC group and 39.1% in IBS-D group (p=0.56)}. Mean age was 13.2(±2.6) years {12.4(±2.5) years for HC group and 14.1 (±2.4) years for IBS-D group (p=0.033)}. Serum C4 was directly correlated to 48FBA {Spearman coefficient 0.59 (p=0.002), n=24}. Serum C4 was inversely correlated to FGF-19 {-0.26 Spearman correlation test (p=0.07), n=50}. Mean 48FBA was significantly different {p=0.014} between HC (296.3±48 μmol/48h) and IBS-D (487.2±53.7). Mean C4 was significantly different {p=0.06} between HC (9.6±2.0ng/mL) and IBS-D (15.6±2.33ng/mL). Mean FGF-19 was not significantly different {p=0.61} between HC (109.7±13.0) and IBS-D (97.6±14.6). Based on interquartile data of C4 and FGF-19 in HC, 17% of patients with IBS-D met criteria for BAD based on fasting serum C4 levels and 8% based on FGF-19. Mean stool frequency /day was significantly different {p<0.001} between HC (1.6±0.23/day) and IBS-D (3.13±0.26/day). Mean Bristol score for stool consistency was significantly different {p<0.001} between HC (3.4±0.15) and IBS-D (4.5±0.17).

Conclusion: In this study, serum C4 correlated well with 48FBA and appears to be a useful marker to assess fecal bile acid loss in children and adolescents with suspected IBS-D. Abnormal BA tests based on fasting serum C4 were found in 17% of IBS-D patients. Serum C4 and 48FBA may be useful to differentiate between HC and patients with IBS-D and may be useful for clinical practice.

55 ***IMPROVED FUNCTIONING PRECEDES IMPROVEMENT OF ABDOMINAL PAIN IN PEDIATRIC PATIENTS WITH FUNCTIONAL GASTROINTESTINAL DISORDERS.*** *Beate Beinvogl[1], Elizabeth Burch[1], Julie Snyder[1], Neil Schechter[2], Amy Hale[1], Bobbie Riley[2], Emma Albright[1], Toni Solari[3], Samuel Nurko[1]*
[1]Pediatric Gastroenterology, Center for Motility and Functional Gastrointestinal Disorders, Boston Children's Hospital, Boston, MA; [2]Department of Anesthesiology, Critical Care and Pain Medicine, Boston Children's Hospital, Boston, MA; [3]Pediatric Gastroenterology, Center for Nutrition, Boston Children's Hospital, Boston, MA

Introduction: Functional gastrointestinal disorders (FGIDs) are common in children and adolescents and symptoms can result in poor quality of life and severe disability. Patients who wait for improvement of pain before returning to normal functioning in daily life may experience prolonged periods of disability, including social withdrawal and school absenteeism. Studies have shown that a multidisciplinary, rehabilitative approach is effective in treating pediatric patients with severe disability related to FGIDs. In this context, we sought to determine the relationship between improvement in function and in pain.

Methods: This study is a retrospective review of 37 patients who were seen in a multidisciplinary functional abdominal pain program for an initial evaluation and two follow-up visits. All patients were screened prior to the appointment and only severely disabled patients were seen. Only patients with pain-predominant FGIDs were selected, including irritable bowel syndrome (IBS), functional abdominal pain (FAP) and functional dyspepsia (FD), and all had previously seen at least one pediatric gastroenterologist. Patients underwent a multidisciplinary clinic visit with individualized treatment

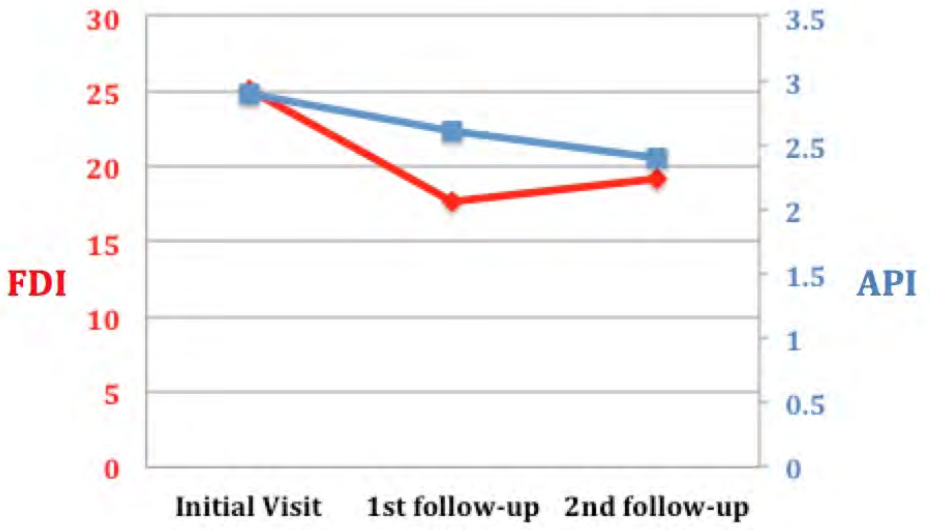
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recommendations including pharmacologic and non-pharmacologic treatments. The importance of a rehabilitative approach with emphasis on improving functioning was discussed with each family.
Patients completed questionnaires before the initial visit and at each follow-up visit. These included the Functional Disability Inventory (FDI) and the Abdominal Pain Index (API). The FDI measures the degree of difficulty in physical and psychosocial functioning due to their health status by asking patients to rate how much physical difficulty was perceived for a variety of everyday activities. The API consists of five items evaluating the frequency, duration and intensity of abdominal pain episodes experienced during the prior two weeks. Demographics were obtained from electronic medical records. Data Analysis was performed using SPSS. Means and frequencies were calculated for demographic data and scores. A Wilcoxon signed rank test was used to compare API and FDI at the initial visit compared to follow-up visits

Results: Study population: 37 patients, 64.9% female, mean age 13.3 ±1.9 years with a mean duration of symptoms of 11.9 ± 7.7 months prior to being seen for the initial visit.
Diagnoses:40.5% FAP (15/37), 37.8% IBS (14/37), 21.6% FD (8/37)
Comorbidities: Most common comorbid symptoms included headache (43.2%), POTS/orthostatic intolerance (27%) and chronic fatigue (2.7%). Other common comorbidities included endometriosis (5.4%) and well-controlled celiac disease (8.1%). Psychiatric comorbidities reported at the initial visit included anxiety (40%), depression (14.3%), ADHD (8.1%), ODD (2.7%), and somatic symptom disorders (5.4%).
Follow-up: All patients had two follow up visits. The first and second follow-up visits were at a median of 9 weeks and 23 weeks after the initial visit, respectively.
Functional disability: The mean FDI at the initial visit was 25.1 ± 9.4 and improved significantly to 17.6 ± 10.5 at first follow-up visit ($p<0.05$). At the second follow up, the FDI had a minimal increase to 19.2 ± 11.4 ($p=0.376$), Compared to the initial FDI, there was significant improvement overall between the initial visit and the second follow-up ($p<0.05$). (**Figure 1)**
Abdominal pain: Mean API at the initial visit was 3 ± 0.94, and improved insignificantly by the first follow up API 2.62 ± 1.04 ($p=0.53$) and significantly at the second visit 2.47±1.23 ($p=0.025$) (**Figure 1)**

Conclusion: All patients had improvement of both their FDI and API scores after treatment in a multidisciplinary clinic. It is noteworthy that functioning improves more rapidly and before improvement of abdominal pain. Our results provide support for emphasizing to patients and families that improvement in functioning will occur ahead of improvement in abdominal pain when discussing the multidisciplinary treatment approach for pain predominant FGIDs.

Figure 1. FDI and API trend over follow-up period



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56 ***UTILIZATION AND COST FOR PEDIATRIC IRRITABLE BOWEL SYNDROME BASED ON NATIONAL INSURANCE DATABASE CLAIMS DATA.*** *Beate Beinvogl[1], Nathan Palmer[2], Isaac Kohane[2], Samuel Nurko[1]. [1]Pediatric Gastroenterology, Center for Motility and Functional Gastrointestinal Disorders, Boston Children's Hospital, Boston, MA; [2]Department of Biomedical Informatics, Harvard Medical School, Boston, MA*

Introduction: Patients with Irritable Bowel Syndrome (IBS) can have severely disabling symptoms, which often results in high utilization of the health care system, resulting in substantial cost. Prior studies in the adult literature have shown a significant economic burden associated with IBS. No such data exists in the pediatric and adolescent population. We aim to determine the annual all-cause costs of IBS and health care utilization of pediatric and adolescent patients with IBS compared to children without any chronic diseases based on national insurance database claims data.

Methods: This is across sectional cohort study using un-identifiable claims data from a national managed care plan. Members were selected based on PheWas codes, which represent hierarchical phenotypes formed from grouped ICD-9 codes. Male and female members age 6-21years with 12 months of continuous enrollment in or prior to 2014 were included. Members with diseases that mimic IBS and members with chronic diseases of childhood at any time during enrollment were excluded. Subjects were defined as any member with a PheWAS code for IBS in 2014, all others were selected as controls. Primary outcome was the annual all-cause cost per IBS patient per year compared to controls. Secondary outcomes included details of health care utilization, including place of service and type of service as well as subspecialty consultations.

Results: *Patient characteristics:* 1,325,713 patients were included in the cohort with a mean age of 13.7 ±4.5 (median 14) years (56% female); 2,376 patients were identified as IBS subjects (69.2% female) and 1,323,337 were identified as controls (44% female). The mean age was 17.3 ±3.6 (median 18) years in the IBS group and 13.7 ±4.5 (median 14) years in the control group.
Cost: Mean absolute total annual all-cause cost of pediatric patients with IBS in 2014 was $11,640, or an incremental cost of $6,622 more than controls (adjusting for gender).
Health Care Resource Utilization: Patients with IBS had higher rates of health care utilization including higher rates of outpatient visits ($p<0.05$), emergency department visits ($p=0.053$) and inpatient admissions ($p<0.05$).
Types of Service: Medical Services were utilized with equal frequency between IBS patients and controls ($p= 0.364$). Mental health ($p<0.05$), radiology and lab services ($p<0.05$), surgery ($p<0.05$) and anesthesia ($p<0.05$) were more frequently utilized by IBS subjects. (Figure 1)
Subspecialty Visits: Consultation with Gastroenterology ($p<0.05$), Nutrition ($p<0.05$), Radiology ($p<0.05$), Mental Health Professionals ($p<0.05$), Neurology ($p<0.05$), Emergency Medicine ($p<0.05$), Gynecology ($p<0.05$), Dermatology ($p<0.05$), Family Medicine ($p<0.05$) and Internal Medicine ($p<0.05$) was significantly more frequent in patients with IBS than healthy controls. (Figure 2)

Conclusion: Patients with IBS incur a significantly annual cost compared to controls through increased health care resource utilization.

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Figure 1. Type of service utilized in patients with IBS compared to controls (* p < 0.05)

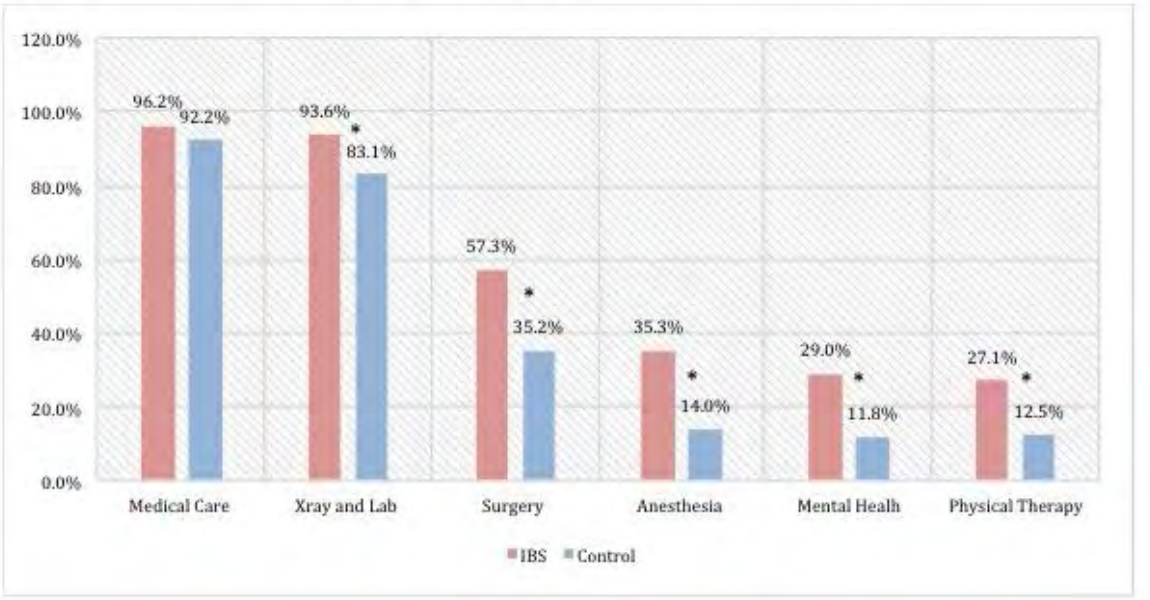
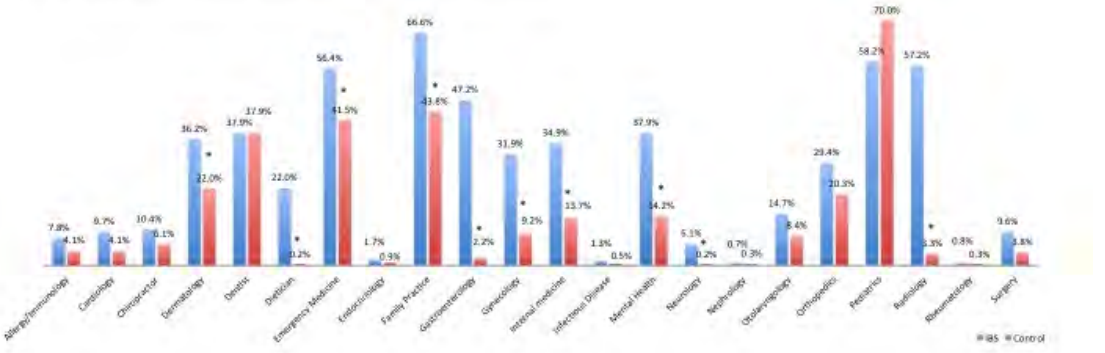


Figure 2. Subspecialty Consultation by patients with IBS compared to Controls (* p<0.05)



57 ***PREVALENCE OF FUNCTIONAL GASTROINTESTINAL DISORDERS IN PANAMANIAN INFANTS UNDER 12 MONTHS: COMPARISON BETWEEN THE ROME III AND ROME IV CRITERIA.*** *Ricardo Chanis[1], Carlos Velasco-Benitez[2]. [1]Pediatria, Hospital del Niño, Panama, Panama; [2]Pediatria, Universidad del Valle, Cali, Colombia*

Introduction: Functional gastrointestinal disorders (FGIDs) are frequent in children <4 years, with a prevalence of 24.7% in the United States according to the Rome IV Criteria (RIV). **Objective:**To determine the prevalence to present FGIDs in infants according to RIV and compare it with the Rome III Criteria (RIII). **Methodology:**Observational type prevalence study performed on legal representatives of Panamanian infants under 12 months who attended the External Consultation on Healthy Child Growth and Development during October 2018 and March 2019, who answered the Questionnaire for Pediatric Digestive Symptoms in Spanish Version RIV to identify Colic (in children under 4 months), Dyschezia (in children under 9 months) and Regurgitation, Rumination, Functional Diarrhea (FD), Cyclical vomiting syndrome (CVS) and Functional constipation. These data were compared with a previous study carried out with RIII. **Results:**65 infants of 6.9±3.9 months were included; 55.4% of the male gender. 40.0% of children had at least 1 FGIDs: 25.0% colic; 2.3%

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dyschezia; 21.0% regurgitation and 7.7% functional constipation. No cases of FD or CVS were identified. The prevalence for presenting some FGIDs was similar to RIII (45.8% vs. 40.0%, p = 0.372); with an increase in the prevalence for regurgitation (9.3% vs. 21.5%, p = 0.020), decrease for dyschezia (35.0% vs. 2.3%, p = 0.001) and absence for rumination (8.5% vs. 0.0%, p = 0.011). **Conclusion:** The prevalence to present FGIDs in Panamanian infants under 12 months according to RIV did not change; however, for regurgitation it was significantly greater, and both for dyschezia and rumination, lower

58 ***NAUSEA WORSENS FUNCTIONAL DISABILITY IN PEDIATRIC PATIENTS WITH CHRONIC OVERLAPPING PAIN CONDITIONS (COPC).*** *Gisela Chelimsky[1], Rasiki Deshpande[2], Thomas Chelimsky[3], Pippa Simpson[2], Mingen Feng[2], Jody Barbeau[2]. [1]Gastroenterology, Medical College of Wisconsin, Milwaukee, WI; [2]Medical College of Wisconsin, Milwaukee, WI; [3]Neurology, Medical College of Wisconsin, Milwaukee, WI*

Background: Nausea is not a well understood pediatric symptom, mainly in COPC. Pediatric patients with COPC have multiple comorbidities that cause significant disability and often undiagnosed and undertreated.

Methods: Retrospective chart review of the Neuro-gastroenterology clinic was done. Subjects completed a symptom questionnaire through MyChart prior to appointment, including top symptoms, comorbid conditions and family history. Subjects without nausea, with nausea as top 3 symptoms (key sx), and with nausea not reported as top 3 symptoms (not otherwise specified [NOS]) were compared using Kruskal-Wallis, Fisher's exact, and Pearson's chi-squared tests.

Results: Of 71 charts, 20 had no nausea, 27 had nausea key sx, and 24 had nausea NOS. Gender (p=0.44) and age (p=0.93) were not different among the three groups. Depression (p>0.99), anxiety (p=0.57), and post-traumatic stress disorder (p=0.19) were also not significantly different among the 3 groups.
Comorbidities such as dizziness (p=0.29), fatigue (p=0.51), fainting spells (p=0.30), abdominal pain (p=0.20), infrequent bowel movements (p=0.25), and discomfort or pain with eating (p=0.11) did not vary. Vomiting (p=0.0028) and sleep problems (p=0.021) were more frequent in nausea key sx than no nausea groups. Nausea NOS group had more migraines (p=0.015), sleep problems (p=0.019), and aches and pains (p=0.027) than no nausea group. Aches and pains also differed between patients with nausea as key sx and nausea NOS (p=0.030). In comparison to patients without nausea, functional disability inventory was significantly higher in patients with nausea as key sx (p=0.0051) and nausea NOS (p<0.0001). Family history of irritable bowel syndrome (p=0.66), fibromyalgia (p>0.99), migraines (p=0.75), chronic fatigue (p=0.85), and cyclic vomiting syndrome (p=0.19) were not different.

Conclusions: Nausea is associated with worse functional disability, migraines and vomiting. Interestingly, family history of migraine was **not** more prevalent in the nausea groups.

59 ***DIAGNOSTIC ACCURACY OF TWO HOUR AND THREE HOUR GASTRIC RETENTION VALUES IN CHILDREN UNDERGOING A FOUR HOUR GASTRIC EMPTYING SCINTIGRAPHY EVALUATION.*** *Omar Malik[1], Eric Chiou[1], Robert Orth[2], Robert Shulman[1], Bruno Chumpitazi[1]. [1]Pediatrics, Baylor College of Medicine, Houston, TX; [2]Radiology, Texas Children's Hospital, Houston, TX*

Background: Four-hour solid meal gastric emptying scintigraphy (**GES**) with hourly measurements is being increasingly used in the evaluation of potential cases of gastroparesis; a 4-hour gastric retention value of >10% is considered abnormal and diagnostic of gastroparesis (PMID: 18028513). However, at some centers, the 2- and 3-hour time points are used to identify gastroparesis. Yet, the diagnostic accuracy of the 2- and 3-hour time points to identify an abnormal vs. normal GES study is unknown.
Objective: To determine the diagnostic accuracy of different gastric retention values at 2- and 3-hours in identifying gastroparesis as determined by the 4-hour value, in a large cohort of children undergoing 4-hour GES.
Methods: We completed a retrospective chart review of 4-hour Tougas solid meal GES studies at a quaternary care children's hospital. Gastric retention values were captured from each hourly time point. The positive and negative likelihood ratios of a range of gastric retention values (range: 20-80%) at the 2- and 3-hour time points were computed on the basis of 4-hour values. A positive likelihood ratio of >10 was determined *a priori* as the threshold for high diagnostic accuracy for identifying gastroparesis (4-hour gastric retention value >10%). A negative likelihood ratio of 0.10 was determined *a priori* as the threshold for high diagnostic accuracy for identifying a normal study.
Results: 364 studies (mean age of subjects: 12.9 ± 3.8 years; 234 (64%) female) were included for analysis of whom 106 (29.1%) demonstrated gastroparesis. Despite evaluating a wide range of gastric retention values, for the 2-hour time point a positive likelihood ratio greater than 10 predicting gastroparesis was not identified. In contrast, a negative likelihood ratio of 0.10 was identified at <35% retention at the 2-hour time point predicting a normal study. At the 3-hour time point,

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gastric retention ≥35% had a positive likelihood ratio >10 and gastric retention <20% had a likelihood ratio <0.1.
Conclusions: In children, the 2-hour time point has limited value in predicting gastroparesis but may be helpful in identifying a normal 4-hour GES study. In contrast, values at 3-hours are helpful in either predicting gastroparesis or a normal 4-hour GES study.

60 ***EVALUATION OF DEFECATION DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDER BY COLONIC MANOMETRY.*** *Alexander Coe[2], Jacob Ciricillo[3], Khalil El-Chammas[1], Neha Santucci[1], Alisara Damrongmanee[1], Lin Fei[4], Chunyan Liu[4], Ajay Kaul[1]. [1]Gastroenteroloty, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Department of Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]University of Toledo College of Medicine, Toledo, OH; [4]Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*
INTRODUCTION: Gastrointestinal complaints have been described in about seventy percent of individuals with Autism Spectrum Disorder (ASD). Preclinical data demonstrates delays in upper and lower gastrointestinal transit in animal models with autism. Given the burden of gastrointestinal symptoms, there has been debate whether there is true colonic dysmotility causing the defecatory disorders so commonly observed in patients with ASD.
OBJECTIVES: The primary objective of this study was to determine if colonic dysmotility evaluated by colonic manometry (CM, contributed to the defecation disorders in ASD patients.
METHODS: This was a retrospective, propensity-matched, case-control study, with review of the electronic medical records of patients with ASD, and control patients without ASD, that had defecatory disorders and underwent evaluation by CM. All patients were evaluated at the Neuro-gastroenterology center at Cincinnati Children's Hospital for defecatory disorders, including refractory constipation. At the time of manometric work up, each patient had the CM catheter placed endoscopically under anesthesia, and the study was performed the next day, according to published guidelines. Catheter position was verified radiographically the following day prior to commencement of the study. Abnormal CM was defined as any study that demonstrated inadequate propagation or low amplitude of colonic contractions, absent colonic contractions, hyperactive contractile patterns or absent gastrocolic reflex. A pediatric neuro-gastroenterologist read all the studies.
The propensity score (PS) model included the following variables: age, race, gender, duration of symptoms, disease severity, history of gastrointestinal surgery, history of gastrointestinal co-morbidity, history of neuro-psychiatric comorbidity and selected interactions. Each ASD patient was matched to a control within a caliper of 10% standard deviation of PS. The CM results of the ASD cohort were compared against non-ASD controls both before and after matching, using a Chi-square test.
RESULTS: Thirty-three constipated patients with ASD and one hundred forty-nine controls without the diagnosis of ASD were included. Demographics between the two groups differed considerably prior to PS-matching. The cohort with ASD was older as a group (range 31 -231, mean 149.4, and median 157 months), and had marked differences in sex (78.8% male) and race (90.9% white) when compared to the control population (age range 28-293, mean 125, median 114 months, 49% male, and 80.5% white). There was no significant difference in abnormal CM findings between the controls and cohort with ASD. There were 35 patients among the 149 controls and 10 among the 33 cases that had abnormal CM results (23% vs. 30%, p=0.41). After propensity score matching, 29 patients with ASD and 29 matched controls were compared. Again, there was no significant difference between the two groups in abnormal CM findings, with 9 out of 29 matched control patients, and 8 out of 29 ASD matched patients had findings of abnormal colonic motility by CM evaluation (31% vs. 28%, p=0.77).
CONCLUSION: Despite the evidence for delayed gastrointestinal transit in animal models of ASD, there did not appear to be any specific findings on CM that was unique to the ASD cohort. This finding has important implications on the management strategies used to treat disorders of defecation, especially, constipation, in children with ASD.

61 ***PREVALENCE OF JOINT HYPERMOBILITY IN CHILDREN WITH FUNCTIONAL GASTROINTESTINAL DISORDERS: A PROSPECTIVE CASE-CONTROL STUDY.*** *Jessica Barry[1], Hanan Nashed[2], Sophia Patel[1], Michael Schmalz[1], Praveen Kumar Conjeevaram Selvakumar[1]. [1]Pediatric Gastroenterology, Hepatology and Nutrition , Cleveland Clinic, Cleveland, OH; [2]General Pediatrics, Cleveland Clinic, Cleveland, OH*
Background: Joint hypermobility (JH) could be an isolated benign variant in the general population or a clinical manifestation of connective tissue diseases such as Marfan syndrome or Ehlers-Danlos syndrome. The prevalence of benign JH in healthy children is reported to be highly variable (3-30%) depending on age, sex and ethnicity. Adult studies have shown an increased prevalence of JH in patients with functional gastrointestinal diseases. However, pediatric studies looking at this association of JH and functional gastrointestinal disorders (FGID) are lacking.
Objective: To determine the prevalence of JH in children with FGID and to compare that to the prevalence of JH in healthy

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controls. To assess the quality of life (QOL) in patients with FGID in correlation with the presence of JH compared to patients with FGID without JH.
Methods: We performed a prospective case-control study involving children (aged 8-18 years) with FGID (irritable bowel syndrome (IBS), functional constipation, functional dyspepsia, cyclic vomiting syndrome (CVS), and functional abdominal pain) based on physician diagnosis from a tertiary Pediatric Gastroenterology clinic, and healthy children (aged 8-18 years) from General Pediatrics clinic during well child visits. JH in children was assessed using the Beighton scoring system and children with a score ≥ 4 were considered to have JH. We excluded children with a history of connective tissue diseases, and or fractures involving those joints assessed for JH. The secondary outcome of QOL was measured by scaled score (continuous outcome with the range of 0-100) and general health score (ordinal outcome with the range of 0-4), evaluated by both the parent, and child self-reporting using pediatric quality of life inventory validated questionnaires (PedsQL) [1]. Continuous variables (such as age and scaled scores) were described using median and interquartile range; categorical variables (such as sex and primary diagnosis) were described using frequency and percentage. Study groups (FGID versus healthy controls and JH-positive vs. JH-negative among FGID children) were compared on demographic and clinic characteristics using Wilcoxon rank sum test for continuous and ordinal characteristics and Chi-square of Fisher's exact tests for categorical characteristics.
Results: A total of 40 FGID patients (females 60%; mean age 15 years) and 43 healthy controls (females 23; mean age 13 years) were included in the study. The prevalence of JH was significantly higher in children with FGID compared to healthy controls (60% vs. 7%; p-value <0.001). Even after adjustment for age and sex, children with FGID had significantly higher odds of having JH compared to healthy controls (OR 14.1 CI 3.5, 84.2; p-value <0.001). There was no significant difference in JH among different sub-groups of FGID. On a sub-group analysis, children with IBS and JH had lower child self-reported scaled QOL scores and general health scores compared to those without JH (68.7 vs. 83.2; p-value 0.036) and (1.66 vs. 2.35; p-value 0.015).
Conclusions: Our study showed that children with FGID had a higher prevalence of JH compared to healthy controls in addition to lower QOL scores among children with IBS and JH compared to those without JH. These results support the hypothesis for the role of connective tissue defects in the pathophysiology of FGID and worsened symptomology.

63 *EFFECTS OF PROVOCATIVE TESTING ON PHASE III MIGRATING MOTOR COMPLEX IN CHILDREN WITH NORMAL ANTRODUODENAL MANOMETRY.*

Alisara Damrongmanee[1], Khalil El-Chammas[1], Lin Fei[2], Chunyan Liu[2], Neha Santucci[1], Ajay Kaul[1]. [1]Gastroenteroloty, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Background: Antroduodenal manometry (ADM) has been used to evaluate the motor function of the antrum and proximal small intestine. The presence of a normal phase III migrating motor complex (MMC) during the inter-digestive state of ADM is a key indicator of normal antral and small bowel motility. During ADM study, provocative testing with IV erythromycin or azithromycin and/or octreotide is often performed to assess the response of antral and small intestinal motor activity. It has been noted that erythromycin and azithromycin stimulate antral activity with varied small intestinal response while octreotide stimulates phase III contractions in small bowel but inhibits antral contractions. There is a lack of data establishing normal phase III MMC patterns in fasting state and after provocative testing in children which marks a major limitation in the interpretation of ADM studies.
Objective: To determine the characteristics of phase III MMC in fasting, post-azithromycin and post-octreotide phase in children with normal ADM
Method: We included children aged ≤ 21 years with normal ADM results seen at the Neuro-gastroenterology and Motility Disorders Center at Cincinnati Children's Hospital Medical Center from January 2018 to March 2019. Demographics, indication, comorbidity, mode of feeding, and characteristics of phase III MMC (frequency, amplitude, and duration of contraction) during fasting phase, post-azithromycin, and post-octreotide administration were collected and analyzed.
Results: ADM tracings of 48 patients were reviewed; mean age was 120.06±68.67 months, 50% were male, and 77% were Caucasian. Indications for ADM included: vomiting (27.1%), feeding intolerance (27.1%), abdominal pain (16.6%), nausea (14.6%), and abdominal distension (14.6%). Most common gastrointestinal diagnoses were constipation (60.4%) and gastroparesis (16.7%), and 10.4% had hypermobility syndrome. Thirty-seven percent of patients were G-tube or GJ-tube fed. During ADM study, all 48 patients had tracings recorded in fasting phase, 28 patients received both IV azithromycin and IV octreotide for provocative testing while 15 patients received IV azithromycin only and 5 received IV octreotide only. The characteristics of antral contractions and phase III MMC are shown in table 1. In fasting phase, there were 18 patients (37.5%) in whom phase III MMC originated from antrum and then propagated to duodenum. In post-azithromycin phase, phase III MMC was observed in 12 patients (27.9%), of which 66.7% originated in antrum. In 33.3% of the patients, 2 phase III MMC were noted (average interval 41.17±14.23 minutes). The frequency of antral contractions, as well as mean and maximum amplitude, increased significantly compared to fasting phase (p<0.0001). In post-octreotide phase, all

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patients had phase III MMC which 75.8% originated in antrum. Thirteen patients (39.4%) had 2 phase III MMC (average interval 33.70±28.73 minutes). The frequency, maximum amplitude, and duration of phase III MMC increased significantly compared to fasting phase (p-value=0.005, 0.02, and <0.0001, respectively). The characteristics of phase III MMC occurring during fasting and post-octreotide phase did not differ between those that originated in antrum or in small intestine. However, mean and maximum amplitude of phase III MMCs that originated in antrum were higher in post-azithromycin phase (p=0.022 and 0.059, respectively). We did not detect any changes in phase III MMC characteristics with the sequence of administration of provocative agents (giving azithromycin before or after octreotide) when given in the average interval of 118.80±54.72 minutes (ranged 62.33-235.20 minutes), and no symptom correlation (either vomiting or abdominal pain) with phase III MMC was noted.
Conclusion: We describe the characteristics of normal motor activity of antrum and small intestine in fasting phase and after provocative testing in children. We found that azithromycin stimulated antral contractions by increasing frequency, mean and maximum amplitude of contractions compared to fasting phase and induced phase III MMC in a third of patients. Of these, 2/3 originated from antrum. Octreotide increased frequency, maximum amplitude, and duration of phase III MMC compared to fasting state, with the majority originating in antrum. We hope to use these measurements to guide us in the interpretation of ADM studies in children in the future and identify abnormal patterns using these normative values.

Table 1. Characteristics of antral contraction and phase III MMC in fasting, post-azithromycin, and post-octreotide phase

Characteristics [mean (SD)]	Antral contractions		Antral phase III MMC			Intestinal phase III MMC		
	Fasting (N=48)	Post-AZI (N=43)	Fasting (N=18)	Post-AZI (N=8)	Post-OCT (N=25)	Fasting (N=48)	Post-AZI (N=12)	Post-OCT (N=33)
Frequency (cpm)	1.2 (0.41)	2.8 (0.64)	3.4 (0.92)	3.9 (0.38)	3.5 (0.87)	10.7 (0.41)	10.6 (0.39)	10.9 (0.43)
Mean amplitude (mmHg)	38.4 (16.59)	79.1 (19.52)	60.6 (18.21)	87.0 (28.02)	56.8 (14.89)	25.6 (4.47)	27.1 (3.90)	26.3 (4.50)
Maximum amplitude (mmHg)	139.0 (47.21)	213.0 (52.25)	144.0 (35.16)	188.4 (40.06)	151.1 (52.07)	48.1 (10.92)	55.6 (17.96)	53.6 (12.72)
Duration (seconds)	-	-	190.2 (77.86)	305.5 (77.68)	211.3 (119.10)	228.1 (69.70)	261.5 (66.84)	336.5 (115.97)

64 ***CHARACTERIZATION OF MEGACOLON AND GASTROINTESTINAL PATHOPHYSIOLOGY IN PATIENTS WITH MULTIPLE ENDOCRINE NEOPLASIA 2.*** *Claire Daniels[2,1], Srivandana Akshintal[3], Brigitte Widemann[3], John Glod[3], Colleen Hadigan[1]. [1]National Institute of Allergy and Infectious Disease, National Institutes of Health, Bethesda, MD; [2]Pediatric Gastroenterology, Walter Reed National Military Medical Center, Bethesda, MD; [3]National Cancer Institute, Pediatric Oncology Branch, National Institutes of Health, Bethesda, MD*
Study Design: A prospective evaluation of children and young adults with MEN 2A (n=6) and 2B (n=45) at the National Institutes of Health (NCT01660984). Each subject underwent a standardized evaluation with a gastroenterologist. All available computerized tomography (CT) and magnetic resonance images (MRI) performed for staging and management of their MEN 2 disease and medullary thyroid carcinoma were reviewed. An average of 3 measures were taken of the widest section of the transverse colon in both axial and coronal planes (Figure 1A). Megacolon was defined as a transverse colon diameter greater than or equal to 6 cm using the average of both axial and coronal measurements.

Results: The average age of MEN 2A subjects was 10.5 years with a body mass index of 40%ile. The average age of MEN 2B subjects was 16 years with a BMI of 3%ile. MEN 2A participants were largely asymptomatic from a gastrointestinal perspective. Conversely, those with MEN 2B commonly reported constipation (66%) and diarrhea (52%). Abdominal pain was the most common symptom, in 71%, while vomiting and dysphagia were uncommon (16%). The use of medications for bowel regimen was notable for 53% treated with polyethylene glycol and 35% treated with loperamide. CT imaging revealed megacolon in a third of MEN 2B subjects, and no MEN 2A subjects. Megacolon was equally distributed by sex and age, and there was no relationship to either thyroid stimulating hormone or BMI. Those with megacolon were more likely to report constipation (90%, p = 0.04), and less likely to report diarrhea (30%, p = 0.07) than those without megacolon. For the three subjects who reported reflux symptoms, all had megacolon on imaging. There were 19 subjects who had both CT scans and MRI scans available for review. There was a high degree of agreement in colonic diameter between CT and MRI scans (R2 = 0.47, p = 0.001, Figure 1B). This agreement increased (R2 = 0.75, p = 0.03) when the cohort was limited to the nine subjects with CT and MRI images obtained ≤ 3 days apart.

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Conclusion: The majority of subjects with MEN 2B report chronic gastrointestinal symptoms, most commonly abdominal pain and constipation. Over half of them require medication to control their bowel habits. A third of MEN 2B subjects have megacolon on CT imaging. It is important for patients and providers alike to know about the megacolon association with MEN 2B, as it can have implications for bowel regimens and quality of life. As a secondary finding, this study revealed that colonic measurements on CT and MRI correlate well when done in close proximity. This conclusion suggests that MRI may be considered as a first line screening method for megacolon in this population, especially children.

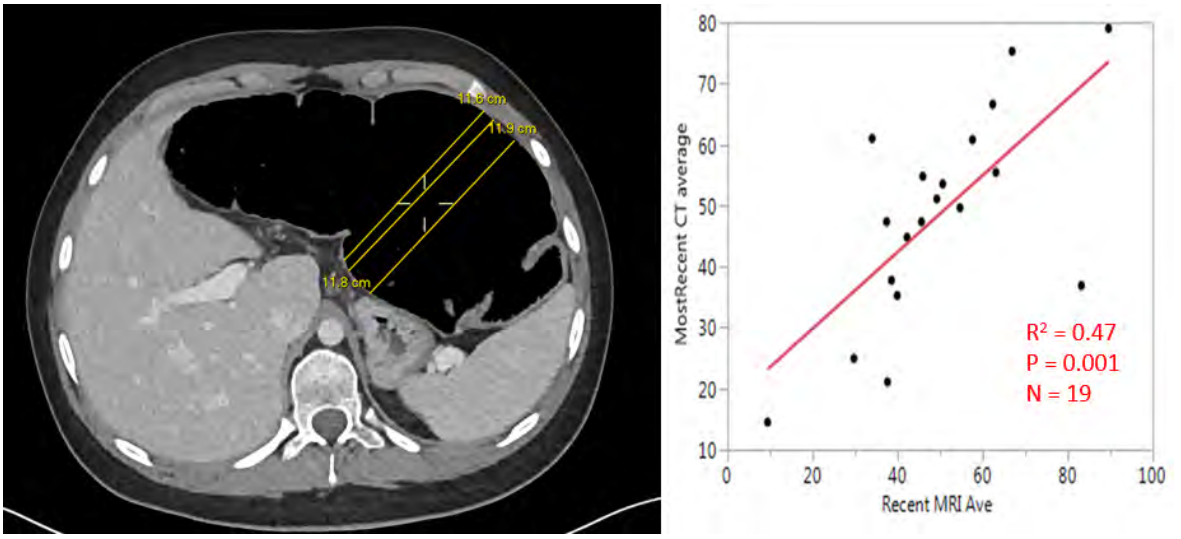


Figure 1: A) Axial view of transverse colon in patient with MEN 2B and megacolon, with average diameter 11.8 cm. B) Correlation in colon size (mm) between computerized tomography (CT) and magnetic resonance imaging (MRI) in 19 subjects who had both images available for review.

65 ***EARLY POSTNATAL MALNUTRITION INDUCED BY LOW-PROTEIN LOW-FAT DIET CAUSES INTESTINAL DYSMOTILITY.*** *Peace Dike[1], Krishnakant Soni[1], Tripti Halder[1], Margaret Connor[2], Geoffrey Preidis[1]. [1]Section of Gastroenterology, Hepatology & Nutrition, Department of Pediatrics, Baylor College of Medicine and Texas Children's Hospital, Houston, TX; [2]Department of Molecular Virology and Microbiology, Baylor College of Medicine, Houston, TX*

Background: Gastrointestinal (GI) dysmotility is observed in states of protein-calorie malnutrition. In patients with kwashiorkor, marasmus, and mild malnutrition, early contrast studies evidenced decreased intestinal tone that was dependent on the severity and duration of malnutrition. Similarly, sigmoidoscopy performed on children with severe kwashiorkor revealed "hypotonicity and laxity" of the distal colon. In other states of malnutrition, such as anorexia nervosa and small-for-gestational age neonates, GI dysmotility is often present in the form of constipation and feeding intolerance. Mechanisms by which malnutrition causes GI dysmotility remain unclear.

Objective: To model malnutrition-associated GI dysmotility in mice and to gain insight into the possible underlying mechanisms.

Methods: Early postnatal malnutrition was induced by giving low-protein, low-fat "regional basic diet" (RBD) chow to lactating dams starting on pup day of life 8. Control litters were given isocaloric chow of normal macronutrient composition. Pups were tested at 2 weeks of age or were weaned to the same RBD or control chow and tested at 2 months of age (as young adults). Upper GI tract motility was assessed by fluorescein isothiocyanate (FITC)-dextran gavage and colonic motility was assessed by rectal bead latency. Intestinal segments were evaluated by light microscopy, and mucosa thickness, crypt depth, and muscularis interna and externa thicknesses were measured. Additional segments of colon were analyzed ex vivo by force transduction to determine the contractile response to cholinergic stimulation. Finally, colon contents were analyzed by targeted LC/MS-MS to measure concentrations of pro-kinetic metabolites.

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Key Results: RBD pups and RBD young adult males were underweight and stunted, whereas RBD young adult females were less affected by malnutrition. Malnourished mice demonstrated slow GI motility: the mean geometric center of gavaged fluorescence was more proximal in RBD pups versus control pups, gastric emptying was delayed in RBD young adult females but not males, and a trend towards prolonged bead expulsion time was observed in RBD young adult females, but not males. Sex differences in dysmotility were only present among young adult mice, not neonatal pups. Although histologic changes due to malnutrition were not observed, force transduction studies demonstrated an exaggerated response to cholinergic stimulation in RBD young adult mice compared to controls. LC/MS-MS revealed significant decreases in 16 of 19 bile acids in the colon of both RBD pups and RBD young adults versus respective controls.

Conclusions: In our diet-induced model of early postnatal malnutrition, GI transit is delayed in a sex-specific manner. Although histologic changes were not identified, we cannot yet rule out the possibility of altered enteric nervous system structure. RBD mice also have decreased quantities of bile acids, potent prokinetic agents, in the colon. These data lead us to hypothesize that intestinal bile acid signaling abnormalities, which result from impaired hepatic bile acid biosynthesis in malnutrition, may contribute to malnutrition-induced GI dysmotility.

66 ***DIFFERENCES AND HEALTH CARE DISPARITIES IN HOSPITALIZATIONS FOR MANAGEMENT OF CONSTIPATION IN CHIDLREN WITH AND WITHOUT AUTISM SPECTRUM DISORDER.*** *Dalya El Tawil*, *Thomas Attard*, *Christina Kapalo Low PhD. Pediatric Gastroenterology*, *Children's Mercy Hospital*, *Overland Park*, *KS*

Background: Children with autism spectrum disorder (ASD) have impairments in social interaction and communication, and demonstrate restricted behaviors. Children with ASD have increased prevalence of GI symptoms including abdominal pain, gastro esophageal reflux, constipation, colitis and diarrhea. As communication impairment is a core deficit of ASD, detection, evaluation and management of GI symptoms in these children can be extremely challenging as symptoms of GI disorders may even be confused with behavioral problems commonly associated with ASD (i.e. aggression), which may contribute to delayed diagnosis and mismanagement. Interestingly, several studies have demonstrated that health disparities exist for children with ASD based on race, ethnicity, and socioeconomic status.

Objectives and Goals: 1.To determine whether inpatient management of constipation differs for children with and without autism spectrum disorder, with respect to length of stay, types and quantities of medications used for constipation management, colonoscopy procedures completed and their findings, and number of readmission.

2. To determine if racial and socioeconomic status differences exist with regards to the hospitalization of children with and without ASD for constipation.

3. To determine if children with ASD and constipation who underwent a colonoscopy were more likely to be diagnosed with colitis or inflammatory bowel disease as compared to neurotypical controls with constipation who underwent colonoscopy.

Methodology: Large-scale, population-based data has the potential to examine and compare the details of the inpatient admissions for children across the nation.

The Pediatric Hospital Information System (PHIS), is an administrative database that contains inpatient, emergency department, ambulatory surgery and observation encounter-level data from 49 not-for-profit, tertiary care pediatric hospitals in the United States. These hospitals are affiliated with the Children's Hospital Association (Overland Park, KS).

Data are de-identified at the time of data submission, and data are subjected to a number of reliability and validity checks before being included in the database.

We will examine all children with an admitting diagnosis of constipation, encopresis or fecal impaction, and identify those children with the diagnosis of autism.

We compared length and cost of inpatient admissions for constipation management, the rates of colonoscopy procedures performed and spectrum of subsequent diagnoses made, the number and type of inpatient medications ordered , and the compounding effect of racial or socioeconomic minority status on the above variables.

Results: A total of 17543 children were admitted for inpatient constipation management across 49 pediatric hospitals in the United States from 2015-2018 with significantly longer inpatient admissions and subsequently incurring higher costs for children diagnosed with Autism Spectrum Disorder. Children with ASD had more medicaid benefits when compared to commercial insurance. The medications used and colonoscopy procedures completed during the admission for constipation managment were similar across all cohorts. No significant racial or socioeconomic health disparities were noted in the admissions.

Conclusion: Children with Autism Spectrum disorder admitted for inpatient management of constipation are more likely to have longer hospital stays, with higher costs and are more likely to be readmitted within 2 years. No differences to suggest socioeconomic or racial disparities were noted. These findings suggest a need for developing more effective outpatient therapies for constipation in children diagnosed with Autism Spectrum Disorder.

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70 ***EVALUATION OF PEDIATRIC ROME IV CRITERIA AND DIAGNOSTIC TESTING FOR FUNCTIONAL GASTROINTESTINAL DISORDERS.*** *Isha Kaul[1], Vincent Staggs[2], Amber Bagherian[2], Amna Ali[1], Robert Shulman[1], Jennifer M Colombo[2], Jennifer Schurman[2], Bruno Chumpitazi[1], Craig Friesen[2]*
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Background: With the advent of the recently published pediatric Rome IV criteria for diagnosing functional gastrointestinal disorders (**FGIDs**), studies are needed to determine their utility. Our objectives were to measure the agreement amongst pediatric gastroenterologists and pediatric gastroenterology fellows in: 1) Making a Rome IV FGID diagnosis; and 2) Deciding on the need for, and if needed, the type of diagnostic testing for FGIDs.

Methods: Pediatric gastroenterologists and pediatric gastroenterology fellows at two medical centers completed a survey containing 10 clinical vignettes summarizing the clinical presentation of patients with FGIDs. For each vignette, raters identified "the most likely diagnosis or diagnoses." Raters also selected which diagnostic test(s) (if any) they typically would obtain based on the vignette. The survey was re-administered to the same raters within 2 months. Initial and test-retest (within physician) percent weighted agreement was determined for the identified diagnoses and diagnostic testing. Linear mixed modeling identified sources of variability in diagnostic testing.

Results: Thirty-four (21 pediatric gastroenterologists and 13 pediatric gastroenterology fellows) raters completed the initial survey. Thirty-one (91%) raters completed a repeat survey.

Rome IV Diagnoses: Overall weighted percent agreement of Rome IV diagnoses amongst physicians for the initial survey was 68.3% and for the repeat survey was 68.4%. Overall intra-rater (within-physician) weighted percent agreement was 76.2%.

Diagnostic Testing: Overall weighted percent agreement for diagnostic testing between physicians for the initial survey was 28.6% and for the repeat survey was 28.9%. Overall intra-rater (within-physician) weighted percent agreement for diagnostic testing was 57.1%. The overall initial median number of tests selected per vignette was 2 (interquartile range 0-6). The overall median number of tests selected per vignette in the repeat survey was 1 (interquartile range 0-5). Based on linear mixed model estimates, between-physician differences accounted for 43% of the variability in the number of tests selected after controlling for the vignette.

Conclusion: Among pediatric gastroenterologists and fellows, pediatric Rome IV diagnostic agreement using patient vignettes was moderate. Agreement on diagnostic evaluation was generally poor, with differences among physicians accounting for a significant portion of the variability.

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Table 1A: Percent diagnostic agreement between physicians.

Vignette	1	2	3	4	5	6	7	8	9	10	Overall
Time 1	81.3	92.2	56.2	74.4	38.9	94.1	67.2	41.7	88.8	48.1	68.3
Time 2	93.5	100	53.0	79.5	34.4	97.8	66.4	40.6	79.6	39.5	68.4

Table 1B: Percent diagnostic agreement from Time 1 to Time 2 (within physicians).

Vignette	1	2	3	4	5	6	7	8	9	10	Overall
Agreement	86.0	64.0	95.7	68.3	77.4	52.7	98.9	75.8	55.4	88.2	76.2

Table 2A: Percent agreement between physicians on labs/tests.

Vignette	1	2	3	4	5	6	7	8	9	10	Overall
Time 1	24.7	59.5	26.7	24.2	23.6	28.3	20.8	24.6	21.5	31.9	28.6
Time 2	27.3	65.8	20.1	25.6	20.8	33.2	26.9	22.5	26.5	20.7	28.9

Table 2B: Percent agreement on labs/tests from Time 1 to Time 2.

Vignette	1	2	3	4	5	6	7	8	9	10	Overall
Agreement	56.3	68.8	63.6	51.0	50.4	57.4	49.8	55.1	62.8	56.3	57.1

Table 2C: Number of labs/tests selected (limited to 31 physicians with data at both time points).

Vignette	1	2	3	4	5	6	7	8	9	10	Overall
Time 1											
Median	1	0	5	4	4	3	3	2	1	5	2
Inter-quartile range	0-5	0-0	1.5-6.5	0.5-6.5	1-5	0-6	1-7	0-5	0-4.5	2-6.5	0-6
Time 2											
Median	1	0	4	2	2	1	3	1	1	2	1
Inter-quartile range	0-4	0-0	1-5	0-5	1-5.5	0-5.5	1-5.5	0-5	0-3.5	1-5.5	0-5

71 ***EFFICACY AND FEASIBILITY OF THE LOW FODMAP DIET FOR CHILDREN WITH IRRITABLE BOWEL SYNDROME: A PROSPECTIVE COHORT STUDY AND PHONE SURVEY.*** *Meghan Holzmacher[1,2], Jody Wall[1], Megan Puritz[1], Kirsten Jones[1], Lauren Storch[1], Ross Maltz[1], Neetu Bali[1], Karla Vaz[1], Desalegn Yacob[1], Carlo Di Lorenzo[1], Peter Lu[1]. [1]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]The Ohio State University College of Medicine, Columbus, OH*

Background: Irritable bowel syndrome (IBS) is a common cause of chronic abdominal pain in children, but response to conventional treatment is often limited. A diet low in fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAPs) has been used to treat adults with IBS. Experience in children is limited. Our objective is to evaluate the efficacy, feasibility, and safety of the low FODMAP diet in children with IBS.

Methods: We conducted a prospective cohort study of children 8-18 years of age with IBS starting the low FODMAP diet. Participants were asked to complete online questionnaires after a 1-week baseline phase, a 3-week FODMAP elimination phase, a 4-week reintroduction phase, and a 4-week maintenance phase. We recorded abdominal pain severity (Wong-

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Baker FACES Pain Rating Scale), stool form (Bristol Stool Form Scale, BSFS), the Pediatric Quality of Life Inventory (PedsQL), weight, medications, and measures of adherence and satisfaction. We also conducted a phone survey of families of children treated with the low FODMAP diet at our institution to administer a questionnaire assessing adherence, response, and satisfaction.

Results: We included 40 children in our prospective cohort study (73% female, median age 14 years, range 9-17 years). As shown in **Table 1**, 14 children (35%) completed the elimination phase questionnaire, 8 (20%) completed the reintroduction phase questionnaire, and 6 (20%) completed the maintenance phase questionnaire. Compliance with the diet decreased over time. However, we found significant improvement in abdominal pain severity in those who completed questionnaires, with 71% of children experiencing a ≥30% decrease in severity after the elimination phase ($p<0.001$). Improvement persisted after completion of the maintenance phase ($p<0.05$). Children with abnormal stool form at baseline (BSFS <3 or >5) experienced improvement after starting the diet at all time points ($p<0.01$, $p<0.01$, and $p<0.05$ respectively). All children with normal stool form at baseline continued to have normal stool form. PedsQL improved after the elimination phase ($p<0.05$). Weight remained stable and medication use did not change in this cohort.

We surveyed 21 families by phone. A summary of survey findings is presented in **Table 2**. Nine children (43%) had stopped the diet at the time of the call: 4 stopped during elimination, 4 completed elimination but stopped during reintroduction, and 1 completed reintroduction but stopped during maintenance. The majority (85%) reported improvement in pain and 43% reported decreased medication use. Although 71% reported that the diet was either hard or very hard, 90% of families surveyed would recommend the diet to other children.

Conclusion: We found that children with IBS who were able to complete the initial elimination phase of the FODMAP diet experienced improvement in abdominal pain severity, stool form, and quality of life. However, only a fraction of children who started the low FODMAP diet were able to complete the elimination phase. Although families generally viewed the diet as difficult to complete, they would still recommend the diet to other children with IBS. The low FODMAP diet is a promising treatment option for children with IBS, but compliance is a challenge.

Table 1: Outcomes of the low FODMAP diet for children with IBS

Variable	Baseline	Elimination Phase (n=14)	Reintroduction Phase (n=8)	Maintenance Phase (n=6)
Compliant most or all of the time (n, %)	-	12 (86%)	4 (50%)	3 (50%)
Pain severity (median)	6	2**	3	3*
Pain severity improvement ≥30% (n, %)	-	10 (71%)***	4 (50%)*	4 (67%)*
Stool form improvement ≥1 (n, %)	-	6/8 (75%)**	5/5 (100%)**	3/4 (75%)*
PedsQL (median)	66.3	78.8*	76.6	77.7

*denotes $p<0.05$, **$p<0.01$, ***$p<0.001$

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Table 2: Summary of phone survey responses from families of children treated with a low FODMAP diet.

Question	Response (n, %)
Reason for stopping diet (n=9)	Diet was too difficult (5, 56%)
	No improvement with diet (4, 44%)
Challenges with diet (n=21)	Eating away from home (7, 33%)
	Needing to plan meals (10, 48%)
	Finding foods the child would eat (7, 33%)
	Avoiding foods from typical diet (i.e. certain spices, high fructose corn syrup, gluten, garlic, and onions) (5, 24%)
	Finding foods that fit into the diet (3, 14%)
	Increased food costs (1, 5%)
Identified food triggers (n=21)	Dairy (8, 38%)
	Wheat (6, 29%)
	Garlic (3, 14%)
	Onions (3, 14%)
	Greasy foods (2, 10%)
	Fructose (2, 10%)
	Spicy foods (1, 5%)

72 ***EFFICACY AND SAFETY OF ANAL SPHINCTER BOTULINUM TOXIN INJECTION IN CHILDREN WITH ANORECTAL AND COLONIC DISORDERS.*** *Alexandra Hallagan[2,1], Haley Pearlstein[1], Kelsey Ryan[2,1], Devin Halleran[3], Marc Levitt[3], Richard Wood[3], Neetu Bali[1,3], Karla Vaz[1,3], Desalegn Yacob[1,3], Carlo Di Lorenzo[1,3], Peter Lu[1,3]. [1]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]The Ohio State University College of Medicine, Columbus, OH; [3]Center for Colorectal and Pelvic Reconstruction, Nationwide Children's Hospital, Columbus, OH*

Background: Anal sphincter botulinum toxin (botox) injection is often used to treat children with anorectal and colonic disorders refractory to conventional treatment, but our understanding of its efficacy and safety remains limited. Our objective is to review our institutional experience to better understand the outcomes of botox injection in children with various anorectal and colonic disorders.

Methods: We performed a retrospective review of pediatric patients undergoing anal sphincter botox injection at our institution between 2009 and 2018. We recorded information on patient characteristics, injection technique, clinical response, and complications. Statistical analysis was performed to evaluate responses and associations between baseline characteristics and outcomes.

Results: 456 injections were performed in 303 patients (61.6% male, median age 5.24 years, range 3 weeks-19 years). The most common diagnoses were Hirschsprung disease (HD, 50.2%), functional constipation (FC, 36.8%), anorectal malformation (2.1%), and anal fissure (1.7%). The majority (62.2%) had undergone anorectal manometry. Patients were treated with laxatives (65.3%), rectal enemas (24.4%), and antegrade enemas (8.6%) prior to injection. In addition to the 10.8% who had undergone appendicostomy or cecostomy creation, 46.5% had undergone other operations prior to injection, primarily surgery for HD (82.7%) and colonic resection (12.8%). Patients received a median dose of 100 units (range 90-200) of botox per injection. Of the 318 (70%) injections with response information, 73.3% of patients experienced improvement, 16% no change, and 10.7% worsening of symptoms. The percentage with ≤2 bowel movements per week decreased from 41.4% prior to injection to 9.7% afterwards ($p<0.001$) and the percentage with fecal incontinence ≥1 time per week decreased from 74.5% to 41.7% ($p<0.001$). Abdominal pain, pain with defecation, and straining with defecation decreased as well (all $p<0.001$). Complications were rare, with 2 patients (0.4%) experiencing temporary urinary

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incontinence and 1 patient (0.2%) developing a perianal abscess. Overall response and improvement in bowel movement frequency and fecal incontinence did not differ between males and females or children (<13 years) and adolescents (≥13 years). However, positive clinical response was more common among children with HD (78.2%) than with FC (65.4%, p=0.02).

Conclusion: In this large study of outcomes of anal sphincter botox injection in children, the majority of children experienced improvement in bowel movement frequency, fecal incontinence, and associated symptoms. Clinical response is more common among children with HD compared to those with FC.

INFLAMMATORY BOWEL DISEASE

83 ***HOSPITALIZATIONS IN CHILDREN WITH INFLAMMATORY BOWEL DISEASES.*** *Arik Alper*, *Miguel Algara*, *Uma Phatak*, *Dinesh Pashankar. Pediatrics*, *Yale University*, *New Haven*, *CT*

Background: Inflammatory bowel disease (IBD) is associated with significant morbidity, often resulting in hospital admissions due to disease exacerbations and IBD-associated complications. Data regarding IBD hospitalizations in children is limited. Most studies on this topic are done on large national databases such as Kid's Inpatient Database. While these studies have advantage of a large sample size, they lack details of individual patients. To the best of our knowledge, there is no study of hospitalizations related to IBD from a single center. We report our experience of IBD-related hospitalizations in our patients and aim to assess risk factors for admission.

Methods: We performed a retrospective chart review of children with IBD, who were followed at Yale New Haven Children's Hospital between 2012 and 2017. We collected data on demographics, IBD medications, hospitalizations, and co-morbid conditions such as obesity. For this study, we excluded hospitalizations that were directly related to the initial diagnosis. To determine risk factors for hospitalization, we selected a cohort of patients with complete 2 years of follow up from the diagnosis. For statistical analysis, we used independent t-test for continuous variables and chi-square test for dichotomous ones.

Results: The study population consisted of 224 children with IBD who were followed in our IBD clinic over 6 years. Of these patients, 58% had Crohn's disease and 42% had ulcerative colitis. There were 55% males and 45% females. The mean age of patients at diagnosis was 12.9 ± 3.6 years. Of 224 children, 28% (63) of the children required hospitalizations over the observation period of 6 years; 12% of patients had only one hospitalization, 10% had 2 hospitalizations, and 6% had 3 or more. The major reasons for hospitalizations were ulcerative colitis symptoms flare (38%), Crohn's disease symptoms flare (29%) and elective surgery (12%). The average time between initial diagnosis and time of hospital admission was 1.8 ± 1.9 years. The mean length of hospitalization was 5.2 ± 6 days. Longer length of stay was observed with use of total parenteral nutrition (14 vs. 3.7 days, p=0.001) and administration of a new medicine during admission (6.6. vs. 4.4 days, p=0.023). The annual percentage of hospitalized patients declined during the 5-year time of the study, from 17.6% in 2012 to 7.2% in 2017.

In a subgroup analysis, we assessed risk factors for hospitalization in 117 patients with complete 2-year follow-up data from the initial diagnosis. Of these patients, 32 (27%) required hospitalization and 85 (73%) did not. In these two groups, there was no difference between gender and age at diagnosis. The risk factors for hospitalization included IBD type (ulcerative colitis), administration of infliximab at the time of diagnosis and being obese at the last clinic visit (see table).There were no significant differences in two groups regarding other medications or co-morbidities such as anxiety and depression.

Discussion: In our center, we observed requirement of IBD related hospitalizations in 28% of our patients, with 16% needing more than one hospitalization over 6 years. We noted a significant decrease in the percentage of hospitalized patients per year from 2012 to 2017. Possible reasons for this improvement include quality improvement initiatives with participation in Improvecarenow from 2013 and increased effective use of biologics. In our study, obesity and presence of ulcerative colitis were risk factors for hospitalization compared with Crohn's disease. Use of infliximab immediately after diagnosis was associated with hospitalization, but severity of disease is likely to be a confounding variable. Future studies with a longer study time and larger sample size may aid in predicting risk factors for hospitalizations in pediatric IBD patients.

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Risk factors for hospitalization in 2 years following the diagnosis

	Admitted pts (32)	Non-admitted pts (85)	P value
Age at diagnosis (years)	12.7 ± 3.5	13.7 ± 3.4	0.17
IBD type: Crohn's (64) IBD type: UC (53)	11 (17%) 21 (40%)	53 (83%) 32 (60%)	0.007
Infliximab at diagnosis (11) No Infliximab at diagnosis (106)	6 (55%) 26 (25%)	5 (45%) 80 (75%)	0.034
Obesity at last f/u visit (11) No Obesity at last f/u visit (106)	6 (55%) 26 (25%)	5 (45%) 80 (75%)	0.034

84 ***SURGICAL INTERVENTION IN CHILDREN WITH INFLAMMATORY BOWEL DISEASES.*** *Arik Alper*, *Miguel Algara*, *Uma Phatak*, *Dinesh Pashankar*. *Pediatrics, Yale University*, *New Haven*, *CT*

Background: Inflammatory bowel disease (IBD) in children usually responds to medical therapy, but surgical intervention is required for refractory disease or for complications. In last few years, there were significant advances in IBD medical therapy including aggressive use of biologic therapy and optimization via drug level monitoring. Little is known how this affected the need for surgical intervention in the pediatric population. We therefore investigated the epidemiology of IBD-related surgeries in children in our center and aimed to identify potential risk factors for surgical intervention.

Methods: We performed a retrospective chart review of children with IBD, who were followed at Yale New Haven Children's Hospital between 2012 and 2017. We collected data including demographics, IBD medications started soon after diagnosis and all surgical interventions. For this study, we excluded surgical therapy that was not related to IBD. We compared the data of IBD patients with and without surgeries, using independent t-test for continuous variables and chi-square test for dichotomous ones.

Results: The study population included 224 children with IBD who were followed in our IBD clinic over 6 years. Of these patients, 58% had Crohn's disease and 42% had ulcerative colitis. There were 55% males and 45% females. The mean age of patients at diagnosis was 12.9 ± 3.6 years.

Total of 16 (7%) patients (12 Crohn's disease and 4 ulcerative colitis) required surgical intervention ; 75% (12/16) required one surgery and 25% (4/16) had more than one operations. The mean length of the surgical admission was 5.8 ± 3.3 days. The average time between initial diagnosis and time of surgery was 2.9 ± 2.2 years. The most common surgery was an ileo-cecal resection (50%), followed by partial colectomy (19%), total colectomy (13%), fistula repair (13%) and abscess drainage (13%).

IBD type, gender, BMI, age at diagnosis and history of any previous surgeries prior to initial diagnosis were not statistically different between children with and without IBD-related surgical intervention. However patients that required surgical intervention were more likely to be treated with antibiotics at diagnosis (25% vs, 5%, p=0.001) and less likely to be treated with mesalamine at diagnosis (4% vs. 14%, p=0.009), see table. There was no significant difference between two groups regarding use of biologics or immunomodulators started at diagnosis.

Discussion: In our center, we observed that 7% of children with IBD require surgical intervention over the observation time of 6 years. This rate is much lower than previously reported rates of 11 to 17 % at 2 years for surgical intervention for Crohn's disease and ulcerative colitis respectively. These studies were performed prior to routine use of biologics and therapeutic drug monitoring and this strategy is likely to be the reason for decreased need for surgical intervention in our patients. Ileocecal resection was the most common procedure performed for Crohn's disease in our center. In our study, children treated with mesalamine at diagnosis were less likely to require surgical intervention, possibly as this first line of therapy was reserved for only those who have a mild disease. On the other hand, administration of antibiotics at diagnosis was significantly associated with need for surgical intervention, possibly due to the underlying condition such as abscess or fistula. Future studies with a longer study time and larger sample size are required to predict risks factors for surgical intervention in era of routine biologic therapy with therapeutic drug monitoring.

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Comparison between use of initial medical therapy at diagnosis in patients with and without IBD-related surgical intervention

	Patients with surgery (16)	Patients with no surgery (208)	P value
Mesalamine: yes (150) Mesalamine: no (74)	4% (6) 14% (10)	96% (144) 86% (64)	0.009
Methotrexate: yes (14) Methotrexate: no (210)	7% (1) 7% (15)	93% (13) 93% (195)	1
6MP: yes (25) 6MP: no (198)	15% (4) 6% (12)	85% (22) 94% (186)	0.1
Infliximab: yes (25) Infliximab: no (199)	16% (4) 6% (12)	84% (21) 94% (187)	0.087
Antibiotics: yes (20) Antibiotics: no (203)	25% (5) 5% (11)	75% (15) 95% (192)	0.001

85 ***THROMBOPHILIA PROFILE IN PEDIATRIC PATIENT WITH INFLAMMATORY BOWEL DISEASE.***

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Background: Thrombotic phenomena is an extraintestinal manifestation of inflammatory bowel disease (IBD). Overall, IBD patients have a two- to fourfold increased risk of thrombotic phenomena compared with patients without IBD. The pathogenesis of thrombosis in IBD patients is multifactorial and not fully explained. The most commonly listed factors include genetic and immune abnormalities, disequilibrium between procoagulant and anticoagulant factors.

Aim: The purpose of this study was to evaluate the thrombophilia profile in pediatric patients with inflammatory bowel disease in a pediatric referral hospital.

Methods: A comparative cross-sectional study included 22 children, 10 with ulcerative colitis (UC), 1 Crohn disease (CD) and 11 without IBD. Schoolchildren and adolescents from 6 to 16 years of age who attended the outpatient clinic of our hospital were included. Serum levels of Protein C, S, antithrombin III, fibrinogen and factor VIII were determined in both groups. The Factor V Leiden mutation (FVL), polymorphisms of prothrombin factor II G20210A, methylenetetrahydrofolate reductase gene (MTHFR C677T and A1298C), insertion/deletion in intron 16 of angiotensin I enzyme converting gene ECA-1 (I/D) and 4G/5G of plasminogen activator inhibitor type 1 gene (PAI-1 4G/5G) were determined by polymerase chain reaction in all children.
Statistical analysis: the median, interquartile range, Chi-square and Mann-Whitney U test were performed.

Results: Of the group with IBD, four patients are female (36%) and seven male (64%). The median age was 162 months (IQR) 93. According to age group 4 were school children and 7 adolescents. Of the group without IBD, five patients are female (46%) and six male (54%). The median age was 135 months (IQR) 19. According to the age group 7 were schoolchildren and 4 adolescents. The association of the medians of age by sex did not show significant statistical difference. In relation to the natural inhibitors of coagulation, it was found that two patients with IBD had decreased serum levels of protein C and two patients increased fibrinogen, two patients without IBD had decreased levels of protein S and one of factor VIII. The prothrombotic genetic markers were found in 18 patients (82%) 9 in each group. The MTHFRC 677T polymorphism was found in four patients with IBD and in one without IBD. MTHFRA1298C was found in one patient from each group. The polymorphism ECA-1 (I/D) was found in seven patients with IBD and in five without IBD. The PAI-1 4G/5G polymorphism was found in one patient with IBD. In four patients with IBD and two without IBD, two polymorphisms were presented. The FVL mutation and the polymorphism of prothrombin factor II G20210A were not found in any of the patients included in this study. When the association of the levels of natural inhibitors of the coagulation of the patients with IBD and without IBD was performed, no significant statistical difference was demonstrated. Similarly, when the association of the prothrombotics genetic markers between the two groups was made, no statistical difference was demonstrated**.**

Conclusions: The information obtained was valuable, because it allowed us, despite being a small sample, to know the

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thrombophilia profile in this group of patients. We know that in order to establish the risk of developing thrombotic events, it is necessary to perform a plasma measurement of homocysteine, angiotensin I and II converting enzyme, in which a prothrombotic genetic marker was identified. This opens the possibility of continuing with this line of research with the aim of offering other prophylactic and therapeutic alternatives for patients with IBD.

86 ***QUALITY OF LIFE IN PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASE.*** *Lucia Alvarez Márquez, Rocío Macías. Department of Pediatric Gastroenterology and Nutrition, UMAE Hospital de Pediatria Centro Medico de Occidente IMSS, Guadalajara, Jalisco, Mexico*

Background: Inflammatory bowel disease (IBD) is a lifelong chronic condition, in appearance of this disease in pediatric patients occurs at the end of childhood and adolescence, which are critical moments of cognitive and social emotional transition, with an increase in of the presentation of behavior disorders such as anxiety, and depression. So the evaluation of the quality of life (QoL) is as important as controlling the activity of the disease.

Objective: To evaluate the quality of life in pediatric patients with IBD in a pediatric referral hospital.

Methods: An analytical cross-sectional study was carried out. Sample size (n = 13). We included schoolchildren and adolescents from 9 to 16 years of age, with a diagnosis of IBD who attended the outpatient clinic; all were under treatment and at different stages of the disease. The IMPACT III questionnaire, which includes the following domains, was applied to all patients with the authorization of the author; intestinal and systemic symptoms, emotional and social function, body image and treatment and interventions. It includes 35 items, where the frequency and effects of IBD on various aspects of health are asked in the last two weeks. A 5-point Likert-type response scale is used. The questionnaire has a response time of no more than 15 minutes. In a conventional manner, the better the quality of life, the better the score. The study was approved by the ethics and research committee and a letter of consent was requested from the parents or guardians.
An association and correlation was made with the clinical activity index of the disease (PUCAI). Statistics: median, interquartile range, Mann-Whitney U test, and Pearson's correlation coefficient.

Results: Of the 13 patients included in the study, 5 were female and 8 were male, the median age was 168 months, and no statistical difference was demonstrated when making the association between age and sex.
The median of the overall IMPACT III score was 78.28. The median of the domains considering the scores from lowest to highest was the following: Body image and treatment and interventions 66.66, emotional function 75.00, intestinal symptoms 78.57, social function 79.16, and systemic symptoms of 91.60
An association was made between the global score and the different domains of the IMACT III questionnaire and the age groups and although no statistical difference was demonstrated, it was observed that in the domain of emotional function it was the most affected in the group of adolescents ($p = 0.07$) .
When the association of the medians of the global score and the different domains with the index of clinical activity of the disease (PUCAI), no statistical difference was demonstrated
Correlation was made of the medians of the global score and the different domains with the correlation index of the clinical activity of the PUCAI disease with the following results: Overall score of the IMPACT III $r = 0.53$ $p = 0.05$, treatment / interventions $r = 0.51$ $p = 0.06$, intestinal symptoms $r = 0.51$ $p = 0.07$, body image $r = 0.50$ $p = 0.08$, systemic symptoms $r = 0.34$ $p = 0.25$, emotional function $r = 0.28$ $p = 0.34$, social function $r = 0.19$ $p = 0.52$, observed in the global score of IMPACT III and in three first domains a moderate correlation but without significant statistical difference. These results could be due to the small size of the sample and it was considered a weakness of the study.

Conclusions: This is an initial study that shows an overview of how quality of life is affected in this group of patients. The ideal is to carry out evaluations of this type at the time of diagnosis and at a certain time that the pharmacological treatment is installed, as well as to make evaluations to the parents or caregivers and even to the treating physicians, in order to have a more complete information in the area of quality of life related to health. It is a fact that pediatric patients with IBD require support from a multidisciplinary team and experts in the psychiatric and psychological area with greater involvement of the family and society as part of an integrated management.

87 ***IMPACT OF DISEASE LOCATION ON FECAL CALPROTECTIN ELEVATION IN THE INITIAL INVESTIGATION AND DIAGNOSIS OF PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Elaine Barfield[1], Antonietta D'Urso[1], Sharmi Biswas[1], Jennifer Lentine[1], Jacob Sweeney[2], Victoria Cooley[3], Debra Beneck[2], Robbyn Sockolow[1]. [1]Pediatrics, New York-Presbyterian/Weill Cornell Medicine, New York, NY; [2]Pathology, Weill Cornell Medicine, New York, NY; [3]Biostatistics and Epidemiology, Weill Cornell Medicine, New York, NY*

Background: Fecal calprotectin (FC), a calcium- and zinc-binding protein released by neutrophils, is a well-recognized marker of intestinal inflammation. Inflammation results in increased mucosal permeability and the release of FC into the intestinal lumen. FC is subsequently excreted and can be detected by routine stool testing. Studies have shown that FC

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outperforms commonly used serum measures of inflammation and is a useful tool for screening children for suspected inflammatory bowel disease (IBD). One of the concerns of using fecal biomarkers is the potential for results to vary by disease location: there are conflicting reports regarding the impact of disease location on FC level and its diagnostic accuracy. The objective of this study is to determine whether disease location in pediatric patients with IBD correlates with FC at the time of diagnosis. Secondary objectives include evaluation of characteristics of patients who have normal FC levels and biopsies consistent with IBD; and examination of FC trends in patients with one or more negative endoscopic evaluations prior to being diagnosed with IBD.

Methods: We conducted a retrospective chart review at New York-Presbyterian/Weill Cornell Medicine of pediatric patients newly diagnosed with IBD between January 2010 and December 2018. We included patients between the ages of 3 and 18 years who underwent upper endoscopy and colonoscopy with biopsies which were diagnostic of IBD and who had submitted a FC collected within 30 days prior to endoscopic evaluation. Patients with Crohn's disease (CD) were categorized into groups according to location of disease: small intestinal, ileocolonic, or colonic, based on pathology and available small bowel imaging. Patients with prior steroid or biologic use, concurrent gastrointestinal infection, or FC level collected during bowel preparation for the colonoscopy were excluded. Other information collected included FC level, endoscopic and histologic reports, small bowel imaging, Paris classification, laboratory markers, and demographic data. Descriptive statistics using N (%) and mean, standard deviation, median, min, and max were utilized to generate summary information of the demographic and clinical characteristics of the sample. Wilcoxon rank sum tests were used to compare median FC levels among the clinical groups of interest.

Results: 228 records of children with IBD based on ICD-10 codes and the pathology database were reviewed. One hundred sixty-two were excluded - 74 because they had been diagnosed previously, 85 who failed to submit FC within 30 days of endoscopic evaluation, and three due to a coexisting diagnosis requiring treatment with biologics. Sixty-six patients met inclusion criteria (mean age 11.8 ± 4.3 years): 48 (73%) with CD and 18 (27%) with ulcerative colitis (UC). Of those with CD, 11/48 (23%) had small intestinal, 22/48 (46%) had ileocolonic, and 15/48 (31%) had colonic disease. A mean of 14 days elapsed between FC submission and endoscopic evaluation. FC was abnormal in 65/66 patients (98%) and the remaining patient's FC was borderline (this patient was diagnosed with small bowel CD). In comparison, ESR was elevated in 40/66 patients (60%) and CRP was elevated in 45/66 (68%). Patients with isolated small intestinal CD had a significantly lower median FC level (656 μg/g) than those with predominantly colonic disease (932 μg/g) (p=.022). Presence of growth delay was associated with significantly higher FC levels in CD (p=.040). Median FC in CD patients with any ileal disease (L1±L4 or L3±L4, 648 μg/g) was lower than in those without (932 μg/g) (p=.068). Median FC level in those with proximal intestinal CD (L1 or presence of L4, 1140.15 μg/g) was higher than those without (690 μg/g) (p=.240). Median FC in UC patients with pancolitis (E4, disease proximal to the hepatic flexure) (723.5 μg/g) was lower than those with more limited disease (E1-E3, 838 μg/g) (p=.682). Among UC and CD, median FC level was higher in patients with active proctitis (815 μg/g) versus without (648 μg/g) (p=.128). Median FC in CD patients with perianal disease (815 μg/g) was higher in comparison to those without perianal disease (681 μg/g) (p=.220).

Conclusions: FC was elevated in all patients subsequently diagnosed with IBD, independent of disease location. Patients with CD limited to the small intestine had significantly lower FC than CD limited to the colon. This suggests FC levels may be driven by disease location without affecting its utility as a screening tool across CD and UC in the initial diagnosis of IBD.

88 ***SERUM MIRNA: A POTENTIAL PHARMACODYNAMICS BIOMARKER FOR TREATMENT RESPONSE IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Suruchi Batra[1], Christopher Tully[2], Alyson Fiorillo[2], Christopher Heier[2], Laurie Conklin[1]. [1]Department of Gastroenterology, Hepatology and Nutrition, Children's National Medical Center, Washington, DC ; [2]Research Center for Genetic Medicine, Children's National Health System, Washington, DC*
Objective: Serum biomarkers have emerged as a promising tool used to monitor response to therapy, assess underlying inflammation, and predict outcomes in pediatric Inflammatory Bowel Disease (IBD). One such class of biomarker includes microRNAs (miRNA), which are single stranded RNA molecules involved in post-transcriptional regulation of proteins. We aim to identify serum miRNA that may be predictive of clinical response to IBD treatment with glucocorticoids and anti-TNF alpha treatment.
Methods: Serum was obtained from pediatric IBD patients pre- and post-treatment with either glucocorticoids or anti-TNF alpha treatment. Clinical score indices, Pediatric Crohn's Disease Activity Index and Pediatric Ulcerative Colitis Activity Index were used to identify patients who responded to treatment (decrease in clinical score of at least 12.5 and 20 points, respectively). Twenty patients were included; six patients with Crohn's Disease (CD) and four patients with Ulcerative Colitis (UC) received steroids. Ten patients with CD received anti-TNF alpha treatment (Infliximab n =6; Inflectra n = 4).

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Serum samples were obtained prior to initiation of and up to 30 days after treatment with glucocorticoids or 14 weeks after initiation of treatment for patients treated with anti-TNF alpha treatment. 377 miRNA were assayed with quantitative real time PCR via Taqman Low Density Array cards. miRNAs were analyzed with paired T-test analysis between the entire cohort pre- and post-treatment groups. miRNAs with p </= 0.05 were included. Bioinformatics were performed by analyzing ChIP-seq data on DNA element binding by inflammatory transcription factors via the UCSC Genome Browser. This was performed to assess whether these miRNA markers are regulated by inflammatory transcription factor pathways previously implicated in pediatric IBD.
Results: Approximately 270 miRNAs were detected in patient serum. Of these, we identified eight miRNAs that changed significantly in patients who showed a substantial response to IBD treatment (including prednisone, Infliximab, and Inflectra). Three increased with treatment, miR-193b, miR-636, miR-375, and five decreased with treatment, miR-454, let-7c, miR-226, miR-26b, and miR-26a. Of these markers, miR-193b, miR-636, miR-375 and let-7c have not been implicated in pediatric IBD previously. All eight markers identified were found to have gene promoters or enhancers related to inflammatory pathways previously implicated in pediatric IBD.
Conclusions: We identified candidate serum miRNAs that may serve as pharmacodynamics markers to monitor treatment response in pediatric IBD. Further studies are needed to expand on these findings, prospectively and in a larger cohort.

90 ***EVALUATING HEPATITIS B SEROPROTECTION AND REVACCINATION FOR CHILDREN WITH INFLAMMATORY BOWEL DISEASE.*** *Erica Brenner[1], Ravi Jhaveri[2], Michael Kappelman[1], Ajay Gulati[1]*
[1]Pediatric Gastroenterology, University of North Carolina, Chapel Hill, NC; [2]Department of Pediatric Infectious Diseases, Feinberg School of Medicine, Chicago, IL
Introduction: Many adolescents exhibit waning immunity to hepatitis B virus (HBV) vaccination administered during infancy. This is particularly relevant to patients with inflammatory bowel disease (IBD), as biologics and other immune suppressive therapies may increase the risk of HBV reactivation and/or impair the response to HBV booster. We sought to 1) evaluate HBV seroprotection among previously vaccinated pediatric IBD patients and 2) evaluate seroconversion rates following a single HBV booster and completion of a 3-part booster series.

Methods: We conducted a single center retrospective study following initiation of a protocol to test for HBV seroprotection and re-vaccinate patients with insufficient titers. Inclusion criteria for this analysis were 1) diagnosis of IBD, 2) age 0-22 years, 3) prior receipt of the three-dose HBV primary series, 3) exposure to a biologic agent during the years 2012-2019, and 4) measurement of HBsAb titer. Among the subgroup found to have insufficient titers (HBsAb < 10 IU/L), we obtained HBV vaccine records from EPIC and the North Carolina Immunization (NCIR) database along with follow up HBsAb titers. We evaluated response to a single HBV booster by analyzing serum HBsAb titers following one booster dose. We evaluated response to complete booster vaccination by analyzing serum HBsAb titers after receipt of three boosters OR documented seroconversion before three boosters (i.e. after one or two boosters).

Results: The study population included 159 patients (120 Crohn's disease, 39 ulcerative colitis or IBD unspecified, mean age 16, 52% female). Twenty six percent (41/159) had adequate HBV seroprotection (HBsAb ≥10 IU/L) and seventy four percent (118/159) had insufficient titers on initial HBsAb screening.

Of the 118 patients with insufficient baseline HBsAb titers, 33 received one booster dose followed by a titer recheck. Seventy nine percent (26/33) achieved seroconversion after one booster vaccination.

Of the 118 patients with insufficient baseline HBsAb titers, 59 received complete booster vaccination (defined as receipt of three boosters OR documented seroconversion prior to three boosters) followed by a titer recheck. Ninety eight percent (58/59) achieved seroconversion after complete booster vaccination.

Conclusion: Most previously vaccinated pediatric IBD patients exposed to a biologic agent have insufficient HBV titers. A majority of patients (79%) seroconvert after a single HBV booster, and nearly all (98%) seroconvert after complete booster vaccination. Since a large proportion of pediatric IBD patients respond to a single booster, checking titers after each booster and providing further vaccines only as needed may prevent unnecessary vaccination while achieving seroprotection.

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	Inadequate titers (HBsAb <10 IU/L) (%)	Adequate titers (HBsAb ≥10 IU/L) (%)
After primary series (n = 159)	118 (74)	41 (26)
After one HBV booster (n= 33)	7 (21)	26 (79)
After complete HBV revaccination (n = 59)	1 (2)	58 (98)

Table 1. Hepatitis B Surface Antibody Titers Before and After Hepatitis B Booster Vaccination in Pediatric Patients with Inflammatory Bowel Disease. Abbreviations: HBV, hepatitis B; HBsAb, hepatitis B surface antibody.

91 ***COMPARISON OF DIETARY INTAKE IN CHILDREN WITH INFLAMMATORY BOWEL DISEASE AND HEALTHY CHILDREN.*** *Jessica Breton[2], Ryan Quinn[1], Erica Schwab[2], Kelly Kachelries[2], Shelly Zilber[2], Lindsey Albenberg[2], charlene Compher[1]. [1]University of Pennsylvania, Philadelphia, PA; [2]Pediatric Gastroenterology, Children's Hospital of Philadelphia, Philadelphia, PA*

BACKGROUND: A richer understanding of dietary intake in children with IBD is needed. Indeed, impaired nutritional status and micronutrient deficiencies are common, and a relationship between western diet and IBD pathogenesis has been suggested as potentially mediated through microbiome changes and pro-inflammatory effects. However, there are limited published data describing the dietary patterns and nutrient intake in children with IBD, in particular, as compared to healthy children. The aim of this study was to evaluate the dietary intake adequacy of children with IBD and to compare to a representative cohort of healthy children.

METHODS: Children between 5 and 21 years of age with IBD and healthy controls were enrolled in an 8-week observational study. Participants on enteral nutritional therapy and exclusion diets were excluded from this analysis. Three 24-h dietary recalls, 2 on weekdays and 1 on a weekend day were conducted by a research bionutritionist. Intake of calories, macronutrients, vitamins, and food groups was assessed using the Nutrition Data System for Research (University of Minnesota). Intake of micronutrients was evaluated relative to Dietary Reference Intake (DRI) values for age and sex. Expected energy requirement (EER) was calculated using DRI values based on age, sex, height, weight, and the assumption of a normal physical activity level. BMI-for-age z-score was computed using CDC reference standards.

RESULTS; A total of 126 participants with IBD, the majority (n=111, 88.1%) with Crohn's disease, and 57 healthy controls were enrolled. The demographics and disease characteristics of patients and controls are shown in Table 1A and 1B, respectively. Children with IBD were older, shorter in height, with lighter weight, and BMI z-score than controls. Among participants with IBD, mean disease duration was 1.6 ±2.3 years and active disease was present in 78.6% (n=99) as defined by a fecal calprotectin >250µg/g. Intake in children with IBD was generally similar to healthy controls as shown in Table 2. Overall, macronutrient intake was characterized by a high intake in saturated fat, n-6/n-3 PUFA ratio, added sugar and low fiber intake, the latter being significantly lower in children with IBD (41.3 ±16.7 and 49.3 ±20.3, P= 0.005). Suboptimal intakes in vitamin D, E, calcium, and magnesium were reported in IBD patients and healthy children, but magnesium intake was significantly lower in children with IBD (72.8 ± 35.5 vs 90.7 ± 46.0, p=0.005). Dietary intake was not different by disease status (quiescent or active) or after adjustment for BMI Z-score.

CONCLUSIONS: Children with IBD showed similar energy and macronutrient intakes to a healthy control sample. In our center in North America, both children with IBD and healthy children consume a western diet characterized by high saturated fat, refined sugar, sodium and low fiber intake, notably with the latter being significantly lower in IBD patients. This pattern has previously been described as pro-inflammatory. Whether optimization of dietary quality with higher anti-oxidant and anti-inflammatory properties may improve the disease course of children with IBD through modulation of the microbiome composition is yet to be studied.

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Table 1A. Demographics and Anthropometry

	IBD (N= 126)	Controls (N=57)
Female, n (%)	60 (47.6)	32 (56.1)
Age†, mean (±SD), yr	14.2 ± 2.9	12.5 ± 4.1
6-10†, n (%)	14 (11.1)	18 (31.6)
10-17, n (%)	90 (71.4)	32 (56.1)
> 17, n (%)	22 (17.5)	7 (12.3)
Anthropometry		
Height Z-score†, mean (±SD)	-0.3 ± 1.05	0.2 ± 1.02
Weight Z-score†, mean (±SD)	-0.4 ± 1.22	0.4 ± 0.93
BMI Z-score†, mean (±SD)	-0.4 ± 1.29	0.4 ± 0.97
Malnutrition† (BMIz ≤ -1), n (%)	37 (29.4)	5 (8.8)
Mild (BMIz ≤ -1 to -1.99), n (%)	21 (16.7)	4 (7.0)
Moderate (BMIz ≤ -2 to -2.99), n (%)	11 (8.7)	1 (1.8)
Severe (BMIz ≤ -3), n (%)	5 (4.0)	0 (0)
Stunting (Heightz ≤ -2), n (%)	8 (6.3)	2 (3.5)
Overweight† (BMIz ≥1), n (%)	15 (11.9)	16 (28.1)
Obesity (BMIz ≥2), n (%)	2 (1.6)	1 (1.8)

† $P < 0.05$, IBD vs Control

Table 1B. Disease Characteristics

Disease duration, mean (±SD), yr	1.6 ± 2.3
Duration < 3mo, n (%)	62 (49.2)
Previous bowel surgery, n (%)	2 (1.6)
Crohn's disease, n (%)	111 (88.1)
Disease location, n (%)	
Ileum (L1)	15 (13.5)
Colon (L2)	18 (16.2)
Ileocolonic (L3)	76 (68.5)
Upper GI disease (L4a)	57 (51.4)
Jejunal/ileum (L4b)	10 (9.0)
Perianal fistulizing disease (P1)	20 (19)
Disease phenotype, n (%)	
Inflammatory (B1)	96 (86.5)
Stricturing (B2)	10 (9.0)
Penetrating (B3)	3 (2.7)
Stricturing/Penetrating (B2/B3)	1 (0.9)
Ulcerative colitis or IBD-U, n (%)	15 (11.9)
Upper GI disease, n (%)	2 (13.3)
Disease extend, n (%)	
Proctitis (E1)	1 (6.7)
Left-sided colitis (E2)	6 (40.0)
Extensive colitis (E3)	0 (0)
Pancolitis (E4)	8 (53.3)
Medication, n (%)	
5- aminosalicylic acid (oral and/or rectal therapy)	48 (38.4)
Immunomodulator	26 (19.0)
Systemic corticosteroid	24 (19.2)
Budesonide	4 (5.4)
Anti-TNFα	29 (23.2)
Vedolizumab	2 (2.7)
Ustekinumab	1 (1.4)
Antibiotics (current)	31 (24.8)
Disease activity	
Fecal calprotectin, mean (±SD)	1044.8 ± 923.8

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Table 2. Comparison of Daily Nutrient Intake Between Children with IBD and Controls

	IBD (N= 126)	Controls (N=57)
Total energy intake, mean (±SD)		
% EER "normal active"	75.3 ± 22.5	73.5 ± 19.7
Protein, mean (±SD)		
% Energy from protein	15.1 ± 3.9	14.5 ± 2.7
% DRI	171.2 ± 69.3	161.7 ± 64.3
Fat, mean (±SD)		
% Energy from fat	33.3 ± 5.7	33.5 ± 4.8
% Saturated fatty acids	11.7 ± 3.0	12.2 ± 2.4
% Monounsaturated fatty acids	11.2 ± 2.1	11.2 ± 2.0
% Polyunsaturated fatty acids	7.7 ± 2.3	7.2 ± 1.9
n-6/n-3 ratio	9.1 ± 2.3	9.0 ± 1.9
% Trans-unsaturated fatty acids	1.1 ± 0.6	1.0 ± 0.4
Carbohydrate, mean (±SD)		
% Energy from carbohydrate	52.7 ± 7.4	53.6 ± 5.8
% DRI	184.8 ± 59.1	179.5 ± 54.0
% Added sugar	14.8 ± 6.2	14.9 ± 5.9
Dietary fiber, mean (±SD)		
% DRI*	41.3 ± 16.7	49.3 ± 20.3
% Insoluble fiber	64.7 ± 7.7	66.6 ± 7.0
% Soluble fiber	34.8 ± 7.7	32.9 ± 6.9
Vitamin (% DRI), mean (±SD)		
Vitamin A*	111.9 ± 73.5	153.1 ± 103.2
Vitamin E	65.8 ± 45.6	78.8 ± 51.0
Vitamin D	34.5 ± 24.2	32.0 ± 19.0
Vitamin C*	104.7 ± 76.1	147.8 ± 127.0
Vitamin B1 (thiamin) *	172.7 ± 66.1	201.4 ± 80.1
Vitamin B2 (riboflavin)	189.7 ± 91.2	218.0 ± 107.4
Vitamin B6 (pyridoxine)	154.5 ± 71.8	169.9 ± 94.3
Vitamin B12 (cobalamin)	215.4 ±133.4	252.8 ± 190.1
Vitamin B9 (folate)	112.1 ± 60.3	121.1 ± 67.1
Vitamin K	103.6 ± 85.8	123.8 ± 103.2
Mineral (% DRI), mean (±SD)		
Calcium	71.6 ± 33.5	75.2 ± 27.7
Iron	135.3 ± 64.9	125.6 ± 58.8
Magnesium*	72.8 ± 35.5	90.7 ± 46.0
Phosphorus*	98.7 ± 50.7	119.5 ± 58.5
Sodium	205.4 ± 65.5	195.4 ± 64.1
Zinc	110.3 ± 47.3	122.7 ± 70.5
Copper	120.4 ± 51.1	128.6 ± 53.1

* $P < 0.05$, IBD vs Control

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94 ***EVALUATION OF TRANSITION READINESS IN ADOLESCENTS WITH INFLAMMATORY BOWEL DISEASE.*** *Kimberley Chien[2], Victoria Cooley[1], Linda Gerber[1], Robbyn Sockolow[2]. [1]Healthcare Policy and Research, Weill Cornell Medical College, New York, NY; [2]Pediatrics, Weill Cornell Medical College, New York, NY*

Introduction: Transition care services for adolescents with Inflammatory Bowel Disease (AIBD) have been recognized as a national priority across various major gastroenterological associations. However, these services have not been widely integrated into GI practice for a variety of reasons. One often cited cause for lack of services is the dearth of research regarding transition readiness and evidence-based strategies to optimize the ability for adolescents with IBD (AIBD) to transfer to adult services successfully. To understand the needs of our AIBD, we sought to investigate their transition readiness abilities and potential influential factors on the acquisition of transition-related skills.

Methods: 105 AIBD (age, 14-22 years) completed a demographics questionnaire and Transition Readiness Assessment Questionnaire (TRAQ). Participants' gender, disease type, and PCDAI/PUCAI scores were extracted from their medical chart. Independent and dependent t-tests, Wilcoxon rank sum tests, and ANOVA (and one-way repeated measures ANOVA) with post-hoc pairwise t-tests (and contrast analysis) with Holm adjustment were utilized to compare the average total and mean TRAQ scores across the demographic, clinical, and TRAQ domain groups.

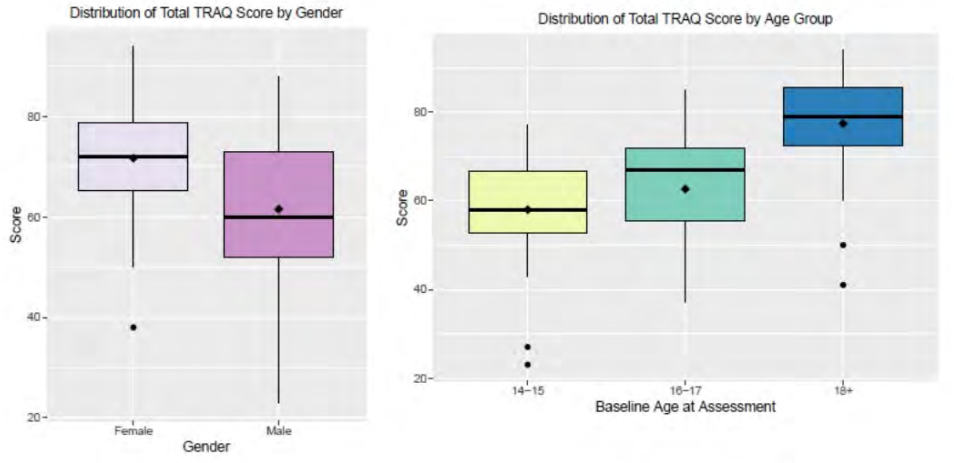
Results: Mean TRAQ score for patients under age 18 years was 3.03 and, for patient 18 years and older, was 3.87. Average total TRAQ score was higher among females than males ($p = .001$) and increased with age ($p < .0001$). However, no significant differences in average total TRAQ scores were found between varying disease types (Ulcerative colitis vs. Crohn's), parental incomes, race, insurance type, paternal or maternal education level. Average domain-specific mean TRAQ scores differed significantly across the TRAQ domains (managing medications, appointment keeping, tracking health issues, talking with providers, and managing daily activities; $p < .0001$ and disease self-management and healthcare utilization/self-advocacy $P < .001$).

Discussion: To understand the current state of transition-related skills of AIBD, we investigated their transition readiness using the TRAQ. We found that average TRAQ scores for our patients, under 18 years and 18 years and older were less than reported TRAQ scores for children with various chronic medical disorders in the literature, though significance could not be determined. AIBD were more able to manage their own disease than to interact with healthcare providers as well as to understand and utilize the healthcare insurance system. Similar to findings in the literature, age is associated with the acquisition of transition readiness skills. However, disease and various socioeconomic factors including race, household income, parental education level do not appear to have bearing on patient's abilities. AIBD may require greater attention than patients with other chronic medical disorders during the transition period. As we create formal transition programs for our adolescent IBD patients, it is important to identify their needs and deficits in order to develop optimal strategies so they can reach their goals and successfully transfer to the adult healthcare system.

Table 1. Demographics

	N	Mean (yrs)
Age (1 missing) (14-22 yr)	104	16.88
Gender	**N**	**%**
Male	60	57.1
Female	45	42.9
Type of Disease	**N**	**%**
Crohn's Disease	80	76.9
IBD-Indeterminate	4	3.8
Ulcerative Colitis	20	19.2
Insurance Type	**N**	**%**
None	1	1
Private	92	88.5
Public	11	10.5
Racial Group	**N**	**%**
White	64	61.5
Black or African American	4	3.8
Native Hawaiian/Other Pacific Islander	1	1
Other combinations not described	15	14.4
Declined	20	19.2

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96 ***HIGHER INDUCTION VEDOLIZUMAB LEVELS ARE ASSOCIATED WITH SUSTAINED TREATMENT AT 1-YEAR AMONG PEDIATRIC IBD.*** *Ruben Colman, Phillip Minar. Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

Background: Vedolizumab (VDZ) is an anti-integrin inhibitor that is a gut-specific agent used for the treatment of inflammatory bowel diseases (IBD). Previously, studies among adult patients have demonstrated that higher VDZ trough levels are associated with improved treatment efficacy and clinical outcomes. However, there are no published pediatric studies to date that have evaluated the role of utilizing vedolizumab trough levels to correlate with and predict clinical outcomes among IBD patients. We hypothesized that higher vedolizumab trough levels in pediatric IBD patients will be associated with improved clinical outcomes.

Methods: We performed a retrospective cohort study to assess the clinical utility of VDZ trough levels and anti-vedolizumab antibodies (AVAs) in a large, tertiary care, children's hospital. Patients were included if they received 3 induction infusions with vedolizumab in a standard fashion and had at least 1 VDZ level available. Patients who had a deviation in infusion timing due to scheduling practicalities were also captured and analyzed. We assessed if VDZ induction levels at the third VDZ infusion were associated with improved steroid-free remission (SFR) during early maintenance (week-14) and ongoing treatment at 1-year after induction. VDZ levels and outcomes were compared using the Mann-Whitney U test. An area under the receiver operating characteristics (AUROC) with Youden J statistic were calculated.

Results: We found 55 IBD patients who had a VDZ concentration and AVAs obtained during their course of therapy. Mean age was 15.4 (SD 4.3) years, with 66% (36/55) of the cohort Crohn's disease (CD) and 53% (29/55) male gender. Thirty-three percent (18/55) had VDZ trough levels measured at the third infusion during induction (median wk-6; range 5-8wks). Patients in SFR at week-14 had a median VDZ level of 38.6 µg/mL (12.4-60) at the third infusion vs 19.4 µg/mL (3-60) who did not achieve SFR at week-14 (P=0.17). A VDZ level ≥ 24.9 µg/mL at the third infusion had an AUROC 0.754, with a sensitivity of 80% and specificity of 70% (P=0.10) for SFR at week-14. Patients who remained on VDZ at 1-year had higher levels at their third infusion than patients who discontinued prior to 1 year, 60 µg/mL (19.4-60) vs 16.6 µg/mL (3-28.2, p=0.01).

Conclusion: Higher vedolizumab trough levels at the third infusion are significantly associated with sustained treatment at 1-year. From our current data, it is not clear if higher induction concentrations are associated with early response measures.

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97 ***THE MICROBIAL AND METABOLIC MATURITY OF PEDIATRIC AND VERY EARLY ONSET INFLAMMATORY BOWEL DISEASE.*** *Maire Conrad[1,2], Yue Ren[2], Kyle Bittinger[1,2], Joseph Zackular[3,2], Hongzhe Li[2], Frederic Bushman[2], Marcella Devoto[4,2], Robert Baldassano[1,2], Judith Kelsen[1,2]*
[1]Pediatric Gastroenterology, The Children's Hospital of Philadelphia, Philadelphia, PA; [2]University of Pennsylvania, Philadelphia, PA; [3]Pathology, The Children's Hospital of Philadelphia, Philadelphia, PA; [4]Genetics, The Children's Hospital of Philadlephia, Philadelphia, PA

The influence of genomics, immune response and the environment, including the microbiome, on inflammatory bowel disease (IBD) varies among patients. We aimed to characterize the differences and determine age and disease effects on the gut microbiome across the pediatric age range, measured by the maturity of the microbiota and its associated metabolic products.

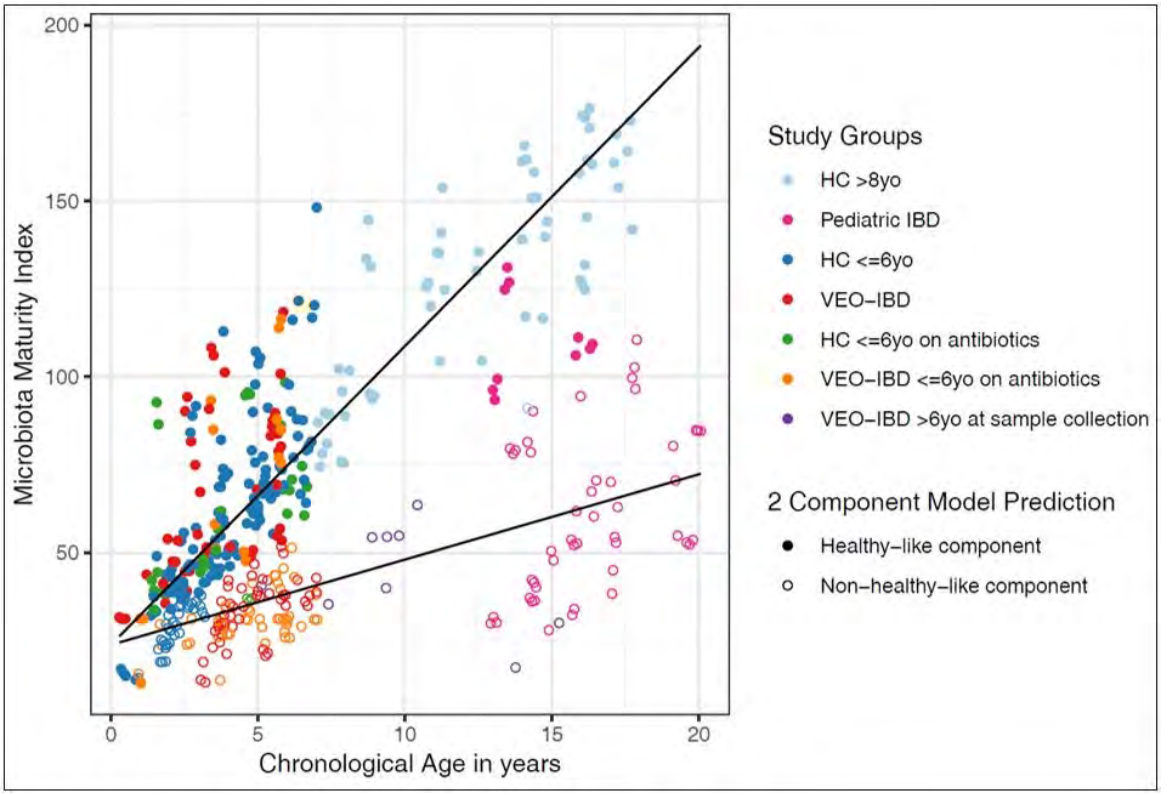
Methods: An 8 week observational study of subjects with very early onset IBD (VEO-IBD), diagnosed <6yo, pediatric IBD diagnosed >8yo and healthy pediatric controls (HC) was performed at the Children's Hospital of Philadelphia. Subjects with recent antibiotic use were analyzed separately. Metadata included disease activity, therapies, and diet history. Total fecal DNA was sequenced using the Illumina HiSeq paired-end method. MetaPhlAn2 assessed taxonomic composition, identifying clade-specific marker genes from bacterial, fungal, and viral sources. Stool metabolites were measured by Metabolon, Inc (Durham, NC) with ultrahigh performance liquid chromatography-tandem mass spectrometry. A Microbiota Maturity Index[1] (MMI) was generated from taxonomic data from HC. We trained a random forest model to predict age based on 29 bacterial taxa that changed in abundance with age in HC. Subsequently, we built a random forest model to apply to the IBD cohorts, determining age predicted by the taxa abundance. The predicted age is the MMI, which is plotted against the chronological age in Figure 1. A multicomponent regression was fit to HC. A two component model was used to divide the samples into healthy-like and non-healthy-like groups. Similarly, a Metabolomic Maturity Index (MtbMI) was generated to predict age based on the top 23 known fecal metabolites from HC that changed with age. Then the model was similarly applied to the IBD cohorts.

Results: There were 83 HC, 21 pediatric IBD, and 66 VEO-IBD enrolled. CD was diagnosed in 75% of all IBD subjects. Despite similar clinical disease activity, fecal calprotectin was significantly higher in VEO-IBD than pediatric IBD (p=.02). Biologic therapies were used in 28% VEO subjects and 90% pediatric IBD subjects. 10 healthy controls <6yo and 23 VEO-IBD subjects were on antibiotics at baseline. The relative abundance of 3 taxa were significantly different between VEO-IBD and pediatric IBD, including increased *Veillonella* unclassified, and decreased *Ruminocccus obeum* and *Akkermansia muciniphila* (FDR adjusted q=.026) in VEO-IBD.

Based on MMI, the IBD cohorts were predicted to have a less mature microbiome than expected for their chronological age. Additionally, the relative MMI was significantly lower in pediatric IBD than VEO-IBD (p=.0006). The samples from IBD subjects that separated into the healthy-like component had a MMI that better matched their chronological age (Figure 1), and had significantly shorter duration of disease (p<.001), higher richness (p=.02), and higher Shannon Diversity (p<.001) than those in the non-healthy cluster. There was no correlation between the MMI and fecal calprotectin in the IBD groups. Similar to the MMI, the MtbMI demonstrated a lower relative microbial metabolite maturity in VEO subjects than HC <6yo (p=0.021). To characterize the relationship between the MMI and the metabolites that composed the MtbMI, we found the more immature microbiota best correlated with products of lysine degradation (Pearson p =-0.45, q=0.01), secondary bile acid metabolism (Pearson p = -0.042, q=0.025), and glutamate metabolism (Pearson p =-0.39, q=0.03).

Conclusion: Both IBD cohorts demonstrated a lower microbiota and metabolite maturity than HC, indicative of disease effect on the microbiota. Pediatric IBD had lower relative microbial and metabolite maturity indices than VEO-IBD. These did not correlate with calprotectin, suggesting that age of onset or duration of disease may play a larger role in the health of the intestinal microbiome than disease activity. These findings suggest that there are available microbial and metabolic targets for therapeutic modulation which require further exploration.

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Microbial Maturity Index by chronological age. A 2 component model divided the samples into healthy and non-healthy groups, which differ by disease duration, richness, and Shannon Diversity.

98 ***CORRELATION OF FECAL CALPROTECTIN WITH ENDOSCOPIC AND HISTOLOGIC ACTIVITY IN A PEDIATRIC INFLAMMATORY BOWEL DISEASE POPULATION.*** *Erin Crawford[2], Catherine Gestrich[1], Thomas Sferra[2], Shahrazad Saab[1], Jonathan Moses[2]. [1]Pathology, University Hospitals, Cleveland, OH; [2]Pediatrics, Rainbow Babies & Children's Hospital, Cleveland, OH*

Background: Inflammatory bowel disease (IBD), which includes Crohn's disease (CD) and ulcerative colitis (UC), is characterized by chronic inflammation of the gastrointestinal tract leading to significant and often debilitating symptoms. In the past, treatment strategies have concentrated on clinical remission; however, this has fallen out of favor as it has been shown to not significantly alter the natural history of the disease and does not correlate with inflammation severity on endoscopy. Treatment strategies have evolved to target mucosal healing, which has been shown to be associated with clinical remission and a decreased rate of disease-related complications. Mucosal healing is evaluated by endoscopy, which is costly, invasive, and poses some level of risk. Fecal calprotectin (FC) is a non-invasive marker of intestinal inflammation, and has been shown to correlate with disease activity in IBD patients. FC is potentially a cheaper, less invasive, and safer test to evaluate intestinal inflammation, though values which correlate with mucosal healing vary across studies, and these studies have involved small cohorts. The aim of our study was to correlate quantitative FC levels with endoscopic and histologic severity and examine for differences in FC levels based on grade of severity.

Methods: We conducted a retrospective chart review of patients who had a FC done between 30 and 1 days before colonoscopy at UH Rainbow Babies and Children's Hospital between January 1, 2014 and May 30, 2018. Patients with IBD had endoscopic scoring performed (simple endoscopic score for Crohn's, or SES-CD, and Mayo scores for UC patients) to assess disease severity. Histologic slides from colonoscopies of IBD patients were assessed to grade severity based on the Geboes method. Severity for both were classed as no disease, mild, moderate or severe disease. Physicians grading the endoscopic and histologic findings were blinded to patient identifying information. Demographics, laboratory values, and colonoscopy results were extracted from the medical record.

Results: 107 IBD cases were included in the study. 63 patients (59%) had a diagnosis of CD. The mean age at endoscopy was 13.7 years, 55% were male and there was no significant difference between gender and ages by disease at time of endoscopy. When correlating endoscopic scoring to FC, the median FC was lowest in IBD patients with no disease (181

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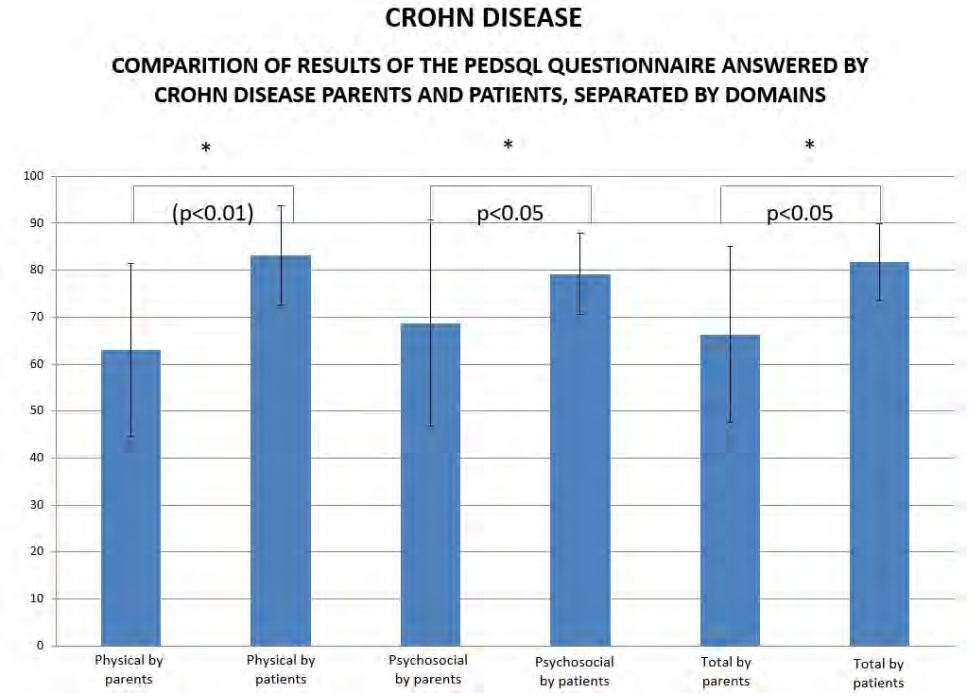
ug/g), followed by those with mild and moderate disease (499 and 599 ug/g respectively) and highest in those with severe disease (921 ug/g). There was statistical significance when comparing no disease to moderate and severe disease (p=0.019, 0.003 respectively) for all IBD patients. In addition, there was significant difference between mild disease and severe disease (p=0.012). When correlating with histology, the median FC level was lowest in IBD patients with no disease (328 ug/g), followed by children with mild and moderate disease (399 ug/g, 674 ug/g respectively) and highest in those with severe disease (895 ug/g). There was significant difference when comparing no disease to moderate and severe disease (p=0.021, 0.018, respectively). In the CD patients, there was significant difference in FC levels between no disease and moderate and severe disease (p=0.047, 0.0047, respectively) on endoscopic scoring. In UC patients, there was significant difference in FC levels between no disease and moderate disease (p=0.023) for histologic scoring.
Conclusion: Fecal calprotectin correlated with disease severity on gross endoscopy and histology and showed significant differences for degree severity for our cohort of pediatric IBD patients. In addition, there were some significant differences when examining the CD and UC individually. This may be used to help determine the severity of inflammation in pediatric IBD patients and affect treatment decisions without the need for repeated and invasive procedures.

100 ***QUALITY OF LIFE IN PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASE IN A HOSPITAL IN SOUTHERN BRAZIL.*** *Caroline Dias*, *Vanessa Scheeffer*, *Carolina da Silva*, *Cíntia Steinhaus*, *Cristina Vicioli*, *Matias Epifanio*, *Cristina Ferreira. Pediatric Gastroenterology, Hospital da Criança Santo Antônio*, *Porto Alegre*, *Rio Grande do Sul*, *Brazil*
Introduction: Inflammatory bowel diseases (IBD) are chronic diseases of multifactorial etiology, interaction of genetic factors, environmental, immunological and intestinal microbiota. Children with IBD have age-related problems such as growth, puberal development, nutrition, bone mineral density and psychosocial. The management of IBD includes inflammation control, and also the medical care with growth and development physical and mental. Several studies report that quality of life (QOL) in patients with IBD is decreased when compared to healthy individuals. Our objective was to analyze and compare the QOL of pediatric patients with CD (Crohn Disease) and UC (Ulcerative Colitis), evaluated by the patients and their parents.
Methodology: The QOL of the pediatric patients with IBD who accompany the outpatient clinic, between 2 and 18 years of age, was evaluated through the questionnaire PEDSQL 4.0. We analyzed by domains (physical, emotional, social and school) and in total. The questionnaire was completed between January and December 2018 by parents and patients.
Results: There were 57 patients with IBD, 31 of them with CD and 26 with UC. In a comparative evaluation of parents versus patients, in CD the highest mean was seen in all domains reported by the patients, with statistical difference in the Physical ($p < 0.01$), Psychosocial ($p < 0.05$) and total ($p < 0.05$) domains. In UC the highest mean was seen in all domains reported by the patients ($p > 0.5$). Parents of CD patients had a higher mean in the Psychosocial domains and in the total result ($p > 0.5$) compared to UC. Patients with CD had higher mean in Physical domains and total result ($p > 0.5$) compared to UC.
Conclusion: Children consider themselves to have a better QOL in relation to what parents report about them. Our study did not show significant differences in QOL among pediatric patients with CD and UC.

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DEMOGRAPHIC DATA

Demographic data	Ulcerative colitis	Crohn Disease	Total
Patients	26	31	57
Male	15	15	30
Female	11	16	27
2-4 years old	0	1	1
5-7 years old	3	1	4
8-12 years old	7	7	14
13-18 years old	16	22	38



101 ***AUGMENTED USTEKINUMAB DOSING IS NEEDED TO ACHIEVE CLINICAL RESPONSE IN PATIENTS WITH ANTI-TNF REFRACTORY PEDIATRIC CROHN'S DISEASE.*** *Phinga Do[2], Phuong Luu[2], Ashish Patel[1], Gaith Semrin[1], John Andersen[1], Bhaskar Gurram[1]. [1]Pediatrics, UT Southwestern Medical Center, Dallas, TX; [2]Pediatrics, Children's Medical Center, Dallas, TX*

Background and Aim: Ustekinumab is a monoclonal antibody which inhibits interleukins 12 and 23. It is approved for treatment of Crohn's disease in adults, however, there is a paucity of data regarding its use in pediatric Crohn's disease. In this paper we describe our experience using ustekinumab in anti-TNF refractory Crohn's disease.

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Method: We performed a retrospective chart review on pediatric patients with Crohn's disease who were started on ustekinumab from January 2016 to November 2018. We collected patient's clinical history, previous treatment history, surgeries related to Crohn's disease, disease severity as measured by abbrPCDAI, and endoscopic severity as recorded by SES-CD before and after ustekinumab.

Results: We identified a total of 10 patients with Crohn's disease who were started on ustekinumab in view of non-response to currently approved agents.The age at onset of CD ranged from 2 to 14 years (median age of 9.5 years). Six (60%) of these patients had perianal disease and 3 (30%) underwent surgery for Crohn's disease. Age at initiation of ustekinumab ranged from 9 to 19 years (median age of 14.5 years). Duration of disease ranged from 3 to 14 years (median duration of 6.5 years). All 10 patients were previously on adalimumab, and 9 were previously on infliximab. Eight (80%) out of 10 patients showed a clinical response as assessed by abbrPCDAI. Seven (70%) out of 10 patients needed augmented maintenance dosing of every 4-6 weeks to achieve clinical response or remission. 6 out of 10 patients had serum ustekinumab levels, with 5 patients showing subtherapeutic drug levels of <4.5 µg/mL while on standard maintenance dosing of every 8 weeks. The remaining 3 patients were on standard maintenance dosing for the duration of treatment. One of these 3 patients achieved clinical remission on every 8 weeks dosing interval with concurrent steroid therapy, but does not have follow up after steroid was discontinued. Two of the 10 patients did not respond to ustekinumab and did not have a trough level prior to therapy discontinuation. Total duration of ustekinumab ranged from 16 to 143 weeks.

Conclusion: In this retrospective chart review, 7 out of 10 patients with anti-TNF refractory pediatric-onset Crohn's disease required augmented maintenance doses of ustekinumab to achieve clinical reponse or remission as measured by abbrPCDAI. The remaining 3 patients on standard maintenance doses either did not respond or had confounding factors affecting clinical response. A prospective study is needed to define appropriate Ustekinumab dosing and interval in management of pediatric Crohn's Disease.
Ustekinumab dosing, interval, levels and duration of therapy

Pt.	Weight kg	Induction dose in mg	maintenance dose in mg	initial dosing interval in weeks	Trough levels µg/mL	Final maintenance dose in mg	final maintenance interval in weeks	Last trough levels	Therapy duration
1	32.2	90	45	8	NA	90	8	NA	142
2	103.8	520	90	8	undetectable	90	4	NA	59
3	46.6	260	90	8	3.6	90	4	8	63
4	38.9	240	90	6	0.8	90	4	7.1	71
5	29.4	180	45	6	0.1	90	6	>10	73
6*	73.2	90	90	4	NA	90	4	NA	
6	86.7	390	90	4	10	90	8	NA	16
7	50.8	260	90	8	NA	90	8	NA	55
8	39.1	90 Q4x3	90	8	1.1	90	6	NA	143
9	73.2	390	90	8	NA	90	8	NA	36
10	70.2	390	90	8	NA	90	8	NA	25

*Patient 6 was induced twice 1.5 years apart NA- Not available

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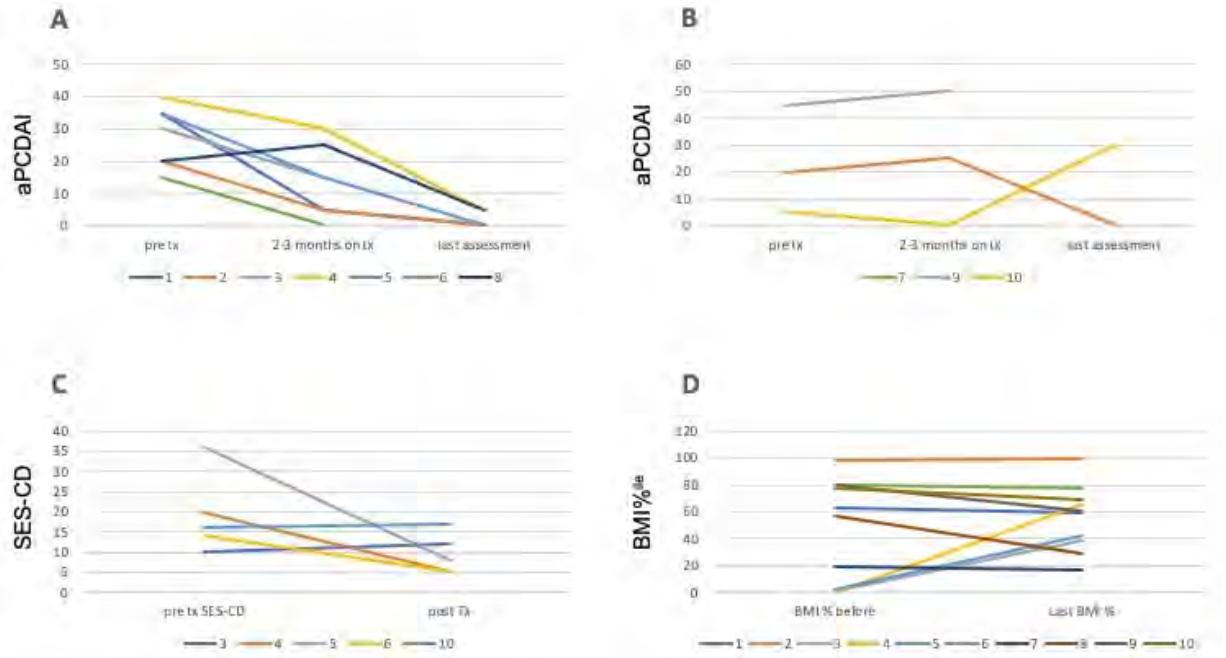


Figure 1: Response to ustekinumab A)clinical response as assessed by abbreviated-pediatric Crohn's disease activity index(aPCDAI) is patients that received augmented dosing with ustekinumab, B) clinical response as assessed by aPCDAI in patients with standard induction and maintenance dosing regimen of every 8 weeks, C) endoscopic response as assessed by simple endoscopic Score- Crohn's disease (SES-CD) and D) body mass index percentile before initiation of ustekinumab and at the time of last clinical assessment post initiation of treatment with ustekinumab

102 ***INSURANCE STATUS BUT NOT RACE DETERMINES SUSTAINED REMISSION IN PEDIATRIC IBD.***

Sylvia Doan[1,2], Alexander Jofriet[2], Octavia Scott[2], Aisha Riswan[2], Suresh Venkateswaran[1], Hari Someneni[1], Barbara Niklinska-Schirtz[1,2], Clair Talmadge[2,3], Christopher Fritzen[2], Michelle Dinser[2], Dana Dykes[2,3], Benjamin Gold[2,3], Cary Sauer[1,2], Subra Kugathasan[1,2], Bess Schoen[1,2]. [1]Pediatric Gastroenterology, Emory, Atlanta, GA; [2]Pediatric Gastroenterology, Children's Healthcare of Atlanta, Atlanta, GA; [3]GI Care for Kids, Atlanta, GA

Background: Racial disparities and poor access to care contribute to worse outcomes in IBD. Inadequate or no insurance coverage is a major contributing factor to inequalities in access to healthcare. Several studies demonstrated African-Americans (AAs) have higher risk for disease complications and worse disease outcomes compared to Caucasians. Understanding the complexities and the factors influencing the poor outcome of AA IBD is difficult, and poorly studied. Children's Healthcare of Atlanta (CHOA), the only children's hospital system in Atlanta (5.5 million population with 2 large pediatric GI practices), provides care for a large diverse pediatric IBD population with approximately 1400 children with IBD, 20% of which self-identify as African-American (AA). This large cohort of children with IBD allowed us to examine socioeconomic factors including race (African-Americans vs Caucasians), insurance status (Medicaid vs. commercial) and practice location that may influence clinical outcome. We examined sustained remission rates and the factors affecting this outcome in our population.

Methods: Data was extracted from ImproveCareNow (ICN) registry, a learning health network for pediatric IBD, in which both pediatric GI practices participate. ICN contains prospective, longitudinal data from outpatient encounters. Characteristics of each patient were broken down by race, insurance type, practice location. Rates of sustained remission were evaluated in each category. Inclusion criteria included more than 365 days since IBD diagnosis, AA or Caucasian descent, complete data including physician global assessment (PGA) and sustained remission status. 871 children (GI care for Kids n=674, Emory n=197) met inclusion criteria. Sustained remission was defined as PGA (per ImproveCareNow definition) quiescent for greater than 13 months. Descriptive statistics and Fisher's exact test were used for comparison between groups.

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Results: Overall sustained remission rate for the entire cohort was 421/872 (49%). The best performing group numerically was the Emory AA commercial insurance group (57%) and Emory's AA Medicaid group had the worst performance (31%). Fisher's exact test showed no difference based on practice location (Odds ratio 1.03 (0.72-1.3, P=0.45), or based on race (OR 1.06 (0.72-1.35, P=0.38). Having commercial insurance had an OR of 1.72 (1.53-1.91, P=0.0007) for sustained remission compared to having Medicaid, regardless of race or location.

Conclusions: Our findings suggest that insurance plays a significant role in achieving sustained remission rates in pediatric IBD among Georgia children with IBD. When evaluated independently, neither race nor practice pattern had any effect or influence on sustained remission rates.

	Total	Sustained remission (%)
GI Care for Kids AA Medicaid	49	22 (44%)
GI Care for Kids AA Commercial	93	49 (52%)
GI Care for Kids Caucasian Medicaid	76	27 (35%)
GI Care for Kids Caucasian Commercial	456	229 (50%)
Emory AA Medicaid	54	17 (31%)
Emory AA Commercial	45	26 (57%)
Emory Caucasian Medicaid	20	10 (50%)
Emory Caucasian Commercial	78	41 (52%)

Table 1: Total number of patients with sustained remission rates categorized by race and insurance status among institution locations
AA=African American

	Sustained Remission	Unsustained Remission	OR (CI)	P value
Practice Location				
Emory	94	103	1.03 (0.72-1.31)	0.453
GI Care for Kids	327	347		
Race				
AA	114	127	1.06 (0.77-1.35)	0.381
Caucasian	307	323		
Insurance				
Medicaid	76	123	1.72 (1.53-1.91)	7.08E-04
Commercial	345	327		

Table 2: Sustained remission rates analyzed by Fisher's exact test and shows that insurance status is significant compared to location and race
AA=African American

103 ***TOFACITINIB USE AFTER BIOLOGIC FAILURE FOR REFRACTORY PEDIATRIC INFLAMMATORY BOWEL DISEASE: A SINGLE CENTER EXPERIENCE.*** *Michael Dolinger[2], Priya Rolfes[1], Becky Phan[2], Marla Dubinsky[2]. [1]Pediatrics, Kravis Children's Hospital at Mount Sinai, New York, NY; [2]Pediatric Gastroenterology, The Mount Sinai Hospital, New York, NY*

***Background*:** Tofacitinib is approved for induction and maintenance of remission in adults with moderate to severe ulcerative colitis (UC). To date, there is no data on tofacitinib use in children with inflammatory bowel disease (IBD).

***Aim*:** We aimed to report on the safety and efficacy of tofacitinib use in children with refractory IBD who had failed all previous biologic therapies.

***Methods*:** As part of an ongoing observational cohort study of biologic-treated pediatric IBD patients age 18 years and

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below, data on demographics, disease behavior, location, and activity, adverse events, treatment and surgical history were collected for all patients treated with tofacitinib. Disease activity was assessed using the weighted Pediatric Crohn's Disease Activity Index (wPCDAI) or Pediatric Ulcerative Colitis Activity Index (PUCAI). Primary outcome was clinical response at last follow up. Secondary outcomes were steroid-free remission at last follow up, change in c-reactive protein (CRP), and adverse events reported including lipid monitoring, hospitalizations, and IBD related surgeries.

***Results*:** A total of 12 children, 5 with Crohn's disease (CD), 5 with UC, and 2 with IBD-unspecified (IBD-U), starting treatment with tofacitinib were analyzed. The patient population consisted of 4 males and 8 females with a median [IQR] weight of 49.7 [44-53.1] kilograms, a median [IQR] age at diagnosis of 11 [8-14] years, and a median [IQR] disease duration of 3 [1.6-7.4] years. Six (50%) patients failed ≥3 biologic therapies prior to induction with tofacitinib. All patients failed previous biologic treatment with infliximab, 5 (41.67%) patients failed treatment with multiple anti-TNF-α agents, 6 (50%) patients failed treatment with ustekinumab, and 5 (41.67%) patients failed treatment with vedolizumab. Overall, efficacy was observed in 8/12 (66.7%) patients; 3/12 (25%) patients had a clinical response, 5/12 (41.7%) patients were in clinical remission, 3 of which were off steroids at last follow up. Of the 5 UC patients, 1 (20%) patient was a responder, 3 (60%) patients were in clinical remission, 2 of which were off steroids at last follow up. Of the 7 patients with either CD or IBD-U, 2 (28.6%) patients were in remission, 1 of which was off steroids. Four (57.1%) patients had a primary non-response to tofacitinib and discontinued therapy with 2 of these 4 requiring surgical intervention with a diverting ileostomy. Combination tofacitinib with vedolizumab was used in 4/12 (33.3%) patients and 3 (75%) were in clinical remission, 2 of which were off steroids. As of last follow up, there were no serious adverse events, including infections, attributable to tofacitinib and no observed lipid abnormalities.

***Conclusions*:** Tofacitinib monotherapy or combination with vedolizumab was safe and effective for biologic refractory pediatric IBD patients. This study is limited by small sample size and retrospective nature; therefore larger prospective studies are needed.

Table 1. Previous biological therapy prior to tofacitinib induction

Previous Biological Therapy (n = 12)	
All biological therapy before Tofacitinib induction, n (%)	
Infliximab	12 (100)
Adalimumab	4 (33.33)
Certolizumab	2 (16.67)
Golimumab	2 (16.67)
Ustekinumab	6 (50)
Vedolizumab	9 (75)
Last biological therapy prior to Tofacitinib induction, n (%)	
Infliximab	3 (35)
Golimumab	1 (8.33)
Ustekinumab	3 (25)
Vedolizumab	5 (41.67)
Reasons for discontinuation	
Infliximab, n (%)	
Primary non-response	2 (66.7)
Secondary loss of response	1 (33.3)
Golimumab, n (%)	
Primary non-response	1 (100)
Ustekinumab, n (%)	
Primary non-response	2 (66.67)
Adverse effect	1 (33.33)
Vedolizumab, n (%)	
Primary non-response	1 (20)
Concomitant use with tofacitinib	4 (80)
No. anti-TNF-α agents failed, n (%)	
1	8 (66.67)
2	1 (8.33)
3	2 (16.67)
4	1 (8.33)
No. total biological failures before Tofacitinib initiation, n (%)	
1	4 (33.33)
2	2 (16.67)
3	3 (25)
4	2 (16.67)
>4	1 (8.33)

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Table 2. Individual treatment course on tofacitinib

Patient	Disease Location	Duration of therapy (weeks)	Response and outcome of therapy
IBD-U1	E3	5	Primary non-response, discontinuation at day 35, switched to ustekinumab
IBD-U2	E4	12.9	Combination therapy with vedolizumab, good response, remission off systemic corticosteroids on local rectal steroid enemas only, therapy ongoing
UC1	E4	9	Combination therapy with vedolizumab, good response, no remission, slowly tapering steroids, therapy ongoing
UC2	E3	11.7	Combination therapy with vedolizumab, good response, steroid-free remission, therapy ongoing
UC3	E3	40.4	Good response, remission off systemic steroids, on oral budesonide only, therapy ongoing
UC4	E4	10.3	No remission achieved, variable disease course, therapy ongoing
UC5	E4	9	Good response, steroid-free remission, therapy ongoing
CD1	L3p	8.4	Primary non-response, discontinuation at day 59, switched to ustekinumab and underwent diverting ileostomy
CD2	L2	8	Primary non-response, discontinuation at day 56
CD3	L3L4p	58.8	No remission achieved, variable disease course, therapy ongoing
CD4	L3L4p	10.7	Combination therapy with vedolizumab, good response, steroid-free remission, therapy ongoing
CD5	L3	5	Primary non-response, discontinuation at day 35, underwent diverting ileostomy

104 ***BIOELECTRICAL IMPEDENCE UNDERSTIMATES BODY FAT MASS IN ACTIVE PEDIATRIC CROHN'S DISEASE.*** *Jenna Dowhaniuk[1], Jillian Owens[2], Caroline Moore[1], Mary Sherlock[1], Muhanad Al Ruwaithi[1], Heather Mileski[2], Stephanie Atkinson[1], Mary Zachos[1].[1]Pediatrics, McMaster University, Hamilton, ON, Canada; [2]McMaster Children's Hospital, Hamilton, ON, Canada*

Background: Children with Crohn's disease often present with marked growth restriction making an accurate assessment of growth and body composition important in clinical monitoring. Dual-energy X-ray absorptiometry (DXA) is considered the gold standard modality to assess body fat, lean and bone mass. Bioelectrical impedence (BIA) is an alternative fast and accessible method to measure body fat. Our objective was to compare measures of percent body fat (%BF) by BIA versus DXA scan in newly diagnosed pediatric Crohn's disease patients.

Methods: Pediatric patients with newly diagnosed Crohn's disease were consented and then completed anthropometric measurements, whole body DXA scan (QDR®4500 series Hologic Inc. Discovery™ Waltham, MA) and bi-pedal BIA (Tanita BF-350). Height (statiometer) and weight (Tanita BF-350) were measured to determine BMI z-score (WHO). The agreement between total body %BF from BIA or DXA was evaluated using a Bland-Altman plot created using GraphPad Prism 7.03 (GraphPad Software, Inc., La Jolla, CA, USA). The difference in %BF between modalities was analyzed by a paired *t*-test. Baseline characteristics are presented as mean and standard deviation, or median and interquartile range.

Results: Children (n=18) were predominantly male (78%), median age 13.5 y (IQR 9.0,16.0). Disease distribution included predominant ileal or ileocolonic disease (Paris L1 or L3; 78%), non-stricturing non-penetrating disease (Paris B1 78%) with 44% having perianal disease. Mean fecal calprotectin was 2353mg/kg (95%CI 1422, 3285) and albumin 27.9g/L (95%CI 24.9,31.0). At disease diagnosis 33% (6/18) of participants were considered wasted with a BMI *z*-score <-2.0 with an overall mean BMI z-score of -0.93 (95%CI -1.5, -0.3). The median percent ideal body weight was 91% (IQR 69-131%). Average %BF was 20.8% (95%CI 17.1%, 24.5%) as assessed by DXA compared to 14.3% (95% CI 11.0%, 17.6%) by BIA. By the Bland-Altman plot of mean vs. difference in %BF between DXA and BIA, BIA yielded 7.1% lower body fat compared to using DXA (r=0.72, p<0.0001, 95% CI -0.09, -0.06). The 95% limits of agreement were -0.16 and 0.01 of mean vs. difference %BF between DXA and BIA.

Conclusion: Bioelectrical impedance analysis significantly underestimated %BF compared to the gold standard DXA. When evaluating body composition in active pediatric Crohn's disease, DXA should continue to be the modality of choice.

107 ***DISEASE-ASSOCIATED COSTS IN CHILDREN WITH INFLAMMATORY BOWEL DISEASE: A SYSTEMATIC REVIEW.*** *WAEL EL-MATARY[1], Ellen Kuenzig[2], Harminder Singh[3], George Okoli[1], Mohammad Moghareh[1], Harsh Kumar[1], Me-Linh Le[1], Eric Benchimol[2]. [1]Pediatric Gastroenterology, University of Manitoba, Winnipeg, MB, Canada; [2]University of Ottawa, Ottawa, ON, Canada; [3]Internal Medicine, University of Manitoba, Winnipeg, MB, Canada*

Background: As a chronic non-curable disorder often diagnosed in childhood or adolescence, inflammatory bowel disease

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(IBD) incurs significant financial lifetime burden. The objective of this systematic review was to determine disease-associated costs (both direct and indirect) associated with IBD in children and young adults.
Methods: We conducted a systematic review of the literature and included any study reporting direct health-services related costs, or indirect economic burden of IBD in persons aged ≤19 years old (PROSPERO protocol number CRD2016036128). A technical panel of experts in pediatric gastroenterology and research methodology formulated the review questions, reviewed the search strategies and review methods, and provided input throughout the review process.
Results: Nine studies met criteria for inclusion, six of which examined direct costs, one examined both direct and indirect costs, one assessed indirect costs, and one assessed out of pocket (OOP) costs. IBD-associated costs were significantly higher compared to costs in non-IBD populations with wide variations in cost estimates which did not allow us to conduct a meta-analysis. Costs in Crohn's disease were higher than in ulcerative colitis. Overall, direct costs shifted from inpatient hospitalization as a major source of direct costs to medications, mainly driven by anti-tumor necrosis factor agents to be the leading cause of direct costs. Predictors of high costs included uncontrolled disease, corticosteroid treatment in the previous year, and comorbidity burden.
Conclusions: Pediatric literature examining IBD-attributable costs is limited with widely variable cost estimates. There is a significant knowledge gap in research surrounding indirect costs and OOP expenses.

108 ***INFLAMMATORY BOWEL DISEASE IN CHILDREN WITH ELEVATED GAMMA GLUTAMYLTRANSFERASE.*** *WAEL EL-MATARY[1], Abin Chandrakumar[1], Rachael Loeppky[1], Mark Deneau[2]. [1]Pediatric Gastroenterology, University of Manitoba, Winnipeg, MB, Canada; [2]Pediatric Gastroenterology, Univeristy of Utah, Salt Lake City, UT*
Objective: To assess the difference in inflammatory bowel disease (IBD) phenotype, clinical characteristics and disease prognosis among children with gamma glutamyltransferase (GGT)>50U/L and primary sclerosing cholangitis (PSC)-ulcerative colitis (UC) in comparison to children with normal GGT and non-PSC, UC respectively
Methods: Our longitudinal population-based cohort comprised of all children diagnosed with ulcerative colitis in the province of Manitoba between 2011 and 2018. Confirmation of PSC diagnosis was based on a combination of cholestatic biochemical markers and cholangiographic feature. Fisher exact test with bonferroni correction was used to test the relationship between categorical variables.
Results: We enrolled 95 children with UC/IBD-U having a median age at diagnosis of 14 years (IQR: 10.4-15.9y) and 1399 person-year follow-up. Among them, 9 children developed PSC-UC at an incidence rate of 6.43 new cases per 1000 person-years. In this cohort, 8 (72.7%) out of 11 children with high baseline GGT, developed PSC-UC in comparison to 3 (3.6%) out of 84 children with normal GGT at baseline ($p<0.001$). All children with high GGT at diagnosis had pancolitis in comparison to only 63.9% in the normal GGT group ($p=0.01$). Children with high GGT were more likely to be pANCA positive than those with normal GGT patients (90.9% vs. 52.0%, $p=0.01$).
Conclusions: Our findings indicated that pediatric UC patients with even mild elevations in the GGT level, especially at baseline, might be predisposed to develop PSC. UC patients should get GGT assessed at the time of diagnosis and at each clinic visit for early identification of PSC-UC.

109 ***STANDARD IFX DOSING IS INEFFECTIVE IN THE MAJORITY OF PIBD PATIENTS, WITH BASELINE ALBUMINE IDENTIFIED AND REPLICATED AS A KEY DETERMINANT OF POST INDUCTION IFX LEVEL IN TWO DIVERSE PIBD COHORTS .*** *Farah Faytrouni[1], Rachel E Harris[2], Sally Lawrence[1], Richard K. Russell[2]. [1]Gastroenterology, Hepatology and Nutrition, British Colombia Children's Hospital, Vancouver, BC, Canada; [2]Paediatric Gastroenterology, Hepatology and Nutrition,, Royal Hospital for Children, Glasgow, United Kingdom*
Objectives: To evaluate the effectiveness of infliximab (IFX) induction regimes in attaining therapeutic post induction levels in 2 paediatric inflammatory bowel disease (PIBD) cohorts; to investigate baseline laboratory values and patient factors as predictors of post-induction levels.

Methods: 78 patients from Vancouver, Canada (Cohort 1 (C1) originator IFX; variable dose induction regime) and 62 patients from Glasgow, Scotland (Cohort 2 (C2) [replication cohort] - biosimilar IFX; standard induction of 5mg/kg at 0, 2 and 6 weeks with 8 weekly maintenance thereafter) were included in the study. Baseline characteristics and laboratory values from time of IFX initiation were recorded. A Mann-Whitney U Test was used to analyse the relationship between IFX trough levels and lab parameters.

Results:

TABLE 1 (Image 1)

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The median dose 4 troughs in C1 & C2 were 4.25 (IQR 7.8) and 1.85 (IQR 3.38) respectively.

TABLE 2 (Image 2)

In C1 patients who had a trough level <3mg/L pre-dose 4, 62% (20/32) had dose adjustment documented prior to this.

The IFX of 39/78(50%) C1 and of 40/62(65%) C2 patients were escalated following the dose 4 levels.

Baseline median albumin was lower and replicated in both cohorts in those with pre-dose 4 IFX levels of:

<0.8mg/L
C1 : 30g/L vs37.5g/L in IFX ≥0.8mg/L, p=0.002
C2 : 34.5g/L vs 37g/L in IFX ≥0.8mg/L, p=0.02

<3.0mg/L
C1 :34.5g/L vs 38g/L in IFX ≥3.0mg/L, p= 0.05
C2 :35g/L vs 37g/L in IFX ≥3.0mg/L, p=0.04

<5.0mg/L
C1 :35g/L vs 39g/L in IFX ≥5.0mg/L, p=0.006
C2 :35g/L vs 37g/L in IFX ≥5.0mg/L, p=0.45

Additional data within C1 showed median IFX level pre-dose 3 was 9.6mg/L (IQR 8.3). Baseline albumin was lower in those with low IFX levels pre-dose 3 (32g/L in IFX <3mg/L vs 38g/L in IFX ≥3mg/L, p= 0.0095 and 32g/L in IFX <5mg/L vs 38g/L in IFX ≥5.0mg/L, p=0.002).

In the combined cohort (C1+2), a patient baseline albumin ≤30g/L had significantly lower IFX levels pre dose 4 (1.4mg/L vs 3.55mg/L in those with albumin >30g/L (p=0.0003)). In patients with an albumin ≤30g/L, 6/26 (23%) achieved a dose 4 trough level of ≥3.0mg/L, however only 1/6 patients received a standard induction regime meaning 1/26 (4%) of patients had a trough ≥3.0mg/L on standard treatment.

Conclusion: Standard IFX induction regime is ineffective at achieving relevant post-induction levels (>5 mg/L) in the majority of patients regardless of IFX type. We suggest that adjustment of initial IFX prescribing based on baseline albumin (e.g. a higher dose given to patients with albumin < 30) and subsequent levels will improve post-induction IFX levels and consequently clinical outcomes for a greater majority of patients.

N (%)	COHORT 1 (n=78)	COHORT 2 (n=62)
CROHN'S DISEASE	57 (73%)	50 (81%)
MALE	42 (54%)	34 (55%)
INDICATION – ACTIVE LUMINAL DISEASE	52 (67%)	45 (73%)
BASELINE PGA MILD/MODERATE	52 (67%)	42 (68%)
HYDROCORTISONE COVER	28 (36%)	59/60 (98%)
CO-IMMUNOSUPPRESSION AT INITIATION	33 (42%)	59 (95%)
STEROIDS AT INITIATION	21 (27%)	22 (36%)

TABLE 1: Cohorts Demographics

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	Pre dose 4 IFX trough level		
	< 0.8mg/L	< 3mg/L	< 5mg/L
C1	10/78(13%)	32/78(41%)	44/78(56%)
C2	18/62(29%)	39/62(63%)	51/62(82%)

TABLE 2: Pre dose 4 IFX trough levels distribution

110 ***HEALTHCARE COST FOR CHILDREN NEWLY DIAGNOSED WITH INFLAMMATORY BOWEL DISEASE.*** *Andrew Fondell[1], Maua Mosha[1], Cliff Frank[2], Jeffrey Brangi[1], Jeffrey Hyams[1]. [1]Connecticut Children's, Hartford, CT; [2]Healthcare Management Solutions, Dunedin, FL*

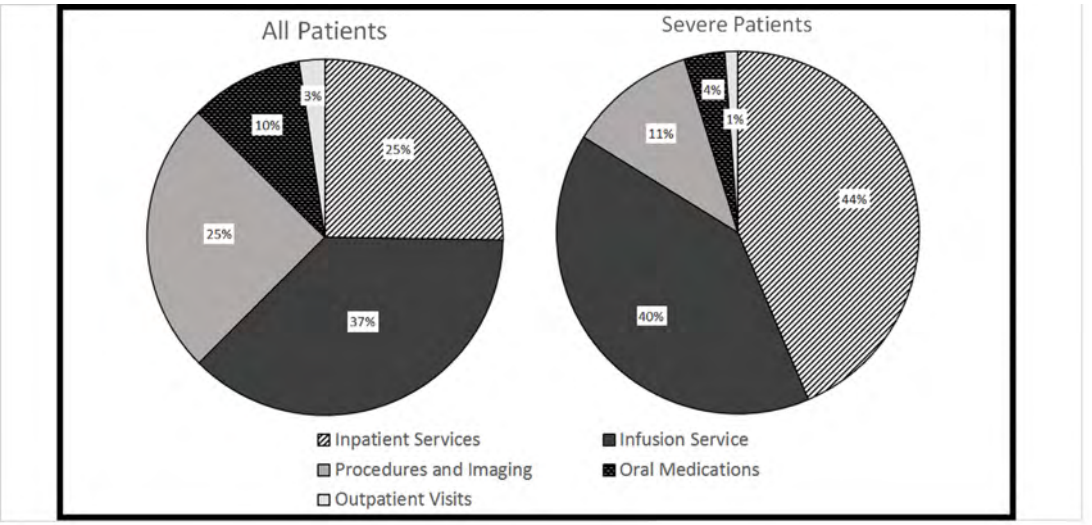
Background: The increasing incidence of pediatric inflammatory bowel disease (IBD), along with more extensive and severe disease in children, raises concern for related healthcare expenditures. **Aim**: Quantify and characterize costs of pediatric IBD in the year following diagnosis. **Methods:** We identified all patients diagnosed with IBD at Connecticut Children's Medical Center in 2016 with a minimum of 1 year follow-up. Clinical and demographic factors were recorded. We examined paid service and professional costs related to outpatient medications and infusions, outpatient procedures and radiology imaging, inpatient services, and outpatient visits. Actual dollar reimbursements were from private and public payers. Data as mean±SD. **Results**: First year cost data were collected on 67 patients (43 Crohn's disease (CD), 24 ulcerative colitis (UC), mean age 13 years (SD 3.22)) revealing a mean cost of $45,753 (SD 37,938), with $43,095 (SD 30,828) for CD and $50,516 (SD 48,557) for UC. Severe CD (n=11) had a mean cost of $71,176 (SD 43,817) and severe UC (n=5) $134,178 (SD 40,920). Patients receiving infusion therapy had a mean cost of $59,376 (SD 38,724) compared to $27,903 (SD 28,795) for those not receiving infusions. Privately insured patients (n=53) had a mean cost of $51,269 and those with Medicaid (n=14) $24,610. Overall cost distribution showed 37% from infusion costs, 25% inpatient costs, 18% outpatient procedures, 10% outpatient oral medications, 7% outpatient imaging, and 3% outpatient visits. **Conclusion**: Infusion therapy and initial severity are key drivers for first year costs for children newly diagnosed with IBD. Understanding cost distribution in relation to disease presentation can be helpful to anticipate future related costs. A large discrepancy exists between reimbursement of costs between private and public payers.

Characteristics of Costs in the First Year Following Diagnosis of Pediatric IBD

	Crohn's Disease			Ulcerative Colitis			Total	
		Mean (SD)+	Median (IQR)+		Mean (SD)+	Median (IQR)+		Mean (SD)+
Patients (N = 67)	n = 43	43,095 (30,828)	38,467 (34,745)	n = 24	50,516 (48,557)	30,300 (34,756)	N = 67	45,753 (37,938)
Severity of Disease*								
Mild	13	26,917 (16,994)	28,994 (22,475)	11	23,804 (10,452)	22,271 (17,349)	24	25,337 (14,070)
Moderate	19	37,906 (16,095)	38,436 (32,270)	8	34,958 (15,381)	32,408 (27,138)	27	37,033 (15,650)
Severe	11	71,176 (43,817)	60,093 (38,453)	5	134,178 (40,920)	154,070 (37,223)	16	90,864 (51,343)
Hospitalized^	9	73,695 (49,815)	55,472 (24,088)	11	81,291 (57,723)	53,940 (121,620)	20	77,873 (53,043)
Surgery	1	133,692		1	161,986		2	147,839 (20,006)
Infusion Therapy	30	52,356 (31,492)	49,507 (23,767)	8	85,698 (53,053)	60,008 (96,321)	38	59,376 (38,724)
Private Insurance	34	48,107 (31,811)	42,379 (23,039)	19	57,121 (52,698)	38,984 (48,471)	53	51,269 (40,311)
Medicaid	9	24,160 (17,465)	20,171 (11,026)	5	25,419 (8,114)	26,556 (7,948)	14	24,610 (14,435)

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+ Mean and Median Costs reported in US Dollars ($) * Severity of Disease at time of diagnosis based on PUCAI or PCDAI based on UC or CD ^ Patients with at least one hospitalization



Distribution of costs (in US $) for all patients and those with severe disease

111 ***THE SAFETY AND EFFICACY OF HIGH DOSE MAINTENANCE INFLIXIMAB THERAPY IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Alice Foster[1,2], Gurman Khera[1], Laura Meleady[1], Leah Nash[1], Marliss Riou[1], Kevan Jacobson[1,2], Sally Lawrence[1,2]. [1]Pediatric Gastroenterology, BC Children's Hospital, Vancouver, BC, Canada; [2]Pediatrics, University of British Columbia, Vancouver, BC, Canada*

Objectives: Dose escalation of infliximab (IFX) is used in children with inflammatory bowel disease (IBD) in order to obtain adequate trough levels or optimize disease control. We evaluated the safety and efficacy of high dose (HD) IFX (greater than 10mg/kg every 8 weeks) during maintenance therapy in children with IBD.

Methods: We retrospectively reviewed all pediatric IBD patients who received HD IFX any time during the maintenance period (after standard induction) between January 1st 2010 and July 1st 2018. Clinical, laboratory and demographic data were collected.

Results: 56 children received HD maintenance IFX at a dose range between 10 and 17.4 mg/kg every 3 to 8 weeks. 69.6% male; 75% Crohn's disease, 16.1% ulcerative colitis, 8.9% IBD unclassified. The median age at IBD diagnosis was 11 years (IQR 10-13) and the median disease duration at HD IFX initiation was 17 months (IQR 7-41). All children were anti-TNF naïve.

At HD IFX initiation 3 (5.4%) patients were receiving corticosteroids and 38 (67.9%) were on concomitant immunomodulatory therapy (50% azathioprine, 50% methotrexate). The median IFX dose at time of HD IFX initiation was dose number 6 (IQR 4-8). Median follow up time after initiation of HD IFX initiation was 25 months (IQR 18-34).

Twelve weeks after initiation of HD IFX, 45/56 (80.4%) were in clinical remission (PCDAI or PUCAI <10). Clinical remission rates at week 52 and week 78 after HD IFX initiation were 41/50 (82.0%) and 42/45 (93.3%) respectively. To note, 25/56 (45%) were in clinical remission at the commencement of HD IFX and the dose escalation was because of low trough levels or mild symptoms. Of the remaining 31 who weren't in clinical remission at HD start, 23/31 (74%) were in clinical remission at week 12, 18/27 (68%) at week 52 and 19/24 (79%) at week 78.

Over the study period, median serum IFX trough levels increased significantly from 1.9 to 8.0 ug/mL ($p<0.0001$). Mean CRP decreased significantly at week 78 from 14.9 mg/L at baseline to 6.9mg/L ($p=0.004$). At last follow up, IFX was discontinued in 8/56 (14.3%) due to loss of response. The median CRP was significantly higher at week 12 in those who ultimately discontinued therapy (13.5 vs. 5.0 mg/L, $p=0.0002$). Dose de-escalation occurred in 29/56 (51.8%), and of those

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3/29 (5.4%) were brought down to standard dosing.

There were 3 (5%) children who developed psoriasis while on HD IFX therapy, 2 (4%) individuals with mild infusion reactions and 1 (2%) with a severe infusion reaction. There were no cases of serious infection or malignancy.

Conclusion: HD IFX therapy may benefit pediatric IBD patients both clinically and biochemically who have failed standard doses of IFX. In this cohort the majority of patients were able to continue therapy and while many had a de-escalation of dosing over time, very few resumed standard dosing. No new safety signals were identified.

112 ***BTK DEFICIENCY LEADS TO NLRP3 INFLAMMASOME DYSREGULATION AND CAUSES MURINE EXPERIMENTAL AND HUMAN IL-1B-MEDIATED COLITIS.*** *Liming Mao[1], Atsushi Kitani[1], Eitaro Hiejima[1], Kim Montgomery-Recht[1,3], Wenchang Zhou[2], Adrian Wiestner[4], Ivan Fuss[1], Warren Strober[1]. [1]mucosal Immunity Section, National Institutes of Health, Bethesda, MD; [2]Theoretical Molecular Biophysics Laboratory, NHLBI, National Institutes of Health, Bethesda, MD; [3]Clinical Research Directorate/Clinical Monitoring Research Program, Leidos Biomedical Research, Inc., NCI Campus at Frederick, Fredrick, MD; [4]Hematology Branch, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, MD*

The NLRP3 inflammasome, when appropriately activated releases mature IL-1B which serves as a mechanism for the induction of pro-inflammatory cytokines participating in host defense. However, this potentiality requires strict regulation if one is to suppress responses that lead inadvertently to inflammatory disease. Several regulatory mechanisms of the NLRP3 inflammasome have in common the fact that they affect the phosphorylation of NLRP3. NLRP3 is subject to a complex pattern of phosphorylation and/or dephosphorylation events occurring at a variety of different sites that serve as checkpoints of inflammasome activation. Another mechanism of regulation of the NLRP3 inflammasome involves the binding of a molecule to NLRP3 that has the capacity to modify (or inactivate) NLRP3 function, such as the molecules NEK7 or CARD8.

In the present study we investigated the regulation of the NLRP3 inflammasome by Bruton tyrosine kinase (BTK). BTK, a critical component of B differentiation and maturation, is present in a wide variety of cells and may have important non-B cell functions. Here we explored the function of this kinase in other hematopoietic cells with studies of its regulation of the NLRP3 inflammasome, in particular to its ability to affect NLRP3 phosphorylation and its binding to NLRP3.

In initial studies we found that purified bone marrow-derived macrophages (BMDMs) from BTK-deficient mice or monocytes from X-linked agammaglobulinemia (XLA) patients exhibit increased NLRP3 inflammasome activity; with increased generation of IL-1B. These studies were in accord with reciprocal (BTK over-expression) in vitro studies involving HEK293T cells transfected with plasmids allowing construction of the complete NLRP3 inflammasome, in which we observed that inflammasome activity by the transfected cells is suppressed by co-transfection of BTK-expressing plasmids. In further studies, we found that BTK binds to NLRP3 during the priming phase of inflammasome activation (LPS activation) and in doing so inhibits NLRP3 oligomerization and subsequent binding to downstream inflammasome molecules such as ASC or NEK7 during the activation phase of inflammasome activation. This action blocks the formation of the inflammasome complex and therefore regulates the generation of IL-1B formation. In additional studies, we found that BTK suppressive activity depends on its capacity to block NLRP3 Ser5 dephosphorylation an event necessary for NLRP3 oligomerization. Furthermore, we observed that BTK-deficient mice subject to experimental TNBS colitis have a more severe colitis than observed in WT mice and such colitis is normalized by administration of anti-IL1B or anakinra, the latter an inhibitor of IL-1B signaling. Finally, BTK-deficient patients with a history of Crohns disease demonstrated similar inflammasome activation and had significant amelioration of disease with anakinra treatment.

Overall, these studies suggest that the activation of BTK in macrophages/dendritic cells serves as a physiologic mechanism of NLRP3 inflammasome regulation in that it blocks the activation of the NLRP3 inflammasome activation. In addition, they provide an explanation for the fact that patients with XLA lacking functional BTK are prone to develop a Crohn-like intestinal inflammation which can be amenable to treatment with anti-IL1B treatment.

114 ***TITLE: POLYETHYLENE GLYCOL: THE USE OF A SINGLE ENTERIC AGENT FOR DIAGNOSTIC MRE IN A COMMUNITY HOSPITAL SETTING.*** *Limary Garcia-Gonzale. Pediatrics, Sinai Hospital of Baltimore, Baltimore, MD*

Background: Magnetic resonance enterography (MRE) has become a primary imaging modality in the assessment of Crohn's disease due to its noninvasiveness and lack of ionizing radiation. An important requirement of an MRE study is to

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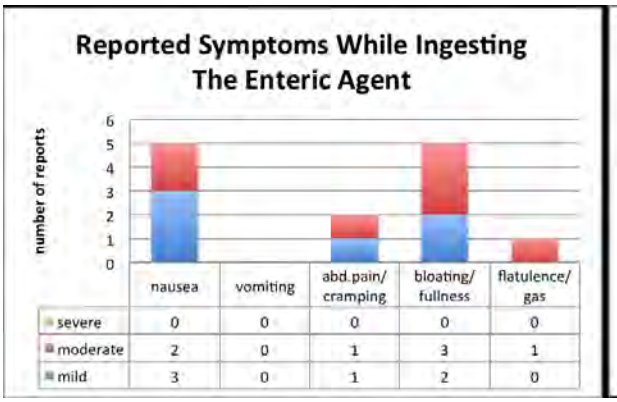
achieve appropriate small bowel distention. This is achieved by using an enteric contrast agent prior to the study. The enteric agents used are biphasic agents that provide low signal intensity on T1 weighted imaging and high signal intensity on T2. Despite similarities in basic principle of contrast agents used in adults and pediatrics, in children it is important to achieve optimal imaging while also prioritizing patient comfort. VoLumen is a commonly used contrast agent comprising of barium sulfate and sorbitol. Some disadvantages of this enteric agent include volume intolerability, associated bloating, cramping, subsequent diarrhea and constipation as well as palatability issues due to texture and taste.

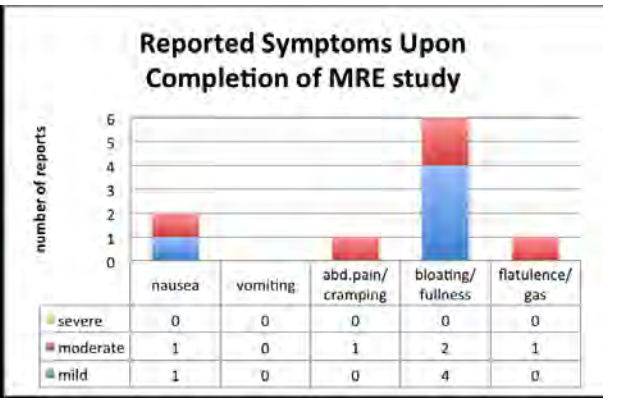
Objective: To implement a quality improvement project to improve the patient experience by using an alternative enteric agent and to assess for proper bowel distensibility. We proposed the use of polyethylene glycol enteric agent, given that is biphasic agent that fulfills radiologic criteria and well-known medication amongst patient with inflammatory bowel disease.

Methods: A protocol with specific polyethylene glycol dosing, based on patient's weight, was established. Patients with established or suspected IBD undergoing MRE study at the Sinai Hospital Radiology Department between September 2018 and May 2019, were prospectively recruited. To assess for tolerability and adverse effect, patients were given two surveys in total. The initial survey was given the day of the MRE study to evaluate for symptoms while ingesting and upon completion of the enteric agent. The second survey was given via phone calls 48-72 hours post-study. Patients rated symptoms of nausea, vomiting, bloating, flatulence and abdominal pain based on severity as mild, moderate or severe. Also information about taste, ease of drinking and overall experience was inquired. To assess imaging quality and appropriate bowel distensibility, the radiologist evaluated MRE studies performed with polyethylene glycol and previous MRE studies performed with voLumen in a blinded fashion. A likert scale was used to compare these results.

Results: A total of 15 patients completed the initial survey while only 3 patients completed the second survey 48-72 hours post MRE study. On preliminary results, a total of 5/15 (33%) patients reported nausea while ingesting the enteric agent. The severity of the nausea was mild for 3/5 (60%) and moderate for 2/5 (40%). Upon completion of the MRE study only 2/15 (13%) reported nausea, in the mild and moderate category. Two out of 15 patients (12.5%) reported mild and moderate abdominal pain while ingesting the enteric agent, and 1/15 (6.6%) reported moderate pain upon completion of the MRE. Bloating was reported in 5/15 (33%) of patients. While ingesting the agent 2/5 (40%) reported mild bloating and 3/5 (60%) reported moderate bloating. Upon completion of the MRE, 6/15 (40%) reported bloating, 4/15 (26%) in the mild category and 2/15 (13%) in the severe category. Lastly, moderate flatulence was reported by 1/15 (6.6%) of patient while ingesting the agent, and 1/15 upon completion of the study. In the second survey, 48-72 hours post MRE study, only 1/3 (33%) patient reported mild nausea. Two out of 3 (66%) reported mild and moderate abdominal pain. Mild bloating was reported by only 1/3 (33%) of patients, and lastly 2/3 (66%) reported flatulence, 1 in the mild and 1 moderate category. There was no reported vomiting in any of the two surveys. The enteric agent taste was rated as neutral by 93% of patients and good by 7% patients. Meanwhile the overall experience was rated as neutral by 60% of patients and good by 40% of patients. In terms of imaging quality and appropriate bowel distention, preliminary radiological findings demonstrated noninferiority of polyethylene glycol compared to low barium sulfate.

Conclusion: The use of polyethylene glycol as an enteric agent was overall well tolerated, associated with minimal side effects and provided good quality of imaging. Finally, as enteric contrast material for diagnostic imaging continues to evolve in pediatrics, it must be kept in mind, to optimize not only the quality of the imaging examination but the patient's experience. Therefore choices of contrast media, flavoring additives related to palatability and quantity of contrast administered should be taken into consideration.





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116 ***ADVERSE EFFECT OF OBESITY ON OUTCOMES OF CHILDREN NEWLY DIAGNOSED WITH INFLAMMATORY BOWEL DISEASE.*** *Alexa Goldfarb[1], Dena Hopkins[2], Maua Mosha[1], Jeffrey Hyams[2]. [1]Pediatrics, Connecticut Children's Medical Center, Hartford, CT; [2]Gastroenterology, Connecticut Children's Medical Center, Hartford, CT*

Background: Childhood obesity is an increasing problem throughout the United States. In 2015-2016, approximately 35% of children in the United States were found to be overweight or obese (Center for Disease Control, CDC). Although obesity was once considered uncommon in inflammatory bowel disease (IBD), recent observations suggest that an increasing percentage of children newly diagnosed with IBD are obese. Previous studies also suggest that obesity may adversely affect outcomes of IBD in adults although little is known about the impact of obesity among children with IBD. **Aims**: 1. Determine the prevalence of overweight/obese status in children newly diagnosed with IBD, 2. Determine the impact of obesity on first year disease course. **Methods**: Single center retrospective cohort study (Connecticut Children's Medical Center, Hartford, CT). Clinical, demographic, and body mass index (BMI) data were obtained on children diagnosed with IBD between 10/1/15 and 2/28/18. BMI-for-age weight status categories (CDC, 2000) and corresponding percentiles were used to categorize children as underweight (BMI<5th percentile), normal (BMI ≥ 5th percentile to <85th percentile), overweight (BMI ≥85th percentile to <95th percentile), or obese (BMI ≥ 95th percentile). Our primary outcome was BMI percentile of children with IBD at diagnosis. Secondary outcomes were BMI percentile at 1 year from diagnosis, disease severity at diagnosis based on Physician Global Assessment (PGA), the need for hospitalization, biologic therapy, and IBD-related surgeries within the first year after diagnosis.**Results**: Data were available for 163 children with IBD, mean±SD age at diagnosis 13.1± 3.2 years, 58% male: 102 with Crohn's disease (CD), 56 with ulcerative colitis (UC), and 5 with IBD-U. The prevalence of overweight/obesity in children with IBD at diagnosis was 12% (9% for CD vs. 18% for UC/IBD-U). Compared to diagnosis, the prevalence of overweight/obesity in children with IBD increased at 1 year to 23% (p<.0001) with a prevalence of 26% in CD and 20% in UC/IBD-U (Table 1). Overweight/obese children with IBD were significantly more likely to be hospitalized at diagnosis (45% vs. 18%, p=0.009) and have a PGA at diagnosis consistent with severe disease (35% vs. 12%, p = 0.011) than normal weight children with IBD. Children with IBD who were overweight/obese at diagnosis had significantly higher rates of hospitalization (60% vs. 34%, p=0.03) and longer hospital stays (mean 6.9 vs. 2.4 days; p=0.007) within the first year after diagnosis than children with normal weights at diagnosis. Rates of surgery (10% vs. 5%, p=0.6) and biologic therapy (55% vs. 56%, p=0.9) within the first year after diagnosis were similar between overweight/obese children with IBD and normal weight patients (Table 2). **Conclusions**: Overweight/obesity increase in children newly diagnosed with IBD in the year following diagnosis. Overweight/obesity may be associated with more severe presenting PGA, a more frequent need for hospitalization, and a greater number of days spent in the hospital annually. While the etiopathogenesis of our findings remains to be clarified, we speculate that the inflammatory load from adipose tissue itself may be a contributing factor.

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Table 1. Weight categories at diagnosis and 1 year from diagnosis in children with IBD.

Weight category at diagnosis	Crohn's disease N(%)	Ulcerative colitis/ IBD-U N(%)	p-value (comparing CD vs. UC/IBD-U)	Total IBD N(%)
Underweight	38 (37%)	11 (18%)	0.0184	49 (30%)
Normal	55 (54%)	39 (64%)		94 (58%)
Overweight+obese	9 (9%)	11 (18%)		20 (12%)
Weight category at 1 year			0.6598	
Underweight	6 (6%)	3 (5%)		9 (6%)
Normal	70 (69%)	42 (75%)		116 (71%)
Overweight+obese	26 (26%)	11 (20%)		38 (23%)

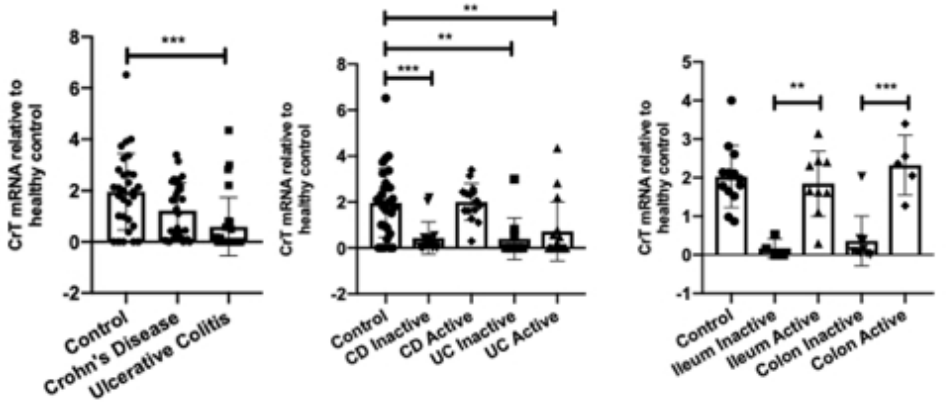
Table 2. Relationship of weight categories to clinical outcomes.

Weight category at diagnosis	Total number patients	PGA severe N(%)	Hospitalized at diagnosis N(%)	Hospitalized within 1st year N(%)	Mean # days in hospital within 1st year (SD)	Surgery within 1st year N(%)	Biologic within 1st year N(%)
Normal	94	11 (12%)	17 (18%)	31 (34%) n=92	2.4 (4.9)	5 (5%)	51 (56%) n=91
Overweight+ obese	20	7 (35%)	9 (45%)	12 (60%)	6.9 (12.1)	2 (10%)	11 (55%)

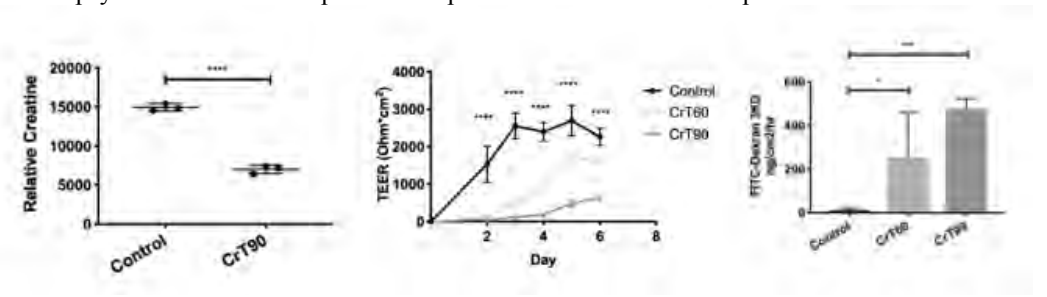
120 ***LOSS OF CREATINE TRANSPORTER EXPRESSION IN INFLAMMATORY BOWEL DISEASE PATIENTS MAY CONTRIBUTE TO UNDERLYING INTESTINAL BARRIER DYSFUNCTION.*** *Caroline Hall[1,2], J. Lee[2], Louise Glover[3], Sean Colgan[2]. [1]Digestive Health Institute, Children's Hospital Colorado, Aurora, CO; [2]Medicine, University of Colorado, Aurora, CO; [3]Merrion Fertility Clinic, National Maternity Hospital Dublin, Dublin, Ireland*

Intestinal barrier function is integral to homeostasis in the gastrointestinal (GI) tract. Underlying barrier dysfunction has been identified in inflammatory bowel disease (IBD) patients and first-degree relatives of patients with IBD. Maintaining a strong epithelial barrier requires energy expenditure which is in part facilitated by creatine shuttling within the cell. Given this important role of creatine in energetic regulation, we hypothesize that creatine and regulation of its uptake by the creatine transporter, CrT, may play a role in intestinal epithelial homeostasis. Evaluation of IBD patient biopsy samples has identified a significant reduction of expression of CrT in both ulcerative colitis and crohn's disease. In order to model the effect of this loss on epithelial function, we created lentiviral shRNA-mediated knockdown of CrT in a colonic epithelial cell line. The loss of transporter expression was associated with a greater than 50% decrease in the intracellular creatine pool. We demonstrated that CrT loss-of-function resulted in a nearly complete inability of cultured intestinal epithelial cells to form barrier, as measured by transepithelial resistance and paracellular flux. Wound healing was similarly impaired in the CrT knockdown cells. Conversely, over expression of CrT in epithelial cells resulted in a more robust barrier formation. The role of creatine in barrier formation is likely to regulate tight junction protein expression and localization as mediated by actin polymerization which we demonstrated in our cell culture system. These findings identify an important role for energy regulation in IBD as mediated creatine activity.

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Patient biopsies were obtained endoscopically, noting disease activity and location of biopsy. mRNA was isolated and evaluated by rtPCR for relative creatine transporter, CrT, expression. CrT expression was reduced in all UC patients. Crohn's disease patients with active disease have normal CrT expression while those with inactive disease have reduced expression. Biopsy location did not impact CrT expression in Crohn's disease patients.



Creatine transporter, CrT, was knocked down in a colonic epithelial cell line. Control cells and 90% knockdown cells, CrT90, were evaluated for intracellular creatine by HPLC with a 50% reduction of intracellular creatine noted in the CrT90 cells. When evaluated for barrier function by transepithelial electrical resistance or TEER, the CrT90 cells had a significantly reduced rate and maximum barrier. Interestingly, a cell line with a 60% reduction in CrT, CrT60, had an intermediate phenotype indicating that there was a quantitative effect of the CrT on barrier. This barrier defect was also evident by FITC-Dextran Flux assay in which barrier strength is measured by the ability of cells to inhibit FITC-Dextran passage through a layer of epithelial cells.

125 ***THERAPEUTIC DRUG MONITORING OF VEDOLIZUMAB AND USTEKINUMAB DURING INDUCTION IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Seth Iskowitz*, *Paula Prieto Jimenez*, *Amal Ayoub*, *Lina Felipez*, *Alisa Muniz Crim. Pediatric Gastroenterology*, *Nicklaus Children's Hospital*, *Miami*, *FL*

Background: Vedolizumab (VDZ), an alpha4beta7 integrin monoclonal antibody, and ustekinumab (UST), a monoclonal antibody to the p40 subunit of IL-12 and IL-23, are second-line biologic agents for pediatric patients with prior failure to anti-tumor necrosis factor (anti-TNF) therapy. Limited data on the utility of therapeutic drug monitoring (TDM) of VDZ and UST in the pediatric population exists. We aim to describe the VZV and UST drug levels and anti-drug antibody (ADA) production in our pediatric population during induction and maintenance therapy.

Methods: This observational cohort study consisted of all IBD patients receiving vedolizumab (VDZ) or ustekinumab (UST) at Nicklaus Children's Hospital between March 2016 and October 2018 who had documented drug levels and anti-drug antibody (ADA) titers. Demographic data, primary diagnosis, sites of involvement, drug levels, and ADA titers were recorded retrospectively. Sample mean, standard deviation, and median were calculated for the patient's current age. Unadjusted logistic regression models as well as L1-penalized (LASSO) multivariate logistic regression were utilized in this study. Our primary outcome of interest was clinical remission rate at 1 year. Though TDM was performed by all providers, decisions regarding dose optimization were at the discretion of the treating physician. All data analyses were performed by using SAS Enterprise Guide 7.1.

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Results: A total of 39 patients (31 VDZ and 8 UST patients) met inclusion criteria. Among our population, 74.4% identified as Hispanic and 53.9% were male. The mean patient age was 15 (range 3-24) years. The mean age at diagnosis was 10.7 (range 1-18) years. 64.1% of our population had Crohn's disease (CD). CD phenotype was described as inflammatory in 28%, penetrating in 56%, and stenosing in 4%. 96% of our CD population in this study had ileocolonic disease. UC phenotype was described as pancolitis in 76.9% and left-sided colitis in 23.1%. Of patients receiving VDZ, mean drug levels at Week 6 were 20.3 (range 0-40) ug/mL. 4% of our VDZ population demonstrated ADA (mean 0.13 U/ml, range 0-3.9 U/ml). Of patients receiving UST, mean drug levels at the third dose were 9.1 (0-25) ug/mL with no ADA recorded.

Discussion: 36% of our patients achieved clinical remission by 1 year. Patient specific characteristics studied in our population did not correlate with 1-year remission. Our data highlight the dynamic nature of TDM processes that require more controlled observation in a prospective fashion. Further studies are needed to isolate optimal dose and intervals for VDZ and UST and correlate with clinical and endoscopic outcomes.

Patient Characteristics

Variable	n	%
Gender		
Female	18	46.1
Male	21	53.9
Race		
White	33	84.6
African American	5	12.8
Asian	1	2.6
Ethnicity		
Hispanic	29	74.4
Non-Hispanic	10	25.6
Primary Diagnosis		
Indeterminate Colitis	1	2.6
Crohn's Disease	25	64.1
Ulcerative Colitis	13	33.3
Phenotype of Crohn's Disease		
Penetrating	14	56.0
Stenosing	2	4.0
Inflammatory	7	28.0
Penetrating + Stenosing	2	4.0
Ileocolonic	24	96.0
Colonic Only	1	4.0
Phenotype of UC		
Left-sided	10	76.9
Pancolitis	3	23.1

129 ***METHOTREXATE POLYGLUTAMATES AS BIOMARKERS OF TREATMENT RESPONSE IN IBD VS. JIA.***

Ryan Morrow[1], *Ryan Funk*[2], *Ashley Sherman*[3], *Mara Becker*[4], *Valentina Shakhnovich*[5,6]. [1]*Pediatrics*, *Children's Mercy*, *Kansas City*, *MO*; [2]*Rheumatology*, *University of Kansas*, *Kansas City*, *KS*; [3]*Biostatistics*, *Children's Mercy*, *Kansas City*, *MO*; [4]*Rheumatology*, *Children's Mercy*, *Kansas City*, *MO*; [5]*Gastroenterology*, *Children's Mercy*, *Kansas City*, *MO*; [6]*Clinical Pharmacology*, *Children's Mercy*, *Kansas City*, *MO*

Background: Methotrexate (MTX) is an immunomodulator used for the treatment of inflammatory bowel disease (IBD) and juvenile idiopathic arthritis (JIA). After administration, inside blood cells, methotrexate undergoes addition of glutamate to form methotrexate polyglutamates (MTX-Glu), classified based on the number (n) of the glutamate side-chains with up to six glutamates (MTX-Glu_n). MTX-Glu show promise as potential biomarkers of systemic exposure to MTX and may have clinical utility for prediction of therapeutic response. The aim of this investigation was to compare MTX-Glu disposition in IBD vs. JIA.

Methods: Cross sectional study of 27 children (5-21 years; 45% female) with IBD or JIA, receiving combination maintenance therapy with infliximab (IFX) and MTX (i.e., no changes in dose or interval of either drug for ≥2 IFX infusion cycles). At the time of MTX-Glu measurements in erythrocytes (HPLC/MS), IFX serum trough concentrations were measured by an established gene-reporter assay (ARUP Laboratories), and disease activity (Remission vs. Active) determined via 1) agreement on Physician Global Assessment by two pediatric gastroenterologist for IBD, or 2) JADAS-71 score for JIA, with scores >3.8 indicative of active disease. Given the variability in clinically prescribed drug dosing, and age and size of children, all data were adjusted ($_{adj}$) for mg/kg drug received and interval since drug administration.

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Spearman's correlation (ρ), Wilcoxon Rank Sum tests, and multivariable logistic regression analyses were used to compare parameters of interest in children with Remission vs. Active Disease (SAS; $\alpha<0.05$). Unless otherwise specified, data are reported as Median (Interquartile Range).

Results: For patients with IBD (90% Crohn's disease), Total $_{adj}$MTX-Glu was significantly higher in Remission [211 (126, 299), n=9) vs. Active Disease [126 (62, 212), n=10], p=0.03. $_{adj}$MTX-Glu$_1$ [109 (53, 120) vs. 37 (0, 50), p=0.008] and $_{adj}$MTX-Glu$_2$ [62 (39, 72) vs. 24 (13, 38), p=0.01] were also significantly higher in Remission vs. Active Disease, with the two study groups comparable for age and disease duration (both p=0.9). Controlling for IFX dose, interval and trough level in a multivariable logistic regression, differences in MTX-Glu between Remission and Active Disease remained significant for $_{adj}$MTX-Glu$_1$ and $_{adj}$MTX-Glu$_2$ (short chain MTX-Glu; $p\leq0.04$) and approached significance for Total $_{adj}$MTX-Glu (p=0.06). For patients with JIA, no statistically significant differences were noted in Total $_{adj}$MTX-Glu, or individual short chain or long chain ($_{adj}$MTX-Glu$_{3,\,4,\,5}$) MTX-Glu in Remission (n=5) vs. Active Disease (n=3). MTX-Glu$_6$ was undetectable in all children.

Conclusion: Adjusted for mg/kg MTX received, total and short chain MTX-Glu were significantly higher in patients with IBD in disease remission vs. active disease, independent of age, disease duration, or IFX dose, interval or trough, suggesting that MTX-Glu may be important determinants of disease response to MTX. We did not observe differences in dose-adjusted MTX-Glu in children with JIA in disease remission vs. active disease; however, this may be secondary to small sample size (n=8). Larger longitudinal studies of MTX-Glu in MTX mono- and combo-therapy are indicated in pediatric autoimmune disorders.

131 ***TRAJECTORY, RISK FACTORS, AND IMPACT OF ABDOMINAL PAIN DURING THE FIRST YEAR AFTER PEDIATRIC IBD DIAGNOSIS: RESULTS FROM THE IMPROVECARENOW NETWORK.*** *Lexa Murphy[1], Kaltrina Gashi[1], Joy Kawamura[2,6], Chuan Zhou[1,4], Daniel Lynch[3], David Suskind[3,4], Tonya Palermo[1,5]. [1]Center for Child Health, Behavior, & Development, Seattle Children's Hospital, Seattle, WA; [2]Department of Psychiatry and Behavioral Medicine, Seattle Children's Hospital, Seattle, WA; [3]Department of Gastroenterology and Hepatology, Seattle Children's Hospital, Seattle, WA; [4]Department of Pediatrics, University of Washington, Seattle, WA; [5]Department of Anesthesiology & Pain Medicine, University of Washington, Seattle, WA; [6]Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle, WA*

Background: Abdominal pain is a hallmark symptom of pediatric IBD, with over half of patients presenting with pain at initial diagnosis and during subsequent flares. While pain has traditionally been attributed to disease activity, recent research indicates that as many as 40% of youth continue to report chronic abdominal pain during disease remission. This is concerning, as pain is associated with poor psychological and functional outcomes as well as higher healthcare utilization. While prior studies have characterized correlates of abdominal pain in pediatric IBD, including sociodemographic (female sex, older age) and clinical (history of severe disease) factors, these studies have been limited by small sample sizes, cross-sectional designs, and inconsistency in follow up periods after diagnosis. To our knowledge, no prior studies have examined trajectories or predictors of abdominal pain prospectively during the first year after pediatric IBD diagnosis. This represents a critical gap in knowledge needed to develop early screening and tailored pain management interventions for youth with IBD. Using the ImproveCareNow (ICN) database, we aimed to: (1) Identify sociodemographic and clinical predictors of abdominal pain during the first year after IBD diagnosis, (2) Determine impact of pain on activity limitations and well-being over and above the influence of disease severity, and (3) Determine predictors of a high-risk pain group (characterized by pain during disease remission) at 12-months after diagnosis.

Methods: Participants included 13,875 youth aged 8-18 (M=13 years; 56% female; 81% Caucasian) with data during the first year after IBD diagnosis (visits ranged 1-22) enrolled in the ICN database (65% Crohn's Disease, 28% Ulcerative Colitis, 7% Indeterminate Colitis). Youth or parents reported on youth abdominal pain during visits to their IBD provider (1=none, 2=mild pain, 3=moderate/severe pain over past 7 days). Families also reported on activity limitations (1=none, 2=occasional, 3=frequent) and wellbeing (1=poor, 2=fair, 3=well). Sociodemographics (sex, age, race, ethnicity) were reported by families and clinical factors (Physician's Global Assessment of severity; BMI; clinical remission status; history of surgery, infection, or enteral therapy) were assessed by providers and/or extracted from medical charts.

Results: Mixed effects ordinal logistic regression models will be conducted to examine pain ratings over time. Below we report preliminary analyses. Within the first month after initial diagnosis, 44% of youth reported no pain, 43% mild pain, and 13% moderate/severe pain. By 12 months, 67% reported no pain, 27% mild pain, and 6% moderate/severe pain. First, regarding predictors of pain across the first year, girls reported significantly higher pain than boys (M_{boys}=1.37, M_{girls}=1.50; t=-15.40, p<.001). Pain differed significantly by race, with White and Asian youth reporting lower pain than Black, Native Hawaiian/Pacific Islander, and American Indian/Alaskan Native youth (Kruskal-Wallis H-test=14.471, p=.02). Disease severity (PGA) was strongly associated with pain (Spearman R=.52, p's<.001). BMI, history of infection, and history of

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enteral supplement had small, positive associations with pain (Spearman R's=.04-.08). Diagnosis, hospitalizations, and surgeries were not significant predictors of pain across the first year after diagnosis. Regarding pain impact, higher pain ratings within first month of diagnosis predicted greater activity limitations (β=.47, p<.001) and poorer wellbeing (β=.29, p<.001) over 12 months, over and above the influence of disease severity (β's=.27,16; p's<.001 respectively). At one year after diagnosis, 65% of the sample was determined to be in remission and 20% of those in remission reported presence of pain (mild to moderate/severe). The following baseline clinical and sociodemographic factors predicted membership in this high risk pain group: more severe disease at diagnosis ($\chi2$=16.34, p<.001), female sex ($\chi2$=38.18, p<.001), and Crohn's Disease diagnosis ($\chi2$=7.96, p=.02).
Conclusions: This study is the first to examine trajectories and predictors of abdominal pain during the first 12 months after pediatric IBD diagnosis. Additionally, this is the first study to report on pain outcomes from the ICN network. Results highlight pain as a common occurrence over the first month after diagnosis, with pain ratings decreasing by 12 months for the majority of patients. Abdominal pain ratings were stronger predictors of activity limitations and well-being than disease severity. Results also highlight a high-risk pain group that continues to report pain despite disease remission at 12 months after diagnosis; this group requires greater research attention and may require targeted intervention. Findings from this study can be used to inform early screening and tailored psychological pain management interventions for youth with IBD who may be at risk for persistent pain.

132 ***CORRELATION OF THE PEDIATRIC ULCERATIVE COLITIS ACTIVITY INDEX WITH ENDOSCOPIC ASSESSMENT OF DISEASE ACTIVITY IN PEDIATRIC PATIENTS WITH ULCERATIVE COLITIS.*** *Barbara Niklinska-Schirtz[1], Isshan Dave[1], Thomas Walters[2], Anne Griffiths[2], Brendan Boyle[8], David Mack[7], Joel Rosh[3], James Markowitz[4], Lee Denson[5], Jeffrey Hyams[6], Subra Kugathasan[1]. [1]Emory University, Atlanta, GA; [2]Hospital For Sick Children, Toronto, ON, Canada; [3]Goryeb Children's Hospital, Morristown, NJ; [4]Cohen Children's Medical Center of New York, New Hyde Park, NY; [5]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [6]Connecticut Children's Medical Center, Hartford, CT; [7]Children's Hospital of East Ontario, Ottawa, ON, Canada; [8]Nationwide Children's Hospital, Columbus, OH*

AIM: The pediatric ulcerative colitis activity index (PUCAI) is used for clinical assessment of disease activity in patients with ulcerative colitis (UC). Alongside the PUCAI, gastroenterologists use the mucosal inflammation and endoscopic assessment of disease activity (Mayo) score to evaluate patient status and response to treatment. Our primary aim of this study is to examine the correlation of the clinical score (PUCAI) to the endoscopic score (Mayo). We further examined the correlation of both clinical and endoscopic scores with inflammatory markers (CRP) and fecal calprotectin (FC), in pediatric patients with UC.

METHODS: The PROTECT (Predicting Response to Standardized Pediatric Colitis Therapy) Study enrolled newly diagnosed children ages 4-17 years old with UC. Patients were recruited from 29 participating centers in the USA and Canada. Demographic, laboratory, clinical, and endoscopic data were obtained. Mayo endoscopic scores of the sigmoid and rectum were obtained by site primary investigators. A total Mayo score (clinical + endoscopy) was determined along with partial Mayo score (symptoms only). Spearman's correlation coefficient and associated 95% confidence intervals were used to quantify associations between laboratory, clinical, and endoscopic data.

RESULTS: 428 patients were included in this evaluation (49% female). At baseline, based on PUCAI scores, 24% have mild, 43% have moderate, and 33% have severe disease. At baseline, based on Mayo endoscopy severity scores, 14% scored 1 (mild), 52% scored 2 (moderate), 34% scored 3 (severe). Comparisons of PUCAI and Mayo scores to one another as well as with laboratory measurements showed a strong correlation between both PUCAI and total Mayo (0.921), PUCAI and partial Mayo (0.940), as well as PUCAI vs endoscopic Mayo (0.641). A moderate correlation was found between PUCAI and fecal calprotectin (0.492), and partial and total Mayo vs calprotectin (0.501, 0.415 respectfully). A negative moderate correlation was seen when albumin was compared to PUCAI (-0.425), total Mayo (-0.420), and partial Mayo (-0.430). There was a weak correlation when hemoglobin was compared to these disease activity scores. 10% of patients with endoscopic Mayo scores of 1 had CRP values above 2x normal. 23% of patients with Mayo 3 score had normal CRP.

CONCLUSION: The comparison of PUCAI as a measure of clinical activity was compared with the Mayo total score, Mayo partial score, as well as Mayo endoscopic score. A strong correlation exists between all 3 entities and can be used to assess disease status. CRP, fecal calprotectin, and albumin showed moderate associations, whereas hemoglobin poorly correlates and should not be used as a single determinant of disease activity.

Acknowledgement. The authors thank the site investigators and coordinators for their valuable role in PROTECT.
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Table 2. Comparisons of PUCAI and Mayo Scores with biospecimens and laboratory measurements.

Comparison	Correlation	95% CI
PUCAI vs Total Mayo	0.921	(0.907, 0.933)
PUCAI vs. Partial Mayo	0.940	(0.934, 0.945)
PUCAI vs. Endoscopic Mayo	0.641	(0.588, 0.687)
PUCAI vs. Fecal Calprotectin	0.492	(0.455, 0.528)
Total Mayo vs. Fecal Calprotectin	0.415	(0.343, 0.483)
Partial Mayo vs. Fecal Calprotectin	0.501	(0.462, 0.538)
PUCAI vs. Albumin	-0.425	(-0.464, -0.384)
Total Mayo vs. Albumin	-0.420	(-0.487, -0.348)
Partial Mayo vs. Albumin	-0.430	(-0.470, -0.388)
PUCAI vs. Hemoglobin	-0.220	(-0.276, -0.163)
Total Mayo vs. Hemoglobin	-0.213	(-0.292, -0.131)
Partial Mayo vs. Hemoglobin	-0.220	(-0.276, -0.163)

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ACID SUPPRESSION MEDICATIONS AND ANTIBIOTICS ADMINISTERED IN INFANCY ARE ASSOCIATED WITH EARLY ONSET INFLAMMATORY BOWEL DISEASE. *Cade Nylund, Elizabeth Hisle-Gorman, Gregory Gorman, Apryl Susi. Pediatrics, Uniformed Services University, Rockville, MD*

Background: Antibiotics in early life are known to be associated with later development of inflammatory bowel disease (IBD). This association is likely explained by early microbiome alterations which lead to immune dysregulation. Other commonly prescribed medications in infancy known to perturb the microbiome include acid suppression medications such as proton pump inhibitors (PPI) and histamine-2 receptor antagonist (H_2RA). It is not known whether PPIs & H_2RAs are associated with inflammatory bowel disease. We sought to investigate the association of PPI, H2RA, and antibiotic prescriptions in the first 6 months of life with an early childhood diagnosis of inflammatory bowel diseases.

Methods:A retrospective cohort study was formed using the Military Healthcare System (MHS) database. Children who had a record of birth in the MHS, followed for at least one year, and had an newborn hospital stay of ≤7 days were included. Outpatient prescription records were used to assess whether an antibiotic, PPI, or H_2RA had been prescribed during the first 6 months of life. International Classifications of Diseases ninth revision codes identified children with an outpatient visit for inflammatory bowel disease. Cox proportional hazards regression was used to determine adjusted hazard with either Crohn's disease or Ulcerative Colitis (UC) as the dependent variables and PPIs, H_2RAs, antibiotics, sex, prematurity, and Cesarean section birth as independent variables.

Results: 968,468 children met the inclusion criteria for this study. 49% were female, 26% were born via Cesarean section, and 4% were premature. 8% had a prescription for a H_2RA, 19% for an antibiotic, and 2% for a PPI. The median length of follow-up was 4.6 years, with a range of 1-13 years. There were 316 children with UC and 586 patients with Crohn's disease. The median age (interquartile range) at diagnosis for children in the cohort of Crohn's disease was 2.5 (1.2-5.6) years, and of UC, 2.7 (1.5-5.4) years. PPIs were associated with a statistically significant increase in hazards for UC (adjusted hazard ratio [aHR], 3.76; 95 % confidence interval [CI],2.28-6.17) but not Crohn's disease (aHR, 1.45; 95 % CI, 0.86-2.42). Antibiotics (aHR, 1.34;95 % CI, 1.11-1.62) and H_2RA (aHR, 1.34; 95 % CI, 1.01-1.80) during infancy were associated with Crohn's disease but not UC (antibiotics [aHR, 1.10; 95 % CI, 0.84-1.44)], H_2RA [aHR, 1.23; 95 % CI, 0.83-1.83)].

Conclusions: There exists an association between acid suppression prescriptions in the first 6 months of life with the development of early onset UC and Crohn's disease. PPIs administered in the first six months of life were highly associated with the development of early onset UC. H_2RAs were weakly associated with Crohn's disease. Early administration of

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antibiotics were associated with the development of early onset Crohn's disease. Limitations include the possibility of protopathic bias in the event that symptoms of IBD presented as gastroesophageal reflux in infancy leading to prescription of acid suppression medications. These findings support the link between early microbiome perturbations and immune dysregulation leading to IBD. These findings signal the need of addressing modifiable preventative measures such as infant medication stewardship to prevent IBD.

LIVER

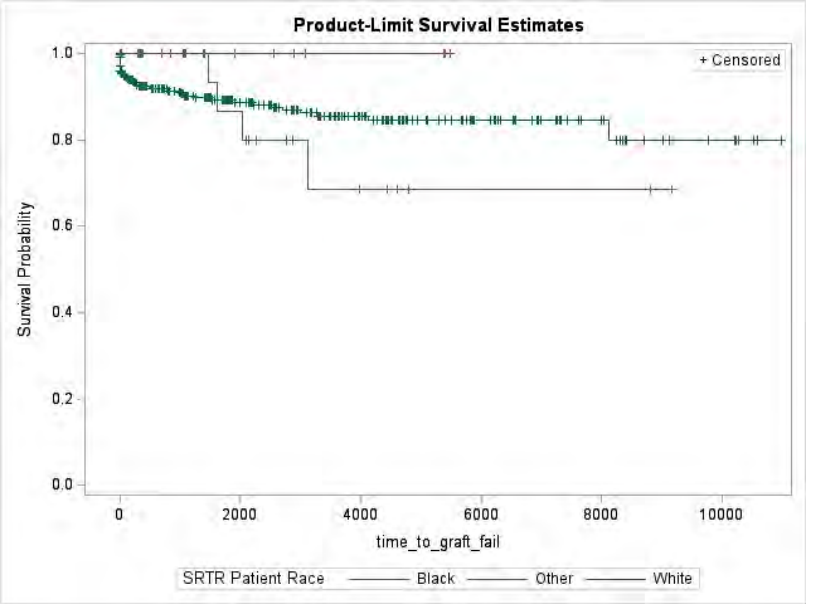
139 ***OUTCOMES OF LIVER TRANSPLANTATION FOR CONGENITAL HEPATIC FIBROSIS IN CHILHOOD VERSUS TRANSPLANTATION AS ADULTS.*** *Tandy Agostini[2], Arul Thomas[1], Sameer Desale[3], Khalid Khan[1].*
[1]Transplant Institute, MedStar Georgetown University Hospital, Potomac, MD; [2]Medicine, Washington Hospital Center, Washington, DC ; [3]Reserch, MedStar, Washington, DC

Background: Congenital hepatic fibrosis (CHF) is part of a spectrum that encompasses autosomal recessive polycystic kidney disease and Caroli disease. While CHF is present from birth the natural history is variable with symptoms appearing in childhood and as adults. The outcomes for this group of patients has not been clearly examined in part related to the small numbers of patients at individual centers. Here we evaluate the outcomes of liver transplants for CHF to determine the natural history of transplanted individuals and the impact of age at presentation.

Method: We examined liver transplant outcomes of CHF using the United Network of Organ Sharing, SRTR data set going back to 1987. Data were divided in to patients being transplanted in childhood, 0-17 years inclusive and those >18 years-of-age at transplantation. Using SAS software, data are presented as mean $\pm$ standard deviation or median and analyzed with the student t test and chi sq. Kaplan Meyer curves constructed and log rank tests applied to test for differences in survival of grafts and patients. A $p<0.05$ is considered statistically significant.

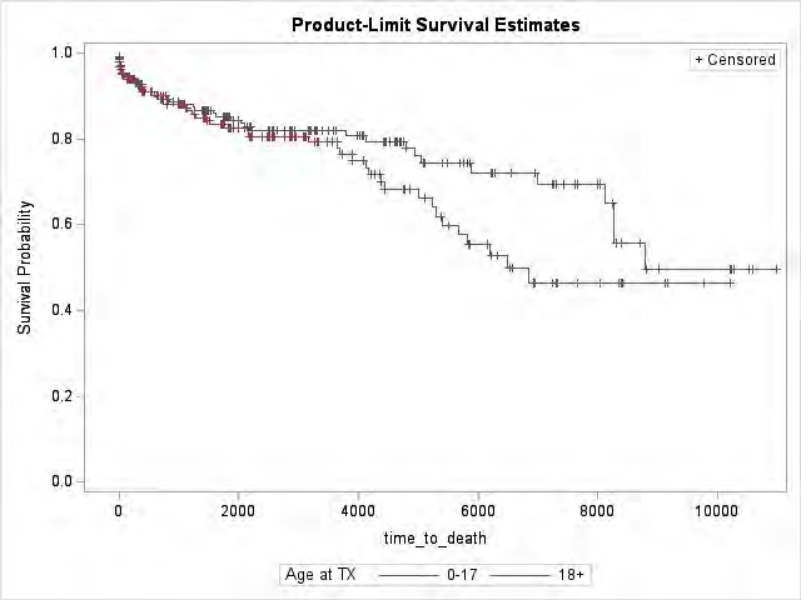
Results: A total of 387 individuals with CHF underwent liver transplantation during this 31-year period. Of this number 203/387 (52.5%) were transplanted from 0-17 years of age and 184/387 (47.5%) transplanted as adults. Of the total 173 (44.7%) were female, there was no difference in graft, p=0.77, or patient survival by gender, p= 0.75. Similarly, there was no difference between the groups for graft or patient survival in hospitalization prior to transplant, dialysis, on life support, previous surgeries or prior transplants. For race graft survival was poor though the difference was not statistically significant, p= 0.42, Figure 1. Overall graft failure occurred in 26/203 (12.8%) pediatric cases versus 19/184 (10.3%) adults; graft survival p=0.54. Patient deaths occurred in 41/203 (20.2%) children and 46/184 (25%) adults, p=0.13. There was a precipitous drop in pediatric patient survival just after 20 years, Figure 2.

Conclusion: Patients with CHF having undergone liver transplantation in childhood versus as adults have an equivalent post-transplant patient outcome. It is likely therefore that actual life span for those being transplanted in childhood is shorter than those transplanted as adults. There is apparent increase mortality after 20 years in the pediatric transplant group. Graft survival however is similar indicating that deaths are unrelated to the liver graft.



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Figure 1
Racial differences in graft outcomes



Pediatric versus adult patient outcomes for liver transplantation in patients with congenital hepatic fibrosis

141 ***LIVER FAILURE AMONG YOUNG SAUDI INFANTS: ETIOLOGY, CLINICAL PRESENTATION, AND OUTCOME.*** *Khurram Lone*, *Bader Alsaleem*, *Ali Asery*, *Abdulrahman Al-Hussaini*. *Division of Pediatric Gastroenterology*, *King Fahad Medical City*, *Riyadh*, *Saudi Arabia*

Objectives: The published data on early infantile liver failure (EILF) are scarce and limited to Caucasians. We conducted this study to describe the etiology and outcome of EILF among Arabs and identify prognostic factors.

Methods: We retrospectively reviewed our database of 524 infants presenting with liver impairment from 2008 to 2018, and identified cases of EILF defined as presence of biochemical pattern of liver disease and INR ≥ 2 (unresponsive to vitamin K) with onset before 3 months of life. Primary outcomes included death or liver transplantation (LT) [poor outcome group] and survival with native liver [good outcome group].

Results: 42 cases of EILF (22 females) were identified (8%). The etiology was indeterminate in 14 (33.3%) and established in 27 (64.3%): galactosemia (7 cases, 16.6%), tyrosinemia (5, 12%), gestational alloimmune liver disease (GALD) and hemophagocytic lymphohistiocytosis (HLH) [[4 each, 9.5%], mitochondrial hepatopathy (3, 7%), and miscellaneous (5, 12%). LF resolved in 15 cases (35.7%), either spontaneously or in response to specific therapy, 23 (54.7%) died, and 4 underwent LT (9.5%). Total bilirubin > 100 µmol/l predicted poor outcome with odds ratio (OR) of 6.5. Among the diagnostic groups, galactosemia and tyrosinemia predicted good outcome (OR 0.16 and 0.04, respectively), while the idiopathic diagnosis predicted poor outcome (OR =13).

Conclusion: Galactosemia, tyrosinemia, GALD, HLH, and mitochondrial hepatopathy are the main players in EILF in Saudi Arabia. Liver failure in young infants carries high mortality. Galactosemia and tyrosinemia predict good prognosis and idiopathic diagnosis predicts poor prognosis.

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Table. Comparison of the good and worse outcome groups

Variables	Poor outcome (n=27)	Good outcome (n=15)	OR [95% CI]	P - value
Gender – Male – Female	14 (51.9%) 13 (48.1%)	6 (47.6%) 9 (60%)	1.615 [0.449 – 5.807]	0.531
Age at onset of jaundice - days (Median)	7	28	1.032 [0.899 - 1.185]	0.652
Age at presentation - days (Median)	30	56	1.001 [0.913 - 1.098]	0.97
Total Bilirubin (µmol/l) >100 <100	23 (85.2%) 4 (14.8%)	7 (46.7%) 8 (53.3%)	6.571 [1.513 – 28.536]	0.013
ALT I/U (Median)	102	55	1.038 [0.999 - 1.078]	0.052
AST I/U (Median)	267	71	0.98 [0.961 - 1.043]	0.356
GGT I/U (Median)	43.5	48	0.974 [0.92 - 1.031]	0.416
INR (Median)	2.8	3.5	0.659 [0.241 - 1.833]	0.171
Serum Lactate mmol/L (Median)	2.4	4	1.001 [0.863 - 1.162]	0.984
Serum Alpha-Fetoprotein µg/L (Median)	3190	63916	1.021 [0.766 - 1.125]	0.233
Serum Ferritin mg/L (Median)	1525	583	0.96 [0.952 - 1.021]	0.27
Diagnosis Galactosemia Tyrosinemia GALD HLH Mitochondrial disease Idiopathic Others	2 (7.4%) 0 (0.0%) 3 (11.1%) 4 (14.8%) 2 (7.4%) 13 (48.1%) 3 (11.1%)	5 (33.3%) 5 (33.3%) 1 (6.7%) 0 (0.0%) 1 (6.7%) 1 (6.7%) 2 (13.3%)	0.16 [0.027 - 0.964] 0.04 [0.002 - 0.741] 1.75 [0.166 - 18.483] 5.22 [0.257 - 105.964] 1.12 [0.093 - 13.483] 13 [1.492 - 113.255] 0.81 [0.12 - 5.5]	0.031 0.001 0.638 0.117 0.929 0.006 0.831

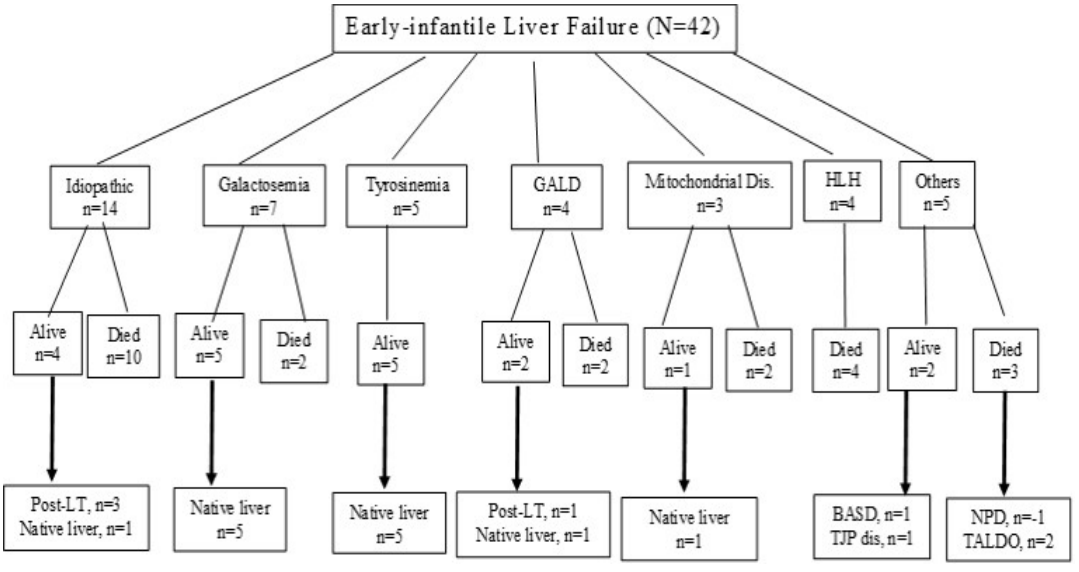


Figure 1. Outcome of 42 young infants with Liver failure.
BASD = bile acid synthetic disorder; TALDO = transaldolase deficiency; TJP = tight junction protein mutation; HLH = hemophagocytic lymphohistiocytosis; GALD = gestational alloimmune liver disease; LT = liver transplantation; NPD = Neman-Pick disease.

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144 ***THE USE OF LIVER BIOPSY TO DETERMINE THE SEVERITY OF NONALCOHOLIC FATTY LIVER DISEASE IN CHILDREN ACROSS THE UNITED STATES.*** *Johanna Ascher Bartlett[1], Luz Gutierrez Sanchez[3], Mohammad Nasser Kabbany[4], Jay Shah[1], Naveen Mittal[1], Naim Alkhouri[1,2]. [1]Pediatrics, UTHSCSA, San Antonio, TX; [2]Texas Liver Institute, San Antonio, TX; [3]Mayo Clinic, Rochester, MN; [4]Cleveland Clinic, Cleveland, OH*

Background: Due to the obesity epidemic in the US, nonalcoholic fatty liver disease (NAFLD) has become the most common form of chronic liver disease. Determining the severity of NAFLD in terms of the presence of nonalcoholic steatohepatitis (NASH) and the stage of liver fibrosis is of utmost importance; however, liver biopsy remains the current gold standard despite serious limitations to its use on a large scale. This study surveyed pediatric gastroenterologists around the United States to determine what guidelines, if any, are used in determining the severity of NAFLD in children, specifically regarding which patients are sent for liver biopsy, and how these guidelines may compare to each other and to current clinical practice across the country.

Methods: 140 pediatric gastroenterologists were contacted via email to complete an electronic survey regarding the current diagnostic practices implemented for NAFLD. Responses were stored in Survey Monkey and reviewed. The survey was distributed by direct weblink, email, and hard copies which were completed, scanned, and returned via email. Responses were compared to current North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN), American Association for the Study of Liver Diseases (AASLD) and European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) guidelines regarding liver biopsy for evaluation of NAFLD.

Results: Of the 140 surveys distributed, 54 responses were collected (38.6% response rate). Participants identified as pediatric gastroenterologists, pediatric hepatologists and transplant hepatologists, and worked in a variety of settings including academic center, community hospital, and private practice. 96.2% of the participants reported familiarity with NASPGHAN guidelines, 22.6% with ESPGHAN guidelines, 39.6% with AASLD guidelines, and 1.9% with 'other' guidelines. 88.7% of the responses documented a desire for a generalized consensus regarding the guidelines, and 11.3% were unsure. On average, pediatric gastroenterologists referred obese patients with abnormal liver enzymes who were suspected to have NAFLD 22% of the time, pediatric hepatologists referred 27.2%, and transplant hepatologists referred 39.9% of the time (one-way ANOVA test performed with p-value of 0.324). 61.5% of participants reported using vibration controlled transient elastography (Fibroscan) and 59.6% used MR elastography to assess severity of NAFLD and presence of liver fibrosis when not pursuing liver biopsy. 92.5% of participants believed the presence of autoimmune antibodies was important in deciding when to proceed to liver biopsy, as well as 88.7% using abnormal screening labs and 75.5% using imaging suggestive of liver fibrosis as part of their decision-making process for proceeding to liver biopsy.

Conclusion: Comparison between the criteria that providers believed warranted a liver biopsy versus those criteria included in society guidelines differed. Specifically, the presence of autoimmune antibodies (92%), abnormal screening labs (88%), and liver fibrosis suggested on imaging (75%) all appeared to be important decision-making factors regardless of current society guidelines. The study also shows that providers tend to rely on imaging, preferring Fibroscan and MR elastography over liver ultrasound despite the lack of validated cutoff values in children.

146 ***CLINICAL MANIFESTATIONS OF LYSOSOMAL ACID LIPASE DEFICIENCY: THE INTERNATIONAL LAL-D REGISTRY™.*** *William Balistreri[1], Manisha Balwani[2], Lorenzo D'Antiga[3], Shona Fang[4], Simon Jones[7], Emilio Ros[5], Florian Abel[4], Don Wilson[6]. [1]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Icahn School of Medicine at Mount Sinai Hospital, New York, NY; [3]Azienda Ospedaliera Papa Giovanni XXIII, Bergamo, Italy; [4]Alexion Pharmaceuticals, Inc., Boston, MA; [5]Hospital Clinic de Barcelona, Barcelona, Spain; [6]Cook Children's Medical Center, Fort Worth, TX; [7]Manchester University Hospital NHS Trust, Manchester, United Kingdom*

Lysosomal acid lipase (LAL) deficiency is a progressive, autosomal recessive lysosomal storage disease caused by homozygous or compound heterozygous mutations in the *LIPA* gene that result in deficient or absent LAL activity. Patients can present across a phenotypic spectrum in infancy through adulthood, and disease severity varies considerably. Patients with infantile-onset LAL deficiency can present with failure to thrive and multiple organ failure, resulting in significant morbidity and early death. In children and adults, prominent features include familial hypercholesterolemia-like hyperlipidemia with elevated low-density lipoprotein cholesterol (LDL-C) levels and low high-density lipoprotein cholesterol (HDL-C) levels, and non-alcoholic fatty liver disease (NAFLD)-like liver disease with microvesicular (lysosomal) steatosis, fibrosis, or cirrhosis. An international registry (NCT01633489) was established to better understand the natural history of LAL deficiency and to evaluate the long-term efficacy and safety of treatment (enzyme replacement). The first patient was enrolled in 2013. Baseline clinical features for patients enrolled through April 1, 2019 are presented (baseline is the date of the first dose of sebelipase alfa for ever-treated patients or enrollment date for never-treated patients). Of 189 patients enrolled, 42 were excluded from analysis (reasons: heterozygous for *LIPA* mutation, deceased

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prior to registry enrollment, unconfirmed LAL deficiency diagnosis, missing inclusion criteria, enrollment date unknown, age/date of birth unknown, treatment start date unknown). Thus, 147 patients with a confirmed diagnosis by biochemical and/or genetic testing were included in the analysis, including 11 infants who started treatment with sebelipase alfa before 6 months of age and 136 children and adults, of whom 97 (71%) were ever treated with sebelipase alfa. LAL enzyme activity testing was performed for 137/146 patients (94%) and genetic testing for 120/145 patients (83%). Of 98 children and adults with reported *LIPA* mutations, 38 were homozygous and 33 were compound heterozygous for the common *LIPA* mutation E8SJM (c.894G>A); all 6 infants with reported *LIPA* mutations were homozygous for other mutations. Of the 147 patients, 63% were <18 years of age, 52% were male, and 84% were white; 10 patients (6.8%) were <6 months of age at diagnosis. Median (range) age at clinical onset was 2.4 months (0.0–2.4) among the 11 infants and 6.0 years (0.0–41.3) among 125 children and adults with data; median (range) age at diagnosis was 2.4 months (-1.2 to 14.4) among 10 infants and 10.8 years (0.2–53.6) among 130 children and adults with data. Median (range) time from clinical onset to diagnostic testing was 1.2 months (0.0–13.2) among 5 infants and 3.8 years (0.0–50.5) among 110 children and adults with data. Manifestations of LAL deficiency present prior to diagnosis that raised suspicion of LAL deficiency were reported in 140/146 patients. Patients with onset of LAL deficiency in infancy presented predominantly with hepatomegaly (8/11 [73%]) and nausea/vomiting (6/11 [55%]), and 6/11 (55%) had a family history of LAL deficiency; children and adults presented predominantly with elevated alanine aminotransferase levels (89/135 [66%]), hepatomegaly (88/135 [65%]), elevated aspartate aminotransferase levels (87/135 [64%]), elevated LDL-C levels (64/135 [47%]), and low HDL-C levels (43/135 [32%]). Of 69 children and adults with available liver biopsy results at baseline, 42 (61%) had microvesicular steatosis, 14 (20%) had both micro- and macrovesicular steatosis, and 25 (36%) had lobular inflammation. Of the 147 patients, 12 (8%) had cirrhosis (determined by clinical history, abdominal imaging, and/or liver biopsy). In conclusion, registry data of >140 LAL deficiency patients demonstrate variable clinical manifestations and early onset of disease symptoms. There is a significant diagnostic delay in children and adults. Long-term follow-up is needed to better understand the natural history of LAL deficiency and to evaluate treatment outcomes.

This study was sponsored by Alexion Pharmaceuticals, Inc.

147 ***HEALTH LITERARY AND STRATEGIES FOR SUCCESSFUL WEIGHT LOSS IN CHILDREN WITH NON-ALCOHOLIC FATTY LIVER DISEASE.*** *Anna Banc-Husu[1], Joy Ito[2], Paige Shyken[2], Saeed Mohammad[1], Mark Fishbein[1]. [1]Department of Pediatrics; Division of Gastroenterology, Hepatology, and Nutrition, Northwestern University, Feinberg School of Medicine, Chicago, IL; [2]Division of Gastroenterology, Hepatology, and Nutrition, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL*

Background: Non-alcoholic fatty liver disease (NAFLD) affects 3-11% of children. Treatment strategies are limited and focus on lifestyle interventions to promote weight loss. Health literacy is an important determinant of overall health in any population and those with limited health literacy have less knowledge about their health, higher health care costs, and poorer health status. We sought to understand the health literacy and lifestyle strategies of children with NAFLD who had achieved successful decrease in body mass index (BMI) and normalization of liver enzymes.

Methods: All children 6-17 years of age followed by Hepatology and diagnosed with NAFLD between 1/1/2015 – 4/30/2019 were identified. Routine weight management strategies were provided at each clinic visit with usual follow-up in 3 or more months. Patients were eligible if they achieved at least a 3% decrease in BMI and had normalization of alanine aminotransferase (ALT), defined as ALT <45 IU/L on follow up. The Newest Vital Sign (NVS), a validated tool in English and Spanish using 6 questions and a food label, was administered to parents either via telephone or in-person to assess health literacy. NVS scores of 0-1 indicate low health literacy, score 2-3 limited health literacy, and score 4-6 adequate health literacy. Parents and children > 12 years of age were each asked a series of open-ended questions about lifestyle interventions including diet and exercise changes. Responses were summarized and categorized based on common themes. Patients were categorized as having low/limited health literacy if NVS score was 0-3 and adequate health literacy if NVS score was 4-6. Comparisons between the two groups were made using Student's t-test and Mann Whitney U test for continuous variables and Fisher exact test for categorical variables.

Results: There were a total of 686 patients seen in NAFLD clinic during the study period. Of these, 32 patients (5%) met inclusion criteria of at least 3% decrease in BMI and normal ALT < 45 IU/L. Sixteen (50%) of parents and patients were able to be contacted and agreed to participate. Median age was 13.0 years (interquartile range [IQR] 11.0-15.0), 50% (8/16) were male and 81% (13/16) were Hispanic, Table 1. The median score of the NVS, performed in 12/16 parents, was 3.5 (IQR 2-4). When comparing those with low/limited health literacy (NVS score 0-3, n=6) and those with adequate health literacy (NVS score 4-6, n=6), there was no difference seen in BMI change with mean decrease of 11.3% (standard deviation [SD]±11.8%) in those with low/limited health literacy as compared to 9.3% (SD±6.5%) in adequate health

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literacy group, p=0.72, Table 1. There was no difference in percent change of ALT between the two groups (64.5±14.5% in low/limited health literacy vs. 73.2±17.2% in adequate health literacy, p=0.37, Table 1). Most patients in made dietary changes, with only 1 patient in the adequate health literacy group reporting no dietary intervention. All patients increased their physical activity with 33% (2/6) in the low/limited literacy group increasing to daily as compared to 66% (4/6) in those with adequate health literacy. Physical activity duration was increased to more than 30 minutes in 66% (4/6) in the low/limited health literacy group as compared to only 33% (2/6) in the adequate literacy group. In both groups, 50% (3/6) reported that they did not get their physical activity advice from any particular place and learned on their own what to do.

Conclusions: The rate of improvement in BMI and normalization of ALT in children with NAFLD is poor, at only 5%. We used a validated health literacy tool and demonstrate limited health literacy. There were no significant differences in BMI change or ALT change when compared across health literacy groups. Although fewer participants with low/limited health literacy increased their physical activity frequency, they were more likely to increase their physical activity duration with most relying on their own knowledge to make changes. These findings suggest that improvement in BMI and normalization of ALT may not be dependent on health literacy and that the rate of improvement while solely relying on lifestyle interventions is poor.

Table 1. Patient Demographics

	Included (n=16)	Low/Limited Health Literacy[#] (n=6)	Adequate Health Literacy[$] (n=6)	p-value*
Age (median, IQR)	13.0 (11.0 - 15.0)	12.5 (11.0 - 15.0)	13.5 (13.0 - 16.0)	0.37
Gender, Male (%)	8 (50%)	3 (50%)	5 (83%)	0.55
Hispanic (%)	13 (81%)	5 (83%)	4 (66%)	1
BMI Change (mean, SD)	9.8% (0.086)	11.3% (±11.8%)	9.3% (±6.5%)	0.72
ALT Initial (mean, SD)	93.5 (120.7)	62.3 (22.9)	153.3 (189.6)	0.29
ALT Follow-Up (mean, SD)	20.8 (7.8)	19.8 (7.0)	21.3 (8.5)	0.75
ALT Change (mean, SD)	64.8% (0.18)	64.5% (±14.5%)	73.2% (±17.2%)	0.37
Length follow-up, months (mean, SD)	13.4 (11.2)	12.3 (±10.6)	18.8 (±14.0)	0.38
Education level				0.55
Not available	4 (12.5%)	2 (33%)	2 (33%)	--
Did not complete high school	4 (12.5%)	2 (33%)	0	--
Graduated High School	2 (6.25%)	0	1 (17%)	--
Started college but did not complete	4 (12.5%)	2 (33%)	1 (17%)	--
Graduated College	1 (3.13%)	0	1 (17%)	--
Graduate degree or above	1 (3.13%)	0	1 (17%)	--

[#]Low/limited health literacy defined as Newest Vital Sign (NVS) Score 0-3.
[$]Adequate health literacy defined as NVS score 4-6.
*Comparison between low/limited health literacy vs. adequate health literacy.

150 ***NOVEL TECHNIQUE FOR ISOLATION OF HEPATOCYTES FROM NEEDLE BIOPSIES TO STUDY HEPATOCYTE HETEROGENEITY.*** *Sindhura Batchu[1], Bruce Wang[2], Deviana Burhan[2], Margaret Tsui[2]. [1]Pediatric Gastroenterology , University of California San Francisco, San Francisco, CA; [2]UCSF, San Francisco, CA*

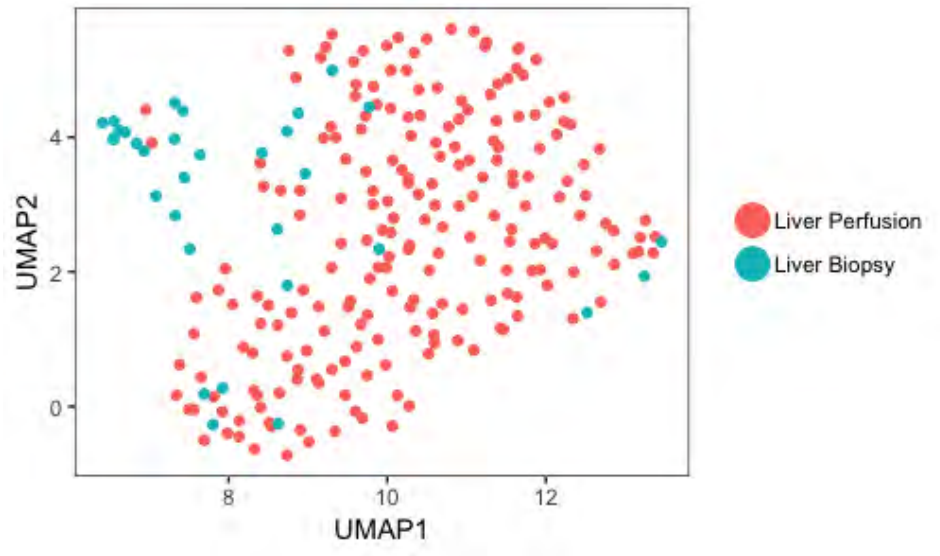
Background: Current methods of hepatocyte isolation use the two-step perfusion technique which requires large amounts of liver tissue, on the order of several grams, making many human samples unsuitable unless acquired from surgical resections. Our lab studies hepatocyte heterogeneity using single cell RNA sequencing and hepatocyte organoid culture techniques, two methods that require small numbers of hepatocytes, on the order of 10^4. We aim to develop a protocol to isolate viable single hepatocytes from small amounts of tissue acquired from needle biopsis of the liver. This novel method will vastly increase our access to liver cells from a wide variety of liver disease samples, acquired in a safer and less invasive way.

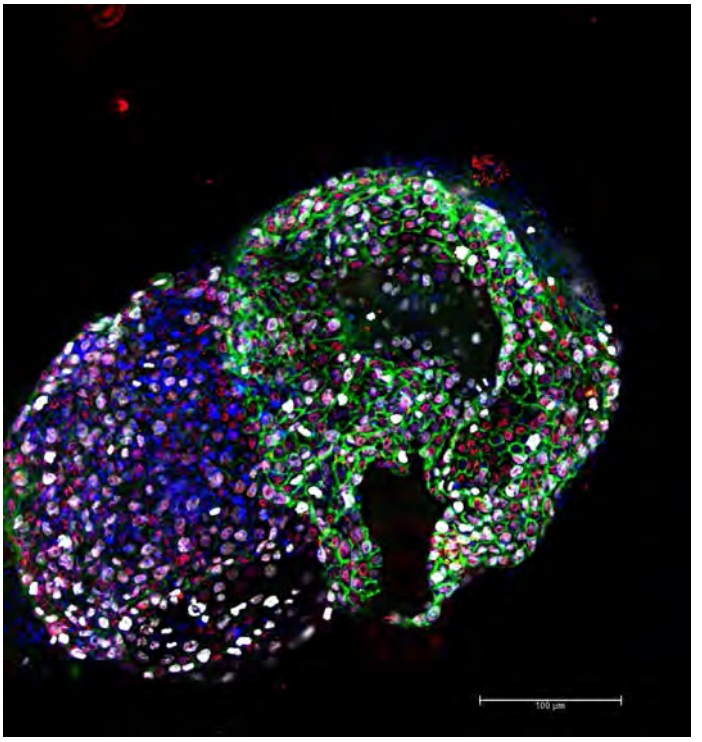
Method: We performed liver biopsies on wild type mice (> 5 weeks of age), sheep, and pigs. A 70mm Jamshidi needle was used to acquire ~5-7cm of core liver tissue. Tissue was minced to ~1mm, incubated in calcium chelator solution for 20 minutes, followed by chemical digestion with various collagenase enzyme mixtures for 30 minutes, then subjected to mechanical separation with trituration. The resulting cell suspension was filtered to yield a single cell suspension and then centrifuged to separate hepatocytes from non-parenchymal cells.

Results: Biopsy samples on average weighed 30mg-70mg. Gentle trituration after chemical digestion in low volume washes

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resulted in the best average total live hepatocyte yield of ~27,000 but with an average viability of 25%. The addition of density gradient separation using Percoll increased hepatocyte viability to ~50%. Single cell RNA sequencing of cells isolated from this protocol showed that we are able to isolate the main cell types in the liver, including hepatocytes. The transcriptomes of hepatocytes isolated from needle biopsies were indistinguishable from that of hepatocytes isolated from perfusion digestion. In addition, we showed that hepatocytes isolated from biopsies could be grown into 3D organoids that maintained hepatocytes specific markers.
Conclusions: Our protocol allows for the isolation of viable hepatocytes on the order of 10^4. We showed that these cells have similar transcriptomes as hepatocytes isolated from perfusion digestion of the liver. We expect this method to vastly increase our ability to access liver cells from diseased human liver tissues.





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152 ***CHARACTERIZATION OF ETIOLOGIES AND OUTCOMES IN NEONATAL ACUTE LIVER FAILURE.***

Kristin Borovsky, *Anna Banc-Husu*, *Katie Neighbors*, *Susan Kelly*, *Estella Alonso*, *Sarah Taylor. Gastroenterology, Hepatology, and Nutrition*, *Ann & Robert H. Lurie Children's Hospital of Chicago*, *Chicago*, *IL*

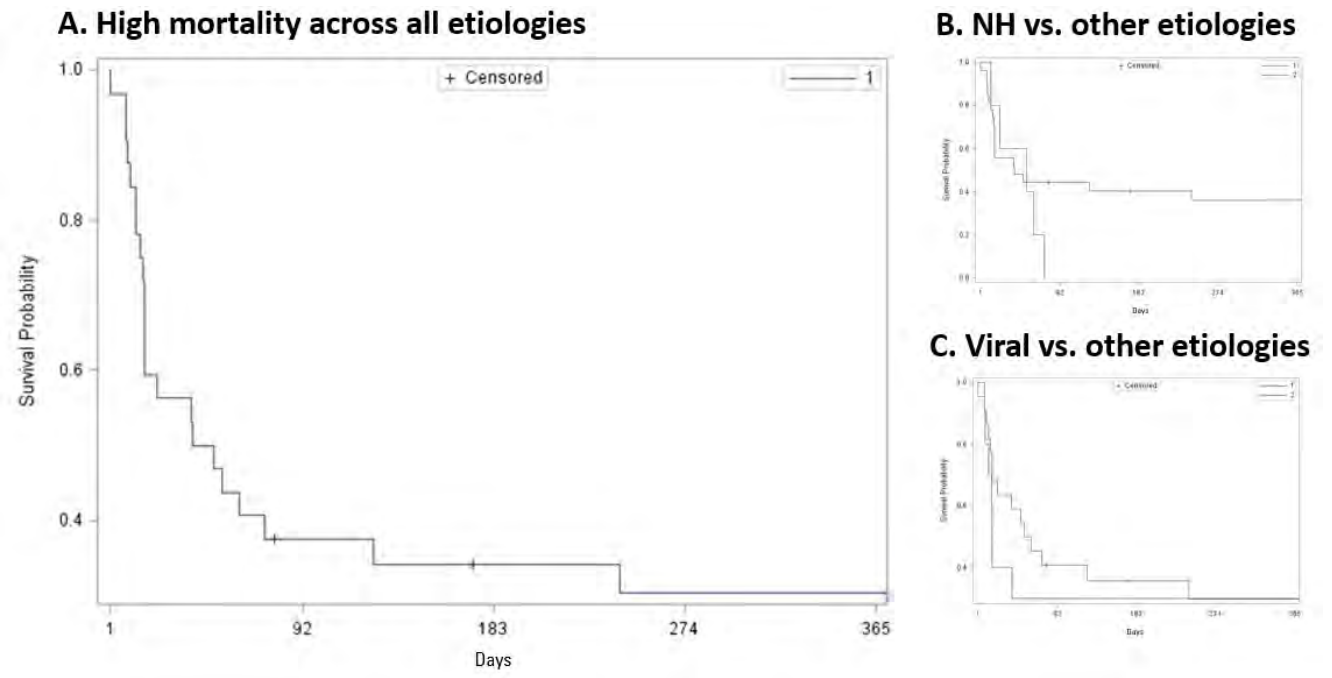
Objectives: Neonatal acute liver failure (ALF) is a rare disease with distinct etiologies and clinical features from pediatric ALF. We characterize the etiology, presenting features, treatment, and outcomes of neonatal ALF in infants at or before 30 days of life.

Methods: Retrospective chart review of infants with neonatal ALF hospitalized at a single pediatric center was performed. Infants with a diagnosis of hepatic failure as defined by ICD-9/10 code and a hospital admission or outpatient clinic visit within the first 30 days of life between 1/1/2008 and 12/31/2018 were identified. Patients were included if they met criteria for neonatal ALF as defined by an international normalized ratio (INR) of $\geq$ 2.0 within the first 30 days of life. Demographics, laboratory data, treatment received, and patient outcomes were collected. Laboratory evaluation for neonatal ALF was assessed for each patient to determine completeness of work-up. Etiology-specific work-up was defined for neonatal hemochromatosis (NH) as alpha fetoprotein, ferritin; viral infection to include cytomegalovirus, enterovirus, Epstein-Barr virus, herpes simplex virus (HSV); hemophagocytic lymphohistiocytosis (HLH) testing for ferritin and soluble interleukin 2 or natural killer cell activity; and genetic/metabolic etiology to include serum amino acids, urine organic acids, and carnitine profile. Median laboratory values were calculated by etiology and ranges reported. Overall and disease-specific survival rates with native liver were estimated by Kaplan Meier analysis.

Results: Thirty-two patients met inclusion criteria for neonatal ALF. Etiologies included viral infection (31%, 10/32), NH (16%, 5/32), HLH (3%, 1/32), mitochondrial disease (3%, 1/32), ischemia (9%, 3/32), and other/not identified (38%, 12/32). HSV was the most common viral etiology (70%, 7/10). Other etiologies included sepsis, consumptive processes, ABO incompatibility, and transient myeloproliferative disorder of Trisomy 21. Median age at presentation for all etiologies was 6.7 days (n=31, range 0-30 days). Incidence of preterm birth was highest among patients with other etiologies (86%). At time of presentation, NH had the lowest initial alanine aminotransferase (ALT) and aspartate aminotransferase (AST) values with an ALT of 21 IU/L (12-94 IU/L) and AST of 57 IU/L (16-397 IU/L). Viral etiologies had the highest levels with an ALT of 1179 IU/L (333-2031 IU/L) and AST of 6204 IU/L (2005-20150 IU/L). INR at initial presentation was highest for viral infection (INR 4.09, 1.3-7) followed by mitochondrial disease (3.8) and NH (INR 3.6, 2.6-10). No patients received a complete laboratory work-up for all four etiologies: 5/32 (16%) received complete work-up for three etiologies, 6/32 (19%) received work-up for two etiologies, and 13/32 (41%) received complete work-up for one etiology. NH was the most common etiology investigated. Infants with neonatal ALF secondary to a viral illness all received acyclovir with first dose given at an average of 6.9 days of life (range 5-10 days). All infants with neonatal ALF secondary to NH received intravenous immunoglobulin between 0 and 32 days of life (average day of first dose at 9.2 days) and 3 of 5 received double volume exchange transfusion. Only 30% (3/10) of patients with viral infection survived and no patients with NH survived. Overall survival was poor with 18 out of 32 patients alive at 30 days (56%) and 10 out of 32 patients alive at 1 year (31%). Cumulative median time of death across all etiologies occurred at 45 days (95% confidence interval [CI] of 17-243 days). The estimated probability of death before 30 days for a patient with NH was 0.40 (95% CI 0.13-0.88) and 0.60 (95% CI 0.25-0.83) for viral infection.

Conclusions: This is the first study to characterize neonatal ALF specifically in infants < 30 days of age. Age at presentation and initial laboratory values are suggestive of the underlying etiology of neonatal ALF with NH having the lowest initial ALT/AST and viral etiologies the highest initial ALT/AST and INR. Despite medical treatment, mortality in neonatal ALF is high across all etiologies.

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Kaplan Meier Analyses

156 ***TRAJECTORY OF VARIABLES BETTER PREDICTS OUTCOMES COMPARED TO VARIABLES AT THE TIME OF LISTING FOR PEDIATRIC LIVER TRANSPLANT WAITLIST CANDIDATES.*** *Lisa Chi*, *Qinghua Lian*, *Charles Goss*, *Janis Stoll*, *Yumirle Turmelle*, *Bonsa Nemera*, *Sakil Kulkarni. Division of Pediatric Gastroenterology, Hepatology, and Nutrition*, *St. Louis Children's Hospital*, *St. Louis*, *MO*

Background: UNOS data indicates that transplant rates on the pediatric liver transplant (LT) waitlist are about 80%. The remaining subjects either die or are delisted. The MELD/PELD score helps prioritize subjects on the waitlist. However, recent studies have shown that this score underestimates the risk of death on the pediatric LT waitlist. The MELD/PELD score relies on variables at a given time point to predict mortality. We hypothesized that the change in clinical and laboratory variables while a subject is on the pediatric LT waitlist may better predict outcomes than variables at a single time point.

Methods: We queried the Scientific Registry for Transplant Recipient database including all pediatric patients (0 to 18 years old) listed on the LT waitlist between 2007 to 2017 (n=5453). Prior LT recipients and subjects listed for combined organ transplant were excluded. Patients were divided into three outcomes: “bad” (death or permanent removal for being too sick to transplant), “good” (removal for spontaneous improvement), and transplant. Demographic, anthropometric, clinical and lab parameters, status at listing (MELD/PELD score, Status 1A or 1B), allocated MELD/PELD scores, application for and acceptance of exceptions, and time spent on the LT waitlist were compared between outcome groups. Diagnostic categories included biliary atresia (BA), non-BA infant cholestasis, metabolic liver disease, acute liver failure, liver malignancy, autoimmune hepatitis, viral hepatitis, drug-induced liver injury, and “other” diagnoses. These parameters were recorded at the time of listing (baseline variables) and just prior to the outcome (pre-outcome). We then calculated “delta” variables, which was the difference between baseline and pre-outcome parameters. We used both Random Forest (RF) and Classification Tree (CT) analysis to determine which variables best predicted outcomes of patients on the LT waitlist.

Results: During this time period, 4407 (80.8%) candidates underwent LT, 641 (11.8%) had a bad outcome and 405 (7.4%) had a good outcome. Variable importance scores from the RF model that included only baseline variables indicated that the five best predictor variables were: number of days on the LT waitlist, non-BA infant cholestasis, “other” diagnostic group, BA, and being on a ventilator. When RF model included both baseline and delta variables, the following five variables were the most predictive: being listed with MELD/PELD score (and not status 1A or 1B) both at baseline and pre-outcome, number of days on the LT waitlist, change in creatinine, “other” diagnostic group, and non-BA infant cholestasis. The model using only baseline variables had an overall out-of-bag misclassification rate (% of observations not used for training the model that were incorrectly classified) of 17.1% vs. 13.4% for the model that included delta variables. CT analysis based on the eight most important variables from RF analysis indicated that LT was the outcome best predicted by CT

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models (96% correctly classified). LTs were most likely to occur in patients listed <500 days and listed with MELD/PELD score at both baseline and pre-outcome. Our model also predicted good outcomes relatively well (61% correctly classified) with patients waitlisted ≥500 days and those without BA most likely to have spontaneous improvement. Bad outcomes were poorly predicted (22%), but our models did suggest that increase in creatinine >0.66 might be an important predictor of bad outcomes.

Conclusions: Models that included delta variables better predicted outcomes compared to models with only baseline variables. Our models performed well for predicting LT and good outcome, but performed poorly for predicting bad outcome. Future studies will focus on using a similar approach to predict outcomes on the LT waitlist in specific age groups, diagnoses (BA, liver malignancy, etc.), and in specific listing groups (MELD/PELD, Status 1A, 1B).

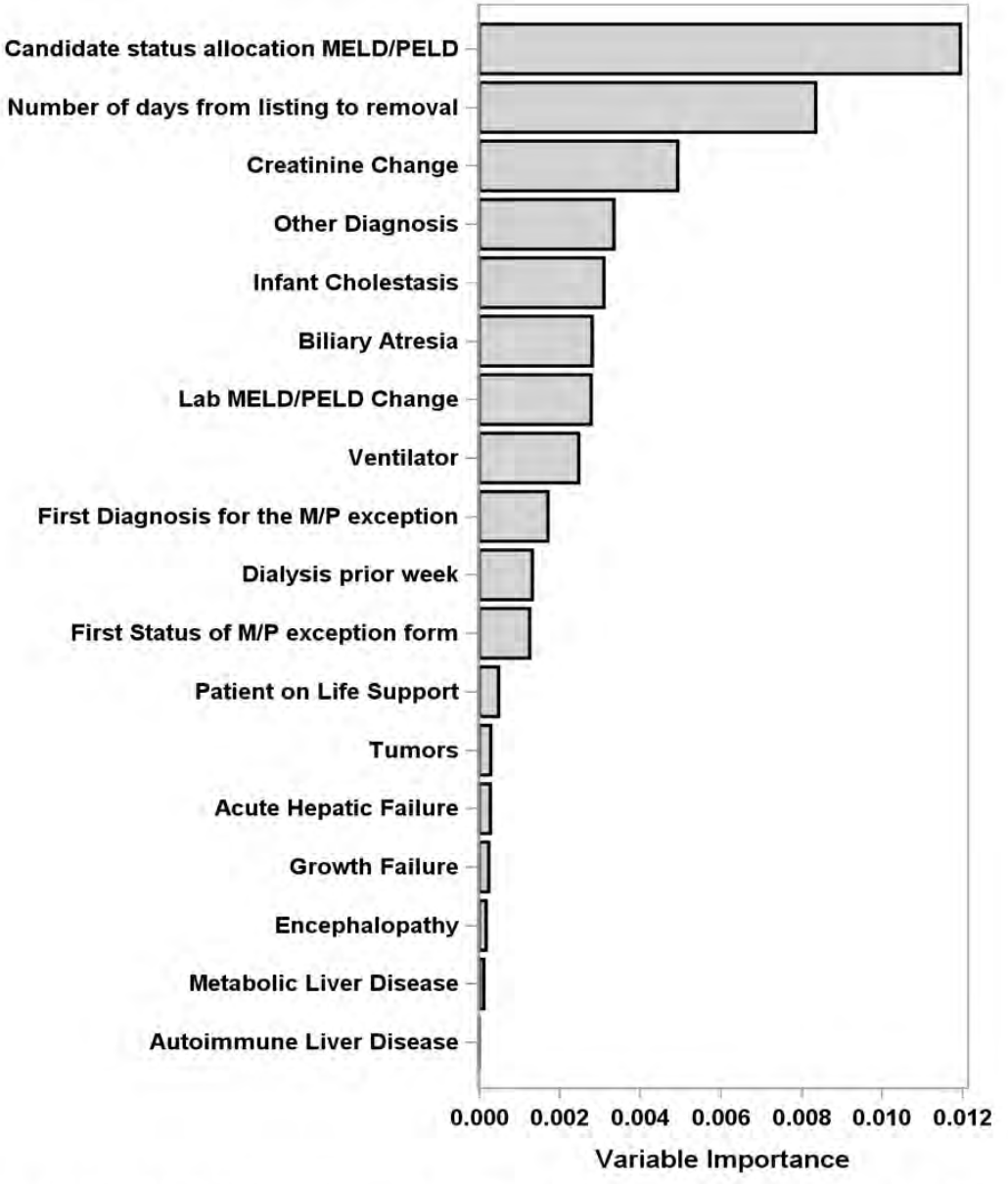


Figure 1. Variable importance scores from RF analysis sorted in descending order of importance (includes both baseline and delta variables). Variables with scores less than zero are not reported in this figure.

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157 ***GLYCOGEN STORAGE DISEASE TYPE III: CLINICAL PRESENTATION AND OUTCOMES IN 47 PALESTINIAN PATIENTS.*** *Thomas Ciecierega[1], Mutaz Sultan[2], Mohammad Radwan[2], Maher Shahrour[2], Imad Dweikat[2], Bassam Libdeh[2], Sundus Shalabi[3]. [1]Pediatrics, NYP-Weill Cornell Medical College, New York, NY; [2]Makassed Hospital, Jerusalem, Palestine; [3]Al-Quds University, Jerusalem, Palestine*

Introduction: Glycogen storage disease (GSD) III is an autosomal recessive disorder caused by deficient debranching enzyme amylo-1,6-glucosidase causing accumulation of abnormal glycogen with short outer chains and hypoglycemia (impairment of glucose release from glycogen). There are three distinct subtypes: IIIa - involves liver and muscle (78%), IIIb - involves liver only (15%) and IIIc - extremely rare subtype believed to be caused by loss of activity of the glucosidase active site of the glycogen debranching enzyme.

Aim: Primary outcome: determine the clinical presentation and outcome after long-term follow up of patients with GSD III in Palestine.
Secondary outcome: determine the mutations spectrum and genotype-phenotype correlation in GSD III affected children in Palestine.

Methods and results: Ethical committee approval was obtained from Makassed hospital, Jerusalem. Consent was obtained from the families to participate in the study.
Retrospective review of children treated at Makassed hospital was performed. Forty seven children with GSD III were identified. Demographic data was collected including time of presentation, diagnostic modalities including genetic testing, disease course, applied treatments, clinical interventions and compliance to treatment. The clinical, imaging and laboratory data were collected at the time of the diagnosis and within the last 6 months.

47 patients were identified; 22 (47%) were males and 25 (53%) were females. 24 patients were diagnosed by enzymatic assay and 23 patients were diagnosed by genetic testing. Eighteen out of twenty three patients who were diagnosed by genetic testing were homozygous for mutation C.1186-3 C>G in AGL gene. All these patients originated from the same village.
The mean age of presentation was 1.06 year (2 months to 6 years) and mean age of diagnosis was 2.3 years (3 months to 11 years). Twenty six patients (66%) originated from consanguineous families. Common clinical finding included hepatomegaly 92%, abdominal distension 85%, failure to thrive 19%, developmental delay 15%, splenomegaly 8.5% and hypoglycemic seizure 6%.
All patients (100%) had AST/ALT elevation; 92% had hepatomegaly and 85% had abdominal distension and high TG. Seven patients had liver biopsy – all abnormal. Twenty three patient had genetic testing: most common mutation was C.1186-3.
Eight patients had elevated creatinine kinase (CK) at the time of diagnosis with a mean value of 226 unit/L (normal < 150). Twenty patient were found to have high CK during follow up with a mean value of 281 units/L.
Thirty five patients had echocardiography during follow up, and only two patients had hypertrophic cardiomyopathy. Only 24 (52%) patients were compliant to dietary treatment by uncooked cornstarch. Comparing the mean laboratory values for treated and untreated patients showed significantly lower transaminases and triglyceride levels in the compliant group.

Conclusion: Hepatomegaly, high transaminases and hypertriglyceridemia are common and should alert the physician to the possibility of GSD. Cardiac and skeletal complications are rare. Dietary compliance is associated with a favorable outcome. A national GSD patient registry is warranted to prospectively define the clinical course and the effect of different dietary interventions.

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159 ***COMPARING THE USE OF TRANSIENT ELASTOGRAPHY TO BIOPSY PROVEN FIBROSIS IN CHILDREN WITH PRESUMED NONALCOHOLIC FATTY LIVER DISEASE OF VARYING SEVERITY.*** *Oladuni Cummings-John[1], Stephenie Geistweidt[1], Candice Angueira[1], Toluwalase Okubote[1], Ian Gabot[1], Johanna Ascher Bartlett[1,2], Jean Filo[1], Mary Barbara[1,2], Amanda Betancourt[1], Eric Lawitz[1], Naim Alkhouri[1]. [1]Hepatology, Texas Liver Institute, San Antonio, TX; [2]Pediatrics, UTHSCSA, San Antonio, TX*

Background: Transient elastography (TE) using Fibroscan™ is a validated noninvasive test to determine liver stiffness and the severity of liver fibrosis in adult patients with nonalcoholic fatty liver disease (NAFLD). TE measurement in children with suspected NAFLD is gradually being used to determine fibrosis severity despite the lack of adequate data in this population. The aim of this study was to assess the accuracy of measuring TE by Fibroscan™ to determine the severity of fibrosis compared to biopsy in a cohort of children referred for suspected NAFLD.

Method: All children in the study were referred to our clinic for suspected NAFLD due to elevated ALT levels or fatty infiltration on ultrasonography. Fibroscan™ testing was performed on a standardized machine with an experienced operator utilizing either a medium (M) or extra-large (XL) probe. Standard criteria for having valid measurements were applied (IQR <30% with ≥ 70% success rate). The severity of liver fibrosis was evaluated using the validated adult cutoffs: < 6 kPa (no fibrosis), 6-10 kPa (mild to moderate fibrosis), >10 kPa (advanced fibrosis). Baseline clinical and laboratory parameters were also collected. Patients who had an ALT value > 80 U/L on 2 separate occasions or a liver stiffness value > 10 kPa (consistent with advanced fibrosis) proceeded to have a liver biopsy. Both NAFLD Activity Score (NAS), the presence of nonalcoholic steatohepatitis (NASH), as well as fibrosis stage (F0-F4) were determined using the NASH CRN criteria.

Results: 134 children with suspected NAFLD were referred to the clinic between May 2017 and April 2019. The mean age at time of assessment was 13.1 (± 3.0 SD). The majority were males (70%), obese (88%) and of Hispanic ethnicity (76%). The mean baseline ALT for all children in the study was 84 U/L. Medium (M) sized probe was used to successfully complete 83/134(61%) scans whereas the extra-large (XL) probes were required for 53/134 (39%) scans. 20 patients had liver biopsy done (14 for having TE > 10 kPa consistent with advanced fibrosis and 6 for having ALT > 80 U/L on 2 separate occasion). Surprisingly, only 1/14 patients with TE > 10 kPa had consistent findings on liver biopsy with bridging fibrosis (F3). 13/14 (93%) patients with TE > 10 kPa had stage F0-F1 on liver biopsy consistent with no significant fibrosis indicating poor specificity of TE in this population. Interestingly, the majority of patients (14/20 or 70%) displayed NASH on biopsy.

Conclusion: Utilizing TE to determine liver fibrosis severity in children with NAFLD yielded poor specificity compared to liver biopsy. Larger studies are needed to evaluate pediatric specific cutoffs and assess variables that may influence liver stiffness such as the presence of NASH.

160 ***GIANT CELL HEPATITIS WITH AUTOIMMUNE HEMOLYTIC ANEMIA IN INFANTS AND YOUNG CHILDREN. THERAPEUTIC APPROACH.*** *Daniel D'Agostino[1,2,3], Susana Lopez[4], Miriam Cuarterolo[5], Alejandro costaguta[6], Ivone Malla[7]. [1]Pediatrics, Hospital Italiano de Buenos Aires, Buenos Aires, Buenos Aires, Argentina; [2]Pediatrics Gastroenterology-Hepatology, Hospital Italiano de Buenos Aires, Buenos Aires, Buenos Aires, Argentina; [3]Pediatrics-Liver transplantation center, Hospital Italiano de Buenos Aires, Buenos Aires, Buenos Aires, Argentina; [4]Pediatrics-Hepatology, Hospital Garrahan, Buenos Aires, Buenos Aires, Argentina; [5]Pediatrics-Hepatology, hospital Garrahan, Buenos Aires, Buenos Aires, Argentina; [6]Pediatric Hepatology, Sanatorio del Niño, Rosario, Argentina; [7]Pediatrics Hepatology, Hospital Austral, Buenos Aires, Buenos Aires, Argentina*

Giant cell hepatitis (GCH) with autoimmune hemolytic anemia (AiHA) is an autoimmune disorder that affects infants and young children, which can lead to liver failure and multiple organ failure.

Study Design: in a population of autoimmune hepatitis, 9 children with this disease were evaluated. We analyzed the treatments and posterior follow-up.

Results: 680 children with autoimmune hepatitis were evaluated, 9 patients with GCH and AiHA positive Coombs , were reported (1.3%) median age 18 months; 5 women, all presented jaundice, hepatosplenomegaly, elevated aminotransferase and AiHA positive Coombs. The appearance of the disease was fulminant liver failure on five patients; the remaining four were severe hepatitis. In the first line of treatment prednisone was used on 100% of the patients; 8 of them were treated with prednisone plus azathioprine. The result was one patient had complete clinical remission, 4 patients did not have remission of the disease, and 4 others had partial remission. Out of four patients without remission, three required therapy with anti-CD20 monoclonal antibody (Rituximab) and one required a liver transplant.

Patients who received Rituzimab had rapid remission and are alive; the only one transplanted patient had good evolution without relapse. Four patients with partial remission required high level of immune-suppression. The treatment was held for a long period. Out of the last four patients treated, two died of sepsis or multiple organ failure.

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Conclusions: giants cell hepatitis associated with autoimmune hemolytic anemia positive coombs is a rare disease with high morbidity and mortality , treatment with immune-suppressors may not be effective. Rituzimab should quickly be administered on non-responders

163 ***DECREASED INCIDENCE OF HEPATIC ARTERY THROMBOSIS IN PEDIATRIC LIVER TRANSPLANTATION UTILIZING TECHNICAL VARIANT GRAFTS: REPORT OF THE SOCIETY OF PEDIATRIC LIVER TRANSPLANTATION (SPLIT) EXPERIENCE.*** *Noelle Ebel[2], Evelyn Hsu[1], Andre Dick[3], Michele Shaffer[4], Kristen Carlin[5], Simon Horslen. [1]Pediatrics, Seattle Children's Hospital, Seattle, WA; [2]Pediatrics, Stanford, Palo Alto, CA; [3]Surgery, Seattle Children's Hospital, Seattle, WA; [4]Statistics, University of Washington, Seattle, WA; [5]Statistics, Seattle Children's Research Institute, Seattle, WA*

Objective: To evaluate risk factors for hepatic artery thrombosis (HAT) and examine the long-term outcomes of graft and patient survival following HAT in pediatric recipients of liver transplantation.

Study design: Utilizing multicenter data from the Society of Pediatric Liver Transplantation (SPLIT), Kaplan-Meier and Cox regression analyses were performed on first-time pediatric (aged 0-18 years) liver transplant recipients (n=3801) in the United States and Canada between 1995 to 2016.

Results: Of children undergoing their first liver transplantation, 7.4% developed HAT within the first 90 days of transplantation and of those who were re-transplanted, 20.7% developed recurrent HAT. Prolonged warm ischemia times increased the odds of developing HAT (OR 1.11, p=0.02). Adolescents aged 11-17 years (OR 0.53, p=0.03) and recipients with split, reduced or living donor grafts had decreased odds of HAT (OR 0.59, p<0.001 compared to whole grafts). Fifty percent of children who developed HAT developed graft failure within the first 90 days of transplantation (AHR 11.87, 95% CI 9.02,15.62) and had a significantly higher post-transplant mortality within the first 90 days of transplantation (AHR 6.18, 95% CI 4.01,9.53).

Conclusions: This national registry study demonstrates poorer long-term graft and patient survival in pediatric recipients whose post-transplant course is complicated by HAT. Notably, recipients of technical variant grafts had lower odds of HAT compared to whole liver grafts.

While the incidence of HAT appears to be decreasing by era, ongoing targets for quality improvement initiatives to prevent HAT remain paramount.

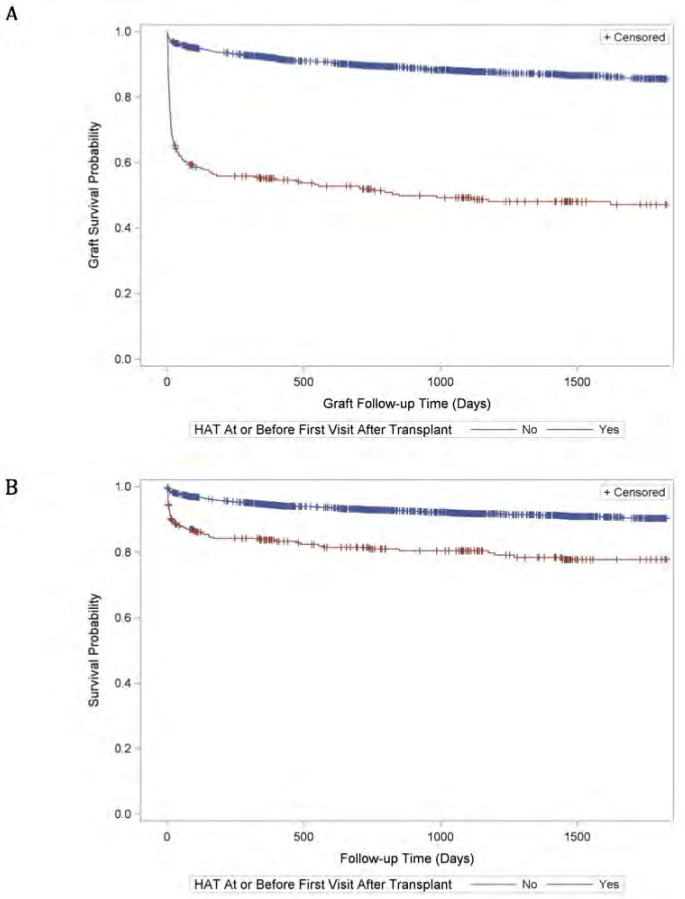
Table 2. Predictors of early HAT, from logistic regression

	Odds Ratio	95% CI	p-value
Age			
< 1	1.20	(0.85, 1.70)	0.30
1-5	Reference		
6-10	1.03	(0.67, 1.60)	0.88
11-18	0.55	(0.35, 0.88)	0.01
Sex			
Male	0.88	(0.66, 1.17)	0.47
Female	Reference		
Diagnosis			
Acute Liver Failure	0.53	(0.29, 0.94)	0.03
Biliary Atresia	Reference		
Other cholestatic liver disease	0.66	(0.39, 1.17)	0.12
Metabolic	1.47	(0.98, 2.21)	0.06
Malignancy	1.43	(0.89, 2.29)	0.14
Other	0.77	(0.45, 1.30)	0.32
Albumin	1.05	(0.97, 1.13)	0.25
Warm Ischemia Time (15 minute time blocks)	1.11	(1.02, 1.21)	0.02
Cold Ischemia Time (hours)	1.02	(0.98, 1.07)	0.30
Liver Type			
Split/Reduced/Living	0.59	(0.43, 0.80)	< 0.001
Whole	Reference		
Payor			
Medicaid or equivalent and/or state funded children's services	0.75	(0.57, 1.01)	0.05
Other Insurance	Reference		

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FIGURES

Figure 1: Kaplan-Meier curve of **A,** graft survival and **B,** patient survival in liver transplant recipients with and without HAT.



165 ***ORAL BUDESONIDE FOR THE TREATMENT OF ACUTE CELULLAR REJECTION FOLLOWING PEDIATRIC LIVER TRANSPLANTATION.*** *Johanna Ferreira[1], Justin Chen[2], Neelima Agrawal[3], Steven Lobritto[4], Mercedes Martinez[4], Dana Goldner[4], Jennifer Vittorio[4]. [1]Pediatrics, Weill Cornell Medicine, New York, NY; [2]Pharmacy, New York Presbyterian Hospital, New York, NY; [3]Northwestern University Feinberg School of Medicine, Chicago, IL; [4]Pediatrics, Columbia University Irving Medical Center, New York, NY*

Background: Corticosteroids are an integral part of liver transplant (LT) immunosuppression regimens but are often accompanied by many adverse side effects. Budesonide is an oral corticosteroid with extensive (80-90%) hepatic first-pass metabolism and minimal systemic absorption. The aim of this study was to examine the safety and efficacy of budesonide for management of acute cellular rejection (ACR) in pediatric LT recipients.

Methods: A retrospective descriptive analysis was performed for all pediatric patients who underwent LT at our center between March 1998 and February 2018 and were prescribed oral budesonide for the treatment of ACR. Patients that received systemic corticosteroids one month prior to budesonide were excluded from analysis. Alanine aminotransferase (ALT) values were obtained at baseline, time of rejection, and at 3 and 6 months post-treatment. Adverse effects secondary to the use of budesonide therapy were also reviewed.

Results: Twenty-nine patients were prescribed budesonide for the treatment of ACR and were eligible for study analysis. Acute rejection was biopsy proven in 65.5% (BPAR) and presumed in 34.5% of patients based on laboratory values. For

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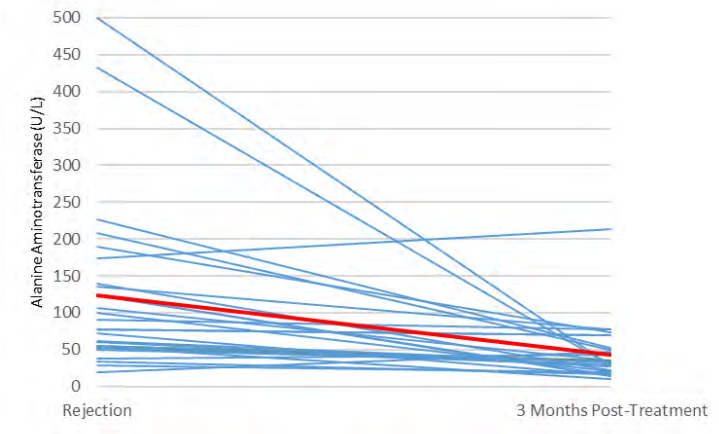
those patients that underwent liver biopsy, rejection was indeterminate in 5.3%, mild in 42.1%, moderate in 47.4% and severe in 5.3% of patients utilizing Banff criteria. Mean follow-up was 17.3 ± 13.2 months. There was a significant decrease in ALT from the time of rejection (mean 123.3 ± 116.1 U/L) when compared to 3 months (mean 43.2 ± 40.1 U/L, p=0.0008) and 6 months (29.3 ± 18.5 U/L, p<0.0001) following treatment with budesonide (Image 1). There was no significant difference between ALT at baseline (prior to rejection) and at 3 months and 6 months, suggesting resolution of inflammation. Three patients required conversion to systemic corticosteroids after failure to demonstrate significant improvement in ALT values. There were 11 adverse events reported (Table 1). These events included both bacterial and viral infections. One patient developed pancreatitis secondary to a viral illness and did not require discontinuation of budesonide. Serious complications were not observed.

Conclusion: Oral budesonide is a safe and effective treatment option for the management of mild/moderate ACR and for empiric treatment of ACR in pediatric LT recipients. Budesonide is a promising alternative to systemic corticosteroids in select patients due to its efficacy and favorable side effect profile. Data from this study may provide the foundation for larger, prospective, multicenter trials to support the use of budesonide in the treatment of ACR.

Adverse events

Adverse Event (AE)	N=29	Severe AE*	Start of Budesonide until AE (Days)
Bacterial infection	2 (6.9%)		
Gastroenteritis	1 (3.4%)	No	32
Cellulitis	1 (3.4%)	No	40
Viral infection	8 (27.6%)		
Upper respiratory infection	4 (13.8%)	No	26-264
EBV reactivation	2 (6.9%)	No	11-90
Pancreatitis	1 (3.4%)	Yes	4

*Basch, E., et al., Development of the National Cancer Institute's patient-reported outcomes version of the common terminology criteria for adverse events (PRO-CTCAE). J Natl Cancer Inst, 2014. 106(9).



ALT at time of Rejection and 3 Months Post-Treatment

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166 ***GENETIC VARIANTS IN TM6SF2-PBX4 REGION ARE ASSOCIATED TO AST AND ALT SERUM LEVELS ON THE GROWTH AND OBESITY CHILEAN COHORT STUDY (GOCS).*** *José Miranda Marín[2], José Santos[2], Gigliola Alberti[1], Ana Pereira[3], Juan Cristóbal Gana[1]. [1]Gastroenterology, Hepatology and Nutrition Unit, Division of Paediatrics, Escuela de Medicina, Pontificia Universidad Católica de Chile, Santiago, Chile; [2]School of Medicine. Department of Nutrition, Diabetes and Metabolism, Pontificia Universidad Católica de Chile, Santiago, Chile; [3]Institute of Nutrition and Food Technology (INTA), University of Chile, Santiago, Chile*

Nonalcoholic fatty liver disease (NAFLD) is a growing public health problem. It is estimated that the worldwide prevalence of NAFLD ranges 20-30% and is strongly associated with obesity, type 2 diabetes mellitus (T2DM) and metabolic syndrome. Aspartate aminotransferase (AST) and alanine aminotransferase (ALT) enzymes are commonly used as indicators of hepatic parenchymal damage. The aim of this study was to carry out an association study using genetic regions containing the TM6SF2 and PNPLA3 candidate genes to estimate their genetic influences on AST and ALT serum levels in Chilean adolescents. This study was conducted in a subset (n=364; 62.6% boys; Age: 14.8 ± 0.6 years) of the participants belonging to the longitudinal Chilean GOCS, which is a population-based pediatric cohort located in Santiago, Chile. We retrieved genetic information from the Multhi-Ethnic Global BeadChip genotyping array. Multiple linear regression analysis with additive models adjusted by sex, age, BMI-z score and 3 Principal Components indicative of ethnic origin were used. Genetic variants with minor allele frequency>0.01 were selected resulting in 75 variants in the targeted genomic region containing TM6SF2, SUGP1, MAU2, GATAD2A, CILP2 and PBX4 genes (TM6SF2-PBX4 region), as well as 46 variants in PNPLA3 ± 10Kb. From the total analyzed variants, 25 in the TM6SF2-PBX4 region reached significant FDR-adjusted P-values for AST and ALT serum levels, including 4 reaching genome-wide significance. The most significant variant was located 718-bp downstream MAU2 gene (variant rs139086798, **P = 2.6 x 10^{-12}**;**Beta, 15.6**; 95% CI 11.8-19.5 for AST; **P = 1.05 x 10^{-14}**; **Beta, 21.4**; 95% CI 16.6-26.21 for ALT. The other 3 genome-wide significant variants are intronic, and were located in PBX4 which are all of them in perfect linkage-disequilibrium (rs14022940, rs17217098 and rs73004967, **P = 7.06 x 10^{-12}**;**Beta, 11.1**; 95% CI 8.2-13.9 for AST;**P = 4.45 x 10^{-10}**; **Beta, 13.0**; 95% CI 9.3-16.6 for ALT. None of the variants in PNPLA3 gene reached significant p-values. In conclusion, genetic variants on TM6SF2-PBX4 region are strongly associated to AST and ALT serum levels in the Chilean population. Funding: FONDECYT 1150416 and 1161456.

167 ***CLINICAL PHARMACOLOGY OF ODEVIXIBAT, A POTENT, SELECTIVE ILEAL BILE ACID TRANSPORT INHIBITOR WITH MINIMAL SYSTEMIC EXPOSURE.*** *Per-Göran Gillberg[1], Jan Mattsson[1], Kristina Torfgård[1], Mathews Adera[2], Patrick Horn[2]. [1]Albireo AB, Gothenburg, Sweden; [2]Albireo Pharma, Inc., Boston, MA*

Background: Odevixibat (A4250) is an oral ileal bile acid transport inhibitor in development for treating pediatric cholestatic liver diseases. Clinical pharmacology in healthy adults has been evaluated in 3 trials; a single- and multiple-ascending dose (SAD/MAD) study, an ADME study and a food-effect study.
Methods: Subjects exposed (dose) were: In the SAD/MAD study, 29 subjects (0.1 to 10 mg single dose) and 17 (1 or 3 mg QD, 1.5 mg BID for 7 days); in the ADME study 6 subjects (3 mg); and in the food effect study 17 subjects (9.6 mg). Plasma concentrations of odevixibat were measured by a validated LCMS method (LLOQ =0.05 ng/mL).
Results: Concentrations were below limit of quantification (BLQ) for single doses of 0.1, 0.3 and 1 mg and for all but 1 sample for 2 subjects administered 3 mg. Quantifiable concentrations were obtained for 5 subjects administered 10 mg; the median T_{max} was 4 h. Geometric mean (geometric CV%) C_{max} and $AUC_{(0-t)}$ were 0.16 ng/mL (85.6) and 0.58 ng*h/mL (39.0), respectively. Following multiple doses, all concentrations were BLQ after 1 mg QD, for 3 subjects administered 3 mg QD and 2 subjects administered 1.5 mg BID. The highest C_{max} observed was 0.1 ng/mL and the T_{max} was 1 to 4 h. Following a single oral dose of 3 mg [^{14}C]-odevixibat all PK samples in plasma and total radioactivity in both whole blood and plasma were BLQ. An average of 0.002% of the total radioactivity was recovered from the urine and 82.886% was recovered from the feces. Following a dose of 9.6 mg, the C_{max} and $AUC_{(0-inf)}$ were 0.55 ng/mL (50.7) and 2.86 ng*h/mL (47.0), respectively in the fasted state and 0.16 ng/mL (39.6) and 1.57 ng*h/mL (22.3) following a high-fat meal. AEs were reported by 44.8% to 66.7% of the subjects, with GI being the most commonly affected system and diarrhea the most frequently reported AE. There were no SAEs or severe AEs reported in any study.
Conclusion: Systemic exposure of odevixibat following single doses of up to 10 mg or multiple doses of up to 3 mg daily was minimal, and odevixibat was eliminated primarily unchanged in the feces. Systemic exposure as measured by C_{max} and $AUC_{(0-inf)}$, was 72% and 43% lower, respectively, following a high-fat breakfast. Local GI side effects were the most frequently reported AEs. These results suggest that the distribution of odevixibat is limited to the GI tract and there is limited systemic exposure.

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168 ***DIRECT ACTING ANTIVIRAL THERAPY FOR HEPATITIS C VIRUS IN PEDIATRICS: A SINGLE-CENTER, REAL-WORLD EXPERIENCE.*** *Lauren Jarchin[1], Caroline Almy[2], Jaime Chu[2], Fiona Henderling[2], John Bucuvalas[2], Ronen Arnon[2]. [1]Pediatric Gastroenterolog, Mount Sinai Hospial, New York, NY; [2]Recanati/Miller Transplantation Institute, Mount Sinai Medical Center, New York, NY*

Background: Hepatitis C virus (HCV) treatment in children is important in the prevention of further complications including cirrhosis and hepatocellular carcinoma. Historically, treatment options were limited in pediatrics with relatively poor efficacy of viral eradication. More recently, newer DAA therapies became available with excellent safety profiles and efficacy in clinical trials. We sought to determine if DAAs were effective in a diverse, primarily urban population of children with chronic HCV.

Methods: This retrospective study included 11 children with chronic, multi-genotype HCV treated with DAA therapy age 12 years and older or weighing >35 kg, and either treatment naïve or exposed. Patients with genotype 1A, 1B, and 6N received 400 mg oral sofosbuvir (SOF) and 90mg ledipasvir (LED) for 12 weeks. One with genotype 3 received 400mg oral SOF and 15mg/kg ribavirin (RBV) divided twice daily for 24 weeks. Baseline demographic data, baseline cirrhosis, prior HCV treatment, baseline and post-treatment laboratory data including HCV genotype, potential side effects and reported compliance were recorded. Primary outcome was sustained virologic response (SVR) at week 12 (SVR12) and secondary outcome was SVR at week 24 (SVR24). Descriptive statistics were used in analyses.

Results: Eleven children with chronic HCV infection were included with the following characteristics: 64% female and the majority were Caucasian (n=8; Hispanic n=1, African American n=1, Asian n=1). 83% of patient had public health insurance and insurance approval for treatment was granted in all cases. 73% had known or suspected vertical transmission, median [IQR] age at diagnosis was 9 [5.5-11.9] years, and median age at DAA initiation was 14.7 [14-16] years. 1B was the most common genotype (64%, n=7; other genotypes: 1A (n=2), 3 (n=1), and 6N (n=1)) and median viral load was 870,751 [50,489-9,913,095] IU/mL. Two were previously treated with interferon + RBV and none were cirrhotic at diagnosis. Side effects included headache (n=1) and abdominal pain (n=1). There was no reported non-compliance with daily medication administration. By a median of 4.3 weeks on treatment, 91% (10/11) had undetectable levels of HCV RNA. 100% of patients achieved SVR12 (9/9; 2 lost to follow-up) and 100% of patients achieved SVR24 (8/8; 1 lost to follow-up).

Conclusions: FDA-approval of DAA use in children has transformed our treatment approach to pediatric chronic HCV and enables treatment regardless of socioeconomic status. Treatment with oral DAAs using SOF/LED and SOF+RBV is effective, well-tolerated and feasible for children with chronic HCV infection. Eligible pediatric patients with chronic HCV should be strongly considered for early treatment with DAA therapy.

169 ***HEPATOBLASTOMA: A "SENTINEL FEATURE" OF CANCER PREDISPOSITION SYNDROMES.*** *Oana Jumanca[1], David Malkin[2], William Foulkes[3], Catherine Goudie[4]. [1]Medicine, McGill University Health Centre, Montreal, QC, Canada; [2]Pediatric Hematology-Oncology, The Hospital for Sick Children, Toronto, ON, Canada; [3]Medical Genetics, Research Institute- McGill University Health Centre, Montreal, QC, Canada; [4]Pediatric Hematology-Oncology, Montreal Children's Hospital, Montreal, QC, Canada*

BACKGROUND: Hepatoblastoma is the most common type of primary liver malignancy in children under age 15. There has been recent development into understanding the molecular mechanisms driving this malignant condition and in particular, its association to other oncogenic predisposing factors. The association between cancer predisposition syndromes and hepatoblastoma has been previously demonstrated, with Beckwith-Wiedemann syndrome and Familial Adenomatous Polyposis being the most common. In fact, a diagnosis of hepatoblastoma will often raise suspicion of a co-existing cancer predisposition syndrome. Nonetheless, screening measures and genetic testing guidelines are inconsistent, raising concern for potentially missed diagnoses.

METHODS: We retrospectively reviewed 69 consecutive children diagnosed with hepatoblastoma at a Canadian tertiary care pediatric hospital between 2000 and 2016. We primarily looked at clinical features and referral practices to genetic evaluation and counseling in patients diagnosed with hepatoblastoma. Exclusion and inclusion criteria were clearly outlined, which included an overview of the principal genetic investigations in hepatoblastoma. Furthermore, we characterized the epidemiology and features of the population for which the development of hepatoblastoma was the sentinel event in diagnosing familial adenomatous polyposis as opposed to recognizing earlier distinctive features.

RESULTS: Of the 69 patients, only 34 (49%) were seen in Genetics and yet 12 (17%) were found to have a cancer predisposition syndrome. Of the 12 patients with an identified syndrome, 7 had Familial Adenomatous Polyposis and 5 had

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Beckwith-Wiedemann syndrome. Of those referred for genetic evaluation, 20 were referred solely based on cancer type and from that subset, 7 were found to have a cancer predisposition syndrome with no characteristics indicative of the formerother than the malignancy itself. 1 patient with Familial Adenomatous Polyposis had a suggestive family history, whereas no patients with Beckwith-Wiedemann syndrome had any suggestive family history. Finally, 11 patients had the cancer predisposition syndrome diagnosed at the time of or afterthe hepatoblastoma diagnosis.

CONCLUSION: Our data highlights that the prevalence of cancer predisposition syndromes in children with hepatoblastoma is high. Of those, Beckwith-Wiedemann syndrome and Familial Adenomatous Polyposis are the most common. Often, a diagnosis of hepatoblastoma becomes the sentinel event which raises the suspicion for a cancer predisposition syndrome in these patients. These conclusions open the discussion for further evaluation of the current screening practices in hepatoblastoma patients regarding their risk of association to a cancer predisposition syndrome, and whether screening is currently appropriately and effectively performed and follows any guidelines. Through that correlation and knowing that hepatoblastoma is confidently recognized as a tumor of early childhood (under 4 years old at time of diagnosis on average), we aimed to highlight the potential of hepatoblastoma diagnosis as an early suspicion tool for cancer predisposition syndromes and in particular Familial Adenomatous Polyposis.

RESULTS

Correct classification of hepatoblastoma as a "Direct referral" tumour type:

- 17.4% of patient population with hepatoblastoma have a confirmed CPS, despite only 49.3% of patients being evaluated in Genetics
- Of 20 patients sent to Genetics because of **cancer type alone**, 7 (35%) were found to have a CPS.

Table 1. Comparison of Clinical Features and Referral Practices in Patients with Hepatoblastoma

	Patient Number (%)	Mean age (years)	Suggestive family history[1]	Multi-focality	Multiple primaries	Congenital anomaly[2]	Growth anomaly[3]
Total	*69 (100)*	*2.09*	*3*	*6*	*0*	*6*	*9*
Referred to Genetics	**34 (49.3)**	**1.58**	**4**	**1**	**0**	**6**	**8**
CPS	12 (17.4)	1.23	1	0	0	2	4
No CPS identified	22 (31.9)	1.85	2	1	0	4	4
Not Referred to Genetics	**35 (50.7)**	**2.59**	**0**	**5**	**0**	**0**	**1**

[1]Suggestive Family History includes a known CPS in family; any cancer occurring at age ≤18 in a close relative* or < 50 in a sibling/half-sibling/parent; same cancer type or same organ affected by cancer in a close relative*; or a close relative with multiple primary tumours
*close relative: parent, sibling/half-sibling, aunt/uncle, first cousin, grand-parent
[2]Congenital abnormalities reported in this patient population: heart defects, developmental delay, abnormal ear and/or palmar creases, clinodactyly and Wolf-hirschhorn syndrome (development and growth delay, hearing loss, renal anomalies)
[3]Growth abnormalities reported in this patient population: hemihypertrophy, macroglossia, macrosomia and tall stature (>97th percentile in height).

Table 1. Comparison of Clinical Features and Referral Practices in Patients with Hepatoblastoma

MICROBIOLOGY/INFECTIONS/PROBIOTICS

171 ***THE FUNCTIONAL ABDOMINAL PAIN DISORDERS (FAPDS) GUT MICROBIOME IS LESS DYNAMIC THAN THE CONTROL GROUP.*** *bassam abomoelak[1], Veronica Derrick[1], Stephani Campion[1], Nickolas Casler[3], Alix Casler[1], Chirajyoti Deb[1], Khoa Pham[1], Michelle Vinson[3], Jennifer Mauck[3], Miguel Saps[2], Devendra Mehta[1]. [1]GI, Orlando Health, Orlando, FL; [2]University of Miami, Miami, FL; [3]Medical school, Florida State University, Orlando, FL*

Background: FAPDs are defined as a group of disorders with pain as the driving symptom lasting for at least 2 months. FAPDs present in a seasonal trend in children, but not in adults with summer being the least common. Data showed that 32% of children experience weekly abdominal pain with 20% of them reporting practical disability including school absenteeism, and limitation with social and physical activities. A subset of these children will fulfill the Rome IV criteria for Functional Abdominal Pain Disorders (FAPDs). While multiple factors including school-related stress may be implicated, changes in gut microbiome may be responsible. Therefore, we studied the seasonal variations in microbiome profile of stool samples in children with FAPDs.

Methodology: 131 children: 45 FAPDs patients, and 86 controls, were recruited. Both males and females, ages 7 to 17 were included. Inclusion and exclusion criteria were followed during the recruitment process. A validated ROME IV

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questionnaire, as well as Stress and Anxiety Questionnaires were administered. Stool samples from the control group and FAPDs group were collected at 3 different time points during the school year/seasons. Genomic DNA was extracted, quantified, and was subjected to quality control assessments. The purified genomic DNA was used to amplify the V3-V4 region of the bacterial 16S rRNA gene, covering both conserved and variable regions. The analysis of metagenomic sequence data was performed using the Quantitative Insights into Microbial Ecology (QIIME) software, version 1.9. Statistical analysis was performed by STAMP software. In addition functional profiling was also performed using PICRUST software.

Results: Sequencing of all the stool samples was performed, and the data was analyzed by bioinformatics pipeline. Microbiome profiling showed seasonal alterations in several bacterial species in controls versus FAPDs patients. Faecalibacterium prausnitzii and bacteroides species showed differential abundances among the seasons. Our data revealed microbiome changes related to school versus vacation season as well. The functional profiling analysis of the two groups showed that some bacterial cellular pathways were affected during the different seasons. In addition, the data showed that the FAPDs microbiome was less dynamic than the control microbiome when compared during the different seasons.

Conclusion: Our data showed the seasonal variations between FAPDs microbiome compared to the control group. Several important bacterial species showed differential abundances among the seasons. Faecalibacterium sp. and Bacteroides sp. are among the most predominant gut bacteria. Both are involved in the gut homeostasis. The link between the clinical data and the microbiome alterations is under investigation.

The study was funded through Florida State University seed grant (UL1TR001427).

172 ***THE ROLE OF ORAL IMMUNOGLOBULIN IN MANAGING DIARRHEA ILLNESS IN IMMUNOCOMPROMISED CHILDREN.*** *Erin Alexander[1], Salim Hommeida[2], Louai Manini[1], Absah Imad[1]. [1]Pediatric GI, Mayo Clinic, Rochester, MN; [2]Pediatric GI, Blank Children's Hospital, Des Moines, IA*

Introduction: Immunosuppressive and immune modulating medications are commonly used in induction and maintenance therapy in children with inflammatory bowel disease (IBD) and post-solid organ transplant. Immunocompromised children are susceptible to infectious diarrhea caused mostly by viruses followed by bacterial pathogens. The most commonly isolated viruses are: rotavirus, norovirus, sapovirus and adenovirus. The use of oral administration of human serum immunoglobulins (OIG) to treat immunocompromised patients with viral gastroenteritis caused by Rotavirus and Norovirus has been reported. It has also been suggested as a treatment of refractory bacterial gastroenteritis.

Objective: assess the efficacy of oral immunoglobulin (OIG) in treating immunocompromised children with chronic (greater than four weeks) and acute diarrheal illness.

Methods: A retrospective cohort review of the Mayo Clinic electronic medical records from January 1, 2005, through February 1, 2019 including children <18 years of age who were immunosuppressed and received OIG as a treatment for a diarrheal illness. Children were defined as having chronic diarrhea (lasting greater than 4 weeks), or acute diarrhea at the time of their treatment. Response to therapy was defined as 50% reduction in stool output, as documented in the medical record.

Result: Twenty-one children were identified (11 males); average age (range) at the time of treatment was 8.6 years (0.3-17). Of those, 11 had inflammatory bowel disease, 5 had solid organ transplant (3 kidney transplant, 2 liver transplant), 2 children with acute myelogenous leukemia (AML), one child with Ewing Sarcoma, one child with combined variable immunodeficiency (CVID), and one child with epidermolysis bullosa. In the acute diarrhea cohort, the mean duration of symptoms was 10 days (4-21). Four children had norovirus, 4 had rotavirus, 2 had adenovirus, 2 had sapovirus1 had astrovirus, and 1 and child had diarrhea of unknown etiology (negative stool pathogen panel. In the chronic diarrhea cohort, the mean duration of symptoms was 41 days (28-90). Four children had rotavirus, 2 had norovirus and 2 had diarrhea of unknown origin. There was one patient with diarrhea of unknown origin. OIG dose varied between 25 mg/kg/dose to 300 mg/kg/dose once daily for 2-3 days. Twelve children received the dose of OIG at 300 mg/kg/dose daily x 3 doses. Improvement, as defined as a reduction in stool volume by 50% or more after finishing the OIG treatment, was seen in 3.5 days (2-6) in the chronic group, and 2.7 days (1-4) in the acute on chronic group. The mean response time for all 21 patients was 3.1 days.

Conclusion: Oral administration of human serum immunoglobulin appeared helpful in shortening the length and burden of diarrheal illness this cohort of immunocompromised children and might be reasonable to consider in similar cases. Large prospective studies are needed to further assess efficacy.

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173 ***PREVALENCE OF HELICOBACTER PYLORI INFECTION USING ^{13}C-UREA BREATH TEST IN JORDANIAN CHILDREN.*** *Eyad Altamimi[1,2], Noor Alsharakhat[3], Afnan AlJawarneh[4], Sarah Alawneh[4], Majd Al-Ahmad[4], Anas Abu Assi[4], Moh`d Abu Hamad[5]. [1]Pediatrics, Jordan University of Science and Technology, IRBID, Jordan; [2]Pediatrics, King Abdullah University Hospital, Irbid, Jordan; [3]Princess Basma Teaching Hospital, Irbid, Jordan; [4]Faculty of Medicine, Jordan University of Science and Technology, Irbid, Jordan; [5]Ministry of Heath, Amman, Jordan*

Introduction: Helicobacter pylori (Hp) is a gram-negative bacteria inhabit the stomach and linked to chronic gastritis, peptic ulcer disease and gastric malignancy. Most of Hp infections acquired during early infancy. Most of infected children will become infected adults unless being treated. The prevalence of Hp infection in Jordanian children was not precisely determined. A previous study estimating the seroprevalence of Hp in Jordanian children to be over 50%.The aim of this study was to establish the prevalence of H. pylori infection in Jordanian children, using ^{13} C-Urea Breath Test.
Materials and Methods: A prospective, cross sectional study involving children presented to the emergency and outpatient departments for non-gastrointestinal complaints in the two major referral hospitals in North Jordan. Children who were able to take the ^{13} C – urea breath test (UBT) were recruited. The research team interviewed the participants with their caregivers and a questionnaire covering; sociodemographic, clinical symptomatology and hygienic risk factors were completed after obtaining informed consent.
Results: 237 children were recruited during the study period. Mean age ± SD was 9.56±3.98 years (range, 4.0–18 years). There were 132 (55.7%) male participants. Forty children (16.9%) tested positive. There was no gender difference (17.4% for males, 16.2% for females, with a p-value 0.806). Children with positive breath test had higher incidence of family history of heartburn and reported the presence of family members received triple therapy, which were statistically significant (0.029 and 0.003 respectively). In our cohort, using school toilets and living in urban areas was associated with higher incidence of breath test positivity.
For most of gastrointestinal symptoms no statistical difference was noted between positively and negatively tested children, except for halitosis and hiccup, where children with positive breath test showed higher prevalence, which was statistically significant (0.05 and 0.008 respectively).
Conclusion: H. pylori infection affected almost one out of six children in North Jordan. Common gastrointestinal symptoms are not predictive of positivity. Family history of heartburn and family member used triple therapy were more common in children with positive breath test.

174 ***HELICOBACTER PYLORI DIAGNOSTIC AND TREATMENT APPROACHES AMONG PEDIATRIC GASTROENTEROLOGISTS.*** *Silvana Bonilla, Ishrat Mansuri. Pediatrics, Boston Children's Hospital, Boston, MA*

Background: The changing epidemiology of Helicobacter pylori infection led to the release of the new 2016 societal guidelines for its diagnosis and management in adult and pediatric population. Emerging data on the impact of these recommendations in adult population suggest there are still significant ambiguities regarding their application in clinical practice. Little is known about the impact and changes in practice among pediatric gastroenterologists.

Methods: Retrospective review of medical records of patients seen at the Division of Pediatric Gastroenterology at Boston Children's Hospital during the period of January 2013 to March 2019. Patients with a proven diagnosis of Helicobacter pylori either by stool antigen, urea breath test and/or upper endoscopy with biopsies who were evaluated by a pediatric gastroenterologist were included in the study. Demographic variables including age, gender, ethnicity as well as prior treatments, initial diagnostic test, culture growth and antimicrobial sensitivities, number of treatments offered, evidence of eradication and eradication test used were obtained. Comparison by study period pre and post new 2016 guidelines, from January 2013 to November 2016, and from December 2016 to March 2019 respectively was conducted. Impact was measured by use of invasive vs. non-invasive testing as initial test in regards to diagnosis, and use of recommended therapies according to individual and/or regional antimicrobial sensitivities in regards to treatment.

Results: 139 patients were included in the study (77 patient's pre-guidelines period and 62 post-guidelines period). 60% were male. Median age was 12 (range 1.5-21y). 42% Caucasian and 34% were Hispanic. 48% were initially diagnosed by non-invasive methods whereas 52% via upper endoscopy. Only 13 patients had Helicobacter pylori gastric biopsy culture sent. Culture growth and antibiotic susceptibility data were low at 38% and 23% respectively. Triple therapy was the common regimen prescribed (80%) followed by quadruple (7%) and other regimens (3%). 10% of patients received more than one course of treatment. Stool antigen was the most common method to assess eradication (46%). 35% of patients did not have confirmation of eradication. There was no significant difference between initial diagnostic methods (p 0.96) and initial treatment offered between study periods (*p* 0.13).

Conclusion: New clinical practice guidelines have not had a significant impact in the diagnosis and management of

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Helicobacter pylori infection among pediatric gastroenterologists. Confirmation of eradication and culture sensitivity require further improvement.

176 ***ANTIBIOTIC RESISTANCE AND EFFECTIVENESS OF ANTIBIOTIC MINIMUM INHIBITORY CONCENTRATION (MIC) GUIDED THERAPY FOR HELICOBACTER PYLORI INFECTION IN INNER CITY CHILDREN.*** *Kimberly Campbell[1], Preeti Malik[1], Wendy Szymczak[2], Micheal Levi[2], Debra Pan[1]. [1]Pediatric Gastroenterology, Children's Hospital at Montefiore, Bronx, NY; [2]Pathology, Montefiore Medical Center, Bronx, NY*

Introduction: The most commonly used empiric therapy of Helicobacter pylori (*H. pylori*) in children is amoxicillin, clarithromycin, and a proton pump inhibitor (PPI). The success of the empiric therapy was thought to be 85-90 % in the past. This number is likely to have declined in recent years due to increased antibiotic resistance to *H. pylori*, which has been reported in many countries, with some regional variations. Our previous retrospective study showed a high treatment failure rate of empiric therapy for *H. pylori* infection among children (submitted for publication). This suggests high rate of antibiotic resistance. We hypothesize that therapy based on bacterial susceptibility will have higher eradication rates than the empiric therapy. Our aim is to assess antibiotic resistance rate through antibiotic (MIC) to *H. pylori* in gastric tissue culture, and to compare treatment outcomes of patients treated with antibiotics based on MIC to those treated with non-MIC guided therapy.

Methods: This was a prospective study for patients aged 1-22 years who underwent esophagogastroduodenoscopy (EGD) for suspicion of *H. pylori* infection from 2016 to 2018. *H. pylori* infection was diagnosed by positive tissue rapid urease test and histology, or positive tissue culture. MIC of cultured samples was obtained for amoxicillin, clarithromycin, levofloxacin and tetracycline. *H. Pylori* eradication was determined by fecal *H. Pylori* antigen or EGD. Exclusion criteria included prior treatment of *H. Pylori* infection, patients who received antibiotics for other reasons within 1 month prior to EGD, and patients < 1 year of age.

Results: A total of 80 patients were included in the study. The most common empiric therapy regimen was amoxicillin/clarithromycin/PPI. *H. pylori* cultures were done in 40 patients, with 16 positive cultures and MIC results. 6/16 patients (38%) showed antibiotic resistance to clarithromycin based on MIC. No resistance to amoxicillin, levofloxacin or tetracycline was found. Fifteen of the positive culture patients were treated based on MIC results; 3 patients were tested post-treatment, and had 100% eradication. In the non-MIC guided therapy group, 17 patients were tested post-treatment, with 76% eradication. Of those, 8/17 patients treated specifically with amoxicillin/clarithromycin/PPI, had 75% eradication.

Conclusions: This data suggests a high resistance to clarithromycin in our population (38%), and that MIC guided therapy may provide better eradication rates than non-MIC guided therapy.

177 ***DIET MODULATES CLOSTRIDIOIDES DIFFICILEPATHOGENESIS THROUGH HOST AND MICROBE BILE ACID METABOLISM.*** *Keith Hazleton[1,2], Nancy Moreno-Huizar[3], Nichole Nusbacher[3], Catherine Lozupone[3]. [1]Pediatric Gastroenterology, Hepatology and Nutrition, University of Colorado, Aurora, CO; [2]Digestive Health Institute, Children's Hospital Colorado, Aurora, CO; [3]Biomedical Informatics and Personalized Medicine, Univeristy of Colorado Anschutz Medical Campus, Aurora, CO*

Objectives: Emerging data shows that low fiber intake is associated with increased colonization of *Clostridioides difficile* in mice. Additionally, saturated fat intake increases excretion of taurine-conjugated primary bile acids, known germination factors for *C. difficile,* but these bile acids can be converted by a healthy microbiota to secondary bile acids that can kill *C. difficile.*We sought to assess the effect of a high-fat/low-fiber Western Diet (WD) on antibiotic-induced microbiota disturbance, *C. difficile*infection (CDI), bile acid and short chain fatty acid (SCFA) levels.

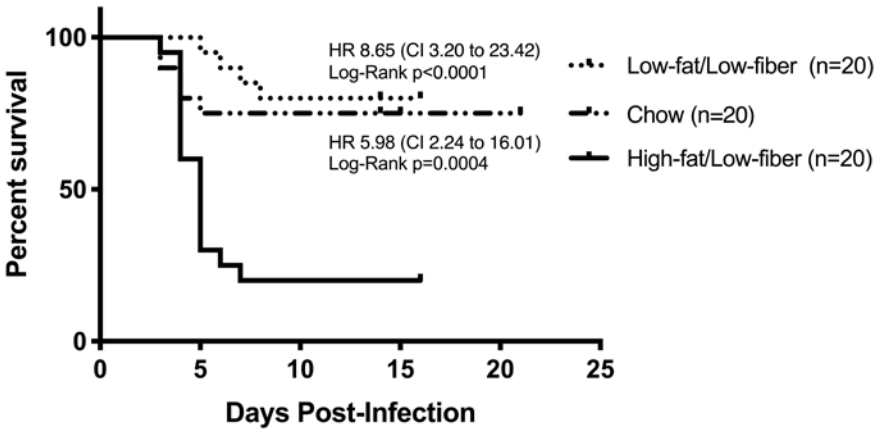
Methods: We utilized a murine-model of CDI (5 oral antibiotics and clindamycin injection, *C. difficile* VPI-strain). Mice were fed either standard mouse chow, a WD, or a low-fiber/low-fat diet. We performed gut microbiome analysis by 16S rRNA gene sequencing, quantified bile acid and SCFA levels in cecal contents by MS, and *C. difficile* Toxin B production by ELISA.

Results: WD-fed mice had a 5.98-fold and 8.65-fold increased risk of death ($p=0.0004$ and $p<0.0001$) compared to chow-fed or low-fat/low-fiber fed mice, respectively. WD-fed mice showed increased microbiome disturbance after antibiotic challenge, with a greater increase of facultative anaerobes (Proteobacteria, Lactobacillales) and disappearance of the strictly anaerobic Clostridiales. Compared to chow-fed mice, WD-fed mice demonstrated higher levels of taurine-conjugated bile acids, a near absence of secondary bile acids and decreased butyrate (all p-values <0.001) and 100-fold increased toxin B

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production (p=0.0005).

Conclusion: The ecologic and metabolic differences between low-fat diet-fed and WD-fed mice suggest that the double-insult of WD and antibiotic treatment leads to a pro-*C. difficile*intestinal environment and drives increased disease severity. These animal data indicate that dietary intervention with a low-fat/high-fiber diet has potential for preventing CDI in high-risk populations.



178 ***PRENATAL AND PERIPARTUM EXPOSURE TO ANTIBIOTICS AND CESAREAN SECTION DELIVERY ALTERS THE INFANT MECONIUM MICROBIOME.*** *Akhilesh Munagala[2], Wendy Wong[2], Shira Levy[2], Varsha Deopujari[2], Ketroya Oliver[2], Robin Baker[3], Rajiv Baveja[3], Maria Gloria Dominguez-Bello[4], Noel Mueller[5], Suchitra Hourigan[1,2]. [1]Gastroenterology, Pediatric Specialists of Virginia, Fairfax, VA; [2]Inova Translational Medicine Institute, Falls Church, VA; [3]Fairfax Neonatal Associates, Fairfax, VA; [4]Rutgers Univeristy, New Brunswick, NJ; [5]Johns Hopkins Univeristy, Baltimore, MD*

Introduction: The meconium microbiome provides insight into intrauterine and peripartum exposures and represents a view of the very earliest intestinal pioneering microbes. Prenatal antibiotics have been associated with later obesity in the child, which is thought to be driven by microbiome dependent mechanisms. However, there is little data regarding the effect of prenatal and peripartum antibiotic exposure, with or without Cesarean Section (CS), on the meconium microbiome.

Aims: To investigate the effect of prenatal and peripartum antibiotic exposure, with and without CS, on the meconium microbiome and associations of the meconium microbiome with excess weight at 1 year of life.

Methods: DNA was extracted from meconium collected from infants in a longitudinal cohort study and 16S ribosomal RNA sequencing was performed of the variable V3 and V4 regions. Detailed clinical information was collected regarding prenatal and peripartum antibiotic use, delivery mode, maternal weight gain during pregnancy and infant weight for length percentiles at 12 months of age. Alpha diversity, beta diversity and the relative abundance of taxa in the meconium microbiome was compared between clinical factors of interest.

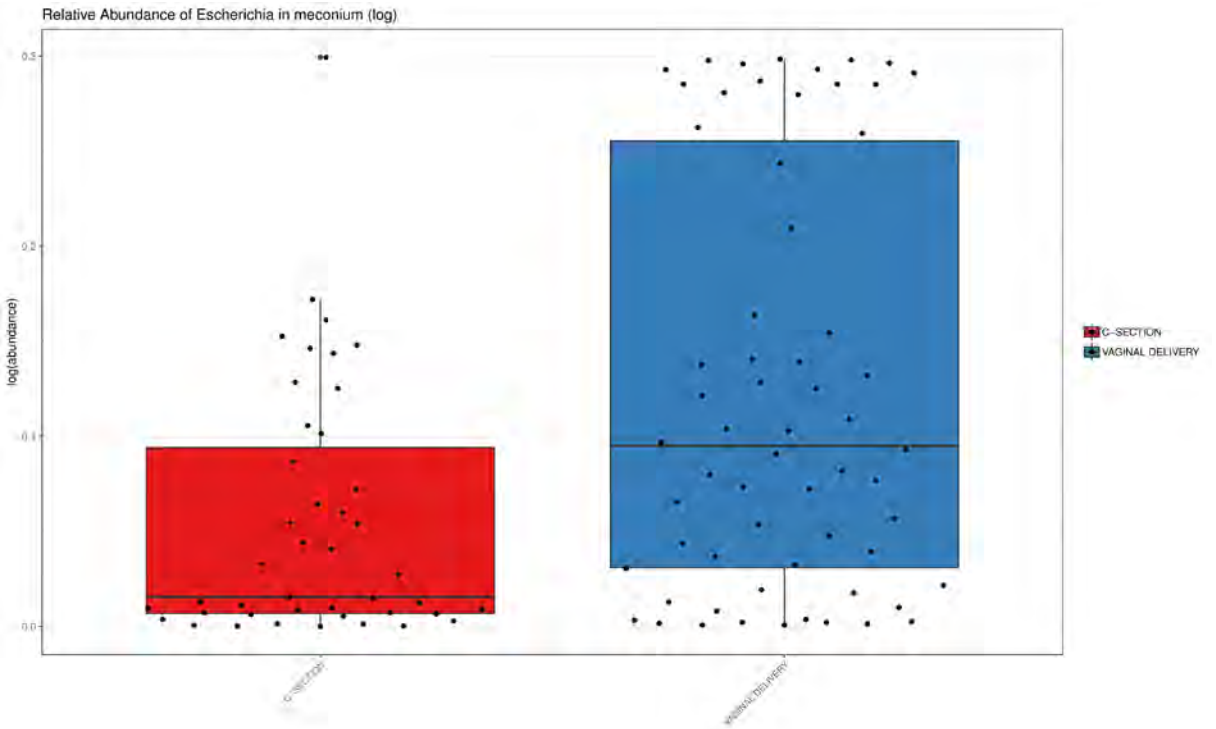
Results: Of the 105 full term infants included, 43 (41%) were delivered by CS and 62 (59%) by vaginal delivery (VD). Peripartum antibiotics were administered to all mothers undergoing CS and an additional 19 (31%) delivered by VD. Of note, 17/105 (16%) mothers received prenatal antibiotics prior to the peripartum period.

After multivariable adjustment, microbial beta diversity (Unweighted Unifrac) of meconium was significantly different by delivery mode (p=0.044), with prenatal antibiotic use (p=0.005) and peripartum antibiotic use (p<0.001). CS and peripartum antibiotics were associated with greater alpha diversity (Shannon and Simpson) (p<0.05). CS born infants had lower *Escherichia* (38% VD vs. 15% CS, adjusted p<0.001, figure 1), and higher *Methylobacterium* (8% VD vs. 27% CS, adjusted p=0.001). After adjustment for multiple testing, delivery mode, peripartum antibiotic use with and without CS, prenatal antibiotic use and infant excess weight at 12 months of age (weight for length percentile ≥ 85th%) were associated with differential abundance of Operational Taxonomic Units (OTUs). OTUs from the genus Streptococcus were increased in CS, more so in scheduled CS than emergency CS, peripartum antibiotic use with and without CS and in the meconium of infants with excess weight at 12 months.

Conclusion: Through examination of the meconium it was found that prenatal and peripartum antibiotic use, in addition to CS delivery, are associated with changes in the structure, diversity and composition of the very early microbiome.

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Prospective longitudinal studies are needed to determine whether early life antibiotic exposure may alter microbiome development trajectories and association with diseases thought to be related to aberrant gut microbiome development such as obesity.



Relative abundance of *Escherichia* in meconium samples stratified by delivery mode

179 ***TREATMENT OF CLOSTRIDIUM DIFFICILE INFECTION IN CHILDREN WITH SPECIFIC CARBOHYDRATE DIET.*** *Tanyaporn Kaenkumchorn[1,2], Mason Nuding[1], Dale Lee[1,2], Ghassan Wahbeh[1,2], David Suskind[1]. [1]Gastroenterology, Seattle Children's Hospital, Shoreline, WA; [2]University of Washington, Seattle, WA*

Background: *Clostridium difficile* (*C. difficile*) is an important nosocomial pathogen in adults and children. Roughly 4 to 5% of non-hospitalized healthy adults carry the organism in their intestinal flora, while adults in long-term healthcare facilities have asymptomatic carriage rates estimated at 20 to 50%. *C. difficile* colonization results in a spectrum of clinical conditions ranging from asymptomatic carrier state to fulminant colitis. Changes in the fecal microbiome are central in the development of *C. difficile* colonization and disease pathogenesis. *C. difficile* infection has been shown to be associated with reduced biodiversity of the gut microbiome and intestinal dysbiosis. With the importance of the intestinal microbiota in development of *C. difficile* and with the known impact of diet on the intestinal microbiota, the aim of the study was to examine the effects of a whole foods exclusionary diet, the Specific Carbohydrate Diet (SCD), on the colonization and recurrence of *C. difficile* in pediatric patients with known colonization.

Methods: This was a single center, open diet controlled study. Patients with persistent *C. difficile* colonization were enrolled from outpatient clinics at Seattle Children's Hospital from June 8, 2016 to September 26, 2018. Participants were provided meals prepared by a chef knowledgeable in the SCD. Patients also received a list of food appropriate for the SCD. Patients maintained on the SCD for one month and then liberalized to a heart healthy whole foods diet. Clinical evaluation occurred at baseline, 2, 4, and 12 weeks. Physician evaluation, anthropometrics, and a dietician visit occurred during each study visit. Stool PCR for *C. difficile* antigen/toxin and microbiome analysis occurred at each visit.

Results: Four participants enrolled. Participants included one female and three males, ages 2 years to 16 years old. One participant was excluded due to negative *C. difficile* testing at screening. The three remaining participants completed the study. Underlying diagnoses included Hurler syndrome status post bone marrow transplant (BMT), Crohn's disease, and Pre-B cell acute lymphoblastic leukemia (ALL) status post BMT. One participant had negative *C. difficile* infection by stool antigen/toxin testing starting at week 2. Another participant experienced clearance by week 4. Both participants

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remained negative through week 12. The third participant did not have *C. difficile* clearance, although he did report more formed stools. There were no adverse effects reported in this study. Microbiome and metabolomics analyses are pending.

Conclusion: The SCD diet appears to be safe and possibly efficacious in pediatric patients with *C. difficile* colonization. Further studies are warranted to help determine the role of diet in the treatment of *C. difficile*.

Table 1. Patient demographics and outcomes

Study participant number	Age	Underlying diagnosis	No. recurrent *C. difficile* episodes prior to study entry	*C. difficile* clearance during study	Study week at which *C. difficile* testing negative	Predisposing risk factors for *C. difficile*	Previous *C. difficile* treatment
1	2 years, 5 months	Hurler syndrome s/p BMT	3*	Yes	2	History of prolonged hospitalization History of immunocompromised state Prior antibiotic use for non-*C. difficile* diagnosis	Metronidazole PO Vancomycin PO Pulse vancomycin PO Fecal microbial transplant
2	16 years	Crohn's disease	1	No	N/A	Inflammatory bowel disease Gastric acid suppression	None
3	2 years	Pre-B cell ALL s/p BMT	6	Yes	4	History of prolonged hospitalization History of immunocompromised state Prior antibiotic use for non-*C. difficile* diagnosis	Metronidazole PO Vancomycin PO

*Number of *C. difficile* episodes documented at Seattle Children's Hospital. Patient reportedly had multiple previous recorded *C. difficile* infections at a different institution.

180 ***PRESERVING THE CENTRAL LINE IN INTESTINAL FAILURE: SHOULD WE BE TREATING THROUGH UNCOMPLICATED CLABSI REGARDLESS OF ORGANISM?*** *Jennifer Lee[1], Conrad Cox[2], Iris Jo[3,4], Christina Hunley[5], Linda Lazar[3,4], Sandra Arnold[6,4]. [1]Pediatric Gastroenterology, Nationwide Children's Hospital, Columbus, OH; [2]Pediatric Gastroenterology, Vanderbilt University, Nashville, TN; [3]Pediatric Gastroenterology, University of Tennessee Health Science Center, Memphis, TN; [4]Le Bonheur Children's Hospital, Memphis, TN; [5]University of Tennesse Health Science Center, Memphis, TN; [6]Infectious Disease, University of Tennessee Health Science Center, Memphis, TN*

Purpose of Study: Patients with intestinal failure (IF) require parenteral nutrition (PN) through a long-term central venous line (CVL) and are, therefore, at risk for central line associated blood stream infections (CLABSI). This is a secondary analysis of a study designed to identify children with IF at low risk for CLABSI who may not need hospitalization when presenting with fever. In the current analysis, we describe the etiology of CLABSI in IF patients. In addition, we determine if duration of time a CVL has been in place, previous CLABSI and number of previous CLABSI in the CVL, or last organism isolated from the CVL affect the risk of infection and the organism isolated during the particular episode.

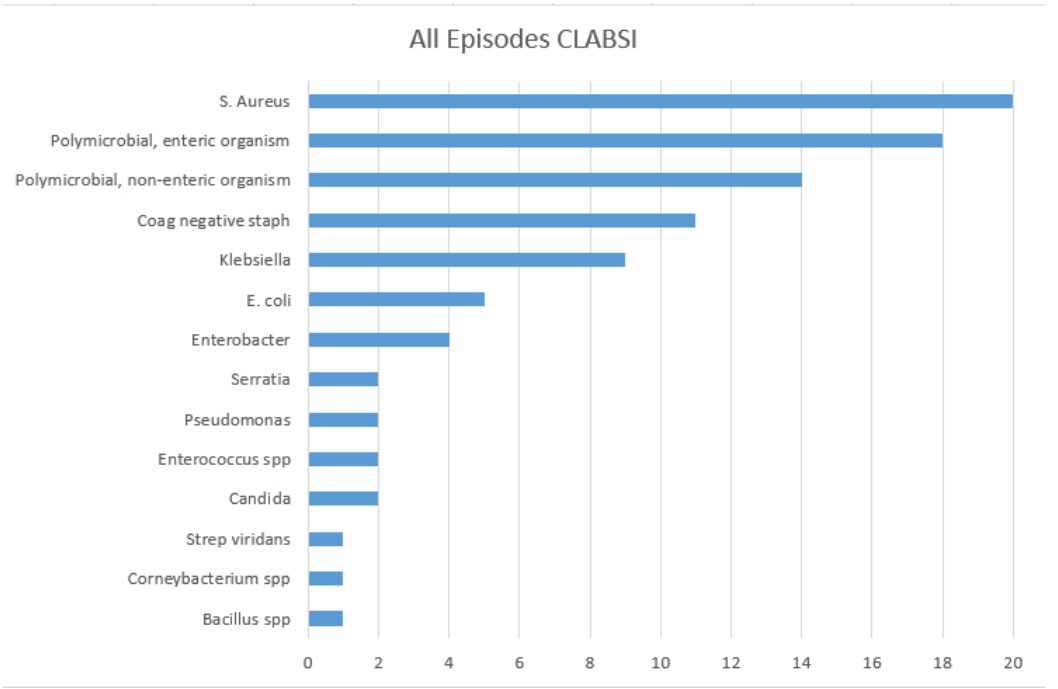
Methods Used: This retrospective cohort study includes children with IF and CVL presenting with fever to an ambulatory or ED setting at an urban free-standing children's hospital between 2010 and 2017. Data were collected by manual chart review. The unit of analysis for the study is episodes of fever, with one or more episodes per patient described. We use descriptive statistics for etiology for CLABSI in current and previous episodes of CLABSI in the same CVL. Mann-Whitney U was used to compare median line duration for febrile episodes with and without CLABSI. Chi-square analysis was used to compare risk of CLABSI in previously infected and uninfected CVL and between CVLs with single prior versus multiple prior CLABSI.

Summary of Results: There were 37 patients with 155 febrile episodes identified and analyzed. Among the 155 episodes, 92 (59.4%) were associated with CLABSI. Figure 1 displays etiology of CLABSI for all episodes. Monomicrobial

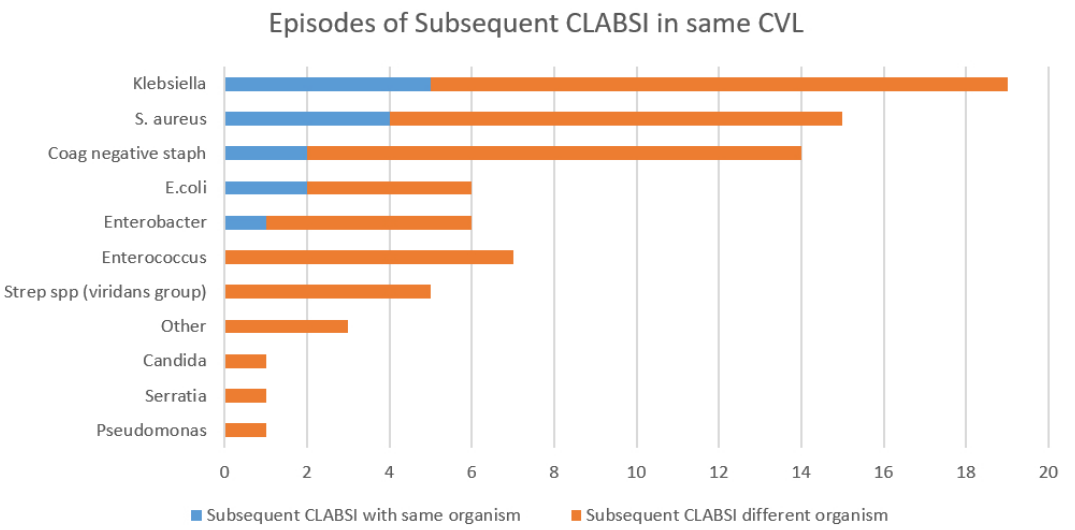
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infections were most common (65%) with *Staphylococcus aureus* most frequently isolated, followed by coagulase negative staphylococci (CoNS) and *Klebsiella* species. There were several polymicrobial infections with multiple enteric organisms or enteric organisms with *S. aureus* or other skin flora. Median CVL duration, in months, was not different between CLABSI and non-CLABSI episodes (4.5 [IQR 2.3 -10.2] versus 8.2[IQR 3.1-13.8] respectively, p=0.09). Among episodes of CLABSI, 78 (84.8%) occurred in a CVL with one or more prior infections. Among previously infected CVLs, 14/78 (17.9%) were infected with the same microorganism as the most recent prior infection (4/15 *S. aureus* (27%), 2/14 CoNS (14%), 2/6 *E.coli* (33%), 5/19 *Klebsiella* species and (26%), 1/6 *Enterobacter* species (17%)). Figure 2 displays etiology for subsequent CLABSI in the same CVL. CLABSI was diagnosed at a similar rate in CVLs with prior infection (45/78, 58%) and CVLs without prior infection (47/77, 61%, p=0.7) CVLs with one prior CLABSI (26/47, 55%) were infected at a similar rate to CVLs with more than one prior CLABSI (19/31, 61%, p=0.7).

Conclusions: Prior infection (and number of prior infections) in the same CVL, and duration of time a CVL has been present do not appear to affect the risk CLABSI during subsequent episodes of fever in children with IF receiving PN through a CVL. In our population, skin organisms, especially *S. aureus*, were the predominant pathogens. Polymicrobial infections were common although many of these included CoNS which could be contaminants. Analysis of etiology of CLABSI in previously infected CVLs indicates that the same organism grows infrequently in subsequent infections, even with *S. aureus* (for which CVL removal is recommended). Larger, multicenter studies are needed to determine safety of retaining CVLs, even for organisms with a high risk of recurrence such as *S. aureus*.



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181 ***CHARACTERISTICS OF H. PYLORI INFECTION IN CHILDREN ATTENDING AN URBAN SAFETY NET HOSPITAL IN THE UNITED STATES.*** *Aditi Mittal[1], Dennis Super[1], Reema Gulati[2]. [1]Pediatrics, Metrohealth Medical Center/CaseWestern Reserve University, Cleveland, OH; [2]Pediatric Gastroenterology, Hepatology and Nutrition, Metrohealth Medical Center/CaseWestern Reserve University, Cleveland, OH*

Background: H. pylori infects gastric mucosa in human beings and is an important cause of peptic ulcer disease and gastric cancer worldwide. Overcrowding, poor sanitation, and maternal infection are considered major risk factors. Infection is commonly acquired during childhood and its prevalence increases with age (5% in younger children versus 25% in children aged 6-19 years in the United States). Large population-based studies have described demographic factors like race/ethnicity and socioeconomic factors to be related to prevailing disparities in H. pylori infection in adults in the United States (US), with a higher prevalence of infection in African-American and Hispanics compared to Caucasians. There is a paucity of such data in children in the United States. Our safety net public hospital system serves a highly diverse population and, hence, we designed this study to describe the association of H. pylori infection with various demographic and clinical characteristics in children at our institution with special emphasis on variables associated with poverty and foreign-born status.

Methods: All children, 0-18 years old, who presented with persistent upper gastrointestinal (GI) symptoms and were tested for H. pylori infection between 2009-2017 at our institution were included in this retrospective cohort study. Various types of testing were performed per clinician discretion for diagnosis of H. pylori e.g. serology test, stool antigen test, urease test and/or histopathology following upper GI endoscopy. Based on test results, we divided our patients into two groups- H. pylori positive (cases) and H. pylori negative (controls). A chart review was performed to obtain the following socio-demographic and clinical data for each patient: - age, gender, race, insurance type, preferred language, BMI z-score, and hemoglobin. Chi-square test, t-test, and multiple logistic regression were used for analyzing the data. For the multiple logistic regression, the dependent variable was H. pylori status (positive versus negative) with the independent variable being government insurance, gender, English as the primary language, BMI z-score <-0.10, African-American race, Hispanic ethnicity, and patient age (years).

Results: Of the 1380 patients tested for H. pylori at our institution during the 9-year period, 226 (16.4%) tested positive for infection. The patients with H. pylori were more likely to have government insurance status (87.1%, 78.7%), female gender (68.1%, 59.9%), anemia (19.2%, 13.0%), African-American race (36.7%, 26.1%) and older age (13.8± 4.4, 12.3± 4.7 years; mean ± SD) (all p values <0.05, two-tailed). The groups were similar for the primary language spoken at home, and BMI. In the multivariate analysis, the following adjusted odds ratios (95% CI) were significant independent risk factors for H. pylori disease: government insurance status [1.950 (1.271, 2.994), p=0.002], African-American race [1.568 (1.097,2.243), p=0.014] and age (years) [1.088 (1.050,1.127), p=<0.001]. English as the primary language spoken at home was protective against H. Pylori infection [0.521 (0.337,0.805), p=0.003].

Conclusion: In our study, H. pylori infection in children was associated with African-American race, government insurance status- a surrogate marker of low socioeconomic status; and foreign-born status as reflected by English language (as

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preferred spoken language) being protective for the disease. While these risk factors are well known in a developing country, this study expands our understanding of the effect of prevailing childhood health disparities in an urban mid-western US city playing a crucial role in the burden of GI diseases associated with H. pylori. Such knowledge, will not only be helpful in early identification and treatment of H pylori in high-risk children but may also prove useful in developing targeted, public-health focused interventions to reduce the transmission and perpetuation of H pylori infection in vulnerable children.

182 ***CLONAL PROLIFERATION OF PRO-INFLAMMATORY GUT BACTERIA AND ALTERATION IN GUT PERMEABILITY ARE ASSOCIATED WITH CARDIOPULMONARY BYPASS SURGERY IN CHILDREN.*** *Jeffrey Salomon*, *Amber Price*, *Chandrashekhara Manithody*, *Ajay Jain. Pediatrics*, *Saint Louis University*, *Saint Louis*, *MO*

Background: The intestinal microbiome has a symbiotic relationship with the human body. External insults, such as sepsis, can change the microbiome resulting in reduced microbial diversity, abundance, and an increase in pro-inflammatory bacteria. These microbial alterations disrupt the intestinal barrier and can perpetuate cytokine mediated systemic injury. Patients with cardiopulmonary bypass (CPB) are known to have secretion of cytokines and clinical findings similar to those seen with sepsis, but without infectious etiology. Considering these findings, we hypothesized that surgery with CPB induces changes in gut microbiota and gut permeability, incrementally adding to morbidity.

Design/Methods: We included a prospective cohort of patients; 1 month to 18 years of age assigned in 2 arms: surgery with CPB and surgery without CPB (control). A pre-surgical stool sample was obtained in the hospital prior to surgery (S). A second stool sample was obtained 3-5 days post-surgery (PS). Blood samples were collected pre-operatively and post-operatively at 24 hours and 48 hours. Stool DNA was extracted using the Qiagen Fecal DNA extraction kit. A library prep for all samples was created followed by bacterial DNA sequencing on the Illumina platform for 16S v3-v4 region and processed into a table of exact amplicon sequence variants present in each sample using DADA2 software.

Results: 29 patients were enrolled in the study, CPB=17, Control=12. There was no statistical difference in bacterial richness between S and PS samples in either group. There was statistical difference in bacterial diversity between the CPB and control arms ($p=0.0013$) as well as between S and PS samples ($p=0.04$) in the CPB arm. At baseline, there were far greater pro-inflammatory bacteria in the CPB arm compared to controls, and this increased further following CPB. There was no difference in baseline markers of intestinal barrier function - Fatty Acid Binding Protein 2 (FABP2), claudin-3 or citrulline in either arm. However, there was a statistically significant increase in FABP2 ($p=0.0013$) and claudin-3 ($p<0.0002$) in the CPB arm compared to controls. There was also a significant decrease in citrulline ($p=0.037$) in the CPB arm compared to controls at the 24-hour post-op sample time. A larger difference between pre and post samples was noted in the CPB arm ($p=0.0023$) compared to the control arm.

Conclusion: Although many variables influence outcomes of surgery with CPB, our study offers novel evidence that CPB alters gut microbial diversity and results in proliferation of pro-inflammatory microbiota which could contribute to morbidity. While further studies are needed to validate and delineate mechanistic pathways, results from this study present a paradigm change in our understanding of CBP driven injury and opens the potential for diagnostic and therapeutic targeting of the intestinal microbiome with such surgical procedures.

183 ***RETROSPECTIVE ANALYSIS OF RECURRENT PNEUMATOSIS INTESTINALIS IN PEDIATRIC PATIENTS: RADIOGRAPHIC DIAGNOSIS, MANAGEMENT, AND OUTCOMES.*** *Allison Ta*[1], *Michael Farrell*[1], *Andrew Trout*[2], *Jonathan Dillman*[2]. [1]*Pediatric Gastroenterology*, *Cincinnati Children's Hospital Medical Center*, *Cincinnati*, *OH*; [2]*Radiology*, *Cincinnati Children's Medical Hospital*, *Cincinnati*, *OH*

Introduction: Pneumatosis Intestinalis (PI) is a radiologic finding of small air collections[DJ1] within the wall of the intestine [2]. This finding can be segmental or diffuse with the most severe cases leading to pneumoperitoneum and portal venous gas. The theories for the pathogenesis of PI include hydrogen producing bacterial, mechanical distention secondary to intestinal obstruction or pulmonary barotrauma, and bowel ischemia [1].

Outside the neonatal period, PI is rare and has similar presenting symptomology as adults[3,4]. Management is typically conservative with bowel rest and antibiotics (78-100%) with rare patients requiring surgical intervention (0-12%).

Prior studies of pediatric PI have small sample sizes and have not reported long term follow up on patients with PI to evaluate their future risk for further complications. The aim of this study was to identify pediatric patients outside of the neonatal period with single episode and recurrent PI to evaluate risk factors, clinical management, and outcomes.

Methods: A retrospective chart review of all patients age >6 months at Cincinnati Children's Hospital Medical Center with an imaging diagnosis of PI from Jan 2017-Dec 2018. We defined recurrent PI as new findings of PI after resolution by imaging or at least 1 month between prior episodes of PI. All imaging studies within the prior 10 years were evaluated for episodes of PI. Patient demographics, clinical background, and clinical outcome were evaluated.

Results: Forty-one children were included in the study with a total of 57 episodes of PI. Mean age was 7.4 years (range: 6

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months to 20 years), and 65% were male. Demographics for the population are presented in Table 1. Presenting symptoms included: abdominal distention, emesis, diarrhea, and bloody stool. Preceding events included gastroenteritis(n=10), urinary tract infections(n=8), or worsening respiratory symptoms(n=4) or acute clinical decompensation(n=5). Management of PI was NPO ranging from 4-7 days and antibiotic treatment averaging 7 days, typically included broad spectrum antibiotics. There were 14 patients (34%) that had recurrent PI accounting for 30 episodes. Time between episodes averaged 1 year (range: 18 days to 9 years). Recurrent PI was associated with longer NPO time, longer length of hospitalization, and higher rates of surgery (Table 1). Surgical intervention included exploratory laparotomy(n=3) and partial colectomy(n=2). Risk factors for recurrent PI included prolonged feeding intolerance, acuity of presentation, and preceding bacterial infection. Overall morbidity for recurrent PI was more significant (including toxic mega colon, parental nutrition dependence) however mortality was equivalent.

Conclusion: Pneumatosis is an imaging finding of intestinal injury that can require surgical intervention. Patients with recurrent PI are more likely to have prolonged hospitalizations and develop more comorbidities.

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	Episodes of Pneumatosis	
	Single	**Recurrent**
Patients	**27**	**14**
Demographics		
Mean Age	7.6	7.2
Male	16	11
Clinical History		
Healthy	3	0
Cerebral Palsy	5	7
Short Bowel Syndrome	2	2
Congenital Heart Disease	4	1
Transplant (organ or blood)	12	5
Immunosuppression	15	7
Diet prior to PI		
Tube feeding	15	11
Parental Nutrition	8	9
Preceding Events		
Gastroenteritis	4	6
Urinary Tract Infection	2	6
Respiratory Failure	1	3
Acute Decompensation	2	3
Cases of PI	**27**	**30**
Symptoms		
Asymptomatic	4	1
Fever	5	8
Abdominal Distention	12	22
Emesis	9	10
Bloody Stool	6	6
Peritonitis	0	3
Artificial airway	3	13
Outcomes		
Average NPO time (days)	5	18
Average Time to recurrence (days)	-	356
Length of Stay (days)	31	85
Change in Feeding (# patients)	1	4
Surgery (# patients)	2	6
Mortality (# patients)	4	2

TABLE1: Patient Demographics, Clinical History and Outcomes for Single Episode and Recurrent Pneumatosis.

184 ***COMPARISON OF INPATIENT AND OUTPATIENT FECAL MICROBIOTA TRANSPLANT IN PEDIATRIC PATIENTS WITH CLOSTRIDIUM DIFFICILE INFECTIONS.*** *Nicole Zeky*, *Sussette Gonzalez*, *Katie Vance*, *Elizabeth McDonough*. *Our Lady of the Lake Children's Hospital*, *Baton Rouge*, *LA*

Purpose: *Clostridium difficile* (*C.diff.*) is a gram positive anaerobic bacillus that commonly resides as part of the colonic microbiome, but a disruption in the gut microbiome balance may lead to *C. diff.* infection (CDI). Fecal microbiota transplant (FMT) is now used as the treatment for the third recurrence of CDI in adult patients. FMT has shown a 90% success rate in adult studies, but there is minimal data on pediatric patients. The purpose of this study is to compare the inpatient and outpatient use of FMT in the eradication of CDI in pediatric patients between the ages of 12 months and 18 years, as defined as fewer than 3 bowel movements per 24 hours within 12 weeks of the FMT. An outpatient procedure was

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defined as a procedure that occurred in the clinic, at home, or both if administered on multiple days. This study compares the efficacy of eradicating the infection and the safety, as measured by adverse effects of FMT, of the two different transplant modalities. The efforts of this research are not to develop a protocol, but rather to contribute to the limited published pediatric data on FMT for the use in pediatric CDI cases.

Methods: This study is a retrospective chart review of patient records within the Pediatric Gastroenterology outpatient clinic and Our Lady of the Lake Children's Hospital between 2012 and 2018 who were diagnosed with CDI and were treated with an FMT. Patients were identified using the ICD 9 code 008.45 or ICD 10 code A04.72 CDI diagnosis codes. Data were analyzed for statistical significance using parametric and nonparametric tests, with significance set at $p < 0.05$.

Results: Since 2012, 272 patients have been diagnosed with CDI at the Pediatric Gastroenterology Clinic or Our Lady of the Lake Children's Hospital. Of these patients, 34 patients have undergone a total of 45 FMTs. Eight of the 14 (57%) patients who received their first FMT in the outpatient setting had a CDI recurrence, while 2 of 20 (10%) of patients first treated in the inpatient setting had a CDI recurrence within 12 weeks of the FMT (p value 0.003). When exluding those done entirely at home, the outpatient failure rate remained high with 5 of those 8 having recurrence. There were no significant differences in adverse events (29% vs 20%), hospitalizations (36% vs 35%), age at transplant (5.1 years vs 5.6 years), or insurance status (21% Medicaid vs 30% Medicaid) for outpatient compared to inpatient FMT, respectively. Of the patients who received outpatient FMT, 2 of 14 (14%) patients received the full FMT within the clinic, while the remaining 12 (86%) patients received some or all of the FMT at home. There was a signficant difference between the average inpatient cost of a FMT versus the outpatient FMT ($14,315 and $801, respectively).

Conclusion: Inpatient pediatric FMT had a success rate (90%) similar to what has been reported in adult FMT studies; however, more than half of the pediatric patients who received FMTs in the outpatient setting had a CDI recurrence within 12 weeks of the FMT. There was no difference between the two settings adverse events that were recorded. There was, however, a significant difference in the average cost between the two settings. When further evaluating the patients risk factors, medications at the time of FMT, and concurrent use of probiotics, there was no significant difference found in the success of the FMT.

	Inpatient (n=20)	Outpatient (n=14)
Male	8	8
White	4	1
African American	16	12
Hispanic	0	1
Medicaid	6	3
Have ≥1 CDI Risk Factor	3	7
On Probiotics	11	12
Non CDI Antibiotics	8	3
On Acid suppression Medications	7	8

Table 1. Patient demographics comparing the inpatient and outpatient FMT. (*denotes a p value <0.005)

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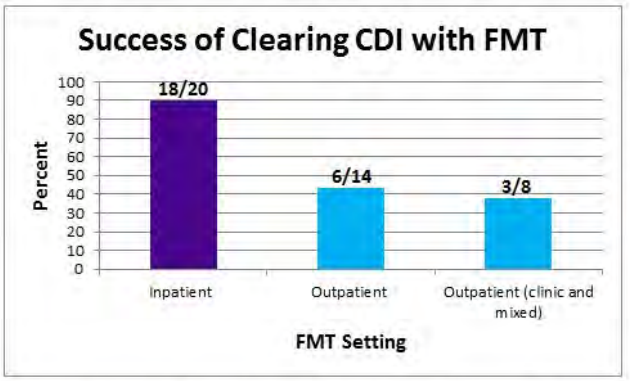


Figure 1. Comparison between inpatient and outpatient FMT success. Eighteen of the twenty inpatient FMTs had no recurrence within the 12 weeks following FMT delivery (90% success). Only 6 of the 14 FMTs in the outpatient setting were successful (43%). When excluding those FMTs done exclusively at home, the success rate remained low at only 38%. (p value 0.003 and p value 0.0038, respectively)

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(p value 0.003 and p value 0.0038, respectively).

185 ***THE DYNAMICS OF TISSUE OXYGENATION, QUANTIFIED USING PHOSPHORESCENCE QUENCHING, IS ALTERED BY INTESTINAL INFLAMMATION.*** *Wenjing Zong[1], Elliot Friedman[2], Ikbal Sencan[4], Sava Sakadzic[4], Sergei Vinogradov[3], Gary Wu[2]*
[1]Gastroeneterology/Hepatology/Nutrition, Children's Hospital of Philadelphia, Philadelphia, PA;
[2]Gastroenterology/Nutrition/Hepatology, University of Pennsylvania, Philadelphia, PA; [3]Biophysics and Biochemistry, University of Pennsylvania, Philadelphia, PA; [4]Optics Division, MGH/HMS/MIT Athinoula A. Martinos Center for Biomedical Imaging, Department of Radiology, Harvard Medical School/MGH, Boston, MA
Inflammatory bowel disease is often associated with a dysbiotic microbiota, in part due to the oxidative nature of inflammation. It's possible that juxtaposition of epithelium next to an anaerobic lumen may perpetuate tissue hypoxia and colitis. Although hypothesized, oxygen concentrations in inflamed intestine has not been previously reported. We have previously quantified tissue and luminal oxygen levels throughout the healthy gut lumen (Albenberg, LA, et al. *Gastroenterology* 2014 and Friedman, ES et al. *PNAS* 2018). For the first time, we characterized the dynamics of tissue oxygenation in the setting of colitis.

Colonic tissue oxygen measurement using the phosphorescence quenching method and water-soluble probe Oxyphor PdG4 has been described previously (Albenberg, LA, et al. *Gastroenterology* 2014). We quantified tissue oxygenation in the cecum under inhalation of ambient air and pure O_2 in mice anesthetized with 1.5% isoflurane. Experiments were performed in the female B6 mice, ages 8-12 week. Colitis group was treated with 3.5% dextran sodium sulfate (DSS) for 6 days to induce colonic inflammation.

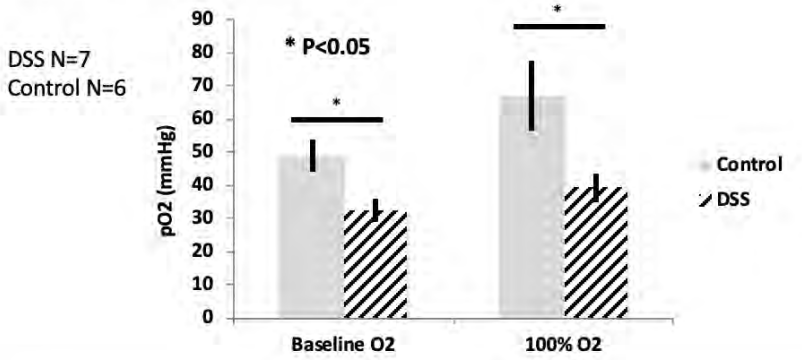
We developed an *in vivo* real time imaging system to assess vascular disruptions during inflammation. A method was developed to immobilize the cecum for microscopy using a 3-D printed stage that also minimizes trauma and dehydration of the tissue during imaging. Preliminary images of cecal vasculature using FITC-dextran were captured at varying depths into cecal tissue to create an intestinal angiogram in healthy B6 female mice.

In this study, we successfully induced acute severe colitis in a murine model. Tissue oxygen in cecal tissue showed a baseline pO_2 of 49 mmHg +/- 4.8, similar to previously reported results (Albenberg, LA, et al. *Gastroenterology* 2014). Inhalation of 100% oxygen led to a rapid increase in tissue pO_2 levels that reached a new steady state of 67 mmHg +/- 10.5($p<0.05$ for baseline vs pure oxygen) (Figure 1). In the setting of DSS colitis, baseline pO_2 was reduced to 32 mmHg +/- 3.5. Inhalation of pure oxygen did not lead to a significant increase where the average plateau reached was 39.4 mmHg +/- 4.3 (Figure 1). There is a statistically significant difference in the baseline oxygenation between control and DSS subjects ($p<0.05$) as well as under 100% oxygen condition ($p<0.05$).
A 3-D angiogram of the cecal vasculature in health mice using FITC-dextran (Figure 2) showed larger vessels towards the serosal side of the tissue that then lead to smaller arborizing network of vessels as the depth of field imaging approached the lumen of the gut. The honeycomb pattern is likely due to the architecture of the vasculature surrounding the colonic crypts.

We show that colitis leads to a reduction in the baseline intravascular oxygen levels as well to lowering the dynamic response to the inhalation of 100% oxygen. Such a response most likely represents an alteration in vascular structure and/or integrity of the intestine associated with the development of colitis. We also demonstrated feasibility of real time *in vivo* imaging to map out the vascular architecture with high resolution in mice. Together with studies focused on characterizing the composition of the gut microbiota and metabolite production, we anticipate these imaging modalities will determine the role intestinal oxygen delivery and consumption in the development and perpetuation of inflammation.

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Figure 1: Baseline tissue O2 and response to 100% oxygen are decreased in acute DSS colitis



	Average (mmHg)		P value
	Control	DSS	Ctrl v DSS
Baseline O2	48.84 +/- 4.8	32.36 +/- 3.54	0.01
100% O2	67.15 +/- 10.48	39.44 +/- 4.3	0.01
P value baseline vs 100%	0.03	0.01	

Figure 1. Baseline cecal tissue O2 and response to 100% oxygen are decreased in acute DSS colitis

Figure 2: 3D map of cecal vasculature

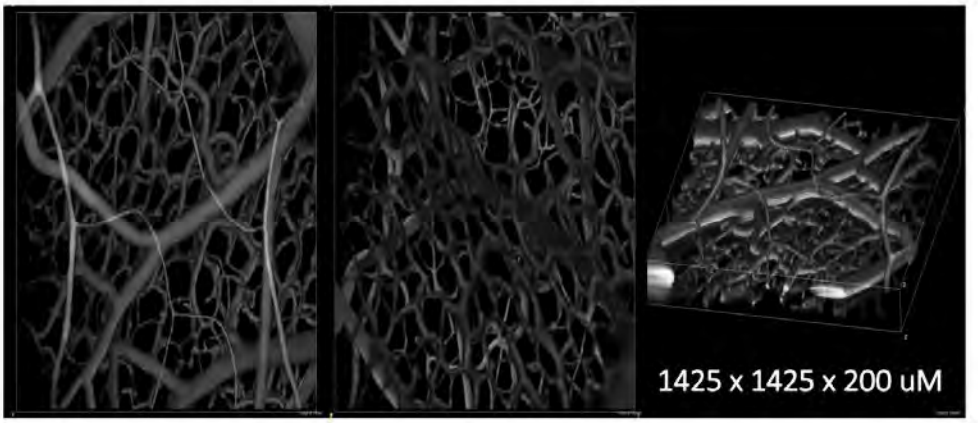


Figure 2. 3D map of cecal vasculature

PANCREAS/CELIAC/MALABSORPTION

188 ***THE INCREASING PREVALENCE OF PEDIATRIC OBESITY AT THE TIME OF CELIAC DISEASE DIAGNOSIS.*** *Gracielle Bahia[1], Hongyue Wang[2], Rebecca Abell[1]. [1]Pediatric Gastroenterolgy & Nutrition, University of Rochester Medical Center - Golisano Children's Hospital, East Syracuse, NY; [2]Biostatistics and Computational Biology, University of Rochester Medical Center, Rochester, NY*

OBJECTIVE: To demonstrate that there is an increased prevalence of obesity in pediatric patients diagnosed with celiac disease. Secondary aims were to look at the prevalence of typical and atypical symptoms at the time of celiac disease diagnosis by weight category.

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BACKGROUND: Pediatric obesity has become a global pandemic over the past decade. More obese children are being diagnosed with organic gastrointestinal conditions that historically have been associated with being underweight. Celiac disease (CD) is an immune-mediated enteropathy in genetically susceptible individuals due to a permanent sensitivity to gluten in wheat and related proteins found in barley and rye. CD clinical manifestations widely vary and can include GI symptoms as well as atypical non-GI symptoms. There is also another sub-group of patients that can be asymptomatic. This poses a challenge since CD was classically thought to present with malabsorption, growth failure, diarrhea, abdominal pain, and distension. Obese and overweight children can be often overlooked for CD screening during evaluation, even if with classic GI symptoms. It becomes even more challenging and can be missed if they have atypical non-GI symptoms or are asymptomatic.

METHODS: This was a retrospective chart review looking at patients less than 21 years of age, diagnosed with celiac disease at URMC Pediatric Gastroenterology from 01/01/2007 to 12/31/2017. Patient charts that were included were those who met the diagnosis of celiac disease based on (1) endoscopic intestinal biopsies with pathology report of either Marsh histologic grade 3 or Marsh histologic grade 1 or 2 plus presence of elevated serum tTg IgA antibodies, (2) 2012 ESPGHAN guidelines without biopsies. Patients excluded from the study were those greater than 21 years old at time of celiac disease diagnosis, those who did not meet the diagnostic criteria for celiac disease, and patients who were diagnosed with celiac disease at another institution prior to URMC initial evaluation.
Data collected from the medical record for analysis included age at CD diagnosis, weight, height, BMI, gender, race, symptoms present at diagnosis (abdominal pain, constipation, diarrhea, nausea +/- vomiting, growth issues, fatigue, headache, anxiety, depression, attention/focus problems). Patients were then grouped into 4 weight status categories based on their BMI percentile of the CDC sex specific BMI for age growth charts.

RESULTS: 148 out of 196 patient charts met inclusion criteria for celiac disease. Age of diagnosis was a mean age of 10 years, ranging between 1.3 years to 18 years. 100 patients were female (68%) and 48 were male (32%). 93% of patients were Caucasian (n=137), 0.68% were African-American (n=1), 0.68% Asian (n=1), 2.03% were Hispanic (n=3), and 4% were other (n=6). 19 patients were identified with obesity (group 1, age range 2 to 18 years, average 11 years) with pediatric obesity prevalence of 13%. 4 patients were identified as overweight (group 2, age range 4 to 14 years, mean age 10 years), with a prevalence of 3%. 116 patients were classified as normal weight (group 3, age range of 1.3 to 17 years, mean age 9.9 years) with a prevalence of 78%. 9 patients were underweight (group 4, age range 2 to 12 years, mean age 8.4 years) with a prevalence of 6%. When looking at the characteristics of patients with obesity, 13 patients were female (68%) and 6 were male (32%); 18 patients were Caucasian (95%) and 1 patient was other. Symptom prevalence at the time of celiac disease diagnosis was recorded, with the most common symptoms being abdominal pain (61% patients, n=91) and constipation (39%, n=57). When looking at patients with obesity, abdominal pain (63% patients, n=12) and nausea and/or vomiting (42%, n=8) were the most common symptoms, with constipation as the 3rd most common symptom (37%, n=7). Anxiety and depression occurred more commonly in obese and overweight children.

CONCLUSION: This study demonstrated a 13% prevalence of pediatric obesity at the time of CD diagnosis. Interestingly, the prevalence of children with normal weight (78%) far exceeded the prevalence of underweight children (6%) at the time of CD diagnosis. This challenges the classic picture of celiac disease patients being underweight at diagnosis.
This study also looked at the prevalence of symptoms at the time of diagnosis. Among all weight groups, the most common symptoms were abdominal pain and constipation. In patients with obesity, in addition to abdominal pain and constipation, symptoms of nausea and vomiting were more common.
This study suggests that the face of pediatric CD is changing. It is vital not to overlook pediatric patients with obesity, especially if they have symptoms of abdominal pain, nausea and/or vomiting, or constipation.

190 ***LABORATORY STEWARDSHIP TO ENCOURAGE APPROPRIATE SCREENING FOR CELIAC DISEASE.***

Sean Bingham[1], Nikki Collier[2], Leslie Willis[3], Rebecca Baker[4], Kelly Sandberg[1], Michael Bates[1]. [1]Gastroenterology and Nutrition, Dayton Children's Hospital, Dayton, OH; [2]Value Improvement, Dayton Children's Hospital, Dayton, OH; [3]Genetics, Dayton Children's Hospital, Dayton, OH; [4]Laboratory Services, Dayton Children's Hospital, Dayton, OH

Celiac disease is a relatively commonly diagnosed disorder, but it is thought to be relatively underdiagnosed because of lack of recognition. Furthermore, the appropriate, cost-effective approach to screening for celiac disease is often poorly understood by providers outside of gastroenterology, in part because of evolving national/international recommendations for serological screening. North American celiac disease screening guidelines for children over 2 years of age agree with the use of tissue transglutaminase IgA as the standard for serologic evaluation in IgA-sufficient patients (Hill et al., J Pediatr Gastroenterol Nutr 40:1, 2005; Rubio-Tapia et al. Am J Gastroenterol 108:656, 2013). Historically, screening for celiac disease using a commercially available panel that interrogates 5 serological parameters was used by providers at our

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hospital. In order to encourage adherence to national guidelines and decrease costs, the Division of Gastroenterology and Nutrition and the hospital's Laboratory Stewardship Committee have collaborated with several initiatives that have resulted in significant changes in provider ordering practices. The clinical significance and financial impact of appropriate screening were communicated with internal and community providers via publications, lectures, and outreach liaisons. An alert message added to celiac screening electronic orders also prompted appropriate screening lab selection. These interventions achieved a consistent increase in appropriate screening labs and diminished use of excessive screening lab panels (Figure). The percentage of patients tested using tissue transglutaminase IgA without other serological markers increased from 20% in 2015 to 81% to date in 2019. During this time the total volume of testing has increased by 54% from 2015 to 2018, suggesting increasing awareness of the possibility of celiac disease in patients with gastrointestinal or nutritional concerns. As a secondary cost saving intervention and to decrease testing turnaround time, the measurement of four celiac serological parameters was brought in-house. Internal processing of the lab panels saved the institution $324.98 per screening panel (when needed for patients under 2 years of age). By using appropriate testing, there was a savings of approximately $409.17 per screening test. The combined savings of these interventions averaged $292,838 in reference laboratory charges per year over two years, and patients benefited from an annual $337,780 reduction in total charges. Thus, the overall total estimated costs of testing for celiac disease have decreased significantly even with an increased amount of testing due to increased awareness.

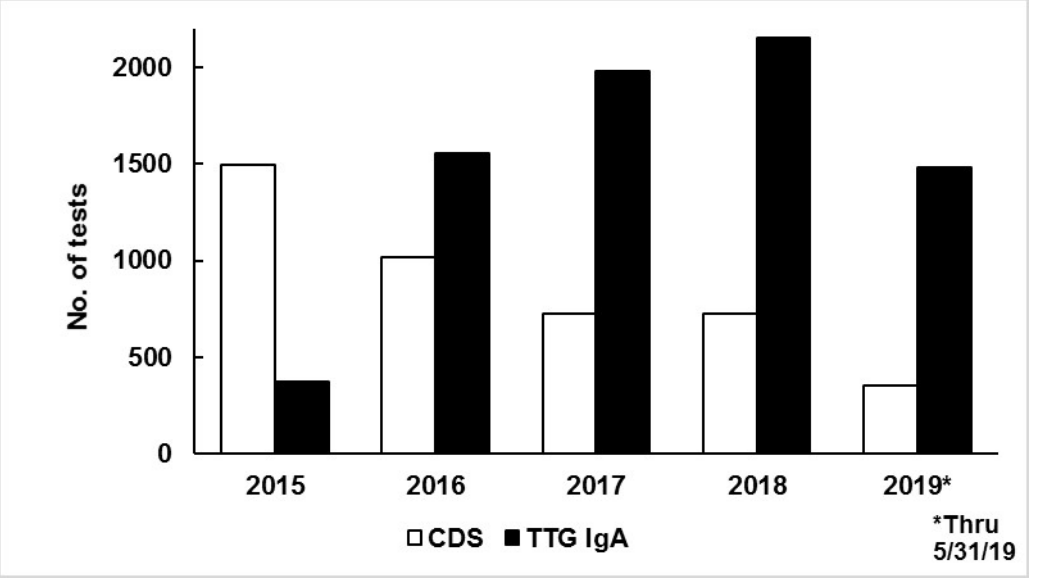


Figure: Number and type of celiac disease serological tests (CDS, celiac disease screening panels; TTG IgA, tissue transglutaminase IgA), January 2015 to May 2019.

191 ***ACID SUPPRESSION MEDICATIONS AND ANTIBIOTICS ADMINISTERED IN INFANCY ARE ASSOCIATED WITH CELIAC DISEASE.*** *Michael Boechler[1,2], Apryl Susi[2], Philip Rogers[1], Elizabeth Hisle-Gorman[2], Gregory Gorman[1,2], Cade Nylund[1,2]. [1]Walter Reed National Military Medical Center, Bethesda, MD; [2]Uniformed Services University of the Health Sciences, Bethesda, MD*

Background: The intestinal microbiota is believed to be one of the factors associated with the pathogenesis of celiac disease. This association is likely explained by early microbiome alterations which lead to immune dysregulation. Commonly prescribed medications in infancy known to perturb the microbiome include antibiotics and acid suppression medications such as proton pump inhibitors (PPI) and histamine-2 receptor antagonist (H_2RA). Antibiotics in early life are known to be associated with later development of immune mediated conditions, but it is not known whether antibiotics, PPIs, H_2RAs are associated with development of celiac disease. We sought to investigate the association of PPI, H2RA, and antibiotic prescriptions in the first 6 months of life with an early childhood diagnosis of celiac disease.

Design/Methods: A retrospective cohort study was formed using the Military Healthcare System (MHS) database. Children who had a record of birth in the MHS, followed for at least one year, and had a newborn hospital stay of ≤7 days were included. Outpatient prescription records were used to assess whether an antibiotic, PPI, or H2RA had been prescribed during the first 6 months of life. International Classifications of Diseases ninth revision codes identified children with an

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outpatient visit for celiac disease. Cox proportional hazards regression was used to determine adjusted hazard with celiac disease as the dependent variables and PPIs, H_2RAs, antibiotics, sex, prematurity, and Cesarean section birth as independent variables.
Results: 968,468 children met the inclusion criteria for this study. 49% were female, 26% were born via Cesarean section, and 4% were premature. 8% had a prescription for a H_2RA, 19% for an antibiotic, and 2% for a PPI. The median length of follow-up was 4.6 years, with a range of 1-13 years. There were 1,704 children diagnosed with celiac disease during the study period. The median age (interquartile range) at diagnosis for children in the cohort of celiac disease was 3.5 (1.8-6.1) years. After adjustment PPI, H_2RA and antibiotics were all associated with a statistically significant increase in hazards for celiac disease (See Table 1).
Conclusion: There is an association between both antibiotic in the first 6 months of life with the development of celiac disease. PPIs and H_2RA administered in the first six months of life were highly associated with the development of early onset celiac disease. Limitations include the possibility of prescriptions being a surrogate for a separate exposure such as infection. It is also possible that gastroesophageal reflux may be an early manifestation of celiac disease. These findings support the link between early microbiome perturbations and immune dysregulation leading to celiac disease. Modifiable preventative factors, such as medication stewardship, need to be addressed to decrease the incidence of celiac disease.
Disclaimer: The opinions and assertions expressed herein are those of the authors and do not necessarily reflect the official policy or position of the United States Army, the United States Air Force, the United States Navy, the Uniformed Services University or the Department of Defense.
Table 1 Adjusted Hazard Ratios for the Development of Celiac Disease

Exposure	Adjusted Hazard Ratio (95 % Confidence Interval)
Antibiotics	1.14 (1.02-1.28)
Histamine-2 receptor antagonist	1.94 (1.67-2.26)
Proton pump inhibitor	2.23 (1.76-2.83)
Female	0.82 (0.70-0.96)
Prematurity	1.06 (0.84-1.35)
Cesarean section	1.03 (0.93-1.15)

192 ***CHARACTERIZATION OF ETIOLOGIES, COMMON FEATURES, AND NOVEL THERAPY OF PROTEIN-LOSING ENTEROPATHY: FINDINGS FROM A SINGLE-CENTER LYMPHATIC IMAGING AND INTERVENTION PROGRAM COHORT.*** *Jefferson Brownell[1], Petar Mamula[1], David Biko[2], Yoav Dori[1]. [1]Pediatrics, Children's Hospital of Philadelphia, Philadelphia, PA; [2]Radiology, Children's Hospital of Philadelphia, Philadelphia, PA*
Background: Protein-losing enteropathy (PLE) is a debilitating disorder of intestinal lymphatic flow, in which protein-rich lymph leaks into the lumen, leading to symptoms of malabsorption and malnutrition. We sought to characterize similarities and differences in phenotypes of patients with PLE due to different etiologies.
Methods: This is a single-center retrospective cohort study of patients with PLE due to a non-cardiac etiology who underwent dynamic contrast MR lymphangiography (DCMRL) via extremity, intranodal (IN), intrahepatic (IH), or mesenteric (M) contrast injection. Changes are reported at baseline and two weeks for patients who underwent a lymphatic embolization. Diseases were grouped by common imaging findings. ANOVA was used to compare nutritional status across etiologies.
Results: Of 92 patients who had a diagnosis of PLE and underwent imaging during the identified time range, 18 (7 female, 39%) did not have a congenital cardiac lesion or single-ventricle circulation. A large portion of the cohort (53%) were <2 years of age, with a median age of 1.2 years (range 0.5-58 years, Table 1). Three distinct disordered lymphatic phenotypes were apparent on imaging: primary intestinal lymphangiectasia (PIL), high central venous pressure (CVP), and aberrant lymphatic channels. Of the patients with PIL, 50% had an abnormal thoracic duct, compared to 75% of the high CVP group and 100% of the abnormal channel group. Lymphatic leak into the duodenum was visualized directly in seven (70%) of patients undergoing IH/M DCMRL, regardless of phenotype (Figure 1). In one patient who underwent only IN DCMRL, duodenal leak was visualized via endoscopy. Serum albumin concentration at the time of lymphatic evaluation was in the normal range in three patients (17%); the remainder had hypoalbuminemia. There was a wide range in normalized anthropometric z-scores. In patients <2 years of age, weight-for-length (WFL) z-scores ranged from -1.2 to 5.3 (median 0.85). In patients ≥2 years of age, BMI z-scores ranged from -0.56 to 1.41 (median 0.62). ANOVA did not reveal any correlation between serum albumin concentration and phenotypic group. Patients who underwent intervention (n=3) experienced subject improvement in symptoms; two of the three had improvements in albumin at two weeks.
Conclusions: This is a relatively large cohort of patients with non-cardiac PLE that has undergone lymphatic imaging

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evaluation and intervention. Based on the imaging findings in this cohort, non-cardiac etiologies of PLE can be grouped into three distinct phenotypes; these imaging findings in future patients with cryptogenic PLE may suggest an etiology. IH and M DCMRL demonstrates that regardless of etiology, lymphatic leak into the duodenum alone (as opposed to the entire GI tract) is a common feature. The patients who underwent intervention had improvement in PLE symptoms, and two of the three had improvement in serum albumin. Novel imaging techniques are useful in suggesting the etiology of cryptogenic PLE. Patients with PLE have significant variation in anthropometrics and serum albumin, and more accurate measures of nutritional status are needed. Lymphatic embolization provides improvement in symptoms and may lead to improvement in hypoalbuminemia.

Table: Characteristics of patients with non-cardiac protein-losing enteropathy

ID	Age (y)	Diagnosis	Sex	Length, cm	Weight, kg	*BMI, kg/m² (z-score)	*Weight-for-Length Percentile (z-score)	Albumin (g/dL)
1	10.7	VATER Syndrome	F	132	32.6	18.7 (0.5)		2.4
2	0.5	Trisomy 21	M	48	5.3		99.9 (5.3)	2.2
3	1.0	Noonan-Like Syndrome	M	71	13.5		99.9 (4.2)	2.6
4	16.5	Intestinal Lymphangiectasia	M	171	77.2	26.4 (1.41)		2.7
5	1.0	Tuberous Sclerosis	F	75	9.2		31.6 (-0.5)	2.5
6	0.6	Intestinal Lymphangiectasia	M	70	7.8		10.9 (-1.2)	2.9
7	6.5	Intestinal Lymphangiectasia	M	103	17.7	16.7 (0.79)		2.5
8	0.5	Intestinal Lymphangiectasia	F	62	6		19.8 (-0.9)	3.1
9	0.9	Intestinal Lymphangiectasia	F	67	7.8		56.7 (0.2)	3.5
10	0.5	Intestinal Lymphangiectasia	M	70	9		73.2 (0.6)	2.6
11	11.7	Intestinal Lymphangiectasia	M	142	43	21.3 (1.17)		2
12	16.9	Constrictive Pericarditis	M	174	70.2	23.2 (0.62)		2
13	14.8	Noonan Syndrome	F	137	35.7	19.0 (-0.29)		3.7
14	15.9	Idiopathic Chylothorax	M	168	53.8	19.1 (-0.56)		1.8
15	28.1	Plexiform Neurofibroma	M	172	68.1	23.0 (n/a)		1.7
16	0.8	Thoracic Insufficiency Syndrome	F	62	7.5		87.1 (1.1)	2.3
17	1.2	Thoracic Insufficiency Syndrome	F	66	12.2		99.9 (4)	3.4
18	58	Constrictive Pericarditis	M	178	57.6	18 (n/a)		1.8
19	0.28	Intestinal Lymphangiectasia	M	63.5	7.97		95.5 (1.7)	3.0

BMI: Body mass index.

*BMI and BMI z-score are reported for subjects between 2 and 20 years of age. Weight for length percentiles and z-score are reported for subjects <2 years of age.

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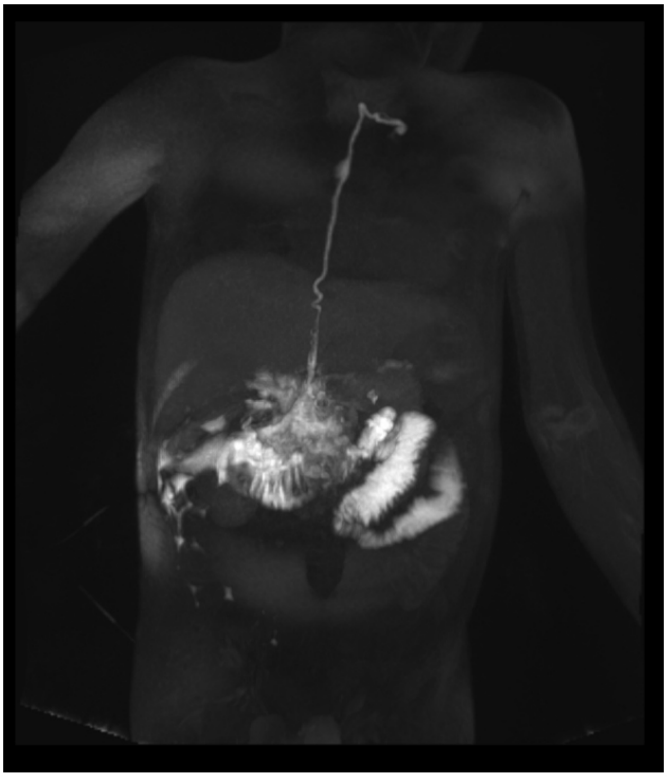


Figure 1: Dynamic contrast magnetic resonance lymphangiography (DCMRL) via hepatic injection (HI) demonstrating PLE. Contrast injected into hepatic lymphatic vessels illuminates the thoracic duct superiorly. Inferiorly, contrast fills large channels and is observed draining into the duodenum and progressing into the jejunum.

193 ***SHORT BOWEL SYNDROME DUE TO COMPLEX GASTROSCHISIS IN CHILDREN: SHOULD WE EXPECT A WORSE PROGNOSIS?*** *Veronica Busoni[2], Luciana Lerendegui[1], Paula Violo[1], Ana Grasso[1], Marina Orsi[2], Rodrigo Sanchez Claria[3], Pablo Lobos[1]. [1]Pediatric Surgery, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina; [2]Pediatric Gastroenterology, Hospital Italiano de Buenos Aires, Buenos AIres, Argentina; [3]Surgery, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina*

Introduction: Short bowel syndrome (SBS) is the main cause of intestinal failure (IF) and complex gastroschisis (CG) is the most frequent underlying cause in our population. It has been reported that children with SBS related to CG have a worse prognosis. The present work aims to analyze our results in the treatment of SBS secondary to CG and compare them with those obtained in cases of SBS related to other underlying diseases.

Methods: A descriptive, retrospective study was carried out, using data collected from institutional electronic records and the specific IF database. Inclusion criteria: patients under 18 years of age, with IF defined as parenteral nutrition (PN) dependency greater than 2 months and diagnosis of SBS. Patients were divided into 2 groups: G1 included cases of SBS associated with CG and G2 patients with SBS related to other diagnosis. Intestinal rehabilitation (sustained suspension of PN), need for intestinal transplantation and mortality were analyzed for both groups. Additionally, the influence of different exposure variables such as anatomical features of the digestive tract and adverse events related to prolonged PN, was analyzed for the group of patients with CG.

Results: We obtained a final number of 86 patients with 24 in G1 and 62 in G2. Both groups were comparable. No statistical difference in intestinal rehabilitation (G1 78.9% vs G2 57,14%) and mortality rate (G1 20.8% vs G2 20,9%) was found, although a trend to better outcome in achieving intestinal rehabilitation was observed for patients with CG. Additionally, all the patients in G1 with complete colon are currently off-TPN with a significant statistical association of this variable to intestinal rehabilitation. Regarding need for transplantation, taking into account all the patients that were transplanted as well as those that are candidates in the waiting list, both groups exhibited similar results with no statistical difference (G1 20,8% vs G2 14,5%).

Conclusions: CG is the main individual cause of IF in our population. In the context of specialized multidisciplinary treatment, our results show that the majority of patients with SBS secondary to CG survive and succeed in suspending PN, with similar results as those observed in patients with SBS secondary to other entities. The preservation of the colon whenever possible, as well as the prevention of adverse events related to PN, can improve the outcome in these patients.

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VARIABLES		Group 1 SBS secondary to CG n=24		Group 2 SBS non related to CG n=62		p value
Sample distribution by gender	N of female pt	9	37,50%	24	38,71%	1.000 (ns)
Type of case	N of referred pt from other institutions	19	79,17%	50	80,65%	1.000 (ns)
Age at the 1st evaluation	Mean age in months	11,42	DS 20.02	16.16	DS 36.59	0,5438 (ns)
Weight at the 1st evaluation	Mean weight in kg	6,72	DS 5,92	7,85	DS 9,82	0,6387 (ns)
Length of residual small bowel (RSB)	Mean lenght of RSB in cm	52,27	DS 37,006	47,41	DS 46,52	0,6754 (ns)
Presence of ileocecal valve (ICV)	N of pt with ICV	6	25,00%	24	38,71%	0,3138 (ns)
Presence of complete colon (CC)	N of pt with CC	14	58,33%	32	51,62%	0,8091 (ns)
Catheter - Associated Infections (CAI)	N of pt with at leastone episode of CAI	18	75,00%	50	80,64%	0,5660 (ns)
Venous Thrombosis (VT)	N of pt with presence of VT	10	41,67%	36	58,06%	0,2292 (ns)

References - Pt: patients, ICV: ileocecal valve, CC: complete colon, CAI: catheter associated infections, VT: venous thrombosis

194 ***PSYCHOLOGICAL NEEDS AND SERVICES IN A MULTIDISCIPLINARY CELIAC DISEASE CLINIC.***

Shayna Coburn[1,2], Meredith Rose[1], Randi Streisand[1,2], Maegan Sady[1,2], Margaret Parker[1], William Suslovic[1], Vanessa Weisbrod[1], Benny Kerzner[1,2], Ilana Kahn[1,2]. [1]Children's National Health System, Washington, DC; [2]George Washington School of Medicine, Washington D.C.

Introduction: Multidisciplinary care has been identified as a key element of celiac disease (CD) management (James, 2005). However, multidisciplinary models in CD are relatively rare and have not been assessed. This study aims to (1) describe the psychological needs of patients attending a multidisciplinary CD clinic, and (2) evaluate psychological screening results and patient experiences from their clinic visit.

Methods: Participants were parents and children attending a multidisciplinary CD clinic who consented for an ongoing clinic database study. They completed a pre-clinic survey about their child's physical and mental health history, current stressors, and psychological symptoms. In clinic, a psychologist conducted 30-minute consultations to screen for psychological symptoms. Finally, families anonymously rated their experience on a 5-point Likert scale ranging from "very dissatisfied" to "very satisfied". Analyses were conducted using SPSS to examine descriptive statistics, frequency distributions, and chi-square analyses to identify incidence and referral rates and to test for group differences by time since CD diagnosis (<3 months vs 3+ months),

Results: Sixty-nine parents (95% mothers) and children (age M(SD)=11(4.7) years; 49% diagnosed <3 months) completed pre-clinic surveys and a clinic visit with psychological consultation. On their pre-clinic survey, 56.9% of children had at least one lifetime psychological diagnosis or elevated symptom. In their clinic visit, the psychologist identified current mood/behavior concerns in 49% of patients and recommended initiating (26.6%) or continuing (20%) mental health treatment and/or neuropsychological assessment (6.7%). There were no differences in psychological concerns or referral rates based on time since CD diagnosis (see Figure 1). In post-clinic surveys (N=35), 68.1% of families identified mental health consultation as one of their top two priorities out of 5 disciplines. Visits averaged 3 hours; 91.2% reported being "very satisfied" with their experience. Suggestions for improvement included snacks, more efficient timing of rotating disciplines, and a written treatment summary.

Discussion: A multidisciplinary clinic presents an opportunity for children with CD and their families to feasibly receive specialized and personalized care. The presence of psychological symptoms and mental health referrals in approximately half of patients highlights a substantial area of need in CD treatment. These needs appear to persist regardless of elapsed time since the CD diagnosis. Ongoing data collection will enable future research to investigate longitudinal trajectories of psychological symptoms and patient-reported needs.

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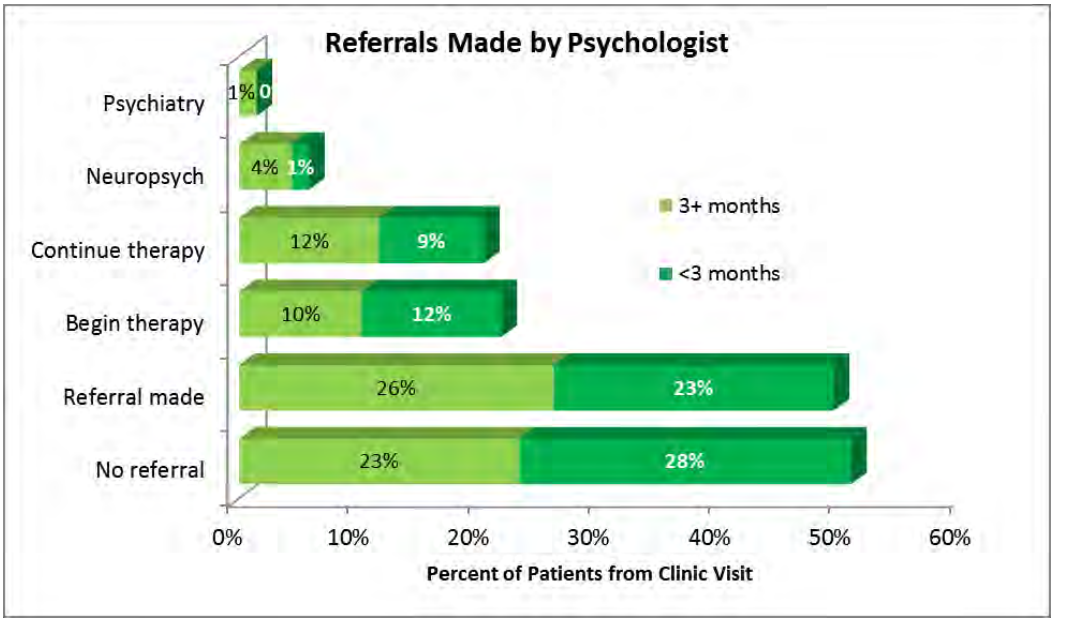


Figure 1. Referral rates for psychological treatment made by psychologist during clinic consultation, total N=69, stratified by time since celiac disease diagnosis (<3 months N=35, 3+ months N=34). There were no significant differences between groups.

196 ***MEDICAL TRAUMATIC STRESS IN PEDIATRIC PATIENTS WITH CHRONIC PANCREATITIS.*** *Addison Cuneo, Ngoc Ly, Zerofsky Melissa, Emily Perito. Pediatrics, University of California, San Francisco, San Francisco, CA*

Background: Children with chronic pancreatitis (CP) endure recurrent exposure to burdensome medical regimens, frequent hospitalizations and invasive procedures. In other pediatric populations intensive medical care has been shown to cause Pediatric Medical Traumatic Stress (PMTS) in approximately 20% of patients; and this has been associated with decreased adherence to treatment regimens, increased opioid dependence and difficult transitions to adult care. PMTS is not well understood in patients who have chronic illness and are exposed repeatedly to potentially traumatic medical events. This is the first report on prevalence and predominant symptoms of PMTS in children and adolescents with CP.

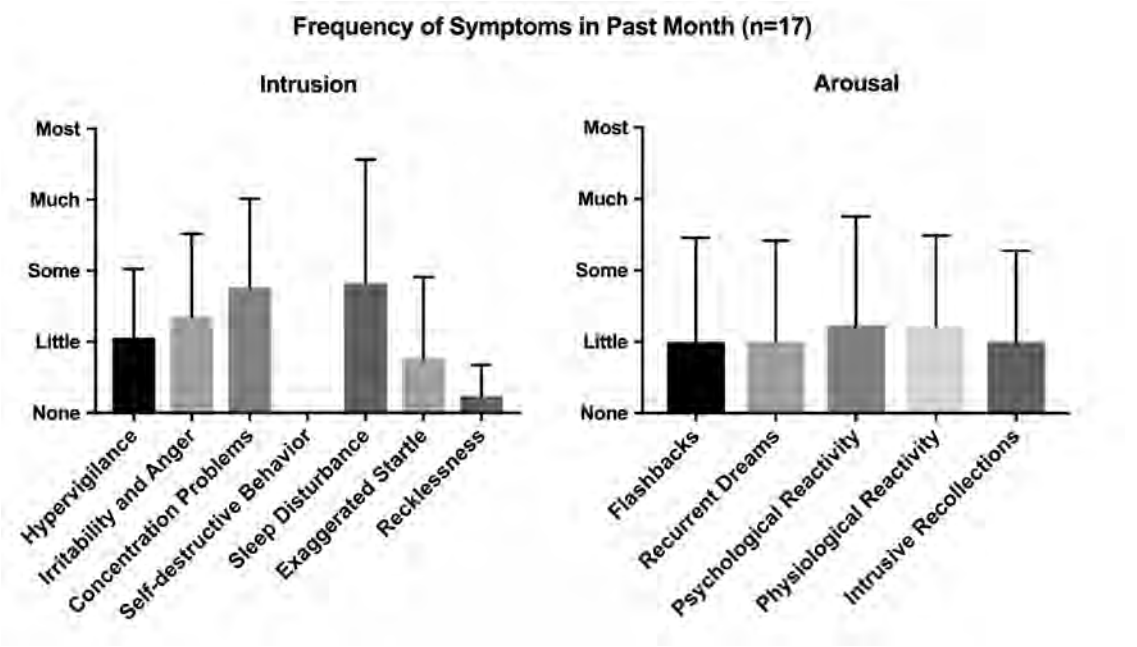
Methods: Single-center, cross-sectional survey of patients aged 8-21 with CP, using the validated UCLA PTSD-Reaction Index which assesses for exposure to a potentially traumatic event and symptoms of traumatic stress in four categories: intrusion, avoidance, negative mood, and arousal. Patients report frequency of symptoms within these categories on a scale of none (never in the last month) to most (almost every day of the last month).

Results: A total of 21 children and adolescents were studied, 67% of whom were female, with an average age of 14 years (range 8 to 19). Exposure to a potentially traumatic "very scary or painful" event during medical care was endorsed by 80% (n=17), with 38% (n=8) also reporting high perceived life threat during treatment. Of the 17 patients who were exposed to a potentially traumatic event during their medical care, 53% (n=9) had symptoms consistent with PMTS. The most frequent positive symptom categories were arousal (n=7) and intrusion (n=6). It was less common to have symptoms of avoidance (n=4) and negative mood (n=3). Within the symptom category of intrusion, patients reported higher frequencies of sleep disturbance and concentration problems over the last month. In contrast, within the symptom category of arousal, patients endorsed a more equal frequency of symptoms (see attached figure). Of the four patients who did not report exposure to a potentially traumatic event, one patient met symptom criteria for intrusion due to high reported frequency of recurrent dreams. That patient did not meet criteria for other symptom categories and the remaining three patients did not meet criteria for any symptom categories.

Conclusion: A high prevalence of children and adolescents with CP report exposure to potentially traumatic events during the course of their medical care. Of this pilot study, over half reported consequential PMTS symptoms, particularly arousal and intrusion symptoms. Within these symptom categories, patients reported frequent sleep disturbance and concentration problems. Further investigation is required to identify potentially modifiable risk factors for PMTS, understand the ramifications of PMTS on the long-term medical and mental health outcomes of CP patients, and implement individualized

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interventions to treat and prevent PMTS.



200 ***VASCULAR COMPLICATIONS IN CHILDREN WITH ACUTE RECURRENT OR CHRONIC PANCREATITIS: RISK FACTORS AND RESPONSE TO ANTICOAGULANTS.*** *Chinenye Dike[1], Gretchen Cress[1], Douglas Fishman[2], Tanja Gonska[3], Chee Ooi[4], Emily Perito[5], David Troendle[6], Cynthia Tsai[2], Mark Lowe[7], Aliye Uc[1]. [1]Stead Family Department of Pediatrics, University of Iowa, Iowa City, IA; [2]Pediatrics, Baylor College of Medicine, Houston, TX; [3]Pediatrics, Hospital for Sick Children, Toronto, ON, Canada; [4]Pediatrics, School of Women's and Children's Health Medicine, University of New South Wales and Sydney Children's Hospital, Sydney, New South Wales, Australia; [5]Pediatrics, University of California San Francisco, San Francisco, CA; [6]Pediatrics, University of Texas Southwestern Medical School, Dallas, TX; [7]Pediatrics, Washington University School of Medicine, St. Louis, MO*

Introduction: Peripancreatic vascular complications may occur as a consequence of acute, acute recurrent (ARP) or chronic pancreatitis (CP) in children. Although their pathogenesis is unclear, it is believed that the local extension of inflammation to the blood vessels causes portosplenomesenteric venous thrombosis (PSMVT) in the venous system and pseudoaneurysm in arteries. The incidence, risk factors and outcomes of pediatric peripancreatic vascular complications are not known. It is also not known whether the use of anticoagulants have an impact on overall outcome.

Methods: We reviewed the INSPIRRE (**IN**ternational **S**tudy Group of **P**ediatric **P**ancreatitis: **I**n search for a cu**RE)** database for the presence or absence of severe acute pancreatitis (SAP) and splenic, portal, mesenteric thrombosis and arterial pseudoaneurysms in 441 children enrolled from August 2012 to August 2017. All children were ≤19 years of age at the time of enrollment. Clinical information and demographics were entered into REDCap at 20 INSPPIRE sites; 4 of these sites were outside the US.

Results: Vascular complications were reported in 5 children (1.1%), all were females: PSMVT was found in 4, arterial pseudoaneurysm in 1, all were associated with SAP. The median age at diagnosis of thrombosis was 13 (range of 6-16 years). Thrombosis occurred within 2-10 years of the first attack of acute pancreatitis. Two children had ARP; three had CP. Risk factors for pancreatitis were genetic mutations (*PRSS1* p.R122H) in 2 patients, hypertriglyceridemia in 1 and idiopathic in 2. These patients did not have any underlying risk factors for thromboembolic events such as cigarette smoking, sickle cell disease or total parenteral nutrition. Thrombus was found in the splenic vein in 3 patients (60%), portal vein in one, left gastric pseudoaneurysm in another one. Anticoagulants (AC) were used in 4 patients with PSMVT (80%). Only one demonstrated recanalization of the affected vessel (splenic vein). AC was not used in the child with left gastric pseudoaneurysm who had a GI bleeding and required aneurysmal coiling. There were no side effects reported with AC use.

Conclusions: Peripancreatic vascular complications are uncommon in children and they are usually associated with severe

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acute pancreatitis. Anti-coagulants are commonly used, but the benefit is unclear.

202 ***USE OF REPEAT BIOPSY IN ASSESSING DUODENAL HEALING IN PEDIATRIC CELIAC DISEASE.***
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Objectives: While adults with celiac disease (CD) are routinely offered a repeat endoscopy after starting a gluten free diet to assess for mucosal healing, this is not currently the standard of care in pediatrics.

We aimed to determine the correlation between duodenal mucosal biopsies and tissue transglutaminase Immunoglobulin A (TTG –IGA) levels in pediatric patients with biopsy-confirmed CD and eosinophilic esophagitis (EoE) who have had repeat duodenal biopsies at least 1 year after initiating a gluten free diet. Specifically, we aimed to determine the rate of duodenal healing at time of repeat biopsy, and the accuracy of using TTG-IGA as a marker of duodenal mucosal healing. We also assessed symptomatology in this patient cohort.

Methods: Charts of all children with CD and EoE that were seen at The Children's Hospital of Philadelphia between 2003-2018 were retrospectively reviewed. Those who had multiple duodenal biopsy procedures and celiac serologic studies were included. Data collected included esophageal, gastric and duodenal biopsy pathology results, celiac serologic studies including TTG-IgA, endomysial antibody IgA, deaminated gliadin IgA and IgG, HLA genotype, symptom report, gluten free diet compliance, and dietician involvement. Duodenal healing was defined as having both normal duodenal villi and no increase in the number of intraepithelial lymphocytes (IEL). The data was further analyzed by assessing whether an individual had an increased number of IEL and normal villi, an increased number of IEL and villous atrophy, and a normal number of IEL and villous atrophy. These data were also correlated with TTG IGA level. Chi-square statistical analysis was used.

Results: Thirty eight patients had a normal IgA level in addition to diagnoses of both CD and EoE. Forty two percent (16 of 38 patients) had a normal repeat duodenal biopsy approximately 1 year after CD diagnosis. Of these, 56 percent (9 of 16 patients) had an abnormal TTG IGA level despite normal duodenal biopsies. Twenty six percent (10 of 38 patients) had both increased intraepithelial lymphocytes and villous atrophy on repeat duodenal biopsy. Of these, 20 percent (2 of 10 patients) had normal TTG IgA levels despite having duodenal mucosa injury on biopsy (p=0.45).

Conclusion: For pediatric patients with CD and EoE, an abnormal TTG-IGA level one year after CD diagnosis is not correlated with duodenal mucosal injury. Furthermore, a normal TTG IgA level does not ensure duodenal mucosal healing. This suggests that celiac serologic surveillance with TTG IGA is not sufficient to monitor CD status in this patient cohort, and further consideration should be made regarding repeat duodenal biopsies in order to screen for duodenal mucosal healing.

203 ***BUN CHANGE FROM ADMISSION AND LEVELS AT 24-48 HOURS ARE SIGNIFICANT PREDICTORS OF SEVERITY IN PEDIATRIC ACUTE PANCREATITIS.***
Peter Farrell[1,2], Lindsey Hornung[3], Peter Farmer[2,8], Ashley Serrette[2,4], Tom Lin[1,5], Jaimie Nathan[6,7], David Vitale[1,5], Maisam Abu-El-Haija[1,5]. [1]Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Pediatric Residency, Children's Hospital of The King's Daughters, Norfolk, VA; [3]Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Division of Emergency Medicine, Cohen Children's Medical Center, New Hyde Park, NY; [5]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH; [6]Division of Pediatric General and Thoracic Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [7]Department of Surgery, University of Cincinnati College of Medicine, Cincinnati, OH; [8]Department of Pediatrics, Eastern Virginia Medical School , Norfolk, VA
Background: Pediatric acute pancreatitis (AP) is increasing in incidence, but there remains limited information regarding optimal management in this population. Previous adult studies have reported BUN levels and change at 24 hours can be predictive of developing severe AP. BUN on admission has been shown to predict AP severity in pediatric patients, however subsequent change at 24 hours has not been studied.
Objective: To examine BUN change from admission and BUN values at 24-48 hours to identify pediatric patients most likely to develop any form of severe AP.
Methods: Pediatric patients with a primary diagnosis of first AP episode were included. Patients were retrospectively examined at Children's Hospital of the Kings Daughters (Norfolk, VA) during a 5 year period. Prospectively collected

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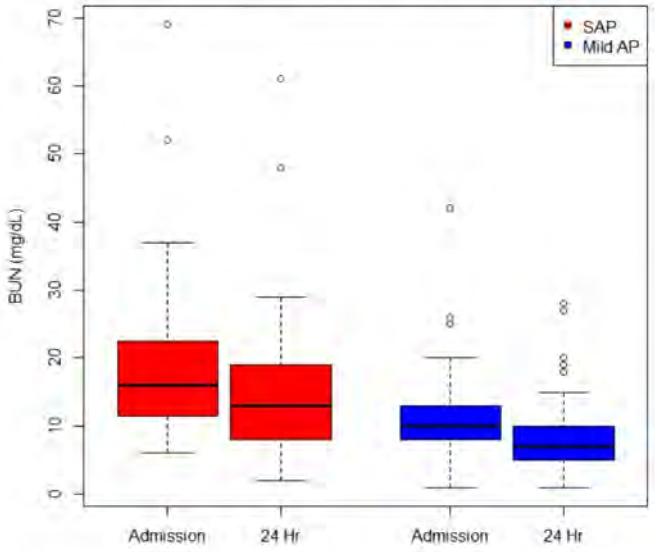
patient data of first AP episode at Cincinnati Children's Hospital Medical Center were also included. Permission was granted by respective local IRBs. Group differences between mild and both moderately severe and severe AP (combined were called SAP) were analyzed.

Results: A total of 176 primary AP patients were included for analysis; 39 (22%) met criteria for SAP. There was no statistical difference based on age, sex, or type of fluid used (isotonic, hypotonic or TPN) in the first 24 hours between the SAP and mild AP groups. The SAP group had elevated BUN levels on admission ($P < 0.001$); SAP: median (IQR) of 15.5 (11.0-22.5) vs mild AP: 10.0 (8.0-13.0). Patients who developed SAP had a significantly smaller percent decrease in BUN from admission to 24-48 hours ($P = 0.002$), SAP median (IQR) decrease of 21.5% (12.5-38.5) vs mild AP group decrease of 35.7% (22.2 -52.9). This resulted in BUN values remaining significantly higher ($P < 0.001$) after 24 hours for SAP median 12.5 (8.0-19.0) compared to the mild AP group median 7.0 (5.0-10.0). Elevated BUN levels within 24-48 hours were predictive of developing SAP (AUROC: 0.76, 95% CI: 0.66-0.85).

Conclusion: This multicenter study demonstrates that smaller relative BUN level decrease from admission and elevated BUN level at 24-48 hours are significant predictors of the development of SAP. Future studies should be directed towards developing a clinical tool.

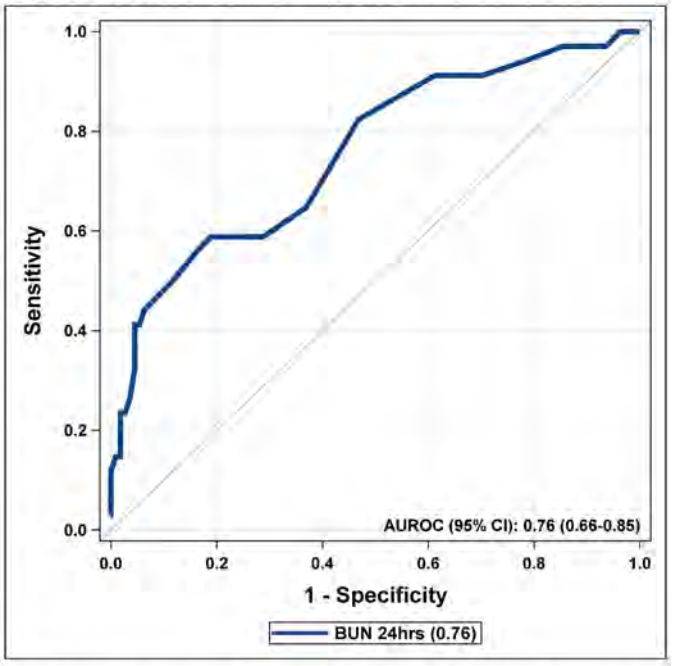
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Figure 1: BUN Levels Based On Severity



BUN levels are significantly higher on admission and at 24-48 hours in the SAP group compared to the Mild AP group, with the SAP group also having a decreased relative change in BUN levels at 24-48 hours when compared to the Mild AP group.

Figure 2. ROC Curve for Development of SAP based on BUN at 24-48 hours



In this population from 2 institutions (n=176), BUN at 24-48 hours is a significant predictor of SAP ($p<0.0001$) .

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204 ***WHO'S AT RISK? A PROGNOSTIC MODEL FOR SEVERITY PREDICTION IN PEDIATRIC ACUTE PANCREATITIS.*** *Peter Farrell[1,3], Lindsey Hornung[2], Peter Farmer[3,4], Angelica DesPain[5], Esther Kim[6], Ryan Pearman[5], Beemnet Neway[5], Ashley Serrette[3,7], Sona Sehgal[11], Tom Lin[1,8], Jaimie Nathan[9,10], David Vitale[1,8], Maisam Abu-El-Haija[1,8].*
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Introduction: Acute pancreatitis (AP) is increasing in the pediatric population but there remains limited pediatric data regarding optimal management. In 2017, severity classification guidelines for pediatric AP were published defining mild, moderately severe, and severe AP. Following these guidelines, a model was developed to predict severity utilizing internal data from Cincinnati Children's Hospital Medical Center (CCHMC). The model identified admission Blood Urea Nitrogen (BUN) as a significant predictor of severe disease (AUROC 0.75, 95% CI 0.61 – 0.89).

Objectives: To validate and optimize the previously generated predictive model.

Study Design: Pediatric patients (age <19 years) with primary diagnosis of first time AP were included. Patients were retrospectively examined at Children's Hospital of the Kings Daughters (CHKD, Norfolk, VA) during a 5 year period. Patients prospectively enrolled in an ongoing study of first time AP at Children's National Health System (CNHS, Washington, DC) were included (ClinicalTrials.gov ID NCT03242473). Permission was granted by respective local IRBs. Differences in lab values at admission between the groups of mild and both moderately severe and severe AP (combined were called SAP) were analyzed using Wilcoxon-Mann-Whitney tests and logistic regression models.

Results: Between CHKD and CNHS, a total of 73 AP patients were included for analysis. Of those, 22 (30%) were included in the SAP group. Patients who developed SAP had significantly higher BUN (p=0.002) and lower albumin (p=0.005) levels. Validation of the BUN model was completed and confirmed BUN to be a significant predictor (p=0.005) of development of any form of SAP (AUROC 0.73, 95% CI 0.60 – 0.86, sensitivity 68%, specificity 73%, PPV 52%, NPV 84%) with values that are consistent with the previously described model. When used in a multivariable model, BUN (p=0.005) and albumin (p=0.004) combined created a better predictive model for SAP (AUROC 0.83, 95% CI 0.72 – 0.94, sensitivity 71%, specificity 79%, PPV 60%, NPV 86%). Finally, when the data from all three centers was combined, it demonstrated that only BUN at admission remained a significant predictor of any form of SAP (AUROC 0.74, 95% CI 0.65-0.83, p<0.001, sensitivity 68%, specificity 71%, PPV 42%, NPV 88%) (Figure 1). The best performance in sensitivity and specificity of the model was at a BUN level of 13 mg/dL, with increasing specificity as the BUN level increases (Table 1).

Conclusion: This study validates the previously described model using a validation cohort from two distinct pediatric hospitals and suggests albumin further optimizes the predictive model. When all three hospitals data was combined, only BUN on admission was confirmed to be a significant predictor of the development of moderately severe or severe AP, with increasing specificity as BUN increases, suggesting BUN on admission could be used to identify patients in the community that would benefit from care in a tertiary referral center.

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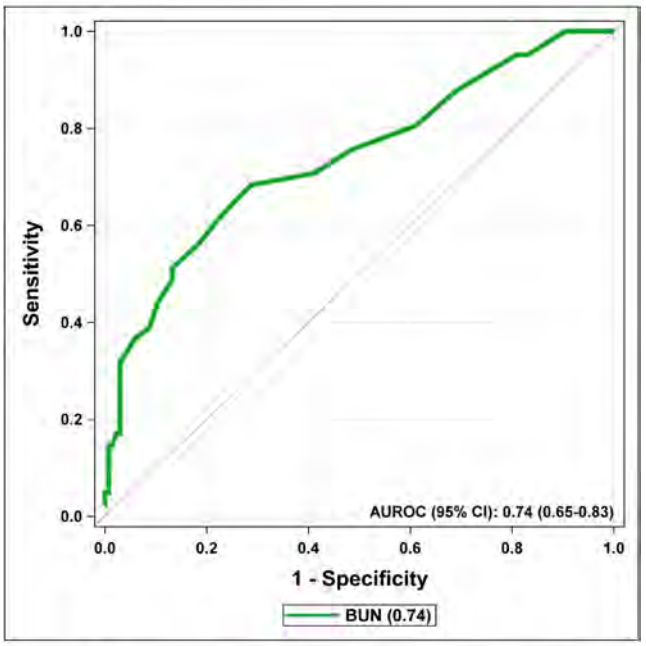


Figure 1. Combined data from all three clinical sites (n= 191). BUN on admission remains a significant predictor for development of severe AP.

Table 1. BUN values and associated predictive stats using all 3 clinical sites (n=191)

BUN Value (mg/dL)	Sensitivity	Specificity	PPV	NPV
10	80%	39%	28%	87%
11	76%	51%	32%	88%
12	71%	59%	34%	87%
13	68%	71%	42%	88%
14	61%	78%	45%	87%
15	56%	82%	48%	86%
16	51%	87%	54%	86%
17	49%	87%	53%	85%
18	44%	90%	56%	84%
19	39%	91%	57%	83%
20	37%	94%	65%	83%
21	32%	97%	76%	83%
22	24%	97%	71%	81%
23	22%	97%	69%	80%
24	17%	97%	64%	80%
25	17%	98%	70%	80%
26	15%	99%	75%	79%

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205 ***PARTNERING WITH COMMUNITY VOICE TO DETERMINE IDEAL PATIENT REPORTED OUTCOME MEASURES IN THE DEVELOPMENT OF THE GALAXY STUDY.*** *Alvin Freeman[1], Baha Moshiree[2], Enid Aliaj[3], Drucy Borowitz[3], Steven Freedman[4], Christina Roman[3], Sarah Jane Schwarzenberg[5], Meghana Sathe[6]. [1]Pediatrics, Emory University , Atlanta, GA; [2]Univeristy of North Carolina, Charlotte, NC; [3]Cystic Fibrosis Foundation, Bethesda, MD; [4]Beth Israel Deaconess Medical Center, Boston, MA; [5]University of Minnesota Masonic Children's Hospital, Minneapolis, MN; [6]University of Texas Southwestern / Children's Health Dallas, Dallas, TX*

Background: Gastrointestinal (GI) manifestations in people with CF represent a significant source of morbidity with studies showing that most experience at least one GI symptom at any given time. GI symptoms significantly impact the quality of life (QOL) and were identified as the second most important topic to prioritize for research by healthcare providers and people with CF. Despite the ubiquitous presence of GI symptoms, several challenges exist in researching GI symptoms, including a lack of standard definitions for common GI conditions in CF and an understanding of the natural history of these symptoms. In order to better understand the GI symptoms and define the natural history of their symptoms, the GALAXY study was created. Our team reviewed available GI-related Patient Reported Outcome Measures (GI-PROMs) in the literature to determine which questionnaire(s) most accurately captured the GI experience for people with CF. Having narrowed the list to two surveys, we partnered with the CFF Community Voice to obtain the insight from people with CF and their caregivers regarding the more appropriate set of questions. Community Voice consists of over 900 patients with CF or their family members who are at least 16 years of age and are engaged in directly impacting programs and initiatives that benefit the CF community.

Methods: The GALAXY study team developed two surveys; a combination survey of PAGI-SYM, PAC-SYM and PAC-QOL and a survey including the GI subset of questions from NIH developed PROMIS questionnaire. Both surveys provided information that could accurately describe GI symptoms in CF. The TDNCC oversaw the distribution of the two surveys to 479 Community Voice members who were asked the following: 1) which survey best described their overall GI health, 2) which survey was easier in terms of time spent, 3) which was more feasible to be completed on a weekly basis and 4) what topics or questions were missing from each survey.

Results: We received 77 responses (66% patients and 34% caregivers). The combined survey of PAGI-SYM, PAC-SYM and PAC-QOL was preferred over PROMIS with respondents stating these were more representative of their experience (63%), easier to complete (75%), and more feasible on a weekly basis (73%). Participants felt questions addressing stool consistency and urgency were lacking. Therefore, the final GALAXY study also includes the Bristol Stool Scale and four disease-specific questions based on this feedback.

Conclusion: The design of GALAXY exemplifies the benefits of partnering with patients and families through a program such as Community Voice to create a study that meets the needs of both participants and researchers.

Supported by the CFF GALAXY Awards

206 ***UTILITY OF ULTRASOUND IN CHILDREN WITH ACUTE PANCREATITIS BASED ON BODY HABITUS.*** *Jared Gelbs[1], Jonathan Miller[1], Samuel Bitton[2], Nina Kohn[3], Toba Weinstein[2]. [1]Pediatrics, Cohen Children's Medical Center - Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, New Hyde Park, NY; [2]Pediatric Gastroenterology, Cohen Children's Medical Center - Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, New Hyde Park, NY; [3]Biostatistics, Feinstein Institute for Medical Research, Great Neck, NY*

Introduction: Acute pancreatitis (AP) is an acute inflammatory condition of the pancreas. The incidence of AP in children has been increasing over the past two decades, reported to range from 3.6-13.2 cases per 100,000 individuals per year. The basis for this increase remains unclear but may reflect increased awareness in pediatrics and an increase in testing, specifically with imaging studies. Imaging studies can help to identify the underlying etiology of AP, to assess the severity of disease, and to detect any complications. Ultrasonography (US) is often the initial imaging study of choice to assess children who present with abdominal pain as this imaging modality is easily accessible, relatively inexpensive, and requires no radiation. However, US is more technician dependent than CT or MRI and may be limited by a patient's body habitus or intraabdominal gas, which can obscure the view of the pancreas and other intraabdominal organs. There are limited studies assessing the utilization of US in the evaluation of AP in children. Our study evaluated the use of US in AP at a single tertiary care children's hospital and the effect body habitus might have on the utility of US in this population.

Methods: We performed a retrospective chart review of children with an ICD-9 or ICD-10 discharge diagnosis code consistent with pancreatitis at Cohen Children's Medical Center from 2011-2018. Patients met criteria for AP based on the presence of $\geq$2 of the following: abdominal pain consistent with pancreatitis, serum amylase and/or lipase $\geq$3 times the upper limit of normal, or imaging findings suggestive of AP. Exclusion criteria were as follows: age >18 years old, recurrent AP or chronic pancreatitis, or those who developed pancreatitis after day 1 of hospitalization. For all patients, a REDCap dataset was created to include demographic data and imaging information. BMI percentile was compared between children in whom US was able to visualize the pancreas and those in whom the pancreas could not be seen. In addition,

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children were stratified into 2 groups based on BMI percentile: those with a healthy BMI (<85th percentile) and those classified as overweight or obese (≥85th percentile) as per the CDC growth charts. The likelihood of visualizing the pancreas on US was compared between these two weight groups. Mann-Whitney test was used for continuous variables and Fisher exact test was used for categorical variables.

Results: One hundred two children were admitted with pancreatitis during the study period and 73 met the inclusion criteria. Seventy-one (97%) had an imaging study performed. Fifty-five of these patients had an ultrasound performed (32M, 23F, mean [SD] 12.4 yrs. [4.7] range 2-18). The primary radiologic findings were as follows: normal (40%), poor visualization of the pancreas (21.8%), gallbladder disease (21.8%), pancreatic parenchymal changes (9.1%), choledochal cyst (1.8%), and other (5.5%). In those patients with a poorly visualized pancreas (n=12), the mean BMI percentile was 68.6 (SD 33.4, IQR 57.5-98). In those patients with a visualized pancreas (n=43), the mean BMI percentile was 63.6 (SD 34.0, IQR 30-93). This was not statistically significant (p=0.6314). When comparing the ability of US to visualize the pancreas in patients stratified based on BMI percentile, <85th percentile (n=33) vs. ≥85th percentile (n=22), the pancreas was visualized in 78.8% and 77.3% of patients respectively. This was not statistically significant (P=1.000).

Conclusions: As part of their initial assessment for AP, 75% of patients had an US performed. The pancreas was visualized in 78.2% of patients. Although the mean BMI percentile was lower in the patients in whom the pancreas was visualized on US, this difference was not statistically significant. Sonographers were equally successful at visualizing the pancreas in both healthy and overweight children. These results suggest that US should be the initial imaging choice in evaluating for AP even in overweight or obese children. US presents lower risk to children than imaging with radiation and is often faster and less expensive than CT or MRI. Additionally, younger children are more likely to require sedation for cross-sectional imaging, adding more risk to the patient and more cost and time for the health system. Sonographers in pediatric specific centers possess skill and experience in performing US in children and are highly successful in obtaining quality images irrespective of body habitus. Larger studies are needed to determine the generalizability of these results to other populations, specifically in non-pediatric centers.

207 ***DIAGNOSTIC ACCURACY OF SEROLOGIC SCREENING TESTS FOR CELIAC DISEASE IN ASYMPTOMATIC ADULTS AND CHILDREN WITH TYPE 1 DIABETES.*** *Michelle Gould[2], Farid Mahmud[1,3], Antoine Clarke[1], Kariym Joachim[1], Esther Assor[1], Amish Parikh[4], Andrew Advani[5], Baiju Shah[6], Bruce Perkins[7,3], Caroline Zuijdwijk[8], Charlotte McDonald[9], David Mack[10], Dror Koltin[11], Eugene Hsieh[12], Eva Szentgyorgi[13], Fred Saibil[14], Geetha Mukerji[15], Heather Lochnan[16], Jeremy Gilbert[6], Kevin Bax[17], Margaret Lawson[8], Melanie Beaton[18], Navaaz Saloojee[19], Olivia Lou[20], Patricia Gallego[21], Robyn Houlden[22], Ronnie Aronson[24], Susan Kirsch[23], William Paterson[25], Zubin Punthakee[26], Peggy Marcon[2,3]. [1]Endocrinology, The Hospital for Sick Children (SickKids), Toronto, ON, Canada; [2]Gastroenterology, The Hospital for Sick Children (SickKids), Toronto, ON, Canada; [3]Faculty of Medicine, Department of Pediatrics, University of Toronto, Toronto, ON, Canada; [4]Endocrinology, Trillium Health Partners, Mississauga, ON, Canada; [5]Endocrinology, St. Michael's Hospital, Toronto, ON, Canada; [6]Endocrinology and Metabolism, Sunnybrook Health Sciences Centre, Toronto, ON, Canada; [7]Endocrinology, University Health Network, Toronto, ON, Canada; [8]Endocrinology, Children's Hospital of Eastern Ontario (CHEO), Ottawa, ON, Canada; [9]Endocrinology and Metabolism, St. Joseph's Health Care, London, ON, Canada; [10]Gastroenterology, Children's Hospital of Eastern Ontario (CHEO), Ottawa, ON, Canada; [11]Endocrinology, Trillium Health Partners, Mississauga, ON, Canada; [12]Pathology, Sunnybrook Health Sciences Centre, Toronto, ON, Canada; [13]Pathology, University Health Network, Toronto, ON, Canada; [14]Gastroenterology, Sunnybrook Health Sciences Centre, Toronto, ON, Canada; [15]Endocrinology, Women's College Hospital, Toronto, ON, Canada; [16]Endocrinology, The Ottawa Hospital, Ottawa, ON, Canada; [17]Gastroenterology, London Health Sciences Centre, London, ON, Canada; [18]Gastroenterology, London Health Sciences Centre, London, ON, Canada; [19]Gastroenterology, The Ottawa Hospital, Ottawa, ON, Canada; [20]Canadian Clinical Trials Network, Juvenile Diabetes Research Foundation (JDRF), New York, NY; [21]Endocrinology, London Health Sciences Centre, London, ON, Canada; [22]Endocrinology, Kingston General Hospital, Kingston, ON, Canada; [23]Endocrinology, Markham-Stouffville Hospital, Markham, ON, Canada; [24]LMC Diabetes & Endocrinology, Toronto, ON, Canada; [25]Gastroenterology, Kingston General Hospital, Kingston, ON, Canada; [26]Endocrinology, Hamilton Health Sciences, Hamilton, ON, Canada*

Background: As related autoimmune conditions, celiac disease (CD) is more common in individuals with Type 1 Diabetes (T1D) and is frequently asymptomatic. Despite this, the diagnostic performance of CD serologic screening tests in asymptomatic T1D patients is not known. This was evaluated as part of the Celiac Disease and Diabetes Dietary Intervention and Evaluation Trial (CD-DIET).

Methods: T1D patients, aged 8-45 yrs, were serologically screened for CD at multiple centers across Ontario, Canada. Patients were deemed asymptomatic on the basis of the absence of GI symptoms, weight changes, and anemia and other

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CD-related clinical features. Screening was conducted in 2,387 subjects using a chemiluminescent (CL, BioFlash™) and immunosorbent (ELISA, Celikey™) tissue transglutaminase (TTG) IgA assay, yielding 140 positive screens. Among the 2,353 subjects screened using CL TTG IgA, 101 subjects (71 adults and 30 pediatric) had a duodenal biopsy for CD confirmation (considered Marsh ≥2). Receiver operating characteristic (ROC) curve analysis was conducted and sensitivity, specificity and PPV of TTG IgA for CD in asymptomatic patients with T1D was calculated.

Results: The area under the ROC curve for CL TTG was 0.918. At the manufacturer referenced upper limit (RUL) of 30 CU, the PPV was 85.9% (95%CI: 82.3-90.8%) and the sensitivity and specificity were 100% and 38% respectively. According to our data, an optimal cut-off of 156.5 CU, or 5.2 times the RUL, showed an improved PPV of 95.8% (95%CI: 92.4-100.0%). CL TTG IgA performed better in adult T1D patients compared to pediatric T1D patients (Figure 1). In regard to screening pediatric T1D patients, we found that at 10 times the RUL, the value at which the current ESPGHAN guidelines state in the general pediatric population CD can be diagnosed without biopsy, the PPV of CL TTG IgA is 91.3%.

Conclusion: This study provides the first description of the sensitivity, specificity and positive predictive value of IgA tTG for CD in asymptomatic patients with T1D and presents optimal cut-offs for the use of this screening test in this high-risk group. We have also demonstrated, as part of a prospective study, that the ESPGHAN biopsy-sparing CD guidelines for symptomatic children in the general population may not apply to asymptomatic children with T1D due to the low PPV of this test in this population at 10 times the RUL. This information will help to guide clinician's decision making when screening for CD in this unique population.

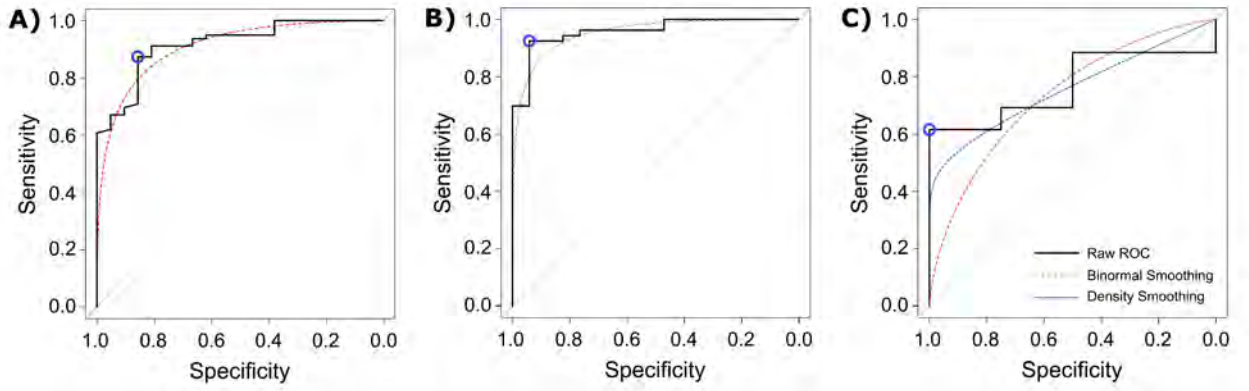


Figure 1. Receiver Operator Curves for chemiluminescent IgA tTG for A) Overall study population, B) Adult subset and C) Pediatric subset. The thresholds at which optimal diagnostic performance was observed are identified by the blue circles. Smoothed ROC curves are presented using the dotted red and blue lines representing binormal and density smoothing, respectively.

211 *PHOSPHORUS BIOAVAILABILITY OF DIFFERENT ELEMENTAL FORMULA IN HEALTHY ADULTS WITH ESOMEPRAZOLE-INDUCED HYPOCHLORHYDRIA .* *Clemens Bergwitz[3], Simone Eussen[2], Pilou L.H.R. Janssens[2], Monique Visser[2], Thomas O. Carpenter[4], Ardy Helvoort[2,1]. [1]NUTRIM: School of Nutrition and Translational Research in Metabolism, Maastricht University, Maastricht, Netherlands; [2]Danone Nutricia Research, Utrecht, Netherlands; [3]Section of Endocrinology and Metabolism, Yale University School of Medicine, New Haven, CT; [4]Department of Pediatrics, Yale University School of Medicine, New Haven, CT*

Background: Recent retrospective chart reviews [1, 2, 3] have reported hypophosphatemia associated with elemental formula use in tube fed infants and children with complex medical conditions and histories who are using multiple medications, including proton-pump inhibitors. The present study aims to evaluate the bioavailability of phosphorus from two commercially available elemental formulae with different mineral salts and to affirm bioequivalence of the two products in subjects receiving proton-pump inhibitors.

Methods: A single-center, double-blind, randomized, cross-over study was conducted in healthy adult volunteers with pharmacologically-induced hypochlorhydria. Hypochlorhydria was induced via 40 mg oral esomeprazole twice daily for four days prior to study entry and confirmed by a gastric aspirate pH measurement. Participants were instructed not to eat or drink any phosphorus rich foods or beverages for 24 hours prior to the study visit. After a standardized low phosphorus

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meal followed by an overnight fast, subjects were randomized to receive 1 gram of phosphorus in a single oral dose of 1217 kcal of Product A (recently reformulated Neocate® infant with dipotassium phosphate, dicalcium phosphate, tricalcium phosphate, calcium carbonate, tricalcium citrate, and calcium glycerophosphate) or Product B (Elecare® Infant with calcium phosphate, potassium phosphate, and calcium carbonate) over 10 minutes. The alternate product was given following a 1-week washout period. Blood and urine were collected at different time points for up to 6 hours after product consumption. Pharmacokinetic parameters including area under the curve (AUC) and peak values (C_{peak}) for serum and urinary creatinine-corrected phosphate and calcium were assessed for equivalence (Product A vs B) considering Food and Drug Administration (FDA) guidelines for bioequivalence [4].

Results: A total of 21 subjects (mean (SD) age: 25.7 (5.1) years; 13 (62%) females) completed the study. The geometric mean ratio (Product A/Product B) and 90% confidence intervals (CI) for serum phosphate were 1.041 [0.998-1.086] and 1.020 [0.963 – 1.080] for $AUC_{0\text{-}360min}$ and C_{peak}, respectively, meeting the predetermined criteria (80-125%) for bioequivalence (Table 1). The amount of phosphate excreted in urine over the sample collection period tended to be slightly skewed towards higher levels for Product A (Table 1). Serum calcium concentrations and urinary calcium corrected by creatinine excretion demonstrated bioequivalence of the two products (Table 1).

Conclusion: The results of this study show that the phosphorus and calcium bioavailability of Product A is equivalent to Product B in healthy adult volunteers. This observation is relevant for infants and children fed with elemental formula combined with treatment with proton-pump inhibitors and/or by-passing gastric acidification due to post-pyloric feeds.

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Table 1. Comparing area under the concentration curve (AUC) and peak concentration (C_{peak}) for serum phosphorus (P) and calcium (Ca) and for urinary creatinine (Cr)-corrected P and Ca of Product A versus Product B.

		Product A		Product B		Product A vs Product B	
		n	Geometric Mean	n	Geometric Mean	Ratio of means	90% CI
Serum P							
	$AUC_{0\text{-}360}$ (mmol/l*min)	21	378	21	363	1.041[1]	0.998-1.086[1]
	C_{peak} (mmol/l)	21	0.89	21	0.87	1.020[1]	0.963-1.080[1]
Urinary P/Cr ratio							
	$AUC_{70\text{-}370}$ (mmol/l*min)	19	224.2	18	220.7	1.099[2]	0.912-1.325[2] *
	C_{peak} (mmol/l)	19	1.60	18	1.44	1.182[2]	1.040-1.343[2] *
Serum Ca							
	$AUC_{0\text{-}360}$ (mmol/l*min)	21	884	21	842	1.002[1]	0.996-1.009[1]
	C_{peak} (mmol/l)	21	2.42	21	2.45	0.991[1]	0.983-0.999[1]
Urinary Ca/Cr ratio							
	$AUC_{70\text{-}370}$ (mmol/l*min)	19	128.8	17	123.7	1.116[2]	1.022-1.220[2]
	C_{peak} (mmol/l)	19	0.71	17	0.65	1.157[2]	1.073-1.247[2]

* Not fulfilling the 80-125% bioequivalence criteria; [1] Results are obtained from general linear model with subject, period and study product as fixed factors; [2] Results are obtained from mixed model analysis of variance with fixed effects for period and study product and compound symmetry covariance matrix and the Kenward-Roger option for degrees of freedom

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PLENARY SESSION
Friday, October 18
8:00am – 10:15am

215 ***BILE DUCT INJURY IS ASSOCIATED WITH A DISTINCT HEPATIC GENE EXPRESSION SIGNATURE AND INFLAMMATORY INFILTRATE IN PEDIATRIC ONSET AUTOIMMUNE LIVER DISEASE.*** *Simon Lam[1], Annika Yang vom Hofe[1], Immaculeta Osuji[1], Ruchi Singh[1], Sean Maynor[1], Mary Mullin[1], Jonathan Dillman[3,4], Rebekah Karns[2], Alexander Miethke[1]. [1]Gastroenterology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Gastroenterology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Radiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Radiology, University of Cincinnati College of Medicine, Cincinnati, OH*

Background: In autoimmune liver disease (AILD), including autoimmune hepatitis (AIH), primary sclerosing cholangitis (PSC), and autoimmune sclerosing cholangitis (ASC), the presence of biliary injury portends a course refractory to medical therapy. The pathophysiology of immune mediated biliary injury is unknown. We aimed to elucidate predominant hepatic immune responses associated with biliary injury in AILD by performing RNA sequencing (RNAseq) and multi-parameter immunofluorescence (IF) studies on liver biopsy samples obtained at the time of prospective research MRCP for assessment of large duct PSC.

Methods: 24 patients (male=13, mean age of 15 years) with AILD (PSC=5, ASC=6, AIH=9 and suspected AIH=4) undergoing liver biopsy were prospectively enrolled. RNAseq was performed on excess liver tissue with 101 base pair, pair end reads at a depth of 50 million reads. Raw reads were aligned to Hg38 using Kallisto. Protein coding transcripts were submitted to a moderated t-test to compare abnormal to normal MRCP, with $p<0.05$ and $FC>1.25$. Subjects underwent a research MRCP within a median of 23 days [IQR 1-61 days] from biopsy. A radiologist blinded to clinical and RNA data classified MRCP exams as abnormal in the presence of extra/intrahepatic ductal dilatation, multifocal strictures, or biliary injury according to the Majoie classification. IF was performed on formalin fixed paraffin embedded biopsies from 9 subjects (3 abnormal MRCP and 6 normal MRCP) with antibodies against panCK, CD4, and FOXP3, followed by imaging on a widefield microscope and automated quantitative image analysis.

Results: Two gene clusters were identified in an unsupervised analysis. Of the 12 subjects with an abnormal cholangiogram, 10 shared a gene expression pattern (Cluster 1), of which 8 had a clinical diagnosis of PSC or ASC (Figure 1). Upregulated genes belonged to pathways associated with increased regulatory T cell (Treg) activation (*IL2RA, SPP1, FOXP3, CD247, and CD79A*) and neutrophil function (*CXCL8, CCL20, and LCN2*). Down-regulated genes were associated with bile and fatty acid metabolism (*CYP7A and HMGCS2*), energy depletion (*GPD1*), and oxidation reduction. When assessed with IF, there were significantly more Tregs (CD4+FOXP3+) per area of tissue imaged in liver biopsies of patients with an abnormal MRCP compared to with those with a normal MRCP ($p=0.03$), corroborating the gene expression studies (Figure 2).

Conclusion: Large duct injury in PSC and ASC is associated with a unique pattern of hepatic gene expression which involves the upregulation of Tregs, innate inflammatory processes and down regulation of bile acid synthesis pathways. Based on our findings, many of the patients with PSC or ASC do not show overt evidence of aberrant T lymphocyte mediated injury. T cell directed immunosuppressive therapy may therefore be of limited benefit, and future therapies controlling hepatic neutrophil infiltration may prove to be more efficacious.

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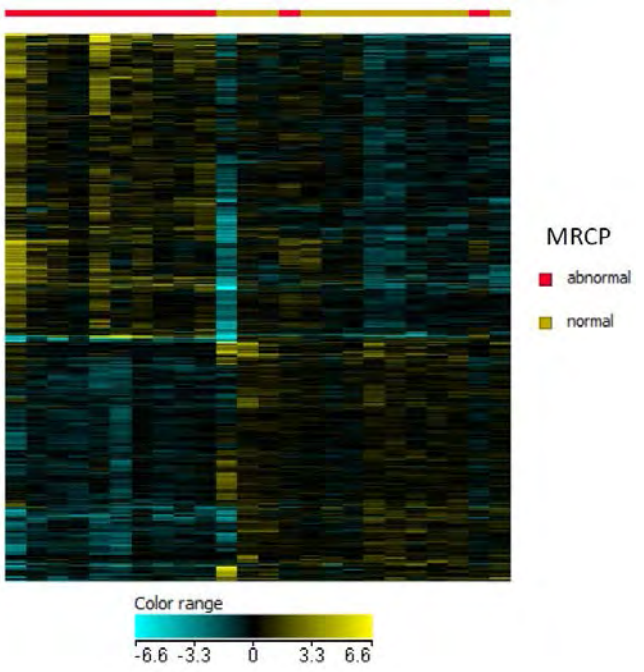


Figure 1: The unsupervised analysis of hepatic gene expression in 24 children with autoimmune liver disease identifies two clusters of subjects with share gene expression pattern which segregate with presence or absence of an abnormal MRCP.

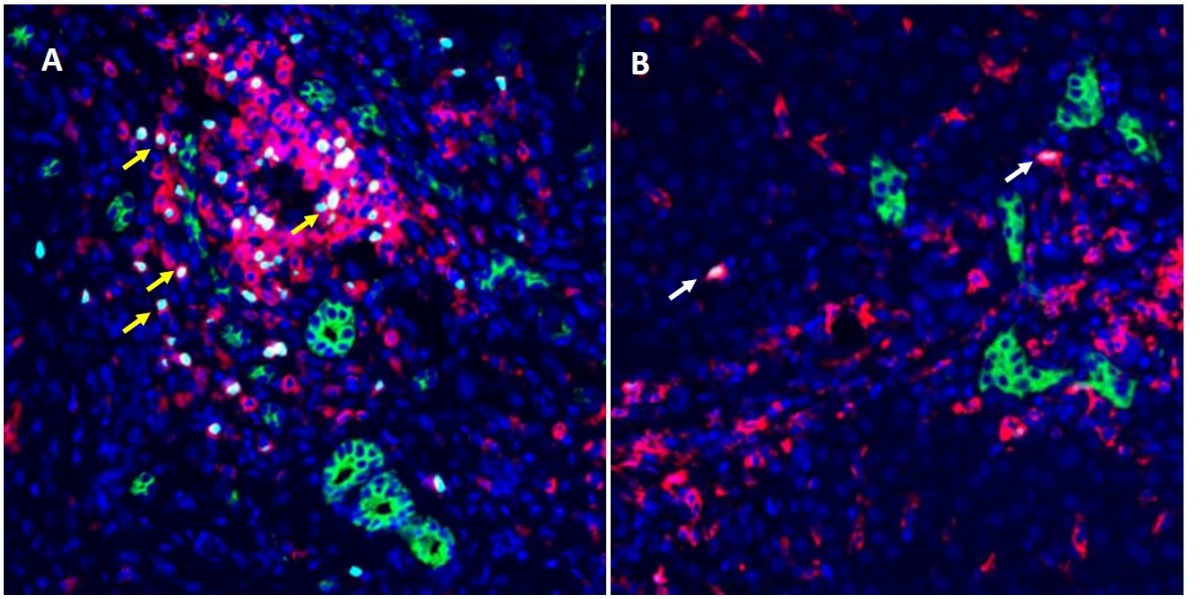


Figure 2: Representative IF images on liver biopsies form patients with an abnormal MRCP (A) and normal MRCP (B). CD4+ cells are decorated in red, FoxP3+ cells in teal, and bile ducts in green. Tregs (CD4+FOXP3+) are denoted by an arrow.

216 ***NUCLEAR RECEPTOR LRH-1 IS A THERAPEUTIC TARGET FOR INFLAMMATORY BOWEL DISEASE (IBD).*** *Hongtao Wang[1], Jae Man Lee[2], Kevin Klatt[3], Guohui Wang[1], Xiangsheng Huang[1], David Moore[4]. [1]Pediatric Gastroenterology, Baylor College of Medicine, Houston, TX; [2]Department of Biochemistry and Cell Biology, Kyungpook National University, Daegu, Korea (the Republic of); [3]Department of Nutrition, Cornell University, Ithaca, NY; [4]Department of Molecular and Cellular Biology, Baylor College of Medicine, Houston, TX*

The nuclear receptor LRH-1 (NR5A2) acts in the liver to promote conversion of cholesterol to bile acids. In the adrenals, its

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close relative SF-1 (NR5A1) promotes conversion of cholesterol to steroids, including corticosteroids. Unexpectedly, LRH-1 adopts the function of its relative in the intestine, driving production of anti-inflammatory glucocorticoids and promoting epithelial repair in response to inflammatory stimuli. Previous studies have correlated low LRH-1 activity with increased inflammation in both mouse colitis models and human IBD. Conversely, we predicted that increased LRH-1 activity would exert a beneficial therapeutic effect in IBD. We used genetic gain of function and loss of function strategies to confirm that LRH-1 has anti-inflammatory effects in IBD murine models (Nature Comm 2018; 9:4055). Our laboratory identified dilauroyl phosphatidylcholine (DLPC; C12:0-12:0 PC) as an extrinsic agonist ligand for LRH-1. We used DLPC to test the predicted beneficial effects of pharmacologically increased LRH-1 activity in murine models of IBD *in vivo* and in cultured enteroids *in vitro*.

We used the standard immunologic IBD model based on transfer of naïve T-cells into immune deficient hosts and treated transferred mice with 7 daily intraperitoneal injections of DLPC. DLPC specifically reduced the enterocolitis index (diarrhea, hematochezia, weight loss, and sick appearance) and histological severity. Similar results were observed in the Dextran Sodium Sulfate (DSS) IBD model. In both models, DLPC induced intestinal expression of the steroidogenic enzymes *Cyp11a1* and *Cyp11b1*, known *Lrh-1* target genes, and decreased expression of TNFa and other inflammatory cytokines.

Structural and biochemical studies reveal functional differences between human (h)LRH-1 and mouse (m)LRH-1. To critically test the function of the human receptor *in vivo*, we generated mice that express h*LRH-1* instead of m*Lrh-1* in the gut epithelium. We confirmed the therapeutic effects of DLPC in DSS treated humanized *LRH-1* mice.

Because endogenous circulating adrenal corticosteroids preclude analysis of glucocorticoid production in gut tissue, we used enteroid culture to assess DLPC induction of epithelial steroidogenesis. When enteroids were primed with TNFa to simulate an inflammatory stimulus, DLPC treatment induced mRNA expression of Lrh-1 target genes (Cyp11a1/b1) as expected. This was accompanied by increased levels of corticosterone in the culture media and inhibition of inflammatory markers.

We also identified the E-box transcriptional factor *Twist1* as *Lrh-1* target and showed that *Twist1* induces expression of the glucocorticoid receptor (*GR*), promoting induction of the anti-inflammatory cytokine (IL-10), a GR target. The combined induction of both glucocorticoid production and GR expression constitutes a frequently encountered regulatory network known as a *coherent feed-forward loop*, which exerts a robust and self-reinforcing anti-inflammatory effect. The importance of the Twist1-GR axis in this response is strongly supported by high mortality of T cell transferred mice with specific knockout of *Twist1* in intestinal epithelial cells and the blunted anti-inflammatory effects of DLPC in *Lrh-1*^{KO} or *Twist1*^{KO} mouse enteroids.

Overall, our findings identify LRH-1 as a pharmacological target for the treatment of IBD. DLPC is used in the production of liposomal formulations for drug delivery and is approved for human use. Thus, direct activation of LRH-1 via the exogenous agonist DLPC has exciting potential for near term translation to preclinical studies of therapeutic efficacy in human IBD.

CONCURRENT SESSION I
Friday, October 18, 2016
10:30am – 12:00pm

NEUROGASTROENTEROLOGY

217 ***IMPAIRED VAGAL EFFICIENCY PREDICTS PAIN REDUCTION WITH PERCUTANEOUS ELECTRICAL NERVE FIELD STIMULATION (PENFS) THERAPY FOR FUNCTIONAL ABDOMINAL PAIN DISORDERS.*** *Katja Kovacic*[1], *Jacek Kolacz*[2], *Stephen Porges*[2].[1]*Department of Pediatrics*, *Medical College of Wisconsin*, *Milwaukee*, *WI*; [2]*Kinsey Institute*, *Indiana University*, *Bloomington*, *IN*

Background: Non-invasive and effective therapies for functional abdominal pain disorders (FAPDs) are scarce. We have demonstrated efficacy of a novel and non-invasive auricular neurostimulation device (NeuroStim®) in adolescents with FAPDs. This device delivers percutaneous electrical nerve field stimulation (PENFS) to branches of cranial nerves including the auricular branch of the vagus in the external ear. Anatomical tracing studies show that these branches project to brainstem nuclei including the nucleus tractus solitarius (NTS). The NTS and the dorsal motor nucleus of the vagus form an efferent-afferent regulatory circuit (dorsal vagal complex) that closely controls digestive functions. Modulation of this

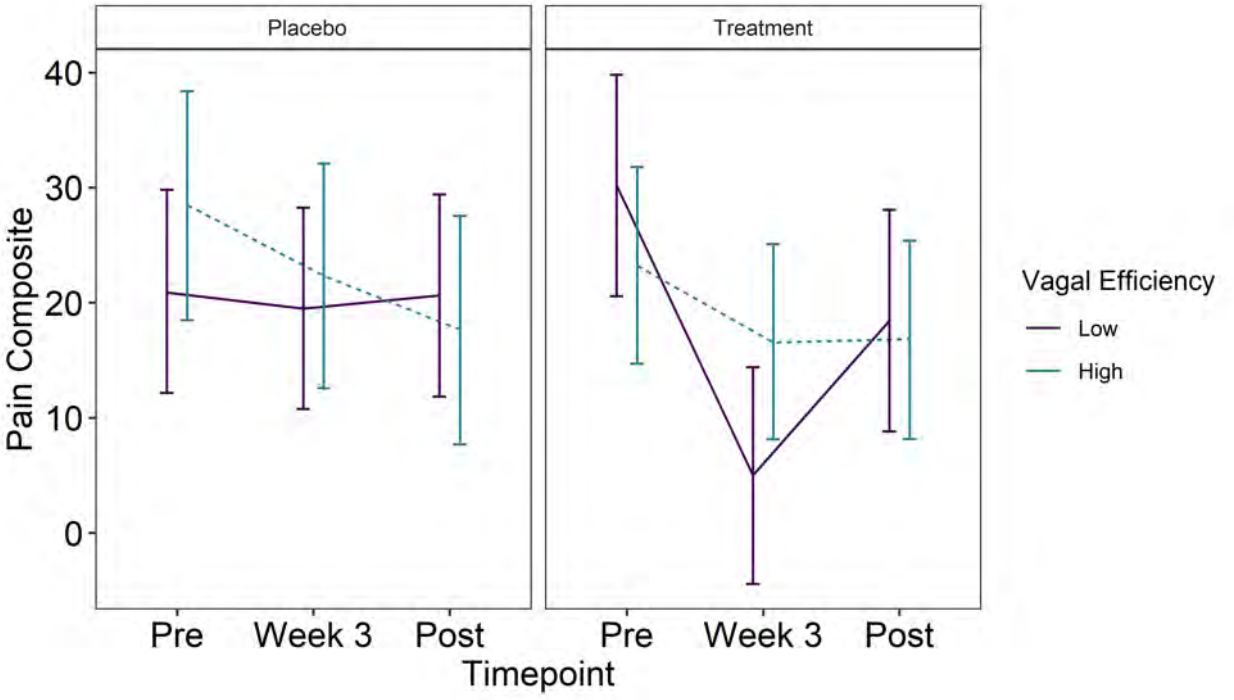
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circuit may thus affect GI sensorimotor function. Preliminary data from our group suggests that PENFS may modulate vagal regulation. The aim of this study was to determine if a baseline vagal efficiency measure can be used to predict pain improvement with PENFS therapy in adolescents with FAPDs.

Methods: A total of 115 adolescents ages 11-18 were enrolled in a randomized, double blind, sham-controlled trial from an outpatient, tertiary care pediatric gastroenterology clinic. All patients met Rome III criteria for at least one FAPD. Subjects were randomized to active vs sham PENFS therapy (3.2V with alternating stimulation frequencies 1-10Hz) for 5 days per week x 4 consecutive weeks. The sham device was identical but lacked electrical charge. A subset underwent heart rate variability measurements before (pre), after 3 weeks of therapy, and 8-12 weeks after end of therapy (post). Subjects completed baseline and weekly abdominal pain assessments by the Pain-Frequency-Severity-Duration scale. A Composite Pain score (0-70) was computed based on the frequency and severity of abdominal pain (higher=more pain). Three minute ECG recordings were performed in supine, sitting and standing positions. Respiratory sinus arrhythmia (RSA) is an established index of vagal tone. A measure of vagal efficiency (VE), i.e. efficiency of the vagal brake in regulating the heart during posture shift was calculated as the slope of the regression line between paired values of RSA and heart period (time between heart beats). Mixed effects modeling was used to estimate the interaction of time point by treatment group by vagal efficiency at the pre assessment.

Results: Baseline (pre) data on VE was obtained on 90 subjects (45 PENFS; 45 sham). 88% of the cohort was female. The mean (range) ages of the groups were similar: PENFS 14.9 (11.0-18.7) years and sham 15.5 (11.1-18.5) years (p=0.117). Median time to follow up (post) was 9.2 weeks. VE was not predictive of pain at the pre-assessment. Treatment and sham groups did not differ in their levels of predicted pain at the pre-assessment (95% bootstrapped confidence intervals: -4.16; 24.58). There was a 3-way interaction of VE with treatment group with the week 3 time-point compared to pre (95% bootstrapped confidence intervals: 0.004; 0.494). This revealed that participants in the treatment group with low VE had reduced Composite Pain scores at the 3-week time point but there was no substantial change in the placebo group or participants in the treatment group that had high VE (Figure 1). There was no significant interaction at the post assessment.

Conclusions: Impaired vagal regulation as measured by vagal efficiency extrapolated from RSA, an index of vagal regulation, is a predictor of pain response to PENFS therapy. These unique findings are suggestive of vagal nerve modulation effects of PENFS in adolescents with FAPDs. Vagal efferent modulation may be an important mechanism responsible for the therapeutic effects of this novel technology. The VE measure may be an essential tool to predict therapeutic response to PENFS.



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Figure 1. Graph illustrates a significant reduction in Composite Pain score after 3 weeks of therapy in subjects with low vagal efficiency in the treatment group compared to minimal change in these subjects in the placebo group. Predicted values calculated from mixed effects model at low vagal efficiency (6.56, 1.5 SD below mean) and high vagal efficiency (101.97, 1.5 SD above mean). Error bars represent 95% confidence intervals drawn from 10,000 simulations of the fixed effect parameters.

CONCURRENT SESSION I
Friday, October 18, 2016
10:30am – 12:00pm

INTESTINAL FAILURE: THROUGH THE LENS OF THE LONG TERM SURVIVORS

218 ***MICROBIAL METABOLITES AS MARKERS OF INTESTINAL DYSBIOSIS IN PEDIATRIC SHORT BOWEL SYNDROME.*** *Arthur Kastl[1], Lindsey Albenberg[1], Christina Bales[1], Michael Bennett[1], Elliot Friedman[2], William Mitchell[1], Ceylan Tanes[1], Natalie Terry[1], Gary Wu[2]. [1]Pediatrics, Children's Hospital of Philadelphia, Philadelphia, PA; [2]Medicine, University of Pennsylvania, Philadelphia, PA*

Background: Short bowel syndrome (SBS) is defined as the surgical loss of intestinal tissue, leading to functional inability of the intestine to absorb the required nutrients and fluid for proper nutrition and hydration [1]. Patients with SBS are dependent on parenteral nutrition (PN) for several months, often years. Small intestinal bacterial overgrowth (SIBO) is relatively common in SBS patients, limiting their ability to tolerate enteral nutrition [2]. However, current methods to accurately diagnose, and properly treat SIBO, are limited. Moreover, literature detailing the gut microbiota and metabolome in these patients is limited. Our primary study objective is to define the composition of the gut microbiota and the stool, urine, and plasma metabolome in patients with SBS, with and without SIBO, relative to healthy controls, and to correlate these differences with clinical metadata.

Methods: We designed a minimal risk cross-sectional and prospective cohort study for patients with SBS (defined as a history of >30% small intestinal resection, plus parenteral nutrition dependence for >2 months) who are between ages 6 months and 21 years, and managed via the CHOP Intestinal Rehabilitation Program. We enrolled 55 participants and collected baseline stool, urine, rectal swab, and plasma biospecimens. Ostomy effluent and swabs were collected when applicable. Baseline stool, ostomy, rectal swab, and ostomy swab specimens were submitted for shotgun metagenomic sequencing via a Hiseq 2500 platform, as well as targeted bile acid, amino acid, and short chain fatty acid quantification (stool and ostomy samples only, Water Acquity uPLC System). Untargeted metabolomics by gas chromatography-mass spectrometry (Agilent Technologies) was performed on baseline urine specimens from enrolled SBS participants.

Results: At the time of enrollment sample collection, 16 (30%) of the enrolled subjects had suspected SIBO and were actively being treated, or had been treated within the prior 3 months. The most commonly-prescribed antibiotics for SIBO included metronidazole, neomycin, and rifaximin. Regimens included continuous monotherapy, cycling antibiotics, or isolated courses. Data from a total of 46 stool/ostomy specimens, 37 swab specimens, and 47 urine specimens have been collected and analyzed to date, in addition to urine specimens from 20 healthy controls. A total of 149 distinct urinary metabolites were identified across the SBS population. Data analyzed to date revealed a significant elevation in urine 4-hydroxyphenylacetic acid (4-HPA) in the SBS participants compared to healthy children (p <0.0001), a compound which is an intermediate metabolite in bacterial tyrosine metabolism of dietary polyphenols [3]. 4-HPA levels were elevated even further in SBS participants with suspected SIBO whom were being treated with neomycin or Augmentin, compared to SBS participants without SIBO (p = 0.036). There was no difference in 4-HPA levels in SBS children treated with metronidazole for SIBO compared to SBS children without SIBO. Additionally, there was no difference in 4-HPA levels in children with a history of D-lactic acidosis compared to those without, although this trended toward significance (p = 0.088). Several other urinary metabolites of interest are being evaluated.
Stool metabolite analysis to date revealed significantly elevated butyrate levels in the SBS population (mean 207 umol/g) compared to the typical range for healthy individuals (<30 umol/g) [4]. In our SBS population, stool butyrate was strongly associated with dependence on at least partial PN (p = 0.003) and trended toward significance with an absence of the ileocecal valve (p = 0.059). Analyzed shotgun metagenomics sequencing data to date revealed a predominance of Proteobacteria in both stool and swab specimens of SBS participants, in particular *Enterobacteriaceae* and *E coli*. Stratification of microbial and metabolomics signatures by clinical phenotypes is on-going, and untargeted metabolomic data from stool and plasma samples is forthcoming.

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Conclusions: Symptoms that limit enteral tolerance of patients with SBS may be ameliorated by antibiotic therapy, arguing for a bacterial contribution to the pathophysiology. This cross-sectional and prospective investigation, to our knowledge, highlights deep analytical sequencing and metabolomic assessment of the largest SBS cohort to date. Data analysis to date has revealed several metabolites of interest, which will be further explored and correlated with various anatomic, growth, and historical variables and clinical phenotypes. Overlaying sequencing and metabolic signatures will broaden our understanding of the biology of SBS patients, and also potentially uncover targets for non-invasive biomarkers of SIBO in this population.

CONCURRENT SESSION I
Friday, October 18, 2016
10:30am – 12:00pm

BASIC SCIENCE OF THE PANCREAS

219 ***EXPLOITING GLOBAL METABOLOMIC AND LIPIDOMIC PLASMA PROFILING TO IDENTIFY BIOMARKERS THAT WILL PREDICT THE RISK OF DEVELOPING THE COMPLICATION OF PANCREATITIS WITH THE ANTI-LEUKEMIC DRUG ASPARAGINASE.*** *Li Wen[2], Yue Wei[3], Chaitanya Srinivasan[4], Paul Fogle[5], Sameer Agnihotri[6], Ying Ding[3], Sohail Husain[1]. [1]Pediatrics, Stanford University, Palo Alto, CA; [2]Gastroenterology, Shanghai General Hospital and Shanghai Jiao Tong University School of Medicine, Shanghai, Shanghai Municipality, China; [3]Biostatistics, University of Pittsburgh, Pittsburgh, PA; [4]Computer Science, Carnegie Mellon University, Pittsburgh, PA; [5]Metabolon, Durham, NC; [6]Pediatrics, University of Pittsburgh, Pittsburgh, PA*
Background: Although asparaginase is a cornerstone therapy for leukemia, a large proportion of users (about 10%) develop the complication of pancreatitis. In this study, we used a non-targeted metabolomic and lipidomic platform to determine whether there are unique biomarker signatures that will predict the development of asparaginase-associated pancreatitis (AAP).
Methods: We analyzed plasma samples, collected prior to asparaginase exposure, from 26 patients who went on to develop AAP, and compared them to 26 matched control patients who failed to develop pancreatitis (after a two-year follow-up from first asparaginase use). The plasma metabolites from extracted, separated by HPLC, and then run through a mass spectrometer to identify metabolites against an established library. Data were normalized and log-transformed. Statistical analysis was performed using Welch's 2-sample t-test, random forest analysis, principal component analysis (PCA), and pathway analysis.
Results: There was a total of 844 metabolites detected using the metabolomics platforms (HD4) and 979 metabolites detected using the lipidomics platform (CLP). Using a cut-off of $p<0.05$ for significance, only 42 metabolites in the HD4 and 49 in the CLP were differentially expressed between the experimental and control group, suggesting precise metabolic changes between the two groups. PCA showed that there was minimal clustering or outliers between the two groups. The differentially expressed pathways were related to β-oxidation, free fatty acids, and polyamine and aromatic amino acid metabolism.
Conclusion: In this pilot study, we identified several metabolic pathways that were altered at baseline in patients who went on to develop AAP, compared to control patients. While additional time point analysis, secondary validation, and mechanistic testing are required to confirm these novel findings, they point to the potential for identifying biomarkers that will predict AAP and, importantly, devising preventive or rescue therapies.

220 ***THE DRUG COMPLICATION OF PANCREATIC INJURY WITH ASPARAGINASE IS RELATED TO PANCREATIC LEVELS OF THE ENDOGENOUS COUNTERACTING ENZYME ASPARAGINE SYNTHETASE AND INTRA-PANCREATIC NUTRIENT STRESS.*** *Amitava Mukherjee[1], Nayyar Ahmed[2], Abraheem Ahmad[1], Tanveer Javed[1], Li Wen[3], Sohail Husain[4]. [1]Pediatrics, University of Pittsburgh, Pittsburgh, PA; [2]Pharmacy, University of Pittsburgh, Pittsburgh, PA; [3]Gastroenterology, Shanghai General Hospital and Shanghai Jiao Tong University School of Medicine, Shanghai, Shanghai Municipality, China; [4]Pediatrics, Stanford University, Palo Alto, CA*
The anti-leukemic drug asparaginase causes pancreatitis in about 10% of users, and the mechanisms underlying this painful complication are not known. Asparaginase primarily depletes circulating asparagine (Asn), and the endogenously expressed enzyme, asparagine synthetase (ASNS), replenishes Asn. In this study, we explored the role of ASNS in the pancreas as a mechanism for preventing pancreatic damage due to asparaginase. We began by determining the expression pattern of ASNS in the pancreas. Compared to other organs, ASNS was most highly expressed in both the human and mouse pancreas, and, within the pancreas, ASNS was primarily present in the acinar cells. The high baseline pancreatic ASNS was associated with higher baseline activation of PERK signaling in the pancreas, and inhibition of PERK in acinar cells

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lessened ASNS expression. Asparaginase exposure, but not the common pancreatitis triggers, uniquely upregulated ASNS expression, indicating that the increase was mediated by nutrient stress. Knockdown of ASNS in the 266-6 acinar cells provoked acinar cell injury and worsened the damage observed with asparaginase, while ASNS overexpression protected against asparaginase-induced injury. We generated inducible ASNS knockouts and found that, within two weeks of inducing ASNS deletion in adult mice, there was spontaneous pancreatic injury. The mechanism for this *in vivo* effect appears to be through Asn depletion, since an Asn-deficient diet led to a similar change. We are in the process of evaluating the effect of rescuing Asn loss due to ASNS deficiency. In summary, ASNS is highly expressed in the pancreatic acinar cells through heightened basal activation of PERK, and ASNS appears to be crucial to maintaining acinar cell integrity. The implications are that ASNS is especially hardwired in the pancreas to protect against both baseline perturbations and with nutrient deprivation stressors, such as during asparaginase exposure.

CONCURRENT SESSION I
Friday, October 18, 2016
10:30am – 12:00pm

SURGERY IN INFLAMMATORY BOWEL DISEASE

221 ***USE OF SMALL BOWEL ULTRASOUND TO PREDICT RESPONSE TO INFLIXIMAB INDUCTION IN PEDIATRIC CROHN'S DISEASE.*** *Michael Dolinger[1], Jungwhan Choi[4], Becky Phan[3], Henrietta Rosenberg[2], John Rowland[3], Marla Dubinsky[1]. [1]Pediatric Gastroenterology, Kravis Children's Hospital at Mount Sinai, New York, NY; [2]Pediatric Radiology, Kravis Children's Hospital at Mount Sinai, New York, NY; [3]The Mount Sinai Hospital, New York, NY; [4]Department of Radiology, Boston Children's Hospital, Boston, MA*

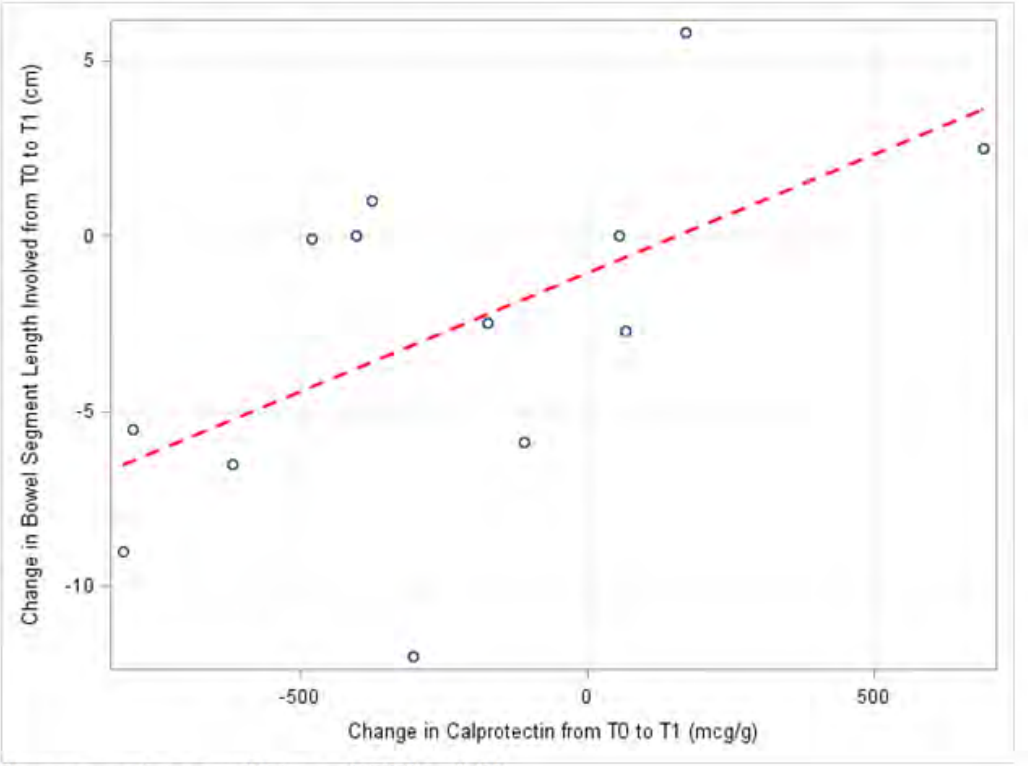
Background: Small bowel ultrasound (SBUS) has been shown to correlate with endoscopy and MRI cross-sectional small bowel imaging in inflammatory bowel disease patients. However, SBUS has not been widely adopted in the USA.
Aim: The purpose of this pilot study was to explore the utility of SBUS as a non-invasive tool to assess disease response to anti-TNF-α therapy with Infliximab (IFX) in pediatric Crohn's disease (CD).
Methods: 15 Pediatric CD patients initiating IFX therapy were prospectively enrolled and 13 patients were included in the analysis. Clinical activity, biomarker (erythrocyte sedementation rate (ESR), C-reactive protein (CRP), and fecal calprotectin) and SBUS data were evaluated at baseline (T0) and immediately prior to week 14 (T1) after induction with IFX. Primary outcome was the association of quantitative and qualitative SBUS parameters (disease extent; bowel wall thickness; presence of bowel wall hyperemia, creeping fat, free fluid, abscess, strictures; and degree of bowel wall dilation, peristalsis, and stool burden) and steroid-free remission at week 14. Secondary outcomes include the association of SBUS changes and fecal calprotectin, and CRP at week 14.
Results: All patients achieved steroid-free clinical remission post-induction ($P < 0.001$) and a significant decrease in CRP ($P = 0.01$) at T1. Bowel wall hyperemia significantly decreased from T0 to T1 ($P = 0.01$). In patients with decreased fecal calprotectin at T1, there was a decrease in bowel segment length involved ($P = 0.02$) and bowel wall hyperemia ($P = 0.01$).
Conclusion: Our pilot data suggests that changes in bowel wall hyperemia and bowel segment length involved on SBUS can be used as a non-invasive tool to monitor pediatric CD progression in response to induction with IFX.

Table 2. SBUS and Clinical Results (T0 v. T1)

SBUS Results (n = 13)	T0	T1	*P* value
Bowel wall thickness (mm), median (IQR)	5 (3.2 – 6)	4 (3.7 – 5)	0.67
Bowel segment length involved (cm), median (IQR)	10 (5 – 14)	5.8 (4.1 – 10.5)	0.07
Bowel hyperemia, n (%)	7 (53.8)	1 (7.7)	0.01
Bowel stricture, n (%)	7 (53.8)	7 (53.8)	>0.99
Creeping fat, n (%)	4 (30.8)	2 (15.4)	0.16
Free fluid, n (%)	5 (38.5)	3 (23.1)	0.16
Diminished small bowel peristalsis, n (%)	4 (30.8)	4 (30.8)	>0.99
wPCDAI, median (IQR)	17.5 (10 – 30)	0 (0 – 7.5)	<0.001
CRP (mg/L), median (IQR)	16.7 (6.7 – 24.5)	2.5 (1.3 – 3.9)	0.01
ESR (mm/hr), median (IQR)	30 (3 – 81)	10 (5 – 32)	0.001
Calprotectin (mcg/g), median (IQR)	358 (261 – 726)	246 (72 – 285)	0.06

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Figure 1. Correlation Analysis for Change in Fecal Calprotectin v. Change in Bowel Segment Length Involved



Pearson correlation coefficient = 0.57 ($P = 0.04$)

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CONCURRENT SESSION I
Friday, October 18, 2016
10:30am – 12:00pm

LIVER TRANSPLANT

222 ***THE ASSOCIATION BETWEEN NEIGHBORHOOD SOCIOECONOMIC MEASURES AND A NOVEL BIOMARKER OF NONADHERENCE: RESULTS FROM A MULTI-CENTER COHORT.*** *Sharad Wadhwani[1], John Bucuvalas[2,3], Cole Brokamp[1,4], Ravinder Anand[5], Ashutosh Gupta[6], stuart taylor[1], Eyal Shemesh[2], Andrew Beck[1,4].*
[1]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Icahn School of Medicine at Mount Sinai, New York, NY; [3]Kravis Children's Hospital, New York, NY; [4]University of Cincinnati College of Medicine, Cincinnati, OH; [5]The Emmes Corporation, Rockville, MD; [6]The Emmes Corporation, Bangalore, India
Background: Medication non-adherence remains problematic in pediatric liver transplant (LT)—estimates suggest that up to 53% of adolescents are non-adherent. We leveraged data from participants who were enrolled in the MALT clinical trial (NCT01154075) to learn if community deprivation was associated with non-adherence in pediatric LT recipients.

Methods: This was a multi-site cohort from 4 US pediatric liver transplant institutions. Primary outcome was Medication Level Variability Index (MLVI); an objective, validated biomarker of non-adherence. MLVI was used as a continuous variable and as a dichotomized variable with a pre-defined, clinically meaningful cut-off of 2.5. Primary exposure, derived from participant addresses, was a validated index of neighborhood deprivation using data from the US Census Bureau. The index has a range of [0, 1] with higher values indicating greater deprivation.

Results: Deprivation measures were extracted from 271/320 participants (84.7%). There was a 5% increase in MLVI for each 0.1 increase in deprivation index (95% CI: -1%-11%). A total of 23.5% of participants from the top quartile of deprivation index had an MLVI ≥ 2.5 compared to 11.8% in the remaining three quartiles (p=0.018). Black children, compared to white children, were more likely to have high MLVI, even after adjusting for deprivation (AOR 4.0 95% CI: 1.7-10.6).

Conclusion: Participants from the most deprived quartile had double the rates of nonadherence than the rest of the cohort. This suggests a threshold effect whereby deprivation is associated with nonadherence only when deprivation is severe. Black race was also associated with nonadherence, even after controlling for the effect of neighborhood deprivation. These results are troubling and suggest that poor outcomes on the basis of social background may be, in part, mediated by nonadherence. Further work to identify underlying causes of nonadherence in patients from deprived neighborhoods may inform alternate strategies to improve medication adherence and long-term graft survival in pediatric liver transplant recipients.

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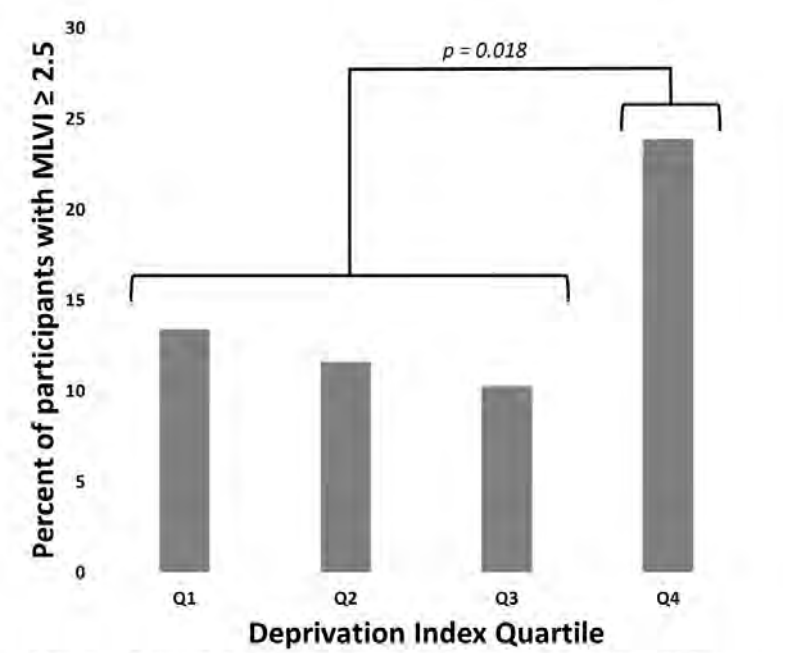


Figure 1. Proportion of participants defined as non-adherent by deprivation index quartile

223 ***LIVER DISEASE ASSESSMENT AND POST-TRANSPLANT LIVER DISEASE EVOLUTION IN ISOLATED HEART TRANSPLANTATION FOR FONTAN FAILURE AS DETERMINED BY CLINICAL SCORING, MRI AND LIVER BIOPSY.*** *Dellys Soler-Rodriguez[1,2], Chad Mao[4,2], William Mahle[4,2], Adina Alazraki[6,2], Kiery Braithwaite[6,2], Shelley Caltharp[5,2], Heather Rytting[5,2], Joseph Magliocca[3,2], kirk kanter[7,2], Rene Romero[1,2]. [1]Division of Pediatric Gastroenterology, Hepatology and Nutrition, Emory University School of Medicine, Atlanta, GA; [2]Children's Healthcare of Atlanta, Atlanta, GA; [3]Division of Transplantation, Emory University School of Medicine, Atlanta, GA; [4]Sibley Heart Center, Emory University School of Medicine, Atlanta, GA; [5]Division of Pediatric Pathology, Emory University School of Medicine, Atlanta, GA; [6]Division of Pediatric Radiology, Emory University School of Medicine, Atlanta, GA; [7]Division of Cardiothoracic Surgery, Emory University School of Medicine, Atlanta, GA*

Long term survivors of the Fontan operation universally develop hepatic congestion, hepatic fibrosis and portal hypertension of varying degrees. Assessment of the severity of this Fontan associated liver disease (FALD) is critically important prior to consideration of isolated heart transplantation (IHT). The pace or degree at which FALD improves after IHT is not well known. In this study, we retrospectively report pre-IHT FALD evaluation and post-IHT FALD evolution in 9 consecutive Fontan pts who underwent IHT from October 2015 through October 2018. **METHODS:** Standard blood tests, abdominal MRI and liver biopsy (LB) were obtained within 6 months (mo) of IHT and by the 12 mo post-IHT heart catheterization (cath). VAST[1] score was calculated as previously described by the examining hepatologist: (1 point each for varices/ascites/splenomegaly on imaging or examination, and 1 point for platelet count <150 K; max =4). A novel Fontan Liver MRI score was determined by two blinded radiologists using the following quantitation: hepatic congestion and fibrosis (scored for each: 1-mild, 2-moderate, 3-severe), extent of varices (1- for splenomegaly/splenic varices, 2- for gastroesophageal varices, 3- for both 1 and 2) and 1 point each for the presence arterially enhancing nodules (NOD) and/or ascites (max MRI score =11). LB was characterized by two blinded pathologists using the Fontan Liver Biopsy score[2] as previously described. Comparison of pre- and 12 mo post-IHT lab tests, MELD, MELD-XI[3], APRI[4], VAST, Schwartz bedside estimated glomerular filtration rate (eGFR), cath data, MRI and LB scores was performed using paired two-sided student's t test with significance taken at $p < 0.05$. **RESULTS:** 8 of 9 patients (pts) had hypoplastic left heart syndrome. All pts had lateral tunnel Fontan operations with fenestrations. Patients' mean age was 13.6 years (range 10-19 yrs) and had a follow up from 21 to 42 mo post- IHT. Mean MELD pre-IHT was 9, with a maximum MELD of 15. MELD-XI maximum was 16. All pts are alive post IHT. Amongst all pts, maximum INR and TB within 48 hours of IHT was 2.3 and 3.5 mg/dl respectively. CICU length of stay (LOS) ranged from 4 to 17 days and total post IHT hospital LOS from 7 to 48 days.There were no significant differences in pre or post IHT WBC, platelet, albumin, creatinine, INR, APRI, or MELD. TB trended toward improvement ($p=0.08$), while eGFR improved post IHT ($p= 0.01$). Central venous pressures decreased post IHT

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(18.8 +/- 2.2 mm Hg vs 8.3 +/- 2.9 mmHg; p<0.0001). MELD-XI and VAST scores improved post-IHT (9.9 +/- 3.1 vs 7.7 +/- 2.4, p = 0.01; and 1.44 +/- 0.8 vs 0.33 +/- 0.50, p = 0.0005, respectively). In 5 pts with paired studies, Fontan Liver MRI scores decreased significantly (8.3 +/- 1.2 vs 3.6 +/- 1.1; p<0.0001). NOD persisted in 2 pts post IHT. 4 of 9 pts had paired liver biopsies. Only one had a reduction in blinded LB score, but as a whole, pre and post IHT LB scores did not differ.
CONCLUSIONS: Patients with FALD and MELD-XI < 16, Fontan Liver MRI scores < 10 and VAST scores < or = 2 can have successful short term IHT outcomes and these scores improve at 1 year post-IHT. Blinded LB scores did not change significantly at 1 year post IHT. Clinical scores may be more useful than LB to assess short-term liver associated risk of IHT and for assessment of post IHT FALD clinical evolution. In pts with NOD on MRI pre-IHT, the persistence of NOD after transplant suggests hepatic malignancy risk may remain even after heart transplantation.
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POSTER SESSION II
Friday, October 18, 2019
12:00pm – 2:30pm

APGNN – EDUCATION/CLINICAL PRACTICE

224 ***ROLE OF BOVINE CLOSTRUM IN THE TREATMENT OF ACUTE DIARRHEA IN EGYPTIAN CHILDREN; A RADOMISED DOUBLE- BLIND PLACEBO CONTROLED TRAIL.*** *Sana Barakat[1], Omnia Omar[1], Marwa Meheissen[2], Doaa El-Bana. [1]Alexandria University, Faculty of Medicine, Pediatrics, Alexandria, Egypt, [2]Alexandria University, Faculty of Medicine, Microbiology, Alexandria, Egypt*

Objectives and Study: Current therapies for the treatment of acute diarrhea in children focus primarily on oral rehydration therapy. However, this does not shorten the duration of diarrheal episodes, nor fasten healing of inflamed intestinal mucosa. Nutritional-based interventions offer a novel therapeutic alternative for acute diarrhea. Breast milk contains both pathogen-specific antibodies and numerous compounds that help intestinal healing, that's why breastfeeding during diarrheal illness is strongly encouraged by the WHO. One strategy to mimic its beneficial role is the use of bovine colostrum (BC).Bovine colostrum is rich in immunoglobulins, lactoferrin, growth, and antimicrobial factors, all of which stimulate digestive tract and immune function growth and maturation which are useful for the recovery of diarrhea.
The aim of the present study was to evaluate the therapeutic efficacy of BC in acute diarrhea in children.

Methods: This prospective interventional randomized clinical trial (RCT) was conducted on 160 children, aged 6 months to two years, with acute diarrhea for less than 48 hours, 80 cases were randomly treated with standard therapy of acute diarrhea plus BC 1 sachet/ day (3g) for 1 week (ImmuGuard®) (BC group) and 80 cases randomly received standard therapy of acute diarrhea plus placebo (placebo group). Children with diarrhea more than 48 hours, dysentery, malnutrition or who received prior antibiotic or antidiarrheal treatment were excluded from the study. The two groups were comparable at entery regarding the frequency and duration of diarrhea and vomiting, , fever , the degree of dehydration and initial Vesikari scoring. All cases were investigated for bacterial causes of diarrhea (Salmonella spp, Shigella spp, diarrheagenic E. coli (DEC), Campylobacter spp., and Vibrio cholerae) as well as for Rotavirus antigen in stool.

Results: A causative organism was identified in 88 cases;55 cases were positive for rotavirus, 31 were positive for DEC , while only two cases were positive for Campylobacter spp.
After 48 hours of treatment, the median stool frequency decreased from 7 stools per day to 2.5 in BC group and to 3 in placebo group (p< 0.001) and Vesikari scoring was significantly lower in the BC group when compared with the placebo group (median 3 vs 6 p< 0.001).. By 72 hs diarrhea stoped in 65% of BC group,, wherea nearly 94% of placebo group were still suffering of diarrhea(p< 0.001). The median time of disappearance of diarrhea was significantly earlier in the BC group compared with the placebo group whether it was due to Rotavirus [3 (3-3) days vs 6 (5-7) days (p =0.000)] or E. coli infection [3 (3-4) days vs 6 (5-7) days (p =0.000)].

Conclusions: BC is effective in the treatment of acute diarrhea whatever it was due to rota virus or bacteria and could be used as adjuvant therapy as it reduces both the frequency and the duration of diarrhea. These findings warrant extension of this treatment methods to larger population after multicentre controlled studies.

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(This study has been registered at Pan African Clinical Trials Registry ,Cochrane South Africa,under identifier PACTR201708002507912)

225 ***IS IT ALL IN MY HEAD? PHARYNGEAL DYSPHAGIA AND CHIARI MALFORMATION IN TODDLERS.***

Megan Enenbach, *Fernando Zapata. GI*, *Children's Hospital and Medical Center*, *Omaha*, *NE*

Introduction: Pharyngeal swallowing begins to develop within the 3rd month of fetal life (Brodsky 2002). This motor skill is important for survival. Any abnormality in the basic swallowing function is defined as dysphagia. Dysphagia can be further classified in the phases of oral, pharyngeal, and esophageal. In children, dysphagia is important to resolve due to increased risk of respiratory compromise. Further investigation into the cause of dysphagia requires evaluation of anatomical structures and central nervous system disorders. One of the central nervous symptom disorders that can impact swallowing function is Chiari Malformations. Chiari Malformation type I, is a malformation of the cerebellar tonsils that are displaced below the formen magnum. Incidence of CM-1 is between 0.1-0.5% and most symptoms present in adolescence or adulthood.The incidence of pharyngeal dysphagia and subsequent findings of Chiari Malformation type I in the toddler age were evaluated in two separate cases.

Case Presentation: Case #1: A 5 month old with supraglottoplasty due to severe laryngomalacia with intermittent reflux and concern for dysphagia. The patient did have history of vomiting 2-3 times a day. Due to concerns of dysphagia, as evidenced by coughing on thin liquids, a barium swallow study was performed and the patient was found to aspirate thin and nectar consistency liquids. Patient was thriving otherwise and meeting developmental milestones. Patient did continue to have some respiratory compromise and was diagnosed with obstructive sleep apnea and required oxygen. A repeat barium swallow study was done without improvement. An endoscopic evaluation by Gastroenterology, ENT, and Pulmonology was completed without abnormality. A brain MRI was conducted and findings of mildly reduced posterior CSF flow at the craniocervical junction. Findings support Chiari I malformation. Patient underwent Suboccipital craniectomy, C1 laminectomy, resection of fibrous band. A limited repeat barium swallow study showed improved dysphagia with patient able to safely consume nectar thickened liquids. Thin liquids were not evaluated as patient refused during study.
Case #2: A 3 month old male with history of intermittent vomiting post pyloromyotomy and occasional coughing with thin liquids. Patient did have vomiting described as 0-8 times a day. No improvement since pyloromyotomy. Patient continued to gain weight appropriately. Due to concerns of a cow's milk protein allergy, formula was modified to an Amino Acid base formula. Partial improvement noted. Growing concerns of coughing with thin liquids lead to initial barium swallow test that showed aspiration with thin liquids. Patient then started developing respiratory infections and worsening coughing with nectar liquids and repeat swallow study reveals aspiration of all consistencies. An endoscopic evaluation by Gastroenterology, ENT, and Pulmonology was completed without abnormality. A third swallow study was done with improvement but still showing aspiration of thin consistency. A brain MRI was done that showed Chiari I malformation with mild prominence of the lateral and third ventricles and arachnoid cyst. Patient is set to have surgery to correct malformation.

Discussion: These cases help bring attention to the early detection of central nervous system abnormalities when symptoms of dysphagia present. Findings of Chiari Malformation are starting to be diagnosed at younger ages due to improved radiology testing for the young population. As clinicians, it is important to consider evaluation of the brain, if no other etiologies are found when any swallowing dysfunction presents. We have already found improvement in swallowing function in Case #1 after neurosurgical intervention. Case #2 is set to have surgical intervention soon and reassessment of swallowing function will follow.

226 ***AMBULATORY PEDIATRIC GASTROENTEROLOGY (GI) TELEPHONE TRIAGE (TT) RED FLAG GUIDELINE: NURSING ASSESSMENT, INTERVENTION AND DISPOSITION.***

Sara Fidanza[1,2], *Amy Pyo-Twist*[1]. [1]*GI*, *Children's Hospital Colorado*, *Denver*, *CO*; [2]*University of Colorado Anshutz Campus*, *Aurora*, *Colorado*, *Afghanistan*

Ambulatory pediatric GI nursing care requires comprehensive clinical knowledge, expertise, education and telephone triage (TT). Since nurses have limited opportunity to acquire TT skills, ambulatory leaders are challenged with the task of providing telephone triage education. TT protocols, guidelines or algorithms are necessary to provide structure for consistent assessment, intervention, and disposition of care to minimize risk and assure excellent patient outcomes.

Literature suggests protocols or algorithms can provide guidance to nurses but are unable to address all the possible situations that exist in telephone triage. Guidelines are more permissive, provide flexibility for judgement or independent decision making and are less of a legal liability if not strictly adhered to.

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Unfortunately, there is limited availability of pediatric GI TT guidelines and current documents are not comprehensive nor validated. To assure nurses are able to address immediate medical concerns during TT, a pediatric GI TT Red Flag guideline was developed. The purpose of this tool is to provide a symptom based decision making guide for disposition of care. The guideline organizes symptoms and disposition into 3 categories: low risk (green), intermediate risk - urgent (yellow), or high risk - emergent (red) intervention. This tool is very similar to an action plan used to provide clinical guidance in patient care delivery. The hope is this TT Red Flag guideline will provide pediatric GI nurses with structural assessment to discern high risk symptoms requiring urgent or emergent disposition and facilitate immediate direction for specific GI medical emergencies.

This pediatric GI TT Red Flag Guideline has not been implemented into practice yet. Next step will be to embed this tool into a new EPIC upgrade where TT guidelines will be linked to nurse triage calls, with documentation in flowsheets or concept enabled notes to assess measureable outcomes. Once nurses are able to access and utilize this guideline a Plan, Do, Study, Act (PDSA) cycle will be performed to analyze, modify,evaluate and validate the tool.

In conclusion, recognition and development of TT guidelines can provide nurses with structural assessment, intervention and disposition of care to improve nurse and patient satisfaction, minimize fear or risk and promote consistent safe patient outcomes.

Telephone Triage Assessment	Green – low risk	Yellow – Intermediate Risk – Evaluation/ED	Red – High Risk – 911
Respiratory/Breathing/Airway	Normal Breathing	Rapid breathing Nasal flaring Intermittent color changes Slight wheezing	Gasping Grunting Unable to speak or cry, Muffled voice Drooling Retractions Coughing/choking Stridor Severe wheezing Swelling of neck Foreign body Color change – pale/blue/gray
Circulation Feeding/Hydration	Normal skin and eyes Moist mucus membranes Urinating frequently Color pink Eating well	Rapid heart rate Chest pain without other symptoms Capillary refill slow Dry mucous membranes Drop in fluid/food intake Less wet diapers or urination Poor feeding in infants Minimal blood loss	Hemorrhage - large blood loss Shock Petechiae Arterial occlusion (white/cold extremity) Altered peripheral circulation – numbness, tingling, weakness DVT (pain/swelling) Testicular pain/swelling Not crying tears Reduced skin turgor No wet diapers or urination in 8 hours Food or fluid refusal No sucking on bottle/breast
Neuro/Behavior/Activity	Responds normally to social cues Content, smiles Stays awake or awakens easily	Headache worsening Not responding normally to social cues No smile Wakes with stimulation Decreased activity Dizzy, not able to ambulate effectively Limited use of a limbs	New onset severe headache No response to social cues Paralysis -unilateral or bilateral Lethargic, does not awake or when aroused does not stay awake Floppy, staring, limp Weak, high-pitched cry or continuous cry "Does not act like my child"

TT Red Flag Guideline

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Comfort/Pain	Strong normal cry/not crying No pain Able to perform all activities	Changes in strength of cry, crying more often Pain present, able to perform activities – crawl, walk, run	Irritable Screaming Whining Inconsolable Constant pain Pain level high10/10 Refusal to perform activities, unable to move Fetal positioning
Fever	Normal temperature	Any fever in in child 3 months or less in age Temperature ≥ 100.4 with CVC Temperature 104 or greater with no response to antipyretic Temp 100.4 for 2 or more times in the past 24 hours	Temperature ≥ 100.4 with CVC Persistent fever without an obvious source of infection and child less than 2 years Persistent high fever All with other symptoms
Mental Health/Behavioral	Normal behavior for child	Changes in behavior or voicing concerns about mental health Acting out behaviors Substance abuse - no signs of harming self or others	Voicing or acting on thoughts to harm self or others Physical or mental abuse causing harm to self or others Substance abuse with changes in physiological status
GI			
Central Line and temp ≥ 100.4		Send to ED	
Button Battery Ingestion		Send to ED	
GT inadvertent removal, unable to replace		Provider or ED visit ASAP	

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227 ***VOMITING: A CASE FROM THE TEXTBOOK.*** *Kristin Madden[1], Fernando Zapata[1], Steven Raynor[2]. [1]GI, Children's Hospital & Medical Center, Omaha , NE; [2]Pediatric Surgery, Children's Hospital & Medical Center, Omaha, NE*

Background/Introduction: Recurrent vomiting is a fairly common childhood ailment and can be associated with many different etiologies. Vomiting classified as chronic, lasting longer than 3 months, requires additional workup including laboratory investigations and often radiology imaging prior to upper endoscopy. In many cases, vomiting can self-resolve if given enough time and there are no risks to waiting for resolution such as weight loss or other red flags. Less often a congenital defect is found to be responsible for vomiting especially in older children. These defects may include:
Gastric duplication – Foregut duplications account for approximately one-third of all congenital duplications of the gastrointestinal tract with gastric duplications accounting for between approximately 4-8% of these. They are more common in females. Presentation classically occurs in infancy, although presentation at any age is possible. Common symptoms are non-bilious vomiting possibly with weight loss, abdominal pain and distention.
Gastric diverticulum – congenital gastric diverticulae are very uncommon. They occur most commonly in the posterior wall, antrum, and pylorus, usually comprising all layers of the stomach wall. Presentation is usually in adult life, although children may resent with recurrent abdominal pain and vomiting. Treatment is by surgical excision. Upper gastrointestinal endoscopy or contrast studies are usually sufficient to make the diagnosis.

The Case: An 11 year old female presented with recurrent nocturnal emesis for the last 3 years occurring 3-5 times per year and not associated with any other symptoms. Vomiting occurred over approximately one hour with multiple episodes. Emesis was described as non-bilious, non-bloody and occasionally consisting of undigested food. There is no aura or feeling of nausea prior to these episodes, no dysphagia or symptoms of gastroesophageal reflux. No associated triggering factors were identified.
Recommendations for workup included CBC, CMP, GGT, Amylase, Lipase, ESR, CRP, Celiac Serology and upper gastrointestinal (UGI) contrast study. Next step would include esophagogastroduodenoscopy with biopsies.

Findings: Laboratory investigations were normal/negative however UGI revealed findings consistent with gastric duplication.
Esophagogastroduodenoscopy was recommended. Pediatric surgery was consulted for additional management.

Conclusions/Discussion: Esophagogastroduodenoscopy demonstrated a diverticular formation supporting findings reported on UGI with the possible duplication/diverticular opening in the fundus near the gastroesophageal junction. Appearance of mucosa was unremarkable however some friability was noted, additionally food residue was noted in the cavity. Remainder of endoscopy was normal. Elective surgical correction to the base of the diverticulum was completed and pathology confirmed identification of the resection as a diverticulum comprising all layers of the gastric wall with patchy mucosal surface erosion. This presentation is very uncommon and generally presents in adults. However, in this case the presentation fits the textbook teaching of a child presenting with vomiting and diagnosis identified on upper GI contrast study.

References:

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228 ***DETERMINING OPTIMAL VISCOSITY OF COMMERCIALLY PREPARED FOOD-BASED BLENDERIZED FORMULA TO BE ADMINISTERED VIA ENTERAL FEEDING TUBE USING THE INTERNATIONAL DYSPHAGIA DIET STANDARDIZATION INITIATIVE FRAMEWORK.*** *Sharon Weston[1], Joseph Moffitt[2], Tracie Clarke[1]. [1]Center for Nutrition, Boston Children's Hospital, Peabody, MA; [2]Phillips Academy, Andover, MA*

Background: Commercially prepared food-based blenderized formula (CBF) can be used in place of standard enteral formula and is composed of blended whole foods. Benefits of using CBF include reduced vomiting and retching, in part related to a higher viscosity. The CBF is administered by an enteral feeding tube pushed in via syringe or run by an enteral feeding pump. Due to the higher viscosity, caregivers often note that they add extra liquid to the CBF in order to aid in the administration of the feeding, especially if using a pump. This results in changes in viscosity but also alters the macro- and micronutrient intake due to dilution. Currently, there are no set guidelines in place to recommend the required volume needed to achieve the optimal viscosity for administration of CBF using an enteral feeding pump.

The goal of our pilot study was to determine viscosity values of various CBFs (full strength and diluted) utilizing the International Dysphagia Diet Standardization Initiative (IDDSI) framework (Image 1). The IDDSI flow test provides an objective method to measure viscosity using a 10 ml syringe and a stopwatch. This test can be easily reproduced by caregivers and providers. Flow test results of the CBF samples tested were categorized in relation to the correlating liquid thickness and compared to standard enteral formulas for reference.

Methods: Using the IDDSI framework, each formula sample (full strength and diluted) was tested at least 3 times. Temperature of all samples was tested and maintained at room temperature for consistent results. The viscosity category was determined using the IDDSI methodology. Incremental amounts of water were then added to each full-strength formula as needed to achieve an IDDSI value representative of a slightly thick liquid. The mean, standard deviation of the sample and confidence interval t-test were determined of all samples.

Results: Flow test results indicated that undiluted CBFs ranged in viscosity from slightly thick to extremely thick when measured at room temperature. The volume of water required to achieve a slightly thick viscosity ranged from 0 to 270 ml per serving, resulting in a wide variation in dilution of formula (Table 1). The IDDSI flow test was simple to perform, and can serve as a helpful tool to achieve a consistent viscosity for thinning blenderized formula.

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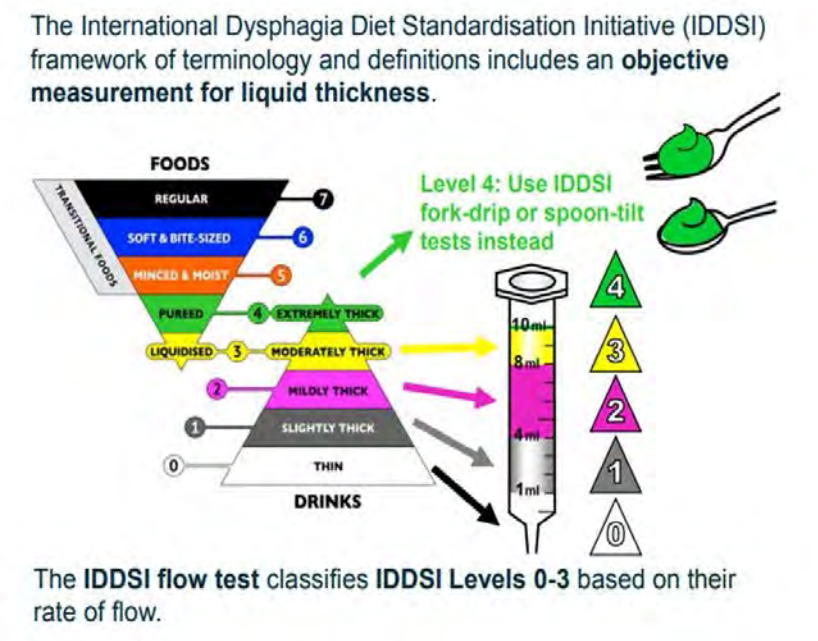


Image 1. IDDSI Flow Test Classification Diagram (The International Dysphagia Diet Standardisation Initiative 2016 @https://iddsi.org/framework/)

FORMULA	SAMPLE SIZE (mL)	WATER ADDED (mL)	MEAN IDDSI VALUE	STANDARD DEVIATION	CORRELATING VISCOSITY (IDDSI)
Compleat Pediatric1.0 (Reference Formula)	250	0	1.8	0.0	Slightly Thick
Pediasure Harvest	237	0	3.2	0.0	Slightly Thick
Kitchen Blends- Tender Chicken	400	0	3.3	0.2	Slightly Thick
Nourish	355	30	2.0	0.2	Slightly Thick
Kitchen Blends- Mixed Vegetables	400	60	3.5	0.3	Slightly Thick
Real Food Blends- Turkey	240	90	3.0	0.0	Slightly Thick
Real Food Blends- Salmon	240	90	2.8	0.5	Slightly Thick
Liquid Hope	355	100	3.0	0.0	Slightly Thick
Compleat Pediatric Organic Blends- Chicken Blend	300	115	3.5	0.0	Slightly Thick
Compleat Organic Blends- Plant Based	300	120	3.2	0.1	Slightly Thick
Compleat Pediatric Organic Blends- Plant Based	300	135	1.2	0.2	Slightly Thick
Real Food Blends – Beef	240	210	3.7	0.1	Slightly Thick
Real Food Blends- Eggs, Apples & Oats	240	270	3.9	0.1	Slightly Thick

Table 1. Variations in Water added to CBFs to Achieve a Slightly Thick Viscosity Based on the IDDSI Framework

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229 ***OPTIMIZING NURSING AND PHARMACY COLLABORATION IN THE CARE OF PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASE.*** *Melanie Oates[1], Barb Drobnic[1], Megan McNicol[1], Jennifer Dotson[1,2], Brendan Boyle[1]. [1]GI Nationwide Children's Hospital, Galloway , OH; [2]The Abigail Wexner Research Institute, Nationwide Children's Hospital, Columbus, OH*

Background: Nationwide Children's Hospital (NCH) gastroenterology department has a designated Inflammatory Bowel Disease (IBD) Center managing over 700 pediatric patients with IBD. Over the last several years therapeutic advances in the treatment of moderate to severe pediatric IBD has trended towards the use of biologic medications because of their proven efficacy. At NCH, 63% of our patients are currently on biologic medications. Patient education and training for pediatric patients started on these therapies is imperative. In addition, the substantial cost associated with these specialty medications results in additional insurance and pharmacy barriers. As the demand for biologics has increased, so has the burden on the IBD nursing staff working to navigate this complex system. This often results in the patients experiencing a delay in therapy and the nursing staff facing additional stressors due to the biologic workload.

Purpose: Describe the role of an integrated clinical pharmacist with nursing staff to better pediatric IBD patient care.

Method: The IBD Center at NCH identified how time intensive the increased use of biologic therapy was becoming for the nursing staff and the patient's delay in therapy that occurred as a result. The increased workload and delay in therapy demonstrated the need for a clinical pharmacist to join the multidisciplinary IBD team to assist with pharmacy related tasks. This need was presented to the pharmacy administration and resulted in the approval of a clinical pharmacist position for the IBD center. Once the clinical pharmacist was on-boarded a new workflow was established to integrate the clinical pharmacist with the GI staff and responsibilities were re-distributed accordingly.

Results: The addition of a clinical pharmacist has helped to expedite availability of specialty medications to our IBD patients. The clinical pharmacist has taken the lead on insurance navigation and completing the prior authorizations (PA) for all injectable biologics. In addition, the clinical pharmacist assists the physicians in drafting letters of medical necessity and navigating the insurance appeal process. These various interventions have decreased the time to therapy for IBD patients. The pharmacist is now responsible for providing patient education and in-person injection training with the patients and their families. Since the integration of a clinical pharmacist, the average time from PA initiation to the patient receiving education and the first dose is 7.1 days when filled at NCH Specialty Pharmacy and 13.5 days when filled at an external Specialty Pharmacy. In addition, the pharmacist aids in enrolling patients in copay assistance, performs compliance assessments, and provides vaccine recommendations when appropriate. The addition of a pharmacist has enabled nursing staff to have increased involvement in IBD clinic days, perform 1-on-1 educational sessions with new diagnosis patients and decrease the turn-around-time for incoming calls to the nursing triage line. The new workflow has greatly improved provider and patient satisfaction regarding biologic therapy and enabled the IBD nurse team to focus on other areas of patient care.

Conclusion: The integration of a clinical pharmacist has helped to decrease the workload on IBD nursing staff surrounding the use of biologic medications. Because of this, the nurses are able to dedicate their time to other areas of patient care. The clinical pharmacist has been able to streamline and expedite the delivery of specialty medications to IBD patients. In addition, the clinical pharmacist is able to provide personalized patient education and injection training surrounding biologic therapy, as well as assist with medication reconciliation, compliance assessments and vaccine recommendations. This integration of a clinical pharmacist with nursing staff on an IBD multidisciplinary team has greatly improved patient care, as well as the nurses overall job satisfaction.

Future Direction: The increased collaboration of nursing staff with a clinical pharmacist has already enabled many advances in IBD patient care, specifically related to biologic therapy. There are currently several other projects underway that will heavily involve the clinical pharmacist. These projects include; ensuring hepatitis B immunity in immunocompromised patients, optimizing the use of biosimilar products, and improving therapeutic drug monitoring. These projects would not have been possible before the implementation of a clinical pharmacist and effective collaboration together with the nursing staff.

230 ***SCREENING AND COUNSELING FOR T1D IN PATIENTS WITH CELIAC DISEASE.*** *Missy Olson, Edwin Liu. Digestive Health Institute, Children's Colorado, Denver, CO*

Introduction: Patients with type 1 diabetes (T1D) get screened yearly with tissue Transglutaminase (tTG) autoantibodies, and about 10% will develop celiac disease (CD). In patients with CD, the risk of developing subsequent diabetes is 2.4 times higher or about 1-1.5 %. Therefore, there is an increased risk of developing diabetes in those who have pre-existing

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CD, but not as high as the other way around. We feel that even though the chance is lower, there is still a need to counsel and possibly screen these patients for diabetes in order to prevent significant morbidity. Below are case presentations of 3 patients with CD, where two developed subsequent T1D and the third is being closely monitored for progression to T1D based on the presence of diabetes autoantibodies.
Findings/Case Description: Patient #1 was diagnosed with celiac disease by biopsy and labs at 8 years of age. He presented with abdominal pain, headaches and poor sleep. At age 15, due to ongoing symptoms of abdominal pain and fatigue despite having a normal tTG level, he underwent a repeat endoscopy, confirming good control of his celiac disease. During a routine follow-up visit several months later he continued with fatigue, abdominal pain and poor growth. He was sent home to obtain screening labs at an outside facility. His mother was concerned about the possibility of diabetes, and before the labs could be reviewed, she used a family member's home glucometer to check his blood glucose. He was seen in the ED and found to have a blood glucose level in the 600's. He was diagnosed with T1D 9 years after his diagnosis of celiac disease. He avoided diabetic ketoacidosis (DKA), and did not require hospitalization. At his most recent visit, his symptoms and growth have since improved.
Patient #2 is a boy of Senegalese descent who was initially seen at age 3 years for vomiting, abdominal pain, and constipation. He had an initial tTG of 30 (normal >20) but did not have further evaluation and was lost to follow-up. He returned at age 8 with a tTG of >100 and was subsequently diagnosed by endoscopy that confirmed celiac disease. At a routine follow-up visit at the age of 9, his gluten-free diet adherence was good, and his tTG was 33.7. We recommended participation in an ongoing Colorado mass screening study, the Autoimmunity Screening for Kids (ASK) research program (which performs free screening for both celiac and diabetes autoantibodies) to assess long-term risk of T1D, and also counseled him on the increased risk of type 1 diabetes and signs/symptoms of hyperglycemia. Before he could get screened through ASK and just 5 days after the clinic visit , he was seen in the ED for polyuria noted by his astute father. In the ED, his blood sugar was 600 and diagnosed with type 1 diabetes. He did not have diabetic ketoacidosis (DKA) and did not require hospitalization. Of note his weight has improved since his diagnosis of T1D, jumping from 25 % to 50% for the first time on his growth curve.
Patient #3 was a 16 yo who presented to us with a diagnosis of celiac disease from an outside provider. She was still complaining of fatigue, dizziness, and abdominal pain, despite her attempts at being gluten free. In addition to nutritional education about the gluten-free diet, we also recommended participation in the ASK research program to screen for diabetes autoantibodies. Her results from the ASK screening showed that she was positive for 3 out of 4 diabetes autoantibodies, indicating a very high risk for development of diabetes (80% risk over 10 years), even though she was currently normoglycemic. As a result of ASK screening, she was identified as having preclinical diabetes, and is now able to receive education and close monitoring for the development of hyperglycemia and new-onset diabetes.
Summary/Recommendations
The development of type 1 diabetes after the diagnosis of celiac disease is uncommon, but does still occur. Often when a child is diagnosed with type 1 diabetes, there will have been several missed opportunities to catch it earlier by providers, and nearly 1 in 3 youths present with potentially life-threatening DKA. Early recognition of the classical triad of polydipsia, polyuria and polyphagia with weight loss is essential, as is awareness of the variable presenting symptoms. In the first 2 cases, we believe that advanced knowledge about the symptoms of hyperglycemia likely led to earlier detection of diabetes, and DKA was avoided. In the third case, early identification of diabetes autoantibodies has identified the patient has having preclinical diabetes, and now steps can be taken to avoid significant morbidity when hyperglycemia develops. Therefore, providers and nurses should be aware of the increased risk of diabetes in children with celiac disease. We also feel that counselling families for risk of diabetes in children with celiac disease should be considered as part of routine care.

231 ***EXPANDING THE SCOPE OF ENTERAL THERAPY FOR PEDIATRIC CROHN'S DISEASE IN THE ERA OF BIOLOGICS.*** *Jennifer Smith[1], Brendan Boyle[1], Amy Donegan[1], Ross Maltz[1,2], Jennifer Dotson[1,]. [1]Gastroenterology, Nationwide Children's Hospital, Columbus , OH; [2]Center of Microbial Pathogenesis Abigail Wexner Research Institute, Nationwide Children's Hospital, Columbus, OH; [3]Center for Innovation in Pediatric Practice, The Abigail Wexner Research Institute, Nationwide Children's Hospital, Columbus, OH*
Background: Enteral Therapy (ET) is not used widely in the United States, despite it being an effective treatment for Crohn's Disease (CD) and its recommendation as primary therapy for children with CD by both US and European pediatric GI societies (NASPGHAN, ESPGHAN, JSPGHAN, and BSPGNAN). It is as or more effective than steroids with little to no side effects. ET is most effective when done exclusively, though it can also be effective with limited foods.

Previously reported Nationwide Children's Hospital developed an algorithm (providing ET as 90-100% calorie requirements) to start and manage patients on ET in 2013. Prior to 2013, <5% of newly diagnosed patients were started on ET and increased to almost 50% of patients by May 2015. In subsequent years the use of ET as primary treatment for newly diagnosed patients with CD has changed with increased use of biologics in our practice. While primary therapy use of anti-

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TNF has increased, ET still has a role and can be used as effective and worthwhile treatment.

Case Presentations:
Severe infection/abscess
Case 1: 17 year old male with newly diagnosed long segment CD with CT findings identifying stricturing and penetrating disease with intraabdominal abscess and ileocecal fistula. Immunosuppression delayed related to abdominal infection and he was started on ET as a bridge to surgery. He completed 3 weeks of ET prior to ileocectomy with an improvement anemia and weight prior to procedure.

Vaccine completion
Case 2: 11 year old female diagnosed with extensive CD. Decision was made to initiate anti-TNF therapy, however patient was not varicella immune. Family opted to initiate ET for the recommended 4 weeks to obtain immunity to varicella prior to starting anti-TNF therapy. The patient had an improvement in symptoms on ET, gained 10 pounds which resolved her mild malnutrition, and was able to use ET until able to initiate anti-TNF treatment.

Anti-TNF initiation
Case 3: 13 year old male seen by dietitian in the endoscopy suite, post endoscopy/colonoscopy with moderate malnutrition and suspected CD. Given the uncertainty of abdominal abscess prior to imaging and concerns about starting immunosuppression, ET was initiated until completion of diagnostic evaluation. Biopsies confirmed Crohn's Disease and MRE findings ruled out abscess, prior authorization for anti-TNF initiated. Completed 4 weeks of ET and gained four pounds prior to first induction dose of anti-TNF. Patient and family wanted to continue ET throughout induction dosing. Completed total of 12 weeks of ET and gained eleven pounds during that time.

Discussion: ET is a safe and effective treatment to induce remission for pediatric Crohn's disease. ET can be used in a wide variety of clinical scenarios, such as severe infection and/or abscess, when live vaccines are needed, as a bridge to surgery, and when there is a delay in initiation of medical therapy. It can also be utilized when immunosuppression is contraindicated such as in cases of EBV infection, histoplasmosis or CMV infection. ET provides a way to improve nutrition which may be poor and potentially treat mucosal disease without suppressing the immune system. It can be started with the family immediately with limited barriers.

232 ***MULTIDISCIPLINARY INFLAMMATORY BOWEL DISEASE EDUCATION: UTILIZING A VIRTUAL PLATFORM TO IMPROVE ACCESSIBILITY.*** *Jamie Stevenson*, *Janine McDermott. Gastroenterology, Hepatology, and Nutrition*, *Children's Hospital of Philadelphia*, *Philadelphia*, *PA*
Background: The successful navigation of a chronic illness like inflammatory bowel disease (IBD), which can be quiescent and then flare, is anything but simple. Education is an integral component of the management of IBD. The need was identified for a multidisciplinary model of IBD education, including nursing, nutrition, and behavioral health team members to provide education to newly diagnosed IBD patients and families. A monthly multidisciplinary outpatient IBD education program was created, and the IBD care team referred patients and families to attend class. Subsequently, barriers to attendance were identified by the IBD nursing team, including geographic location, time of day, and transportation.
Aim: Provide an opportunity to make education accessible for newly diagnosed IBD patients and families unable to physically attend outpatient IBD education by utilizing a virtual platform to attend class remotely.
Methods: Digital Health department was consulted and provided guidance on the use of virtual platform programs, including Vidyo and BlueJeans. Patients and families were scheduled for IBD class, either in person or virtually. Those joining virtually received instructions on how to log in remotely. Vidyo and BlueJeans were trialed during class, and feedback on the use of the virtual platforms was obtained from class attendees joining remotely.
Outcomes: Vidyo and BlueJeans were trialed for virtual education, and ultimately, BlueJeans demonstrated to be more efficient, user-friendly, and suitable for the needs of patients and families joining outpatient IBD class remotely. Virtual attendees can view the educational material, ask questions, and actively participate in class. Outpatient IBD class attendance increased by 150% after the introduction of BlueJeans.
Conclusion: Providing the opportunity for newly diagnosed IBD patients and families to attend the outpatient IBD education program remotely using the virtual platform, BlueJeans, resulted in an increase in class attendance. The IBD nurses are collecting surveys from attendees who joined IBD class in person and virtually to assess for satisfaction. Data collection to measure and compare comprehension by those attending class in person and virtually is a likely next step.
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233 ***EXAMINATION OF TUBE FEEDING SCHEDULES ON ORAL INTAKE: A RETROSPECTIVE CHART REVIEW.*** *Caitlin Waddle[1], Lindsey Burrell[2], Rashelle Berry[1]. [1]Children's Healthcare of Atlanta, Atlanta, GA; [2]Children's Emory Pediatric Institute, Atlanta, GA*

Background: Children who have complex feeding disorders with organic and behavioral red flags require treatment with a multidisciplinary feeding team, but children with milder feeding difficulty can benefit from consultation with a pediatric dietitian[1,2]. Often parents are encouraged to feed their child orally, but are unsure how to adjust the enteral feeding schedule to optimize provision of oral intake. If parents are not provided guidance on adjusting the child's enteral feeding schedule, it may lead to lack of progress with oral feeding. Stimulation of appetite is a critical component of increasing oral intake and weaning tube feeding[3]. Intermittent daytime bolus feeding is often recommended for appetite stimulation as it is thought to be more physiological and preserves hunger and satiety cycles. [4,5,6,7] Overnight feeding is recommended, as well, to enhance appetite, but little research has compared the use of overnight feeding to a daytime bolus schedule in terms of improving oral intake.[6,7]

Method: We will conduct a chart review of tube dependent children that were evaluated by the multidisciplinary feeding team between January 1, 2018 to May 31, 2019. Eligible participants will have received enteral nutrition via nasogastric or gastrostomy tube. Children will be excluded if they were receiving appetite stimulant medications at the time of evaluation. Children will be divided into two groups: continuous feeds and daytime bolus feeds.

Results: The percentage of calories from enteral nutrition versus oral nutrition will be compared between groups of children with continuous and daytime bolus enteral feeds to evaluate any differences in oral food consumption between groups.

Conclusion: We anticipate that children on a daytime bolus tube feeding schedule will have a higher percentage of calories from oral food intake versus children on a continuous feeding schedule. These results could have significant impact on clinical recommendations for tube feeding regimen to promote oral intake.

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ENDOSCOPY/QI/EDUCATION

238 ***IMPROVING ADHERENCE TO QUALITY METRICS USING THE ELECTRONIC MEDICAL RECORD IN THE ENDOSCOPY SUITE.*** *Mary Sawh[1,2], Amy Hemperly[1,2], Griffin Gorsky[2], Heather Pierce[3,2], Lillian Choi[1,2]. [1]Gastroenterology, Hepatology and Nutrition, Rady Children's Hospital, San Diego, CA; [2]Pediatrics, University of California San Diego, School of Medicine, La Jolla, CA; [3]Hospital Medicine, Rady Children's Hospital, San Diego, CA*

Background: Quality metrics in pediatric endoscopy have been established to ensure delivery of high quality patient care while improving patient safety. Given significant variability in endoscopic practice and documentation, evaluation of adherence to these quality metrics has been limited. Our objective was to improve quality and safety in the endoscopy room by incorporating quality metrics into the electronic medical record system (EMR). Aim was to improve documentation of pediatric endoscopy quality measures to 80% within six months.

Methods: Institutional Review Board approval was obtained. A retrospective medical chart review of randomly selected endoscopy procedure notes was performed to establish baseline documentation practice of quality metrics among pediatric gastroenterologists. Quality metrics that were assessed included documentation of bowel preparation, ASA status, time-out, ileal intubation, cecal intubation time, and post-operative adverse events. Ishikawa diagrams were completed to identify barriers to complete documentation. An endoscopy note template that included quality metrics was then created in the EMR. Physicians and staff were educated on quality metrics in pediatric endoscopy and were informed of the new

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endoscopy note template. Post intervention analysis was performed Chi-Square analysis six months after EMR changes were implemented. A p-value of <0.05 was consider significant.
Results: 60 operative notes in the pre-intervention period and 189 operative notes in post-intervention period were assessed for adherence to quality metrics. There was a significant increase in documentation of bowel preparation (21.7% vs 99.5%, p <.001), ASA status (5% vs 92.6%, p < .001) and cecal intubation time (0% vs 95.2%, p < 0.001). There was no significant difference in documentation of time out (100% vs 100%%), or ileal intubation (95% vs 97.3%, p=0.368). There was no change in immediate adverse events post intervention. (0% vs 0%).

Discussion: Documentation rate of endoscopy quality metrics significantly improved by incorporating quality metrics into the EMR endoscopy note template. Individual metrics that did not demonstrate significant improvement are those metrics that were present in the pre-intervention endoscopy note template.

Conclusion: Incorporating quality metrics into the EMR endoscopy note significantly improved overall adherence to established standards in pediatric endoscopy. Future quality improvement intervention cycles include the following: Determine further barriers that limit adherence to quality metrics documentation and work to remove those barriers; use data obtained for each quality metric to improve our delivery of high quality patient care and clinical outcomes; assess other quality metrics in pediatric endoscopy not included in this study including patient satisfaction, time to notification of biopsy results, and documentation of post-discharge adverse events; and evaluate institutional quality metric data against national database.

241 ***LACK OF PARENTAL KNOWLEDGE OF ENDOSCOPY PROCEDURES AFTER INFORMED CONSENT: CHOOSING AN APPROPRIATE LEARNING MODALITY FOR ENDOSCOPY EDUCATION.*** *Heidi Hagerott[1,2], Zarela Molle-Rios[1], Pippa Simpson[2], Mahua Dasgupta[2], Diana Lerner[2]. [1]Pediatrics, Alfred I duPont Hospital for Children, Wilmington, DE; [2]Pediatrics, Medical College of Wisconsin, Milwaukee, WI*
Introduction: Endoscopy is a routine procedure performed in the pediatric population. It is important that parents/guardians understand the risks and benefits. The aim of our study was to determine if the current process of endoscopy education and informed consent is sufficient information to understand the key elements of endoscopic procedures or if supplemental information in either a visual or auditory format improves endoscopy knowledge and its impact on self-reported anxiety.
Methods: This a pre and post-test study design. Participants were recruited from the outpatient surgery center at Alfred I duPont Hospital for Children. After informed consent, participants were escorted to a private consult room. They completed three questionnaires to assess demographics, general anxiety and health literacy. Participants were asked if they received the standard educational endoscopy video via email and if they had watched it. They were given a questionnaire to assess endoscopy knowledge. The questionnaire was composed of 4 endoscopic domains, knowledge of the procedure, pre-op instructions, potential risks and follow-up and 1 question on self-reported state anxiety. Then, half the participants received supplemental written information and half received a brief video on endoscopy procedures, according to systematic randomization. The PI observed the participants review the data, then administered the same questionnaire and a satisfaction survey. The informed consent, written information and brief video all contained sufficient information to answer the questionnaires correctly. Pre and post intervention paired analysis was performed using paired t-test and McNemar's test (p-value <0.05 significant) Post-intervention responses were compared across groups using Mann-Whitney, Chi-square and Fisher's exact tests.
Results: A total of 132 participants were recruited between 2017- 2018; one parent did not complete the study (Table 1). Forty-eight percent of participants received the standard endoscopy educational video and 54% of those participants watched the video. Both intervention groups had significantly higher total scores post intervention (p<0.000; Fig 1). Post intervention total scores were not significantly different across groups (p=0.39). In the satisfaction survey, a significant higher percentage of parents in the video group reported that the pictures were easy to understand. No significant difference was found for self-reported anxiety across interventions. Health literacy did not significantly impact total scores.
Conclusion: Our data showed that standard informed consent processes are not adequate for parent/guardian comprehension of basic endoscopy procedure concepts; however, participants in both groups showed significant increase in knowledge after brief review of two different forms of endoscopy information. The questionnaire was unable to differentiate the better modality. Our study did not have a wide range of health literacy scores. The majority of participants had a health literacy score of a 7thgrade reading level or above. Written information may not be as effective in populations with lower health literacy scores.

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Few participants took advantage of the standard educational information prior to the endoscopy procedure. Since the participants in our study were observed reviewing the information, this suggests that reviewing the information with the parent/guardian in the clinic prior to the procedure may increase parental knowledge vs sending the information home. Self-reported anxiety did not increase after additional information. Further research needs to be completed to improve the informed consent process and to identify the best learning modality for endoscopy education to ensure understanding of endoscopy procedures.

Participant Characteristics (Total N=131)	N (%)
Age	
Up to 35 years	30 (22.9)
35-44 years	54 (41.2)
45 years and more	47 (35.9)
Gender Male	42 (32.1)
Race	
White	111 (84.7)
Black	9 (6.9)
Others	11 (8.4)
Ethnicity	
Non-Hispanic	116 (88.6)
Hispanic	10 (7.6)
Preferred not to answer	5 (3.8)
Education*	
Up to high school	28 (21.4)
College	81 (61.8)
Graduate or Professional	21 (16.0)
Income	
Up to 50K	32 (24.4)
50K-100K	41 (31.3)
>100K	48 (36.6)
Preferred not to answer	10 (7.6)
Standard endoscopy education video received	63 (48.1)
Of those who watched the video	34 (54.0)
Endoscopy (% repeat endoscopy)	56 (42.8)
GAD-7 scores	
Mild	91 (69.5)
Moderate	19 (14.5)
Possible diagnosis of GAD	13 (9.9)
Severe	8 (6.1)
Health Literacy Scores	
3rd grade or below	1 (0.8)
4-6th grade	0 (0.0)
7-8th grade	20 (15.3)
High school	110 (84.0)

*Missing for 1

Table 1.Participant Characteristics

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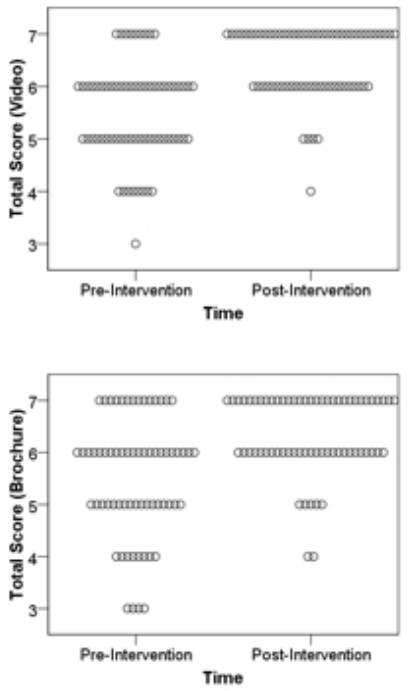


Fig 1.Scores

242 ***SAFELY REDUCING INPATIENT ADMISSIONS FOR PH IMPEDANCE PROBE TESTING FOR YOUNG CHILDREN LEADS TO SIGNIFICANT COST SAVINGS.*** *Keith Hazleton[1,2], Jacob Mark[1,2], Caroline Hall[1,2], Robert Kramer[1,2]. [1]Pediatric Gastroenterology, Hepatology and Nutrition, University of Colorado, Aurora, CO; [2]Digestive Health Institute, Children's Hosptial Colorado, Aurora, CO*

Introduction: pH impedance (pHI) probe monitoring is a valuable tool in assessing a number of pediatric gastric and esophageal pathologies. Because of concerns about accidental dislodgement, it was standard practice at our institution to admit all children under 24 months of age, and common to admit children up to 72 months of age to the hospital for observation to prevent dislodgement and assist in quick replacement of dislodged probes. We sought to assess the cost effectiveness of this practice in order to make and prospectively study practice changes with regards to pH impedance probe ordering at CHCO.

Methods: We conducted a retrospective chart review of patients at highest risk of accidental probe dislodgement (24 months old and younger) that had pHI probe testing conducted while admitted to our institution from 2014-2016. We excluded patients that were admitted for other causes. Patient charts were mined for data regarding the pHI study. Hospital charge data was used to calculate the charges required for each successful probe replacement. Based on these data, we implemented practice change using Plan-Do-Study-Act (PDSA) methodology and prospectively monitored effects of practice changes from 3/2017 to 12/2018.

Results: We identified 219 patients and conducted chart reviews on 100 randomly selected patients for baseline data. We found a dislodgement rate of 10%, of which 50% were successfully replaced and yielded > 15 hours of data. Inpatient observation increased charges on average by $8,133. The number needed to admit in order to save one probe with reliable data was 20, signifying an average of $162,666 in additional charges to save one study. Based on this data we recommended a practice change to perform outpatient monitoring for all pHI studies. PDSA cycle 1 was conducted over 10 months (35 pHI studies). During this, no adverse outcomes were observed, and outpatient pHI was again recommended as standard practice, and PDSA cycle 2 was continued for 12 months (40 pHI studies). Inpatient pHI rates significantly decreased because of study interventions for children < 72 months of age (PDSA cycle 1 inpatient pHI rates 55% vs 25% in cycle 2 $p = 0.009$). Probe dislodgement rates were not different between inpatient and outpatient pHI studies (24% vs 11%, $p = 0.2$). Practice interventions resulted in 18 pHI studies performed as outpatients for children < 25 months of age,

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translating to decreased charges of approximately $132,433 over a period of 22 months in this age group.

Conclusions: We found that routine inpatient admission for pH impedance probe monitoring was not cost effective in young children. A practice change was able to significantly decrease the rate of admission of for probe monitoring with significant cost savings without an increased rate of dislodgement.

243 ***TIME SPENT IN THE ELECTRONIC HEALTH RECORD BY PEDIATRIC GASTROENTEROLOGY: USE OF EPIC SIGNAL DATA TO INFORM PHYSICIAN COMPENSATION*** **.** *Steven Miller[5], Ethan Mezoff[4], Jenifer Lightdale[6], Steven Liu[3], Jeannie Huang[1,2]. [1]Gastroenterology, Rady Children's Hospital San Diego, San Diego, CA; [2]Pediatrics, University of California San Diego, La Jolla, CA; [3]GI Care for Kids, Atlanta, GA; [4]Pediatric Gastroenterology, Nationwide Children's Hospital, Cleveland, OH; [5]Pediatric Gastroenterology, The Johns Hopkins School of Medicine, Baltimore, MD; [6]Pediatric Gastroenterology, University of Massachusetts School of Medicine, Worcester, MA*

Background: Clinical compensation for pediatric gastroenterology (GI) care uses revenue value units (RVUs) based on estimates of physician time spent providing patient care. RVUs were conceived in 1986, prior to current electronic health record systems (EHRs) which encompass many aspects of physician care, including order entry; record, lab and image review; written communications; as well as physician documentation.

EPIC, a commonly utilized EHR, has developed an analysis tool (***Signal)***, which can provide data on time spent by physicians in the EHR. Specifically, ***Signal*** provides data on time spent in order entry, reviewing labs, images and charts, documenting notes and answering communications via EPIC in-baskets. ***Signal*** data can be assessed at the level of an individual physician, an institution, and at a specialty level across institutions. ***Signal*** data may prove a valuable tool for examining true physician workload in pediatric GI beyond estimates currently used to determine RVUs.

Objective: Our goal was to investigate the potential to obtain actual physician, institution and specialty level data on pediatric GI time and volume from key ***Signal*** metrics.

Methods: We accessed national ***Signal*** data from April 2019 and examined metrics of volume and time spent providing patient care by pediatric GIs. To examine for variability across centers, we sampled specific metrics from five select centers representing 70 pediatric GIs from all regions of the US (West, Midwest, South, and East).

Results: National ***Signal*** metrics from 680 pediatric GIs practicing at 151 EPIC sites are presented in Table 1. Pediatric GIs spend an extra 75.2 minutes per day (MPD) outside of scheduled visit times performing work, including time spent in in-basket tasks (median 12 MPD), orders (median 8.2 MPD), chart review (median 15 MPD), and note completion activities (median 40 MPD). We also found notable variation across institutions in specific ***Signal*** metrics (Figure 1). In this subset, pediatric GIs spent an average of 63 to 105 MPD in the EHR outside of scheduled visit times.

Discussion: EHR analysis tools, such as ***Signal*** for EPIC, can provide data that may allow a more accurate determination of time spent by pediatric GIs providing high quality care for their specialty patient population. To our knowledge, this is the first report of volume and duration of patient care as documented in the EHR for a large cohort of Pediatric GIs. Data available in ***Signal*** and other EHR analysis tools should improve upon current RVU determination methods, which rely on estimates.

This analysis has limitations. Data do not account for practice organization or include time spent by other health professionals of the pediatric GI team, e.g., nurses, administrative assistants, and/or nurse practitioners. In turn, our ability to interpret variation encountered across regionally diverse centers and practice types was limited. In addition, we did not examine documentation of phone time. Phone calls are large in volume and critical to patient care, but variably documented. Finally, a number of pediatric GIs who use EPIC may be currently miscategorized as pediatricians and/or adult GIs. Further work in this area should ensure that pediatric GIs are correctly categorized in their specific EPIC sites to best enable meaningful interpretation of data.

All pediatric GIs should be cognizant of the potential for ***Signal*** and similar EHR metric systems to better determine physician workload. Our study provides a starting point for further investigation and discussion. We believe EHR data on physician patient care time has the potential to transform current RVU methodology. It may also prove a useful tool for pediatric GIs, with the support of NASPGHAN, to advocate for appropriate clinical compensation.

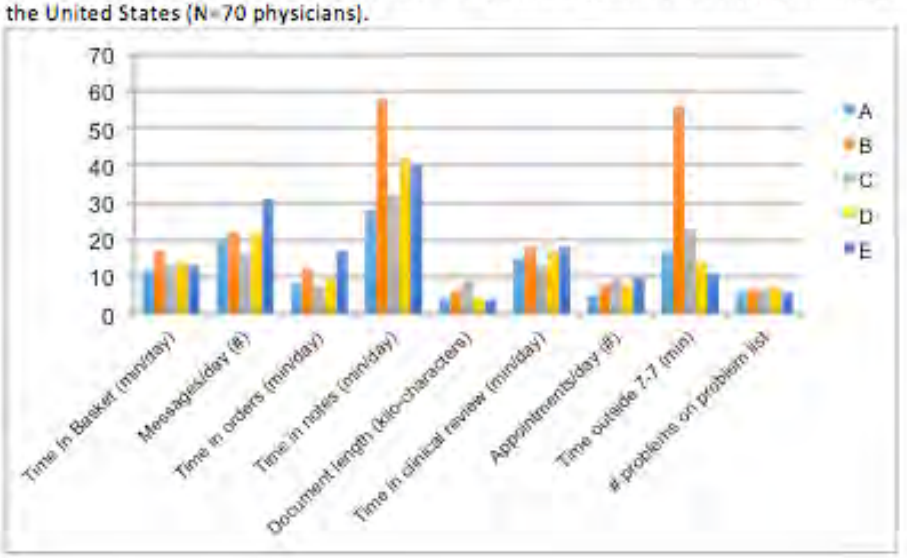
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TABLE 1. Signal metrics of the national Pediatric Gastroenterology cohort.

Metric	Pediatric Gastroenterology (N=680)
Time in In-Basket (min/day)	12 (6.6, 16)
Messages per day (#)	20 (13, 27)
Time in Orders (min/day)	8.2 (6.1, 12)
Time in Notes (min/day)	40 (25, 53)
Document length (kilo characters)	4.1 (2.9, 5.2)
Time in Clinical Review (min/day)	15 (11, 19)
Appointments per day (#)	7.9 (6, 9.8)
Mean time spent in EHR outside clinic (min/day: 7PM to 7 AM)	27
Mean time outside scheduled hours (min/day)	35
Mean time on unscheduled days (min/day)	44
Mean # of Patient Problems on the Problem list	6

Results listed as Median (IQR), except where noted.

FIGURE 1. Signal metrics across 5 representative pediatric gastroenterology practices across the United States (N=70 physicians).



244 ***GASTROINTESTINAL MORPHOLOGICAL AND HISTOPATHOLOGICAL FINDINGS IN A PEDIATRIC POPULATION EXPOSED TO LEAD IN THE AREA OF GREAT FLINT.*** *Fatima Hussain[1,2], Ahmed Sarheed[1], Jenny LaChance[2], Mohammad Tabbah[1]. [1]Pediatrics, Hurley Medical Center, Grand Blanc, MI; [2]Michigan State University, Flint, MI*

Background & Objectives: Previous research has investigated the mechanism of lead absorption through gastrointestinal (GI) tract, but little has focused on the changes of the GI tract after exposure to lead. Our study aimed at investigating the possible endoscopical and histopathological findings in the GI tract of patients who were exposed to lead following the Flint Water Crisis.

Method: The data were collected retrospectively from electronic medical records of Hurley Medical Center/ Flint for the period from 2011-2018.Our sample included 297 patients who all went through endoscopic procedures and had biopsies taken. Patients were grouped into those exposed (n=235) and non-exposed (n=62), and analysis was conducted to compare between the two groups. Gross endoscopic and histopathologic findings were the main variables compared. However, sub-categorization was made for the endoscopic findings (inflammation, erythema, ulceration,mucosal changes, stenosis) and histopathological findings (inflammatory changes, cellular infiltrates, mucosal damages, others); each subcategory was analyzed individually. Other variables were analyzed looking for statistically significant differences :age,gender,ethnicity,and indications for scoping. Chi-Square test and Fisher's exact test were utilized for the analysis, and

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the alpha was set for 0.05.
Results: Results showed no difference in gross endoscopic findings (52.2% exposed vs 49.2% non-exposed, P=0.661). However, statistical significance was observed in the histopathologic subcategories of cellular infiltrates (30.5% exposed vs 16.1% non-exposed, P=0.025) "others" (11.5% exposed vs 1.7% non-exposed, P=0.021). When analysis was done for all the remaining subcategories, no statistically significant difference was observed (inflammation:30.2% exposed vs 32.3% non-exposed, P=0f.75,erythema:27.7% exposed vs 27.4% non-exposed, P=0.875, ulceration: 7.7% exposed vs 8.1% non-exposed, P=0.915, mucosal changes:17.0% exposed vs 12.9% non-exposed, P=0.433, stenosis:1.3% exposed vs 0% non-exposed, P=0.37, inflammatory changes: 48.7% exposed vs 41.9% non-exposed, P=0.342). Variables of age, gender, ethnicity and indications for scoping showed no statistical significance.
Conclusion: Our research indicates that there may be no difference in terms of gross endoscopic findings among those who are exposed to lead in comparison to those non-exposed. However, we observed a pattern of difference in the histopathological findings that showed that exposed children were having more cellular infiltrates in their biopsies. Our research team will continue investigating the "others" category to better understand this statistical difference.

247 ***COLONOSCOPY SKILLS AND "TRAIN THE TRAINER" COURSES FOR PEDIATRIC ENDOSCOPY: NORTH AMERICAN EXPERIENCE.*** *Isha Kaul[1], Karen Queliza[2], Kevin A. Waschke[3], Catharine Walsh[4], Douglas Fishman[2]. [1]Pediatrics, Baylor College of Medicine, Houston, TX; [2]Section of Pediatric Gastroenterology, Hepatology and Nutrition, Baylor College of Medicine, Houston, TX; [3]Department of Medicine, McGill University Health Centre, Montreal, QC, Canada; [4]Division of Gastroenterology, Hepatology and Nutrition, The Hospital for Sick Children, Toronto, ON, Canada*
Background: Simulation is increasingly being recognized as an important modality in not only training colonoscopy skills but also in improving supervisors' abilities to teach endoscopy effectively. We hypothesize that endoscopy training can be enhanced by teaching endoscopists standardized colonoscopy skills and endoscopy training frameworks. We aimed to evaluate physicians' experiences with simulation-based "Colonoscopy Skills" and "Train the Trainer" courses tailored specifically to pediatric endoscopy.
Methods: Four simulation-based Colonoscopy Skills courses and one Train the Trainer course were offered at an annual pediatric conference for gastroenterology (GI) faculty and fellows in 2017 and 2018. Attendees were eligible to attend the Train the Trainer course if they had completed a Colonoscopy Skills course. They were led by 2 endoscopist with expertise in endoscopy education. Surveys were completed before and after each course to assess participants' experiences. Respondents rated their level of agreement with each statement on a 5-point scale.
Results:
Colonoscopy Skills: Sixty-three surveys were completed prior to the course. Sixty-two percent of respondents were attending physicians, 25% were GI fellows, and 13% were listed as other or unknown. Forty-six percent of respondents reported being involved in endoscopy training, 51% reported that they had not taken prior courses to improve their ability to teach endoscopy, and 52% had not participated in courses to improve their own colonoscopy skills. Prior to the course, 63% and 67% reported understanding use of patient position change and abdominal pressure during colonoscopy, respectively. Fifty-four percent reported confidence in performing loop reduction and 37% in torque steering. Post-course surveys were completed by 45 participants. There was a significant reported improvement in both knowledge and skills post-course (see Table 1).
Train the Trainer: Twenty-two surveys were completed prior to the course. Sixty-four percent reported that they discussed goals with trainees before each procedure, 77% provide feedback to trainees during procedures, and 73% give oral feedback following procedures. Fourteen percent reported difficulty verbally explaining concepts to trainees and 57% reported needing to physically demonstrate techniques during the procedure. Of the 18 post-course survey respondents, all reported an improved understanding of the "Preparation-Training-Wrap-Up" framework, ability to align the goals of the trainer and trainee, use of standardized language, performance enhancing feedback and improved conscious competence (see Table 2).
Conclusion: Simulation-based Colonoscopy Skills and Train the Trainer courses improved participants' perceived knowledge and skills related to both performing and training endoscopy. Future prospective studies to assess course impact are required.

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Table 1: Colonoscopy Skills Course

1A: Colonoscopy skills pre-course survey responses

Survey Item	Response* (Mean ± SD)
I have taken prior courses or participated in seminars to improve my ability to teach/train endoscopy	2.3 ± 2.0
I am involved in training individuals to perform endoscopy	2.0 ± 2.2
I have taken prior courses or participated in seminars to improve my own colonoscopy skills	2.4 ± 1.8
I am interested in improving my ergonomic technique when performing colonoscopy	4.6 ± 0.6
I am comfortable with performing loop reduction during colonoscopy	3.5 ± 1.1
I am comfortable using facilitated torque steering (vs. tip steering) during colonoscopy	3.2 ± 1.2
I understand the role of patient position change during colonoscopy	3.8 ± 1.0
I understand the role of abdominal pressure during colonoscopy	3.8 ± 0.9

*Rated on a 5-point Likert scale (1= disagree strongly, 2= disagree, 3= neutral, 4= agree, 5= agree strongly)

1B: Colonoscopy skills post-course survey responses showing knowledge and skills improvement in specific knowledge and skills

Survey Item	Percent Agreement* (%)
This course improved my technical skills regarding colonoscopy	93
This course improved my cognitive skills regarding colonoscopy	100
This course improved my knowledge and skills in torque steering	98
This course improved my knowledge and skills in loop recognition	87
This course improved my knowledge and skills in loop reduction	91
This course improved my knowledge and performance of teaching colonoscopy	77

*Percentage of participants rating improvement as ≥ 4 on 5-point scale

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Table 2: Train the trainer

2A: Train the trainer pre-course survey responses for questions related to feedback

Survey Item	Percent Agreement*(%)
I discuss goals with the trainee before each session/procedure	64
I give feedback to trainees during each procedure	77
I give ORAL feedback to trainees after each session/procedure	73
I give WRITTEN feedback to trainees after each session/procedure	5
I sometimes have a hard time verbally explaining to the trainee what I want them to do	14
I sometimes need to physically demonstrate during endoscopic training in order to show a technique	57

*Percentage of participants rating improvement as ≥ 4 on 5-point scale

2B: Train the trainer post-course responses showing improvement in specific knowledge and skills

Survey Item	Percent Agreement*† (%)
"**Preparation-Training-Wrap-up framework":** a framework that can be used by pediatric endoscopy trainers to help guide an endoscopy training session	100
Aligning Agendas: the ability to discuss and develop an agenda for an endoscopy training session that aligns with both the trainer and trainee's goals for the session	100
Training language: use of standardized language to ensure clarity of instruction and avoid confusion	100
Performance enhancing feedback: use of feedback at the end of the training session to reinforce learning and identify key aspects of performance that could be improved during future training episodes	100
Conscious competence: the importance of fostering endoscopists' conscious understanding of the steps required for performance of colonoscopy procedures	100

*Percentage of participants rating improvement as ≥ 4 on 5-point scale
†Each item rated in relation to whether "This course has improved my knowledge and skills in this area."

250 ***PROBE-BASED CONFOCAL LASER ENDOMICROSCOPY OFFERS AN IN-VIVO REAL TIME ASSESSMENT OF THE MUCOSA IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Chloe Kupelian[2], Roberto Gugig[3], Clifton Huang[1]. [1]Pediatric Gastroenterology, Cook Children's Healthcare, Fort Worth, TX; [2]Pediatric Gastroenterology, Valley Children's Hospital, Madera, CA; [3]Pediatric Gastroenterology, Lucile Packard Children's Hospital, Palo Alto, CA*

Introduction: In the evaluation of Inflammatory Bowel Disease (IBD), histologic confirmation is needed to determine whether the presence of mucosal abnormalities is consistent with this disease. Probe-based confocal laser endomicroscopy (CLE) is an emerging technology that enables in vivo evaluation of the mucosa (up to 1500 fold magnification) and may provide images similar to histologic findings. This study aims to compare conventional biopsies to CLE images in both IBD and healthy patients (6-21 years/old).

Methods: In a retrospective approach, CLE images obtained from 13 Ulcerative colitis (UC), 12 Crohn's disease (CD) and 8 healthy patients were compared to conventional endoscopic images and histologic samples. Both virtual and histologic biopsies were obtained at the same site using a double channel colonoscope.

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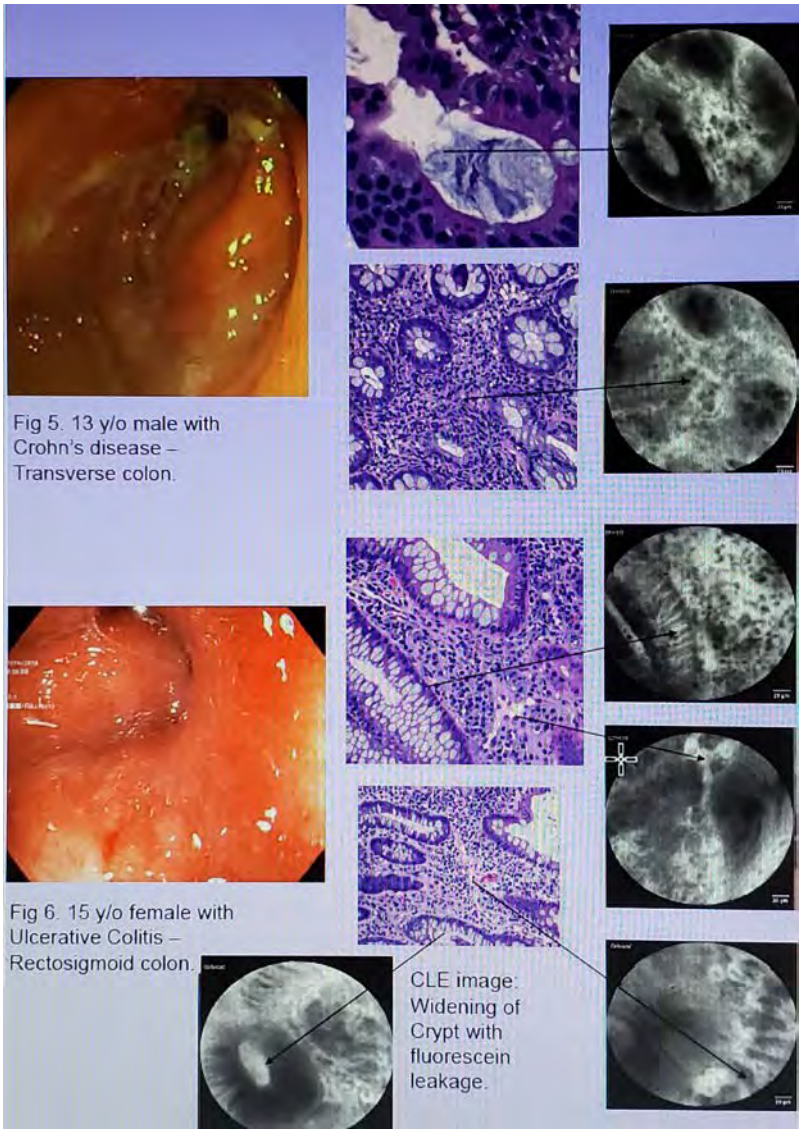
Results: All patients with histologic findings of moderate to severe CD showed findings of increased epithelial gap density with fluorescein leakage (small bowel), crypt architecture distortion, microvascular alterations, and increase cellular infiltrate within the lamina propria. All patients with histologic findings of moderate to severe UC showed crypt architecture distortion, microvascular alterations, and increase cellular infiltrate within the lamina propria. All patients with mild CD and mild UC showed findings of microvascular alterations and increase cellular infiltrate within the lamina propria.
All healthy subjects had normal histologic findings as well as normal CLE findings

Conclusions: Increased epithelial gap density, crypt architecture distortion, microvascular alterations, fluorescein leakage, and cellular infiltrates within the lamina propria are important observational markers in CLE which may confirm the diagnosis of IBD in vivo.
CLE can aid in demonstrating mucosal healing in terms of deep remission or histologic remission beyond the absence of mucosal/endoscopic ulceration or inflammation.

	Crohn's Disease (N=12)	Ulcerative Colitis (N=13)
Mean age of diagnosis	12.6	12
Female %	66 (8)	53 (7)
Mean disease duration /years (Median range)	3.7 (0.5-10)	2.4 (0.5-6)
Endoscopic disease location %		
Small bowel	16.7 (2)	
Ileo-Colonic	66.7 (8)	
Pancolitis	16.6 (2)	69 (9)
L-side colitis		31 (4)
Histologic disease severity %		
Normal	16.7 (2)	31 (4)
Mild	41.7 (5)	38.2 (5)
Moderate	16.6 (2)	15.4 (2)
Severe	25 (3)	15.4 (2)
Medications %		
Biologic	92 (11)	92 (12)
Methotrexate	33 (4)	46 (6)
Steroids	8 (1)	15 (2)
Aminosalicylate	0	15 (2)
Enteral therapy	33 (4)	0

Normal Endoscopy Subjects	(N=8)
Mean age at time of procedure	13.7
Male %	62.5 (5)
Indications for endoscopy	Rectal bleeding/Chronic diarrhea
Endoscopic findings	Normal

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252 ***IDENTIFYING PATIENTS WITH RARE DISEASES FOR RESEARCH USING BILLING CODES: IS THERE A BETTER WAY?*** *Jennifer Lee[1], Jeffrey Hoffman[3], Courtney Hebert[2], Kathy Nuss[3], Cory Hussain[2], Steven Erdman[1]. [1]Pediatric Gastroenterology, Nationwide Children's Hospital, Columbus, OH; [2]Biomedical Informatics, The Ohio State University Wexner Medical Center, Columbus, OH, OH; [3]Clinical Informatics, Nationwide Children's Hospital, Columbus, OH*

Background: Identifying patient cohorts using billing codes is challenging. ICD-10 contains roughly 68,000 diagnosis codes, but unique codes do not exist for every rare disease. Even when a code exists, the description does not always match the clinical term used by physicians for that same diagnosis.

To help with physician-entered diagnoses, hospital systems employ concept mapping which links pre-defined clinically relevant terms to a specific ICD-10 code, often using a third-party database. When a physician enters a clinical diagnosis in the electronic health record (EHR), it is mapped behind-the-scenes to the appropriate code. Because clinical diagnosis descriptions can be more specific than ICD-10 codes, they have the potential for improved identification of patient cohorts. Clinical diagnosis descriptions can be queried in the EHR using natural language processing techniques and could be used regardless of EHR vendor, making multicenter cohort identification possible.

In this study, we analyzed ICD-10 code mappings for clinical diagnosis descriptions representing 10 rare pediatric gastroenterology diseases and hypothesize that clinical diagnosis descriptions are more specific for rare disease diagnosis

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than each corresponding ICD-10 code.

Methods: We chose 10 rare pediatric gastroenterology diseases that have specific diagnostic criteria (Gardner's syndrome, juvenile polyposis syndrome (JPS), Alagille syndrome, hereditary pancreatitis, eosinophilic esophagitis (EoE), type 2 achalasia, type 2 autoimmune hepatitis, congenital short bowel syndrome, long segment Hirschsprung disease, and type 3 biliary atresia). We felt the distinction in diseases with multiple types to be important because the types have distinct clinical outcome implications when compared to other types with the same name.

We identified the ICD-10 code recommended by the Centers for Medicare and Medicaid Services (CMS) for each disease and used Oracle SQL developer to query the Epic™ Clarity database for all mapped clinical diagnosis terms at a large, free-standing pediatric children's hospital. Additionally, we included a subsequent evaluation for the CMS recommended ICD-10 code of *APC*, *SMAD4*, *JAG1*, and *PRSS1* gene mutations associated with Gardner syndrome, JPS, Alagille syndrome, and hereditary pancreatitis respectively. A pediatric gastroenterologist evaluated each clinical diagnosis term for concordance with the rare disease in study. We then calculated positive predictive value (PPV) of clinical diagnosis term mapping to the ICD-10 code.

Results: The 10 corresponding ICD-10 codes for clinical diagnoses were mapped to 360 individual clinical terms with 0-100% positive predictive value between clinical diagnosis description and rare disease diagnosis (Table 1). *APC*, *SMAD4*, *JAG1*, and *PRSS1* gene mutations mapped to Z15.89 (Genetic susceptibility to other disease) while only *APC* and *SMAD4* had dual mapping to both Z15.89 and Z15.09 (Genetic susceptibility to other malignant neoplasm). Z15.89 and Z15.09 are mapped to 3636 and 343 different clinical terms respectively, with PPV 0 (n=1 for *APC*, *SMAD4*, *JAG1*, and *PRSS1*) and 0.5 (n=2 for *APC* and *SMAD4*) respectively for associated genes.

Conclusions: ICD-10 codes for clinical diagnoses in our study were mapped to 5 – 74 individual clinical diagnosis terms while the ICD-10 codes for genetic variants were mapped to 343-3636 . ICD-10 codes have low PPVs for identifying rare pediatric gastrointestinal disorders. More studies are needed to determine the clinical utility of leveraging clinical diagnosis terms for patient cohort identification rather than using ICD-10 codes.

Rare Disease Diagnosis	ICD-10 Description	ICD-10 Count	Clinical Term Count	PPV (n= true positives)
Gardner's syndrome	D12.6 Benign neoplasm of colon, unspecified	1	74	4.1 (3)
JPS	D12.6 Benign neoplasm of colon, unspecified	1	74	1.4 (1)
Alagille syndrome	Q44.7 Other congenital malformations of liver	1	41	7.3 (3)
Hereditary pancreatitis	K85.90 Acute pancreatitis without necrosis or infection, unspecified	1	73	13.7 (10)
	K86.1 Other Chronic Pancreatitis	1	36	13.9 (5)
EoE	K20.0 Eosinophilic esophagitis	1	5	100 (5)
Type 2 Achalasia	K22.0 Achalasia of cardia	1	33	0 (0)
Type 2 Autoimmune hepatitis	K75.4 Autoimmune hepatitis	1	14	7.1 (1)
Congenital short bowel syndrome	K91.2 Postsurgical malabsorption, not elsewhere classified	1	26	3.8 (1)
Long segment Hirschprung disease	Q43.1 Hirschsprung's disease	1	47	2.1 (1)
Type 3 Biliary Atresia	Q44.2 Atresia of bile ducts	1	11	18.2 (2)

253 ***PEDIATRIC ERCP EXPERIENCE FOR PANCREAS INDICATIONS AT A DEDICATED PANCREAS CENTER.*** *Sagar Pathak[2], Maisam Abu-El-Haija[1], Jaimie Nathan[3], David Vitale[1], Lindsey Hornung[4], Tom Lin[1].*
[1]Gastroenterology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH
Introduction: Performing endoscopic retrograde cholangiopancreatoscopy (ERCP) in children has been shown to be safe and effective with equivalent adverse events rates, specifically post-ERCP pancreatitis (PEP), to the adult population. There have been limited studies looking at *pancreas-specific*ERCP indications and endoscopic interventions in children. We

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sought to review our ERCP experience at our pediatric multi-disciplinary, comprehensive Pancreas Care Center.

Methods: ERCPs were performed at a single pediatric tertiary care hospital between February 2012 and December 2018. An IRB-approved retrospective review of procedure information was performed. Collected data included patient age at time of the initial ERCP intervention, identifiable genetic risk factor(s), procedure indication(s), procedure complexity (as based upon the ASGE consensus list), therapeutic interventions performed, and procedure-related adverse events encountered. Adverse events were defined as described by recently published ASGE guidelines.

Results: A total of 294 ERCPs were performed in 154 unique patients for a pancreatic indication. Of these, 78% (230/294) were exclusively for a pancreatic indication and 22% (64/294) for a combined biliary and pancreas indication. Mean patient age for ERCPs performed for any pancreas indication was 10.7 years (range: 1-24 years). Fifty-seven percent (88/154) of patients underwent only one ERCP, 20% (31) 2 ERCPs, 19% (29) 3-4 ERCPs, 4% (6) >=5 ERCPs. The median number of procedures performed per patient was 1 (range: 1-11). Seventy-four percent (114/154) of patients underwent pancreatitis genetic risk factor testing, and 73 patients were found to possess at least one genetic variant including pathogenic, likely pathogenic, and variant of unknown clinical significance. Genetic testing for the remaining patients was not clinically indicated (e.g. biliary pancreatitis, first and only occurrence of acute pancreatitis). Eighty-five percent (249/294) of ERCPs included performance of a therapeutic endoscopic intervention other than placement of a prophylactic pancreatic stent. Comparison of patients who underwent genetic testing revealed that those positive for a genetic variant were significantly more likely to develop intraductal stone material encountered at the time of ERCP than those who tested negative (p=0.03).

The majority of ERCPs were done for an indication of chronic pancreatitis (CP, 55%, 162/294). Other indications included acute recurrent pancreatitis (ARP, 22%, 64/294), acute pancreatitis (including suspected biliary pancreatitis), suspected anomalous pancreaticobiliary junction, pancreas trauma, suspected pancreatic duct leak, and abnormal pancreas imaging (including pancreatic cyst, pancreas mass). The number of procedures based on complexity was: 0.3% (1) grade 0, 1% (3) grade 1, 1.7% (5) grade 2, 72% (213) grade 3, 25% (72) grade 4. The majority of grade 4 procedures were increased from a grade 3 due to the procedure having been performed outside of normal working hours, as per the ASGE consensus list.

Eleven procedures failed to deeply cannulate the pancreatic duct, though a pancreatogram may have been performed. Procedure adverse events included: 34 PEP (25 mild, 8 moderate, 1 severe; 12% overall occurrence rate), 1 moderate bleeding, 1 Type II perforation secondary to sphincterotomy (not requiring surgery), 1 severe bacteremia (requiring a 4-day hospitalization for intravenous antibiotics). There were no procedure-related deaths. Twenty-one percent (33/154) of patients went on to undergo a pancreatic surgical intervention for their disease: 30 total pancreatectomy with islet autotransplantation (TPIAT), 1 subtotal PIAT, 1 Frey procedure, 1 distal pancreatectomy.

Conclusion: We report a large cohort of children that have undergone ERCP intervention for pancreatic disease at our Pediatric Care Center, demonstrating its overall safety and utility in children. The majority of ERCPs were performed for ARP or CP indications, with frequent need for therapeutic interventions. The PEP adverse event rate in our cohort is higher than that of prior reports, though may reflect a higher degree of procedure complexity given 97% of procedures were grade 3 or 4. Therapeutic ERCP interventions are frequently performed in children but may not be solely effective, with some patients requiring surgical intervention, most frequently TPIAT, which is available at a select few pediatric centers.

254 ***SAFETY AND EFFECTIVENESS OF PLACEMENT OF NASOGASTRIC TUBE UNDER ENDOSCOPIC GUIDANCE IN PREVENTION OF STRICTURE FORMATION, AFTER CORROSIVE INGESTION IN CHILDREN.***

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Objective: To determine the safety and effectiveness of placement of nasogastric tube under endoscopic guidance after corrosive ingestion in children**.**

Patients and Methods: The data of 30 paediatric patients who underwent nasogastric tube placement under endoscopic guidance within 48 hours of corrosive ingestion at the Paediatric gastroenterology department, Military hospital Rawalpindi from March 2014 till December 2017 was gathered. Patients were followed up for 3 months after the procedure. SPSS version 20.0 was used for statistical analysis of data

Results:40 patients were included in the study. Mean patient age was 46.30 months. 56.7% patients were male while 43.3% patients were female. 56.7% corrosive agents were alkali while 43.3% corrosive agents were acids. 46.7% patients had grade 1 esophageal corrosive injury, 43.3% patients had grade 2 esophageal corrosive injury and 10% patients had grade 3 esophageal corrosive injury. Most complications were minor and self-limited. 66.7% of patients did not have any complications. 13.3% patients suffered from accidental NGT removal, 10% patients from nasal mucosal laceration and 10%

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patients from nasal bleeding. Three months after NGT placement, endoscopy revealed normal mucosa in 93.3% of patients, while strictures in only 6.7%.
Conclusion: We concluded from our study that that fiberoptic endoscopic guided nasogastric tube placement is a very safe, effective and minimally invasive technique for paediatric patients who accidentally ingest corrosive agents and report to hospital within first 24 to 48 hours of ingestion.
Complications:

	Frequency	Percentage
None	20	66.7
Accidental NG Tube Removal	4	13.3
Nasal Mucosal Laceration	3	10
Nasal Injury	3	10

Endoscopic Findings

		Frequency	Percentage
Initial Endoscopy	Grade 1 Mucosal Damage	14	46.7
	Grade 2 Mucosal Damage	13	43.3
	Grade 3 Mucosal Damage	3	10
01 Month Endoscopy	Normal Mucosa	26	86.7
	Mucosal Erythema	3	10
	Mucosal Laceration	1	3.3
03 Months Endoscopy	Stricture	28	93.3
	Normal Esophagus	2	6.7

258 ***RESULTS OF DUODENOSCOPE CULTURE AND QUARANTINE AFTER MANUFACTURER-RECOMMENDED CLEANING PROCESS.*** *Jacob Mark[1,2], Karin Underberg[3], Robert Kramer[1,2]. [1]Section of Pediatric Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Digestive Health Institute, Children's Hospital Colorado, Aurora, CO; [2]Pediatrics, University of Colorado School of Medicine, Aurora, CO; [3]Perioperative Services, Children's Hospital Colorado, Aurora, CO*
Background: Outbreaks of infections transmitted by duodenoscopes have prompted changes to duodenoscope cleaning protocols. However, little is known about effectiveness of clinical cleaning practices. We present culture data after duodenoscope manufacturer-recommended cleaning.
Methods: Duodenoscopes (Olympus models TJF-Q180V, TJF-160, PJF-160) were cleaned according to the manufacturer's revised reprocessing manual protocols to decrease chances of patient-to-patient pathogen transmission (immediate bedside cleaning followed by manual cleaning, two cycles of automated endoscope reprocessor cleaning using 22% hydrogen peroxide and 5% peroxyacetic acid, 4.3% trisodium phosphate, detergent, then 70% isopropyl alcohol and drying). After this, cultures were obtained using brushings from the distal tip, including elevator mechanism, and by flushing sterile water through the working channel. Specimens were grown in broad culture media. Duodenoscopes were quarantined until cultures resulted. Positive cultures were defined as > 10 colony forming units (CFUs) of low-concern organisms (coagulase negative staphylococci, micrococci, and gram positive rods) or any CFUs of high-concern organisms (yeast, Staphylococcus aureus, Enterococcus, or gram-negative enteric bacilli). If either culture was positive, the cleaning, culturing, and quarantine steps were repeated until cultures were negative, or, if either of the 3rd set of cultures was positive, the duodenoscope was returned to the manufacturer for assessment. A treating endoscopist was able to remove the duodenoscope early from quarantine if necessary. Culture data was collected from 12/2015 to 7/2018. We compared culture data to our prospective endoscopic adverse event monitoring system data to assess for infections related to ERCP.

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Results: There were 141 instances of duodenoscope cleaning, and 282 cultures. 28 of 236 (11.9%) initial cultures were positive. 31 of 36 2nd cultures were negative after repeat cleaning (86% clearance). 6 of 8 3rd cultures were negative after 3rd cleaning (75% clearance). The 3rd positive culture was traced to cracking in the tip of the duodenoscope. 98% of organisms cultured were gram positive (figure 1). There were 8 instances when both culture methods were positive, otherwise only one method was positive. There were 11 instances (7.8%) of duodenoscope removals from quarantine before final culture results for urgent patient care. There were no patients who had significant infections after ERCP.
Conclusions: 11.9% of duodenoscopes had a positive bacterial culture after initial cleaning following manufacturer's recommendations. Only 2% were gram negative organisms. Recleaning was 86.1% and 75% effective at eliminating initial and repeat positive cultures respectively. Culture and quarantine identified damage to a duodenoscope as a potential nidus for infection. Initial cleaning per manufacturer recommendations is not always effective at eliminating bacterial contamination, and other steps may be necessary to decrease risks of duodenoscope-transmitted infections.

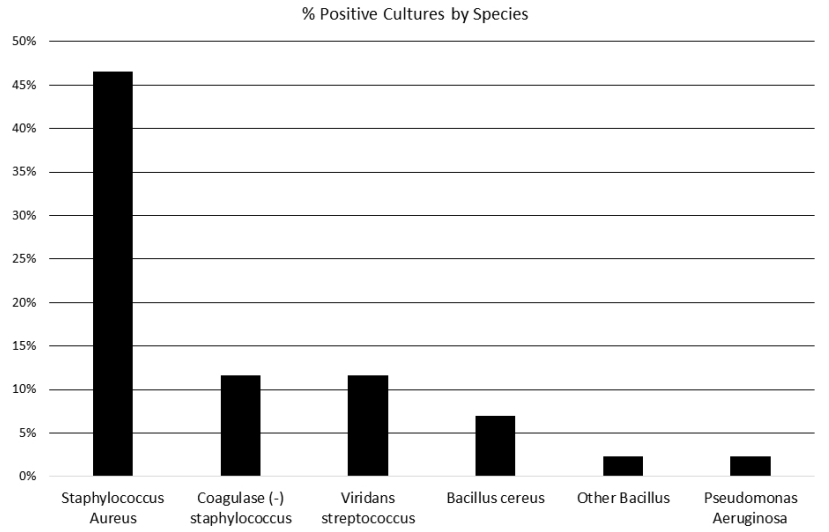


Figure 1. Organisms cultured from duodenoscopes after cleaning.

260 ***ENDOSCOPIC BALLOON DILATION AS INITIAL MANAGEMENT FOR CHILDREN WITH STRICTURING CROHN'S DISEASE: A SINGLE CENTER EXPERIENCE.*** *Brianna McSorley[1,2], Johanna Palmadottir[2], Candi Jump[2], Keri Walker[2], J. Antonio Quiros[2].[1]Pediatrics, MUSC, Charleston, SC; [2]Pediatric Gastroenterology, MUSC, Charleston, SC*

Background: Crohn's Disease (CD) has a multitude of complications including intestinal strictures from fibrostenotic disease. When symptoms develop from these strictures, the treatment in children has primarily been surgical resection. Endoscopic Balloon Dilation (EBD) has been proven as a safe and efficacious alternative to surgery in adults, but there is a paucity of evidence regarding use in children. The aim of our study is to evaluate the longitudinal outcomes of children with CD who underwent EBD versus surgical resection as a treatment of their strictures in an effort to demonstrate the utility of this procedure as an alternative to surgery in a pediatric CD population.

Methods: In a single-center retrospective cohort study, we looked at current pediatric patients (ages 0-18) who carry the diagnosis of CD. We identified those with fibrostenotic disease through the ICN database and using diagnostic and billing codes through Epic and evaluated their demographics, clinical variables, whether they underwent EBD versus surgery or both, and their longitudinal clinical outcomes.

Results: Of the 139 active patients with CD, 25 (18%) developed intestinal strictures. Twelve patients (48%) were female, 22 patients (88%) were Caucasian and 3 patients (12%) were African-American (Table 1). The mean age at diagnosis of CD was 13 years. The mean time of development of strictures from diagnosis was 1.5 years. Twenty (80%) of these

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strictures were located in the terminal ileum, 3 (12%) in the rectal/ anal region, 1 (4%) in the duodenum, and 1 (4%) in the colon. At the time of the procedure or surgery, 21 patients (84%) were on biologic therapy and 3 (12%) were on corticosteroids. Overall, 17 (68%) patients with a stricture underwent EBD at some point in their disease and 12 (48%) underwent surgical resection as initial form of therapy with 4 of these patients requiring further EBD post-surgery. The frequency of EBD procedures performed on individual patients was: 7 (41%) underwent 1 EBD, 8 (47%) had 2-3 EBDs and 2 (12%) had 4 or more dilation procedures at the same stricture site (Figure 1). All of the 17 patients who underwent EBD at some point in their disease did not have procedural complications, such as a perforation. For those 8 patients who underwent successful surgical resection alone, 4 of these patients (50%) had a fistula present near the stricture site and 4 (50%) had strictures greater than 5 cm in length.

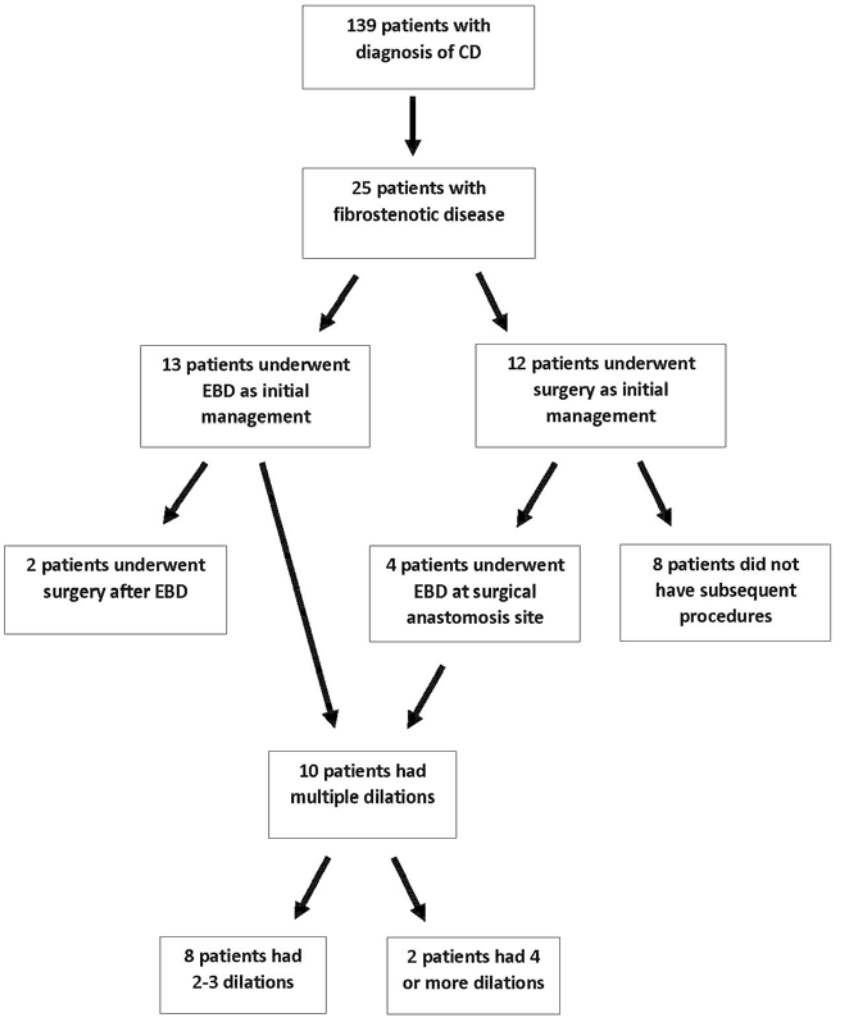
Conclusion: In pediatric IBD patients with fibrostenotic disease, EBD is a viable first choice for long term resolution even after failed surgery. Overall, 88% (15/17) with fibrostenotic strictures treated endoscopically did not require any further surgical interventions showing that EBD is efficacious as initial management of strictures in children and adolescents with CD. Further research is needed to develop ideal tools and techniques to manage children with IBD-related intestinal strictures.

Table 1: Patient Demographics

	Surgery Only n=8	EBD only n= 11	Surgery and EBD n=6
Sex (n, %)			
Male	4 (50%)	6 (55%)	3 (50%)
Female	4 (50%)	5 (45%)	3 (50%)
Age at Diagnosis (n, %)			
0-10	1 (12%)	1 (9%)	1 (17%)
11-18	7 (88%)	10 (91%)	5 (83%)
Race (n, %)			
Caucasian	7 (88%)	11 (100%	4 (67%)
African-American	1 (12%)	0 (0%)	2 (33%)
BMI (n, %)			
Underweight	2 (25%)	2 (18%)	0 (0%)
Normal	0 (0%)	7 (64%)	5 (83%)
Overweight	6 (75%)	2 (18%)	1 (17%)
On Biologic (n, %)	6 (75%)	10 (91%)	5 (83%)
On Steroids (n, %)	0 (0%)	2 18%)	1 (17%)

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Figure 1: Management of patients with stricturing CD via surgery or EBD



262 ***PEDIATRIC ENDOSCOPY QUALITY IMPROVEMENT: STANDARDIZATION OF ENDOSCOPIC BIOPSY PRACTICES AMONG GI PRACTITIONERS AT A TERTIARY PEDIATRIC CENTER.*** *Gautam Nagendra*, *Quratulain Merchant*, *Sharon Tam. Gastroenterology*, *Children's Hospital Los Angeles*, *Los Angeles*, *CA*

Background: Biopsies are routinely taken during pediatric endoscopy to ensure accurate detection of disease, a practice that is unique to the pediatric population. Insufficient or incorrect biopsies lead to unnecessary repeat procedures and added anesthesia risk. The European Society of Gastrointestinal Endoscopy (ESGE) and the European Society for Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) have jointly published disease-specific endoscopic biopsy guidelines that should be followed with specificity in site and number of biopsies. However, existing literature shows that adherence to these guidelines remain low among GI practitioners (8-35% in one pediatric study). We aim to improve the adherence rate to published biopsy guidelines in regards to four diseases: Eosinophilic Esophagitis (EoE), Celiac disease (CD), h.pylori gastritis (HP), and Inflammatory Bowel disease (IBD) at our tertiary pediatric center, by utilizing a standardized GI biopsy checklist pre-procedure.

Method: This was a quality improvement project conducted at Children's Hospital Los Angeles between October 2018 and March 2019, consisting of two 10-week Plan-Do-Study-Act (PDSA) cycles. The primary intervention involved deployment of a 'GI biopsy checklist' pre-procedure asking the endoscopist to identify if any of the 4 diseases (EoE/CD/HP/IBD) was suspected. The site and number of biopsy required to fulfill each specific biopsy guideline are listed as a reminder to the

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endoscopist. A ‘Standard’ biopsy practice was also created internally, and to be followed if none of the 4 listed diseases were suspected. The checklist was to be used to communicate intended biopsies from the endoscopist to the circulating nurse as an adjunct to verbal communication. Statistical Process Control (SPC) charts with binominal distribution were used to track changes in our measures: overall utilization of checklist, utilization of checklist as intended, and adherence rate to biopsy guidelines.

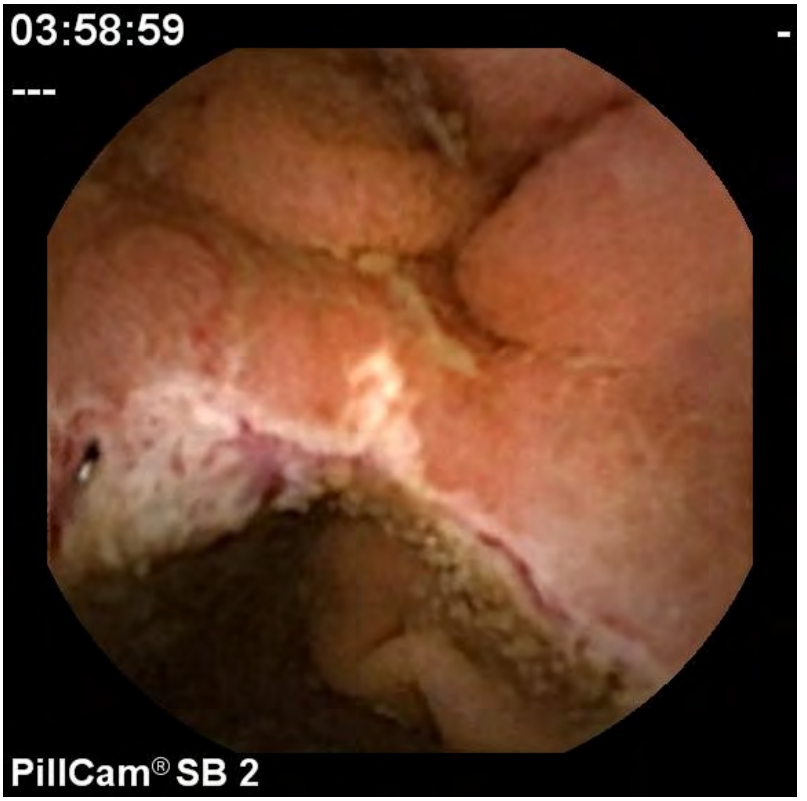
Results: Deployment of the GI Biopsy Checklist resulted in an increase in average adherence to biopsy guidelines to 41% after PDSA 1 and 61% after further refinement of the checklist in PDSA 2. However, utilization of the checklist remained low and inconsistent after PDSA 1, subsequently limiting further improvement in adherence rate. Therefore efforts were made to make the checklist more accessible, user-friendly, and better integrated into current procedure workflow in PDSA 2. This resulted in improved average utilization rate of 75% by the end of PDSA 2 and reduced mistakes in filling out the checklist. Subgroup analysis showed improvement in average adherence rate to biopsy guidelines for EoE (84%) and CD (77%), but not for HP or IBD.

Discussion: A pre-procedure GI biopsy checklist is an effective tool to standardize endoscopic biopsy practices and improve adherence to published biopsy guidelines. Reviewing the indication of endoscopy and the biopsy guidelines associated with the suspected disease pre-procedure resulted in better and more targeted biopsy practice. The checklist also allowed non-MD staff to anticipate biopsies being obtained. Integration of the checklist into existing procedure workflow for all members involved was essential in its successful adoption. Future direction involves integrating the checklist as part of Electronic Medical Record to have increased reliability and sustained change in practice, as well as creating a platform that can be revised easily as new guidelines arise.

263 ***PEDIATRIC CAPSULE ENDOSCOPY: ACHIEVING 0% CAPSULE RETENTION RATE IN THE DIAGNOSIS AND MANAGEMENT OF GASTROINTESTINAL DISORDERS IN CHILDREN.*** *Stephen Nanton*, *Joelle Roskens. Pediatrics*, *Avera McKennan Hospital* , *Sioux Falls*, *SD*

Objective: We evaluated the indications and clinical utility of video capsule endoscopy (VCE) in the diagnosis and management of gastrointestinal disorders in children. SUBJECTS: We studied consecutive children referred for VCE. (Age range from 2.5 to 21.5 years). The weight of the smallest child was 14.6 kg. RESULTS: 618 VCE procedures were performed. Indications for VCE included suspected Crohn's disease, anemia, abdominal pain, polyposis syndrome, celiac disease, and GI bleeding. The majority of capsules were placed using a capsule delivery device. In 25 patients, the capsule could not be placed using the standard technique, and a novel technique was developed using laryngoscopic assistance. By this method, 24 of these 25 patients had successful capsule placement. There were no complications. CAPSULE RETENTION RATE: There were no patients with capsule endoscope retention. Thus our capsule retention rate was 0%. We achieved this ideal retention rate by performing a patency capsule examination on all patients with known Crohn's disease or vomiting, prior to placement of the capsule endoscope. CELIAC DISEASE: A total of 52 children with elevated TTG levels were examined by VCE. A novel finding of proximal small bowel polyps were found in 7 patients. One patient was subsequently diagnosed with Bannayan-Riley-Ruvalcaba syndrome. Other VCE findings included classic scalloping of duodenal mucosa, loss of villi and mosaic pattern. MONITORING RESPONSE TO THERAPY IN CROHN'S DISEASE: 15 children with Crohn's disease underwent two or more VCE studies in order to monitor response to therapy. The VCE findings lead to changes in patient managements in 15 out of the 15 patients (100%). In 6 out of the 15 patients with Crohn's disease, who underwent multiple VCE to monitor therapy, step up treatment from Mesalamine to 6-MP was initiated based on VCE findings. In 8 out of 15 patients biologic therapy was initiated based on VCE findings. In 1 patient, therapy with Budesonide was initiated for persistent small bowel Crohn's disease. Clinical improvement in response to step up therapy was noted in all 15 patients and endoscopic improvement was documented in 8 of the 15 children by VCE POLYPS: Seventeen patients were found to have polyps in the small bowel. Two patients were known to have FAP. Three patients had IBD and 8 patients had celiac disease. DUODENAL WINDSOCK: A rare finding of duodenal windsock diverticulum was made by CE when abdominal CT suggested intussusception. CONCLUSION: The use of VCE in children is safe and has a significant impact on the diagnosis and management of pediatric gastrointestinal diseases.

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264 ***DETECTION OF ESOPHAGEAL HETEROTOPIC GASTRIC MUCOSA IN ESOPHAGEAL ATRESIA AND NON-ESOPHAGEAL ATRESIA POPULATIONS USING BOTH WHITE LIGHT AND NARROW BAND IMAGING.***

Peter Ngo[2], Ali Kamran[1], Jessica Yasuda[2], Susannah Clark[1], Shawn Anderson[1], Benjamin Zendejas[1], Thomas Hamilton[1], Russell Jennings[1], Michael Manfredi[2]. [1]Surgery, Boston Children's Hospital / Harvard Medical School, Boston, MA; [2]Gastroenterology, Boston Children's Hospital / Harvard Medical School, Boston, MA

Background: Heterotopic gastric mucosa (HGM) in the cervical esophagus, known as an inlet patch, is an under-recognized cause of symptoms in children and ablation therapy has been reported to improve inlet patch associated symptoms in both children and adults. HGM incidence ranges from 0.1 to 10% in studies but is frequently missed with white light endoscopy. Narrow Band Imaging (NBI) improves visibility of esophageal mucosal abnormalities. Although a 1971 cadaveric study reported an increased incidence of HGM in esophageal atresia (EA) patients, there has been no further report on the incidence of HGM in the EA population since that time.

Methods: Endoscopy records from January 2017 to May 2019 performed by a single provider in the Esophageal and Airway Treatment Center at Boston Children's Hospital who routinely documented the presence or absence of HGM using both white light and NBI with upper endoscopies were identified. Operative notes in which the presence or absence of esophageal HGM was documented utiziling both white light and NBI were reviewed. The number and largest diameter of HGM patches as well as diagnosis of EA were recorded. Incidence of HGM in EA patients was compared to non-EA patients. Patients referred for potential ablation of suspected symptomatic HGM and patients who had undergone esophagectomy or esophageal replacement were excluded.

Results: 503 unique pediatric patients who underwent at least 1 endoscopy in which the presence or absence of HGM was documented with the use of both white light and NBI were identified. HGM was identified in 105/503 (20.8%) patients. HGM incidence was 13% (44/342) in non-EA patients and 38% (61/161) in EA patients ($P < 0.0001$). Median number of HGM patches in both non-EA and EA patients was 2 (IQR 1-2) $P = 0.96$. Median diameter of the largest HGM in non-EA vs. EA patients was 6 (IQR 4-10) vs. 5 (IQR4-7) $P = 0.36$.

Conclusion: Incidence of HGM was greater in EA patients compared to non-EA patients without a significant difference in the number or size of HGM patches. Use of NBI may improve the detection rate of HGM which was identified in 13% of non-EA patients with a median of 2 HGM patches per patient.

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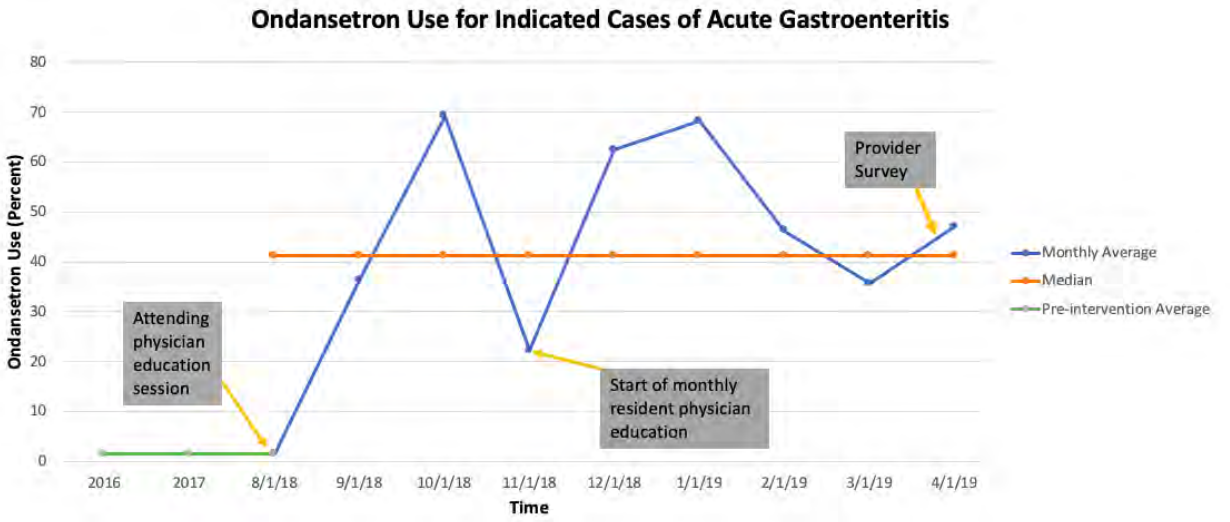
265 ***IMPROVING ONDANSETRON USAGE FOR ACUTE GASTROENTERITIS IN A PEDIATRIC ACUTE CARE CLINIC.*** *Perseus Patel, Thomas Wallach, Anne Lyon, Chathruckan Rajendra, Vivek Shenoy, Sindhura Batchu, Addison Cuneo, Matthew Nordstrom, Zachary Marcus, Jennifer Burgis, Sofia Verstraete. Pediatrics, University of California San Francisco, San Francisco, CA*

Introduction: Pediatric acute gastroenteritis (AGE) accounts for 1.5 million clinic appointments, 200,000 hospital stays, and 300 deaths annually in the United States. Ondansetron improves efficacy of oral rehydration therapy, decreases need for intravenous rehydration, and reduces hospitalization rates. A 2016 retrospective analysis of University of California San Francisco (UCSF) Mount Zion pediatric acute care clinic revealed rare use of ondansetron (<2%) in eligible patients. This quality improvement project aimed to better align ondansetron use at the Mount Zion Acute Care clinic with the international standards of care for pediatric AGE by improving rate of ondansetron prescription for eligible patients (age 1-18 with AGE and no major comorbidity) to 80% in one year.

Methods: We utilized Lean A3 methodology to address low rates of ondansetron usage inconsistent with international standards of care. Our initial implementation plan utilized educational sessions with the general pediatricians and pediatric residents to improve awareness of safety and utility of ondansetron. Secondary interventions included follow-up surveys of stakeholders regarding safety and utility of Zofran, with the goal of tailoring future education sessions or disseminating relevant literature to combat specific concerns. As our study was conducted at a teaching hospital with rotating residents, we instituted monthly resident-focused education sessions. We collaborated with the general pediatricians at Mount Zion to develop a standardized set of patient instructions describing the appropriate steps of oral rehydration as well as ondansetron use at home. We were unable to objectively measure the percentage of visits for which our patient instructions were disseminated, therefore as a surrogate marker we surveyed the general pediatricians as to whether they primarily use the pre-populated patient instructions.

Results: Over 8 months since the initiation of our intervention, the ondansetron prescription rate increased to a median of 41.3% [monthly range: 22.2%-69.2%](Figure 1). A survey of general pediatricians conducted during the 7th month of the intervention showed 100% concurrence with statement that ondansetron is safe and well tolerated, however 42.8% of providers continued to feel ondansetron could mask more serious conditions. The survey also showed that 42.8% of providers preferred primarily using our standardized set of patient instructions. Response rate was 7 out of the 12 of the general pediatricians (58.3%).

Discussion: Although we drastically improved appropriate ondansetron use from <2% to 41.3% of eligible cases, we have not yet reached our goal of 80%. Our early data indicates that continued physician education can result in significant improvements to guidelines. Key drivers of month-to-month variation in ondansetron prescription rates include: changes in which providers were serving at the urgent care, timing of educational sessions, and changing well-established anticipatory guidance that differed from guidelines. An additional obstacle involves provider concerns for masking serious abdominal pathology, which will be specifically addressed in future targeted education sessions. We plan to expand these interventions to a primary care clinic and pediatric emergency department at the UCSF Benioff Children's Hospital San Francisco. Future analysis will evaluate impact on number of emergency room visits and re-presentations to care.



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267 ***EFFICACY OF PEDIATRIC COLONOSCOPY PREPARATORY PROTOCOLS: A SINGLE CENTER QUALITY IMPROVEMENT INITIATIVE.*** *Tiffany Patton, Timothy Sentogo, Hilary Jericho, Ruba Azzam, Ranjana Gokhale, Stefano Guandalini. Pediatric Gastroenterology, University of Chicago, Chicago, IL*

Background: Improper utilization and application of colonoscopy bowel preparatory protocols can lead to decreased efficacy of colonoscopy procedures to identify and accomplish set endoscopic objectives. Suboptimal pre-colonoscopy bowel preparation can occur in up to 33% of cases and can be associated with missed diagnosis, procedural risks, and increased costs from repeated procedures. (1) Ideally, bowel preparations should be tailored to specific patients to maximize their efficacy. Within our institution we sought to evaluate and improve the efficacy and application of colonoscopy bowel preparations in pediatric patients, taking into consideration age and anthropometric variations.

Methods: We monitored the application of our 2 most frequently used colonoscopy bowel preparations over a 5-month period, documenting the efficacy and compliance with each application. Our primary bowel preparation instructs patients to take Miralax 51 grams in 24oz clear liquid, maintain a clear liquid diet, and take an age-dependent dose of Magnesium Citrate (1oz/year; maximum dose of 10oz for any child 10 years and older) within 1.2 days of the intended colonoscopy procedure for all patients < 55kg. Our secondary bowel preparation instructs patients >55kg to take Miralax 238 grams in 64oz of electrolyte containing clear fluid, maintain a clear liquid diet, and take two 5mg Bisacodyl tablets on the day prior to the colonoscopy procedure. Following a 5-month period of data collection, we applied the use of the latter, secondary prep to all patients >45kg. Efficacy of bowel preparation was determined at the time of colonoscopy utilizing the Boston Bowel Preparation Scale. All data was reviewed and compared following a 12-month period.

Results: Comparison of the efficacy and application of our previous colonoscopy preparation with our new modified application yielded similar efficacy rates with an unexpectedly slightly higher number of poor preparations in the modified group, despite similarly reported compliance rates.

Conclusion: While the newer, modified colonoscopy bowel preparation is more consistent with the 2014 NASPGHAN Best Practices Cleanout Regimen; the application of this prep in patients >45kg did not significantly improve compliance or the efficacy of the bowel preparation.

Table 1: Efficacy of Colonoscopy Bowel Preparation

Bowel Preparation Application	Compliance	**Efficacy of Colonoscopy Preparation**				Aborted procedure
		Excellent	Good (Fair)	Poor	Inadequate	
Pre-Modification (n = 48)	93.8%	16/48 (33.3%)	26/48 (54.2%)	6/48 (12.5%)	0/48 (0%)	0
Post-Modification (n = 52)	92.3%	20/52 (38.5%)	24/52 (46.2%)	9/52 (17.3%)	0/52 (0%)	1

268 ***QUALITY IMPROVEMENT: USING THE PUCAI IN THE CARE OF PEDIATRIC PATIENTS HOSPITALIZED WITH ULCERATIVE COLITIS.*** *Meryl Perlman, Rasha Elmaoued, Kriston Ganguli, Esther Israel. Pediatric Gastroenterology, Hepatology, and Nutrition, Massachusetts General Hospital for Children, Chelsea, MA*

Objective: Pediatric ulcerative colitis (UC) patients are at a high risk of having acute severe flares, with a 30-40% colectomy rate 10 years after diagnosis. Other concerning complications include toxic mega colon and hemorrhage. The pediatric ulcerative colitis activity index (PUCAI) has been validated for assessment of symptom severity. It is used widely in inpatient and outpatient settings and guidelines published by the European Crohn's and Colitis Organization and the European Society of Pediatric Gastroenterology, Hepatology and Nutrition (ECCO/ESPGHAN) for the management of acute severe colitis (ASC) are highly reliant upon the PUCAI to guide treatment decisions for hospitalized patients. For these reasons we aimed to consistently increase the pediatric gastroenterology service PUCAI documentation on all patients

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hospitalized with ASC at our hospital and actively utilize the score to guide management decisions on the critical days 3 and 5 of IV steroid therapy, based on the ECCO/ESPGHAN guidelines.
Methods: A chart review was done in the EPIC electronic medical record system to collect baseline data on all patients hospitalized on the pediatric units at our hospital for ASC flares from January to December 2017 (Cycle 0). Data collected included number of hospitalizations for a UC flare, length of stay, number of days on steroids, details regarding escalation of therapy, specifics regarding PUCAI documentation, and whether the documented treatment plan reflected the then current 2011 ECCO/ESPGHAN guidelines for days 3 and 5 of treatment with IV corticosteroids.
Our cumulative interventions from April 2018 to March 2019 (Cycles 1 and 2) consisted of: 1) insertion of a section prompting documentation of the PUCAI score into all inpatient note templates and management decision documentation based on reference to the updated 2018 ECCO/ESPGHAN guidelines, 2) a division wide teaching session on the importance of PUCAI scoring and 3) monthly email reminders to all members of the division regarding this documentation. After intervention Cycles 1 and 2, the same data was collected as from Cycle 0 on all hospitalized UC patients and compared to baseline data.
Results: At baseline, PUCAI scores were documented in the chart by the pediatric gastroenterology service 47% of possible times on any day of admission. After the Cycle 1 and 2 interventions, the rate of daily PUCAI score documentation reached 85%, which met our primary endpoint of increasing the PUCAI documentation by the gastroenterology service by 50%. From a clinical perspective, at baseline the 2011 ECCO/ESPGHAN guidelines for management decisions on days 3 and 5 of IV steroids were adhered to 36.4% and 33.3% of the time, respectively (n = 11 and 9, respectively) whereas after the intervention, the rate of adherence to the 2018 ECCO/ESPGHAN guidelines on days 3 and 5 increased to 83.3% and 100%, respectively (n = 6 and 4, respectively).
Discussion: Pediatric UC is a chronic inflammatory and multisystem disease that can impact the medical status, growth, puberty, nutrition, and psychosocial well-being of patients and their families. For this reason, it is critical to be able to assess and communicate the status of symptoms in a uniform and consistent way to provide the best care to the individual patient. The PUCAI is a validated measure of disease status in UC and the 2018 ECCO/ESPGHAN guidelines recognize the PUCAI as a reliable indicator of patients with steroid responsive versus non-responsive disease. It is therefore of the utmost importance that it be utilized consistently for management of inpatients with ASC.
Conclusion: We have shown that simple interventions result in consistent inclusion of the PUCAI in daily progress notes and increased adherence to the ECCO/ESPGHAN guidelines for management decisions.

269 ***ASSESSMENT OF TELEMEDICINE PERCEPTION AS A GUIDE FOR PROGRAM EXPANSION IN PEDIATRIC GASTROENTEROLOGY.*** *John Rosen[1], Morgan Waller[2]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, The Children's Mercy Hospital, Kansas City, MO; [2]Telemedicine, The Children's Mercy Hospital, Kansas City, MO*
Growth of telemedicine services in the United States outpaces all other health care delivery modalities, providing improved access and high value care. As telemedicine programs are established and expanded, barriers to participation may be encountered at many levels. In order to assess potential barriers to participation in pediatric gastroenterology telemedicine prior to program expansion, a survey was administered to division doctors, nurse practitioners, and psychologists.

The assessment was designed based on feedback obtained during prior program development efforts and was administered in December 2018 as an optional, anonymous, electronic REDCap form. Seventy-two percent (31/43) responded with all aware that telemedicine was provided in the division, and 26% (n=8) reporting that they currently participate. Eight reported interest in integrating telemedicine into their practice, 12 reported possible interest, and 3 were not interested. Themes reported that may influence the decision to participate included concerns about credentialing/training, extra time required, quality of care, patient privacy, and patient satisfaction. 77% (24/31) reported that some patients should not be seen through telemedicine; populations recommended for exclusion included new or acutely ill patients, and those seen in multidisciplinary clinics. Twenty-nine (94%) respondents indicated that growth of telemedicine services should be a priority for the division. None of the respondents personally received medical services through telemedicine, and 33% would consider doing so in the future.

Based on survey results, those interested in providing telemedicine were directly approached and educated on necessary training and credentialing. Patient data from division telemedicine visits was shared with all surveyed providers, showing 70% of patients with equal satisfaction and 29% with increased satisfaction compared to in-person appointments. Additional telemedicine education is planned for the division, as well as directed efforts to address concerns and initiate services for those reporting possible interest. Repeat evaluation of division telemedicine perception and analysis of program growth is planned annually.

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Telemedicine is an increasingly important and accessible medical system in pediatric gastroenterology, but resistance of adoption by some providers and other barriers remain. Assessment of personal and professional telemedicine concepts followed by directed intervention is an achievable process to aid in program growth.

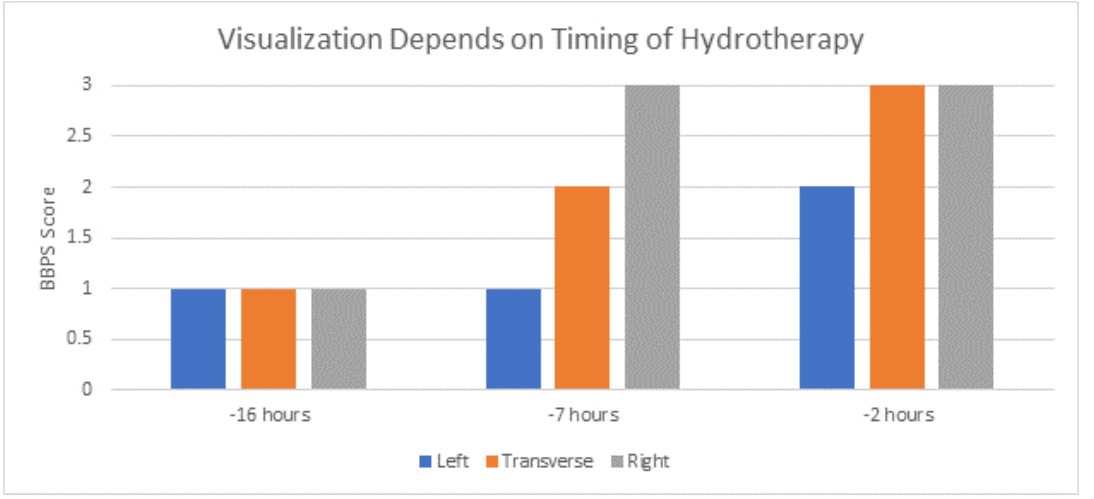
270 ***COLONIC HYDROTHERAPY PRIOR TO COLONOSCOPY WHEN ORAL BOWEL PREPARATION IS INADEQUATE – A PROOF OF CONCEPT STUDY.*** *Joseph Garzia[2], Thomas Attard[1], John Rosen[1]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, The Children's Mercy Hospital, Kansas City, MO; [2]Gastroenterology, Mater Dei Hospital, Msida, Malta*

Background: Bowel preparation for colonoscopy is inherently important to safety and quality of the procedure. While novel therapies are frequently explored to improve patient tolerance and maximize effectiveness, there is not a single regimen that is adequate for all patients. Alternatives to standard bowel preparation regimens are important to address patient preference, health risks, adverse effects or intolerance, and in the case when standard preparation is ineffective. Further, oral options can be especially limited in children due to intolerance and anesthesia-related risk. This is the first series of colon hydrotherapy as colonoscopy bowel preparation, intended to examine tolerance, efficacy, optimal timing, and safety.

Methods: Inclusion was considered if subjects required repeat colonoscopy but desired an alternative bowel preparation method to the institution standard of oral polyethylene glycol. Exclusion of subjects was based on potential safety parameters (diverticulosis, pregnancy, recent abdominal surgery, active inflammatory bowel disease), or potentially confounding therapies (antidiarrheal or antibiotic medication, and those receiving hydrotherapy with coffee or herbal preparations). Subjects were randomly assigned to one of three arms, receiving colon hydrotherapy with 30-35 liters purified water either 16 hours (day before), 7 hours (early morning), or 2 hours (proximate to procedure) prior to colonoscopy. Endoscopists were blinded to the study and recorded the Boston Bowel Preparation Score by colon segment (Left, Transverse, Right) as part of their routine documentation.

Results: Fourteen subjects (50% female) aged between 47 and 59 years of age were recruited from a single endoscopy center, and 5 assigned each to the -16h and -7h group, with 4 assigned to the -2h group. There were no reported complications. All subjects tolerated and preferred colon hydrotherapy over the standard oral bowel preparation. BBPS scores were better in subjects receiving hydrotherapy closer in time to colonoscopy (FIGURE 1).

Discussion: Colon hydrotherapy was effective bowel preparation in adults and was tolerated well. Performance of hydrotherapy closer to colonoscopy provided improved mucosal visualization and was effective as a mechanical stool evacuation technique. Further evaluation of dose, timing, tolerance, will help determine for which patients colon hydrotherapy should be considered and optimal administration methods.



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271 ***PREVALENCE AND EPIDEMIOLOGY OF EOSINOPHILIC ESOPHAGITIS IN PATIENTS WITH CYSTIC FIBROSIS UTILIZING A POPULATION-BASED 5-YEAR STUDY.*** *Omar Alaber[1,2], Ramy Sabe[1,2], Senthilkumar Sankararaman[1,2], Virginia Baez Socorro[1,2], Thomas Sferra[1,2]. [1]Pediatric Gastroenterology, Hepatology & Nutrition, UH Rainbow Babies & Children's Hospital, Cleveland, OH; [2]Pediatrics, Case Western Reserve University School of Medicine, Cleveland, OH*

BACKGROUND: The prevalence of eosinophilic esophagitis (EoE) has increased over the most recent years and is being more frequently identified as having an increased incidence in several different disease states. In our institution we have cared for an increasing number of patients with cystic fibrosis (CF) who have EoE.

OBJECTIVE: To investigate the epidemiology of EoE in patients with CF.

METHODS: Data were obtained from a commercial medical administrative database, IBM Explorys. This database contains deidentified patient information from 26 healthcare networks comprising 360 hospitals. We identified adult and pediatric patients with CF or EoE who were active within the database for the time period from May 2014 to May 2019. We extracted demographic and clinical information for these patients. Comparisons between groups were made using the Chi-square analysis.

RESULTS: At the time of the search, the database included 37,778,420 patients. Of those, there were 19,420 patients with a diagnosis of CF, accounting for 0.05% of all the population within the database and 28,670 patients with EoE (0.08% of the population). The prevalence of EoE was higher in patients with CF compared to the general population (0.31% vs. 0.075%; P<0.0001). Patients with CF+EoE compared to those with CF and no EoE were more likely to be female (73.7% vs 50.0%; P<0.0001) and younger (≤18 years 33.3% vs. 16.0%; ≥18 years 66.7% vs. 84.1%; P=0.0005). There was no difference in ethnicity (both groups were most frequently non-Hispanic; 83.3% vs. 81.5%; P=0.033) or race (both groups were most frequently to be Caucasian; 83.3% vs. 83.4%; P=0.99) between the two groups. The presence of the gastrointestinal co-morbid symptom of dysphagia was more frequent in those with CF+EoE (50% vs. 5.0%; P<0.0001) and vomiting, though common, was not different from the CF population without EoE (33.3% vs. 31.5%; P=0.88). Atopic conditions were more common overall in the patients with CF+EoE: asthma (50% vs. 2.1%; P<0.0001), allergic rhinitis (33.3% vs. 13.5%; P<0.0001), allergic contact dermatitis (16.7% vs 0.6%; P<0.0001), and immunoglobulin E-mediated allergic disorders (33.3% vs. 14.4%; P<0.0001). Although, there was not a significant difference in the prevalence of eczema (16.7% vs 9.4%; P=0.085) between the two groups. Overall, atopic conditions were more frequent in those with CF+EoE than the general population with EoE (P<0.0001). Patients with CF and no EoE did not have a higher prevalence of atopic conditions than EoE patients without CF.

CONCLUSIONS: We found EoE to be over 4 times more prevalent in patients with CF than the general population. Thus, EoE must be considered high in the differential diagnosis of patients with CF presenting with the appropriate symptoms. Patients with CF and EoE more frequently have associated atopic conditions as compared to the CF patient population without EoE and those with EoE in the non-CF population. This suggests that this patient cohort has a unique set of risk factors for atopic conditions.

EOE/GERD/AERODIGESTIVE

272 ***RAMAN METABOLOMICS DELINEATES TISSUE LEVEL BIOCHEMICAL DIFFERENCES ASSOCIATED WITH EOSINOPHILIC ESOPHAGITIS.*** *Girish Hiremath[2,1], Andrea Locke[1], Giju Thomas[1], Rekha Gautam[1], Henan Correa[2], Sari Acra[2], Evan Dellon[3], Anita Mahadevan-Jansen[1]. [1]Vanderbilt Biophotonics Center, Nashville, TN; [2]Monroe Carell Jr. Children's Hospital at Vanderbilt, Nashville, TN; [3]University of North Carolina at Chapel Hill, Chapel Hill, NC*

Introduction: Tissue biochemistry is considered closer to the tissue phenotype than the transcriptome or proteome, as the post-transcriptional and post-translational modifications can exert a strong influence on the tissue state. Our understanding of the metabolic alterations resulting in a transformation of unaffected esophageal tissue to inflamed tissue in eosinophilic esophagitis (EoE) is in its infancy. Delineating these changes can provide novel insights into EoE pathobiology. Our aim was to test Raman spectroscopy (RS) as a label-free, sensitive, and automatable method of delineating metabolic fingerprint of esophageal tissue in EoE. We hypothesized that RS can identify precise biochemical changes associated with EoE.

Methods: A single distal esophageal biopsy sample was collected from 14 children (ages 6-18 years) during an upper endoscopy. Multiple point-by-point RS measurements were obtained *ex vivo* on the biopsy samples using a 785 nm laser (10 mW; 50x Objective) and averaged for ratiometric analyses. The biopsies were then sectioned (5 µm thickness), stained by H&E, and assessed for histologic changes including the degree of eosinophilic inflammation [eosinophils/high power field (eos/hpf)]. Based on their clinical presentation and histologic findings, participants were classified as active EoE [aEoE; n = 5, defined as ≥ 15 eos/hpf], inactive EoE [iEoE; n = 5, defined as having previous diagnosis of EoE and currently having < 15 eos/hpf], and healthy controls (HC; n=4, having no histologic abnormalities). To delve deeper into the differences in the global biochemical composition associated with disease states, high-resolution Raman mapping was

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performed on distal esophageal biopsies from 6 additional children (2 each with aEoE, iEoE and HC). We used 20 µm section of the sample and mapped one region of the section with a step size of 6 µm at 20 mW laser power. Adjacent 5 µm section from each of these biopsies were assessed for microscopic changes.

Results: The ratiometric analyses of point-by-point Raman spectra revealed notable changes in lipid, protein, glycogen, and DNA content of the tissue by the disease states (**Fig. 1**). Specifically, compared to HC and iEoE the Raman peak indicative of tissue glycogen content was significantly lower and the peak pertaining to tissue proteins were significantly increased in aEoE. Only the Raman peak indicative of proteins was significantly higher in iEoE when compared to HC. Raman mapping revealed the tissue distribution of two main regions showing the most significant changes in C-C stretch mode of glycogen (910- 950 cm^{-1}), and C-N stretching of proteins in Amide III (1200-1280 cm^{-1}) (**Fig. 2).**

Discussion: RS holds promise to qualitatively and quantitatively identify biochemical changes associated with EoE and reflect the histologic activity. Raman peaks indicating relatively lower glycogen levels in aEoE compared to iEoE and HC may be due to relatively higher utilization of tissue glycogen during inflammation. Higher tissue protein levels in aEoE compared to iEoE, and in iEoE compared to HC could be due to the varying concentrations of inflammatory chemokines, cytokines, and cells. Studies with larger sample size and are currently underway to validate these findings. Global and targeted metabolomics are planned to confirm these findings.

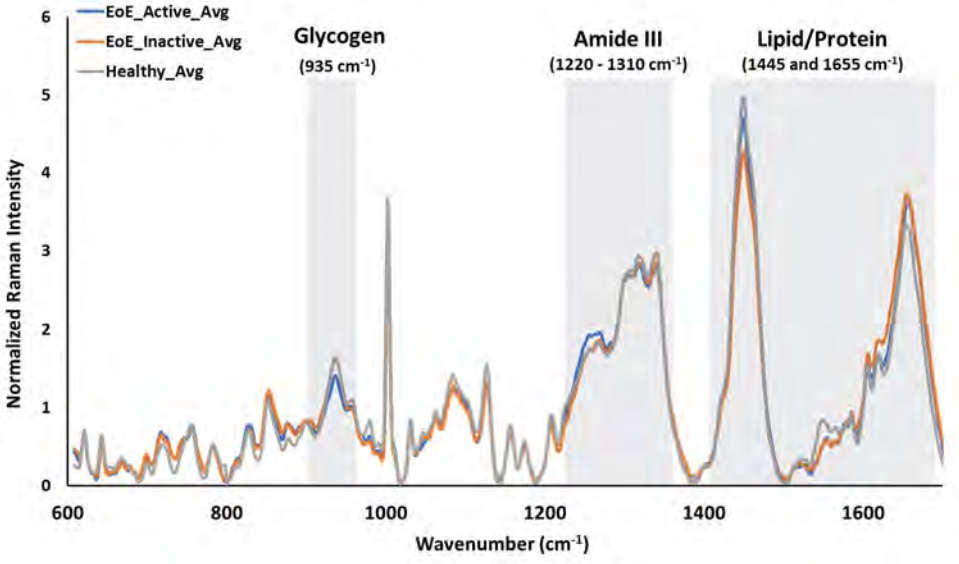


Fig 1: Average of Raman spectra showing differences in the biochemical composition between aEoE, iEoE and HC

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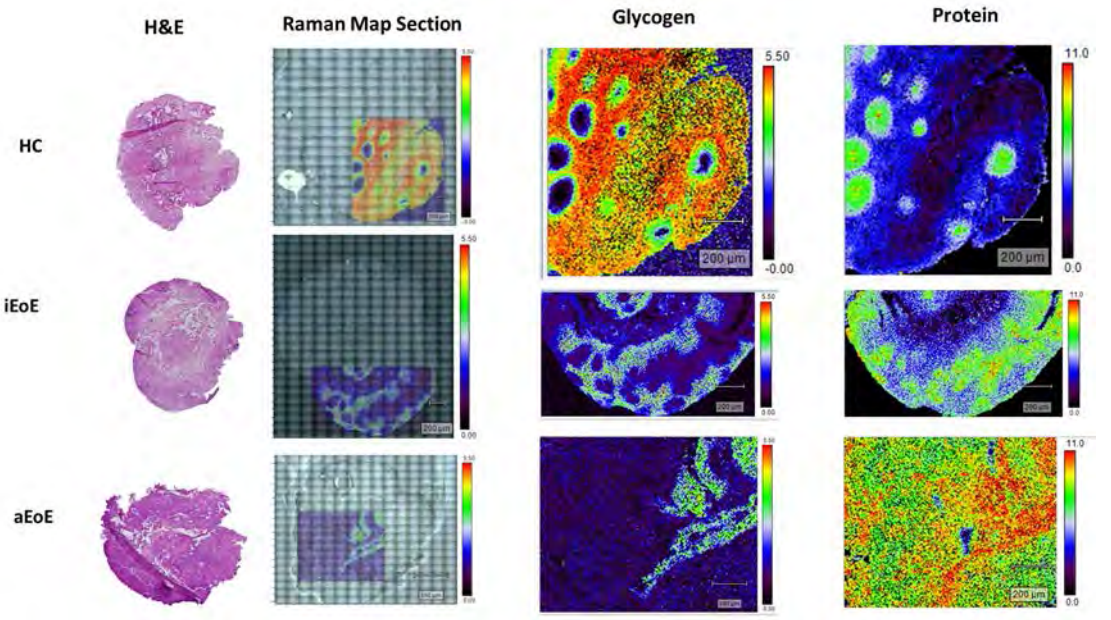


Figure 2: Raman mapping of aEoE, iEoE and HC depicting significant differences in the amount and distribution of the glycogen and protein

273 ***DOSE AND FREQUENCY REDUCTION OF ORAL VISCOUS BUDESONIDE THERAPY IS NOT EFFECTIVE IN MAINTAINING HISTOLOGIC REMISSION IN PEDIATRIC EOSINOPHILIC ESOPHAGITIS.***

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Introduction: Eosinophilic esophagitis (EoE) is a chronic immune mediated eosinophilic infiltration of the esophageal epithelium with long term consequences related to subepithelial fibrosis and stricture formation. Oral viscous budesonide (OVB) is an effective treatment with reported remission rates between 55-87%, however prolonged therapy has been linked to negative outcomes including candida esophagitis, adrenal suppression, increased medical cost and lifestyle implications. Further, rapid relapse is frequently observed after discontinuation of treatment. In spite of existing studies demonstrating the efficacy of OVB in inducing disease remission, there are no clear recommendations for the use, dosing, and follow up strategies for the long term use of OVB in treating EoE. The objective of this study is to assess whether dose and/or frequency reduction of OVB can sustain histological remission.

Methods: This is a prospective cohort study of children with EoE, who had more than 15 eosinophils/hpf in the mid or distal esophagus who elected to undergo treatment with OVB based on shared patient-provider decision making per standard treatment guidelines. Histological state was assessed after 3 months of induction therapy with OVB, dosed 0.5 mg twice daily for < 10 years of age, and 1 mg twice daily for those ≥ 10 years of age. Those in histologic remission (defined as asymptomatic with <15 eosinophils/hpf in the mid and distal esophagus) were offered dose or frequency reduction of OVB. These regimens included once daily dosing of the induction dose (0.5 or 1 mg daily), every other month, and every fourth month treatment of the induction dose (0.5 or 1 mg twice daily) Patients were assessed endoscopically after several cycles of a dose and/or frequency reduction, during the interrupted treatment phase to capture peak disease activity. The primary outcome of interest was the efficacy of the OVB dose liberated regimens in maintaining histologic remission among those that responded to the induction treatment.

Results: Thirty five patients aged 2-23 years were placed on continuous OVB induction course, of which 31 (88%) were able to achieve histologic remission. Those that were in remission were then stepped down to a dose or frequency reduced regimen. The every fourth month regimen was able to sustain histologic remission in 62% of individuals when they were endoscopically assessed during the treatment phase. However, only 16% remained in remission when they had endoscopic

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assessment during the period when the medication was being held. Fifty percent of those on the every other month treatment regimen was able to maintain remission when the disease was assessed during the interrupted treatment phase. Only 33% of those on once daily dosing was able to sustain endoscopic remission. The differences between the three cycled regimen groups were not statistically significant. However, the continuous induction course was more likely (OR 2.7-46.5) to induce remission than any of the cycled regimens in maintaining it (Table1).

Conclusion: EoE is a chronic condition, and guidelines for long term monitoring and treatment of the disease are still emerging. This study demonstrates that our induction regimen, which allows for lower doses in children less than 8 years, is effective in inducing remission in up to 88% of patients studied, and is consistent with previously reported remission rates in the literature. However, rises in eosinophil counts, and commonly, loss of remission was seen in a large portion of individuals who had dose or frequency de-escalation of OVB. The studied interrupted and dose reduced OVB regimens were not effective in maintaining histologic remission among children with EoE. In particular, once daily dosing of OVB suggested by more recent studies do not have improved remission rates as compared to the other studied frequency reduced regimens. Larger prospective studies are required to confirm these findings.

Table 1: Odds of histologic remission of OVB continuous induction compared to interrupted and dose reduced regimens.

Treatment regimen	Remission N (%)	OR
Continuous Induction	31 (88%)	
Every fourth month	1 (16%)	46.5 (4.39-492.1)
Every other month	4 (50%)	7.75 (1.37-43.87)
Once daily	4 (33%)	15.5 (2.74-87.74)

274 ***THE UTILITY OF EPITHELIAL EOSINOPHILIC DERIVED NEUROTOXIN MEASURED IN ESOPHAGEAL BRUSHING DURING ENDOSCOPY IN THE DIAGNOSIS OF EOSINOPHILIC ESOPHAGITIS.***

Puanani Hopson, *Justin de Boer*, *Samit Patel*, *Chirajyoti Deb*, *Devendra Mehta*, *Yamen Smadi. Pediatric GI*, *Orlando Health, University of Florida*, *Orlando*, *FL*

INTRODUCTION: The diagnosis of eosinophilic esophagitis (EoE) requires obtaining multiple biopsies from different segments of the esophagus and a peak eosinophilic count (PEC) of ≥ 15 cells/high power field (HPF = 0.3mm2) in at least one biopsy. Pitfalls of histologic assessment include unequal distribution of eosinophilic cells in the esophagus, variability in eosinophil count quantification and lack of correlation between histology, endoscopy and symptoms. Eosinophil derived Neurotoxin (EDN), an eosinophil granule protein, measured in esophageal brushing has been shown as a viable measure of disease activity in EoE. We aim to study the utility of measuring EDN in esophageal brushes in the diagnosis of EoE with a focus on two scenarios specifically: cases of exclusive distal eosinophilia and cases of discrepancy between endoscopy and histology.

METHODS: This is a prospective cross-sectional study of patients who underwent esophagogastroduodenoscopy (EGD) with measured EDN in esophageal brushing in the period from October 2014 till October 2018 in Arnold palmer Hospital for Children, Orlando, Florida, USA. We collected demographic, clinical, endoscopy and pathology data. Active EoE was defined as PEC ≥ 15 in at least one esophageal level. Subjects in the EoE group were divided into 6 subgroups based on the distribution of the esophageal eosinophilia (PEC ≥15/hpf): ≥ two levels, ≥ one level, ≥ one level other than distal, distal eosinophilia only, mid or proximal eosinophilia only, and no eosinophils. EREFS score was used to grade endoscopy features of EoE. EDN is measured in esophageal brushing and positive EDN was defined >10 mcg/ml. Level of EDN was compared with endoscopy and histological findings.

RESULTS: Two hundred and eighty nine subjects (67.5% male, mean age 10.3 years, range 1-22 years) were enrolled. PEC, EREFS scores and EDN were higher in subjects with active EoE (n=122 (42%), PEC = 50 ± 26, EREFS = 3.3 ± 1.4, EDN = 276 mcg/ml ± 971) than in subjects with inactive EoE (n = 77 (26.6%), PEC = 1.9 ± 3, EREFS = 0.5 ± 0.9, EDN = 5.8 mcg/ml ± 25.7) and subjects with no esophageal disease (n=90 (32%), PEC = 0.8 ± 2.3, EREFS = 0.3 ± 0.9, EDN = 2.8 mcg/ml ± 16), p <.001. EDN values correlated with EREFS scores and PEC (Spearman's rho = 0.758 (p<0.0001) and 0.823 (p<0.0001) respectively). EDN highly predicted EREFS scores and PEC (Table 1) and when dividing subjects based on the level of eosinophilia, EDN mirrors PEC and EREFS scores (Figure 1). EDN in subjects with exclusive distal eosinophilia was lower than EDN in subjects with eosinophilia in one level only other than distal esophagus (23.76 mcg/ml ± 46.14 vs 327.89 mcg/ml ± 1063 respectively, p .006). EREFS scores in subjects with exclusive distal eosinophilia and negative EDN were lower than in those with exclusive distal eosinophilia and positive EDN (1.35 ± 1.15 vs 3.33 ± 0.98 respectively, p < .0001). EDN values were more consistent with EREFS score in cases of discrepancies between histology and pathology, p < .005.

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CONCLUSION: EDN measured in esophageal brushing samples during endoscopy reflects the disease activity objectively and accurately and it offers a significant value in cases of exclusive distal esophageal eosinophilia and when discrepancies encountered between endoscopy and histology.

EDN	SN (%)	SP (%)	PPV (%)	NPV (%)	AUC	P-value
Predicting EREFS score ≥ 1	68.8	97.0	96.4	72.3	0.870	<0.0001
Predicting EREFS score ≥2	81.9	95.1	92.9	87.0	0.925	<0.0001
Predicting EREFS score ≥3	88.6	89.7	83.0	93.2	0.932	<0.0001
Predicting PEC ≥15 in at least TWO esophageal levels	95.5	86.5	75.9	97.7	0.962	<0.0001
Predicting PEC ≥15 in at least ONE esophageal level	84.4	94.6	92.0	89.3	0.954	<0.0001
Predicting PEC ≥15 in at least ONE esophageal level other than distal	94.7	88.7	80.4	97.2	0.962	<0.0001

Table 1: Predictive values of EDN in EREFS and PEC. EREFS; Edema, Rings, Exudate, Furrows and Stricture. PEC; peak eosinophilic count

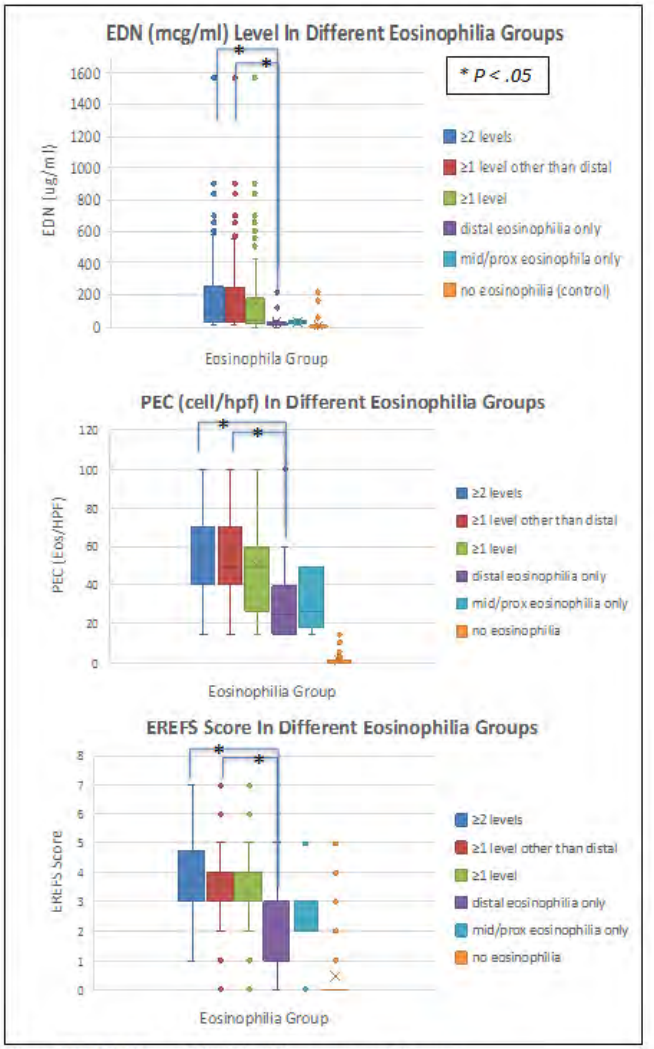


Figure 1: EDN, PEC, and EREFS in difference eosinophilia groups.

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275 ***A NOVEL FOOD ADDITIVE REMOVAL DIET FOR EOSINOPHILIC ESOPHAGITIS (FREE STUDY): CONCEPTUAL DESIGN AND CLINICAL TRIAL METHODS.*** *Shannon Henry[1], Joshua Wechsler[5], Dale Lee[4], David Suskind[4], Zarela Molle-Rios[3], Hadeel Al' Atrash[1,2], Franciosi James[1,]. [1]GI, Nemours Children's Hospital, Orlando, FL; [2]Pediatrics, University of Central Florida, Orlando, FL; [3]Gastroenterology, Alfred I. Dupont Hospital for Children, Wilmington, DE; [4]Gastroenterology, Seattle Children's Hospital, Seattle, WA; [5]Gastroenterology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL*

Eosinophilic esophagitis (EoE) is a chronic, long term esophageal inflammatory condition that has been clearly linked to our diet, and dietary elimination has been an effective therapy. EoE is more more common in Western countries and a traditional Western pattern diet is rich in food additives and preservatives. Food additives are thought to promote a pro-inflammatory state in the GI tract and impact the GI tract microbiome, yet their role in EoE has not been studied. Removal of food additives has been shown to reduce GI inflammation, improve GI symptoms and affect the microbiome in other GI conditions. We hypothesize that dietary elimination of dairy plus food additives will improved efficacy compared to dairy elimination alone for pediatric EoE. The Food additive Removal diet for Eosinophilic Esophagitis (FREE) Study is a randomized, open label, prospective, pragmatic dietary intervention comparing a (1) dairy free diet to a (2) dairy free and food additive free diet. Children > =3 - 18 years of age with isolated esophageal eosinophilia (>=15 eos/hpf) will be randomized to one of the two diets for 12 weeks. Participants will undergo dietary education, complete 3-day diet diaries, and complete 24-hour diet recalls to assess adherence and nutritional adequacy. Parent and patient reported outcomes including the Pediatric Quality of Life Inventory-EoE Module (PedsQL-EoE ModuleTM) and the Pediatric Eosinophilic Esophagitis Symptom Score®v2.0 (PEESS®v2.0) will be collected throughout the study. Histological remission will be assessed using Collins scoring system and the Eosinophilic Esophagitis Endoscopic Reference Score (EREFs). This novel FREE clinical trial will better define the role of food additives in pediatric EoE.

276 ***STAT6 VARIANTS ASSOCIATE WITH RESPONSE TO PPI THERAPY FOR MAINTENANCE OF LONG-TERM HISTOLOGICAL REMISSION OF EOSINOPHILIC ESOPHAGITIS.*** *Edward Mougey[3], Vivian Nguyen[4], Carolina Gutierrez-Junquera[6], Sonia Fernandez- Fernandez[5], Maria Luz Cilleruelo[6], Ana Isabel Rayo[5], Luis Echeverría[5], Enriqueta Román[6], Carmen Lois[6], Montserrat Chao[5], John Lima[3], Hadeel Al' Atrash[1,2], Franciosi James[1,2] [1]GI, Nemours Children's Hospital, Orlando, FL; [2]Pediatrics, University of Central Florida College of Medicine, Orlando, FL; [3]Centre for Pharmacogenomics and Translational Research, Nemours Children's Health System, Jacksonville, FL; [4]College of Pharmacy, University of Florida, Gainsville, FL; [5]Department of Pediatric, Hospital Universitario Severo Ochoa, Madrid, Spain; [6]Pediatrics, Hospital Universitario Puerta de Hierro-Majadahonda, Madrid, Spain*

Objectives: We hypothesized that genetic variants of *STAT6* would associate with response to PPI therapy for long-term histological remission of eosinophilic esophagitis (EoE).

Methods: Esophageal biopsy samples (73) were collected from children who responded to eight weeks of high dose (2 mg/kg/day) PPI therapy for EoE and were subsequently stepped down to a maintenance dose of 1 mg/kg/day for one year. Genomic DNA was prepared from microtome sections of formalin-fixed paraffin-embedded tissue and genotyping was by TaqMan. Sustained histological remission on PPI maintenance therapy was defined as complete (<=5 peak eos/hpf), partial (<15 peak eos/hpf), or relapse (>=15 peak eos/hpf).

Results: Among 73 EoE patients on PPI maintenance therapy for 12 months, 36 (49%) maintained complete remission, 14 (19%) maintained partial remission, and 23 (32%) relapsed to EoE. Negative binomial regression shows that three *STAT6* gene variants in linkage disequilibrium (r^2 >= 0.8) were associated with higher eosinophil counts after one year of maintenance therapy: rs324011, +9[-0.5,20] median peak eos/hpf, (OR[95% CI], 3.23[1.30,8.02], p=0.012); rs167769, +9[-0.5,20] median peak eos/hpf, (2.81[1.14,6.93], p=0.025); rs12368672, +9.5[5.5,19.5] median peak eos/hpf, (2.67[1.07,6.68], p=0.036). Logistic regression analysis shows that carriage of any of the three *STAT6* variants is associated with a 2.2-2.9 fold decreased odds of maintaining remission of EoE: rs324011 (0.40[0.17,0.94], p=0.035); rs167769 (0.46[0.21,1.04], p=0.063); rs12368672 (0.35[0.15,0.8], p=0.013). In addition, the same variants were associated with a 2.3-3.6 fold decreased odds of maintaining complete histological remission: rs167769 (0.44[0.20,0.97], p=0.043); rs324011 (0.41[0.18,0.92], p=0.031); rs12368672 (0.28[0.12,0.65], p=0.003).

Conclusion: EoE patients who initially responded to 8 weeks of high dose (2 mg/kg/day) PPI therapy, are more likely to relapse to EoE following 1 year of 1mg/kg/day PPI maintenance therapy if they are carriers of *STAT6* variants rs324011, rs167769 or rs12368672.

277 ***THE GREAT BREASTMILK DISCREPANCY: A LOOK AT EXPOSURE AMONGST PATIENTS WITH ESOPHAGEAL ATRESIA/TRACHEOESOPHAGEAL FISTULA.*** *William Haug[3], Paul Kingma[4], Carrie Smith[5], William Middlesworth[2], Julie Khlevner[1]. [1]Pediatrics, Columbia University Irving Medical Center, New York, NY; [2]Pediatric Surgery, Columbia University Irving Medical Center, NY, NY; [3]Institute of Human Nutrition, Columbia University Irving*

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Introduction: Esophageal atresia (EA) is the most common congenital anomaly of the esophagus. It is most often accompanied by tracheoesophageal fistula (TEF) and is typically repaired primarily with a 93% survival rate. While surgical innovations and advances in neonatal critical care have been key to achieving this high survival rate, many patients suffer complications including anastomotic leak, esophageal stricture and dysmotility, significant feeding difficulties, and are at increased risk for developing reactive airway disease and eosinophilic esophagitis. Exclusive breastfeeding during the first two weeks of life has been associated with a lower risk of asthma and allergies. In addition, very-low birth weight infants who receive breastmilk experience shorter overall lengths of stay and a lower frequency of morbidities related to premature birth. Given these and other health benefits of breastfeeding and human breastmilk, the potential lack of exposure in this vulnerable population is of concern. The Center for Disease Control has reported an 11% increase from 2009 to 2015 in exclusive breastfeeding through 3 months (thought to be an effect of the "Healthy People 2020" campaign). However, literature about exclusive breastfeeding or any exposure to breastmilk in infants born with EA/TEF is sparse; data on whether EA/TEF patients have seen a similar improvement in exposure to breast milk as the general population is unavailable.

Aims: The purpose of this study was to determine the proportion of infants with EA/TEF who were exposed to breast milk or exclusively breastfed at one month of age during their stay in the neonatal intensive care unit (NICU) and to compare this percentage to the reported national rates. In addition, we sought to determine whether the presence of other congenital anomalies or comorbidities further reduces exposure to breastmilk in EA/TEF patients.

Methods: A retrospective review of feeding data was performed for patients followed in the EA/TEF multidisciplinary clinic at Morgan Stanley Children's Hospital (MSCH) who were born between 2001-2018. Of the 101 patients enrolled in our database, 29 were born at MSCH and thus met the inclusion criteria. Data from an additional cohort of 91 EA/TEF patients born at Cincinnati Children's Hospital Medical Center (CCHMC) since 2010 or transferred on the first day of life to CCHMC were also analyzed, making a total of 120 infants. Feeding data were extracted from the electronic health record. The cohort was reviewed for the presence of additional birth defects (congenital heart disease, VACTERL [vertebral defects, anorectal malformation, cardiac defects, EA/TEF, renal and limb abnormalities], scoliosis, renal) and comorbidities (anastomotic leak, esophageal stricture, gastroesophageal reflux disease, feeding difficulties, chronic lung disease, tracheomalacia) and then was further classified based on the following feeding designations: exclusively breastfed, partially breastfed, exposure to breastmilk or exclusively formula-fed. The World Health Organization's (WHO) definition of exclusive breastfeeding was utilized.

Results: The reported U.S. national rates of exclusive breastfeeding and exposure to breastmilk at 1 month of life for children born in 2015 were 59.1% and 79.0%, respectively. In our study, 31/120 (25.8%) in total were exclusively breastfed at 1 month of life [2/29 (6.9%) from MSCH and 29/91 (31.9%) from CCHMC] and 62/120 (51.7%) had exposure to breastmilk in the NICU [19/29 (65.5%) from MSCH and 43/91 (47.2%) infants from CCHMC]. These proportions were significantly lower when compared to the national rates (p-values < 0.001). At MSCH, the presence of comorbid conditions or other congenital anomalies did not significantly decrease the odds of breastmilk exposure ($p = 0.67$) or being exclusively breastfed at 1 month of life ($p = 0.091$).

Conclusions: Our data show that infants with EA/TEF have a considerably lower rate of breastmilk exposure when compared to the general population. We conclude that EA/TEF poses a considerable obstacle to initiating breastfeeding or being exposed to breastmilk in the NICU. Additionally, the likelihood of a child with EA/TEF receiving breastmilk while in the NICU was not further reduced by the presence of comorbidities or other congenital anomalies. The health benefits of breastfeeding and breastmilk exposure have been well established, thus it is crucial that every effort is made to increase the percentage of breastmilk exposure in the EA/TEF patients, an already vulnerable population with increased risk of allergic disorders.

278 *CLINICAL, HISTOLOGICAL AND MOLECULAR CHARACTERIZATION OF VERY EARLY ONSET EOSINOPHILIC ESOPHAGITIS REVEALS LARGE OVERLAP WITH LATER ONSET DISEASE AND RESPONSIVENESS TO DIETARY THERAPY.*

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Background and Aims: Eosinophilic esophagitis (EoE) is a chronic, food allergen-mediated, inflammatory disease characterized by esophageal dysfunction and eosinophil accumulation. We hypothesized that EoE presenting in the first year of life (very early onset or vEoE) would represent a distinct endotype of EoE with increased heritability, more severe

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phenotype, and distinct clinical, molecular, and genetic features.

Methods: Within our EoE registry, we identified all patients diagnosed with EoE at ≤12mo (vEoE). We performed a retrospective cohort study comparing vEoE to patients diagnosed with EoE between 14-18yo (L-EoE). Cohorts were analyzed for clinical, endoscopic, histopathologic, and molecular features.

Results: Within the Eosinophilic Gastrointestinal Disease database, 16.6% of patients were diagnosed with EoE within the first two years of life (n= 301 of 1813 total patients between 0-18yo).The vEoE group (n=48) had similar baseline characteristics to the L-EoE group (n=48) including sex, race, and duration of clinical follow-up. In contrast to our hypothesis, vEoE did not demonstrate increased heritability as defined by prevalence of EoE in first-degree relatives (19.1% vs 13.3%, p=.46). Furthermore, vEoE did not have higher esophageal peak eosinophil levels at diagnosis (median [IQR] PEC, 57 [31, 100] vs 66 [42, 100], p=.56) or increased frequency of refractoriness to therapy (6.3% vs 6.3%, p=1.0) (Table 1). In addition, the vEoE cohort has a higher rate of initial dietary therapy (68.8% vs 18.8%, p<.0001) and was more likely to attain histologic remission on dietary therapy (88.9% vs 27.0%, p<.0001) compared to L-EoE (Table 1). vEoE had trends toward higher incidences of preterm delivery (19.6% vs 5.0%, p=.06) and c-section (45.8% vs 15.8%, p=.05) but did not differ from L-EoE in terms of living in an urban environment. Overall symptoms prior to diagnosis differed between groups with L-EoE more likely to have dysphagia (68.8% vs 31.3%, p=.0002) while vEoE was more likely to have feeding issues (31.3% vs 10.4%, p=0.02), weight concerns (72.9% vs 10.4%, p<.0001), and nausea/vomiting (79.2% vs 25.1%, p=0.005). There was no significant difference in pain prior to diagnosis between groups (vEoE 60.4% vs L-EoE 75.0%, p=.125). EoE-related gene expression, via the 96 transcripts assessed in the Eosinophilic Diagnostic Panel, was largely similar between groups. Notably, gamma-2 actin (*ACTG2*), a smooth muscle actin protein found predominantly in urinary and intestinal tracts previously reported as having decreased expression in steroid responsive patients with EoE, showed 26.7-fold greater expression in vEoE (p<0.05) (Figure 1).

Conclusions: We have determined that EoE frequently occurs in early life. While this early-onset disease does not appear to have increased heritability or a more severe phenotype compared to later onset disease, it is largely responsive to dietary therapy and has increased esophageal transcript expression of *ACTG2*.

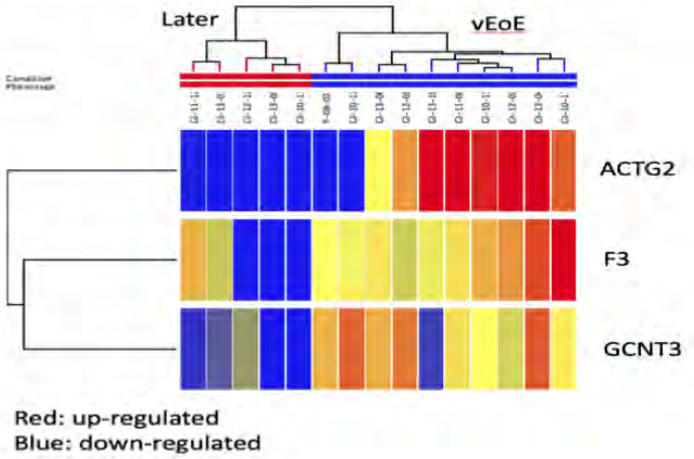
Table 1: Response to Therapy

	n	vEoE	n	L-EoE	p-value
PEC* (median, IQR)	47	57 (31, 100)	44	66 (42, 100)	0.56
Initial TX**	48		48		
Diet		33 (68.8%)		9 (18.8%)	<0.0001
Swallowed corticosteroids		17 (35.4%)		35 (72.9%)	0.0002
PPI		40 (83.3%)		39 (84.8%)	0.85
Successful TX**	48		48		
Diet		40 (88.9%)		10 (27.0%)	<0.0001
Swallowed corticosteroids		19 (42.2%)		28 (75.7%)	0.002
Histologic Remission at last EGD (%Y)	48	35 (72.9%)	48	20 (42.6%)	0.0025
Refractory to therapy	48	3 (6.3%)	48	3 (6.3%)	1.0
Therapy non-compliance	48	1 (2.1%)	48	23 (47.9%)	<0.0001

*Peak eosinophil count from initial, pre-treatment EGD.
**Values represent if particular intervention was included as a part of treatment.

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Figure 1: Supervised cluster analysis of the discovery cohort demonstrated 3 differentially increased genes in vEoE.



279 ***PATTERNS OF ACID SUPPRESSION MEDICATION USE FOR REFLUX-RELATED OUTPATIENT GI VISITS.*** *Lisa Mahoney[1], Jenny Chan Yuen[2], Caitlin Lenz[2], Alison Mann[2], Taruna Banerjee[2], Rachel Rosen[1]. [1]GI/Nutrition, Boston Children's Hospital, Boston, MA; [2]Department of Pediatrics, Boston Children's Hospital, Boston, MA*

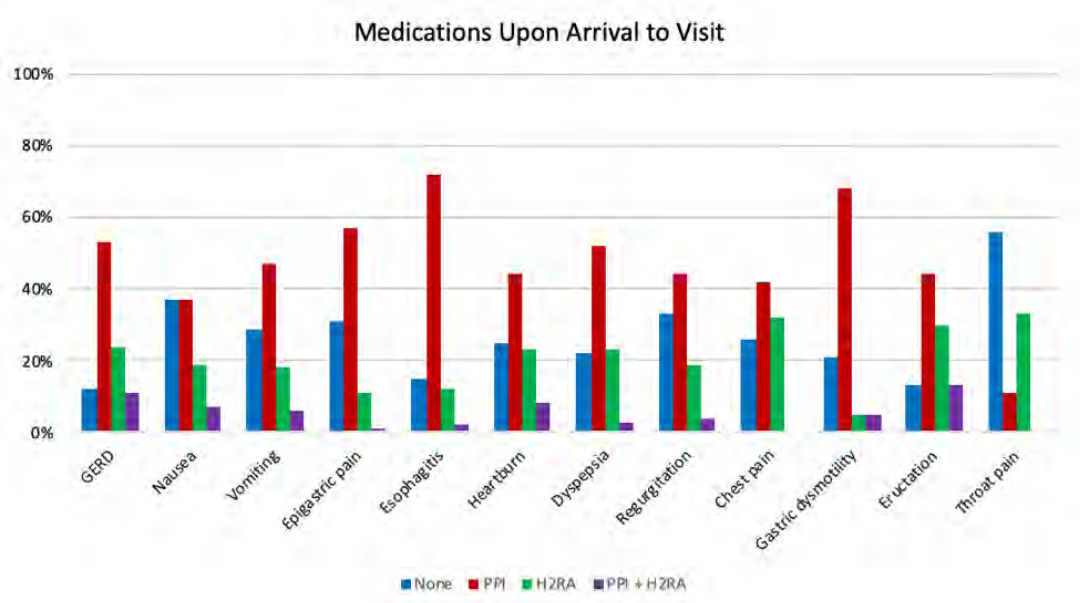
Introduction: Gastroesophageal reflux disease (GERD) is one of the most common disorders encountered in pediatric gastroenterology. In clinical practice, patients are often prescribed empiric trials of acid suppression medications such as proton pump inhibitors (PPIs) to treat possible acid-related symptoms. While there is abundant data on the use of acid suppression medications in infants, little data exists on the frequency of use in older children and the diagnoses for which they are being prescribed. In order to reduce use over time, it is important to understand the indications and frequency for which these medications are prescribed. As part of a quality initiative to reduce acid suppression use, our first step was to determine patterns of acid suppression use in a high-volume GI division.

Methods: Using the new 2018 NASPGHAN GERD guidelines and supporting data, we developed an institutional evidence-based GERD algorithm which we disseminated to all clinicians in the Division of Gastroenterology and Nutrition at Boston Children's Hospital through formal presentations and media outlets in November 2018. Starting in December 2018, clinicians received surveys querying medication use for all patients > 5 years of age presenting to an outpatient GI clinic visit when entering billing charges for suspected GERD. Suspected GERD was identified through ICD-10 billing codes for GERD, heartburn, regurgitation, dyspepsia, nausea, vomiting, epigastric pain, chest pain, esophagitis, eructation, throat pain or gastric dysmotility. Providers documented details of reflux medication use in a billing survey integrated with an electronic data warehouse containing demographic, administrative and clinical data. Data was analyzed for the period of time between December 2018 and April 2019 to identify baseline patterns of medication use.

Results: There were 2859 total unique outpatient GI visits for which the survey was triggered. Of these, 1358 patients arrived to the visit on acid suppression medications with 865 (30%) arriving on a PPI, 357 (12%) arriving on a histamine 2 receptor antagonist (H2RA) and 136 (5%) arriving on both a PPI and a H2RA. The frequency of medication use by billing diagnosis is shown in the Figure. For the patients on acid suppression medications, at the end of the visit, no medication changes were made in 896 (66%) patients, 69 (5%) switched class of medication (e.g. PPI to H2RA), 122 (9%) discontinued medication (79 PPI and 43 H2RA), 125 (9%) decreased medication dose (104 PPI and 21 H2RA) and 85 (6%) increased medication dose (65 PPI and 20 H2RA).

Conclusions/Future Directions: Approximately half of patients arrive to their outpatient GI visit for suspected reflux on acid suppression medication. The majority of these patients continued on their medications without changes after the visit. Future directions in this quality improvement project include individual provider level incentivized competitions to decrease duration of PPI use in patients who do not respond optimally to these medications and linking medication use with diagnostic testing.

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280 ***ARE WE CAUSING FOOD ALLERGIES? FOOD PROTEIN-INDUCED ALLERGIC PROCTOCOLITIS IS PROSPECTIVELY ASSOCIATED WITH IGE-MEDIATED FOOD ALLERGY BY AGE 3.*** *Victoria Martin[1,2], Yamini Virkud[3,2], Neelam Phadke[3,2], Kuan-wen Su[4], Hannah Seay[3], Micaela Atkins[5], Corinne Keet[6], Wayne Shreffler[3,2], Qian Yuan[1,2]. [1]Pediatric Gastroenterology and Nutrition, Massachusetts General Hospital, Cambridge, MA; [2]Harvard Medical School, Boston, MA; [3]Pediatric Allergy and Immunology, Massachusetts General Hospital, Boston, MA; [4]Pediatrics, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan; [5]Pediatrics, Massachusetts General Hospital, Boston, MA; [6]Pediatric Allergy and Immunology, Johns Hopkins University School of Medicine, Baltimore, MD*

Rationale: Current management of food protein-induced allergic proctocolitis (FPIAP) involves dietary antigen avoidance over the first year of life. Recent data shows that early introduction of potentially allergenic foods prevents later development of life-threatening IgE-mediated food allerigies. Whether FPIAP is associated with IgE-mediated food allergies has not previously been prospectively evaluated.

Methods: Using the Gastrointestinal Microbiome and Allergic Proctocolitis (GMAP) prospective observational cohort study we followed 903 healthy newborn infants to identify the rates of FPIAP and IgE-mediated food allergies through age 3. FPIAP was diagnosed by the primary care provider, and study staff independently confirmed by chart review whether subjects met predefined case-inclusion criteria including clinical symptoms and guaiac positive or grossly bloody stools not attributable to other etiology. IgE-mediated food allergy was determined by independent agreement of two allergist reviewers based on comprehensive chart review, clinical reactivity, and documented IgE sensitivity.

Results: Of 903 infants analyzed, 153 (16.9%) children were diagnosed with FPIAP and 56 (6.2%) children were diagnosed with IgE-mediated food allergy. Adjusting for eczema (given its reported association with both FPIAP and IgE-mediated food allergy), children with FPIAP had twice the odds of developing IgE-mediated food allergies as those who did not (OR 1.9 [1.0, 3.6], p=0.036). While we were not powered to look at individual foods, FPIAP appears most strongly to be associated with food allergy to milk (OR 5.4 [1.4, 20.8], p=0.013), though trends towards egg (OR 2.0 [0.9, 4.5], p=0.106) and peanut (OR 1.4 [0.6, 3.6], p=0.440) were also seen (**Table 1.**)

Conclusions: Infants with FPIAP were significantly more likely to develop IgE-mediated food allergies, contrary to classic teaching. Further study is required to elucidate whether FPIAP represents an early previously unrecognized step on the atopic march, whether our current management of FPIAP with antigen elimination and avoidance in the first year of life increases the risk of IgE-FA, or perhaps both. These findings raise important questions about current duration of dietary antigen avoidance in the treatment of FPIAP.

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Table 1. Prospective Association between FPIAP and IgE-Mediated Food Allergy

	Unadjusted OR [95% CI]	p-value	Adjusted* OR [95% CI]	p-value
Any IgE-FA (n=56)	2.3 [1.3, 4.2]	**p=0.007**	1.9 [1.0, 3.6]	**p=0.036**
Milk (n=9)	6.3 [1.7, 23.7]	**p=0.007**	5.4 [1.4, 20.8]	**p=0.013**
Egg (n=28)	2.4 [1.1, 5.4]	**p=0.034**	2.0 [0.9, 4.5]	p=0.106
Peanut (n=28)	1.7 [0.7, 4.0]	p=0.253	1.4 [0.6, 3.4]	p=0.440

FPIAP: Food protein-induced allergic proctocolitis; IgE-FA: IgE-mediated food allergy; OR: Odds ratio; CI: Confidence Interval
*adjusted for eczema

282 ***UNDERSTANDING VARIATION IN PHYSICIAN DIAGNOSIS AND MANAGEMENT OF PEDIATRIC EOSINOPHILIC ESOPHAGITIS.*** *Talya Miller[1,2], Dale Lee[2], Amanda Muir[3], Miriam Haviland[4], K. Casey Lion[1,4]. [1]Pediatrics, University of Washington, Seattle, WA; [2]Gastroenterology, Seattle Children's Hospital, Seattle, WA; [3]Gastroenterology, Children's Hospital of Philadelphia, Philadelphia, PA; [4]Pediatrics, Seattle Children's Hospital, Seattle, WA*

Background: The prevalence of eosinophilic esophagitis (EoE) is increasing, approaching 1 per 1000 in the U.S. pediatric population. Guidelines for EoE diagnosis and management were initially published in 2007 and updated in 2018 to exclude initiation of proton pump inhibitor therapy prior to endoscopy. Widespread variation in EoE diagnosis and treatment has previously been reported; it is unknown why such variation exists, or whether it may have changed following the 2018 guideline update.

Objectives: (1) To describe variation in diagnosis and management of pediatric EoE by pediatric gastroenterologists following publication of the updated guidelines in 2018. (2) To identify reasons for variation in EoE diagnosis and treatment among pediatric gastroenterologists.

Methods: A 28-item multiple-choice questionnaire was created through a multi-step process. A literature review and a series of key informant interviews with EoE experts guided the development of the content areas. Survey items were drafted within each content area and tested and refined through expert validation. Five rounds of cognitive interviews were conducted with other gastroenterologists to ensure survey item and response option understandability. Survey domains included knowledge of and adherence to published guidelines, diagnostic approach and rationale, management approach and rationale, and participant demographics. Pediatric gastroenterologists were invited via email over the PEDGI Bulletin Board, subscribed to by 3343 pediatric gastroenterologists around the world. Participants completed the survey anonymously via Redcap. Descriptive statistics were used to analyze the responses.

Results: A total of 287 pediatric gastroenterologists from 6 continents completed the survey, the majority of whom were from North America (84.6%). Most respondents practiced in an academic center (72.5%) and had been in practice less than 15 years (78.6%). Sixty-three percent of participants reported knowledge of the 2018 updated guidelines; however, only 51.6% of those reported agreeing with them. About half (50.2%) of the total survey participants reported preferring to have a patient off of PPI therapy at the time of their first endoscopy. Participants who reported not agreeing with the 2018 updated guidelines cited concerns regarding insufficient data (23.3%) increasing numbers of endoscopies (70.7%), and misdiagnosing eosinophilia from reflux (55.2%) as reasons for their disagreement. Interestingly, 26.8% of participants not adherent to the updated guidelines (i.e., performing initial endoscopies on PPI therapy) reported that they were doing so because they were following guidelines.

To understand how physicians choose therapies for individual patients, we asked participants which factors they weigh most heavily when deciding on first-line therapy. Physicians cited that the most common drivers of decision-making were patient/family preference and evidence/guidelines. Among therapy choices for first line EoE treatment, 78.4% of participants reported offering PPI therapy as an option, 78.7% offered food elimination, and 72% offered swallowed steroids. While all participants cited that a pediatric gastroenterologist makes management decisions, some reported that management decisions are also made by advanced practice practioners (15.8%) and allergists (22.1%) within their practice.

Conclusions: The majority of pediatric gastroenterologists who participated in the survey reported being familiar with updated EoE guidelines, but almost half were not in full agreement with them. Concerns regarding increasing numbers of endoscopies and misclassification of eosinophilia from reflux were the primary reasons for disagreement with updated guidelines. Additionally, decisions regarding treatment choice were guided both by patient/family preference and guideline

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adherence.

Physician Variation in Diagnosis and Management of EoE results

Participant Information	N=287
Location of Practice	
Academic Center	208 (72.5%)
Private Practice	54 (18.8%)
Large Hospital System	87 (30.3%)
Years in Practice	
Current fellow	66 (23.2%)
<5 years	87 (30.5%)
6-10 years	45 (15.8%)
11-15 years	26 (9.1%)
>15 years	61 (21.4%)
Prefers to have patient off of PPI at the time of first endoscopy	
Yes	144 (50.2%)
No	102 (35%)
Sometimes	41 (14.3%)
Reasons to perform the initial endoscopy off of PPI	
Following 2018 AGREE consensus statement	87 (60.8%)
May confuse endoscopic or histologic assessment	100 (69.9%)
Following other guidelines of care	5 (3.5%)
Other	5 (3.5%)
Prefers to have patient on PPI at the time of first endoscopy	
Trial for symptomatic relief	77 (54.2%)
To eliminate the contribution of reflux on endoscopic/histology assessment	96 (67.6%)
Following guidelines of care	38 (26.8%)
Other	4 (2.8%)
Familiar with AGREE guidelines from 2018	
Yes	181 (63.3%)
No	44 (15.4%)
Somewhat	61 (21.3%)
Agrees with these guidelines	
Definitely Yes	32 (13.2%)
Yes	93 (38.4%)
Somewhat	86 (35.5%)
No	16 (6.6%)
Definitely no	1 (0.4%)
Unsure	14 (5.8%)
Reasons to not be in full agreement	
Insufficient data	27 (23.3%)
Increased number of procedures generated	82 (70.7%)
Misclassification of eosinophilia from reflux	64 (55.2%)
Other	7 (6%)

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283 ***STUDY DESIGN AND BASELINE PATIENT CHARACTERISTICS OF A PHASE 3, RANDOMIZED, PLACEBO-CONTROLLED TRIAL OF BUDESONIDE ORAL SUSPENSION IN PATIENTS WITH EOSINOPHILIC ESOPHAGITIS.*** *Evan Dellon[1], Ikuo Hirano[2], Vincent Mukkada[3], David Katzka[4], Benjamin Gold[5], Nirav Desai[6], Lan Lan[6], James Williams[6], Margaret Collins[7]. [1]Center for Esophageal Diseases and Swallowing, Division of Gastroenterology and Hepatology, Department of Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC; [2]Division of Gastroenterology and Hepatology, Northwestern University Feinberg School of Medicine, Chicago, IL; [3]Division of Gastroenterology, Hepatology, and Nutrition, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH; [4]Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN; [5]Children's Center for Digestive Healthcare, LLC Gi Care for Kids, Atlanta, GA; [6]Shire, a Takeda company, Lexington, MA; [7]Department of Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, University of Cincinnati College of Medicine, Cincinnati, OH*

Introduction: Eosinophilic esophagitis (EoE) is a chronic immune-mediated condition and a major cause of upper gastrointestinal morbidity in children and adults. First-line therapies for patients with EoE include corticosteroids and dietary modifications. However, with a paucity of approved treatment options, there is a critical need for new therapeutics. The efficacy and safety of budesonide oral suspension (BOS) for the treatment of EoE has been demonstrated in phase 2 studies. Here we report on the study design, baseline patient demographics and disease characteristics at the induction of treatment in a phase 3 study of BOS.

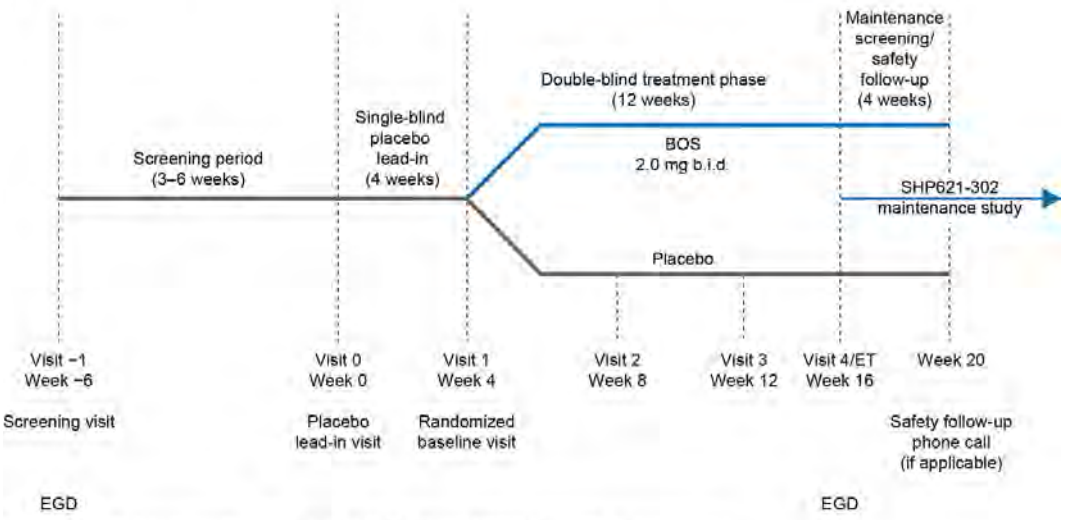
Methods: This phase 3 randomized, double-blind, placebo-controlled trial (SHP621-301; NCT02605837) investigated the safety and efficacy of BOS in pediatric and adult patients aged 11–55 years, with EoE and dysphagia. Patients received placebo or 2.0 mg BOS twice daily (b.i.d.), every morning after meals and at bedtime for 12 weeks. The study consisted of a 3- to 6-week screening period, a 4-week single-blind placebo lead-in, and a 12-week double-blind, randomized (2:1 BOS to placebo) treatment period (**Figure**). Key inclusion criteria were: histologically active EoE with a peak eosinophil count of ≥15 eosinophils/high-powered field (eos/hpf) from 2 of 3 levels of the esophagus; symptoms of dysphagia as measured by the dysphagia symptom questionnaire (DSQ) on a minimum of 4 days; and completion of the questionnaire on ≥70% of days in 2 weeks during screening and prior to the first visit. Key exclusion criteria were: prior/anticipated immunomodulatory therapy; use of swallowed topical or systemic corticosteroids within 4 weeks prior to qualifying esophagogastroduodenoscopy (EGD); presence of high grade esophageal stricture or dilation within 3 months prior to screening; use of a pure liquid diet/the 6-food elimination diet; or inflammatory bowel disease and other diseases of the gastrointestinal tract. The co-primary efficacy endpoints of this study were a histologic response (peak eosinophil count ≤6 eos/hpf) across esophageal levels and a dysphagia symptom response (≥30% reduction in DSQ combined score) at final treatment period evaluation.

Results: A total of 322 patients were randomized (BOS, n=215; placebo, n=107), of whom, 318 patients received at least one dose of double-blind therapy (BOS, n=213; placebo, n=105; **Table**). Of these, 296 patients (93.1%) completed the study. Of 318 patients, 60.1% (BOS, 60.6%; placebo, 59.0%) were male and 12.9% (BOS, 12.7%; placebo, 13.3%) were aged <18 years. At baseline, the mean (standard deviation [SD]) overall peak eosinophil count was 75.2 (41.1) eos/hpf (BOS, 74.5 [39.2]; placebo, 76.6 [45.0]), and the total mean (SD) endoscopic reference score (EREFS) was 7.8 (3.5) (BOS, 7.6 [3.6]; placebo, 8.2 [3.3]). The proportion of patients on diet restriction at baseline was 10.1% (BOS, 9.9%; placebo, 10.5%). In terms of prior disease management, 25.2% of patients (BOS, 25.4%; placebo, 24.8%) were previously on diet therapy, while 7.9% (BOS, 8.5%; placebo, 6.7%), 20.8% (BOS, 23.0%; placebo, 16.2%), and 34.6% (BOS, 36.2%; placebo, 31.4%) had previously received systemic (oral) corticosteroids, budesonide suspension, or swallowed fluticasone, respectively. Prior to study entry, the proportion of patients who required dilation during EoE-related endoscopy on one or more occasions was 41.8% (BOS, 41.3%; placebo, 42.9%).

Discussion: Patient demographics and baseline disease characteristics of patients recruited to this phase 3 study investigating BOS for the treatment of EoE were comparable in each study arm. To our knowledge, this study represents the largest clinical trial of a corticosteroid for EoE to date. The maintenance study (SHP621-302) is currently on-going.

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Figure. Study design.



b.i.d., twice daily (every morning after meals and at bedtime); BOS, budesonide oral suspension; EGD, esophagogastroduodenoscopy; ET, end of treatment.

Figure

Table. Patient demographics and disease characteristics at baseline (full analysis set).

	Placebo n=105	BOS 2.0 mg b.i.d. n=213	Total N=318
Age, years	33.9 (12.1)	33.8 (11.9)	33.9 (12.0)
Age group, n (%)			
< 18 years	14 (13.3)	27 (12.7)	41 (12.9)
≥ 18 years	91 (86.7)	186 (87.3)	277 (87.1)
Sex, n (%)			
Male	62 (59.0)	129 (60.6)	191 (60.1)
Female	43 (41.0)	84 (39.4)	127 (39.9)
Ethnicity, n (%)			
Not Hispanic or Latino	100 (95.2)	204 (95.8)	304 (95.6)
Other	5 (4.8)	9 (4.2)	14 (4.4)
Race, n (%)			
White	101 (96.2)	200 (93.9)	301 (94.7)
Other[a]	4 (3.8)	13 (6.1)	17 (5.3)
Weight, kg	84.8 (22.1)	82.1 (20.9)	83.0 (21.3)
Height, cm	172.5 (11.2)	172.2 (11.1)	172.3 (11.1)
BMI, kg/m^2	28.2 (6.3)	27.5 (6.0)	27.7 (6.1)
Diet restriction, n (%)	11 (10.5)	21 (9.9)	32 (10.1)
DSQ combined score (Q2+Q3)	30.4 (13.1)	30.3 (13.9) (n = 211)	30.4 (13.7) (n = 316)
DSQ pain score (Q4)	10.3 (10.5)	10.5 (10.5) (n = 211)	10.5 (10.5) (n = 316)
Peak eosinophil count, eos/hpf			
Overall	76.6 (45.0) (n = 104)	74.5 (39.2)	75.2 (41.1) (n = 317)
Proximal	43.2 (40.3) (n = 104)	39.4 (36.0)	40.7 (37.4) (n = 317)
Mid	58.1 (42.5) (n = 104)	55.8 (37.2)	56.5 (38.9) (n = 317)
Distal	56.0 (39.0) (n = 103)	56.4 (36.4)	56.3 (37.2) (n = 316)
Total EREFS	8.2 (3.3)	7.6 (3.6)	7.8 (3.5)
EoE HSS combined total grade score ratio	0.4 (0.1) (n = 104)	0.4 (0.1)	0.4 (0.1) (n = 317)
EoE HSS combined total stage score ratio	0.3 (0.1) (n = 104)	0.3 (0.1)	0.3 (0.1) (n = 317)

Data are mean (SD) unless otherwise stated.
b.i.d., twice daily (every morning after meals and at bedtime); BMI, body mass index; DSQ, dysphagia symptom questionnaire; EoE HSS, eosinophilic esophagitis histologic scoring system; eos, eosinophils; EREFS, Endoscopic Reference Score; hpf, high-powered field; Q, question; SD, standard deviation; [a]Categories included Black or African American, Native Hawaiian or Other Pacific Islander, Asian, American Indian or Alaska Native and Other.

Table

284 ***DOES EOSINOPHIL DERIVED NEUROTOXIN PREDICT RESPONSIVENESS TO TREATMENT WITH PROTON PUMP INHIBITOR IN CHILDREN AND YOUNG ADULTS WITH EOSINOPHILIC ESOPHAGITIS?***

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Introduction: There is no predictive test or patient factors to rely upon when deciding on the best treatment approach for a

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patient with eosinophilic esophagitis (EoE). The prevalence of PPI responsive EoE in children ranges from 30-71%. Multiple studies have shown that baseline clinical, histological, and endoscopic characteristics were similar in responders and non-responders. Additionally, esophageal pH monitoring has not been shown to predict responsiveness to PPI. Eosinophil derived neurotoxin (EDN), an eosinophil granule protein, measured in esophageal brushing has been shown as a viable measure of disease activity in EoE. Our aim is to identify if EDN can be used to help predict response to PPI in patients with EoE.

Methods: We conducted and IRB-approved prospective cross-sectional study to compare EDN between PPI- responsive and non-responsive EoE subjects at the EoE center in Arnold Palmer Hospital for children between 2015 and 2018. Active EoE was defined based on symptoms of esophageal dysfunction and increased esophageal intraepithelial eosinophilia (>15 eos/hpf) in at least one biopsy of the esophagus during esophagogastroduodenoscopy (EGD). PPI- responsive EoE was defined by improvement of esophageal eosinophilia to less than 15 eos/hpf in all biopsies. Control subjects were defined when EGD did not reveal any pathology. EDN was measured in esophageal epithelial brushing samples by ELISA at initial endoscopy before treatment. Enrolled patients with active EoE were treated with high dose PPI divided in two doses daily and underwent repeat endoscopy to determine PPI-responsiveness. After the second scope, subjects were divided into PPI-responsive and non-responsive EoE groups. EDN and peak Eosinophilic count (PEC) were compared between the two groups and with controls.

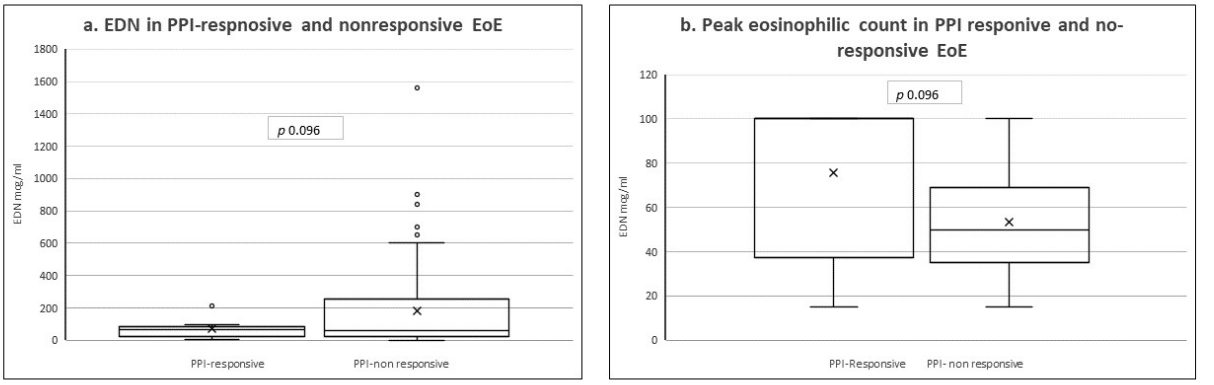
Results: We enrolled 85 subjects with EoE (mean age 10 years, range 2-22) and 90 control subjects (mean age 11 years, range 2-19). Nine subjects were found PPI-responsive (mean age 10 years, range 2-7) and 76 subjects were non-responsive (mean age 10.5 years, range 2-22). EDN in PPI-non-responsive EoE group was significantly higher than PPI-responsive EoE group (183.40 ± 262 mcg/ml and 68.24 ± 60 mcg/ml respectively, p 0.002) (Graph 1). EDN in the control group (2.8 ± 16 mcg/ml) was significantly less than PPI responsive and non-responsive EoE groups (p 0.0001). There was no difference in PEC between PPI-non responsive and responsive EoE groups (53±24 and 75±34 eos/hpf respectively, p 0.09), (Graph 1)

Conclusion: EDN measured in esophageal epithelial samples obtained by brushing during endoscopy may predict PPI-responsiveness in EoE in children and young adults.

Patient Demographics

	PPI-R (n=9)	PPI-NR (n=76)	Total (n=85)
Mean Age (yrs)	11	10.3	9.8
Gender			
Male	7	56	63
Female	2	20	22
Mean PEC	75.6	53.3	55.6
Mean EDN	68.2	183.4	171.2

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Graph 1. Comparison of eosniophilic derived neurotoxin EDN (a) and peak eosinophilic count PEC (b) between PPI-responsive and non-responsive EoE subjects.

285 ***PEDIATRIC ESOPHAGEAL FOOD IMPACTIONS: ASSESSING MANAGEMENT TRENDS, FOLLOW-UP AND ASSOCIATION WITH EOSINOPHILIC ESOPHAGITIS ACROSS A LARGE, INTEGRATED HEALTHCARE SYSTEM.*** *Karyn Parsons[2], Katherine Wolpert[3], Andrea McInerny[1], Kathryn Peterson[4], Kent Korgenski[5], Kelly Huynh[5], Molly O'Gorman[1], Jacob Robson[1]. [1]Pediatrics, Gastroenterology, University of Utah / Primary Children's Hospital, Salt Lake City, UT; [2]Pediatrics, University of Utah, Salt Lake City, UT; [3]Pediatrics, Emergency Medicine, University of Utah, Salt Lake City, UT; [4]Internal Medicine, University of Utah, Salt Lake City, UT; [5]Pediatric Clinical Program, Outcomes Data, Intermountain Healthcare, Salt Lake City, UT*

Background and Aims: Pediatric esophageal food impactions (EFIs) with meat are presumed to be associated with eosinophilic esophagitis (EoE), but clinical research confirming this association is limited. In the ninth revision, the international classification of diseases (ICD-9) coding system included EFIs along with all other esophageal foreign bodies. The ICD-10 introduced a specific code for food in the esophagus, making EFIs easier to identify and study. Herein, we report our experience identifying pediatric EFIs using the ICD-10 code across the Intermountain Healthcare (IH) system. We hypothesized that EFIs with meat/fish would be strongly associated with EoE, but that many children with EFIs would not receive a full evaluation for EoE.

Methods: We reviewed all pediatric (<18 years old) encounters for EFI (T18.120A or T18.128A) in the IH Enterprise Data Warehouse between 10/1/15 to 6/30/18. We excluded encounters where EFIs were miscoded or where patients had a history of congenital esophageal anatomic abnormalities. Unique cases with an EFI were reviewed in-depth, including the EFI encounter and any previous or subsequent visits for endoscopy. All participants had at least 6 months of follow-up time from the EFI encounter. Active EoE was defined as >14 eosinophils per high-power field on an esophageal biopsy. Patients were subcategorized by EFI food type (meat/fish or other food) and statistical hypothesis tests were utilized to study key differences between groups.

Results: ICD-10 code search yielded 264 pediatric EFI encounters over the study period. 24 cases (9.1%) were miscoded (no active EFI) and an additional 20 (7.6%) were excluded (most often repaired tracheoesophageal fistula). Remaining were 178 unique patients with a total of 220 EFI encounters (10 had multiple EFIs in dataset and 32 had more than one EFI code during a single EFI encounter). Children with meat/fish stuck were older and more likely to be male and White non-Hispanic race (Table); they also had 8.6 times the odds (95% CI: 3.62-20.51, $p<0.001$) of having EoE (either before, during or after the EFI) compared to children with other food at EFI. Rates of esophageal biopsy at EFI removal were fair (42/76 who underwent endoscopy at EFI, 55.3%), but in those that did not require endoscopic removal of the EFI, 89/102 (87.3%) never had a follow-up endoscopic evaluation to assess for EoE.

Discussion: ICD-10 code search proved a specific method to identify pediatric EFIs across a large, integrated healthcare system which serves that vast majority of children in Utah. Across this population-based cohort, we confirmed that children with EFI and common EoE risk factors had extremely high rates of EoE when evaluated by endoscopy with biopsy. However, many children with an EFI were not adequately tested for EoE. Educating

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providers involved in pediatric EFI management, including emergency department staff and all pediatric endoscopists, should be a target of future quality improvement initiatives; key targets include increasing esophageal biopsy rates during endoscopic EFI removal and ensuring close follow-up for children with EFI who have other clear EoE risk factors. Expeditious EoE evaluation in children who present with an EFI may allow for early initiation of EoE treatment targeted towards preventing further esophageal fibrostenosis and need for serial dilations in adulthood.

Patient Demographics, Management at EFI Encounter and EoE Status, by EFI Type

		Meat/Fish	Other Food
	N=178	N=120	N=58
Mean Age		12.35†	7.52
Gender		N (%)	N (%)
	Male	96 (80)**	34 (58.6)
	Female	24 (20)	24 (41.4)
Race			
	Non-Hispanic White	105 (87.5)**	40 (69)
	Other	15 (12.5)	18 (31)
Endoscopy associated with EFI encounter			
	Yes	68 (56.7)***	8 (13.8)
	No	52 (43.3)	50 (86.2)
Biopsies obtained during endoscopy			
	Yes	41 (60.3)*	1 (12.5)
	No	27 (39.7)	7 (87.5)
EoE diagnosis status: endoscopy with biopsy at time of EFI			
	Prior to EFI	3 (7.3)	1 (12.5)
	At EFI	31 (75.6)	0
	In follow-up from EFI	3 (7.3)	0
	Never met EoE diagnostic criteria	4 (9.8)	7 (87.5)
EoE diagnosis status: no endoscopy with biopsy at time of EFI			
	Prior to EFI	6 (7.6)	2 (4)
	At EFI	0	0
	In follow-up from EFI	22 (27.8)	4 (8)
	Never met EoE diagnostic criteria	51 (64.6)	44 (88)
Ever diagnosed with EoE			
	Yes	65 (54.2)***	7 (12.1)
	No	55 (45.8)	51 (87.9)
	† denotes p<0.001 by t-test		
	* p<0.05, ** p<0.01, *** p<0.001 by logistic regression		

286 ***NATURAL HISTORY OF EOSINOPHILIC ESOPHAGITIS IN CHILDREN: A RETROSPECTIVE CHART REVIEW FROM A TERTIARY CARE CENTER.*** *Elizabeth Hilow*, *Praveen Kumar Conjeevaram Selvakumar*, *Sophia Patel*. *Pediatric Gastroenterology*, *Cleveland Clinic Foundation*, *Cleveland*, *OH*

Background: Eosinophilic esophagitis (EoE) is a clinicopathologic condition characterized clinically by symptoms related to esophageal dysfunction and histologically by eosinophil-predominant inflammation (≥15 eosinophils per high powered field). EoE is believed to be a chronic disease with established progression from inflammatory to fibrostenotic phenotype. However, being a relatively new diagnosis, there is limited data on the natural history of EoE, particularly in children including long-term outcomes, need for endoscopic therapy and complications.

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Objective: In this study, we aimed to describe demographics, natural history, and treatment choices in children with EoE at Cleveland Clinic Children's. We planned to describe associations between patient demographics, development of complications, and symptomatic presentation in our patient population.

Methods: We performed a retrospective chart review of children with EoE being diagnosed and followed at Cleveland Clinic Children's. Inclusion criteria were: Age ≤ 18 years, diagnosed with EoE at Cleveland Clinic and at least 1 follow-up appointment at Cleveland Clinic. Exclusion criteria included diagnostic biopsy at an outside hospital to avoid data loss with regards to histology and/or no follow-up at Cleveland Clinic. Data with regards to demographics, histology, use of proton pump inhibitor (PPI), treatment choices and complications such as stricture and food impaction were collected. Association between patient characteristics and clinical variables were assessed using Chi-square or Fisher's exact tests, Kruskal-Wallis tests, and Spearman rank correlation coefficients.

Results: A total of 92 patients were included in the study analysis (24 were females and median age was 11). 9 patients developed strictures and 12 patients experienced food impaction. A majority of patients were started on topical steroids for treatment (77%) with the remaining patients started on elimination or elemental diets. Patients presenting with dysphagia were significantly older with a median age of 13 whereas those presenting with emesis (median age=6.5), weight loss (median age=7.5), and food refusal (median age=6.5) were significantly younger (p-value ≤ 0.05). Patients PPI at time of diagnosis had significantly higher degree of eosinophilia on their diagnostic biopsy compared to patients not on PPI (52.5 eosinophils vs. 40 eosinophils; p-value 0.022). Patients with history of atopy also had significantly higher degree of eosinophilia compared to those without eosinophilia (50 eosinophils vs. 30 eosinophils; p-value 0.049). Patients with stricture or food impaction were found to be significantly older than those without stricture or food impactions (median age with complication was 14 yr. vs. no complications was 10 yr.; p-value ≤ 0.05). We found no significant increase in risk in of strictures based on gender or history of atopy.

Conclusions: Younger children with EoE more often presented with emesis, food refusal, and weight loss while older patients presented with dysphagia. Older patients were more likely to develop strictures. Interestingly, patients on PPI at diagnosis had a higher degree of eosinophilia on histology, which could either reflect the timeframe of management guidelines publication or change in clinical practice over the past decade.

287 ***CLINICAL CHARACTERISTICS ASSOCIATED WITH FAILURE TO FOLLOW UP AFTER ESOPHAGEAL FOOD IMPACTION.*** *Kent Rosenwald[1,2], Calies Menard-Katcher[1,2]. [1]Digestive Health Institute, Children's Hospital Colorado, Aurora, CO; [2]University of Colorado School of Medicine, Aurora, CO*

BACKGROUND: Esophageal food impaction (EFI) is an acute event that often requires urgent endoscopic intervention and which is often associated with treatable underlying esophageal disease, most commonly eosinophilic esophagitis (EoE). Natural history studies of EoE have revealed that consistent treatment with topical steroids reduces EFI, and patients who have untreated EoE may be at risk of further fibrotic sequelae. However, outpatient subspecialty follow-up rates after EFI may be suboptimal (as low as 24%)[1], and pediatric gastroenterologists may be less likely than their adult counterparts to recommend outpatient follow-up after EFI.[2]

OBJECTIVES: We aimed to establish the current rate of subspecialty outpatient follow-up for children experiencing EFI and to identify clinical characteristics associated with pediatric subspecialty follow-up after EFI.

METHODS: We conducted a retrospective chart review of patients who presented with esophageal foreign bodies requiring endoscopic removal at a tertiary care children's hospital over a nine-year period (2010-2018). Individuals experiencing EFI were identified, and clinical information and subspecialty follow-up data were recorded for these individuals. Subspecialty follow-up was defined as an outpatient clinic visit with pediatric gastroenterology or pediatric surgery within 1 year of EFI event. Clinical characteristics were compared between groups using Fisher exact test for categorical variables, t-test for continuous variables with parametric distribution, and Mann-Whitney test for continuous variables with non-parametric distribution. Significance was defined as $p < 0.05$.

RESULTS: We identified 858 patients with esophageal foreign body that underwent endoscopy for foreign body removal between Jan 2010-Dec 2018. Of these, 127 EFI were identified in 123 individuals. These patients were largely male (89/123, 72%) with mean age 12.2 ± 4.6 years (range 1.5-21.1). A slight majority of EFI (59%, 75/127) were managed by pediatric gastroenterology, with the remainder managed by pediatric surgery. Biopsy samples

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were collected in 75% of cases (95/127). Of cases in which biopsies were collected, 76% (72/95) demonstrated >15 eosinophils/hpf, and 61% of individuals with >15 Eos/hpf had follow-up care. Communication of biopsy results was documented in 73% of cases in which biopsies were collected (69/95), and clear recommendations for outpatient follow-up were documented in 74% of all cases (94/127). The overall institutional follow-up rate after EFI was 50% (63/127). Individuals who did receive subspecialty follow-up care were equally likely to have been managed by a pediatric gastroenterologist or surgeon (p=0.10) but were more likely to have history of atopy (p=0.008) or have prior diagnosis of EoE (p=0.04) [Table 1]. Individuals with endoscopic evidence of stricture were more likely to follow up (p=0.005). Collection of esophageal biopsies was not associated with follow-up rate in this study but exhibited trend toward significance (p=0.07). Eosinophil density >15/hpf was associated with increased follow-up (p=0.03). Of note, documented communication of biopsy results and a clear documented recommendation for subspecialty follow-up were each associated with increased follow-up rate (60% vs 83%, p= 0.02; 59% vs 90%, p<0.0001).

CONCLUSIONS: Subspecialty follow-up rates following EFI are suboptimal given the proportion of patients with EFI who have a treatable underlying esophageal condition. Communication of biopsy results and clear written recommendations to follow-up are potential areas to target to improve follow-up rates.

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Table 1. Comparison of Cohorts who Did and Did Not Receive Outpatient Subspecialty Follow-Up Care after Esophageal Food Impaction.

	No Follow-Up (n =64)	Follow-Up (n = 63)	P
Male, n (%)	46 (72%)	47 (75%)	0.84
Age at time of EFI event, years, mean ± SD	12.44 ± 4.52	11.97 ± 4.69	0.57†
History of previous esophageal stricture, n (%)	7 (11%)	9 (14%)	0.60
History of previously-diagnosed EoE, n (%)	3 (5%)	10 (16%)	0.04
History of atopy, n (%)	13 (20%)	31 (49%)	0.008
Subspecialty Service, n (%)			
Pediatric Gastroenterology	31 (48%)	42 (67%)	0.10
Pediatric Surgery	33 (52%)	21 (33%)	
Time of Foreign Body Removal, n (%)			
06:00-18:00	18 (28%)	28 (44%)	0.26
18:00-06:00	46 (72%)	35 (56%)	
Presence of Gross Endoscopic Abnormalities, n (%)			
Edema	21 (33%)	18 (29%)	0.70
Rings	18 (28%)	17 (27%)	1.00
Exudate	10 (16%)	12 (19%)	0.65
Furrows	18 (28%)	24 (38%)	0.26
Stricture	7 (11%)	17 (27%)	0.02
Esophageal biopsies obtained, n (%)	43 (67%)	52 (83%)	0.07
Eosinophils >15/hpf, n (%)	28/43 (65%)	44/52 (85%)	0.03
Peak Eosinophil count, median (IQR)	25 (8-55)	32 (21-52)	0.21‡
Documented communication of biopsy results to family, n (%)	26/43 (60%)	43/52 (83%)	0.02
Documented clear recommendation for outpatient subspecialty follow-up, n (%)	37 (59%)	57 (90%)	<0.0001

P-value by Fisher Exact test unless otherwise specified. † Independent T-test. ‡ Mann-Whitney test.

FUNCTIONAL/MOTILITY

288 ***ERYTHROPOIEITIN ACCELERATES FUNCTIONAL RECOVERY IN POSTOPERATIVE ILEUS IN MICE.*** *Walaa Elfar[1], Anagha Gurjar[2,3], M.A. Hassan Talukder[2,3], Mark Noble[5], Carlo Di Lorenzo[4], John Elfar[2,3]*
[1]Pediatrics, The Pennsylvania State University, Milton S. Hershey Medical Center, Hershey, PA; [2]Orthopaedics and Rehabilitation, The Pennsylvania State University, College of Medicine, Hershey, PA; [3]Center for Orthopaedic Research and Translational Science, The Pennsylvania State University, Milton S. Hershey Medical Center, Hershey, PA; [4]Pediatrics, Nationwide Children's Hospital, Columbus, OH; [5]Biomedical Genetics, Universtiy of Rochester, Rochester, NY

Background: Erythropoietin (EPO) is a multifunctional tissue-protective cytokine with potent anti-inflammatory and anti-oxidative properties. Postopertaive ileus (POI) is a major clinical problem after surgical trauma and it is associated with increased intestinal inflammation and oxidative stress. While both EPO and EPO receptors (EPOR) are widely expressed in the gut, the role of EPO in POI is largely unknown.

Methods: Mice were subjected to intestinal manipulation to induce standard POI and intestinal transit time was

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determined at 24-hour post-injury with or without EPO treatment (5000 units/kg, once, IP, immediately after intestinal trauma). Intestinal samples and serum were harvested for histological, immunohistochemical, and ELISA analysis.

Results: Systemic EPO significantly improved intestinal transit time compared with control (saline) group and it was associated with significantly reduced level of oxidative stress. There was no significant difference in gross histological features or macrophage activity between EPO and saline groups.

Conclusions: These preliminary data provide *in vivo* evidence that EPO treatment accelerates functional recovery in a mouse model of POI and it is predominantly mediated by increased anti-oxidative activity of EPO.

289 ***GASTROINTESTINAL (GI) SYMPTOMS IN CHILDREN DURING GASTRIC EMPTYING SCINTIGRAPHY TESTING (GES).*** *Liz Febo-Rodriguez[1,2], Bruno Chumpitazi[1,2], Andrew Sher[3], Robert Shulman[1,2]*
[1]Pediatric Gastroenterology, Baylor College of Medicine, Houston, TX; [2]United States Department of Agriculture, Children's Nutrition Research Center, Agriculture Research Services, Houston, TX; [3]Body and Nuclear Radiology, Texas Children's Hospital, Houston, TX

Background: In both adults and children there is poor correlation between GI symptom report based on recall and gastric emptying rate measured by GES. However, whether symptoms engendered by the meal captured prospectively during GES correlate with gastric emptying rate in children has, to our knowledge, not been explored.

Aims: To determine the feasibility of capturing GI symptoms during a GES study and if so, ascertain their severity and time course of appearance in children undergoing GES. We hypothesized that: 1) Capturing prospective symptoms will be feasible; 2) The severity and time course of appearance of GI symptoms during GES will differ between those children with gastroparesis (**GP**; gastric retention >10% at 4 hours, PMID: 18028513) vs normal gastric emptying (**NGE**); and 3) Symptoms will correlate with the percent gastric retention.

Methods: In an ongoing prospective study, children between the ages of 5-18 years of age undergoing a 4-hour solid (Tougas) meal GES study record their GI symptoms at baseline (prior to meal ingestion), during meal ingestion, and at 15, 30, 45, 60, 120, 180, and 240 min. following the meal. The measured symptoms include abdominal pain, chest burning, nausea, bloating, fullness, and hunger. Children rate the severity of their symptoms on a 0-100 visual analogue scale. Symptoms are quantified by determining area under the curve (**AUC**) of symptom rating vs time, maximum symptom rating, and time to maximum symptom rating. Total symptom score is defined as the sum of the scores excluding the rating for hunger.

Results: Of the 80 children enrolled thus far, complete data were obtained in 71 children (89%). Mean age was 13.1 ± 2.8 years with 66% female. Thirty-four children (48%) had GP. Using adult criteria, mild and moderate delay were defined as 11-20% and 21-35% percent retention at 4 hours, respectively (PMID: 25667018). No children had a gastric retention value > 35%. Both mild and moderate groups showed an inverse correlation between emptying delay and reported GI symptoms (Figure 1); however, the change in symptoms over time was greater for the moderate group (difference in slopes $P<0.001$; Figure 1). Among patients with GP, the regression model showed a relationship between pain and nausea ($R2=0.8$), fullness and bloating ($R2=0.7$), bloating and nausea ($R2=0.7$), fullness and pain ($R2=0.7$). Among patients with no delay, the regression model showed a relationship only between bloating and nausea ($R2 = 0.8$). In terms of overall symptoms, both groups had symptoms at baseline (before eating the meal) and throughout the GES. Bloating and nausea appeared to increase immediately following the meal in GP (Figure 2a) but decline in NGE (Figure 2b). In both groups there was little change in pain score over time.

Conclusions: These preliminary data demonstrate that it is feasible to capture GI symptoms prospectively during a pediatric GES study. These early results suggest that the initial time course of bloating and nausea symptoms may differ between children with GP and those with no delay in emptying. In contrast to retrospective symptom reporting during GES, there seems to be a correlation between degree of emptying delay and severity of GI symptoms.

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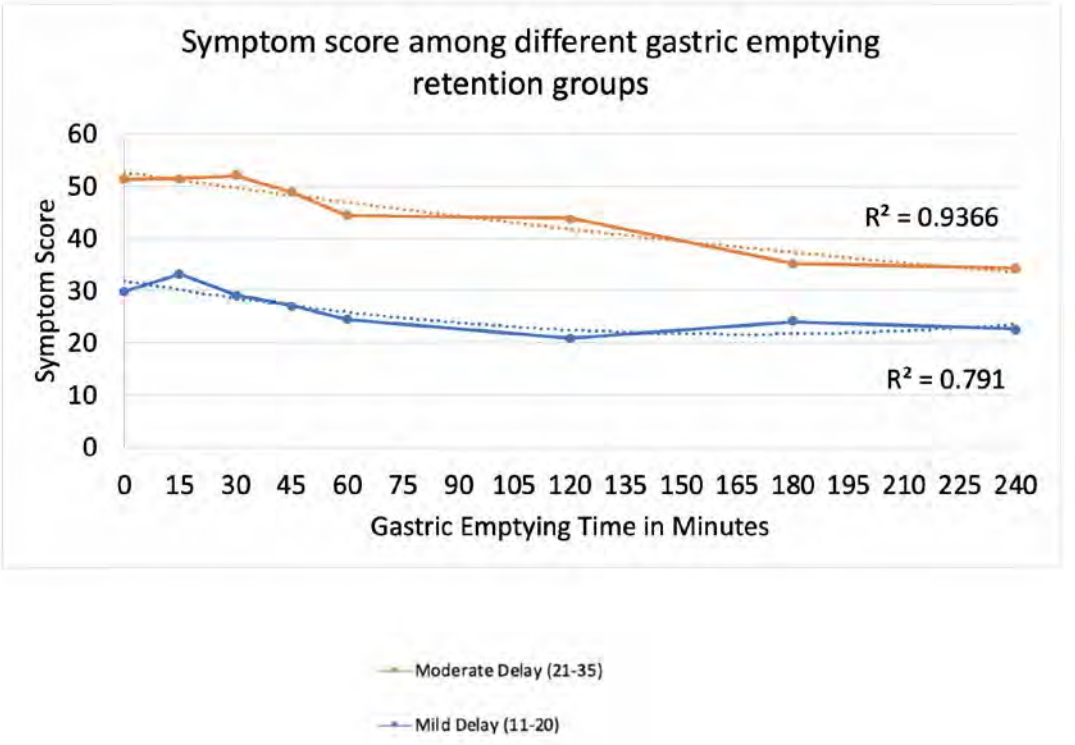


FIGURE 1: Mild and moderate delay defined in adults as 11-20% and 21-35% percent retention at 4 hours, respectively (PMID: 25667018). This data shows there seems to be a correlation between emptying delay and reported GI symptoms.

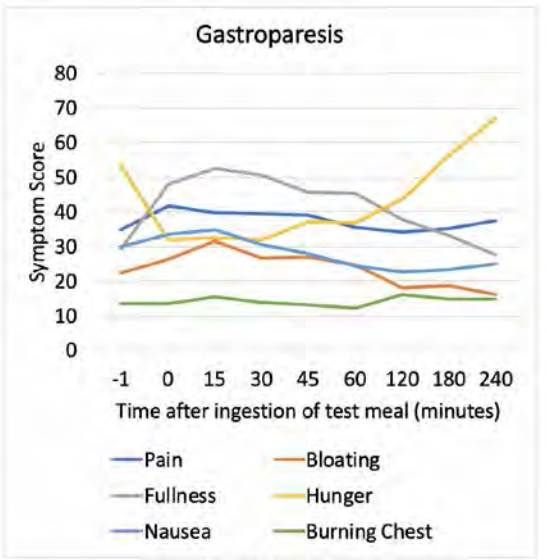


Figure 2a

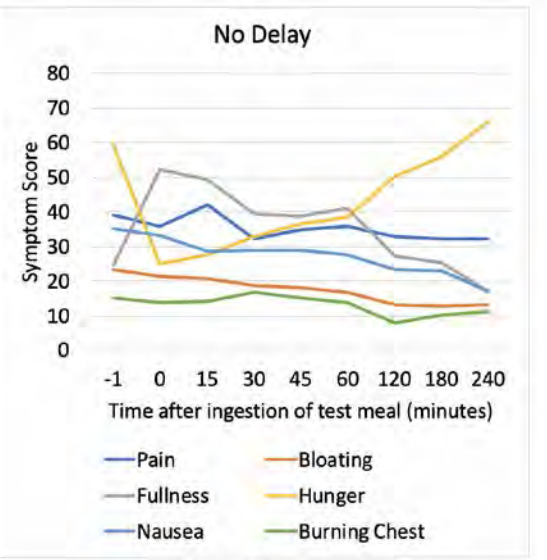


Figure 2b

FIGURE 2: Symptom ratings of children (n=34) diagnosed with GP (2a) and symptom ratings of children (n=37) with normal emptying (2b).

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290 ***INFLUENCE OF FAMILY HISTORY ON CHILDREN WITH IRRITABLE BOWEL SYNDROME.***

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BACKGROUND AND OBJECTIVES: Irritable bowel syndrome (IBS) is a functional gastrointestinal disorder characterized by chronic abdominal pain and altered bowel habits. There are strong family aggregations in patients with IBS, however, the influence of family history on children with IBS is lacking. Our objective was to compare the clinical profile and management differences between children with a family history of IBS (FH-IBS) versus children without.

METHODS: A retrospective chart review was conducted on children from 0-18 years of age who was diagnosed with IBS between 2009 to 2018 at a single pediatric tertiary care center. Subjects were excluded from the study if family history was not documented or documented as unknown. Data was collected including FH-IBS, sex, race, IBS subtype, initial age of presentation, age of diagnosis, dietary modification, symptomatic pharmacologic therapy, psychologic background, and psychologic interventions. Clinical features and management were compared between patients with FH-IBS versus patients without.

RESULTS: There were 302 patients included in the study, 87 patients (29%) had FH-IBS and 215 patients (71%) did not. The mean age of initial presentation was earlier in patients with FH-IBS compare to patients without (11.8±3.4 vs 12.7±3.4, P= 0.032). The age of diagnosis of IBS was also earlier in patients with FH-IBS compare to patients without (12.7±3.3 vs 13.5±3.1, P= 0.047). There were no significant differences between most types of management between the two groups. These included dietary changes, herbal supplements, antispasmodics, laxatives, antidiarrheal agents, and cyproheptadine. Additionally, no significant difference was found between the number of these medications needed on a daily or on an as-needed basis. Patients with FH-IBS had a significantly higher rate of anxiety and/or mood disorder diagnosis (36.8% vs. 21.9%, P=0.008) (Table 1), and had a significantly higher rate of requiring counseling services (43.7% vs. 22.8%, P<0.001) (Table 2). The use of antidepressant and/or mood stabilizer was also significantly more frequent in patients with FH-IBS versus without (32.2% vs. 19.5%, P=0.018).

CONCLUSIONS: Most types of management for IBS do not differ between patients who have a family history of IBS or not. However, patients with a family history are presented and diagnosed at an earlier age. This is more likely due to the parents' familiarity with the disorder and the understanding of key signs and symptoms related to IBS. Patients, however, with a family history of IBS are more likely to be diagnosed with anxiety and/or mood disorder. They are also more likely to require counseling services and require antidepressant and/or mood stabilizer medications. Based on this information, we conclude that obtaining a family history of IBS is important and may influence medical decision making, as patients with a family history may benefit from earlier mental health intervention.

Table 1

		Diagnosed with Anxiety and/or Mood Disorder		P value
		Yes	No	
FH-IBS	Yes, n (%)	32 (36.8%)	55 (63.2%)	0.008
	No, n (%)	47 (21.9%)	168 (78.1%)	

Table 1: Numbers and percentage of patients with FH-IBS who had anxiety and/or mood disorder diagnosis vs. patients without FH-IBS

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Table 2

		Requiring Counseling Services		P value
		Yes	No	
FH-IBS	Yes, n (%)	38 (43.7%)	49 (56.3%)	<0.001
	No, n (%)	49 (22.8%)	166 (77.2%)	

Table 2: Numbers and percentage of patients with FH-IBS who required counseling services vs. patients without FH-IBS

291 ***COMORBIDITIES AND MEDICATIONS ASSOCIATED WITH ALTERED COLONIC MOTILITY IN CHILDREN WITH CHALLENGING CONSTIPATION.*** *Roberto Gomez Suarez[1,2], Kimberley Taba-Hirata[2], Julia Nedimyer[2], Hadeel Al' Atrash[1,2], Pablo Palomo[1,2], Franciosi James[1,2], Lloyd Werk[3], Jobajer Hossain[4], Shanon Henrry[5], Amanda D'Ambra[1]. [1]Pediatric Gastroenterology Hepatology and Nutrition, Nemours Children's Hospital, Orlando , FL; [2]University of Central Florida, College of Medicine, Orlando, FL; [3]Pediatrics, Nemours Children's Hospital, Orlando, FL; [4]Research, Alfred Dupont Children's Hospital, Whilmington, DE; [5]Biomedical Research, Nemours Children's Hospital, Orlando, FL*

Background: Constipation is a significant problem in the pediatric population, affecting almost 15 percent of patients. There is a well-known correlation among challenging constipation and certain medical comorbidities , such as ADHD, developmental delay, and with certain medications. Additionally, the impact of such comorbidities and medications on colonic motility has not yet been clarified. The aim of this study is to assess the association between colonic manometry, and comorbidities in children with challenging constipation.

Hypothesis: certain comorbidities specially obesity and the cocommitant use of certain medications affect the motility of the colon playing a role in intractable constipation in children.

Materials and methods: This study retrospectively analyzes clinical data and manometry traces of patients who underwent colonic manometry between October 2013 and December 2018 at the Neurogastroenterology and Motility Center of Nemours Children's Hospital. All patients had a standard colonic manometry received Bisacodyl 0.2 mg/kg .

Results: Data from 107 patients (47 female, 60 male) was retrospectively analyzed, mean age (± SD) 9.95 ± 4.2 years. Eighty-seven patients had associated comorbidities with the following distribution: obesity in 33%, ADHD in 26%, autistic spectrum disorder in 24%, depression and/or anxiety in 30%, and developmental delay in 17.8%. In 23 patients, colonic manometry was abnormal (12 total dysmotility, 11 distal dysmotility). Obesity and the use of of alpha 2 agonists, antipsychotics, and alpha 1 adrenergic antagonists were significantly associated with decreased amplitude and duration of contractions. (p=0.05), (p=0.03),(p=0.06),(p=0.02). There was an increased risk of having an abnormal colonic manometry (distal or total dysmotility) associated with the following comorbidities: developmental delay Odds Radio OR1.6, obesity OR1.1 and the following medications: stimulants OR1.4, anticonvulsants benzodiazepines OR1.25, alpha-2 adrenergic antagonists OR1.95, beta adrenergic antagonist OR1.2. There was a non-significant association between autism, depression, anxiety, ADHD and abnormal colonic motility.

Conclusion: Obesity and the use of certain medications adversely affected colonic manometry parameters. Obesity and certain medications may increase the risk of an abnormal colonic manometry in patients with intractable constipation.

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292 ***COMORBIDITIES ASSOCIATED WITH ALTERED ANORECTAL MANOMETRY IN CHILDREN WITH CHALLENGING CONSTIPATION.*** *Roberto Gomez Suarez[1,2], Kimberley Taba-Hirata[2], Julia Nedimyer[2], Hadeel Al' Atrash[1,2], Pablo Palomo[1,2], Julie Denham[1,2], Lloyd Werk[1,2], Shannon Henry[1], Amanda D'Ambra[1], Carmen Romero[3]. [1]Pediatric Gastroenterology Hepatology and Nutrition, Nemours Children's Hospital, Orlando , FL; [2]University of Central Florida College of Medicine, Orlando, FL; [3]University of Central Florida, Health Sciences, Orlando, FL*

Background: Constipation is a significant problem in the pediatric population, affecting almost 15 percent of patients. There is a known correlation among constipation and medical comorbidities, such as obesity, ADHD, developmental delay, autism .The impact of such comorbidities on the anorectal physiology has not yet been clarified. The aim of this study is to assess the association between anorectal manometry parameters, and different comorbidities in children with challenging constipation.

Hypothesis: Psychosocial factors and comorbidities affect the motility of the ano-rectum playing a role in intractable constipation in children.

Materials and methods: This study retrospectively analyzes clinical data and manometry traces of 100 boys and 76 girls who underwent anorectal manometry between October 2013 and December 2018 at the Neurogastroenterology and Motility Center of Nemours Children's Hospital in Orlando FL
We exclude procedures performed under anesthesia

Results: Patients mean age was10.7 ± 4.3 years. Mean BMI was 19.6 ± 5.5.kg/sm. .Comorbidities included obesity 58(33%); ADHD 41 (18.4%), developmental delay 28 (12.6%), anxiety 23 (13.4%), autism 21 (11.5%), depression 13 (5.9%). Mean sphincter length was 4±1.1 cm, resting pressure was 53.5± 32.2mmHg, squeezing pressure was 125.4± 57.2 mm Hg. Recto anal inhibitory reflex RAIR was present in 164(93.2%);ano-rectal sensitivity was abnormal in 53(30.1%); anismus was present in 84(47%);balloon expulsion was successful in 15(8%).
Obesity was associated with increased anal anal squeezing pressures (p=0.038), and associated with a higher resting pressure. Developmental delay was associated with decreased anal squeezing pressures (p=0.09). There was no difference in the resting and squeezing pressure comparing gender, presence of ADHD, depression, anxiety, autism. Anorectal sensitivity was decreased in patients with obesity (p=0.08),depression (p=0.03);anxiety(p=0.05) presence of RAIR was affected in obesity (p=0.08), balloon expulsion was affected in depression(p=0.05). No significant differences were found in patients with ADHD, Autism,

Conclusion: Anorectal physiology is affected in patients with challenging constipation and presence of certain comorbidities such as depression obesity and developmental delay

293 ***THE RELATIONSHIP BETWEEN PREMATURITY, METHOD OF DELIVERY, AND FUNCTIONAL GASTROINTESTINAL DISORDERS IN CHILDREN.*** *Carlos Velasco-Benitez[4], Susan Gutierrez[3], Cara Axelrod[1], Miguel Saps[1,2]. [1]Pediatric Gastroenterology, University of Miami, Miami, FL; [2]Pediatric Gastroenterology, Jackson Memorial Hospital, Miami, FL; [3]Pediatrics, University of Miami/Jackson Memorial Hospital, Miami, FL; [4]Pediatrics, Universidad del Valle, Cali, Colombia*

Background: The pathogenesis of functional gastrointestinal disorders (FGIDs) remains unknown. Early life events including method of delivery and length of gestation may be risk factors for FGIDs. Data from studies on the effect of these early life events and the development of FGIDs are scarce and contradictory
Objective: To assess the association between mode of delivery, length of gestation, and development of FGIDs in children. We hypothesized that delivery via Cesarean section and prematurity would be associated with an increased prevalence of FGIDs in children.
Methods: Questionnaires were mailed to families of school-aged children from 3 cities in Colombia. Parents completed information on mode of delivery, demographics, and past medical history. School-children completed the Spanish version of the Questionnaire of Pediatric Gastrointestinal Symptoms Rome IV (QPGS-IV). Categorical data was analyzed using Fisher exact tests. Calculation of OR with 95% CI was performed. Institutional Review Board approval was obtained.
Results: 1497 children/adolescents (535 preadolescents 10-12 years, 962 adolescents 13-18 years) participated. For participants born via Cesarean delivery, there was no significant increase in prevalence of any of the Rome IV FGIDs compared with vaginal delivery. There was a significant association between prematurity and FGIDs for

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those born between 28 and 32 weeks [CI 0.99-3.37] (P=0.03). In this group, functional nausea was the only category of FGID to reach significance [0.16-112.23] (P=0.02). However, statistical significance was lost when gestational ages were grouped together with multivariate analysis.

Conclusions: Our findings provide insufficient evidence to support Cesarean delivery and prematurity as risk factors for the development of FGIDs. Future studies evaluating early life events are warranted to strengthen our understanding on the relationship between method of delivery, prematurity, and FGIDs.

	<26-28 WEEKS GA			28-< 32 WEEKS GA			32 -<34 WEEKS GA			34-36 WEEKS GA			37-41 WEEKS GA		
	OR	CI 95%	p	OR	CI 95%	p	OR	CI 95%	p	OR	CI 95%	p	OR	CI 95%	p
FGIDs	0.85	0.15-3.19	0.81	1.9	0.99-3.37	0.03	3.4	0.04-269.94	0.35	0.9	0.56-1.43	0.67	0.81	0.58-1.14	0.21
FGIDs associated with nausea & vomiting		N/A		2.1	0.52-5.90	0.17		N/A		1.5	0.57-3.47	0.30	0.72	0.36-1.58	0.36
Aerophagia		N/A		5.3	0.11-48.63	0.09		N/A		2.1	0.04-19.39	0.48	0.35	0.05- 3.91	0.21
Functional nausea and vomiting		N/A		2.7	0.29-11.51	0.17		N/A		1.7	0.31-5.90	0.39	0.59	0.20-2.08	0.31
Functional nausea		N/A		8.9	0.16-112.23	0.02		N/A			N/A		0.52	0.04- 27.91	0.58
Functional vomiting		N/A		1.6	0.03-10.27	0.67		N/A		2.2	0.39-7.80	0.22	0.61	0.19-2.58	0.39
Rumination syndrome		N/A		N/A				N/A			N/A			N/A	
Cyclic vomiting syndrome		N/A		1.3	0.02-8.09	0.83		N/A		1.7	0.31-5.90	0.39	0.79	0.25-3.25	0.68
FGIDs associated with abdominal pain		N/A		1.4	0.35-3.87	0.55		N/A		1	0.37-2.22	1.00	0.93	0.50-1.87	0.83
Functional dyspepsia		N/A		2.3	0.42- 7.49	0.18		N/A		1.2	0.31-3.52	0.70	0.8	0.34- 2.18	0.61
Postprandial distress syndrome		N/A		2.5	0.48-8.53	0.12		N/A		1.4	0.35-4.03	0.54	0.7	0.29-1.92	0.41
Epigastric pain syndrome		N/A						N/A			N/A			N/A	
Irritable bowel syndrome (IBS)		N/A		0.9	0.02- 5.88	0.948		N/A		0.8	0.08-3.20	0.75	0.84	0.31-2.87	0.74
IBS with constipation		N/A			N/A			N/A			N/A			N/A	
IBS with diarrhea		N/A			N/A			N/A						N/A	
Mixed IBS		N/A			N/A			N/A		2.2	0.22-10.27	0.31	0.34	0.09-1.60	0.07
IBS unclassified		N/A		2.9	0.06-21.92	0.29		N/A			N/A		1.59	0.21-70.25	0.66
Abdominal migraine		N/A			N/A			N/A			N/A				
Functional abdominal pain not otherwise specified		N/A			N/A			N/A		0.8	0.01-5.55	0.85	2.31	0.34-98.71	0.41
FGIDs associated with defecation	1.68	0.30-6.33	0.41	1.7	0.78-3.45	0.11	6.7	0.08-529.91	0.12	0.7	0.37-1.35	0.32	0.8	0.53-1.24	0.30
Functional constipation	1.68	0.30-6.33	0.41	1.7	0.78-3.45	0.11	6.7	0.08-529.91	0.12	0.7	0.37-1.35	0.32	0.8	0.53-1.24	0.30

Relationship between length of gestation and FGIDs

Type of Delivery	n (%)
Vaginal	1039 (69.4%)
Cesarean	458 (30.6%)
Gestational Age at Delivery (weeks)	
Premature (< 37)	200 (13.4%)
< 28	15 (1.0%)
≥ 28 to 32	55 (3.7%)
≥ 32 to 34	2 (0.1%)
≥ 34 to 36	128 (8.6%)
Full term (≥ 37 to 41)	1272 (85.0%)
Early full term (≥ 37 - 38)	1222 (81.6%)
Late full term (≥ 39 - 42)	50 (3.3%)
Postterm (≥ 42)	25 (1.7%)

Gestational age and mode of delivery of participants

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294 ***VALUE OF DIGITAL RECTAL EXAM IN PREDICTING ANORECTAL FUNCTION.*** *Fatima Jamshed[1], Julie Shotwell[1], Sally Tarbell[1,2], John Fortunato[1,3]. [1]Gastroenterology, Hepatology and Nutrition, Ann and Robert H. Lurie Children's Hospital, Chicago, IL; [2]Psychiatry and Behavioral Sciences, Northwestern Feinberg School of Medicine, Chicago, IL; [3]Pediatrics, Northwestern Feinberg School of Medicine, Chicago, IL*

Objective: Evaluate the relationship between digital rectal examination (DRE) and anorectal manometry (ARM) in children undergoing diagnostic assessment for chronic constipation, stool incontinence and anorectal malformations.

Methods: Retrospective chart review was performed of children aged 5-18 years enrolled in a large urban tertiary pediatric gastroenterology clinic from 2016-2019. Qualitative assessment on DRE of anal tone, ability to push/strain and squeeze, and presence or absence of rectal vault dilatation was compared to ARM findings of resting pressure, push/strain and squeeze pressures, and balloon volume to elicit first sensation.

Results: 208 children, 109 girls (52.4%), 99 boys (47.6%), underwent a DRE and ARM. Mean age =10.75, SD=3.87. Ethnicity: white/non-Hispanic, 160 (77.3%), white/Hispanic 45 (21.7%), other or non-reported 3 (1%). 83.7% of patients were diagnosed with constipation and/or encopresis. Strong tone on digital rectal exam correlated with higher mean resting pressure on ARM (Spearman's rho=.323, p<.001); a dilated rectal vault correlated positively with increased volume first sensation on ARM (Spearman's rho=.472, p<.001) (Figure 1). A significant association was observed between squeeze on the DRE and the ARM (Spearman's rho=.467, p <.001). There was a significant association between push/strain to defecate on DRE and push/strain on ARM (Spearman's rho=.338, p<.001).

Conclusions: ARM is the gold standard for assessing anorectal sensorimotor function yet the DRE is a robust and valid marker in predicting anorectal function. DRE provides information regarding physical findings and function, comparable to ARM emphasizing the value of physical exam in the evaluation of children with elimination disorders.

295 ***EVOLUTION OF FUNCTIONAL CONSTIPATION IN ECUADORIAN SCHOOLS AND ADOLESCENTS ACCORDING TO THE CRITERIA OF ROME IV VERSUS ROME III.*** *EDGAR JATIVA[1,2], Zahira Jativa[3], Byron Guevara[4], Daniel Narvaez[5], Carlos Velasco[6]. [1]Dirección Desarrollo Académico, Universidad Central del Ecuador, Quito, Pichincha, Ecuador; [2]Doctorado en Ciencias Medicas, Universidad de La Frontera, Quito, Pichincha, Ecuador; [3]Clinica Pediatrica, Hospital Pediatrico Baca Ortiz, Quito, Pichincha, Ecuador; [4]Dirección Desarrollo Académico, Universidad Central del Ecuador, Quito, Pichincha, Ecuador; [5]Postgrado de Gastroenterologia y Endoscopia, Pontificia Universidad Católica del Ecuador, Quito, Pichincha, Ecuador; [6]Pediatria, Universidad del Valle Cali Colombia, Cali, Del Valle, Colombia*

Introduction: The prevalence of DGFs in children older than 8 years old according to the Rome III Criteria in Ecuador is 22.8%, being the main cause functional constipation (EF).
Objective: To determine the prevalence of PE in Ecuadorian schoolchildren and adolescents according to the Rome IV Criteria and compare it with the prevalence previously described according to the Rome III Criteria.
Material and methods: Descriptive observational study of prevalence type in Ecuadorian children from a public school and a private school who underwent the Questionnaire for Pediatric Digestive Symptoms Rome IV (QPGS-IV) in Spanish to identify EF. the children were matched by sex, age, and socioeconomic status. The statistical analysis included univariate analysis by means of the central tendency measures by means of Fischer's exact test and chi-square, and bivariate analysis by calculating the ORs with their respective 95% CI, with p <0 being significant, 05
Results: 951 children of 11/12/8 years old and 60.7% of the male gender were analyzed. The prevalence to present EF was 14.4%. There were no significant differences when comparing this prevalence with that previously described according to the Rome III Criteria (11.8% p = 0.108).
Conclusion: The prevalence for PE according to the Rome IV Criteria in school and adolescents of public and private schools of Quito, Ecuador does not present variations in relation to that previously described by the Rome III Criteria.

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296 ***INTRA-ANAL BOTULINUM TOXIN INJECTION AND DILATION: SHORT TERM OUTCOMES FOR CHILDREN AND ADOLESCENTS WITH CONSTIPATION.*** *Sarah Kemme[1], Maneesh Chidambaram[2], Khalil El-Chammas[2], Lin Fei[2], Ajay Kaul[2], Manav Mathur[2], Azadavir Singh[2], Qin Sun[2], Neha Santucci[2]. [1]Digestive Health Institute, Children's Hospital Colorado, Denver, CO; [2]Gastroenterology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

BACKGROUND: Constipation is a common problem, accounting for 3-10% of visits to general pediatric clinics and up to 25% of referrals to pediatric gastroenterologists worldwide. Approximately 95% of childhood constipation is functional in nature due to painful stools and stool withholding behavior, making functional constipation (FC) the most prevalent functional gastrointestinal disorder in toddlers and children. Current treatment of FC includes education, disimpaction of rectal fecal mass, and maintenance of soft stools with medications, and is successful in 50-60% of children after 1 year. Botulinum toxin A, a neurotoxin that inhibits the release of acetylcholine into the synaptic cleft leading to localized reduction in muscle contractility, has been studied for anal fissures in children and adults, but there is little pediatric data for use in functional constipation. At CCHMC, we use intra-anal botulinum toxin injection of 25 units each in 4 quadrants of the anal sphincter followed by manual dilation, and have anecdotally seen success in patients with chronic constipation.

AIM: The aim of this study was to retrospectively assess short term response rates to intra-anal botulinum toxin injection and dilation in comparison with a control group who did not get botulinum injections and treated as standard of care. We hypothesized that this intervention would lead to symptomatic improvement in children and adolescents with constipation.

METHODS: We reviewed the CCHMC EMR database to gather demographic data, diagnoses, contrast enema, anorectal manometry (ARM), and colonic manometry (CM) results, and post procedure follow up (within 6 months) in patients who have undergone intra-anal botulinum toxin injection and dilation. These patients were treated with standard of care therapy in addition to botulinum injection and dilation. We included patients with clinical diagnosis of constipation (ICD 10 code of K 59.00) and ICD 10 codes of 46505 (anal botulinum injection) and 45905 (anal dilation). Control group were patients who had constipation, did not get anal botulinum injection and dilation, and were treated as standard of care. Results of contrast enema, anorectal manometry, and colonic manometry were analyzed if available. Complete symptomatic response to botulinum toxin injection and dilation was identified as having >3 bowel movements into the toilet and no episodes of fecal incontinence per week. If improvement was noted but without specifying number of bowel movements or episodes of fecal incontinence in a week, this was included as a partial response. In order to eliminate as much confounding effect as possible, we applied propensity score matching method to pair botulinum toxin injection and dilation treated patients with non-treated patients. Given limited information, we were able to match based on these four factors: age group, gender, fecal incontinence, and behavioral issues.

RESULTS: 175 patients received standard of care therapy alone and 93 underwent intra-anal botulinum toxin injection and dilation. After a 10% propensity caliper matching, we included 78 patients in each group. Patients who underwent botulinum toxin injection and dilation had more rates of dilated rectum and sigmoid colon on water soluble contrast enema if done (21/66, 31.8%) than those who received standard of care therapy alone (3/29, 10.3%; p=0.039). Those who underwent botulinum toxin injection and dilation had a higher partial response rate to injection (33/78, 42.3%) but less rates of complete response (20/78, 25.6%) than those who received standard of care therapy alone (29/78, 37.2% and 34/78, 43.6% respectively, p=0.041). We did not find any differences between the standard of care therapy and intra-anal botulinum toxin injection and dilation group in regards to baseline external anal sphincter pressures on anorectal manometry (ARM), dyssynergia presence on ARM, push dynamics on ARM, relaxation during push on ARM, and normal or abnormal colonic manometry.

CONCLUSION: Combined intra-anal botulinum injection and dilation in addition to standard of care therapy were associated with some improvement in symptoms in many patients in this small cohort but were comparable to standard of care therapy alone. Interestingly, standard of care therapy was more likely to induce complete response in patients than botulinum toxin injection and dilation in addition to standard of care therapy. This may be due in part to the fact that those undergoing botulinum toxin injection and dilation had more severe constipation and higher rates of rectosigmoid dilation. A limitation of this study is that the patients were not matched based on severity of disease, which should be a consideration going forward. Another limitation is recall bias during follow up visits and inconsistent documentation during chart review. Prospective clinical trials are also required to assess efficacy of these treatments in children and adolescents with constipation.

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297 ***CARDIAC AUTONOMIC REGULATION AND JOINT HYPERMOBILITY IN ADOLESCENTS WITH FUNCTIONAL ABDOMINAL PAIN DISORDERS.*** *Jacek Kolacz[2], Katja Kovacic[1], Gregory Lewis[2], Stephen Porges[2]. [1]Department of Pediatrics, Medical College of Wisconsin, Milwaukee, WI; [2]Kinsey Institute, Indiana University, Bloomington, IN*

Background: Benign joint hypermobility syndrome is manifest in musculoskeletal symptoms and associated with altered autonomic nervous system function and gastrointestinal (GI) symptoms. Multiple studies report a high prevalence of joint hypermobility in adolescents with functional GI disorders. Understanding the autonomic mechanisms that link these conditions and optimizing the autonomic assessment methodology can inform clinical interventions. Our primary aim was to examine the relation between joint hypermobility and autonomic activity in adolescents with functional abdominal pain disorders (FAPDs). Autonomic function was assessed by a brief, 9-minute supine-seated-standing posture challenge. Our secondary aim was to identify optimal joint hypermobility cut off scores that best index autonomic regulation in this population.

Methods: Data were drawn from a prospective sample of 115 adolescents 11-18 years old seen in a tertiary care pediatric GI clinic and who met at least one Rome III criteria for a FAPD. Subjects were assessed for joint hypermobility at enrollment by Beighton scoring performed by one gastroenterologist. This measures hypermobility in 5 different joints with a score range 0-9. ECG recording was conducted during 3-minute supine, sitting, and standing posture shifts. Heart period (HP) is the average length of time between heart beats, measured in milliseconds, and provides a composite measure of neural and neuro-chemical influences on the heart. Respiratory sinus arrhythmia (RSA), an established index of cardiac vagal regulation, was measured using the Porges-Bohrer (1990) method. Vagal efficiency, the efficiency of the vagal brake in regulating the heart during posture shift, was calculated as the slope of the regression line between paired 10-second epoch values of RSA and heart period across the three posture segments of the protocol (as per Porges et al., 2018). Mixed effects models were used to assess the effect of Beighton score on RSA and HP during each posture. A linear regression was used to model the prediction of Beighton score on vagal efficiency. Beighton cut off scores were then sequentially compared to assess the optimal cut off that coincides with autonomic activity, based on variance explained (R^2).

Results: ECG-derived variables were collected for 90 subjects (Mean age = 15.21, female = 88%). 53.3% of the sample had a Beighton score of 4 or higher (a traditional cut off). Subjects with higher Beighton scores had lower RSA and shorter HP during supine position as well as lower vagal efficiency across all postures (left Figure). A Beighton cut off of 4 was found to optimally distinguish subjects based on the autonomic activity, with the best physiological marker being vagal efficiency assessed across all postures (right Figure).

Conclusions: Our results reveal a high rate of joint hypermobility among adolescents with FAPDs. In this sample, joint hypermobility was related to decreased vagal efficiency, indicating suboptimal autonomic regulation compared to those without joint hypermobility. Vagal efficiency over the course of a supine-seated-standing posture challenge provided the best index of joint hypermobility, compared to heart period and respiratory sinus arrhythmia within any single posture. A Beighton score cut off of 4 had the best convergence with vagal efficiency score, providing support for this commonly used criteria. Autonomic disturbance may be important factor in comorbidities related to gastrointestinal dysfunction and mental health (e.g., anxiety disorders). Autonomic monitoring of vagal efficiency during posture shifts is recommended for assessing comorbidities in individuals with GI disorders and may inform treatment opportunities.

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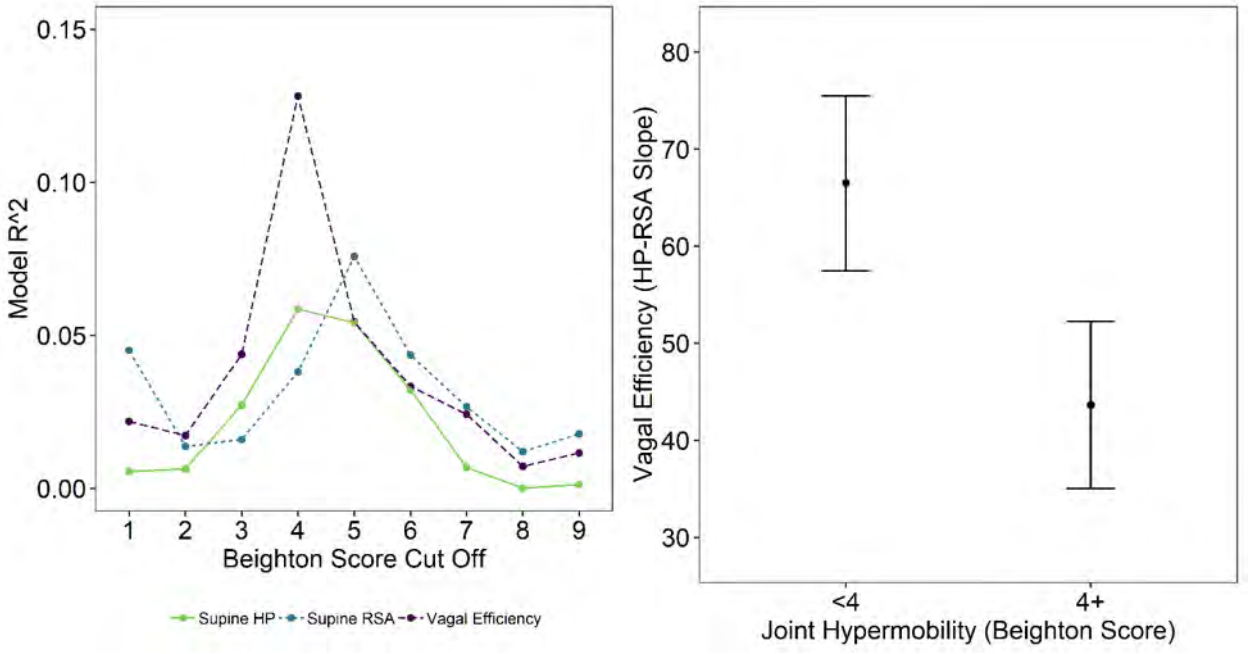


Figure 1. Left: Comparisons of models to identify best Beighton cut off score to index ECG-derived physiology variables. Seated and standing HP and RSA variables performed poorly (all R^2 < .04; not shown). Regression models with binary Beighton scores run sequentially and R^2 values (explained variance) compared. A cut off score of 4 generated the most predictive model for vagal efficiency (VE). Right: Predicted values and 95% confidence intervals from model predicting VE across all postures as a function of Beighton score of 4 (optimal model). B = -22.86, SE = 6.36, p = .0005, R^2 = .13. Predicted mean VE in low Beighton group = 66.48, high Beighton group = 43.61.

298 ***FECAL EXCRETION OF REDUCING SUBSTANCES IN HEALTHY INFANTS ACCORDING TO THE TYPE OF FEEDING.*** *Laura Flores-Fong*[2], *Alfredo Larrosa*[1]. [1]*Instituto de Nutrición Humana*, *Universidad de Guadalajara*, *Guadalajara*, *Jalisco*, *Mexico*; [2]*Pediatric Gastroenterology*, *Hospital Civil de Guadalajara Dr. Juan I. Menchaca*, *Guadalajara*, *Jalisco*, *Mexico*

Objective: To compare the excretion of reducing substances (RS) in the stools of healthy infants less than 10 weeks of age fed on exclusive breastfeeding (EBF) or with lactose containing formula (LCF).

Material end methods: Eighty-five healthy infants less than 10 weeks of age fed with EBF or on LCF were studied in a four-week period. Patients were recruited in physiological nurseries from four private hospitals and in the waiting room of two general pediatrician's offices whose reason for consultation was monthly check-up. We included term children, born by normal delivery, with adequate weight for gestational age and clinically healthy. A stool sample was collected in a sterile plastic bag; no maneuvers were performed to obtain the sample. The semi-quantitative determination of reducing substances was carried out with Clinitest ®. Statistics: chi square, OR, 95% CI.

Results: Forty-two infants were EBF and 43 were fed with LCF. The mean age in the overall group was 5.2 ± 2.1 weeks. Reducing substances were identified in 27 breastfed infants (64.3%) and in 13 (30.2%) who were fed with a LCF (p=0.001, OR 4.3, 95% CI 7-10.3).

Conclusions: RS in stools were identified in both groups; the higher frequency in FBF infants could be due to the presence of human milk oligosaccharides. This apparently normal condition in a proportion of normal infants during the first weeks of life, particularly on EBF, should be considered in clinical decision making.

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299 ***INTESTINAL CONSTIPATION, IRRITABLE BOWEL SYNDROME AND RETENTIVE FECAL INCONTINENCE IN A COHORT OF CHILDREN TAKEN CARE FOR COLIC DURING THE FIRST THREE MONTHS OF LIFE.*** *Alfredo Larrosa*. *Instituto de Nutrición Humana*, *Universidad de Guadalajara*, *Guadalajara*, *Jalisco*, *Mexico*

Objective: To describe the frequency of intestinal constipation, irritable bowel syndrome and retentive fecal incontinence in a cohort of children taken care for colic during the first three months of life.
Methods: This is a descriptive study of a cohort of 92 consecutive children who were taken care for colic during 2009 and 2010. Primary care was performed in a pediatric gastroenterology office. In 2018 the clinical files of those who had had subsequent consultations were reviewed; telephone and e-mail search of the rest was carried out. With Rome-III based criteria, diagnoses of constipation, irritable bowel syndrome and retentive incontinence were sought.
Results: The age at the initial evaluation was 6.2 ± 2.1 weeks; 54.3% were girls. The follow-up time was 6.4 ± 2.2 years. Of the 92 patients, 20 could not be located. Of the remaining 72, 49 (68%) had subsequent consultations; 23 were located and interviewed by telephone or e-mail. In 29 cases (40.3%) no functional digestive disorders were identified. In the remaining 43, the diagnoses were functional constipation in 21 (29.4%), irritable bowel syndrome in 19 (25.4%) and retentive fecal incontinence in 3 (4.1%).
Conclusions: Nearly two-thirds of the children who were taken care for early infant colic had functional digestive disorders in the preschool and school-age periods. This may suggest the existence of common associated etiological factors among these 4 entities that may be expressed at different times and circumstances as a broad clinical spectrum.

300 ***INTER-OBSERVER RELIABILITY FOR STOOL CONSISTENCY BETWEEN THE BRISTOL STOOL SCALE AND THE BRUSSELS INFANT AND TODDLER STOOL SCALE (BITSS) WHEN USING ROME IV CRITERIA IN YOUNGER CHILDREN.*** *Alejandro Llanos-Chea*[1], *Carlos Velasco-Benitez*[2], *Miguel Saps*[1]
[1]*Pediatrics*, *University of Miami*, *Miami*, *FL*; [2]*Pediatrics*, *Universidad del Valle*, *Cali*, *Colombia*

Introduction: Adequate diagnosis of functional gastrointestinal disorders (FGIDs) is imperative especially in the pediatric population. One of the criteria for functional constipation in Rome IV criteria is the presence of hard or painful bowel movements. In adults and children, the Rome IV criteria recommend the use of the Bristol stool scale which is widely using among practitioners. The Bristol stool scale uses photographs of different types of stool in order to assess its consistency. There has been poor validation of Bristol scale in older children, and this scale is thought not to be appropriate for evaluation of stool consistency in young children and infants. Recently, the Brussels Infant and Toddler Stool Scale (BITSS) was developed as a visual stool form scale for infants and younger children wearing diapers. The only study to date on BITSS was aimed to assess inter-evaluator agreement. There are no prior studies comparing BITSS with Bristol stool scale. Our main aim was to compare parental assessment for stool consistency using the Rome IV questionnaire against BITSS and Bristol stool scales. In addition, we also correlated parental assessment of stool consistency between BITSS and Bristol stool scales.

Methods: Surveys were provided to parents of participants that attended their well child visit in two cities from Colombia. Questions included demographics, Rome IV validated questionnaire and assessment of participant's stool consistency using pictures for Bristol stool scale and BITSS. Interobserver reliability was measures using the kappa statistic.

Results: 815 children were recruited. Mean age was 17.6 months (range 1 to 48 months). 173 patients (21.2%) fulfilled criteria for FGIDs using the Rome IV questionnaire and 78 children (9.6%) had functional constipation. There was overall slight to fair inter-rater agreement between Rome IV versus Bristol scale and BITSS. Inter-rater reliability between Bristol scale and BITSS was overall fair (k0.28) and moderate when used in infants up to one year of life (k0.42). Stratification of patients by presence/absence of FGIDs or functional constipation did not elicit any significant improvement on kvalues (Table 1).

Conclusion: There is no adequate parental inter-observer reliability between Rome IV and stool consistency assessment with either Bristol stool scale or BITSS. Moreover, BITSS does not have good parental reliability when compared to Bristol stool scale. Stool consistency evaluation remains to be challenging in younger pediatric populations.

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Age\κ values	Rome IV vs BITSS		BITTS vs Bristol		Rome IV vs Bristol	
	FGID(+)	FGID(-)	FGID(+)	FGID(-)	FGID(+)	FGID(-)
0-48 months (n=815)	0.2459		0.2820		0.3223	
	0.1881	0.2600	0.3338	0.2680	0.2885	0.3326
0-12 months (n=366)	0.2918		0.4205		0.3389	
	0.1807	0.3340	0.3561	0.4465	0.1755	0.4044
1-2 years (n=246)	0.1644		0.1344		0.2644	
	0.1130	0.1681	0.1823	0.1240	0.3882	0.2404
2-3 years (n=121)	0.1579		0.1424		0.2448	
	0.1855	0.1498	0.1424	0.1425	0.3712	0.2125
3-4 years (n=82)	0.1354		0.1277		0.1982	
	0.0565	0.1992	0.4872	0.0712	0.2000	0.1832

301 ***A PRELIMINARY INVESTIGATION OF PHYSIOLOGICAL AND PSYCHOLOGICAL RISK FACTORS FOR THE DEVELOPMENT OF MULTIPLE PEDIATRIC CHRONIC PAIN CONDITIONS IN YOUTH WITH ABDOMINAL PAIN OR HEADACHE.*** *Deidre Logan[1,2], Taylor Turisi[1], Beate Beinvogl[3], Samuel Nurko[3], Neil Schechter[1]. [1]Department of Anesthesiology, Critical Care and Pain Medicine, Boston Children's Hospital, Boston, MA; [2]Psychiatry, Boston Children's Hospital, Boston, MA; [3]Division of Gastroenterology, Hepatology, and Nutrition, Boston Children's Hospital, Boston, MA*

Introduction: Many children with pain predominant abdominal pain ultimately develop overlapping pain complaints. Overlapping pain conditions are associated with higher levels of functional disability, co-morbid psychiatric disorders, and healthcare utilization compared to individuals with a singular chronic pain condition. Literature about the development of multiple pain conditions is sparse or limited in scope. Identification of specific risk factors for the development of overlapping pain conditions is of great importance, as it will allow for the development of targeted interventions for those at highest risk.

Objective: This is a preliminary analysis that seeks to cross-sectionally compare physiological and psychological attributes between adolescents with multiple chronic pain conditions and adolescents with a single chronic pain condition to identify potential risk factors for the development of multiple pain conditions.

Methods: Study Sample characteristics: Children ages 11-18 presenting with at least 3 month history of pain predominant abdominal pain (Rome IV [9]) or headaches (ICHD-3 classification). Participants were deemed as having multiple pain conditions if they met criteria for both headache and abdominal pain or had one of these conditions plus widespread musculoskeletal pain. Procedures: Participants completed a battery of self-report questionnaires examining demographic information, anxiety, pain-related catastrophizing and fear, mood, optimism, and stressful life events. After completing self-report questionnaires, participants completed quantitative sensory testing (QST) that assessed mechanical, temperature, and vibration detection/sensation thresholds in addition to mechanical, temperature, and pressure pain thresholds. Analyses: Mann-Whitney U-Tests were performed to non-parametrically examine between-group differences in psychological measures and sensory testing.

Results: Our study includes 22 adolescents (Age – Mean: 16.5, SD = 2.2 | Female = 91.7%) with a single chronic pain condition (SPC) and 12 adolescents (Age – Mean: 15.9, SD = 2.5 | Female = 63.6%) with multiple chronic pain conditions (MPC). .
The table shows the main findings of the study. Participants with multiple pain conditions are characterized by significantly greater levels of avoiding activities due to pain, and pain-related fear. In addition, participants with multiple pain conditions demonstrate lower pain thresholds when exposed to hot temperatures (in degrees Celsius) applied to the anterior forearm, cold temperatures applied to the dorsal foot, and pressure (in Newtons) applied to medial plantar region.

Conclusion: Identifying risk factors for the development of overlapping pain conditions can help promote the importance, and therefore development of targeted interventions for those at highest risk. Preliminary results suggest

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that the phenotype of adolescents with multiple chronic pain conditions may differ for that of adolescents with a singular chronic pain condition. Specifically, lower pain detections thresholds on QST and higher levels of fear or pain and pain-avoidance bear further study as potential risk factors for development of multiple pains. Further planned longitudinal (12-months) follow-up of this sample will provide more insight into these associations.

	Single Pain N=22	Multiple Pain N=12	p
Age	16.2 [14.8 - 16.8]	16.2 [15.9 - 17.9]	0.15
Sex (Female)	14 (63.6%)	11 (91.7%)	N.S.
Headache	7 (31.8%)	8 (66.7%)	N.S.
Abdominal Pain	15 (68.2%)	4 (33.3%)	N.S.
Fear of Pain Questionnaire | Avoidance Subscale	16.0 [13.3 - 22.5]	22.5 [17.0 - 27.0]	0.05
Fear of Pain Questionnaire | Fear Subscale	17.5 [13.5 - 30.5]	29.0 [22.8 - 33.0]	0.04
Mechanical Detection Threshold | Dorsal Foot	4.0 [3.3 - 4.7]	5.3 [4.1 - 6.6]	0.02
Cold Pain Temperature Threshold | Dorsal Foot	17.5 [4.2 - 23.3]	24.4 [16.9 - 27.7]	0.03
Warm Pain Temperature Threshold | Posterior Forearm	41.8 [40.2 - 44.6]	36.1 [35.0 - 39.0]	0.02
Pressure Pain Threshold | Medial Plantar	29.8 [19.1 - 40.2]	16.4 [12.6 - 20.9]	0.02
Median (IQR) or N (%)			

302 ***PROSPECTIVE COMPARISON OF SACRAL NERVE STIMULATION VERSUS ANTEGRADE CONTINENCE ENEMAS FOR CHILDREN WITH SEVERE FUNCTIONAL CONSTIPATION.*** *Lyon Wang[2,1], Desiree Baaleman[3,1], Mana Vriesman[3,1], Devin Halleran[4], Karen Diefenbach[4], Marc Levitt[4], Richard Wood[4], Seth Alpert[5], Marc Benninga[3], Neetu Bali[1,4], Karla Vaz[1,4], Desalegn Yacob[1,4], Carlo Di Lorenzo[1,4], Peter Lu[1,4]*
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Background: Sacral nerve stimulation (SNS) and antegrade continence enemas (ACE) can be helpful for children with severe functional constipation (FC) refractory to conventional treatment, but research comparing the two treatments is limited to our prior retrospective review. Our objective is to prospectively compare outcomes of SNS and ACE for children with severe FC.

Methods: We performed a prospective cohort study. We included children with FC starting either SNS or ACE treatment at our institution. We excluded children with prior surgery for constipation. Participants completed symptom questionnaires at baseline and follow-up visits. Families were contacted by phone to complete the Glasgow Children's Benefit Inventory (GCBI) and a satisfaction questionnaire. Demographic information, medical history, and symptoms at baseline, 6 months, and 12 months were recorded. We compared symptoms and laxative use between baseline and follow up, as well as clinical improvement, complications, and patient benefit between groups.

Results: We included 31 patients treated with SNS (65% female, median age 9 years, range 6-16) and 10 treated with ACE (60% female, median age 10 years, range 5-16). Sex and age did not differ between groups. At baseline, SNS patients were more likely to have ≥3 bowel movements (BMs) per week (p=0.03) and ACE patients were more likely to be using rectal enemas prior to starting ACE (p <0.01). Groups were similar in measures of fecal incontinence (FI), hard stools, pain with defecation, abdominal pain, and laxative use. SNS did not improve BM frequency, but increased the percentage of children with FI <1 time per week from 37% at baseline to 66% at 6 months (p=0.03) and 67% at 12 months (p=0.01). ACE increased the percentage of children with ≥3 BMs per week

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from 40% at baseline to 100% at 6 months (p=0.01) and 12 months (p=0.04), but did not decrease FI. Patients treated with SNS had improvement in hard stools and abdominal pain at 6 and 12 months (all p<0.05), which was not seen with ACE. Patients treated with ACE were able to decrease laxative use at 6 and 12 months (both p<0.05) and enema use at 12 months (p<0.04), while those treated with SNS were not. Over the 12 month follow-up period, SNS patients had fewer major complications requiring surgery (2/31 versus 3/10, p=0.05) and total complications (7/31 versus 7/10, p<0.01) than ACE patients. Both SNS and ACE patients reported similarly positive GCBI scores (SNS: +50, range +19-88; ACE: +31, range +27-44). All patients would recommend their treatment.

Conclusion: In the first prospective comparison of SNS and ACE for children with FC, we found that SNS led to a greater improvement in FI while ACE led to a greater improvement in BM frequency. Our findings suggest that SNS may be better reserved for the child with more regular BMs but continued FI, while ACE should be used for the child with infrequent BMs and FI. Further research is needed to clarify the roles of SNS and ACE in the management of pediatric FC refractory to conventional treatment.

303 ***SACRAL NERVE STIMULATION FOR CHILDREN WITH ANORECTAL MALFORMATION: A PROSPECTIVE COHORT STUDY.*** *Lyon Wang[3,1], Devin Halleran[2], Karen Diefenbach[2], Marc Levitt[2], Richard Wood[2], Seth Alpert[4], Neetu Bali[1,2], Karla Vaz[1,2], Desalegn Yacob[1,2], Carlo Di Lorenzo[1,2], Peter Lu[1,2]*
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Background: Sacral nerve stimulation (SNS) is an emerging treatment option for children with constipation and fecal incontinence (FI) refractory to conventional treatment, but has been primarily studied in children with functional constipation. Research on SNS for children with organic causes of constipation or FI is very limited, but our earlier studies that included children with anorectal malformation (ARM) suggested benefit. Our objective is to prospectively evaluate outcomes of SNS for children with ARM.

Methods: We performed a prospective cohort study. We included children with ARM starting SNS treatment at our institution for constipation and/or FI. Participants completed symptom questionnaires at baseline and at follow-up visits. We recorded demographic information, medical history, and symptoms at baseline, 6 months, 12 months, and 24 months after starting SNS. We compared symptoms and laxative use between baseline and follow up. We recorded complications.

Results: We included 15 patients with ARM who underwent SNS treatment (67% male, median age 14 years, IQR 11-16, range 5-19). ARM subtypes included cloaca (2), imperforate anus without fistula (2), recto-bulbar fistula (2), rectal stenosis (1), recto-bladder neck fistula (1), vestibular fistula (1), and undefined subtype (6). We had follow-up data for 14/15 patients at 6 months, 14/15 at 12 months, and 13/15 at 24 months. At baseline, the majority of our patients had <3 bowel movements (BMs) per week (13/15, 86.7%) and >1 episode of FI per week (11/15, 73.3%). 11 patients were treated with antegrade continence enemas (ACE) with a median of 7 ACE per week and 4 patients were treated only with oral laxatives. Although the percentage of patients who had <3 BMs per week decreased after SNS from 13/15 (86.7%) to 10/14 (71.4%) at 12 months and 9/13 (69.2%) at 24 months, this change was not significant. The percentage who had >1 episode of FI per week also decreased after SNS from 11/15 (73.3%) to 6/14 (42.9%) at 12 months and 6/13 (46.2%) at 24 months, but again this change was not significant. There were no significant changes in hard stools, pain with defecation, abdominal pain, nausea, and vomiting at any time point. Laxative use increased at 12 months (p<0.05) and 24 months (p<0.01) after SNS while ACE use decreased at 12 months (p<0.02) and 24 months (p<0.03). Median ACE per week decreased from 7 to 0 at 12 and 24 months (both p<0.05). Two patients had complications from SNS requiring surgery, both because of wound infection.

Conclusion: In the largest study of children with ARM treated with SNS, we found that BM frequency and FI trended towards improvement over a two-year follow-up period even while ACE use decreased. Although our findings are encouraging, further studies with larger sample sizes are needed to better understand the role of SNS in the management of children with ARM.

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305 ***MISDIAGNOSIS OF CONGENITAL SUCRASE-ISOMALTASE DEFICIENCY IS COMMON IN CLINICAL PRACTICE: EVIDENCE BASED ON DISACCHARIDASES AND CSID GENOTYPING.*** *Chirajyoti Deb*, *Stephani Campion*, *Veronica Derrick*, *Vanessa Ruiz*, *Bassam Abomoelak*, *Angelina Avdella*, *Devendra Mehta*
Translational Research, *Orlando Health*, *Orlando*, *FL*

Background: Congenital sucrase-isomaltase deficiency (CSID) is a rare genetic disorder associated with mutations in the *SI* gene. CSID diagnosis is considered for cases with typical symptoms of carbohydrate malabsorption and low sucrase and normal lactase activities on duodenal biopsies. Recently several studies have shown importance of CSID, including heterozygous cases in IBS in children and adults. We hypothesized that retrospectively available FFPE tissues from pediatric patients with normal histology of duodenal biopsy, and low sucrase activity would enable us to better understand how often this diagnosis is missed in a clinical setting of several groups of Pediatric gastroenterologists sending samples to a single center.

Method: This was an IRB approved retrospective exploratory study using DNA extracted from formalin-fixed paraffin-embedded (FFPE) tissue samples from non-Hispanic white pediatric cases with known clinical CSID symptoms, disaccharidase assay results, and normal histopathology over a 7 year period. The entire coding sequence (48 exons) of the *SI* gene was sequenced for all the samples (n=125) using next-generation sequencing (NGS) to detect the presence of known CSID pathogenic variants (n = 41). Correlation of sucrase activity levels, different CSID related symptoms, and identified variants, and statistical significance analysis were performed. We reevaluated the cases detected with CSID variants based on ROME IV criteria for their FGIDs and assessed the coexisting pattern of lactase deficiency, generalized disaccharidase deficiencies, how clinicians responded to disaccharidase deficiencies and related symptoms, and how the physicians planned diagnosis and treatment.

Results: All FFPE tissue samples were adequate for further analysis. Thirteen different CSID pathogenic variants, of 41 tested, were detected in 36 (av. age: 11.5 yrs.; 18 F/18 M) of the 125 CSID symptomatic cases (av. age: 12.5 yrs.; 63 F/62 M) – 29 as heterozygous, 5 as compound heterozygous, and one each as homozygous, and compound homozygous forms: p.Val577Gly, p.Gly1073Asp, p.Phe1745Cys, p.Pro348Leu, p.Val371Met, p.Ile1378Ser, p.Tyr975His, p.Val1667Leu, p.Glu801Ter, p.Arg1367Gly, p.Gly515Val, p.Ile799Val, and p.Leu914Ile.
Twenty three of 36 cases had lactase deficiency (LD), and 13/36 had pan-disaccharidase deficiency (PDD).
The 36 patients were reevaluated using ROME IV criteria and 12 had IBS (IBS-D 7, IBS-M 2, IBS-C 3), 10 had FAP, 7 had FD, and 7 had NERD. While all had abdominal pain, surprisingly, nausea (60%) was the second commonest symptom, followed by vomiting (31.4%) and diarrhea (30.5%). Overall, 14/36 (39%) did not have classical symptoms associated with carbohydrates at presentation.
In the 26 with follow up data available, CSID was correctly identified in 10 (38.5%) only, and 2 had subsequent diagnosis considered the likely cause (1 Celiac, 1 Crohn's). Of the remaining 16 without CSID diagnosis, 4 were thought to have small bowel microbial overgrowth, 4 management was only directed at lactase deficiency and in the remaining 8 the low disaccharidases were dismissed as laboratory errors. Of the 10 managed for sucrose isomaltase deficiency, Sucraid was started in 7 with universally terrific response, including 2 with FD, and 3 were on low sucrose diet pending initiation of Sucraid.
Interestingly, 12/16 (86%) of those who were not considered to have sucrase isomaltase deficiency had atypical NERD or FD presentations, compared with the 10 managed for CSID, who were predominantly IBS or FAP (7/10). In addition, 11/16 cases missed by practitioners were either with PDD, or LD.

Conclusion: CSID is common in cases with abdominal pain, low sucrase activity and normal histology in duodenal biopsies. In 36 cases confirmed with CSID on mutational analysis, the disaccharidase patterns included common co-occurrence of LD as well as PDD. The symptoms at presentation were non-specific for carbohydrate malabsorption in 39%. Both these factors seem to predict cases dismissed by practitioners as lab error. The response to Sucraid was universally dramatic, including in 2 with FD. This suggests genetic testing is warranted in all cases with low sucrase and normal histology to confirm diagnosis. The two cases later identified as Crohn's and celiac disease suggest potential need to consider CSID in other GI disorders with FGIDs symptoms persisting. Patterns of presentation and disaccharidase deficiency are varied and may remain challenging even with education and training. One other curious finding was the high prevalence of nausea with or without vomiting. Response to therapy in those not yet treated will help relate these to CSID.

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INFLAMMATORY BOWEL DISEASE

307 ***ASSOCIATION AND EPIDEMIOLOGY OF EOSINOPHILIC ESOPHAGITIS IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE USING THE EXPLORYS DATABASE.*** *Omar Alaber[3,1,2], Basma Dahash[1], Apoorva Chandar[3,2], Judy Splawski[1,2], Jonathan Moses[1,2], Amitabh Chak[3,2], Thomas Sferra[1,2]*
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Introduction: Eosinophilic esophagitis (EoE) is becoming more prevalent and is increasingly recognized as being associated with other medical conditions including autoimmune mediated diseases. In our clinical practice we have noted an increase in the number of pediatric patients with inflammatory bowel disease (IBD) who meet the criteria for diagnosis of EoE. Thus, the aim of this study was to assess the association and epidemiology of EoE in patients with inflammatory bowel disease (IBD).

Methods: Data were obtained from the commercial patient database Explorys (IBM, Inc.). This medical administrative database integrates de-identified electronic health records from 26 healthcare systems within the United States and encompasses more than 360 hospitals. A cohort of pediatric and adult patients with EoE and either IBD (Crohn's disease, CD, and ulcerative colitis, UC) were identified using the Systematized Nomenclature of Medicine Clinical Terms (SNOMED) during the period from May 2014 to May 2019. Patient demographics and comorbidities were extracted. Chi-square analysis and odds ratios (with confidence intervals, CI) were used to compare groups.

Results: At the time of data extraction, the database included 36,857,870 patients. Of those, 400,040 (1.08% of the total population) had IBD and 28,670 (0.08%) had EoE. Patients with IBD had a higher prevalence of EoE compared to the general population (0.31% vs. 0.08%, P<0.0001) and had a 4.1 (95% CI 3.9–4.4) times higher odds of having a concomitant diagnosis of EoE compared to the general population. The prevalence of EoE was similar in patients with CD as compared to those with UC (0.35% vs. 0.32%, P=0.33; odds ratio: CD 4.5, CI 4.1–4.8 vs UC 4.2, CI 3.9–4.7). Patients with IBD who had EoE (IBD+EoE) more frequently had a history of dysphagia (46% vs. 8.6%; P<0.0001) and gastroesophageal reflux disease (64.5% vs. 35.4%; P<0.0001) as compared to those IBD patients without EoE. Also, this subset of patients (IBD+EoE) had a higher prevalence of atopic IgE-mediated allergic disorders (37.9% vs. 20.9%; P<0.0001).

Conclusion: EoE is four times more likely to occur in patients with IBD than the general population. The reason for this association is unclear. It is possible that pathologic abnormalities in IBD (e.g. increased intestinal permeability, altered microbiome) or specific therapies confer a risk for EoE. Alternatively, the observed increase in EoE prevalence in IBD might be the result of disease awareness by the managing gastroenterologist. Further exploration into this association is necessary including investigation as to whether there are differences between pediatric and adult patients. Our finding that IBD patients with EoE are more likely to have proximal gastrointestinal tract symptoms and IgE-mediated allergic disorders offer clinical clues as to which IBD patients also might have EoE.

309 ***TEACHING CHILDREN ABOUT THEIR INFLAMMATORY BOWEL DISEASE: A PILOT STUDY.*** *Lara Hart[1,2], Sally Lin[3], Mallory Chavannes[4], Mary Zachos[2], Mary Sherlock[2], Sylviane Forget[1], Ernest Seidman[1]*
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Background: Pediatric inflammatory bowel disease (IBD) is a chronic condition that can be associated with unpredictable symptoms, disease flares and hospitalizations. It can therefore have a significant impact on a child's self-esteem, psychosocial development and quality of life. Self-efficacy focuses on coping with stress and symptoms and understanding one's disease and its management. In other pediatric chronic diseases, group sessions for patient education played a pivotal role in medication compliance, self-management and improved clinical outcomes. While there have been education programs for adolescents and adults, no such program has been created for the younger patients. Therefore, the aims of this initiative is to teach disease-related information and coping skills to 9-12 year old children with newly diagnosed inflammatory bowel disease and determine if it improved knowledge of the disease, self-efficacy and their attitude towards chronic illness.

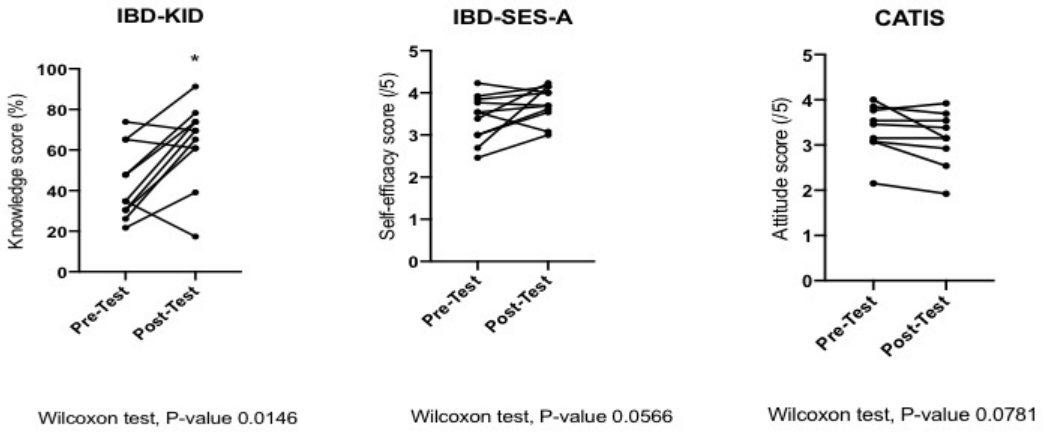
Methods: We developed an educational curriculum based on the current literature about challenges faced by children with IBD. We recruited children 9-12 years old who had been diagnosed with IBD within the last 12 months (regardless of medications they were taking). Participants were asked to attend an educational session that covered

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the curriculum objectives. Prior to attendance they completed 3 validated questionnaires: IBD-KID knowledge assessment (Otley et al), child attitude towards illness scale (CATIS) and IBD self-efficacy scale (SES-A, Izagguire and Keefer). After attending the educational session, they completed the same three questionnaires, as well as a satisfaction questionnaire.

Results: Three small group sessions were held from May 2017-May 2019 and 12 children participated. By attending and participating in the session, knowledge of IBD significantly increased (p=0.015), and self-efficacy improved, but did not reach statistical significance (p=0.057). Attitude towards illness did not improve after the educational session (p=0.078). Participants and parents were very satisfied with the educational program. 90% of parents felt it was very helpful for their child's understanding of the disease, and 100% would recommend it to others. They found the content and length of the session to be appropriate.

Conclusion: Small-group educational sessions for 9-12 year old patients with IBD can increase their knowledge of their disease. Such sessions could also increase IBD-related self-efficacy, but further larger studies are warranted to confirm this finding.



Pre-test to Post-test change in knowledge, self-efficacy and attitude towards illness

310 ***CANNABIS USE OVER 12-MONTH FOLLOW-UP IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Edward Hoffenberg[1], Brittany Murphy[2], Shannon McWilliams[3], Susan Mikulich-Gilbertson[3], Analice Hoffenberg[4,5], Christian Hopfer[3]. [1]Pediatrics-GI, U Colorado Denver, Aurora, CO; [2]Research Institute, Children's Hospital Colorado, Aurora, CO; [3]Psychiatry, U Colorado Denver, Aurora, CO; [4]Family Medicine, UC Denver, Aurora, CO; [5]Public Health and Epidemiology, UC Denver, Aurora, CO*

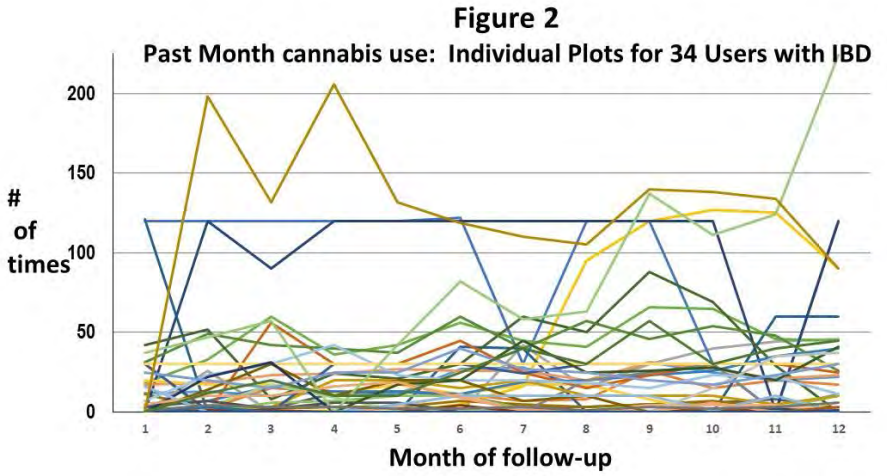
Background: Some adolescent and young adult patients with inflammatory bowel disease (IBD) use cannabis products for medical as well as recreational reasons. The variety of cannabis products and delivery mechanisms continues to increase and cannabis oil enriched in cannabidiol has become popular. Little is known about duration of use of cannabis products over time.

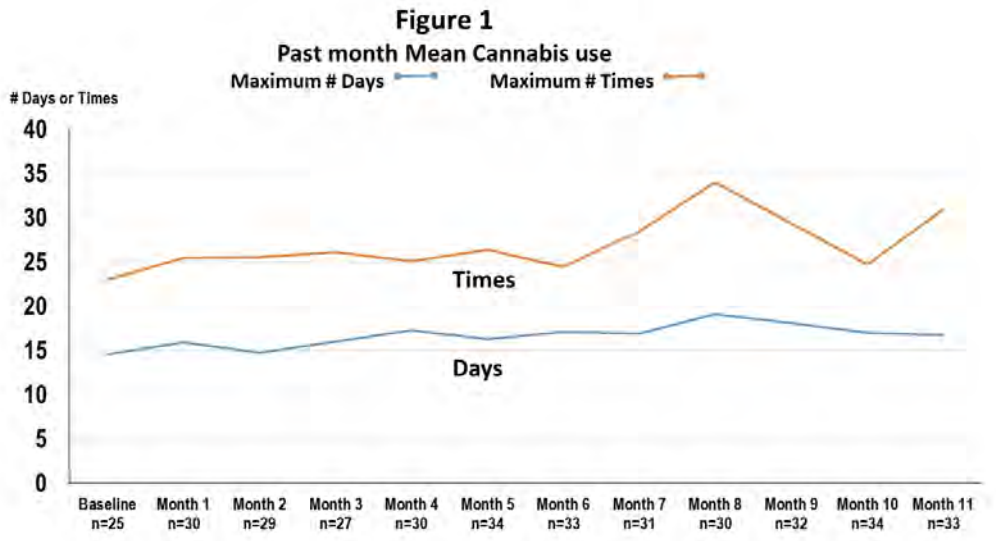
Methods: In a prospective study of patients 13-23yo with IBD followed at our center, subjects completed a baseline substance use survey and then monthly questionnaires on use of cannabis. Data were analyzed for responses at enrollment, 6 months, and 12 months of follow-up.

Results: 34 subjects endorsed cannabis use and completed 12 months of follow-up. Mean, SD age was 16.6±1.7y, 47% were male, 71% were Caucasian, 68% had Crohn's disease, 24% had ulcerative colitis, and 8% had undifferentiated colitis. At study start, 84% had quiescent or mild disease activity. For any month, 25 to 34 subjects used a cannabis product, most commonly smoking, but also vaping, dabbing, edibles, and oils. For all types of cannabis use in the past month, the maximum number of days varied from 14 at baseline to 19 by the 8th month, and maximum number of times varied from 23 at baseline to 34 by the 8th month of follow-up. On average, cannabis was used about 17 days a month and 26 times a month (Figure 1). Average use (days or times) may have increased

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over time due the intensified use by a few. Although most individuals showed stable pattern of times of use (50 times or less per month), there were approximately 5 (15% of 34) who had periods of very intense use (Figure 2). Although more subjects smoked cannabis, those who used cannabis oil used more intensely (more number of days in past month and more times in the past month, more concentrated formulation), than those who smoked cannabis.
Conclusions: Most adolescent and young adult IBD patients who use cannabis products, consume most days and 1-2 times a day. Cannabis oil products are used more intensely than smoked cannabis. Use over one year seems to be stable for most, but intense use by a few was observed. Whether cannabis is used for recreation, self-medication for medical or psychiatric reasons, care providers should be asking about cannabis use and screening for cannabis use disorder.





311 ***ULCERATIVE COLITIS EXPERIENCES AMONG CHILDREN: FINDINGS FROM A QUALITATIVE STUDY WITH CHILDREN AND PARENTS.*** *Jason Randall[2], Aiste Guobyte[3], Theresa Hunter[1], Louise Newton[2], Tara Symonds[2], Laure Delbecque[4]. [1]Eli Lilly and Company, Indianapolis, IN; [2]Clinical Outcomes Solutions, Folkestone, United Kingdom; [3]Clinical Outcomes Solutions, Chicago, IL; [4]Eli Lilly and Company, Brussels, Belgium*
Background: Ulcerative Colitis (UC) is a chronic gastrointestinal disease that often presents during one's most productive years and is characterized by colon inflammation. Key symptoms and impacts in adults are well-known, however, experiences among pediatric populations have not been well documented.
Objective: To explore UC symptoms and impacts in children.
Methods: Children with UC and, caregivers of children with UC, were recruited from US clinical sites. In-depth,

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face-to-face open-ended concept elicitation interviews were undertaken, audio-recorded and transcribed. Participant collages and play-doh models were used during child interviews. Transcripts were analyzed using thematic analysis using NVivo software. Results were used to develop a disease model using participant language.
Results: A total of 32 interviews were conducted, consisting of 12 pediatric and 20 parents/caregiver interviews. Three children aged 5–7 years and their parent, 9 children aged 8–11 years and their parent, and 8 parents of children aged 2–4 years were interviewed. All children and parents reported that stomach/abdominal pain was a key symptom of UC. This was the only symptom discussed by all children and parents. Other symptoms discussed by at least 75% of the children and parents were diarrhea, incomplete evacuation, blood in stool, urgent bowel movement, and frequent bowel movements. The most common impacts included impact on school, physical activities and play, and experiencing fatigue/tiredness. Impact on weight was only discussed by parents, no symptoms were discussed by only parents or children.
A disease model was developed from the participants' reported symptoms, using their language, to reflect the lived experience of UC in children.
Conclusion: The findings from this qualitative study highlighted the burden of UC and indicate that lived experiences of UC reported by children and parents were similar. The disease model highlights the overwhelming nature of the UC patient experience in children.

312 ***IMPACT OF BIOLOGIC TREATMENT OF CROHN'S DISEASE ON HEALTHCARE RESOURCE UTILIZATION AMONG PEDIATRIC CD PATIENTS IN THE UNITED STATES.*** *Theresa Hunter*, *April Naegeli*, *Yan Dong*, *Casey Choong*, *Wallace Crandall. Eli Lilly and Company*, *Indianapolis*, *IN*
OBJECTIVES: This study compared healthcare resource utilization (HCRU) among pediatric Crohn's Disease (CD) patients currently receiving biologics and pediatric CD patients not currently receiving biologics.

METHODS: Pediatric (0-17 years) patients with ≥1 CD diagnosis code (ICD-9: 555.x; ICD-10:K50.x) from January 1, 2017 to December 31, 2017 were included in this retrospective analysis of medical and pharmacy claims data from the IBM Marketscan Commercial and Medicaid Claims database. Patients with an Ulcerative Colitis diagnosis were excluded from this study. Subgroups analyses were conducted to compare pediatric CD patients r prescribed biologics (at least 1 claim) and pediatric CD patients not prescribed biologics during 2017. A two-sample t-test was conducted to compare continuous variables and chi-squared tests were used to compare categorical variables.

RESULTS: A total of 4,507 CD patients were included in this analysis; 2,274 patients (50.5%) were prescribed a biologic and 2,233 (49.5%) were not prescribed a biologic. Biologic users were more likely to be male (59.6% vs. 53.2%; $p<0.0001$) and older (mean age: 13.98 vs. 12.70 years; $p<0.0001$) when compared to patients not prescribed a biologic. Biologic users were more likely to be prescribed corticosteroids (33.3% vs. 27.5%; $p<0.0001$) during the one year period, however patients not prescribed biologics were more likely to be prescribed immunomodulators (21.9% vs. 15.9%; $p<0.0001$) and 5-ASAs (31.5% vs. 16.8%; $p<0.001$) during the one year period. Biologic users were more likely to have surgery (4.3% vs. 1.7%; $p<0.0001$), gastroenterologist visits (including infusion visits) (67.2% vs. 52.8%; $p<0.0001$), and inpatient hospital visits (17.4% vs. 13.1%; $p<.0001$); however patients not prescribed biologics had higher rates of ER visits (42.7% vs. 35.6%; $p<0.0001$).

CONCLUSIONS: Corticosteroid use, rates of surgery, gastroenterologist visits, and inpatient hospital visits were higher among pediatric CD patients prescribed biologics. These results may indicate an unmet treatment need among pediatric CD patients; however, these findings are limited by the cross-sectional nature of this study.

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Table 1. Patient Characteristics of Pediatric Crohn's Disease Patients

Characteristic:	Total Population N=4,507	Have Biologic N=2,274	No Biologic n=2,233	P-value
Gender				<.0001
Male; n (%)	2,544 (56.4%)	1,355 (59.6%)	1,189 (53.2%)	
Female; n (%)	1,963 (43.6%)	919 (40.4%)	1,044 (46.8%)	
Mean Age (SD)	13.35 (3.55)	13.98 (2.74)	12.70 (4.12)	<.0001
Comorbid Conditions				
Diabetes Type 1; n (%)	20 (0.4%)	8 (0.4%)	12 (0.5%)	0.3486
Diabetes Type 2; n (%)	37 (0.8%)	15 (0.7%)	22 (1.0%)	0.2258
Psoriasis; n (%)	110 (2.4%)	91 (4.0%)	19 (0.9%)	<.0001
Medications				
Immunomodulators; n (%)	852 (18.9%)	362 (15.9%)	490 (21.9%)	<.0001
5-ASA; n (%)	1,085 (24.1%)	382 (16.8%)	703 (31.5%)	<.0001
Corticosteroids; n (%)	1,371 (30.4%)	758 (33.3%)	613 (27.5%)	<.0001
Opioids; n (%)	1,259 (27.9%)	657 (28.9%)	602 (27.0%)	0.1482
Healthcare Resource Utilization				
Surgery; n (%)	134 (3.0%)	97 (4.3%)	37 (1.7%)	<.0001
Gastroenterologist Visit; n (%)	2,709 (60.1%)	1,529 (67.2%)	1,180 (52.8%)	<.0001
ER Visit; n (%)	1,762 (39.1%)	809 (35.6%)	953 (42.7%)	<.0001
Inpatient Hospital Visit; n (%)	688 (15.3%)	396 (17.4%)	292 (13.1%)	<.0001
Outpatient Visit; n (%)	4,506 (100.0%)	2,274 (100.0%)	2,232 (100.0%)	0.4955
Number of Outpatient Visits; mean (SD)	21.63 (29.73)	21.86 (25.22)	21.40 (33.72)	<.0001

313 ***IMPACT OF BIOLOGIC TREATMENT OF ULCERATIVE COLITIS ON HEALTHCARE RESOURCE UTILIZATION AMONG PEDIATRIC UC PATIENTS IN THE UNITED STATES.*** *Theresa Hunter*, *April Naegeli*, *Yan Dong*, *Casey Choong*, *Wallace Crandall. Eli Lilly and Company*, *Indianapolis*, *IN*

OBJECTIVES: This study compared healthcare resource utilization (HCRU) among pediatric Ulcerative Colitis (UC) patients currently receiving biologics and pediatric UC patients not currently receiving biologics.

METHODS: Pediatric (0-17 years) patients with ≥1 UC diagnosis code (ICD-9: 556.x; ICD-10:K51.x) from January 1, 2017 to December 31, 2017 were included in this retrospective analysis of medical and pharmacy claims data from the IBM Marketscan Commercial and Medicaid Claims database. Patients with a Crohn's Disease diagnosis were excluded from this study. Subgroups analyses were conducted to compare pediatric UC prescribed biologics (at least 1 claim) and pediatric UC patients not prescribed biologics during 2017. A two-sample t-test was conducted to compare continuous variables and chi-squared tests were used to compare categorical variables.

RESULTS: A total of 2,296 UC patients were included in this analysis; 501 patients (21.8%) were prescribed a biologic and 1,795 (78.2%) were not prescribed a biologic. Biologic users were more likely to be female (51.1% vs. 48.9%; p=0.3753) and older (mean age: 13.79 vs. 12.54 years; p<0.0001) when compared to patients not prescribed a biologic. Biologic users were more likely to be prescribed corticosteroids (50.3% vs. 29.1%; p<0.0001) during the one year period. Biologic users were also more likely to have surgery (3.2% vs. 1.5%; p=0.0136), gastroenterologist visits (including infusion visits) (66.9% vs. 56.9%; p<0.0001), and inpatient hospital visits (25.9% vs. 15.8%; p<.0001); however patients not prescribed biologics had similar rates of ER visits (38.8% vs. 41.7%; p<0.2334) and outpatient hospital visits (99.9% vs. 100.0%; p=1.000).

CONCLUSIONS: Corticosteroid use, rates of surgery, gastroenterologist visits, and inpatient hospital visits were higher among pediatric UC patients prescribed biologics. These results may indicate an unmet treatment need among pediatric UC patients; however, these findings are limited by the cross-sectional nature of this study.

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Table 1. Patient Characteristics of Pediatric Ulcerative Colitis Patients

Characteristic:	Total Population N=2,296	Have Biologic N=501	No Biologic n=1,795	P-value
Gender				0.3753
Male; n (%)	1,163 (50.7%)	245 (48.9%)	918 (51.1%)	
Female; n (%)	1,133 (49.3%)	256 (51.1%)	877 (48.9%)	
Mean Age (SD)	12.81 (4.24)	13.79 (3.13)	12.54 (4.47)	<.0001
Comorbid Conditions				
Diabetes Type 1; n (%)	18 (0.8%)	3 (0.6%)	15 (0.8%)	0.7781
Diabetes Type 2; n (%)	20 (0.9%)	5 (1.0%)	15 (0.8%)	0.7852
Psoriasis; n (%)	21 (0.9%)	12 (2.4%)	9 (0.5%)	0.0004
Medications				
Immunomodulators; n (%)	373 (16.2%)	95 (19.0%)	278 (15.5%)	0.0623
5-ASA; n (%)	1,291 (56.2%)	274 (54.7%)	1,017 (56.7%)	0.4327
Corticosteroids; n (%)	775 (33.8%)	252 (50.3%)	523 (29.1%)	<.0001
Opioids; n (%)	571 (24.9%)	141 (28.1%)	430 (24.0%)	0.0552
Healthcare Resource Utilization				
Surgery; n (%)	43 (1.9%)	16 (3.2%)	27 (1.5%)	0.0136
Gastroenterologist Visit; n (%)	1,357 (59.1%)	335 (66.9%)	1,022 (56.9%)	<.0001
ER Visit; n (%)	905 (39.4%)	209 (41.7%)	696 (38.8%)	0.2334
Inpatient Hospital Visit; n (%)	414 (18.0%)	130 (25.9%)	284 (15.8%)	<.0001
Outpatient Visit; n (%)	2,295 (100.0%)	501 (100.0%)	1,794 (99.9%)	1.0000
Number of Outpatient Visits; mean (SD)	20.89 (31.27)	22.49 (17.65)	20.45 (34.11)	<.0001

314 ***SERUM ZINC AND SELENIUM STATUS IN PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASE: A RETROSPECTIVE MULTICENTER STUDY IN JAPAN.*** *Jun Ishihara[1], Katsuhiro Arai[2], Takahiro Kudo[3], Ryusuke Nambu[4], Hitoshi Tajiri[5], Tomoki Aomatsu[6], Naoki Abe[7], Toshihiko Kakiuchi[8], Kunio Hashimoto[9], Tsuyoshi Sogo[10], Michiko Takahashi[11], Yuri Etani[12], Hirotaka Sakaguchi[1], Ken-ichiro Konishi[1], Tatsuki Mizuochi[1]. [1]Pediatrics and Child Health, Kurume University School of Medicine, Kurume, Japan; [2]Gastroenterology, National Center for Child Health and Development, Tokyo, Japan; [3]Pediatrics, Juntendo University Faculty of Medicine, Tokyo, Japan; [4]Gastroenterology and Hepatology, Saitama Children's Medical Center, Saitama, Japan; [5]Pediatrics, Osaka General Medical Center, Osaka, Japan; [6]Pediatrics, Osaka Medical College, Takatsuki, Japan; [7]Infection and Immunology, Aichi Children's Health and Medical Center, Aichi, Japan; [8]Pediatrics, Faculty of Medicine, Saga University, Saga, Japan; [9]Pediatrics, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan; [10]Pediatric Hepatology and Gastroenterology, Saiseikai Yokohamashi Tobu Hospital, Yokohamashi, Japan; [11]Pediatrics, Sapporo Kosei General Hospital, Sapporo, Japan; [12]Gastroenterology and Endocrinology, Osaka Women's and Children's Hospital, Osaka, Japan*

Objectives and study: Zinc and selenium deficiencies in patients with inflammatory bowel disease (IBD) have been reported mostly from Western countries. Whether Japanese children with IBD have zinc and selenium deficiencies remains unclear. We aimed to clarify the prevalence of zinc and selenium deficiencies in Japanese children with IBD.

Methods: Subjects were retrospectively enrolled children under 17-year-old who visited at 12 pediatric centers in Japan between November, 2016 and February, 2018 and were divided into 3 groups such as children with ulcerative colitis (UC), Crohn's disease (CD), and normal control (NC) including patients with irritable bowel syndrome and healthy children. Serum zinc and selenium were measured by atomic absorption spectrophotometry. Zinc and selenium deficiencies were defined as <70 μg/dL and <9.5 μg/dL, respectively. We excluded patients who were treated with zinc and/or selenium preparations.

Results: Two hundred and fifty-nine subjects from 118 patients with UC (median age, 11 years), 98 CD (11y), and 43 NC (11y) were examined. Serum zinc and selenium levels were significantly lower in CD (median, 64 μg/dL and 12.6 μg/dL) than in UC (69 and 14.6; *P<0.05* and *P<0.001*) and NC (77 and 15.7; *P<0.01* and *P<0.001*), respectively. The prevalence of zinc deficiency was significantly higher in CD (60.2%) than in NC (37.2%; *P<0.05*), but not in UC (51.7%; *P=0.22*). The prevalence of selenium deficiency was significantly higher in CD

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(15.3%) than in UC (5.9%; *P<0.05*) and NC (0%; *P<0.01*).
Conclusion: Zinc deficiency is common in Japanese children with IBD. Serum zinc and selenium levels were significantly lower in Japanese children with CD than in UC and NC. Our study supports the role for monitoring and replacement of zinc and selenium in children with IBD, particularly with CD.

315 ***IMPLICATIONS OF B-CELL DYSREGULATION IN PEDIATRIC DUODENAL CROHN'S DISEASE.***
Taina Jausurawong[1], Carrie Vylidahl[2], Vivekanand Singh[3], Jeffrey Johnston[4], Tomi Pastinen[4], Valentina Shakhnovich[1,5]. [1]Gastroenterology, Children's Mercy, Kansas City, MO; [2]Clinical Pharmacology and Toxicology, Children's Mercy, Kansas City, MO; [3]Pathology, Children's Mercy, Kansas City, MO; [4]Genome Center, Children's Mercy, Kansas City, MO; [5]Pediatrics, University of Missouri Kansas City School of Medicine, Kansas City, MO
Background: Genome wide association studies have previously identified immune system dysregulation in the pathogenesis of Crohn's disease, a chronic immune-mediated inflammatory condition that can affect any part of the gastrointestinal tract. Duodenal involvement in Crohn's disease is more commonly encountered in the pediatric population, with limited data regarding the tissue specific immune mediators involved in disease expression. The aim of this investigation was to explore cell-specific genetic signatures of duodenal Crohn's disease in children, using single-cell mRNA expression to deconvolute bulk mucosal RNA-Seq data.

Methods: mRNA was extracted from fresh frozen mucosal duodenal biopsies, obtained from treatment naïve children (i.e., no prior immunosuppressive or immunomodulator therapy) with and without Crohn's disease. The clinical and histopathologic diagnosis of Crohn's disease vs. Control was confirmed via agreement by 2 independent pediatric gastroenterologists and pathologists, respectively. Libraries were made using the Illumina stranded total RNA kit and paired-end sequencing performed on an Illumina NovaSeq 6000. Sequencing reads were processed by kallisto to quantify expression against GENCODE release 19 gene annotations for genome build GRCh37. Differential expression was performed using DESeq2 with default parameters. Log fold change >1.5 in gene expression and adjusted p-value of <0.1 were considered significant prior to performing single cell analyses to localize gene expression to specific cell types in the mucosa (e.g., white blood cells, epithelial cells). Single cell gene expression was performed on fresh duodenal mucosal biopsies from 5 children without intestinal pathology using the 10X Genomics platform, followed by Illumina sequencing. After quantification by 10X Cell Ranger, Seurat was used to filter out low-quality cells and identify cell clusters. The SingleR package was used to match identified clusters to publicly available cell-specific signatures from genetic databases HPCA and Blueprint Encode.

Results: Comparison of the duodenal mucosal transcriptome in 11 children with active duodenal Crohn's disease vs. 16 children with Crohn's disease and no duodenal pathology vs. Controls is summarized in Figure 1. A prominent B-cell signature was identified, with greater expression of *MZB1* (2.00-fold change, p=0.0003) in active disease vs. Control (Fig. 1A), and lower MZB1 expression (2.19-fold change, p=0.000106) in Crohn's disease without duodenal involvement vs. active duodenal disease (Fig. 1B).

Conclusion: Based on single cell mucosal transcriptome analyses, B-cells appear to have a role in the expression of Crohn's disease in the duodenum. Specifically, *MZB1*, a gene involved in antibody production and assembly and previously implicated in colitis, is upregulated in duodenal B-cells in active duodenal Crohn's disease and downregulated in Crohn's disease without duodenal involvement. Additional gene analyses are underway.

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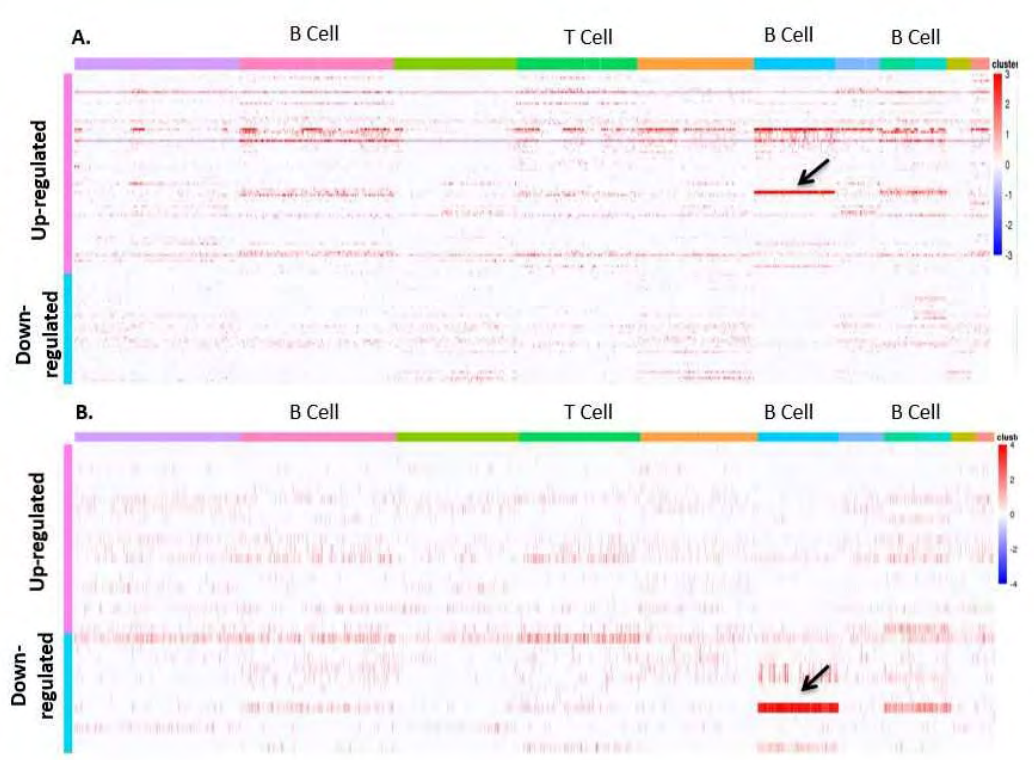


Figure 1: Mucosal transcriptome signatures of immune cells in the duodenum of A) active duodenal Crohn's disease vs. Controls; and B) Crohn's disease without duodenal involvement vs. active duodenal Crohn's disease.

316 ***REDUCTION IN CORTICOSTEROID USAGE AMONG PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASE IN A LARGE LEARNING HEALTH SYSTEM.*** *Prashanthi Kandavel[1], Jeremy Adler[1,2]. [1]Pediatric Gastroenterology, University of Michigan , Ann Arbor, MI; [2]Susan B. Meister Child Health Evaluation and Research Center, University of Michigan, Ann Arbor, MI*

INTRODUCTION: Corticosteroids reduce inflammation and are commonly used to treat inflammatory bowel disease (IBD). However, increased cumulative exposure to corticosteroids is associated with serious adverse effects. Immunomodulators and biologic agents are considered steroid sparing therapies (SST) and are recommended by society guidelines and the model care guidelines of the ImproveCareNow (ICN) Network, a pediatric IBD quality improvement (QI) collaborative. Despite these recommendations, it remains unknown whether corticosteroid usage has decreased among pediatric IBD patients.

METHODS: We performed a retrospective multi-center cohort study of prospectively collected data from the ICN Network registry. Patients diagnosed with Crohn's disease (CD), ulcerative colitis (UC) or IBD-undifferentiated (IBD-U) between 2007-2017 were included. Patients were excluded only if information about systemic corticosteroid use was missing. We assessed the serial point prevalence of corticosteroid usage among the entire ICN population and additionally by age, race, sex, and disease type. Chi square test, multivariate logistic regression analyses, and statistical process control analyses were used.

RESULTS: There were 33,436 patients with IBD in the ICN registry (64% CD, 29% UC, and 7% IBD-U). The average age at diagnosis was 12.1 ± 0.9 yrs. 82% of the population was white and 56% were male. CD patient phenotypes at diagnosis were 80% inflammatory, 7% stricturing, 6% penetrating, and 2% of patients had both a stricturing and penetrating phenotype. UC extent at diagnosis was 60% pancolitis, 10% extensive colitis, 17% left sided colitis, and 8% proctitis only. Overall, the point prevalence of corticosteroid use decreased from 26% in 2007 to 14% in 2017. In 2007, there was a wide disparity in corticosteroid usage between black and white patients (35% vs 28%). By 2017, this gap had decreased to 16% in black patients compared to 13% in white patients. Steroids were

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more commonly used in CD patients with inflammatory phenotype (33%) compared to stricturing (26%) or internal penetrating (20%; p<0.001). UC patients with pancolitis received corticosteroids more often (46%) than less extensive disease (23 to 39%; p<0.001).

CONCLUSION: Corticosteroid use in pediatric IBD patients has been steadily decreasing over the years. Disparities between black and white patients are improving. Population management with specific QI focus on reducing steroid use may be responsible for improvements.

Table 1: PATIENT CHARACTERISTICS AT DIAGNOSIS

Variable	Total	Overall steroid use	
Disease type			
Crohn's disease	20,762 (64%)	6,491 (31%)	
Ulcerative colitis	9,420 (29%)	4,010 (43%)	p < 0.001
IBD-undifferentiated	2,384 (7%)	994 (42%)	
Age at diagnosis			
< 10 yr	8,622 (27%)	2,854 (33%)	
10-17 yr	20,957 (65%)	7,563 (36%)	p < 0.001
> 17 yr	2,549 (8%)	959 (38%)	
Race			
Black	3,203 (11%)	1,249 (39%)	
White	24,200 (82%)	8,256 (34%)	p <0.001
Other	2,097 (7%)	745 (36%)	
Gender			
Male	18,586 (56%)	6,421 (35%)	p = 0.024
Female	14,849 (44%)	5,306 (36%)	
Crohn's Disease Phenotype			
Inflammatory	15,887 (80%)	5,216 (33%)	
Stricturing	1,305 (7%)	342 (26%)	p < 0.001
Penetrating	1,256 (6%)	257 (20%)	
Stricturing & penetrating	483 (2%)	113 (23%)	
Ulcerative Colitis Disease location			
Proctitis	705 (8%)	165 (23%)	
Left sided	1,428 (17%)	559 (39%)	p < 0.001
Extensive	796 (10%)	359 (45%)	
Pancolitis	4,999 (60%)	2,293 (46%)	

Table 1. Patient characteristics at time of diagnosis.

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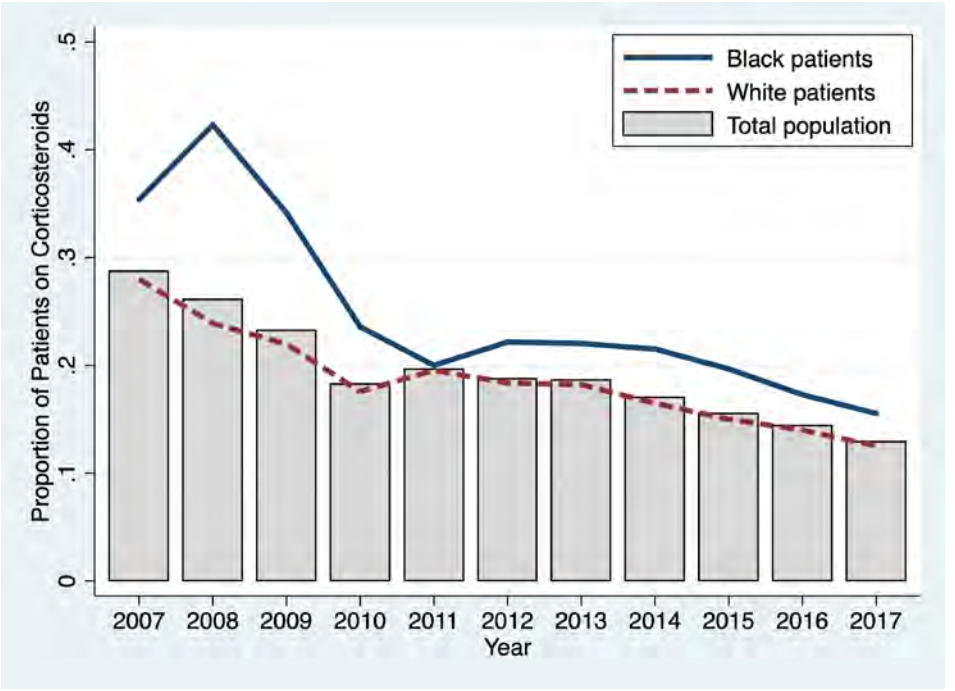


Figure 1. Corticosteroid use in the total population by year. The red dotted line (white patients) and blue solid line (black patients) represent corticosteroid use by race.

317 ***DURABILITY OF INFLIXIMAB THERAPY IN VERY EARLY ONSET INFLAMMATORY BOWEL DISEASE.*** *Basavaraj Kerur[1], Eric Benchimol[2], Karoline Fielder[3], Marisa Gallant[4], Jeffrey Hyams[5], Michael Stephens[6], Ying Lu[7], Marian Pfefferkorn[8], Razan Alkhouri[9], Jennifer Stropple[10], Judith Kelsen[11], Leah Siebold[12], Alka Goyal[13], Joel Rosh[14], Neal LeLeiko[15], Johan Van Limbergen[16], Anthony Guerrerio[17], Ross Maltz[18], Lina Karam[19], Eileen Crowley[20], Anne Griffiths[3], Sofia Verstraete[28], Mark Deneau[21], Keith Benkov[22], Joshua Noe[23], Dedrick Mouton[24], Helen Pappa[25], Joseph Galanko[26], Scott Snapper[27], Aleixo Muise[3], Michael Kappelman[26]*
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Background: Children with Very Early Onset IBD (VEOIBD) are treated with anti-TNF biologics despite lack of FDA approval in this age group. Evidence describing the utilization of anti-TNF biologics and durability of response in VEOIBD is scarce. We sought to 1) Describe the utilization of Infliximab in VEO-IBD, 2) Characterize the sustained use (persistence) of infliximab, the most commonly prescribed anti-TNF in VEO-IBD, as an indicator of durability of response, and 3) evaluate whether age of diagnosis, age at the time of infliximab induction, or use of combination immunomodulatory therapy were associated continuation of infliximab therapy.

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Methods: We performed a retrospective cohort study of patients diagnosed with VEOIBD (≤ 6 years of age) between 2008 to 2013 at 25 North American centers participating in the Pediatric Resource Organization for Kids with Inflammatory Intestinal Digestive Diseases network (PRO-KIIDS). Eligible patients were systematically identified to ensure complete case ascertainment at each center, and a random sample was selected for chart review. Using a standardized case reporting form, we abstracted uniform data at diagnosis and at 1, 3 and 5 years following diagnosis. Standard descriptive and univariate statistics were used to characterize the population of patients undergoing treatment with infliximab. Kaplan-Meier survival curves were applied to compare persistence of infliximab treatment over time by age at diagnosis, age at infliximab induction, and use of concomitant immunomodulator therapy.

Results: Treatment data from 261 children were available beyond 1 year from diagnosis. Of these, 119 children (45%) were treated with biologics. The initial biologic was infliximab in 97 patients (mean age at diagnosis 4.2 years (SD 1.3), mean age at anti-TNF initiation 6 years (SD 2); 46% Crohn's disease, 41% female; 82% received combination immunomodulatory therapy). Overall, ongoing use of infliximab was 73% at 1 year and 50% at 3 years. The most common reasons for discontinuation of infliximab were loss of response in 24 (57%) followed by adverse reaction in 10 (24%). Numeric trends towards longer persistence in patients diagnosed at age > 3 years versus < 3 years **(Fig 1),** induced at age >6 years versus < 6 years **(Fig 2),** and receiving monotherapy versus combination therapy were not statistically significant.

Conclusions: Approximately 50% of VEOIBD patients in this multi-center North American cohort were treated with biologics within 5 years of diagnosis. Overall, persistence of infliximab therapy was modest and similar to older populations described in other cohorts. Future optimization of anti-TNF treatment and expansion of drug development for patients with VEOIBD are crucial.

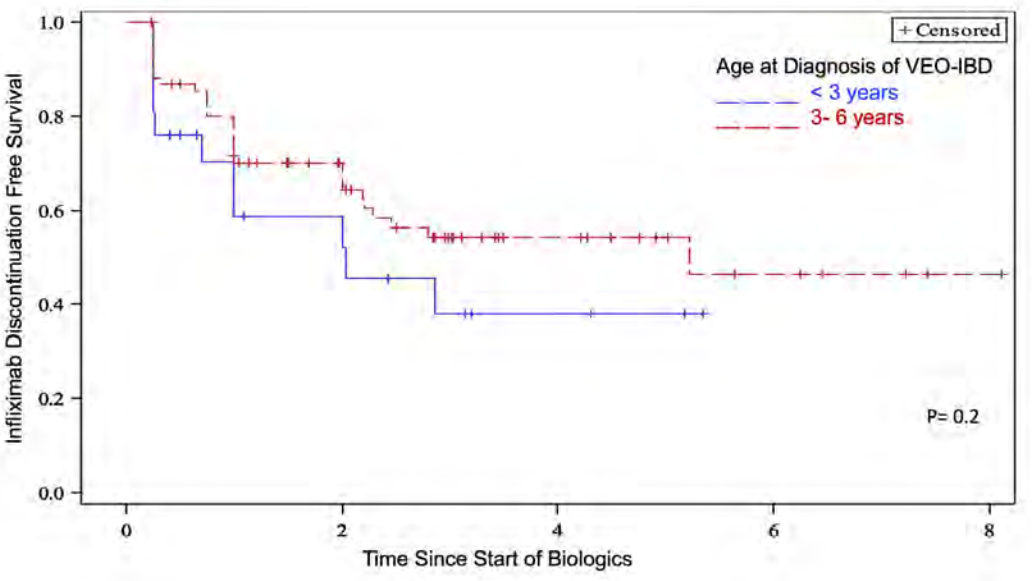


Fig 1: Infliximab Persistence by Age at Diagnosis in VEO-IBD (<3 yr vs >3 yr)

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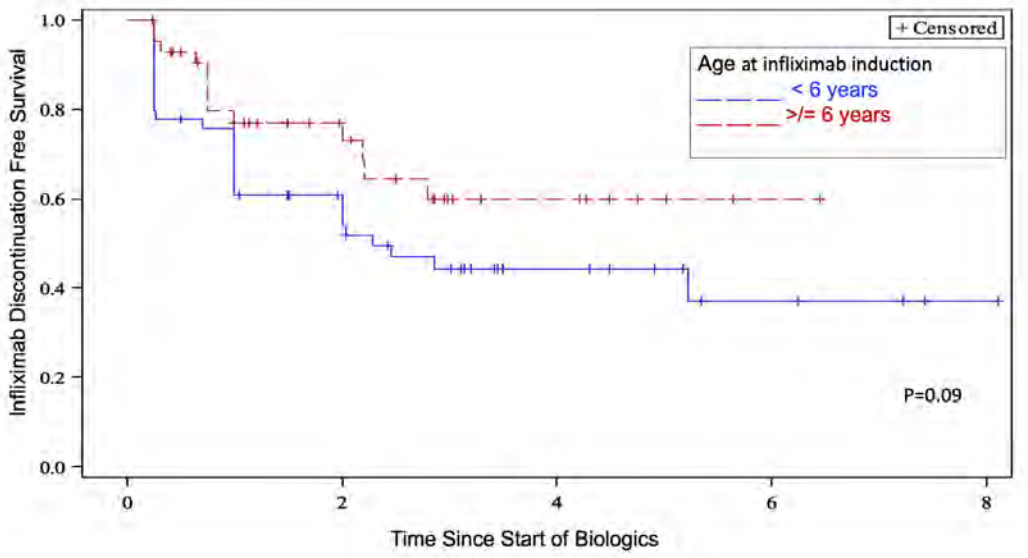


Fig 2: Infliximab Persistence by Age at Induction of Infliximab (<6 yr vs >6yr)

318 ***CLINICAL HISTORY OF CHILDREN WITH CROHN'S DISEASE WHO REQUIRE FIRST TIME SURGERY.*** *Yelena Korotkaya*, *Gayathri Naraparaju*, *Steven Miller*, *Carmen Cuffari*. *Pediatric Gastroenterology* , *Johns Hopkins*, *Baltimore*, *MD*

Background: Despite improvements in medical therapy, up to 1/3 of pediatric CD patients will require invasive procedures within 5 years of diagnosis. In children with CD, there are a multitude of absolute and relative indications for surgery, and the decision about when to perform procedures can be subtle and difficult. No standards exist regarding timing of surgical intervention, and few published studies have examined surgical outcome as a function of time spent waiting for surgical intervention.

Objectives: The aim of this study was to analyze indications for first time surgery in each Crohn's Disease patient who underwent surgery during the study period, to calculate the time from date of first indication to date of surgery, and to identify patients' peri-operative complications

Methods: 100 patients with CD who underwent first operation from 2008-2018 were identified via ICD-9 and -10 codes. This study was approved by the Johns Hopkins Institutional review board. Data was collected by a single reviewer using a standardized form for each patient. Indications for surgery included both: relative and absolute indications. The date of first indication marked Time 0. Indications for surgery were identified in the chart based on clinical notes, imaging, endoscopies, and growth charts. Similarly, for each patient, peri-operative complications were identified 0-90 days prior to and following the time of surgery.

Results: Data of 100 patients were identified (41: F;59:M) with a median (range) age 16 years (3-21) at the time of surgery. Overall, median time (range) from diagnosis to surgery was 1.6 years (0-14), with 39% operated within first year of diagnosis. 37% of patients had a positive family history of IBD. 78 % of patients were on therapy with a biologic agent. Five patients were diagnosed at the time of first surgical intervention. The BMI Z-scores of African American patients were statistically lower (P=0.0013) than Caucasian patients.

Overall, the most common indication for surgery was partial stricture. Patients with partial structuring and fistulizing disease had a longer mean time to surgery of 157 days, while patients with complete obstructions had a mean time to surgery of 8 days. 12% of patients with known stricture presented with obstructions or perforations requiring surgery, more than half within 4 months of diagnosis. Perioperative complications included pre-operative hospitalizations in 54% of patients and post-operative rehospitalization in 24% of patients. 14 (14%) patients required repeat surgical interventions within 90 days from initial surgery, most commonly in stricturing and

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fistulizing phenotype. Other complications included intraabdominal abscess, bleeding, sepsis, obstruction and ED visits.

Discussion: Patients with known partial strictures had a longer time to surgery, most likely because these patients are treated medically with the expectation of improvement in narrowing. More close follow up of response to therapy and cross sectional imaging of these patients, especially if found near CD diagnosis, may aid to decrease CD related complications which can occur early in disease course. BMI Z-scores differences may be related to availability or access to health and nutritional services. Despite improvements in medical therapy surgical interventions remain an important consideration in CD.

Table 1: Clinical Data

	AA(N=31)	Caucasian (n=61)	other (n=8)	overall(n=100)
Age at surgery Median (Min-Max)	16 (9-21)	16(3-21)	17 (13-21)	16 (3-21)
Time from Diagnosis of Crohn's Disease Median (Min-Max)	1 (0-14)	1.83 (0-10)	4.25 (0-8)	1.6 (0-14)
Length Z-score Median (Min-Max)	-0.59 (-2.1-1.57)	-0.48 (-2.8-1.75)	-0.7 (-2.8-0.27)	-0.55 (-2.8-1.57)
BMI Z-score Median (Min-Max)	-0.79 (-5.85-0.51)	-0.16 (-3.22-1.92)	-0.24(-3.23-0.51)	-0.36 (-5.85-1.92)
Length of stay Median (Min-Max)	8 (3-72)	6 (1-57)	6 (5-18)	6 (1-72)
ESR Median (Min-Max)	38 (5-130)	25(1-130)	16.5 (6-61)	27 (1-130)
CRP Median (Min-Max)	4.35 (0.1-29.6)	1.2 (0.1-19)	4 (3.9-7)	2.4 (0.1-29.6)

Table 2: Time from indication to surgical intervention

Indication	Days (mean)
Partial stricturing and fistulizing diease	157
Medical Therapy Failure	64
Complex Perianal Disease	47
Growth Failure	114
GI hemorrhage	11
Intra-abdominal abscess	43
Obstruction	8
Perforation	4.5

319 ***GRANULOMAS PREDICT PERIANAL FISTULA, WHICH MAY BE PREVENTABLE WITH ANTI-TNFα THERAPY.*** *Lindsey Lawrence[1], Andrew Singer[1], Amer Heider[3], Jeremy Adler[1,2]. [1]Pediatric Gastroenterology, University of Michigan, Ann Arbor, MI; [2]Susan B. Meister Child Health Evaluation and Research Center, University of Michigan, Ann Arbor, MI; [3]Department of Pathology, University of Michigan, Ann Arbor, MI*

Introduction: There is limited evidence for predicting disease outcomes among children with Crohn's disease (CD). Patient characteristics such as age, race, and endoscopic findings have limited prognostic value. Histologic features such as granulomas may be associated with more aggressive CD. We hypothesized that the presence of mucosal granulomas at CD diagnosis is associated with increased risk of perianal fistulizing complications. We also sought to determine whether or not this risk is modifiable with early anti-tumor necrosis factor a(TNFα) therapy.

Methods: Retrospective cohort study of pediatric CD patients at University of Michigan (UM). Inclusion required: 1) CD diagnosed at UM (11/1/2005-11/11/2015); 2) age ≤21 years at diagnosis; 3) availability of original diagnostic biopsies. Patients were excluded if no follow-up after diagnosis.

We retrospectively reviewed electronic medical records (EMR) of all potentially eligible patients. Records were

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manually reviewed to determine if the patient met study criteria. Relevant clinical information was abstracted including diagnostic features (age, phenotype, BMI, labs), and dates of starting anti-TNFα therapy, and for the timing of perianal fistula development, if any. Biopsy reports were reviewed. Ambiguous or unclear reports were reviewed by a pediatric pathologist who was blinded to history and results. Patients who had perianal fistulae at or before diagnosis were excluded. Perianal fistulae were identified by magnetic resonance enterography imaging or by physician exam documented in the EMR. Perirectal abscesses were considered as fistulae for the purposes of this study. Medical therapy with anti-TNFα was included only if started >90 days prior to development of perianal fistula.

We used descriptive statistics, chi square analyses, and cox proportional hazard models.

Results: We identified 200 patients with Crohn's disease. 48 (24%) were excluded for perianal fistulae at diagnosis, leaving 152 for inclusion in the study. Mean age at diagnosis 11.9 ±3.2 years, 36% were female. Paris phenotype included ileal only (L1) 20%, colon only (L2) 13%, ileocolonic (L3) 67%, and upper tract (L3 or L4) 66%. 79 (52%) had granulomas on biopsies at diagnosis (71% colonic, 52% small bowel, and/or 46% gastroesophageal). 118 (78%) were treated with early anti-TNFα.

Overall, 30 (20%) developed perianal fistulae. Patients with granulomas were more likely to develop perianal fistulae (27%) compared to those without granulomas (12%; p=0.027). Fewer patients who were treated with early anti-TNFα developed perianal fistulae (14%) compared to those not treated with anti-TNFα (41%; p<0.001).

Time to fistula development results are in Table 1. Granulomas on biopsy were associated with greater hazard of developing perianal fistula (hazard ratio [HR] 3.3; p=0.005). Anti-TNFα was associated with lower hazard of developing fistulae (HR 0.18; p<0.001). Patients with granuloma, who were not treated with anti-TNFα (N=17) had the highest hazard of developing perianal fistulae compared to the lowest-risk group (HR 13.0; p<0.001; Figure 1).

Conclusion: Among children with Crohn's disease who did not have perianal fistulae at diagnosis, granulomas found in diagnostic biopsies were associated with a 3-fold increased risk of developing perianal fistulae. This risk appears to be modifiable. Early infliximab treatment reduced the risk of perianal fistula by approximately 80%.

Characteristic	**Bivariate** HR (95% CI)	**Multivariate** HR (95% CI)
Female	HR 1.09 (0.51-2.31)	
Age at diagnosis (per year increase)	HR 0.92 (0.82-1.02)	**HR 0.87 (0.77-0.98)**
Non-white race	HR 2.26 (0.78-6.55)	HR 2.08 (0.71-6.09)
Granuloma on biopsy	**HR 2.25 (1.02-4.93)**	**HR 3.34 (1.44-7.34)**
Upper GI tract disease*	HR 0.82 (0.39-1.74)	
Lower GI tract disease*	HR 1.09 (0.68-1.74)	
Infliximab	**HR 0.88 (0.11-0.49)**	**0.18 (0.08-0.40)**

*According to Paris classification
Hazard ratio, HR; CI, confidence interval; GI, gastrointestinal

Table 1. Cox Proportional Hazard Models of Time Free From Perianal Fistula

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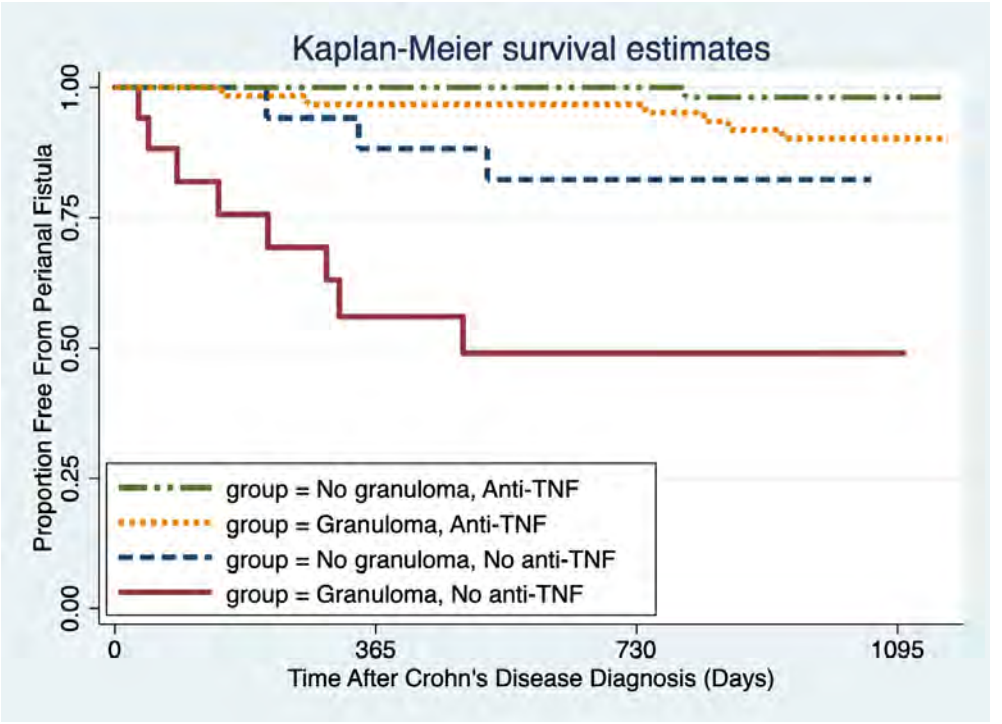


Figure 1. Time Free From Perianal Fistula

320 ***MAKING LEMONADE OUT OF LEMONS: BENEFIT FINDING AMONG YOUTH WITH CROHN'S DISEASE AND ULCERATIVE COLITIS.*** *Rachel Lawton[1], Robert Rothbaum[2], Jill Weissberg-Benchell[3], David Victorson[4], Jason Washburn[3]. [1]Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital and Medical Center, Cincinnati, OH; [2]Pediatrics, University of California - San Francisco, San Francisco, CA; [3]Psychiatry and Behavioral Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL; [4]Medical Social Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL*

Background: The concept of benefit finding refers to the process by which individuals identify positive outcomes associated with potentially negative or difficult experiences. These positive outcomes are varied, but commonly include changes in outlook, sense of self, and relationships with others. Experiences associated with pediatric chronic illness are rife with opportunity for benefit finding, and the construct has been explored and established among a range of pediatric patient cohorts, including pediatric oncology and Type 1 diabetes. To date, no research has assessed benefit finding among youth with IBD. This project explored and characterized benefit finding among pediatric patients with Crohn's disease and ulcerative colitis.

Methods: Researchers completed a prospective, single cohort study. Data was collected from a cohort of 36 pediatric IBD patients. All measures were completed online and were validated with sound psychometric properties. Measures assessed benefit finding, general psychosocial symptoms, health-related quality of life, medical traumatic stress, post-traumatic growth, social connectedness, and loneliness.

Results: Sixty-nine percent of participants were diagnosed with CD. The mean age at participation was 13.6 years old (*SD* = 1.9 years, *R* = 10 – 18 years old). IBD diagnosis did not vary by gender or age. Thirty-six percent of patients were diagnosed 5+ years prior to study participation, while an additional 39% were diagnosed within the 1-4 years prior. One quarter of participants were diagnosed in the past 12 months. Fifty-eight percent of participants reported one or more prior inpatient hospitalizations, while 28% endorsed prior surgical history.

Sixty-six percent of youth with Crohn's and UC reported that "Having IBD has helped me know how much I am loved" as very true or true most of the time, while the vast majority of patients (77.8%) reported that "Having IBD has taught me to be happy and enjoy good things when they happen" as very true or true most of the time. More than half of participants (52.8%) reported that "Having IBD has helped me become a stronger person" was very true or

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true for most of the time. An even greater percentage of participants (55.6%) reported that "Having IBD has helped me learn who my real friends are" was very true or true for most of the time. Total rumination (worry) was significantly correlated with total benefit finding (r = .36, p = .03). Total benefit finding scores were also significantly correlated with total post-traumatic growth scores (r = .53, p = .001). Though benefit finding varied by recency of diagnosis – with recently diagnosed patients reporting the greatest benefit finding – these differences were not statistically significant (F (2, 33) = 2.29, p = .12).

Conclusions: Benefit finding was extremely common among pediatric patients with IBD. More specifically, youth identified their sense of self, their relationships, and their outlook as positively impacted by their experiences with IBD. In addition, the positive association between benefit finding and rumination suggests that there may be an unexpectedly positive utility in frequent worry and/or contemplation about the experience of IBD. Broadly, these descriptive results suggest that a significant portion of youth with IBD actively identify positive outcomes associated with their experience. Future research should attempt to clarify the mechanism by which this process occurs and the relationship between benefit finding and factors associated with positive medical and psychosocial outcomes.

321 ***CLINICAL HYPNOSIS IN PEDIATRIC CROHN'S DISEASE.*** *Amanda Lee[1], Dedrick Moulton[1], Lindsey Mckernan[2], Alexa Russell[1], Sari Acra[1], Lynn Walker[3]. [1]Pediatric Gastroenterology, Vanderbilt University Medical Center, Nashville, TN; [2]Osher Center for Integrative Medicine, Vanderbilt University Medical Center, Nashville, TN; [3]Adolescent Medicine, Vanderbilt University Medical Center, Nashville, TN*

Background: Crohn's disease (CD) is a chronic, immune-mediated condition associated with abdominal pain, altered bowel habits, and a significant psychosocial impact. Even in remission, patients experience chronic pain and psychological comorbidities. Clinical hypnosis, a mind-body therapy involving deep relaxation and therapeutic suggestion, is beneficial for functional gastrointestinal disorders, acute and chronic pain, and psychological distress. Additional evidence supports its anti-inflammatory effects, and therefore a potential adjunctive role in inflammatory diseases. No randomized controlled trials have evaluated the impact of hypnosis as an adjunct to standard care on quality of life (QoL), psychological measures, and disease activity in pediatric CD.

Methods: 40 subjects ages 12-18 years old with quiescent to moderately active CD diagnosed at least 3 months prior were recruited from the Vanderbilt Pediatric Gastroenterology Division and randomized 1:1 to a hypnosis intervention (HI) or waitlist control group (WC). HI subjects participated in a 25-minute in-person hypnosis session, then received education on self-hypnosis and 4 audio recordings for home practice. Subjects were encouraged to practice self-hypnosis regularly for 8 weeks and received daily text message reminders. WC subjects received standard care. Primary outcome was change in QoL from baseline to 8 weeks using the Impact-III for subjects, PedsQL 4.0 parent-proxy, and a single-item modified Cantril Scale (10-point scale with 10 representing best QoL). An additional assessment occurred at 16 weeks. The study was powered to detect an 8-9% change in Impact-III scores. Paired t-test will be used to measure differences from baseline to follow up. Secondary outcomes included depressive symptoms, anxiety, and sleep disturbance (PROMIS pediatric short forms); abdominal pain frequency and severity (modified Abdominal Pain Index); coping (Pain Beliefs Questionnaire short form); school absenteeism and healthcare utilization (parent report); and disease activity (Physician's Global Assessment [PGA], Pediatric Crohn's Disease Activity Index [PCDAI], and stool inflammatory markers). HI subjects also reported weekly on frequency of home practice and provided qualitative feedback on their experience.

Results: 40 subjects (20 female, 20 male) were enrolled and randomized evenly into HI or WC from February to May 2019. Baseline mean Impact-III scores were 73.5 (SD 15.6, 95% CI 66.7-80.4) in HI and 65.3 (SD 14.4, 95% CI 59-71.7) in WC, with lowest subdomain scores in systemic symptoms, emotional functioning, and body image. Single-item QoL scores were 7.1 (SD 2.2, 95% CI 6.1-8.1) in HI and 6.1 (SD 2, 95% CI 5.2-7) in WC. At baseline, 45% of subjects (7 HI, 11 WC) had moderate to severe depressive symptoms. 23% (4 HI, 5 WC) had mild anxiety and 20% (3 HI, 5 WC) had moderate to severe anxiety. 32.5% (5 HI, 8 WC) had moderate to severe sleep disturbance. 62.5% (11 HI, 14 WC) reported abdominal pain. By PGA, 82.5% (n=33) had quiescent disease, 10% mild (n=4), and 7.5% moderate (n=3); PCDAI ranged from 0 to 45 (mean 10, SD 10). Baseline depressive symptoms and sleep disturbance were greater in WC compared to HI ($p<0.05$) while QoL, anxiety, abdominal pain, and disease activity did not differ between groups ($p>0.05$). In June 2019, 8-week follow-up data were available for 14 subjects—6 HI (all quiescent) and 8 WC (6 quiescent, 2 mild). In these subjects, the mean Impact-III scores for HI and WC improved by 6.1 points and 0.2 points, respectively (p=0.04). Mean single-item QoL scores improved by 1.2 in HI and 0.5 in WC (p=0.1). HI subjects with baseline moderate or severe depressive symptoms either normalized or improved, while WC subjects did not. Greater improvement in anxiety was seen in HI compared to WC; all follow-up HI scores were below the threshold for anxiety. Sleep disturbance improved in both groups. All

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HI subjects with baseline abdominal pain reported a decrease in pain frequency, usual intensity, and greatest intensity, while most WC subjects with baseline abdominal pain were worse or unchanged on these measures. All HI subjects reported home hypnosis practice 3-4 days per week and described pain relief, stress reduction, greater sense of control, and decreased fatigue. No adverse events were reported.
Conclusions: Hypnosis is an acceptable and feasible adjunct for adolescents with CD. Patients demonstrate significant QoL impairment, depression, anxiety, and abdominal pain despite disease remission, indicating targets for improvement with hypnosis. Subjects report regular home practice and enjoy decreased pain and stress. Preliminary follow-up data demonstrate promising trends for improvement in QoL, pain, and psychological comorbidities with hypnosis compared to standard care, independent of disease activity. Full results and statistical analyses will be compiled September 2019.

322 ***IDENTIFICATION OF SERUM PROTEIN BIOMARKERS FOR NON-INVASIVE DIAGNOSIS OF PEDIATRIC IBD USING SOMASCAN.*** *Tina Morhardt[3,5], Simon Dillon[1,5], Hasan Otu[4], Xuesong Gu[1,5], Emma Li[3], Jess Kaplan[3,5], Christopher Moran[3,5], Harland Winter[3,5], Towia Libermann[2,5]. [1]Medicine, Beth Israel Deaconess Medical Center, Boston, MA; [2]Medicine, Beth Israel Deaconess Medical Center, Boston, MA; [3]Massachusetts General Hospital, Boston, MA; [4]University of Nebraska Lincoln, Lincoln, NE; [5]Harvard Medical School, Boston, MA*

Background and Aims: There remains an unmet need for the development of reliable biomarkers for the accurate diagnosis and monitoring of pediatric inflammatory bowel disease (IBD). The diagnosis of Crohn's disease (CD) and ulcerative colitis (UC) is based on clinical and histologic data. High accuracy, non-invasive tests that discriminate between IBD and non-IBD as well as CD and UC are needed. SOMAscan, a new aptamer-based, high multiplex, sensitive, immune-like proteomics platform,that enables measurement of 1,305 biologically relevant proteins, including very low abundant proteins, was tested to discover potential serum protein biomarkers capable of differentiating between pediatric IBD and non-IBD as well as CD and UC.
Method:SOMAscan (SomaLogic; Boulder, CO) quantitative serum protein profiles were generated from pediatric subjects, who using standard diagnostic criteria had CD (n=26), UC (n=26), or non-IBD inflammatory and non-inflammatory gastrointestinal conditions (n=48). To develop high accuracy predictors with the lowest number of proteins for discriminating IBD from non-IBD and CD from UC, discriminatory analysis was performed using 10,000 sub-sampled datasets. Each dataset contained a 4-fold split (i.e., 75%) of the original sample size. Counting the number of times a protein was identified with an adj. $p<0.05$ in a "split" ranked these proteins according to their frequencies. Prediction accuracy, sensitivity and specificity of every combination of the top 10 proteins was determined to identify the highest accuracy predictors.
Results:A Leave-One-Out-Cross-Validation prediction accuracy of 97.2% was achieved for differentiating between pediatric IBD and non-IBD using a 109-protein signature (adj. $p<0.05$). The 109-protein signature includes proteins previously linked to IBD such as CRP and various proteins without prior link to IBD. Similarly, we identified a 78-protein predictor ($p<0.05$) that discriminated between CD and UC. Prediction analysis using combinations of the top 10 proteins identified a 4-protein signature that distinguished between IBD and non-IBD with an average 4-fold cross validation accuracy of 96.2% (96.7% sensitivity; 95.8% specificity). The diagnostic accuracy was confirmed in an independent validation set. A 7-protein panel discriminated between CD and UC with an average 4-fold cross validation accuracy of 86.9% (88% sensitivity; 85.8% specificity). ELISA validation of predictive proteins in an independent validation test set has been performed with candidate protein biomarkers matrix metallopeptidase 1 (MMP1) and matrix metallopeptidase 3 (MMP3) showing significance for differentiating IBD from non-IBD controls. ELISA validation of several additional protein biomarkers for differentiating IBD form non-IBD and CD from UC is ongoing and will be presented.
Conclusion: This study demonstrates the feasibility of SOMAscan to discover high accuracy circulating serum protein biomarkers linked to IBD. The utility of SOMAscan demonstrates not only the clinical value of these diagnostic biomarkers, but also the potential to discover pathophysiological pathways using Ingenuity pathway analysis that distinguish CD from UC and IBD from non-IBD.

323 ***FEATURES AND PREVALENCE OF INFLAMMATORY BOWEL DISEASE IN PEDIATRIC PATIENTS WITH HIDRADENITIS SUPPRATIVA AND ROLE OF CALPROTECTIN IN SCREENING: A SINGLE CENTER EXPERIENCE..*** *Allison Lloyd-McLennan[2], Nicole Kittler[1,4], Sabina Ali[5,3]*
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Children's Hospital Oakland, *Oakland*, *CA*; [4]*Dermatology*, *University of California San Francisco Benioff Children's Hospital Oakland*, *Oakland*, *CA*; [5]*Pediatrics*, *University of California San Francisco*, *San Francisco*, *CA*
Inflammatory Bowel Disease (IBD) is a systemic disorder, associated with extraintestinal manifestations including the skin. Hidradenitis suppurativa (HS) is a chronic inflammatory skin disease characterized by painful recurrent, suppurating, and malodorous abscesses in areas rich with apocrine sweat glands, such as the axillae and genital area (1). There have been reports of concurrence of IBD in patients with HS. It has been reported that prevalence of IBD in adults with HS is around 3.3% with a female predominance (2-3). A recent series described 7 Pediatric Crohn's disease patients diagnosed with HS (4) We therefore investigated features and prevalence of IBD in our pediatric patients with HS by analyzing clinical data and performing a literature review. We also evaluated role of calprotectin as screening modality for IBD in this cohort.

METHODS: We performed a retrospective chart review from 2013 through 2018 at our institution. Patients 6-18 years-old when diagnosed with HS were eligible for inclusion. We identified 109 pediatric patients with HS for inclusion. The majority were female (82.6%), with a median age of HS diagnosis of 15.5 years (9-18 years). Eleven percent were Caucasian, 30.3% African American, 2.8% Asian and 56.9% identified as Hispanic or Latino had HS. We identified total of 5 patients (4.6%) who were diagnosed with IBD, All patients were diagnosed with Ulcerative Colitis (UC) and none with Crohn’s Disease.

RESULTS: We identified five patients (4.6 %) with IBD, all classified as Ulcerative Colitis. Of the 5 patients 2 were black, 2 Hispanic and 1 was Asian. 3 out of 5 were female. All patients had pan colonic disease.48.62 % of HS patients reported gastrointestinal (GI) symptoms. Among patients with HS who reported GI symptoms, fecal calprotectin was ordered in 17%, completed in 8.25%. Of patients with HS who reported GI symptoms, 9.4% were eventually diagnosed with IBD. Fecal calprotectin was elevated (>120 μg/g) in all patients diagnosed with IBD who had a level available. All (100%) of patients with elevated calprotectin levels had GI symptoms.

CONCLUSIONS: Inflammatory Bowel Disease and Hidradenitis Suppurativa are both inflammatory conditions that can develop in the same patient. While the shared etiology between these two diseases remains unclear, screening for IBD should be considered in HS patients.Fecal calprotectin can be a useful initial screening modality.

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325 ***EFFECT OF A PRACTICE-WIDE ANTI-TNF PROACTIVE THERAPEUTIC DRUG MONITORING PROGRAM ON OUTCOMES IN PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASE.*** *John Lyles[1], Aditi Mulgund[1,2,3], Laura Bauman[1], Weizhe Su[4], Lin Fei[7,8], Deepika Chona[1,2], Puneet Sharma[1,5], Renee Etter[1], Jennifer Hellmann[1,8], Lee Denson[1,8], Phillip Minar[1,8], Dana Dykes[1,8,6], Michael Rosen[1,8]*
[1]Gastroenterology, Hepatology, and Nutrition, *Cincinnati Children's Hospital Medical Center*, *Cincinnati*, *OH*; *[2]Internal Medicine*, *University of Cincinnati College of Medicine*, *Cincinnati*, *OH*; *[3]Gastroenterology and Hepatology*, *Medical College of Wisconsin Associated Hospitals*, *Milwaukee*, *WI*; *[4]Mathematical Sciences, Division of Statistics and Data Science*, *University of Cincinnati*, *Cincinnati*, *OH*; *[5]Pediatrics*, *Cincinnati Children's Hospital Medical Center*, *Cincinnati*, *OH*; *[6]GI Care for Kids*, *Atlanta*, *GA*; *[7]Biostatistics and Epidemiology*, *Cincinnati Children's Hospital Medical Center*, *Cincinnati*, *OH*; *[8]Pediatrics*, *University of Cincinnati College of Medicine*, *Cincinnati*, *OH*
Background and Aims: Proactive therapeutic drug monitoring (TDM) during anti-TNF treatment is associated with reduced risk of treatment failure and anti-drug antibodies (ADA) in adults with inflammatory bowel disease (IBD). Reports on the feasibility and effectiveness of translating proactive, anti-TNF TDM into practice-wide quality improvement (QI) are lacking. We aimed to determine whether a TDM QI program improved treatment outcomes at our large academic pediatric gastroenterology practice.

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Methods: In October 2014, we instituted local anti-TNF TDM practice guidelines to proactively monitor and optimize drug levels (goal >5 mg/ml). We conducted a retrospective single-center cohort analysis of patient outcomes before (PreTDM, Oct 2011-2013) and after (PostTDM, Oct 2014-Feb 2017) guideline institution allowing for a 1-year washout period and assessed their independent effect by multivariable regression. The primary outcome was sustained clinical remission (SCR22-52), defined as physician global assessment (PGA) of inactive from 22 to 52 weeks and off corticosteroids at 52 weeks. Secondary outcomes were time to high titer ADA, anti-TNF cessation, anti-TNF cessation related to any detectable ADA, and monthly sustained clinical remission rates.

Results: We identified 108 PreTDM and 206 PostTDM patients. Baseline characteristics and laboratory values were similar except for an expected higher starting IFX maintenance dose in PostTDM patients (8.1±4.4 mg/kg/8wks vs 6.2±2.8 PreTDM, *P*<.001) and expected longer duration of clinical follow up in PreTDM patients (3.0±1.0 years vs 1.9±0.5 PostTDM, *P*<.001). SCR22-52 was achieved in 42% of PreTDM and 59% of PostTDM patients (risk difference 17.6%, 95%CI 5.4-29%, *P*=.004), and the PostTDM group had an increased adjusted odds of achieving SCR22-52 (OR 2.03, 95% CI 1.27-3.26, *P*=.003). The adjusted risk of developing high titer ADA was lower in the PostTDM group (HR .18, 95% CI .09-.35, *P*<.001) (Table 1) (Figure 1). Although the risk of anti-TNF cessation for any reason was not significantly different, there was a lower adjusted risk of cessation related to any detectable ADA in the PostTDM group (HR .45, 95% CI .26-.77, *P*=.003). In addition, after stopping initial anti-TNF, PostTDM patients were more likely to start a drug with a different mechanism of action (33%) compared to PreTDM (11%, *P*=.031), likely due to availability of new drugs. Associations were upheld after multivariable analysis (Table 1). Process control analysis demonstrated improvement in the mean proportion of patients in sustained clinical remission each month from 55.2% in July 2014 to 69.6% in December 2018 following implementation of our anti-TNF proactive TDM program.

Conclusions: A practice-wide proactive anti-TNF TDM QI program improved key clinical outcomes at our institution including sustained clinical remission, incidence of high titer ADA, and anti-TNF cessation related to ADA.

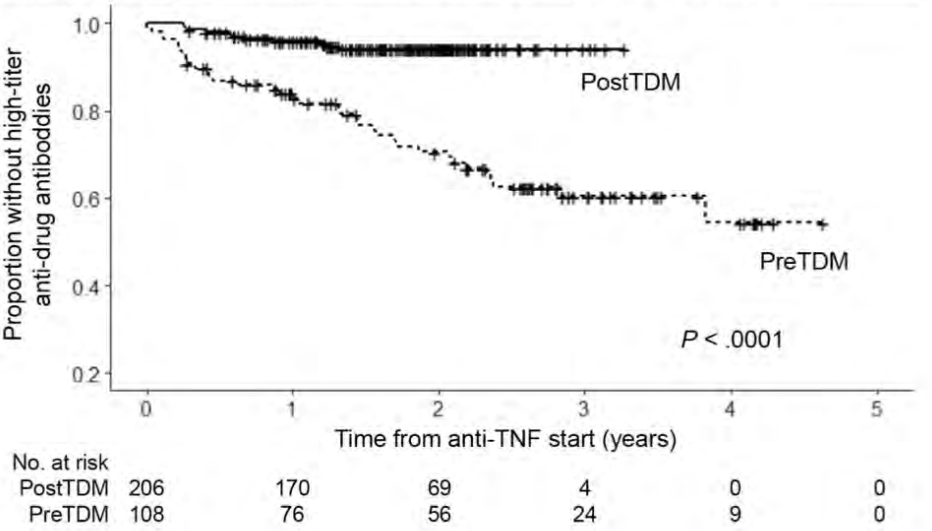
Table 1. Variables significantly associated with outcomes by univariable and multivariable analysis

	Univariable			Multivariable		
	P	OR/HR	95%CI	*P*	OR/HR	95%CI
SCR22-52						
PostTDM vs. PreTDM	.003	2.03	1.27-3.26	.003	2.03	1.27-3.26
UC/IBD-U vs. CD	.068	.60	.35-1.04			
Time to High Titer ADA						
PostTDM vs. PreTDM	<.001	.18	.09-.35	<.001	.18	.09-.35
High drug dose	.027	.31	.11-.88			
Time to anti-TNF cessation						
Age	.067	.95	.90-1.00	.04	.94	.89-.99
UC/IBD-U vs. CD	.001	2.08	1.34-3.23	<.001	2.15	1.38-3.33
Time to anti-TNF cessation due to any detectable ADA						
PostTDM vs. PreTDM	.005	.47	.27-.79	.003	.45	.26-.77
Age	.019	.92	.86-.99	.012	.92	.86-.98

Variables tested: PostTDM vs. PreTDM, age, sex, race, weight at first anti-TNF dose, diagnosis, anti-TNF dose (high vs. standard), prior anti-TNF use, immunomodulator use for at least 3 months, albumin, C-reactive protein, PGA

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Figure 1. Proportion of PostTDM vs. PreTDM patients without high titer ADA over time



326 ***ANEMIA PREVALENCE IN PEDIATRICS INFLAMMATORY BOWEL DISEASE: STILL PERSISTED AFTER 1 YEAR.*** *Preeti Malik[1], Mimi Kim[2], Gia Puopolo[1], John Thompson[1], Gitit Tomer[1]*
[1]Pediatrics, Division of Gastroenetrology, Hepatology and Nutrition, The Children's Hospital at Montefiore, Bronx, NY; [2]Department of Epidemiology & Population Health, Albert Einstein College of Medicine, Bronx, NY

Introduction: Anemia is a common complication of pediatric inflammatory bowel disease (IBD) patients. It significantly affects the quality of life and impacts cost of healthcare. Identifying anemia in our pediatric IBD patients can lead to interventions that will improve quality of life.

Aim: 1) Evaluate the prevalence of anemia and treatment for anemia at IBD diagnosis, 6 month and 1 year follow up. 2) Identify predictors of anemia at diagnosis.

Methods: We performed a retrospective study on pediatrics patients diagnosed with IBD from Jan 2011- March 2018 who are actively enrolled in ImproveCareNow (ICN), a multicenter, prospective pediatric IBD registry. Patients who had hemoglobin, albumin and CRP levels obtained at the time of diagnosis, 6 months and 1 year follow-up were included in the study. Clinical and demographic information was obtained using chart review and ICN database. Anemia was classified according to the WHO classification. Data was analyzed with SAS software using Fisher exact, Chi-square, Wilcoxon Rank Sum and paired t tests. The p value of <0.05 was considered statistically significant.

Results: In a final cohort of 68 IBD patients (47-CD and 21-UC), 64.2% were male, 47.1% were Hispanic and 23.5 % were African American. Overall 69.1% of our IBD patients were anemic at diagnosis, 44.1% at 6 months follow up and 33.8% at one year follow up respectively. We found that IBD patients with low albumin at diagnosis are more likely to have anemia ($p<0.0001$). Bivariate analyses showed that, after one-year follow up, there was significant increase in mean hemoglobin and albumin levels and decrease in mean CRP levels ($p<0.0001$, $p<0.0001$ and $p<0.0002$) respectively in patients with anemia compared to no anemia. 75% of anemic population was treated with oral iron therapy at diagnosis which increased to 90% treatment at 6 months follow up and then 81% at one year follow up. In multivariable analyses using logistic regression, younger age and low albumin levels at diagnosis were significant predictors of anemia at diagnosis ($p<0.015$, $p<0.0015$) respectively.

Conclusion: We found that more than half of our (69.1%) patients had anemia at diagnosis. After one year there was decrease in anemia prevalence but it still persisted. None of our patients received IV iron therapy. This explains the need for developing new quality improvement intervention for early diagnosis and treatment of persistent anemia in pediatrics IBD patients.

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Table1: Demographics and clinical features of Pediatrics IBD population

Variable	Overall IBD N =68 (%)	Anemia N=47(%)	No Anemia N=21(%)	p value
Age at Diagnosis				
Mean± SD	13±3	12±3	14±4	0.0131
Gender				
Male	44 (64.71)	27(56.52)	17 (80.95)	0.053
Female	24 (35.29)	20(43.48)	4 (19.05)	
Ethnicity				
White	13 (19.12)	9 (19.15)	4 (19.05)	0.3631
African-American	16 (23.53)	13 (27.66)	3 (14.29)	
Hispanic	32 (47.06)	22 (46.81)	10 (47.62)	
Others	7 (10.29)	3 (6.38)	4 (19.05)	
Type of IBD				
CD	47 (69.12)	35(74.47)	12 (57.14)	0.1531
UC	21 (30.88)	12 (25.53)	9 (42.86)	
Location Crohn's Disease (CD)				
Ileal	9 (13.24)	7(14.89)	2 (9.52)	1.000
Ileocolonic	29 (42.65)	21 (44.68)	8 (38.10)	
Colonic	9 (13.24)	7 (14.89	2 (9.52	
Location Ulcerative colitis (UC)				
Pancolitis	15 (22.06)	9 (19.15)	6 (28.57)	0.4060
Proctitis	2 (2.94)	0 (0)	2 (9.52)	
Left Side UC	3 (4.41)	2 (4.26)	1(4.76)	
Extensive UC	1 (1.47)	1 (2.13)	0 (0)	
Steroids				0.0844
Yes	30 (44.12)	24 (51.06)	6 (28.57)	
No	38 (55.88)	23 (48.94)	15 (71.43)	
Type of Anemia at diagnosis				
Mild- Moderate		32 (47.06)		
Severe		15 (22.06)		
Treatment at diagnosis				
Oral	41 (60.29)	35 (74.47)	6 (28.57)	0.0004
No Treatment	27 (39.71)	12 (25.53)	15 (71.43)	
Type of Anemia at 1 year follow up				
Mild- Moderate		20 (29.41)		
Severe		3 (4.41)		
Treatment at 1 year follow up				
Oral	49 (73.13)	38 (80.85)	11 (55.00)	0.0289
No Treatment	18 (26.87)	9 (23.40)	9 (35.00)	

* Please note all the percentages in the bracket are column percentages to compare anemia with no anemia with other variables.

Demographics and clinical features of Pediatrics IBD population

329 ***COMPREHENSIVE CARE FOR CHILDREN WITH INFLAMMATORY BOWEL DISEASES: WHOSE JOB IS IT ANYWAY?*** *Hilary Michel[1], Sandra Kim[1], Nalyn Siripong[3], Robert Noll[2]. [1]Gastroenterology, Hepatology and Nutrition, Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]Pediatrics, University of Pittsburgh School of Medicine, Pittsburgh, PA; [3]Clinical and Translational Science Institute, University of Pittsburgh, Pittsburgh, PA*

Background: Inflammatory bowel diseases (IBD) are chronic conditions of the gastrointestinal tract. Approximately 20% of patients are diagnosed as children, and all require life-long treatment. Primary care recommendations also exist for patients with IBD. Despite these guidelines, research suggests that adult patients are at risk for receiving inadequate primary care. We aimed to explore patterns of care delivery in pediatric patients with IBD to delineate which members of the healthcare team were providing services and to identify gaps in care.

Methods: We conducted a cross-sectional survey of parents of children with IBD (ages 2-17 years) and adolescents

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with IBD (ages 13-16 years) at a large free-standing children's hospital. The survey assessed family demographics; patient medical history; and details of primary and IBD care. Specifically, we presented 18 different healthcare services and inquired who provided each service within the past year.

Results: 214 parents and 140 adolescents agreed to participate in the study. 3 parents and 7 adolescents declined. One hundred sixty one parents (75% response) and 84 adolescents (60% response) completed the survey. Mean patient age was 13.9 years (SD 2.7); 51% were male, 80% had Crohn's, 16% had ulcerative colitis, and 4% had indeterminate colitis. The mean duration of disease was 4 years (SD 2.6). 78% of patients were on biologics, and 38% were on immunomodulators. 30% of patients had at least one other chronic disease. Mothers primarily completed the survey (86%). The majority of parents were Caucasian (94%), had a bachelor's degree or higher (61%), and were part of a two-parent household (79%) living in a suburban setting (57%). Patients mostly had private insurance (43%) or private primary insurance with public secondary insurance (34%).

In the last year, the majority of patients received annual check-ups (70%), vaccinations (78%), and care for minor illnesses (74%) at their PCP office. Check-ups for gastrointestinal symptoms, monitoring of IBD activity, and adjustment of IBD therapy were provided by the IBD provider in 77, 93, and 86% of patients, respectively. Discussions about puberty were completed by a medical provider in about 80% of patients, and this task was frequently shared by the PCP and IBD provider. Discussions about family and peer relationships; school and extracurricular activities; and mood were not addressed 30-40% of the time. Significant proportions of adolescents reported that no one had talked to them about alcohol or drug use (40%), sexual or reproductive health (50%), or body image (60%). 79% of parents and 75% of adolescents reported that no one had discussed transitioning to an adult provider in the last year.

Conclusions: Children and adolescents with IBD are missing essential components of their care, especially in the areas of social and emotional health. Lack of clarity regarding ownership of these tasks by health care providers may be contributing. Future work should identify barriers to comprehensive care in pediatric IBD, explore consequences of incomplete care, and support the development of roadmaps to guide care delivery for families and providers.

330 ***PATTERNS OF PRIMARY, URGENT, AND EMERGENT CARE IN PEDIATRIC PATIENTS WITH INFLAMMATORY BOWEL DISEASES.*** *Hilary Michel[1], Robert Noll[3], Nalyn Siripong[2], Sandra Kim[1].*
[1]Gastroenterology, Hepatology and Nutrition, Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]Clinical and Translational Science Institute, University of Pittsburgh, Pittsburgh, PA; [3]Pediatrics, University of Pittsburgh School of Medicine, Pittsburgh, PA
Background: Approximately 20% of patients with inflammatory bowel diseases (IBD) are diagnosed as children and adolescents. They require life-long, disease-specific treatment and monitoring in addition to routine health maintenance services. We aimed to explore patterns of care delivery in pediatric patients with IBD and understand how disease-related, health care system-related, and socioeconomic factors may affect emergency department (ED) and urgent care utilization.

Methods: We conducted a cross sectional survey of parents of children with IBD ages 2 to 17 years at a large free-standing children's hospital. The survey assessed family demographics; patient medical history; details of primary and IBD-specific care; and logistical details related to receipt of care.

Results: 214 parents agreed to participate in the study and 3 declined; 161 (75% response rate) completed our survey. Mean patient age was 13.9 years (SD 2.7); 51% were male, 80% had Crohn's, 16% had ulcerative colitis, and 4% had indeterminate colitis. The mean duration of disease was 4 years (SD 2.6). 78% of patients were on biologics, and 38% were on immunomodulators. 30% of patients had at least one other chronic disease. Mothers primarily completed the survey (86%). Our population was predominantly Caucasian (94%). The majority of parents had a bachelor's or higher degree (61%) and were part of a two-parent household (79%) living in a suburban setting (57%). Patients mostly had private insurance (43%) or private primary insurance with public secondary insurance (34%).

The majority of parents reported their child had 1 to 2 IBD-related office visits (54%) and no IBD-related ER visits (79.5%) or hospitalizations (78.8%) within the past year. 31% of patients had a lifetime history of an IBD-related surgery. 93% of patients had a GI attending and 7% a GI fellow as their primary IBD provider. The majority of

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patients were seen at the main children's hospital, while about a third were seen at satellite locations. Patients were almost always able to see the same provider at IBD visits, and usually were seen at the same office.

88% (n=141) of the parents reported having a primary care provider (PCP) for their child. Of these patients, most (70%) saw their PCP 1 to 2 times per year. Patients were able to see the same PCP 60% of the time. 89% of families lived within 15 miles of the PCP office; 38% lived within 15 miles of their IBD provider. 20% of families lived greater than 60 miles from their IBD provider. 90% of patients could get to their PCP in less than 30 minutes compared to 30% who could get to their IBD provider in this timeframe. Nearly all parents (98%) reported driving their own car to IBD and PCP visits. Of the 139 patients who received health care from places other than their PCP or IBD provider, 30% were seen in the ER, 54% were seen at an urgent care, and 52% were seen by another specialty doctor.

We completed further analyses to determine if patient-level, system-level, or socioeconomic variables predict ED or urgent care use. There were no statistically significant differences in ED/urgent care use by patient age, presence of other chronic conditions, use of immunosuppressive therapy, history of IBD-associated hospitalization in the past year, or history of IBD-related surgery. Neither living setting (rural vs. urban vs. suburban) nor insurance status predicted use. While having a PCP had no significant effect on ED/urgent care use, there was a trend toward increased utilization in those who visited the PCP more frequently, but this did not reach statistical significance ($p = 0.08$). Children of parents with less than a bachelor's degree were more likely to have used the ED or urgent care in the past year compared to those with a bachelor's degree or greater (85% vs. 67% respectively, $p = 0.03$).

Conclusions: The majority of children with IBD had a PCP and saw them on a regular basis in addition to their IBD medical visits. The PCP office tended to be closer to home and require less travel time. Even so, a majority of children also received care in the ER/urgent care, and lower parental education level was significantly associated with increased use. Future studies should examine why children with IBD are using the ED/urgent care, in what ways parental educational level modulates utilization, and where this care should optimally be delivered.

331 ***USER CENTERED DIGITAL DEVELOPMENT OF A DECISION SUPPORT TOOL TO IMPROVE ANEMIA CARE IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Steven Miller[1], Harold Lehmann[1], Zachary Murphy[1], Joshua Gray[1], Ayse Gurses[2], Andrew Maslen[2], Maria Oliva-Hemker[1]. [1]Pediatrics, Johns Hopkins University School of Medicine, Baltimore, MD; [2]Health Science Informatics, Johns Hopkins University School of Medicine, Baltimore, MD*

Background: Anemia is a common complication of inflammatory bowel disease (IBD) in children. Despite the high prevalence of anemia, most children do not receive guideline-recommended screening for iron deficiency anemia (IDA) and subsequent treatment with iron. Computerized clinical decision support (CCDS) could help improve IBD anemia screening and treatment. Many CCDS interventions have shown poor uptake by providers due to poor usability. User-centered digital development (UCDD) can be used to optimize adoption of a CCDS to improve anemia care. UCDD is a model for development of CCDS that puts the user at the center and involves four phases: concept generation, user testing, pilot testing, and optimization.

Objective: Implement UCDD to develop a usable CCDS tool to improve anemia screening and treatment in children with IBD.

Methods: Baseline rates of anemia screening prevalence, and treatment informed the UCDD concept generation phase. A multidisciplinary team carried out interviews and workflow observations to create a prototype IBD anemia CCDS. During the UCDD user testing phase, practitioners completed "Think Aloud" usability testing, which involved speaking their thoughts as they used the CCDS. Each participant completed four mock patient encounters, which varied by setting, presence of IDA, and prior screening. Participants completed the system usability scale (SUS). Two study staff independently coded audio/video transcripts for metrics of usability.

Results: The initial data analysis of our cohort of n=634 IBD patients over 2 years, 90.2% were screened for anemia and 39.1% for iron deficiency (ID). Of those screened for anemia (n=572), 59.3% were anemic and among those screened for ID (n=248), 65.3% had IDA. Of those with IDA (n=162), 56.2% were prescribed iron. Workflow analysis showed that CCDS would be most beneficial if it helped provider cognitive workload around diagnosis and treatment during encounters. Based on this data, a prototype CCDS was built. "Think Aloud" usability testing of the

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tool proceeded over 2 rounds with 3 providers per round who varied according to role and experience. This feedback is summarized in Table 1. The average SUS score was 77.5 / 100. The final version of the tool is shown in Figure 1.

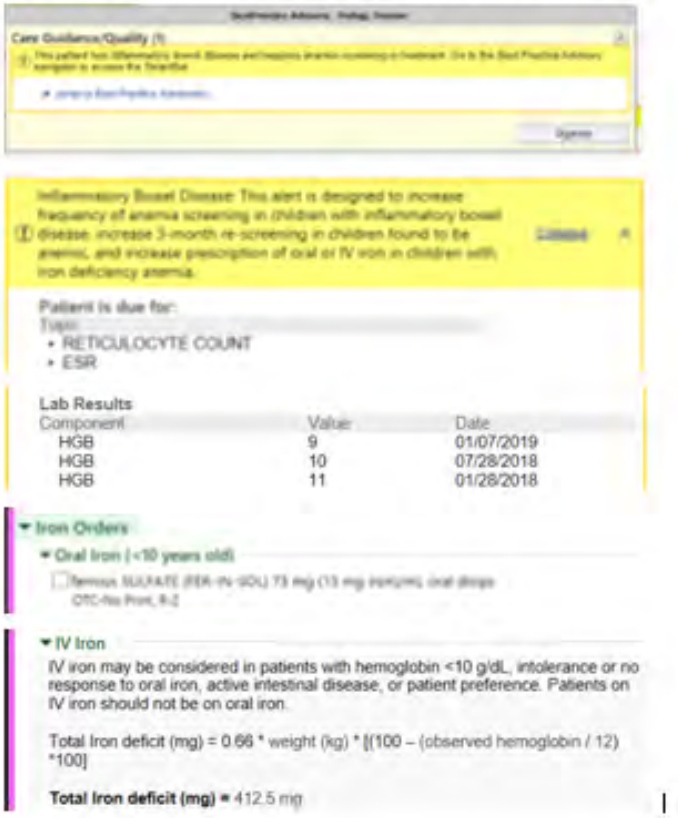
Discussion: This is the first use of UCDD in the field of pediatric gastroenterology. It demonstrates that detailed analysis of patient data and workflow with end-user interviews can generate a working prototype that can be iteratively refined with end-user input to create a usable CCDS tool. A key part of the process was the baseline data analysis showing fair rates of IDA screening and treatment at our institution, though iron treatment was likely underestimated given the use of over the counter iron. The high rates of anemia and IDA gave the team insight into areas to target in the CCDS and also lead to implementation of a strategy of annual IDA screening. “Think Aloud” testing showed that practitioners wanted an interruptive alert that contained comprehensive information for decision-making and reduced provider work with links to orders and calculation of iron dosage. In the future, this tool will be implemented and optimized with potential for scaling across centers.

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Table 1: Selection of "Think Aloud" usability feedback

Usability Metric	Quote	Actionable suggestion
Usability	"I cannot remember everything off the top of my head."	Include normal values
Visibility	"The pop-up really brings your attention to the anemia."	Use interruptive alert
Workflow	"It would be helpful if that took me to the alert."	Add a link to the alert section
Content	"I see it says not due but here it says due."	Correct smartset logic
Understandability	"I presume they are not on iron at this time, right?	Include iron rx information
Practical usefulness	"It's confusing for providers to do that equation."	Automatically calculate iron repletion
Medical usefulness	"I [can't be] sure that this is iron deficiency anemia."	Include pertinent lab results
Navigation	"It would be nice if the treatment plan would actually show."	Ensure infusion link is functional

Figure 1: Final computerized clinical decision support system tool



332 ***INFLIXIMAB DASHBOARD POWERED BY PHARMACOKINETIC MODELING WITH BAYESIAN ESTIMATION SIMPLIFIES INTERPRETATION OF THERAPEUTIC DRUG MONITORING.*** *Phillip Minar*[1], *Ye Xiong*[1], *Kelly Thomas*[2], *Alexander Vinks*[1]. [1]*Pediatrics*, *Cincinnati Children's*, *Cincinnati*, *OH*; [2]*University of Cincinnati*, *Cincinnati*, *OH*

Background: The approved dosing regimen for infliximab (IFX) in Crohn's disease (CD) is 5 mg/kg at 0, 2 and 6 weeks (induction) followed by infusions every 8 weeks (maintenance). Despite significant improvements in outcomes with IFX, the yearly loss of response rate is 12% while >25% develop auto-drug antibodies secondary to subtherapeutic drug concentrations. These poor long-term response rates are in line with the observation that most

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therapeutic dosing regimens have been designed for the “average patient” and not based on a well characterized dose-exposure-response relationship. We aimed to simplify and personalize the interpretation and subsequent, clinician response to IFX therapeutic drug monitoring. **Methods:** With support from a software designer, we have built an operational decision support tool for IFX, RoadMAB^{TM}. Utilizing Bayesian estimation and the published Fasanmade et al. pharmacokinetic (PK) model[1], RoadMAB^{TM} allows the clinician to interpret IFX drug concentrations collected at any timepoint during induction or maintenance phase to instantaneously provide precision dosing recommendations for the individual patient at the point of care. **Results**: To demonstrate RoadMAB^{TM} functions, we have created the following patient simulation. The CD patient is a 16 year old male with a weight of 60 kg. For the Fasanmade et al model, patient weight, serum albumin, presence of antibodies to IFX and use of immunomodulators were found to be significant covariates of clearance (CL).[1] For this patient, serum albumin was 3.2 mg/dL, he had no antibodies to IFX and was not on an immunomodulator. The patient received 300 mg of IFX with standard induction at 0, 2 and 6 weeks. Based on the patient’s PK parameters, the model predicted a start of maintenance (week14) trough of 1.9 µg/ml (Figure1a). In Figure1b, we show the predicted week 14 trough was 2.7 µg/ml based on a mid-interval drug concentration obtained at 10 weeks (4 weeks from the last dose) of 12 µg/ml. Unsatisfied with this subtherapeutic trough, the clinician then provides feedback to the Dashboard by inputting a maintenance target range of 5-10 µg/ml. The Dashboard then calculates the next dose should occur 5 weeks and 2 days from the previous dose to achieve a predicted trough of 7.4 µg/ml (Figure2). **Conclusion**: While additional studies are needed to test the usability and efficacy of model-informed dosing, physician support tools, such as the RoadMAB^{TM} Dashboard, are novel methods to integrate individual parameters (biomarkers) to personalize infusion regimens and more accurately achieve user-defined targeted drug concentrations.

1. Fasanmade et al. Clin Ther. 2011 Jul:33(7): 946-64

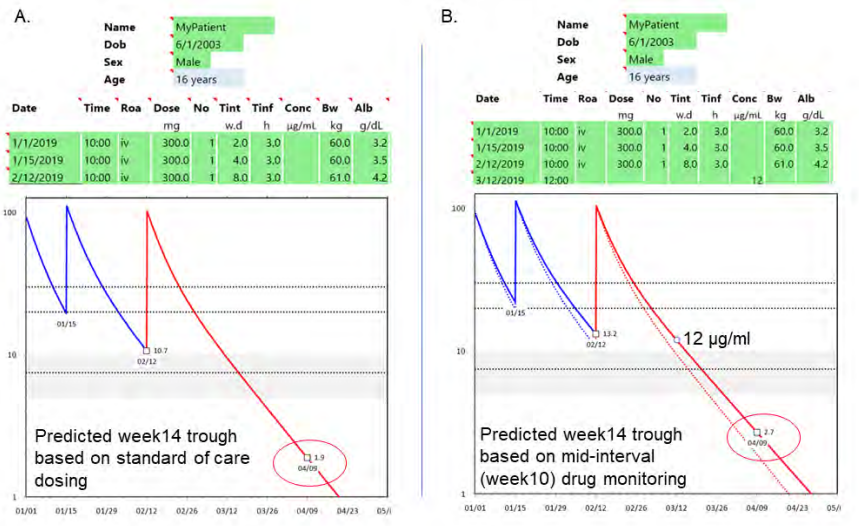


Figure 1. RoadMABTM displays patient demographics, infusion regimen with dates and time of administration and produces a PK curve for the individual patient. A). The first IFX dose was on 1/1/2019. With a weight of 60 kg, the patient received 300 mg of IFX at 0, 2 and 6 weeks. Using a previously published PK model, RoadMABTM predicted a trough at the start of maintenance of 1.9 µg/ml (circled). B). For the same simulated patient, the IFX concentration at week 10 (4 weeks from the 3rd induction dose) was 12 µg/ml. Utilizing Bayesian estimation (patient feedback) and the patient’s individual PK, the model predicted a start of maintenance (infusion4, week14) trough of 2.7 µg/ml (circled)

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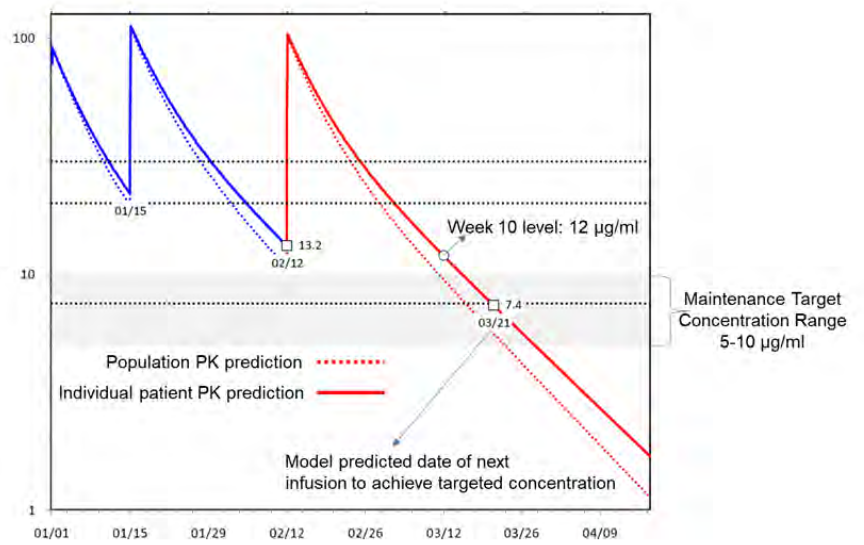


Figure 2. RoadMABTM displays the predicted PK curves for the population (dashed line) and individual patient (line). For this simulated patient, to achieve the physician selected, target concentration (5-10 µg/ml), the first maintenance dose should be administered 5 weeks and 2 days from the last infusion (3rd induction dose), on 3/31/2019. Although not shown, RoadMABTM provides the clinician the opportunity to simulate multiple alternative dosing strategies.

334 ***DIAGNOSTIC ACCURACY OF SERUM PROTEINASE 3 ANTINEUTROPHIL CYTOPLASMIC ANTIBODIES FOR PEDIATRIC PATIENTS WITH ULCERATIVE COLITIS: A PROSPECTIVE MULTICENTER STUDY IN JAPAN.*** *Tatsuki Mizuochi[1], Katsuhiro Arai[2], Takahiro Kudo[3], Ryusuke Nambu[4], Hitoshi Tajiri[5], Tomoki Aomatsu[6], Naoki Abe[7], Toshihiko Kakiuchi[8], Kunio Hashimoto[9], Tsuyoshi Sogo[10], Michiko Takahashi[11], Yuri Etani[12], Yugo Takaki[1], Ken-ichiro Konishi[1], Jun Ishihara[1], Shunsuke Kurei[13], Keiichi Mitsuyama[14]*
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Background: Various serologic markers such as perinuclear antineutrophil cytoplasmic antibodies (p-ANCA), the putative antigen is thought to be myeloperoxidase (MPO), have been reported to screen for patients with ulcerative colitis (UC). However, MPO-ANCA was found to have limited accuracy in Asian population. The antigen recognized by cytoplasmic pattern ANCA (c-ANCA) is a 29-kD serine protease from myeloid azurophilic granules that is known as proteinase 3 (PR3). Takedatsu et al reported that serum PR3-ANCA is more useful for diagnosis of UC in Japanese adult population than MPO-ANCA (sensitivity of 39.2% and specificity of 96.6%; J Gastroenterol Hepatol 2018). The aim of this study was to clarify whether PR3-ANCA is a useful serologic marker for diagnosis of UC in Japanese pediatric population.
Methods: Subjects were prospectively enrolled children under 17-year-old who visited at 12 pediatric centers in Japan between November, 2016 and February, 2018 and were divided into 4 groups such as patients with UC, Crohn's disease (CD), intestinal disease control (IDC) including IBD unclassified, Behçet's disease, and XIAP deficiency, irritable bowel syndrome and infectious colitis, and healthy control (HC). Serum PR3-ANCA was analyzed using chemiluminescence enzyme immunoassay kits (STACIA® MEBLux™ test, Medical and Biological Laboratories, Aichi, Japan). The cutoff value of the assay, as provided by the manufacturer, was ≥ 3.5 U/mL.
Results: Three hundred and sixty-seven serum samples from 148 patients with UC (median age, 12 years), 120 CD (13y), 56 IDC (10.5y), and 43 HC (10y) were examined. PR3-ANCA levels (median) in UC, CD, IDC, and HC were

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1.6 U/mL, 0.2 (compared with UC, *P<0.001*), 0.15 (*P<0.001*), and 0.1 (*P<0.001*), respectively. ROC analysis demonstrated an area under the curve of 0.80. The manufacturer's cutoff value (3.5 U/mL) had a sensitivity of 36.5% and specificity of 93.2% for diagnosing UC. A cutoff value of 0.8 U/mL according to the ROC curve demonstrated higher sensitivity (64.9%) and good specificity (85.3%).
Conclusion: PR3-ANCA was a useful serologic marker for diagnosis of UC in Japanese children.

335 ***COMORBID DIAGNOSIS OF EOSINOPHILIC ESOPHAGITIS AND INFLAMMATORY BOWEL DISEASE IN CHILDREN.*** *Hillary Moore[1], Joshua Wechsler[2,3], Sara Rosenbaum[4], Robert Baldassano[1,5], Jonathan Markowitz[6,7], Amanda Muir[1,5]. [1]Gastroenterology, Hepatology, and Nutrition, Children's Hospital of Philadelphia, Philadelphia, PA; [2]Gastroenterology, Hepatology & Nutrition, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [3]Northwestern University Feinberg School of Medicine, Chicago, IL; [4]Pediatrics, Children's Hospital of Philadelphia, Philadelphia, PA; [5]Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA; [6]Gastroenterology and Nutrition, Greenville Hospital System Children's Hospital, Greenville, SC; [7]University of South Carolina School of Medicine-Greenville, Greenville, SC*
Background: Eosinophilic Esophagitis (EoE) and Inflammatory Bowel Disease (IBD) are immune-mediated diseases of the gastrointestinal tract associated with high morbidity. Both diseases have complex pathogenesis that involves helper T call (Th) and cytokine mechanisms of inflammation, as well as abnormalities in epithelial barrier function. Given these shared pathologic mechanisms, co-occurrence of both diseases in the same patient is not uncommon. While recent studies have begun examining this diagnosis overlap in the general population, few studies have investigated this co-occurrence in children specifically. We sought to examine the cohort of children at our quaternary care institution with comorbid diagnoses of both EoE and IBD to better understand the epidemiology and clinical implications of this disease overlap in the pediatric population.

Methods: We conducted a chart review of all patients seen at the Children's Hospital of Philadelphia (CHOP) from January 2008 to December 2018 with diagnoses of both EoE and IBD. The definition of EoE was based on the 2018 AGREE guidelines. IBD diagnosis was based on endoscopic and histologic findings. Data including demographic information, concomitant history of atopy, and age at the time of each diagnosis were documented. Classification of IBD and location and phenotype of Crohn's disease (CD), if applicable, were documented. In terms of EoE, endoscopic findings and histology were noted. These parameters were also evaluated in 150 randomly-selected subjects with a diagnosis of IBD alone and 150 subjects with EoE alone.

Results: Fifty-four subjects were identified as having diagnoses of both EoE and IBD. During the time period of interest, 2630 patients at CHOP carried a diagnosis of EoE, and 2135 carried a diagnosis of IBD. The prevalence of IBD in the EoE population was 2.1% (54/2630) and the prevalence of EoE in the IBD population was 2.5% (54/2135).

Subjects with both EoE and IBD were more likely to have an IgE-mediated food allergy compared to subjects with IBD alone (35% vs. 7%, p = 0.001). In general, subjects with EoE alone were more atopic than subjects with dual-diagnosis in all categories (95% vs 59%, p = 0.001).

The rates of CD, Ulcerative Colitis (UC), and Indeterminate Colitis (IC) were similar in the dual-diagnosis and IBD alone groups. In terms of CD phenotype, subjects in the dual-diagnosis group were less likely to have perianal disease than those subjects with CD in the IBD alone group (3% vs. 20%, p = 0.013). There was otherwise no difference in terms of disease location or phenotype between the dual-diagnosis and IBD alone groups. There was no difference in the presence of fibrostenotic disease, defined by food impaction, stricture, visualization of rings on endoscopy, and/or lamia propria fibrosis on histology, between the dual-diagnosis and EoE alone groups. There was no difference in terms of mean age of diagnosis of IBD between groups. Subjects in the EoE alone group were younger at age of diagnosis of EoE than those in the dual-diagnosis group (7.3(4.9) vs. 12.1(4.9), p = 0.001).

Discussion: The rate of coexistence of EoE and IBD was similar or higher in our population than in other published studies. This may be due to a disproportionately rapidly increasing incidence of both diseases in the pediatric population. Subjects with dual-diagnosis were more likely to have IgE-mediated food allergies than subjects with IBD alone. This suggests that there should be a high index of suspicion for EoE in IBD patients with atopic comorbidities, specifically those with IgE-mediated food allergies. Subjects with perianal CD were less likely to have concomitant EoE, so the index of suspicion in this group may be lower. Otherwise, there does not seem to be a

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phenotypic difference between the dual-diagnosis population and the single diagnosis populations. Further investigation into shared underlying pathologic mechanisms of these diseases will help to elucidate the predisposition, natural history, and most effective treatment modalities for these patients.

336 ***SOMASCAN AS A DISCOVERY PLATFORM TO IDENTIFY PREDICTIVE SERUM PROTEOMIC BIOMARKERS OF INFLIXIMAB RESPONSE IN PEDIATRIC PATIENTS WITH CROHN'S DISEASE.*** *Tina Morhardt[1], Simon Dillon[2], Hasan Otu[3], Gabor Veres[4], Towia Libermann[2], Harland Winter[1]. [1]Pediatrics, Division of Gastroenterology, Massachusetts General Hospital for Children, Brookline, MA; [2]Beth Israel Deaconess Medical Center, Boston, MA; [3]University of Nebraska, Lincoln, NE; [4]University of Debrecen, Debrecen, Hungary*
Objectives and Study: Anti-TNF therapies such as infliximab (IFX) are particularly effective in ameliorating Crohn's disease (CD) in many, but not all, patients. Importantly, not all patients respond to these immune-modulatory biologics (primary non-response) and many patients secondarily lose response during treatment. Mechanisms underlying infliximab efficacy have yet to be fully elucidated and, to date, there are no reliable non-invasive biomarkers predictive of the response and outcome upon infliximab therapy. Our aim was to evaluate the utility of SOMAscan, a new aptamer-based proteomics platform, for identifying serum proteins predictive of response to infliximab in pediatric CD patients.

Methods: Serum from pediatric CD patients (N=17) prior to treatment with IFX were analyzed on SOMAscan prior to standard induction and dosing at 5 mg/kg. Primary outcome for response was at least a 15 point decrease in Pediatric Crohn's Disease Activity Index (PCDAI) compared to baseline at the 4thinfusion. Using SOMAscan (SomaLogic; Boulder, CO), an aptamer-based proteomics platform, quantitative protein profiles were generated to identify candidate protein biomarkers predictive of therapeutic response and outcome. Associations between the 1,305 proteins detected with SOMAscan and the improvement in disease activity were assessed using t-test. Targeted validation studies were performed using a standard diagnostic assay, ELISA.

Results: Six out of 17 patients did not show improvements in PCDAI scores after IFX therapy. SOMAscan and discriminatory analysis of the 17 pre-treatment samples defined a set of differentially expressed proteins discriminating between patients who despite IFX therapy, did not demonstrate an improvement in disease activity. Disease activity was linked to differential expression of 102 proteins ($p<0.05$) in pre-treatment serum samples including increased expression of proinflammatory proteins. ELISA measurement of the candidate biomarkers in a **validation** cohort have confirmed clusterin (CLU) as a highly significant candidate protein that may predict clinical response to infliximab. Using Ingenuity pathway analysis further identifies inflammatory and apoptosis pathways involved in response to IFX.

Conclusion: This study demonstrates the feasibility of SOMAscan to identify potential biomarkers of response and outcome. If confirmed to be mechanistically involved in response to IFX, targeted inhibitors of these proteins may serve as effective methods to enhance response to IFX. Clusterin, induced by apoptotic stimuli, has been shown previously to be associated to inflammatory bowel disease, however this is the first report demonstrating clusterin's association with response to IFX in pediatric CD.

LIVER

344 ***EMPLOYING GENETIC APPROACHES FOR IDENTIFYING THE ETIOLOGY OF PREVIOUSLY UNDIAGNOSED FAMILIES WITH RARE PEDIATRIC GASTROINTESTINAL DISORDERS.*** *Eyad Altamimi[1,2], Omar Rabab`h[3], Lina Mustafa[4], zain Dardas[5], lama Srour[4], Belal Azab[5]*
[1]Pediatric, Jordan University of Science and Technology, Irbid, Jordan; [2]Pediatric, King Abdullah University Hospital, Irbid, Jordan; [3]Jordanian Medical services, Irbid, Jordan; [4]The University of Jordan, Amman, Jordan; [5]Pathology, Microbiology and Forensic Medicine, The University of Jordan, Amman, Jordan
Introduction:
The traditional approach to rare medical conditions frequently leaves the affected individual without a diagnosis or effective treatment. This includes determining the etiology of children suffering from unexplained life threatening gastrointestinal (GI) disorders. Those rare disorders when associated with familial recurrence or parental consanguinity could probably be due to genetic drives. Recent advancements DNA sequencing technologies have allowed genetic diagnosis of a certain disease-causing gene panel, to Whole Exome Sequencing (WES) and Whole Genome Sequencing (WGS). In this study we aimed to utilize genetic approaches to reach proper diagnosis of four

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Jordanian families suffering from undiagnosed GI disorders.

Methods: Consanguineous families affected with GI diseases, who were investigated thoroughly with no confirmed diagnosis were included in this study. WES was performed on the affected proband of four families. Briefly, exome enrichment of the patient's extracted DNA was performed using Agilent SureSelect Human All Exon V6 kit. DNA was sequenced using 100 bp paired-end reads on Illumina NovaSeq platform. Raw data were processed by Illumina base-calling software 1.7 using default parameters. The sequencing reads were aligned to the NCBI reference sequence (GRCh38), using the Burrows-Wheeler Aligner (BWA), and variant calls were made using the Genomic Analysis Tool Kit (GATK). The detected variants were annotated and filtered against four databases (i.e., NCBI CCDS, RefSeq, Ensembl and Encode.

Results: To determine the disease-causing gene multistep analysis approach was applied using Illumina basespace variant interpreter tool. Variants were filtered based on (i) Quality (total read depth ≥ 10. (ii) Genomic position (within exons and flanking intronic regions). (iii) Allele frequencies; we only included variants with MAF < 0.01 in EXAC, gnomAD, 1000 Genomes project, or ESP. (iv) Mode of inheritance. The variants were then classified as benign, likely benign, variant of unknown significance, likely pathogenic, and pathogenic according to the American College of Medical Genetics and Genomics (ACMG) standards and guidelines for the interpretation of sequence variants.
The affected children clinical presentations varied between chronic diarrhea, chronic constipation and cholestasis. Family 1; a patient with congenital diarrhea and recurrent dehydration, after exclusion of other possible differential, his WES revealed a novel pathogenic variant in the NEUROG3 gene. Family 2; two sisters presented with high GGT cholestasis and severe itching. An older sister with liver cirrhosis died after massive upper GI bleeding. Although their liver biopsies highly suggestive of Progressive Familial Intrahepatic Cholestasis (PFIC), their WES demonstrated that all classical candidate gene were normal while, a new candidate gene (MPRIP) identified might be responsible for their condition. Family 3; young girl with infantile intestinal obstruction, underwent colostomy under the assumption of Hirschsprung's disease. Colonic biopsies` results showed reduced ganglions` number. Her condition never improved even with higher level ileostomies and kept re-obstructed. Her WES came back homozygous for (ACTG2 gene) which is believed to be responsible for her recurrent pseudo-obstructions. Family 4; a 2.5-year-old girl presented with severe perianal skin tags. The tags removed surgically. The histopathology examination confirmed the presence of granuloma. Extensive immunological workup came back normal. Overtime developed persistent fever, diarrhea and recurrent respiratory symptoms with lung nodules. Her colonoscopy featured inflammatory bowel disease. Her very early onset IBD (VEO-IBD) was related to NOD2 mutation. Her lung problem might reflect pulmonary sarcoidosis which may be related to the same mutation

Conclusion: Diagnosis of rare diseases is of enormous importance. Using new modalities in investigating such disorders can be life-saving and cost-effective. WES needs to be considered in investigating patients with rare GI diseases especially when Mendelian inheritance suspected. Patients coming from consanguineous families are candidates for such investigations especially when no alternative diagnosis is available.
Results of genetic testing

Family number	Presentation	Candidate gene	Mutation
1	Congenital diarrhea	NEUROG3	(c.413>G,p.T138R)*
2	Cholestasis and severe itching	MPRIP	(c.566_568delGCA,p(Ser189del)*
3	Infantile intestinal obstruction	ACTG2	(c.769C>T,p.(Arg257Cys)
4	Perianal skin tags and VEOIBD	NOD2	(c.1190C>T,p.(Pro397Leu)

* Novel mutation

350 ***EXTRACELLULAR VESICLES BEARING INTEGRIN B1 MEDIATE MONOCYTE ADHESION AND PROMOTE LIVER INFLAMMATION IN MURINE NASH.*** *Furuta Kunimaro*, *Qianqian Guo*, *Luz Gutierrez Sanchez*, *Samar Ibrahim. Pediatrics*, *Mayo Clinic*, *Rochester*, *MN*
Background and aims: We have previously reported that extracellular vesicles (EVs) released from hepatocytes during lipotoxic stress (lipotoxic EVs) are key players in the monocyte-derived macrophage inflammatory response in nonalcoholic steatohepatitis (NASH). Monocyte adhesion to the liver sinusoidal endothelial cells (LSECs) is a

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key step in the inflammatory process in NASH. To further elucidate the molecular mediators in this process, we aimed to examine whether lipotoxic EVs contain active cell adhesion molecules that promote the recruitment and retention of inflammatory monocytes in the liver. **Methods:** Primary mouse hepatocytes (PMH) were treated with either vehicle or a lipotoxic mediator lysophosphatidylcholine (LPC), EVs were isolated by ultracentrifugation from the conditioned media, and analyzed by mass spectrometry, immunoblotting, immunogold electron microscopy, and nanoscale flow cytometry. Lipotoxic EV-associated monocyte adhesion to liver sinusoidal endothelial cells (LSECs) *in vitro* was assessed by a shear stress adhesion assay using microfluidic chambers. Adult C57BL/6J mice were fed a diet rich in fat, fructose, and cholesterol (FFC) for 24 weeks to induce NASH. Mice received 1 μg/g of either anti-ITGβ_1 neutralizing antibody (ITGβ_1Ab) or control isotype antibody (IsoAb) twice per week for the last 4 weeks. Blood and liver samples were collected for biochemical and histological analysis. **Results:** Ingenuity Pathway Analysis (IPA) of lipotoxic EV proteome indicated that integrin (ITG) signaling is the top overrepresented canonical pathway. Immunoblotting confirmed significant enrichment for many ITG, especially ITGβ_1 in lipotoxic EVs compared to vehicle EVs, suggesting that hepatocyte lipotoxic treatment sort ITGβ_1 for EV release. Also, immunogold electron microscopy and nanoscale flow cytometry demonstrated that **ITGβ_1 in an active conformation was enriched in lipotoxic EVs**. Adhesion assay indicated that monocytes treated with lipotoxic EVs exhibited enhanced adhesion to LSECs, which was remarkably attenuated in the presence of ITGβ_1Ab. In the mouse NASH model, ITGβ_1Ab-treated mice had reduced liver injury compared to IsoAb-treated controls, as demonstrated by significant reduction of serum ALT levels and the number of TUNEL-positive hepatocytes. ITGβ_1Ab-treated mice also had decreased inflammation as assessed by reduced Mac-2-positive area in liver tissues, and lower mRNA expressions of proinflammatory genes such as CD68, TNFα, and CCR2, indicating the involvement of ITGβ_1 in monocyte hepatic recruitment and subsequent liver inflammation. Furthermore, ITGβ_1Ab treatment significantly ameliorated liver fibrosis, as assessed by Sirius-red staining, αSMA immunohistochemistry, and mRNA expressions of collagen1a1 and osteopontin. **Conclusion:** Lipotoxic EVs mediate monocyte adhesion to LSECs mainly by an ITGβ_1-dependent mechanism, and ITGβ_1 neutralizing antibody ameliorates diet-induced NASH in mice, suggesting that blocking ITGβ_1 is a potential anti-inflammatory therapeutic strategy for human NASH.

356 ***COMPROMISE OF THE RED BLOOD CELL (RBC) MEMBRANE IS COMMON IN CHOLESTATIC PEDIATRIC PATIENTS.*** *Theodore Kocoshis*, *Theodosia Kalfa*, *Alexander Miethke*, *William Balistreri*, *Crystal Slaughter*, *Ruchi Singh*, *Samuel Kocoshis. Pediatrics*, *Cincinnati Children's Hospital Medical Center*, *Cincinnati*, *OH*

In patients with cholestasis cholesterol conversion to bile acids and apolipoprotein b binding to cholesterol may be impaired resulting in an increased red cell membrane cholesterol to phospholipid ratio. This, in turn, results in decreased osmotic fragility and decreased deformability of red cells (spur cell anemia. We performed ektacytometry on blood from cholestatic children and young adults to assess red cell mechanics,

Methods: Following IRB approval, 17 cholestatic children and young adults (ages 1-20 years old) and 17 age-matched noncholestatic controls were recruited. A 500-1000 mcl aliquot of blood from all subjects was collected in an EDTA tube and 300 microliters were injected into the Osmoscan LoRRca MaxSis (Mechatronics Instruments BV, Zwaag, The Netherlands) ektacytometer. RBC deformation was monitored while cells were exposed to a constant shear stress of 30 Pa and an increasing osmotic gradient in order to generate the ektacytometry curves. A positive result is seen as a divergence of the Omin to the left of the control's values. We tested for significance of a "shift to the left" of the control via a two tailed t test, and measured correlation between bilirubin level, age, and duration of cholestasis with the degree of left shift via linear regression analysis.

Results: Patients carried diagnoses of extrahepatic biliary atresia (5 patients), Alagille syndrome (5 patients), autoimmune hepatitis (3 patients), progressive familial intrahepatic cholestasis (1 patient), autoimmune primary sclerosing cholangitis (1 patient), primary sclerosis cholangitis due to Langerhan's cell histiocytosis (1 patient), and bile duct obstruction associated with duodenal atresia (1 patient). Fourteen showed a statistically significant ($p<0.002$) shift of the curve to the left of their controls. One mildly cholestatic patient had a curve minimally to the right of the control. Of the other two whose curve was shifted to the right, one was diagnosed with hereditary spherocytosis and the other has a suspected congenital RBC membrane abnormality. The magnitude of the left shift correlated well with serum bilirubin levels ($r=0.64$), but not with duration of cholestasis or age of the patients.

Conclusions: This pilot study suggests that subclinical red cell membrane abnormalities exist in most cholestatic pediatric patients likely predisposing to hemolysis (especially with oxidative stress). Hence efforts to minimize pro-oxidant medications and to maximize antioxidant agents (such as vitamin E) are advisable.

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357 ***YOUNG MICE DEVELOP ENHANCED IRE1α/XBP1 AND PERK PATHWAY ACTIVATION OF THE UNFOLDED PROTEIN RESPONSE (UPR) AND HIGHER SERUM ALT LEVELS IN RESPONSE TO CHOLIC ACID FEEDING.*** *Alyssa Kriegermeier[1], Angela Hyon[1], Susan Hubchak[2], Brian LeCuyer[2], Xiaoying Liu[2], Richard Green[2]. [1]Pediatric GI/Hepatology, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [2]Division of Gastroenterology and Hepatology, Northwestern University Feinberg School of Medicine, Chicago, IL*

Background & Aim: Cholestatic liver diseases are the leading indication for pediatric liver transplant and a significant cause of morbidity, yet there are few effective interventions to prevent progressive liver damage in pediatric cholestasis. The unfolded protein response (UPR) is an adaptive cellular response to endoplasmic reticulum (ER) stress. The hepatic protein kinase RNA-like endoplasmic reticulum kinase (PERK) and inositol-requiring enzyme 1α/X-box binding protein 1 (IRE1α/XBP1) pathways of the UPR reduce ER stress, but their role in pediatric cholestatic liver injury remains unclear. The purpose of study is to determine differences in bile acid toxicity and hepatic UPR activation between young and adult mice.

Methods: Male C57BL/6J mice weaned at 28 days (weanlings) and adult (7-8 week) mice were fed either standard chow or chow supplemented with 0.5% cholic acid (CA diet) for 7 days. Serum ALT levels were measured, hepatic homogenate and nuclear protein were used for western blotting and gene expression was assayed using qPCR.

Results: When weanlings were fed a CA diet for 7 days, serum ALT values were significantly higher than CA fed adult mice (141±22 vs 66±5, $p< 0.01$), and were greater than all chow fed mice (39±6, $p< 0.001$ and 53±5, $p< 0.01$ in weanling and adult mice, respectively). Consistent with the elevated ALT, hepatic XBP1s gene expression was 1.8-fold higher in CA fed weanlings compared to adult mice (1.8±0.4 vs 1.0 ± 0.2, respectively, $p<0.05$). Western blotting confirmed that nuclear XBP1s and homogenate p-IRE1α protein expression were greater in the CA fed weanlings compared to adult mice. Hepatic expression of the PERK pathway was also significantly higher in the CA fed weanling mice compared to adults. Hepatic p-PERK expression was increased, with its downstream target p-eIF2α markedly increased. Hepatic eIF2α gene expression in CA fed weanling mice was 1.4-fold higher than adults ($p<0.01$). Western blotting confirmed that the PERK downstream targets ATF4 and nuclear CHOP were markedly greater in weanlings. Gene expression of Cyp7a1 and NTCP decreased, and Abcb11 and SHP increased similarly following CA diet in both groups, suggesting comparable CA intake and bile acid metabolism.

Conclusion: Serum ALT levels in weanling mice fed CA diet were significantly increased compared to adult mice. Consistent with these findings, there was markedly greater activation of the IRE1α/XBP1 and PERK pathways of the UPR. Bile acid–responsive genes were similar in weanling and adult CA fed mice. These data suggest that young mice are more susceptible to bile acid injury and ER stress, providing a putative mechanism for the significant injury seen in pediatric cholestatic liver diseases.

358 ***VEDOLIZUMAB THERAPY FOR CHILDREN WITH PRIMARY SCLEROSING CHOLANGITIS: DATA FROM THE PEDIATRIC PSC CONSORTIUM.*** *Trevor Laborda[1], Amanda Ricciuto[2], Madeleine Aumar[4], Nicholas Carman[13], Matthew DiGuglielmo[17], Laura Draijer[9], Katryn Furuya[10], Nitika Gupta[11], Bart Koot[9], Kathleen Loomes[3], Ellina Lytvyak[7], Mercedes Martinez[19], Tamir Miloh[14], Aldo Montano-Loza[7], Emily Perito[8], Pushpa Sathya[6], Uzma Shah[12], Eyal Shteyer[5], Ruchi Singh[20], Amy Taylor[20], Pamela Valentino[16], Bernadette Vitola[18], Melissa Zerofsky[8], Andreanne Zizzo[15], Mark Deneau[1]. [1]University of Utah, Primary Children's Hospital, Salt Lake City, UT; [2]The Hospital for Sick Children, Toronto, ON, Canada; [3]Children's Hospital of Philadelphia, Philadelphia, PA; [4]CHU Lille, University of Lille, Lille, France; [5]Shaare Zedek Medical Center, Wilf Children's Hospital, Jerusalem, Israel; [6]Memorial University of Newfoundland, St. John's, , Canada; [7]University of Alberta, Edmonton, AB, Canada; [8]UCSF Benioff Children's Hospital, San Francisco, CA; [9]Academisch Medisch Centrum Universiteit van Amsterdam, Amsterdam, Netherlands; [10]Mayo Clinic, Rochester, MN; [11]Emory University, Atlanta, GA; [12]Massachusetts General Hospital for Children, Boston, MA; [13]University of Ottawa, Ottawa, ON, Canada; [14]Texas Children's Hospital, Houston, TX; [15]London Health Sciences Center Children's Hospital, London, ON, Canada; [16]Yale-New Haven Children's Hospital, New Haven, CT; [17]Nemours/Alfred I. duPont Hopsital for Children, Wilmington, DE; [18]Medical College of Wisconsin, Children's Hospital of Wisconsin, Milwaukee, WI; [19]CUMC/New York-Presbyterian Morgan Stanley Children's Hospital, New York, NY; [20]Cincinnati Children's Hospital, Cincinnati, OH*

Background: Most patients with primary sclerosing cholangitis (PSC) also have inflammatory bowel disease (IBD). Both the liver and colon express MADCAM-1, a target of lymphocyte homing integrin molecules. Inflammation spanning the gut-liver axis is likely involved in the pathogenesis of PSC-IBD. Vedolizumab (VDZ) is an integrin antibody used to treat IBD. Its effect on hepatobiliary inflammation in pediatric-onset PSC is unclear. We aimed to investigate whether VDZ improved liver biochemistry, histopathology, and/or imaging in children with PSC-IBD.

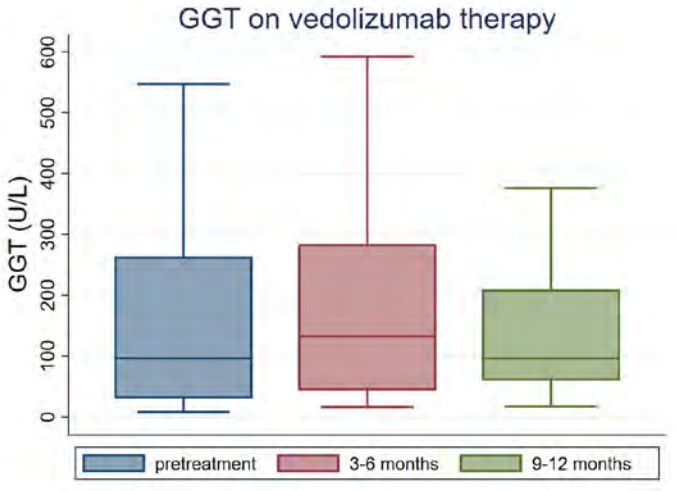
Methods: VDZ-treated patients were identified within the Pediatric PSC Consortium, a multicenter research

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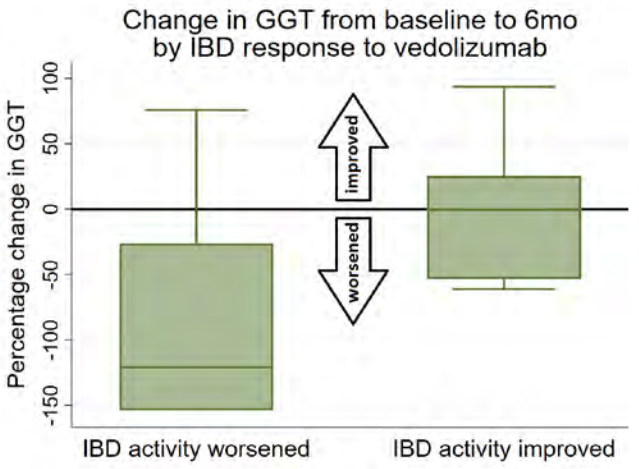
registry. We collected retrospective demographic, phenotypic, biochemical, radiological, histopathologic and IBD activity data over one year of VDZ therapy. We defined a biochemical response as a 75% or greater reduction in initial GGT, or a GGT that fell to < 50 IU/L over 12 months on VDZ. We defined IBD response as improved Mayo endoscopy grade or if follow-up endoscopy was unavailable, improved IBD activity and/or physician global assessment scores.

Results: We identified 40 patients with pediatric-onset PSC-IBD from 19 centers in North America and Europe. VDZ was initiated at median age of 16.5 years [IQR 15-18]. IBD and PSC were present for median 3.5 years [IQR 2.5-5.8] and 2.8 years [IQR 1.8-4.9] prior to VDZ initiation, respectively. 68% were male, 65% had large duct involvement, 20% had autoimmune hepatitis overlap and 15% had extensive (Metavir F3/F4) fibrosis. 60% had ulcerative colitis, 30% had Crohn disease and 10% had IBD-U. 70% failed prior anti-TNFα therapy. Immunomodulator co-therapy was used in 40%, ursodeoxycholic acid in 23% and oral vancomycin in 8%. Of 22 patients with abnormal GGT at baseline and biochemical follow-up through one year, 23% had a biochemical response and 77% did not. Median GGT, ALT and total bilirubin were 96 U/L, 57 U/L and 0.6 mg/dL before VDZ, 132, 55 and 0.5 at 3-6mo and 96, 59 and 0.7 at 9-12mo follow-up. Pre and post-treatment MRCPs were available in 16 patients: relative stricturing was worse in 19% and unchanged in 81%. Pre and post-treatment liver biopsies were available in seven patients: none had a change in fibrosis stage. For IBD, 26% had clinical or endoscopic remission, 30% had response, 30% were unchanged or worsened, and 14% required colectomy within one year of initiation of VDZ. Change in biliary inflammation was different based on whether or not a patient's IBD responded to VDZ: over 6 months, GGT decreased by 6% in patients who had an IBD treatment response, but increased by 121% in those with medically-refractory IBD, p=0.04.

Conclusion: We present an important negative study in the search for an effective therapy for PSC. VDZ did not improve liver biochemistry, liver fibrosis, or relative biliary stricturing. Liver biochemistry tended to worsen over time in the subset of patients with IBD activity unresponsive to VDZ, but remained unchanged in patients whose IBD improved. Progressive liver disease may be more common in patients with a medically-refractory IBD phenotype, giving insight into the interplay between liver and intestinal inflammation along the gut-liver axis in PSC.



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360 ***LACTOBACILLUS RHAMNOSUS GG PLUS BIFIDOBACTERIUM LACTIS BB12 AND LACTOBACILLUS REUTERI MODULATE GUT DYSBIOSIS AND IMPROVE FATTY LIVER IN HIGH-FAT DIET INDUCED OBESE MICE.*** *Yu-Cheng Lin[1], Hsueh-Fang Lin[1], Yen-Hsuan Ni[2]. [1]Pediatrics, Far Eastern Memorial Hospital, New Taipei City, Taiwan; [2]Pediatrics, National Taiwan University Hospital, Taipei, Taiwan*

Objectives: Recent evidence has demonstrated that gut dysbiosis may be relevant in the development of nonalcoholic fatty liver disease (NAFLD). Thus, gut microbiota may be a target for improving NAFLD. The aim of this study is to examine the effects of two probiotic products (*Lactobacillus rhamnosus* GG (LGG) plus *Bifidobacterium lactis* Bb12 (BB12) and *Lactobacillus reuteri* DSM 17938) on fatty liver and gut dysbiosis.

Methods: Experimental NAFLD was induced by a high-fat diet (HFD) for 16 weeks in C57BL/6JNarl male mice. Mice were randomly divided into four groups: chow diet (CD) control, HFD control, HFD + LGG plus BB12 treatment and HFD + *L. reuteri* treatment groups. The treatment groups were administered with probiotics via gastric lavage 3 days/week for 4 weeks whereas mice in the HFD control group were given the same volume of sunflower oil via gastric lavage. Image J was used to quantify liver fat by measuring the percentage of area of lipid droplets relative to the total field of view. Nuance multispectral image analysis module (PerknElmer, Inc) was used to quantify liver fibrosis by measuring the collagen proportionate area (CPA). Quantitative real-time PCR was used to measure the expression levels of genes involved in lipogenesis, fatty acid transport, fatty acid β-oxidation, lipolysis, pro-inflammatory cytokines and fibrosis. Metagenomes via 16S-based extrapolation to reference genomes were profiled to analyze structural assembly of the gut microbiome in different treatment groups.

Results: HFD control group has much higher percentage of area of lipid droplets relative to the total field of view than CD control group. HFD + LGG plus BB12 and HFD + *L. reuteri* treatment groups have much lower percentage of area of lipid droplets than HFD control group **(Fig. 1)**. CD control group has very low level of liver fibrosis, while HFD control group has much greater CPA than CD control group. HFD + LGG plus BB12 and HFD + *L. reuteri* treatment groups have much lower percentage of CPA than HFD control group. Both probiotics-treated groups had lower expression levels of genes involved in fatty acid and collagen synthesis compared to HFD control. The principal coordinates analysis clustering plots revealed a significant separate clustering in microbiota structure among HFD control, HFD + LGG plus BB12 and HFD + *L. reuteri* groups. Compared with HFD control group, the family *Desulfovibrionaceae* significantly decreased in both probiotics-treated groups **(Fig. 2)**.

Conclusion: The present results elucidated the potential mechanism of *Lactobacillus rhamnosus* GG plus *Bifidobacterium lactis* Bb12 and *Lactobacillus reuteri* DSM 17938 in fatty liver, by decreasing fatty acid and collagen synthesis and modulating gut microbiota dysbiosis.

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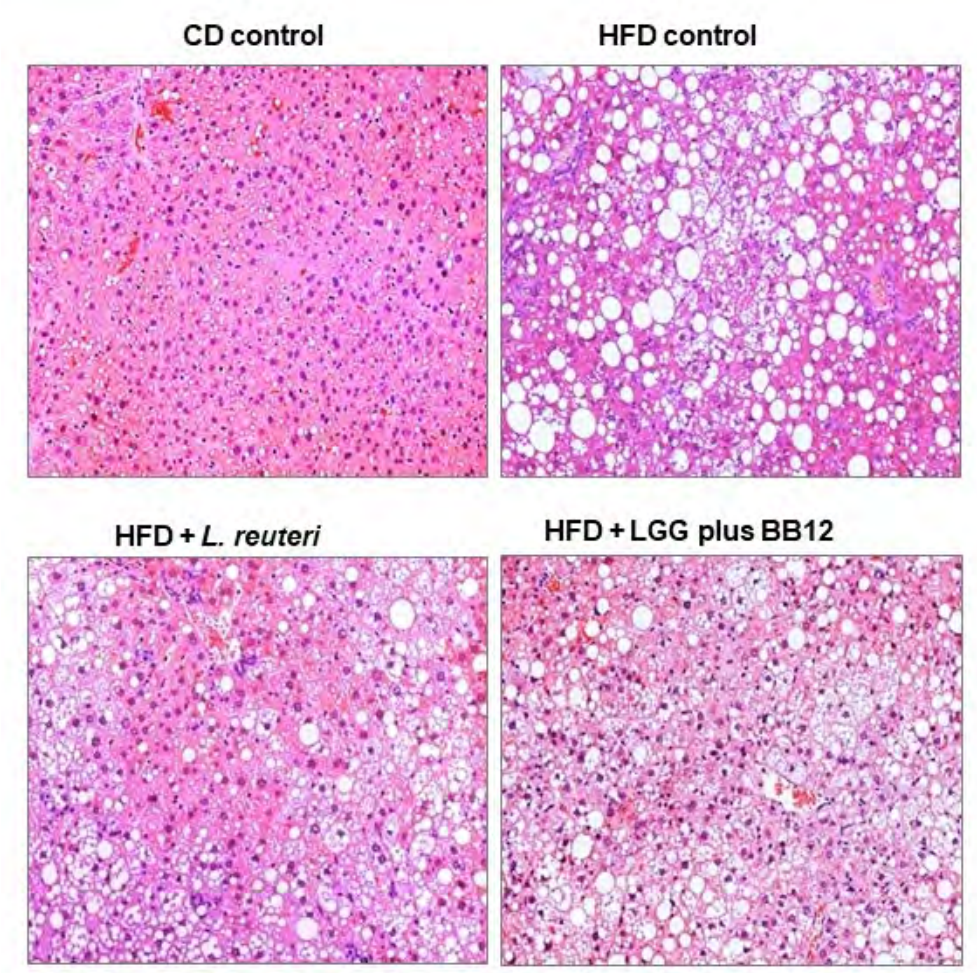


Figure 1

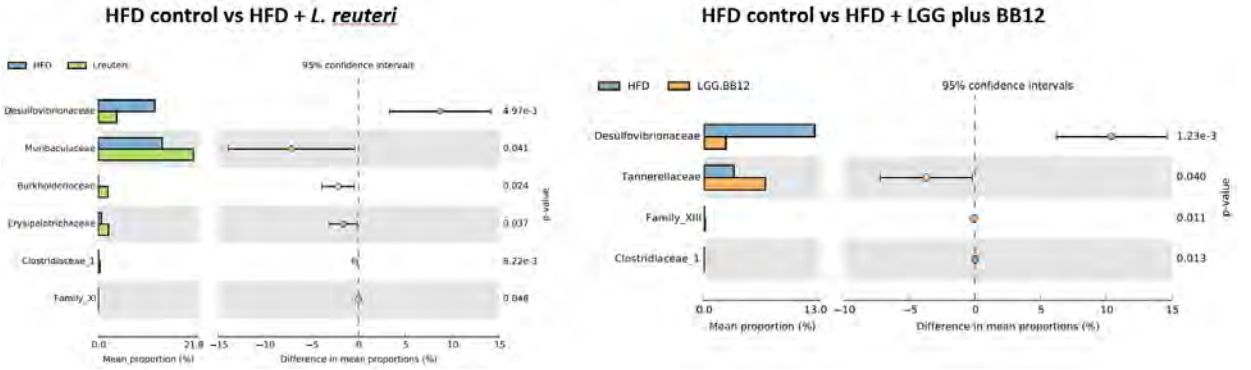


Figure 2

365 ***RACIAL/ETHNIC DISPARITIES AND INCREASING TREND IN INPATIENT PEDIATRIC LIVER DISEASE BURDEN: A STATE-WIDE POPULATION BASED STUDY IN CALIFORNIA.*** *Melissa Martin*[1], *Biyao Zou*[2], *Donghak Jeong*[2], *Joseph Hoang*[2], *Mindie Nguyen*[2]. [1]*Pediatric GI*, *Stanford*, *Palo Alto*, *CA*; [2]*Gastroenterology, Hepatology, and Nutrition*, *Stanford*, *Stanford*, *CA*

Background: Liver disease in children can range from acute life-threatening illness to chronic conditions that only require lifestyle changes. Most recently, liver disease in pediatrics has come to light in the public eye given the worsening obesity epidemic and its associated effects on the liver, including fatty liver disease. However, liver

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disease burden in children in the US has not been well characterized.

Purpose: Utilizing a hospital claims database that includes over 98% of all hospitalizations in California (CA), we aimed to examine the total inpatient pediatric admission burden, its time trend in the past decade, and its distribution by specific disease etiology, age, socioeconomic status, and race/ethnicity. Given CA is one of the most populous states in the US (39.5 million), the data can inform future research and public health planning for preventive strategies.

Methods: We performed a retrospective analysis of the Office of Statewide Health Planning and Development (OSHPD) database from 2005-2016. This population-based longitudinal and validated administrative database documents inpatient admissions for over 450 hospitals, including children's hospitals in CA. Patient records include demographics, primary and secondary diagnoses, disposition, total inpatient charges, and insurance status. Diagnoses and procedures are coded using ICD-9 and ICD-10 codes. We included all admissions associated with a liver disease diagnosis that occurred in pediatric patients (≤age 21 years).

Results: There were a total of 21,457 inpatient pediatric admissions associated with a liver disease diagnosis in CA between 2005 to 2016, which has increased from 1,515 in 2005 to 2,278 in 2016 (Figure 1). As shown in Table 1, pediatric liver disease admissions followed a bimodal age distribution, with about one-quarter occurring in very young children aged <5 years and one-half in older children aged 16-21 years. However, while Black and Hispanic/Latino only represent 6.5% and 39% of the total CA population (https://www.census.gov/quickfacts/CA, last updated 7/1/18, accessed 6/5/19), they each represented about 50% of inpatient pediatric liver disease admissions. Notably, the Medi-Cal population also represented about half of the total admissions. Among admissions associated with three common liver disease etiologies, there were differences in various characteristics, such as autoimmune hepatitis admission accounting for >50% of admissions in patients 16 years or older.

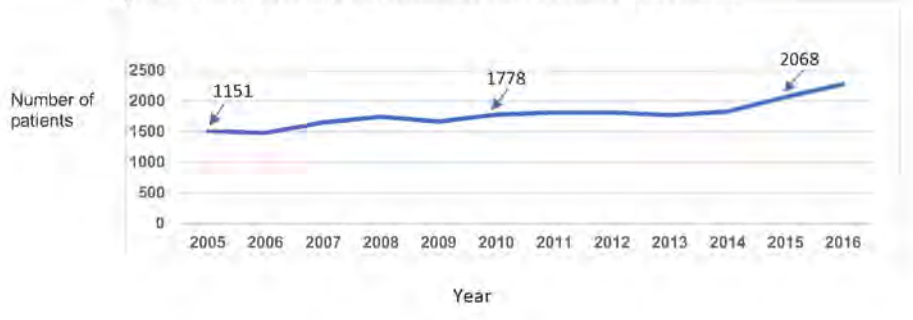
Conclusion: In this state-wide and close to whole population study of inpatient admissions in CA, the number of pediatric admission associated with liver disease has significantly increased in the past decade, with over-representation with admissions covered by Medi-Cal and ethnic minorities especially Black. Further studies are needed to investigate the drivers for this increasing trend and associated racial/ethnic and socioeconomic disparities in order to inform all stake holders.

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Table 1. Characteristics of inpatient admissions in pediatric patients with a liver disease diagnosis in California from 2005-2016 (sample)

	All liver disease (n=21,457)	Autoimmune hepatitis (n=774)	HCV (n=2333)	Primary Sclerosing Cholangitis (n=2245)
Age (years)				
0-5y	4519 (21.1%)	67 (8.7%)	36 (1.5%)	661 (29.4%)
6 to 10	1932 (9.0%)	116 (15.0%)	32 (1.4%)	198 (8.8%)
10-15	3427 (16.0)	132(17.1%)	120 (5.1%)	289 (12.9%)
16-21	11,579 (54.0)	459 (59.3)	2145 (91.9)	1097 (48.9%)
Gender				
Female	9957 (46.4%)	273 (35.3%)	942 (40.4%)	814 (36.3%)
Male	11,500 (53.6%)	501 (64.7%)	1391(59.6%)	1431 (63.7%)
Race				
White	6390 (29.8%)	160 (20.7%)	1414 (60.6%)	617 (27.5%)
Black	10,764 (50.2%)	394 (50.9%)	538 (23.1%)	1074 (47.8%)
Native/Alaskan/Aleutian	1654 (7.7%)	114 (14.7%)	164 (7.0%)	203 (9.0%)
Asian/Pacific Islander	1714 (8.0%)	46 (5.9%)	83 (3.6%)	255 (11.4%)
Others/unknown	935 (4.4%)	60 (7.8%)	134 (5.7%)	96 (4.3%)
Ethnicity				
Hispanic	10,764 (50.2%)	394 (50.9%)	538 (23.1%)	1074 (47.8%)
Non-Hispanic	10,499(48.9%)	376 (48.6%)	1751 (75.1%)	1155 (51.5%)
Unknown	194 (0.9%)	4 (0.5%)	44 (1.9%)	16 (0.7%)
Insurance				
Medicare	279 (1.3%)	1 (0.1%)	52 (2.2%)	16 (0.7%)
Medi-Cal	10,831 (50.5%)	377 (48.7%)	1143 (49.0%)	1094 (48.7%)
Private	7311 (34.1%)	267 (34.5%)	735 (31.5%)	853 (38.0%)
Self-pay	575 (2.7%)	18 (2.3%)	147 (6.3%)	58 (2.6%)
Others	2461 (11.5%)	111 (14.3%)	256 (11.0%)	224 (10.0%)
Comorbidities				
Cardiovascular disease	1859 (8.7%)	46 (5.9%)	160 (6.9%)	111 (4.9%)
Diabetes mellitus	1929 (9.0%)	43 (5.6%)	133 (5.7%)	41 (1.8%)
Hypertension	1498 (7.0%)	68 (8.8%)	71 (3.0%)	89 (4.0%)
Any cancer (other than HCC)	1244 (5.8%)	20 (2.6%)	16 (0.7%)	43 (1.9%)
Hyperlipidemia	926 (4.3%)	8 (1.0%)	31 (1.3%)	23 (1.0%)
Chronic kidney disease and dialysis	608 (2.8%)	24 (3.1%)	47 (2.0%)	35 (1.6%)
Mental illness	1514 (7.1%)	43 (5.6%)	595 (25.5%)	23 (1.0%)

Figure 1. Number of pediatric liver disease admissions in California 2005-2016



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366 ***EVALUATION OF RISK FACTORS FOR HEPATIC ARTERY THROMBOSIS POST PEDIATRIC LIVER TRANSPLANTATION.*** *Jordan McDonald[1], Tamir Miloh[1], Kathleen Thompson[1,2], Kathleen Hosek[2], John Goss[2,1]. [1]Baylor College of Medicine, Houston, TX; [2]Texas Children's Hospital, Houston, TX*

Background: Outcomes of liver transplants in children (PLTs) have improved in the last 50 years with immunosuppression and operative techniques. Hepatic artery thrombosis (HAT) is more common in children than adults, with the prevalence being between 5-18%. HAT is a major cause of graft loss (approximately 50%) and mortality after LT. Treatment for HAT includes balloon angioplasty, reconstruction of the anastomoses or re-transplantation. Risk factors include ABO incompatibility, low donor/recipient age ratio and recipient weight to donor weight ratio greater than 1.25.

Aim: Evaluate whether patient or donor demographics are associated in increase incidence of HAT, as well as to determine the graft loss and morbidity associated with HAT at Texas Children's Hospital since 2011.

Methods: This is a retrospective, cross-sectional chart review study of pediatric patients with HAT post PLT performed at Texas Children's Hospital from January 2011 to March 2019. Demographic data, specifically age, gender, ethnicity, insurance type, weight, outcome and graft loss/success, was collected and evaluated. Donor demographic data, specifically, age, weight, BMI, cause of death, gender, CMV status and EBV status was evaluated as well. Age (months) and weight (kg) were analyzed by a T-test, while the other parameters were evaluated by Pearson's Chi Square exactness of fit test.

Results: A total of 284 PTL were performed during this time, with 21 PLTs resulting in HAT. The patient's age ranged from 2 months to 285 months. In comparing patients with HAT to without HAT, there was not a significant difference in weight, age, gender, ethnicity, etiology of liver disease, and donor demographics. In the PLT patients with the complication of HAT, 62% (13/21) of patients had private insurance, while 38% (8/21) of patients had a type of public insurance. This is significant ($p = .019$, $p < .05$) to patients without the HAT complication (34% (90/263) private insurance, 60% (160/263) public insurance, and 5% (13/263) other). The survival rate of the HAT group was 67% (14/21), while the survival to date of patients without HAT was 99% (260/263) ($p < .00001$). Graft survival in the group of patients with the HAT complication was 33% (7/21), while graft survival in the non-HAT group was 92% (242/263) ($p < .00001$).

Conclusion: This study demonstrated that multiple patient and donor demographics were not potential risk factors for the development of HAT post-PLT in our population. Insurance type appeared to be a predictor of HAT complication. Reducing the risk of HAT and its association with increased morbidity and mortality remains a challenge for future research.

TABLE 1: PATIENT AND DONOR DEMOGRAPHICS OF HAT VS. NON HAT GROUPS

	HAT	NON-HAT	P VALUE	ODDSRATIO
MEAN WEIGHT (KG)	16.73	24.60	p = .077	
MEAN AGE (MONTHS)	60.6	76.42	p = .357	
MALE	52.4% male	46% male	p = .563	
ETHNICITY	White 47.6% Hispanic 42.9% Asian 0% African American 0% Multi-Racial 9.5%	White 35.4% Hispanic 44.2% Asian 3.5% African American 11.4% Multi-Racial 2.7%	p = .366	
ETIOLOGY OF DZ	BA 43% HBL 5% AIH 10% AHN 5% Other 47%	BA 30% HBL 8% AIH 4% AHN 10% Other 48%	p = .422	
INSURANCE TYPE	Private 62% Public 38% Free/Self 0%	Private 34% Public 61% Free/Self 8%	p = .019	2.88
MEAN DONOR AGE (MONTHS)	5.05	9.69	p = .0506	
MEAN DONOR WEIGHT (KG)	15.2	35.0	p = .0574	
BMI OF DONOR	19.2	19.4	p = .42	
ETIOLOGY OF DONOR DEATH	Anoxia 57% Head Trauma 38%	Anoxia 43% Head Trauma 44%	p = .92	
DONOR EBV + STATUS	62%	70%	p = .28	
DONOR CMV + STATUS	62%	56%	p = .62	
RECIPIENT/DONOR WEIGHT RATIO	.68	.77	p = .32	
MALE	59% M	52% M	p = .34	
% PT SURVIVAL	67%	99%	p < .00001	33
% GRAFT SURVIVAL	33%	92%	p < .00001	23

Table 1: Demonstrates the data collected for patient and donor parameters including the p values for significance. BA: biliary atresia, HBL: hepatoblastoma, AIH: autoimmune hepatitis, AHN: acute hepatic necrosis

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370 ***QUALITY OF LIFE AMONG PEDIATRIC LIVER VERSUS BOWEL TRANSPLANT PATIENTS.*** *Sera Na[1], Abhilasha Banerjee[1], Cal Matsumoto[2], Stuart Kaufman[3], Nada Yazigi[3], Khalid Khan[3]. [1]Pediatrics, Medstar Georgetown University Hospital, Washington, DC; [2]Transplant Surgery, Medstar Georgetown University Hospital, Washington, DC ; [3]Pediatric Gastroenterology, Medstar Georgetown University Hospital, Washington, DC*

Background: There is scant data on the long-term outcomes of intestinal transplantation in children. Our study aimed to compare quality of life scores (QoL) among pediatric liver versus bowel transplant patients.

Method: This was a single center study at MedStar Georgetown University Hospital with institutional review board approval. The study was conducted using a validated quality of life (QOL) questionnaire, "the PedsQL inventory" comparing children who had undergone an isolated liver transplant with those who had undergone an intestinal transplant (including multivisceral transplants). Questionnaires were completed by the patient and parent/family member and encompassed four categories: physical functioning, emotional functioning, social functioning, and school functioning. Scoring rubric for all self-reported questionnaires among patients aged 8-18 and all parent questionnaires were as follows for the aforementioned categories: 0=never a problem, 1=almost never a problem, 2=sometimes a problem, 3=often a problem, 4=almost always a problem. Scoring rubric for self-reported surveys in patients aged 5-7 were based on pictorial faces with a smiling face equivalent to a score of 0, a middle face equivalent to a score of 2, and a frowning face equal to a score of 4. Only parent questionnaires were required for toddlers aged 2-4. Statistical analysis using software (MINITAB 17) included descriptive statistics and applying the student t-test, chi square and Mann-Whitney test for nonparametric analysis, $p<0.05$ was considered statistically significant.

Results: A total of 19 questionnaires (13 liver, 6 bowel transplants) were included in this study. The mean ages were 9.7+ 7.3 versus 8.7+ 4.1 (p=0.7). There were 5 males in the liver transplant group and 3 in the intestine transplant group (p=0.64). The median self-rated patient score comparing liver to bowel transplant patients for physical functioning was 0.0 versus 1.2 (p=0.09), 1.25 versus 1.5 (p=0.9) for emotional functioning, 0.0 versus 0.67 (p=0.14) for social functioning, and 1.3 versus 2.0 (p= 0.22) for school functioning. Parental equivalent report scores on physical functioning were 0.2 versus 1.6 (p=0.14), 1.0 versus 1.25 (p=0.33) for emotional functioning, 0.0 versus 0.67 (p=0.05) for social functioning, and 1.7 versus 2.8 (p=0.21) for school functioning.

Conclusion: Our QoL survey indicates that bowel transplant patients and their parents perceive greater problems in comparison to our liver transplant cohort, though only parental perception of social functioning was statistically significant. In the future, we hope to expand our study population and determine if any associated or causal factors exist for the discrepancy in QoL.

372 ***APPLICATION OF MODIFIED INTERNATIONAL AUTOIMMUNE HEPATITIS GROUP (IAIHG) SCORING IN CHILDREN WITH AUTOIMMUNE HEPATITIS.*** *Gayathri Naraparaju[1], Yelena Korotkaya[1], Paul Wasuwanich[2], Ann Scheimann[1], Christine Karwowski[1], Wikrom Karnsakul[1]. [1]Pediatric Gastroenterology, Hepatology and Nutrition, Johns Hopkins, Baltimore, MD; [2]School of Medicine, Johns Hopkins, Baltimore, MD*

INTRODUCTION: The International Autoimmune Hepatitis Group (IAIHG) scoring system was developed in 1992 utilizing a set of clinical history, biochemistry, serologic tests for common viral hepatitis, autoimmune markers and liver histopathologic findings for the diagnosis of auto-immune hepatitis (AIH). This scoring system is to guide clinicians having a high index of suspicion for AIH, with somewhat increased level of confidence in the diagnosis of AIH before and after the treatment in adults. In 1999, the modified IAIHG scoring system was developed to improve the specificity, to exclude a diagnosis of AIH in those with autoimmune biliary diseases. The use of the original (1992) and 1999 (modified) IAIHG scoring system in pediatric patients was not defined. In 2012, one study from Canada published their application of the IAIHG scoring system to the retrospective cohort of pediatric patients with chronic immune liver disease to determine its use in classifying children as having either definite or probable AIH. They noted some of the criteria applied in the scoring system which have little practical significance to pediatric patients such as the level of alcohol intake. The aim of our study is to apply the 1999 modified IAIHG scoring system to our retrospective pediatric cohort with the diagnosis of autoimmune hepatitis to determine its use in classifying children as having either definite or probable AIH, pre and post treatment; if pre liver biopsy scores can predict AIH based on the laboratory values and history alone and if liver biopsy results and certain laboratory values can predict the actual diagnosis of AIH in children.
METHODS: This is a retrospective chart review of pediatric patients below 18 years of age, with a diagnosis of

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autoimmune hepatitis with or without sclerosing cholangitis between January 1, 1979-May 24, 2019, referred and treated at Johns Hopkins Children's Center, Division of Pediatric Gastroenterology and Hepatology. Modified IAIHG scoring system was applied retrospectively in these patients using these variables: hepatic function panel, serum titers of ANA or anti-nuclear antibody, ASMA or anti smooth muscle antibody, total immunoglobulin G (IgG), histologic features such as: interface hepatitis, predominant plasma cells and biliary changes, hepatitis viral markers and history of drug exposure, to calculate the scores- pre and post treatment and pre liver biopsy score. Sensitivity and specificity were calculated for IAIHG pre/post treatment scores and pre-liver biopsy score (for definite and probable scores) in predicting the actual diagnosis of AIH at the final encounter during the study period. Logistic regression was used to infer the association between features or values used in the modified scoring system and the diagnosis of AIH. T-test was used to correlation between the liver biopsy findings consistent with AIH and the final diagnosis of AIH.
RESULTS: A total of 30 patients, median age of 14 years (range 18 months – 17 years), 20 females: 9 male patients. Sensitivity of the definite score in the pre-treatment (>15), pre-liver biopsy (> 15) and post-treatment (>17) to detect AIH is 21.7%, 0% and 8.7% respectively; for probable score in the pre-treatment (10-15), pre-liver biopsy (10-15) and post treatment (12-17) is 60.7%, 34.8% and 60.7% respectively. Specificity of the definite score in the pre-treatment, pre-liver biopsy and post-treatment is 71.4%, 100% and 85.7% respectively; for probable score in the pre-treatment, pre-liver biopsy and post- treatment is 42.9% for all the categories respectively. There is no association of positive liver biopsy findings with diagnosis of AIH at the final encounter (p=0.26) but predominant plasma cells were associated with higher pre-treatment scores (p=0.01). History of hepatotoxic drug exposure led to lower scores in all the categories (p= 0.008). Laboratory values such as total Ig G, ANA or detection of ASMA did not predict AIH as the actual diagnosis at the final encounter (p=0.8, 1.3 and 1.8 respectively). Obesity was seen in only 2 patients, of which only one of them had a final diagnosis of AIH. Immune deficiency, Lupus, Inflammatory bowel disease (IBD) were diagnosed in three other patients. No reported alcohol intake in any of the patients.
CONCLUSION: IAIHG scoring in pediatric patients may not be a sensitive tool to definitively predict AIH but can be useful to further guide management in patients who are classified as probable AIH. This may be due other factors such as drug-induced liver injury, underlying comorbidities such as immune deficiencies or inflammatory bowel disease or obesity which can present with false positive ANA. The scoring system may not be applicable pediatric patients and we need further collaborative studies before using it as a standardized tool in children.

373 ***PROTECT (PERFUSION REGULATED ORGAN THERAPEUTICS WITH ENHANCED CONTROLLED TESTING): NOVEL HUMAL MODEL TO MITIGATE ISCHEMIA-REPERFUSION INJURY.*** *Mustafa Nazzal[1], Erik Madsen[1], Minh-Tri Nguyen[2], Amber Price[1], Chandrashekhara Manithody[1], Adam Welu[1], Salim Munoz[2], Himani Madnawat[1], Christine Denton[1], Miguel Guzman[3], Douglas Blackall[3], Jeffrey Teckman[1], Chintalapati Varma[2], Ajay Jain[1]. [1]Pediatrics, Saint Louis University, Saint Louis, MO; [2]Surgery, Saint Louis University, Saint Louis, MO; [3]Pathology, Saint Louis University, Saint Louis, MO*
Background: Over 13,000 patients with advanced liver disease await a liver transplant. However, sadly due to the acute shortage of livers almost 8 people die every day waiting on the list, despite an almost 10% discard rate of 'marginal donor livers' (MDL), deemed unsuitable for transplantation due to the risk of ischemia reperfusion (IR) injury. We hypothesized that targeting pathways regulating IR injury, prior to organ harvesting could enable successful transplant of such MDL. In order to perform therapeutic testing, we developed a novel model using human MDL to recapitulate such injury.
Methods: Upon approval by institutional regulatory bodies we procured human MDLs (n=5). An Extracorporeal Membrane Oxygenation (ECMO) machine was significantly modified to pump and bifurcate blood flow into hepatic and portal circulations (Figure 1) which we have designated as the PROTECT pump. Scheduled blood draws, liver biopsy, arterial blood gas, temperature and pressure readings were obtained. Pair wise t-test for normally distributed data otherwise pairwise Mann Whitney U test were planned for analysis. All tests were 2 tailed using a significance level of 0.05.
Results: Successful perfusion of the MDL was performed. While, stabilization in ALT was noted within 3 hours on the pump with our first liver (Delta: 2 hour = 893 U/L vs 3 hour 12 U/L), a rise in ALT (Peak: 3523U/L) was accompanied by LDH and GGT elevation (10989 U/L, 129.7 U/L), $p<0.05$, and metabolic acidosis which was subsequently corrected. Using a modified protocol for rigorous chemistry regulation, bile production and improvement in synthetic surrogates was noted in our subsequent testing, attesting to restoration of synthetic function with a peak ALT and AST of (1881 U/L, 1442 U/L). Further, we noted on the PROTECT pump stabilization/reduction in liver transaminases with no significant hepatocellular necrosis, ductular changes or inflammation on histology. Successful temperature control and IVC flow was achieved. As a further advancement to

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the PROTECT model we have successfully perfused split liver segments, with independent portal and hepatic blood flows. This represents a critical step for therapeutics testing to enable rigorous internal controlling.
Conclusion: Our PROTECT model presents a major development for testing regulators of IR injury in human livers. We believe our system demonstrates a platform for rapid translatability towards clinical applications and could lead in drug discovery to drive a paradigm change to organ recovery in transplant medicine.

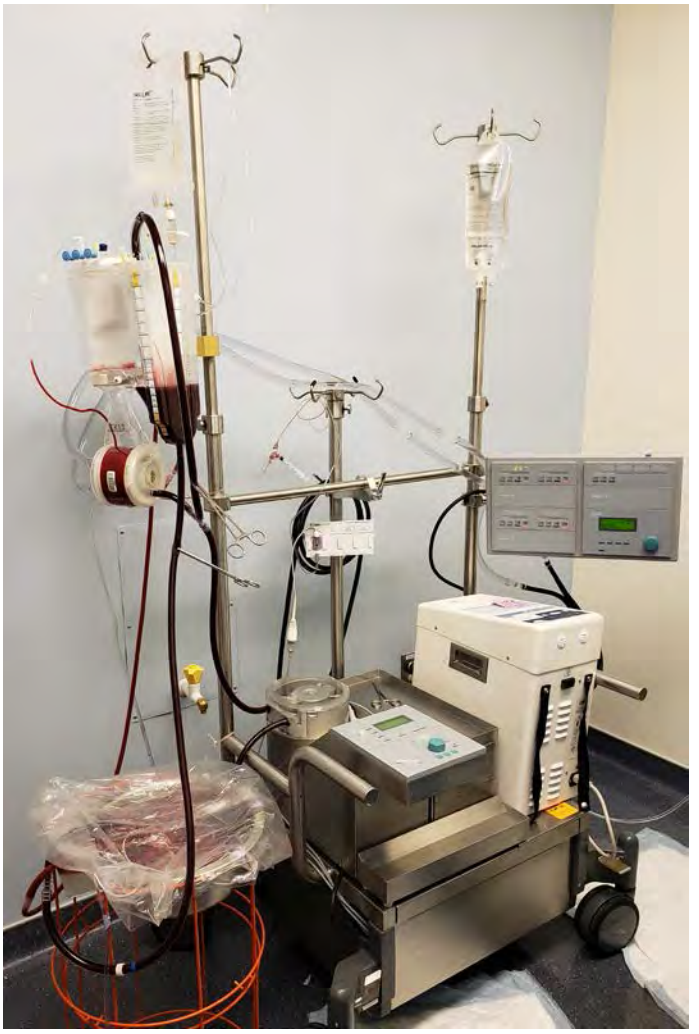


Figure 1: Human liver successfully perfused on our PROTECT pump developed at SLU

375 ***SOCIOECONOMIC BARRIERS FACING YOUTH WITH NON-ALCOHOLIC FATTY LIVER DISEASE .*** *Sarah Orkin[1], Julie Anderson[1], Emily Vincent[1], Sanita Ley[2,5], Ana Catalina Arce-Clachar[1,5], Kristin Bramlage[1], Stavra Xanthakos[1,5], Andrew Beck[3,4,5], Marialena Mouzaki[1,5]. [1]Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Division of General and Community Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Division of Hospital Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [5]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH*
Background: Non-alcoholic fatty liver disease (NAFLD) is the leading cause of chronic liver disease in children. Currently, the only treatment for pediatric NAFLD is lifestyle modification targeted at obesity reduction, which may be challenging for many to implement and sustain due to socioeconomic (SE) barriers. The prevalence of SE

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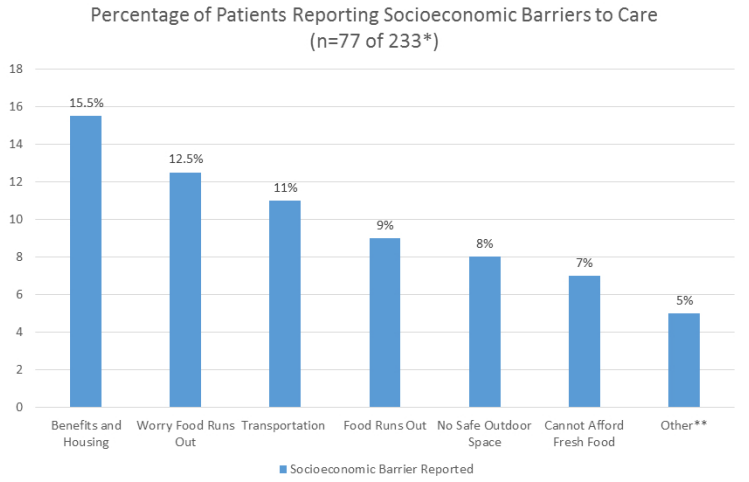
barriers within the pediatric NAFLD population is not known.

Hypothesis and Objective: We hypothesize that patients with NAFLD experience socioeconomic barriers. The objective of this study was to describe the prevalence of these SE barriers experienced by youth with NAFLD.

Methods: This was a retrospective study performed in the Steatohepatitis Center of Cincinnati Children's Hospital Medical Center. Patients seen from 9/2018 to 4/2019 were administered a screening questionnaire as part of routine clinical care assessing the following SE barriers (12 total): food insecurity, access to produce, supplemental benefits and housing issues, medication costs, transportation, and safe outdoor space.

Results: Responses were available for 233 patients (73% male, mean age 14 years, 66% non-Hispanic). One in three patients (n=77) disclosed the presence of at least one SE barrier, with 30 patients (39% of positive respondents) reporting multiple barriers (median number of barriers for all patients is 0, range 0-6). Among the total sample, the most common single barrier present was the worry of food running out (12.5% of respondents, n=29), followed by food actually running out (9%, n=21, **Figure 1**). Of 208 respondents, 167 (80%) had at least one meal per day provided at school, with 99 children (59%) reporting 2 or more meals per day provided. Seventeen patients (8%) reported a lack of safe outdoor space. Supplemental benefits and housing troubles combined were present in 15.5% (n= 35) of respondents. Forty six percent of patients resided in single-parent household. Lastly, 46% of parents had educational attainment of less than a high school degree.

Conclusions: Youth with NAFLD experience socioeconomic barriers which may impact both a clinician's ability to counsel patients effectively and also the patients' ability to successfully implement the medical recommendations given. Assessment and targeted interventions for these barriers may optimize treatment for these individuals.



* Multiple patients reported multiple barriers, thus total n does not equal 77
** Other = paying for medications, proximity to grocery store, miscellaneous manually entered comments

379 ***PREDICTORS OF SEVERE LIVER STIFFNESS AND SIGNIFICANT STEATOSIS IN PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE.*** *Stephanie Schuckalo[1], Stephanie Chiu[2], Nadia Ovchinsky[1]*
[1]Pediatric Gastroenterology, Hepatology & Nutrition, Atlantic Health System, Morristown, NJ; [2]Atlantic Center for Research, Atlantic Health System, Morristown, NJ

Background: Non-alcoholic fatty liver disease (NAFLD) is the most common cause of chronic liver disease (CLD) in children with a pooled mean prevalence of 7.6% in the general US pediatric population and of 34% in children with obesity. The presence of fibrosis in NAFLD may indicate a more severe disease phenotype and is most predictive of future adverse outcomes. Due to the high prevalence of NAFLD in overweight and obese children, it is

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important to identify children at higher risk of significant liver damage. Transient elastography (TE) is a novel, ultrasound-based method found to be accurate in predicting advanced fibrosis; it measures liver stiffness via a transducer probe that emits low-frequency vibration and calculates the speed of the propagating mechanical wave and generates a stiffness score as well as a controlled attenuated parameter (CAP) steatosis score. The aim of this study was to use TE to establish prevalence of more significant liver stiffness and steatosis in patients referred for suspected NAFLD and to identify clinical predictors of severe liver stiffness and significant steatosis.

Methods: Eighty-seven children ≤ 18 years of age referred for evaluation of suspected NAFLD based on elevated aminotransferases and/or echogenic liver on ultrasound were studied consecutively at a single pediatric hepatology practice from June 2018 to April 2019. Liver stiffness measurement (LSM) and controlled attenuated parameter (CAP) steatosis score were obtained using FibroScan™502 Touch device. LSM ≥ 6 kPa was considered clinically significant stiffness and LSM ≥ 8.6 kPa was considered severe stiffness. Cutoff of CAP for detecting significant steatosis was 280 dB/m. Descriptive statistics were used to summarize the demographic and clinical variables captured. Distribution of continuous variables were compared between kPa groups using one way ANOVA or Kruskal Wallis as appropriate. CAP and kPa variables were transformed into binary variables and univariate and multivariate analyses were performed.

Results: 45/87 (51.7%) had significant liver stiffness and 18/87 (20.7%) had severe liver stiffness. 62/87 (71.3%) had significant steatosis. Median LSM was 6.1 kPa and median cap score was 318 dB/m. Patients with severe liver stiffness had statistically higher AST and ALT levels (Table 1). Multivariate analysis demonstrated that aspartate aminotransferase (AST) (OR = 1.0224; 95% CI 1.0061 - 1.0389) and alanine aminotransferase (ALT) (OR = 1.0118; 95% CI 1.0037 - 1.0199) were independent predictors of severe liver stiffness. At univariate analysis, Z-score of body mass index (z-BMI), ALT, gamma-glutamyl transferase (GGT), insulin level, and triglycerides were associated with more significant steatosis (all p <0.05).

Conclusions: Since NAFLD has become the most common cause of CLD in children, it is imperative to identify predictors of significant liver injury for referral of at-risk patients to subspecialty clinics for evaluation. We found high prevalence of children with significant liver stiffness (51.7%) among patients referred with suspected NAFLD. ALT was identified as a predictor of both severe liver stiffness and significant steatosis. The risk factors identified in this study can help identify which children with suspected NAFLD are vulnerable to more substantial liver injury and need to be evaluated in larger cohorts of pediatric patients.

Table 1. Patient Characteristics

	Liver Stiffness			
	<6 kPA n=42	Significant (≥6 kPA) n=27	Severe (≥8.6 kPA) n=18	P-value
Gender, n (%)				
female	16 (38.1%)	10 (37.04%)	11 (61.11%)	p-0.2
male	26 (61.9%)	17 (62.96%)	7 (38.89%)	
age (years), mean (SD)	13.171 (3.556)	14.222 (2.621)	14.667 (2.249)	p=0.162
CAP score (dB/m), mean (SD)	301.33 (61.82)	320.77 (44.63)	322.22 (34.45)	p=0.219
BMI z-score, median (min-max)	2.01 (-0.39-2.76)	2.05 (0.1-2.59)	2.265 (-0.01-2.76)	p=0.123
AST (IU/L), median (min-max)	33.5 (16-211)	28 (15-109)	69 (20-143)	**p=0.001**
ALT (IU/L), median (min-max)	46 (14-262)	45 (16-272)	110.5 (22-275)	**p=0.002**
GGT (IU/L), median (min-max)	26 (12-89)	29.5 (16-222)	46 (13-142)	p=0.105
HgbA1c (%), mean (SD)	5.3583 (0.2701)	5.44 (0.3089)	5.45 (0.2939)	p=0.567
insulin, mean (SD)	28.14 (14.61)	30.8 (16.97)	42.06 (22.94)	p=0.144
cholesterol (mg/dl), mean (SD)	163.82 (37.47)	157.81 (34.75)	165.92 (33.95)	p=0.808
Triglycerides (mg/dl), mean (SD)	137.2 (65.8)	148.8 (70.7)	165.3 (64.7)	p=0.459
HDL (mg/dl), mean (SD)	39.96 (6.96)	39 (9.99)	42.54 (9.57)	p=0.522
LDL (mg/dl), mean (SD)	93.04 (35.66)	85 (32.14)	91.46 (22.87)	p=0.724

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380 ***CONGENITAL HEPATIC FIBROSIS, 20 YEAR EXPERIENCE IN A REFERRAL PEDIATRIC CENTER IN MEXICO.*** *Pablo Sempértegui*, *Flora Zarate Mondragon*, *Jaime Ramirez Mayans*, *Erick Toro Monjaraz*, *Roberto Cervantes Bustamante*, *Jose Cadena Leon*, *Karen Ignorosa Arellano*
Gastroenterology and Pediatric Nutrition, *Instituto Nacional de Pediatria*, *Ciudad de Mexico*, *Mexico*

Introduction: Arrest of maturation and the lack of remodeling of the ductal plate leads to the persistence of an excess number of immature embryonic duct structures. This abnormality has been termed the ductal plate malformation, and its spectrum includes congenital hepatic fibrosis, Caroli disease, autosomal dominant polycystic kidney disease, autosomal recessive polycystic kidney disease and Von Meyenburg complexes. They are rare disease with low prevalence and incidence. They affect primary the liver, but also kidney and other leading organs. This disease can lead to growth failure, portal hypertension, liver failure, recurrent cholangitis and development of hepatocellular carcinoma or terminal kidney failure. There are not reports in Mexico about frecuency, clinical presentation, diagnosis, treatment and natural history of the disease until now.

Objective: To determine the clinical presentation of patients with congenital hepatic fibrosis, managenement recieved and long-term evolution.

Methods: A cross-sectional study was performed. From 1997 to 2018, patients with diagnosis of congenital hepatic fibrosis were included. The statistical analysis was performed in SPSS 22. We obtained frecuencies and percentages, Shapiro-Wilk analysis for normality of quantitative variables was perfomed, obtaining standar deviations and mean ranges in case of having normal distribution or median and interquartile ranges (IQR) in the opposite case. In case of complications and defunctions we obtained disease free survival and global survival curves by Kaplan-Meier and factors were compared by Log-Rank.

Results: 17 patients were included of whom 35.3% were females, the mean age was 30 months (IQR 50), minimal value 0.7 months and maximum 151 months. 23.5% of patients had only congenital hepatic fibrosis and the rest presented another ductal plate malformation, being autosomal recessive polycystic kidney disease the most frequent associated. 64.7% of patients were malnourished, 5.9% had family history of ductal plate disease. Signs present at diagnosis time were in order of frecuency were hepatomegaly (94.1%), splenomegaly (76.5%), nephromegaly (41.2%) and arterial hypertension (29.4%); terminal kidney disease was present in 35.3% and 23.5% debut as upper GI bleeding (Table 1). In all cases liver and renal ultrasound was carried out reporting liver findings in 41.2% of cases consisting of cysts (35.3%); in the kidney reported nephromegaly 64.7%, kidney cysts 58.8%, decreased corticomedullary differentiation 41.2% and lithiasis 5.9%. In all cases liver biopsy was perfomed reporting periportal fibrosis (100%), cholestasis (52.9%), ductular proliferation and dilated ducts (41.2%), multiple biliary hamartomas 5.9% and regenerative nodules 5.9%. Only in 82.4% of patients diagnostic upper GI endoscopy was perfomed and in 47.1% of patients underwent variceal banding procedure. 18.8% underwent portosystemic shunt and 17.6% partial splenectomy. 82.4% required at least 1 antihypertensive and 58.9% $\geq$ 2 antihypertensive, 12.5% dialysis and int 6.3% kidney trasplantation. The free survival of bleeding was of 76% in a year and 55% at 5 years, the survival without terminal kidney disease was 94% and 87% respectively. The case- fatality rate was 11.8% with global survival rate of 94.1% at one year and 87.8% al 5 years. The cause of death was hypertensive crisis in all cases; the upper GI bleeding did not influenced the overall survival (p 0.652) while the terminal kidney diseas influeced negatively (p 0.039)

Conclusion: Congenital hepatic fibrosis is the most common presentation of ductal plate malformations, and the most common association is with autosomal recessive polycystic kidney disease. Most of cases are malnourished. Most common clinical findings are hepatomegaly, splenomegaly and nephromegaly. Kidney complications are very frequent at diagnosis time and they influence in a negative way to the overall survival rate.

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381 ***PEDIATRIC PREVALENCE OF HEPATITIS C VIRUS IN 15 COUNTRIES.*** *Jonathan Schmelzer[1], Ellen Dugan[1], Sarah Blach[1], Ivane Gamkrelidze[2], Sarah Robbins[1], Homie Razavi[1]. [1]Epidemiology, Center for Disease Analysis, Lafayette, CO; [2]Modeling, Center for Disease Analysis, Lafayette, CO*

Hepatitis C virus (HCV) prevalence estimates for adults and high-risk groups have been widely published, however the disease burden in pediatric populations is poorly documented or studied, despite critical differences in transmission, pathology, and clinical presentation. Similar to adult populations, HCV prevalence in pediatric populations varies largely between countries due to differing risk factors and standards of care. Direct-acting antivirals (DAA) were recently approved for pediatric patients aged 12–17 years, and trials are ongoing in younger children. Pediatric prevalence estimates at the country level are needed to inform treatment scale-ups as well as screening and diagnosis strategies for this population. This analysis combines past modeling and epidemiological work in over 100 countries with a focus on pediatric ages to estimate the current HCV prevalence in the pediatric populations in 15 countries – Australia, Canada, China, Egypt, France, Georgia, Germany, India, Italy, Japan, Pakistan, Russia, Spain, United Kingdom and United States.

A comprehensive literature search and review were completed for peer-reviewed articles published between January 2000 and March 2019 to identify anti-HCV or viremic prevalence data in pediatric ages. Additional sources, including non-indexed government reports and personal communications with local experts, were considered as part of the review. In countries where the prevalence data in pediatric ages were not available, an algorithm was used to estimate pediatric prevalence. The algorithm was developed by assigning population-weighted ratios of HCV prevalence in 0–4-, 5–9-, 10–14- and 15–19-year-olds, relative to the prevalence in 20–24-year-olds, in countries with available pediatric data stratified by injection drug use as a major risk factor (defined as people who inject drugs accounting for >10% of the infected population). Annual incidence of horizontally acquired cases of HCV infection in a previously published Markov disease burden model was calibrated to these prevalence data for each country up to the year the data were collected; perinatally acquired incident cases were calculated by applying age-specific fertility rates and transmission rate of HCV to the modeled HCV-infected women of childbearing age. The subsequent progression of liver disease was followed until the beginning of 2019 to calculate the HCV prevalence in the pediatric populations.

A total of 11,521 studies were identified in the literature search, and among these, 707 were included in a full-text review. Pediatric prevalence data were identified in 26 countries to use in developing the algorithm for extrapolating to countries without data. Viremic prevalence rates in 2019 among the 15 countries of interest ranged from <0.01% in 3–6-year-olds in Germany to 1.46% in 15–19-year-olds in Pakistan. The countries with the highest number of viremic cases were Pakistan (791,000), China (336,000), Egypt (121,000), Russia (94,000) and India (91,000).

There are few reliable studies of HCV prevalence in the general population of children as most studies are conducted in high-risk groups and highly endemic geographic areas. This analysis provides the first known prevalence estimates of HCV in the pediatric population at the country level and shows that prevalence rates are highly variable across countries in children, just as they are in adults. Treatment in pediatric patients requires different therapies and screening interventions than in adult patients. Due to this heterogeneity, country- and age-specific estimates of HCV prevalence are important and needed as countries develop national strategies for eliminating HCV.

	Viremic Cases		
Country	3-6 Year Olds	7-11 Year Olds	12-18 Year Olds
Australia	490 (0.04%)	770 (0.05%)	1,300 (0.06%)
Canada	320 (0.02%)	490 (0.02%)	890 (0.03%)
China	39,300 (0.06%)	80,700 (0.10%)	216,000 (0.19%)
Egypt	16,100 (0.16%)	27,500 (0.26%)	77,800 (0.62%)
France	260 (0.01%)	370 (0.01%)	730 (0.01%)
Georgia	320 (0.15%)	610 (0.23%)	1,400 (0.47%)
Germany	120 (<0.01%)	170 (<0.01%)	430 (0.01%)
India	9,500 (0.01%)	20,600 (0.02%)	60,800 (0.03%)
Italy	730 (0.04%)	1,400 (0.05%)	4,500 (0.11%)
Japan	220 (0.01%)	450 (0.01%)	1,200 (0.02%)
Pakistan	154,000 (0.77%)	231,000 (1.00%)	406,000 (1.46%)
Russia	14,300 (0.19%)	16,200 (0.19%)	63,500 (0.63%)
Spain	290 (0.02%)	520 (0.02%)	1,000 (0.03%)
UK	360 (0.01%)	720 (0.02%)	2,400 (0.05%)
United States	1,700 (0.01%)	2,800 (0.01%)	14,800 (0.05%)

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NUTRITION/OBESITY

382 ***HIGH FODMAP MEALS AND ABDOMINAL PAIN IN SCHOOL CHILDREN.*** *Cara Axelrod[2], Román Bigliardi[1], Luz Vieyra[4], Cecilia Zubiri[3], María Blanco[5], María Jaure[6], Miguel Saps[2]. [1]Pediatric Gastroenterology, Hospital Nacional Posadas Argentina, Buenos Aires, Argentina; [2]Pediatric Gastroenterology, University Of Miami, Miami, FL; [3]Pediatric Gastroenterology, Hospital De Niños Sor Maria Ludovica, La Plata, Argentina; [4]Licenciada Nutricionista Empresa Cooks., Buenos Aires, Argentina; [5]St Georges Collage, Quilmes, Argentina; [6]Instituye Arco Iris, La Plata, Argentina*

Background: Abdominal pain (AP) is common in childhood and negatively impacts quality of life. Some children recognize certain foods as a trigger for their AP. The low fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) diet is sometimes recommended for the treatment of functional AP disorders. FODMAPs are short chain carbohydrates that are poorly absorbed in the small intestine and are fermented to produce gas in the colon. Data from studies on the effect of FODMAP content and AP in children are scarce. The primary aim of the study was to assess the incidence of AP in a sample of school children. The secondary aims were to determine; (a) the incidence of the development of AP secondary to the ingestion of FODMAP rich meals, (b) the relationship between AP and FODMAP load, and (c) the relationship between the development of AP by high FODMAPs and noncompletion of the meal. We hypothesized that high FODMAP diets trigger symptoms in healthy community children, that higher FODMAP content results in more severe AP, and that children that report AP with the ingestion of FODMAPs will restrict their intake regardless of its FODMAP load.

Methodology: Study information packets were mailed to children's families in 2 schools in Argentina. Parents completed informed consent as well as demographic and past medical history questions including presence of AP. Subjects received a school lunch meal rich in FODMAPs (38.85-39.45 grams) for two consecutive days, followed by a 1 day washout with a "standard Argentinian meal", followed by another two days of a school lunch meal rich in FODMAPs (10.72-17.08 grams) although lower than the initial two days of the study. The amount of FODMAPs in the meals were calculated by Registered Dietitians. Participants were blinded to the hypothesis of the study. Three hours after the FODMAP rich meals were provided, participants completed confidential standardized questionnaires to assess their GI signs/symptoms in the last day. Participants were advised to report presence of AP, duration and severity of AP on a numeric rating scale (0-10). Questionnaires were collected by the research team upon completion. Approval was obtained by the local Institutional Review Board and school authorities.

Results: 142 subjects (51.4% girls, mean age 9.5 years, range 7–12 years) completed the study.

Primary aim: 50 subjects (35.2%) reported AP or discomfort in recent months (58 % girls, mean age 9.58 years).

Secondary aims: (a) Out of all children, 58 (40.8%) developed AP on days of the dietary intervention. 92 subjects reported no AP prior to the investigation. Of these 92 subjects, 38 (41.3%) experienced AP on days of the meals. Of the 50 subjects with AP prior to the intervention, 20 (40%) experienced AP on days of the meals (12 girls, 60% girls) (P = 1.000).

(b) 289 meals containing 38.85 to 39.45 grams were served. 56/289 (19.4%) meals were associated with AP. Out of the 56 meals associated with days of AP, 36 (64.3%) meals weren't consumed in full. 233/289 meals weren't associated with days of AP (80.6%), and 89 of these meals weren't consumed in full (38.2%) (**P=0.0005**). 276 meals containing high FODMAPs in the range between 10.72 to 17.08 grams were served. 64/276 meals were associated with days of AP (23.2%). Of this group of 64 meals associated with AP, 36 meals weren't consumed in full (56.3%). 212/276 meals weren't associated with AP (76.8%), and 89 meals of these meals weren't consumed in full (42%) (**P= 0.0465)**. (c) Greater FODMAP load didn't associate with more pain (P=0.3037) and food restrictions (P=0.4).

Conclusions: Our results suggest that AP is common amongst children in Argentina, and children experience AP regardless of their FODMAP load. History of AP does not predict the onset of AP with FODMAPs. Children who report AP with a high FODMAP meal are more likely to limit their intake than those who do not report AP. Greater FODMAP load did not associate with more pain and food restrictions. Future studies evaluating FODMAP content and AP are warranted.

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Day	Meals served	Meals associated with pain/ Meals associated with pain and not eaten in full	Meals not associated with pain/ Meals not associated with pain and not eaten in full	P value
Day 1 FODMAP (38.85 to 39.45 grams)	146	26 / 18 (62.2%)	120 / 50 (41.7%)	P= 0.0161
Day 2 FODMAP (38.85 to 39.45 grams)	143	30 / 18 (60.0%)	113 / 39 (34.5%)	P= 0.0199
Day 1 and 2 combined FODMAP (38.85 to 39.45 grams)	**289**	**56 / 36 (64.3%)**	**233 / 89 (38.2%)**	**P=0.0005**
Day 3 Washout				
Day 4 FODMAP (10.72 to 17.08 grams)	140	36 / 21 (58.3%)	104 / 46 (44.2%)	P= 0.0805
Day 5 FODMAP (10.72 to 17.08 grams)	136	28 / 15 (53.6%)	108 / 43 (39.8%)	P= 0.2050
Day 4 and 5 combined (10.72 to 17.08 grams)	**276**	**64 / 36 (56.3%)**	**212 / 89 (42%)**	**P= 0.0465**
Day 1 and 2 combined versus Day 4 and 5		P=0.4556	P= 0.4391	

High FODMAP meals, abdominal pain, and noncompletion of food

383 ***IMPACT OF COMMERCIAL BLENDED DIETS ON PARENTAL QUALITY OF LIFE AND FAMILY FUNCTIONING.*** *Irini Batsis[1], Lindsay Borden[3], Laura Prichett[2], Wu Linxuan[2], Laura Davis[4], Darla Shores[1], Maria Oliva-Hemker[1]. [1]Pediatric Gastroenterology, Johns Hopkins, Baltimore, MD; [2]BEADcore, Johns Hopkins, Baltimore, MD; [3]Behavioral Psychology, Johns Hopkins Children's Center, Baltimore, MD; [4]Nutrition, Johns Hopkins Children's Center, Baltimore, MD*

Background: An increasing number of commercially available blended diets made with whole foods are now available. Previous studies have reported that homemade blended diets improve feeding tolerance, normalize stooling patterns and are highly accepted by caregivers. However, the body of data is limited regarding commercial blended diets. The objective of this study was to prospectively assess caregiver quality of life (QOL), health related QOL and family functioning with commercial blended diets, as well as the effect on patient GI symptoms.

Methods: Outpatients ages 1-21 yrs, who were receiving gastrostomy feedings with standard formula and then switched to commercial blended diets were enrolled from Mar 2018 to Feb 2019. Demographics were obtained. Peds QL-Family Impact Module (FIM)- Parental Report questionnaire was used to assess caregiver QOL, health related (HR) QOL and family functioning at baseline and at one-month post initiation of a commercial blended diet. Higher scores were indicative of higher functioning. Clinical evaluation, at baseline and 1 month, included measuring frequency of any upper GI symptom (gagging/retching, emesis), any lower GI symptom (diarrhea, constipation) and any general GI symptom (abdominal bloating/distention, abdominal pain/discomfort). A series of paired t tests were employed to assess the changes in Family Impact Module Scores and in GI between baseline and follow up.

Results: 14 patients were enrolled (7 F, 7 M). Mean age (range) at switch to commercial blended diet was 4.3 years (1.4, 12.2). Underlying primary diagnoses were neuro/muscular disorders in 12 patients, gastrointestinal disorder in 1, and congenital cardiac disease in 1. Eleven had received a fundoplication. While on standard formula, 6 were

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receiving whole cow milk formula, 6 amino acid based formula, 1 hydrolysate and 1 soy based formula. 6 patients were on bolus feeds, 2 on continuous feeds, 6 on combination feeds. Mean total score of the PedsQL FIM increased from 58.1 at baseline to 68.7 ($p<0.008$) representing overall QOL of caregivers', at one-month post commercial blended diet initiation. Statistically significant changes were observed in HRQL, and in the subscales for physical, emotion, cognitive functioning and worry (Table 1). There was statistically significant decreases in upper GI symptoms (92.9% to 42.9%, p=.003) including gagging/retching and vomiting, and diarrhea (42.9% to 14.3%, p=.014) (Table 2). Overall, 53.8% of patients with any upper GI manifestation, 50% with any lower GI symptom and 75% with general GI manifestation had complete resolution of symptoms. New symptoms developing while on the blended diet included 1 patient with constipation that was controlled with osmotic laxatives, and one with abdominal pain and bloating, yet they continued on the blended diet. 1 patient was transitioned to transpyloric feeds with standard formula due to lack of improvement in upper GI symptoms and one discontinued the blended diet temporality due to skin discoloration secondary to b-carotene hypervitaminosis.

Conclusion: In our prospective sample, the initiation commercial blended diets was associated with improved in HRQL and caregivers' worry of child's medical condition; and were associated with improvement in upper GI symptoms and diarrhea. The changes were noted within the first month of blended diet. Overall the diet was well tolerated with no significant adverse events. Controlled prospective clinical and translational studies are needed to confirm these findings and to delineate the physiologic mechanisms.

	Baseline (n=12)	1 Month (n=12)	Paired t test result
FIM Scores	Mean (SE)	Mean (SE)	P value (<0.05)
Total	58.1 (6.5)	68.7 (6.3)	0.008
Parent HRQL Summary	59.6 (7.4)	70.9 (6.3)	0.011
Subscales (functioning):			
Physical	54.2 (6.8)	67.7 (6.5)	0.009
Emotional	63.8 (9.0)	74.2 (6.9)	0.026
Social	58.4 (8.4)	61.5 (9.5)	0.658
Cognitive	62.5 (9.6)	79.2 (6.2)	0.046
Communication	61.1 (8.4)	66.0 (9.3)	0.349
Worry	42.9 (8.5)	59.6 (9.9)	0.009
Family Functioning Summary Score	62.7 (8.1)	70.6 (5.5)	0.234
Family Daily Activities	72.5 (8.0)	54.2 (7.1)	0.277
Family Relationships	72.5 (8.8)	80.4 (5.7)	0.221

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FIM

	Baseline (n=14)	1 Month (n=14)	Paired t-test
GI Symptoms	Percent (%)	Percent (%)	P value
Any Upper GI symptom	92.9	42.9	0.003
Gagging/retching	85.7	35.7	0.003
Emesis	57.1	14.3	0.008
Any Lower GI symptom	78.6	50.0	0.104
Diarrhea	42.9	14.3	0.04
Constipation	76.9	35.7	0.054
Any General GI symptom	57.1	28.6	0.104
Abdominal bloating/distention	42.9	21.4	0.189
Abdominal pain/discomfort	42.9	14.3	0.104

Change in GI symptoms

384 ***BIOELECTRICAL IMPEDANCE AND SLAUGHTER EQUATION TO EVALUATE THE PERCENTAGE OF BODY FAT IN PEDIATRIC PATIENTS WITH CYSTIC FIBROSIS.*** *Karen Buendía Juárez*, *Rocío Macías*, *Sergio Pacheco Sotelo. Pediatric Gastroenterology*, *Hospital de Pediatría CMN Occidente, IMSS*, *Guadalajara*, *Jalisco*, *Mexico*

Background: The Normal weight obesity (NWO), phenotype associated is associated is related to alteration in metabolic pathways and inflammation. In population with and without cystic fibrosis (CF) reduced pulmonary function independently of body weight has been associated with a greater degree of adiposity

Methods: Analytical cross-sectional survey of children diagnosed with CF in a third-level care center. The nutritional status was assessed with weight, height, body mass index (BMI) adjusted to z score and according to the WHO classification, % body fat (%BF) was obtained through the Slaughter equation (SE) when evaluating the tricipital and subscapular skin fold and bioelectrical impedance (BIA), a specific validated equation for CF was used to quantify fat mass (FM) and %BF. The results were classified according to McCarthy's reference pattern. Statistical analysis: frequencies, percentages, median, interquartile range (IQR), Pearson correlation and χ^2test.

Results: Twenty patients participated in the study, 50% female sex, with a median age of 10 years (IQR 4.5); According to BMI/A, 10 (50%) patients with normal nutrition status were found, 5 (25%) with moderate undernutrition and 5 (25%) severe undernutrition. The median %BF determined by SE was 10.45 (IQR 8.8), 25.6 (IQR 8) and 34.14 (IQR 7.20) by BIA and after being adjusted for illness respectively. Based on McCarthy's reference standard, 15 patients (75%) had underfat, while 5 (25%) had a normal degree of adiposity by SE; through BIA 8 (40%) patients presented %BF normal, 3 (15%) were classified as underfat, 1 (5%) patient with overfat and 8 (40%) with obesity, and when adjusted to illness 2 (10%) patients presented %BF normal, 3 (15%) overfat and 15 (75%) patients presented obesity.

A moderate correlation was obtained between %BF by SE and that reported by BIA (r=0.500, p=0.027); no correlation was found between %BF by BIA and BMI (r=0.401, p=0.120). However, when performing the correlation between % BF by SE and BMI, a very high correlation was obtained (r=0.945, p <0.001). No association was found between %BF by SE when classified by percentiles (underfat or normal fat) and clinical manifestations of respiratory or digestive type; However, it was found that 8 (40%) of patients with underfat had a higher prevalence of them.

Conclusions: The BMI is an easy measurement, however it is limited by its failure to distinguish between fat mass (FM) and lean mass (FFM), its use as a substitute for adiposity is still debated in the pediatric population due to fat mass contributions and lean to body weight that vary according to age, sex, pubertal status and populations.

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385 ***LONG-TERM RETROSPECTIVE FOLLOW-UP OF PEDIATRIC PATIENTS WITH SHORT BOWEL SYNDROME–ASSOCIATED INTESTINAL FAILURE (SBS–IF) WHO COMPLETED 12 WEEKS OF TREATMENT IN TED-C13-003 (SHP633-303).*** *Beth Carter[1], Susan Hill[2], Simon Horslen[3,4], Samuel Kocoshis[5], MinJung Yoon[6], Andrew Grimm[6]. [1]Children's Hospital Los Angeles, Los Angeles, CA; [2]Great Ormond Street Hospital for Children NHS Foundation Trust, London, United Kingdom; [3]Seattle Children's Hospital, Seattle, WA; [4]University of Washington School of Medicine, Seattle, WA; [5]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [6]Shire Human Genetic Therapies, Inc., Lexington, MA*

To evaluate long-term safety and efficacy outcomes of pediatric patients with SBS–IF who were treated with teduglutide (TED) for 12 weeks in the TED-C13-003 study (NCT01952080; EudraCT 2013-004588-30). The SHP633-303 long-term extension study (NCT02949362; EudraCT 2016-000863-17) included the collection of retrospective data after the completion of the prior study.

All patients enrolled had been treated with teduglutide 0.0125, 0.025, or 0.05 mg/kg/day subcutaneously once daily for 12 weeks. The retrospective observation period consisted of 2.4–3.3 years of follow-up after the end of the prior study. Retrospective safety data included serious adverse events (SAEs), adverse events (AEs) related to teduglutide, events of polyps or neoplasia, retrospective exposure to teduglutide, and growth parameters. Prescribed parenteral support (PS) for each 12-week interval since the end of the prior study were also captured. Baseline was from the 12-week study baseline visit. Results are reported using descriptive statistics (mean ± SD unless indicated otherwise).

Of the 40 patients who completed the 12-week study, 29 patients (73%) consented to retrospective data collection. Among these 29 patients, 24 did not receive additional teduglutide (TED/NTT), and 5 received additional teduglutide (TED/TED) during the retrospective period. TED/TED patients did not resume teduglutide treatment until 78–96 weeks after the 12-week study (42.9±17.92 exposure weeks). Treatment-related AEs were reported by 0 TED/NTT and 1 TED/TED patients (1 event of abdominal pain and 1 event of constipation, both moderate in severity). Serious AEs were reported by 23/24 (95.8%) TED/NTT and 4/5 (80.0%) TED/TED patients; none were treatment-related and the most frequent were central-line associated infections. No cases of polyps or neoplasia were reported. There were no clinically meaningful changes in z scores for weight, height, or body mass index. Minimal changes from baseline in PS volume were observed during long-term observation of the TED/NTT patients for whom PS volume requirements remained stable and below baseline values; PS volume declined from baseline in TED/TED patients (**Table**). At Week 72, before teduglutide treatment was reinitiated in any TED/TED patients, the change from baseline in PS calories was +23.3%±99.38% (n=5); at Week 120 it was –38.6%±97.8% (n=5). At Week 72, the change from baseline in PS days per week was –1.4±3.00 (n=5); at Week 120 it was –3.8±3.70 (n=5).

During long-term retrospective observation of patients who had previously been treated with teduglutide for 12 weeks, AEs were consistent with the underlying disease. No events of polyps or neoplasia were identified, and no SAEs were related to teduglutide, even among the few patients who received additional teduglutide treatment. In the absence of additional teduglutide treatment, minimal intestinal adaptation occurred, indicating that these patients had minimal prospect for spontaneous intestinal adaptation. In patients who received additional teduglutide, treatment was temporally associated with reductions in PS volume, calories, and infusion time.

Funding: Shire, a member of the Takeda group of companies.

Table. Percent Change in PS Volume Requirements

Parameter*	TED/NTT (N=24)		TED/TED (N=5)	
PS volume, mL/kg/day		n		n
Baseline	68.9±28.34	24	44.7±15.12	5
% Change				
Wk 24	–10.7±33.08	24	–32.1±31.64	4
Wk 48	–14.0±39.39	23	–65.2±31.65	4
Wk 72	–14.2±40.5	22	–14.1±58.45	5
Wk 96	–12.0±51.63	24	–61.2±29.34	5
Wk 120	–12.9±49.37	22	–69.61±39.19	5

PS=parenteral support; NTT=not treated with teduglutide; TED=teduglutide; Wk=week.*Data are mean ± SD values.

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386 ***SAFETY FINDINGS IN CHILDREN TREATED WITH TEDUGLUTIDE FOR SHORT BOWEL SYNDROME–ASSOCIATED INTESTINAL FAILURE: POOLED ANALYSIS OF 4 CLINICAL STUDIES.***

Beth Carter[1], Valeria Cohran[2], Susan Hill[3], Simon Horslen[4,5], Stuart Kaufman[6], Samuel Kocoshis[7], David Mercer[8], Russell Merritt[1], Mikko Pakarinen[9,10], Susan Protheroe[11], Sharon Smith[12], John Thompson[13], Charles Vanderpool[14], Robert Venick[15], Paul Wales[16], MinJung Yoon[12], Andrew Grimm[12]. [1]Children's Hospital Los Angeles, Los Angeles, CA; [2]Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [3]Great Ormond Street Hospital for Children NHS Foundation Trust, London, United Kingdom; [4]Seattle Children's Hospital, Seattle, WA; [5]University of Washington School of Medicine, Seattle, WA; [6]MedStar Georgetown University Hospital, Washington, ; [7]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [8]University of Nebraska Medical Center, Omaha, NE; [9]Children's Hospital, Helsinki, Finland; [10]Helsinki University Central Hospital, Helsinki, Finland; [11]Birmingham Children's Hospital NHS Foundation Trust, Birmingham, United Kingdom; [12]Shire Human Genetic Therapies, Inc, a member of the Takeda group of companies, Lexington, MA; [13]Children's Hospital at Montefiore, Bronx, NY; [14]Riley Hospital for Children at Indiana Health, Indianapolis, IN; [15]Mattel Children's Hospital UCLA, Los Angeles, CA; [16]The Hospital for Sick Children, Toronto, ON, Canada

Teduglutide, a glucagon-like peptide-2 analog, reduces the need for parenteral support (PS) in children with short bowel syndrome–associated intestinal failure (SBS−IF). To provide safety information regarding teduglutide treatment for pediatric patients with SBS–IF, we assessed the combined safety data from 4 clinical studies.

TED-C13-003 (NCT01952080, EudraCT 2013-004588-30) and TED-C14-006 (NCT02682381; EudraCT 2015-002252-27) were phase III studies of teduglutide that treated children aged 1–17 years with PS-dependent SBS. In the 12-week, open-label TED-C13-003 study, patients received standard of care (SOC) or teduglutide (0.0125, 0.025, or 0.05 mg/kg once daily). The 24-week TED-C14-006 study included 2 randomized, double-blind teduglutide dose groups (0.025 and 0.05 mg/kg once daily) and a nonblinded SOC arm. Two ongoing extension studies, SHP633-303 (NCT02949362, EudraCT 2016-000863-17; TED-C13-003 extension) and SHP633-304 (NCT02954458, EudraCT 2016-000849-30; TED-C14-006 extension) had an interim analysis of prospective data (July 24, 2018 cutoff). In the extension studies, patients received 0.05 mg/kg teduglutide once daily in 28-week cycles (24 weeks of treatment plus 4-week follow-up) if their PS needs plateaued or they clinically deteriorated after prior teduglutide treatment ended.

89 patients (mean±SD age, 5.6±3.64 [range, 1.0–15.0] years) were treated with teduglutide. Mean±SD teduglutide exposure in all studies was 48±24.6 weeks (median: 51, range: 5–95). The extent of teduglutide exposure was 9 (10.1%) patients with ≤12 weeks, 16 (18.0%) patients with 12–≤24 weeks, 11 (12.4%) patients with 24–≤48 weeks, and 53 (59.6%) patients with 48–≤96 weeks. Adverse events (AEs) using MedDRA coding were reported in 89 patients (100.0%); the **Table** lists AEs reported in ≥10% of patients. AEs considered related to teduglutide treatment were reported in 35 patients (39.3%); the most common were abdominal pain and vomiting (5 patients each; 5.6%) and injection site bruising, injection site pain, injection site swelling, nausea, and stoma complication (3 patients each; 3.4%). Serious AEs (SAEs) were reported in 69 patients (77.5%); those occurring in ≥5.0% of patients were pyrexia (25 patients; 28.1%), device-related infection (24 patients; 27.0%), influenza (9 patients; 10.1%), device breakage (8 patients; 9.0%), dehydration (7 patients; 7.9%), and upper respiratory tract infection (6 patients; 6.7%). An SAE in 3 patients was considered related to teduglutide. No AEs of neoplasia were reported. There was one case of cecal polyp that was not biopsied or seen on repeat colonoscopy. Two patients (2.7%; both in SHP633-304) discontinued teduglutide because of an AE; neither event was considered related to teduglutide. A patient with a history of cholestasis discontinued teduglutide because of an SAE of elevated blood bilirubin that was assessed by the investigator as related to iatrogenic iron overload. A second patient discontinued teduglutide because of an SAE of enterocutaneous fistula following elective open gastrostomy tube placement and lysis of adhesions, and second gastrostomy to improve placement. The fistula was considered a complication of extensive lysis of adhesions and the extra gastrostomy incision. One death occurred following withdrawal from study, secondary to elective withdrawal of nutritional support after partial response to teduglutide and additional comorbid conditions limiting quality of life. After 24 weeks of treatment, 8 patients (15.4%) were positive for anti-teduglutide antibodies, and 3 patients (5.8%) had neutralizing antibodies to teduglutide.

In summary, there were no new safety concerns identified in pediatric patients with SBS–IF treated with teduglutide after a pooled analysis of 4 clinical studies. AEs were as expected for this patient population and reflected reactions to teduglutide, complications of the underlying disease, and unrelated AEs common in children.

Funding: Shire, a Takeda company

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Table. AEs Reported in ≥10% of Patients Receiving Teduglutide in 4 Clinical Studies

AE Preferred Term, n (%)	Teduglutide (N=89)
Vomiting	46 (51.7)
Pyrexia	39 (43.8)
Upper respiratory tract infection	37 (41.6)
Cough	30 (33.7)
Device-related infection*	26 (29.2)
Abdominal pain	23 (25.8)
Diarrhea	23 (25.8)
Alanine aminotransferase increased	18 (20.2)
Headache	18 (20.2)
Viral infection	18 (20.2)
Nasopharyngitis	18 (20.2)
Rash	15 (16.9)
Nausea	15 (16.9)
Influenza	14 (15.7)
C-reactive protein increased	13 (14.6)
Dehydration	13 (14.6)
Device breakage*	13 (14.6)
Abdominal pain upper	12 (13.5)
Blood bicarbonate decreased	12 (13.5)
Abdominal distension	11 (12.4)
Device occlusion*	10 (11.2)
Rhinorrhea	10 (11.2)
Fatigue	10 (11.2)
Gastroenteritis viral	9 (10.1)
Rhinitis	9 (10.1)
Device dislocation*	9 (10.1)

AE=adverse event; PS=parenteral support.

*All device-related events were related to central venous catheters used to administer PS, not to the teduglutide injection device.

387 ***PREDICTING THE RISK OF SEVERE VITAMIN D DEFICIENCY USING COMMON CLINICAL AND LABORATORY PARAMETERS: A NEW SCORE PROPOSAL..*** *Kenny Castro-Ochoa[1], Jose Rojas-Camayo[1], Maria Fermin[1], Upma Suneja[1], Swati Dave-Sharma[1], Sivan Kinberg[2]. [1]Pediatrics, Lincoln Medical Center, Bronx, NY; [2]Pediatric Gastroenterology, Hepatology and Nutrition, Columbia University Irving Medical Center, New York, NY*

INTRODUCTION: Vitamin D deficiency is highly prevalent in children and is a worldwide problem.

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Consequences include hypocalcemia and nutritional rickets, and it has been associated with other non-skeletal conditions including increased risk of cancer and autoimmune diseases such as inflammatory bowel disease (IBD). Vitamin D is thought to play a protective role on gut health, and several clinical studies have pointed to a critical role for vitamin D in ameliorating disease outcomes.

Diverse thresholds for defining vitamin D deficiency have been proposed. The Pediatric Endocrine Society and the American Academy of Pediatrics recommends that 25 (OH)-D should be at least above 20ng/mL, and recently a Global Consensus of 10 Pediatric Endocrine Societies defined sufficiency >20ng/mL, insufficiency 12-20ng/mL and deficiency <12ng/mL. Identifying children with an increased risk of severe vitamin D deficiency is crucial because levels <10ng/mL may result in impaired bone mineralization, calcium malabsorption, osteomalacia/rickets and myopathy.

Prediction models that recognize children at risk of severely low vitamin D levels are lacking. Our goal is to create a model for identifying those children at risk of severe vitamin D deficiency.

METHODS: We conducted a cross sectional retrospective study of 329 children aged 2-20 years who had vitamin D levels checked in a pediatric outpatient clinic from January 2015 to January 2018. We defined severe vitamin D deficiency as 25 (OH)-D <10ng/mL.

We used Statistical Package for the Social Sciences software v25.0 for statistical analysis, using descriptive statistics for demographic data and other descriptive variable. We used a Receiving operating curve (ROC) to determine variables that predicted severe vitamin D levels and we selected variables that has Area under the curve (AUC) >0.6 and p values <0.1. Then, in order to select the best cut-off value, we used the Youden's index, and for further risk analysis we used Binomial Logistic Regression.

RESULTS: In our model, we found that Age ≥12 years (adjusted OR: 8.79, 95CI 1.13-68.56), Body Mass Index ≥27kg/m2 (adjusted OR: 3.6, 95CI 1.08-12.05), Triglycerides/High Density Lipoprotein ratio ≥ 1.5 (adjusted OR 5.50, 95 CI 1.21-25.04), and Hemoglobin A1c % ≥6 (adjusted OR: 4.33, 95 CI 1.63-11.54) independently predicted the risk of severe vitamin D deficiency (<10ng/mL), adjusted for gender and ethnicity. Using a model based on the number of risk factors present, we found that in our low risk group (0-2 risk factors) 1.7%; in the medium risk group (3 risk factors) 15.3%; and in the high-risk group (4 risk factors) 38.9% of patients had vitamin D levels <10ng/mL with AUC 0.82 (p <0.001).

DISCUSSION: Our clinical scoring system has the capacity to detect the risk of severe vitamin D deficiency (<10ng/mL) in a population with a high prevalence of deficiency, using clinical and laboratory data that are commonly available in pediatric outpatient settings. Classifying children into three risk groups is to the best of our knowledge the first clinical scoring system that predicts risk of severe vitamin D deficiency in children. It is interesting that our model predicts severe vitamin D deficiency with AUC of 0.82 using only 4 objective clinical and laboratory parameters commonly available in outpatient pediatric practices, while avoiding the inherent bias when using variables that need recall from patients. This scoring system could potentially be integrated into Electronical Medical Records and automatically notify clinicians of the risk of severe vitamin D deficiency in their patients.

Current guidelines do not recommend routine screening for vitamin D because of invasiveness, high cost and lack of evidence to support cost-effectiveness. However, identifying children with increased risk of severe vitamin D deficiency is crucial because levels <10ng/mL may result in serious skeletal and non-skeletal complications and poor clinical outcomes.

One of our limitations is that our model has not been validated in other populations. Our patient population was predominantly Hispanic and African American. An additional limitation was that we did not include the season of the year in our study, which could have led to a better prediction of the model.

CONCLUSION: Our model, which includes Body Mass Index, age, Triglycerides/High density lipoprotein ratio and Hemoglobin A1c, has the potential to predict the risk of severe vitamin D deficiency in children in a population with high prevalence of vitamin D deficiency. Further studies need to be done to improve and validate our model.

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388 ***CLINICAL USE AND SAFETY OF AN AMINO ACID-BASED INFANT FORMULA IN A REAL WORLD SETTING.*** *Pamela Cekola[1], Aimee Henrikson[1], Heidi Reichert[2], Sarah Cohen[2], Maureen Huhmann[3], Krysmaru Araujo Torres[1]. [1]Medical Affairs, Nestle Health Science, Bridgewater, NJ; [2]EpidStrategies A Division of ToxStrategies, Cary, NC; [3]Research and Development, Nestle Health Science, Bridgewater, NJ*

Objective: Amino acid-based (AA) infant formulas are used in the nutritional management of children with cow's milk protein allergy (CMPA), multiple food allergies or malabsorptive conditions. The American Academy of Pediatrics as well as other published allergy guidelines recommend AA formulas for children with symptoms that do not resolve with the use of an extensively hydrolyzed infant formulas (EHF)[1-4]. To our knowledge, this was the first post-market safety surveillance study with an AA infant formula. The primary aim of this study was to assess the frequency and nature of adverse events in infants fed an AA formula. Secondary objectives were to describe demographic and clinical characteristics in subjects.

Methods: This prospective, post-market surveillance program with AA formula (Alfamino® Infant) was conducted during February 2017 - May 2018 at 30 sites in the United States. Enrollment was open for 14 months with no limit to the number of infants to be enrolled. Consent was obtained from caregivers for all Infants ≤ 12 months of age, > 37 weeks corrected gestation age (CGA) at enrollment, and with planned or current use of Alfamino® Infant formula. There were no mandated clinic visits as part of the protocol. Subjects were followed by their healthcare providers (HCP) as per usual care. Data were collected for 4 months after enrollment, or until discontinuation of formula.

Results*:* 144 infants were enrolled and 88 (61%) were followed for 4 months. Demographics are described in **Table 1**. Sixty-nine percent of infants (100 of 144) included in the study were diagnosed with CMPA. Within this CMPA population, 84% (84 of 100) were classified as severe, based on protocol criteria of any physician report, history of anaphylaxis or failure of EHF to resolve symptoms. Six serious adverse events (SAE) were reported in 6 subjects, 3 with severe CMPA. Eighty-three (83%) percent of SAE were reported as Unrelated (5 of 6), or Unlikely related to study formula in 1 subject. No SAE were reported with Probable or Definite relationship to study formula. A total of 156 adverse events (AE) were reported in 58 (40%) subjects. Ninety (90 of 156) events (58%) were reported in 31 (37%) subjects with severe CMPA. Seventy-eight (78%) percent of AE were reported as Unrelated to study formula (122 of 156), 9% reported as Unlikely related to study formula (14 of 156), 11% reported as Probably related to study formula (17 of 156), and less than 1% reported as Definitely related to study formula (1 of 156). Emesis and constipation were the most frequently reported events with Probable association. No reports of anaphylaxis were observed during study.

Conclusion*:* This post-market prospective surveillance of an amino acid infant formula in infants with CMPA, severe CMPA and malabsorptive conditions demonstrated no unexpected safety concerns in the overall or severe CMPA population.

References:

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Table 1: Subject Demographics (N=144)

	N (%)
Gender	
Male	71 (49)
Female	73 (51)
	Mean [Std]
Gestational birth age, weeks	37.8 [3.1]
Age at enrollment, weeks	21.0 [12.6]
	N **Mean [Std]**
Birth Z Scores	
Weight (g)	117 -0.80 [1.8]
Length (cm)	102 -0.98 [3.7]
Enrollment Z Scores	
Weight (g)	141 -1.04 [1.5]
Length (cm)	141 -1.08 [2.0]
Birth WHO Percentiles	
Weight (g)	117 36.3 [31.5]
Length (cm)	102 45.9 [37.6]
Enrollment WHO Percentiles	
Weight (g)	141 27.9 [30.4]
Length (cm)	141 29.8 [33.0]
	N (%)
Diagnosis	
CMPA	100 (69)
Malabsorption	5 (3)
Other	39 (27)

389 ***FRUCTAN SENSITIVE CHILDREN WITH IRRITABLE BOWEL SYNDROME HAVE DISTINCT GUT MICROBIOME SIGNATURES.*** *Bruno Chumpitazi[1], Kristi Hoffman[2], Ann McMeans[1], Joseph Petrosino[2], James Versalovic[3], Robert Shulman[1]. [1]Pediatrics, Baylor College of Medicine, Houston, TX; [2]Alkek Center for Metagenomics and Microbiome Research, Baylor College of Medicine, Houston, TX; [3]Pathology, Baylor College of Medicine, Houston, TX*

Background: Dietary fructans worsen gastrointestinal symptoms in a subset of children with irritable bowel

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syndrome (IBS). Whether gut microbiome composition is associated with fructan-induced symptoms in children with IBS is unknown.
Objectives: In children with IBS: 1) To determine whether bacterial gut microbiome composition is associated with fructan-induced symptoms; and 2) To determine whether gut microbial community types affect microbial fructan response.
Methods: Children 7-17 years (n=33) with pediatric Rome III IBS completed a double-blind, randomized, placebo controlled crossover (fructan vs. maltodextrin) trial. During each dietary intervention lasting 72 hours, abdominal pain frequency was captured. A washout period of ≥10 days separated each dietary intervention. Stools were obtained at baseline and during each dietary intervention period. Gut microbial composition (16s rRNA sequencing) comparisons between fructan sensitive (>30% increase in abdominal pain frequency during the fructan challenge) and fructan insensitive subjects were made using ATIMA and Linear Discriminant Analysis (LDA) Effect Size. Gut community types were determined using Dirichlet multinomial mixtures modelling.
Results: Baseline: Fructan sensitive (n=15) subjects [vs. fructan insensitive (n=18)] subjects had lower baseline alpha diversity ($q<0.05$). At baseline, fructan sensitive subjects were enriched in *Veillonella* whereas fructan insensitive subjects were enriched in eleven OTUs with broad saccharolytic properties including *Romboutsia*, *Blautia*, *Clostridium sensu stricto*, and *Ruminococcaceae*. Fructan challenge: Fructan sensitive (but not fructan insensitive) subjects had significant increases in *Bifidobacterium* (LDA(log10)=4.5, P=0.007) and *Anaerostipes* (LDA(log10)=4.0, P=0.009) during the fructan (vs. maltodextrin) challenge. During the fructan challenge, fructan sensitive subjects were enriched in *Eubacterium rectale* and *Lachnospira*. In contrast, fructan insensitive individuals were enriched in *Romboutsia*, *Intestinbacter*, *Ruminiclostridium_5, Roseburia*, and *Tyzzerrella*. Community Types: Two distinct community types were identified - one having a higher predominance of *Bacteroides/Bifidobacteria (B/B)* and the other having a higher predominance of *Ruminococcus/Prevotella (R/P).* Community type was not associated with fructan sensitivity. However, microbial changes during the fructan challenge varied by community type with significant increases in *Bifidobacteria* primarily found in the B/B type vs. significant increases in *Anaerostipes* primarily found in the R/P type.
Conclusions: Microbial composition differences at baseline and during the fructan challenge differentiate fructan sensitive vs. fructan insensitive children with IBS. Microbial community type may modulate the microbial composition differences which occur during a fructan challenge.

390 ***WEIGHT GAIN AND TOLERANCE IN PEDIATRIC PATIENTS USING PLANT-BASED ENTERAL FORMULAS.*** *Stanley Cohen[1], Ana Ramirez[1], Bailey Koch[1], Benjamin Gold[1], Vanessa Millovich[2]. [1]Children's Center for Digestive Health Care, Atlanta, GA; [2]Clinical Nutrition, Kate Farms, Inc, Santa Barbara, CA*
Introduction: The purpose of this study was to assess the experience of pediatric patients consuming a novel plant-based enteral formula at a single pediatric gastroenterology center.

Methods: After institutional review board approval, a retrospective chart review was conducted on pediatric patients who had been taking a plant-based enteral formula (Kate Farms® Santa Barbara, California) within the previous two years. Age, anthropometrics, medical history, method of administration and nutritional regimen were collected from the patient records for analysis. After inclusion, a member of the research team administered a five-question survey with the primary caregiver of each patient by phone.

Results: A total of 11 patients were found; 9 had anthropometric data available for analysis. The mean age was 13.1+7.3 years with use of the plant-based formula on an average of 5.9+3.3 months. Medical diagnoses varied: the most common diagnoses were feeding difficulties in 66% (n=6) and failure to thrive (FTT) in 44% (n=4). Ten patients were placed on the intact standard polymeric plant-based formula (1.0 kcal/mL; mean of 704 mL/day); 2 went onto the 1.5 kcal/mL peptide plant-based formula (n=1 at 975 mL/day). The prescribed formula and quantities were decided by the dietitian and/or physician. Four patients received the formula by mouth and 5 received it via feeding tube. For those subjects with available data, 6 were also on a regular diet along with formula.

Of the 9 patients with complete anthropometric data, 7 showed weight gain while on the plant-based formula (Table). For those patients <21 years old with a documented weight-for-age z-score (n=7), 6 showed improvement.

Tolerance questionnaires were completed for 10 patients: 90% of caregivers agreed that their child tolerated the plant-based formula better than their previous regimen and that the new formula improved their child's nutrition; 80% of caregivers also indicated that the plant-based formula improved their child's digestive symptoms (easier

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bowel movements, less stomach aches, less nausea).

Conclusions: Improved weight-for-age z-scores, weight gain, and parental-reported outcomes of improved tolerance were noted, retrospectively, in this small cohort of patients consuming a plant-based formula at a single pediatric GI center. This is the first study to demonstrate efficacy and tolerance of these novel plant-based enteral formulas in a pediatric population. Prospective trials are needed to expand upon these initial observations.

Weight Change in Patients with Complete Data

Pt # - Sex	Age (years)	Diagnosis	Duration on Formula (months)	Weight (wt.) Change (kg)	Wt.-for-age z-score before	Wt.-for-age z-score after
1-M	19	Feeding difficulty, anorexia, food allergies	6	+0.8	-3.32	-3.32
2-M	5	Feeding difficulty	8	+2.3	-2.64	-2.00
3-M	6	FTT*, feeding difficulty	8	+2.1	-2.38	-2.11
4-F	3	FTT	5	+1.8	-1.61	-1.26
5-F	17	Esophageal dysphagia	2	+0.8	-3.00	-2.84
6-F	7	FTT	13	+2.4	-1.62	-1.41
7-M	12	Feeding difficulty	6	-0.2	-0.63	-1.06
8-F	23	Feeding difficulty, milk and soy allergy	5	+3.6	N/A	N/A
9-F	20	Feeding difficulty	12	0	N/A	N/A
Mean	13	N/A	6	N/A	-2	-2

*Failure to thrive

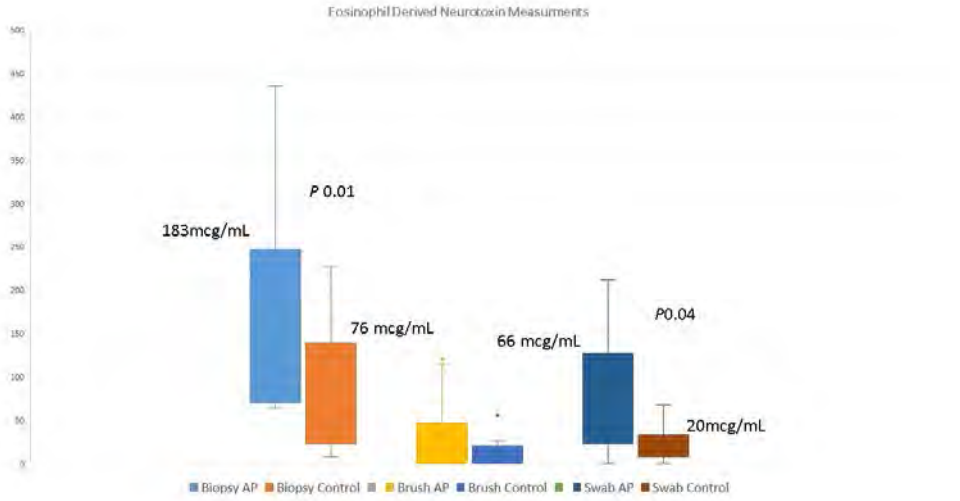
391 ***PILOT STUDY OF EOSINOPHILIC BIOMARKER MEASURED IN RECTAL SWABS IN THE DIAGNOSIS OF ALLERGIC PROCTOCOLITIS.*** *Justin de Boer*, *Patricia Subnaik*, *Samit Patel*, *Puanani Hopson*, *Nishant Patel*, *Karoly Horvath*, *Devendra Mehta*, *Yamen Smadi. Pediatric Gastroenterology*, *University of Florida/Arnold Palmer Hospital*, *Oakland*, *FL*

Allergic Proctitis (AP) caused by cow's milk protein allergy is common in infants. The gold standard to confirm the diagnosis AP is by performing a flexible sigmoidoscopy (FS) to obtain biopsy samples and evaluating for elevated eosinophil counts on pathology. Currently, non-invasive testing is limited in its ability to confirm the diagnosis. Unfortunately, cow's milk protein allergy remains a common diagnosis in infants without the use of accurate testing. The current recommendation for suspected AP is diet avoidance with formula change and looking for resolution of symptoms. Infants who are misdiagnosed with AP may directly result in increased health care cost and family burden. Eosinophil Derived Neurotoxin (EDN), an eosinophil granule protein, has been shown previously to correlate well with eosinophil infiltration in the esophagus and on fecal measurement, is suspected to be elevated in cases of allergic proctocolitis. We aimed to study the utility of measuring EDN in the diagnosis of AP. We prospectively collected rectal swab samples, rectosigmoid biopsy, as well as performed rectal cytology brushing through the endoscope (under direct visualization). AP was defined as increased levels of eosinophils in the rectosigmoid biopsy(>60eos/10 hpf). Levels of EDN measured by ELISA were compared with histological findings. 24 subjects underwent flexible sigmoidoscopy with EDN measurement in the extra biopsy, endoscopic brushing and rectal swab sample. 13 subjects were considered controls with normal histopathology and 11 had biopsy confirmed allergic proctocolitis. We found that EDN in rectal biopsies and swabs were significantly elevated and positively correlated with the diagnosis of AP. Using 66mcg/mL and 21mcg/mL in the EDN of the biopsies and swabs, respectively, as a cut off has sensitivity of 81% and specificity of about 69%. Performing a rectal swab with EDN testing could be a useful tool to screen for AP and avoid unnecessary diet changes and inappropriate labeling of pathology.

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- **Based on histopathology, subjects were divided into AP and Control groups**
  - 24 subjects underwent flexible sigmoidoscopy who's parents consented to the extra samples being taken

Total Subjects	24
Number with AP	11
Mean age of AP	7.5 months range of 1-28months
%Female	54%
Controls	13
Mean Age	19 months range of 1-25months
%Female	23%



392 ***ENTERAL ANTIBIOTICS DRIVE CLONAL EXPANSION OF GUT INFLAMMATORY MICORBIOTA AND SIGNIFICANT HEPATIC CHOLESTASIS IN ANIMALS ON TOTAL PARENTERAL NUTRITION.***

Christine Denton[4], Amber Price[4], Chandrashekhara Manithody[4], Hector Osei[2], Sutthatarn Pattamon[2], Salim Munoz[2], Kyler Douglas[4], Yogi Patel[4], Pranjali Rajalakshmi[4], Obeid Ilahi[3], John Long[5], Ajay Jain[1]. [1]Pediatric Gastroenterology, Saint Louis University, Valley Park, MO; [2]Pediatric Surgery, Saint Louis University, Saint Louis, MO; [3]Surgery, Washington University, Saint Louis, MO; [4]Pediatrics, Saint Louis University, Saint Louis, MO; [5]Comparative Medicine, Saint Louis University, Saint Louis, MO

Background: Total parenteral nutrition (TPN) is the method of providing intravenous nutritional support to those with impaired gut function, however it is associated with significant side effects. Our lab has noted alteration in gut-systemic signaling with TPN and also described the role of the gut protective *Firmicutes* phylum. To further interrogate mechanistic pathways, using our ambulatory piglet model, we hypothesized that enteral antibiotics would cause selective *Firmicutes* inhibition and promote a clonal expansion of gut inflammatory microbiota, exacerbating TPN associated liver and gut injury.

Methods: 23 animals were allocated to receive TPN plus 14 days of high dose, broad spectrum antibiotics (ampicillin, neomycin, vancomycin and metronidazole – TPN-A), TPN only, or enteral nutrition (EN) only. Serial stool samples were obtained throughout the study and at sacrifice. Serum, gut and liver tissue were obtained at

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sacrifice. Pair wise t-tests for normally distributed data were performed, otherwise pairwise Mann-Whitney U tests were performed for analysis. All tests were two-tailed using a significance level of 0.05.
Results: While animals on TPN demonstrated a significant, 5 fold elevation in serum bilirubin (p=0.006), it resulted in an almost 8 fold elevation in the TPN-A group. Serum GGT, a marker of cholangiocytic injury was significantly higher in TPN-A vs both TPN (p=0.000013) and EN group. The mean ± SE for GGT was EN (20.27±1.96), TPN (36.56±7.25) and TPN-A (130.45±11.11). TPN-A animals also had significantly higher total cholesterol and LDL vs TPN (p=0.00005, p=0.03) and EN animals. Antibiotics resulted in increased triglycerides and BUN against both TPN and EN animals. In order to quantify gut atrophy we measured proximal bowel gut mass (grams / cm) which was significantly decreased in TPN-A vs TPN (p=0.023) and EN (p=0.00009). In conjunction with these findings, we also report significant reduction in gut protective *Firmicutes* phylum and expansion of gut inflammatory *Proteobacteria* phylum (p=0.007) with TPN therapy.
Conclusion: In this current era of greater availability and use of antibiotics, our study provides novel evidence for the detrimental effects of broad spectrum antibiotic treatment during TPN, including an increase in intestinal failure associated liver injury and gut mucosal atrophy. Our results urge caution against the use of antibiotics in human subjects, especially those on TPN.

393 ***REFEEDING SYNDROME IS RARE IN INFANTS ADMITTED WITH MALNUTRITION.*** *Michelle Dunn*, *Jennifer Panganiban*, *Nina Sainath. Pediatrics*, *Children's Hospital of Philadelphia*, *Philadelphia*, *PA*
Background: Refeeding syndrome encompasses a severe electrolyte disturbance, specifically low serum concentrations of phosphate, potassium and magnesium, with metabolic abnormalities in undernourished patients undergoing refeeding whether orally, enterally, or parenterally. There is a lack of consensus when it comes to the definition, monitoring, and treatment for this patient population. Much of the pediatric refeeding literature focuses on patients with anorexia and chronic diseases. The incidence of refeeding syndrome in hospitalized infants with a primary diagnosis of malnutrition is unknown, and no guidelines exist to help identify which patients require laboratory monitoring for the possibility of refeeding syndrome.

Methods: We conducted a retrospective chart review of 471 infants (0-12 months) admitted to a large free standing children's hospital with a primary admission or discharge diagnosis of malnutrition over a period of 3.5 years. 369 patients had electrolytes performed either in the emergency department or during admission. We reviewed all charts of patients who had electrolyte abnormalities, cutoffs were based on our laboratory normal values for age, defined as phosphorus less than 4.5 mg/dL, potassium less than 3.5 mmol/L, or magnesium less than 1.5 mg/dL.

Results: Of the 471 patients in our cohort, 369 (78%) had laboratory data. Twenty three (4.8%) patients were found to have at least one electrolyte abnormality (hypophosphatemia, hypokalemia, or hypomagnesemia). Three (0.63%) of these patients required electrolyte supplementation for refeeding syndrome and were further characterized. The first patient was a 7 week old with severe malnutrition with a history of fever, vomiting, and weight loss, who required potassium and magnesium supplementation. Our second patient was a 6 month old with moderate malnutrition who required NG feeds and potassium phosphate supplementation. The third patient was a 4 month old with severe malnutrition who presented with several days of poor oral intake, diarrhea and hemoccult positive stools who was initially thought to have milk protein allergy, but was ultimately diagnosed with very early onset inflammatory bowel disease. He required potassium repletion during his hospitalization.

Conclusions: Due to concern for the morbidity and mortality associated with unrecognized refeeding syndrome, screening electrolytes are typically sent on the majority of infants with malnutrition. Surprisingly, only a minority of the patients in our large cohort had electrolyte abnormalities, and less than 1% required electrolyte repletion. Refeeding syndrome appears to be less common in infants than previously thought. Based on this information, patients should be stratified based on risk factors and only the infants at highest risk of refeeding syndrome should be reassessed in order to guide clinical practice.

Age	Gender	Malnutrition Dx	Lowest Serum Potassium	Lowest Serum Phosphate	Lowest Serum Magnesium	Repletion Required	Other clinical features
7 wks	F	Severe	2.4	4.6	1.1	KCl, Mag Gluconate	fever, emesis, weight loss
6 mo	M	Moderate	3.5	3.6	2.2	Kphos	Acidosis-serum bicarbonate 17
4 mo	M	Severe	2.2	3.8	2.2	KCl	hyponatremia, hematochezia

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394 ***INFLUENCE OF EXERCISE ON BODY COMPOSITION AND PATIENT OUTCOMES IN A PEDIATRIC MULTIDISCIPLINARY OBESITY CLINIC: DESCRIPTION OF EARLY OUTCOMES.*** *Rebecca Espinosa[1], Melissa Jalil[5], Lisa Farkas[2], Ryan Cranshaw[3], Cara Boyarin[3], Debora Duro[4]. [1]Graduate Medical Education, Broward Health Medical Center, Fort Lauderdale, FL; [2]Clinical Dietician, Broward Health Medical Center, Fort Lauderdale, FL; [3]Wellness and Cardiopulmonary Rehabilitation, Broward Health Medical Center, Fort Lauderdale, FL; [4]Program Director Pediatric Gastroenterology and Nutrition and Medical Director of the Multidisciplinary Obesity Clinic at Salah Foundation Children's Hospital, Broward Health Medical Center, Fort Lauderdale, FL; [5]Pediatric Gastroenterology, Broward Health Medical Center, Fort Lauderdale, FL*

Introduction: Childhood obesity has become a global epidemic over the last 3 decades, with as many as 34% of American children affected. Obesity is a top public health threat due to its associated morbidity and mortality, affecting multiple body systems. In our local community, it is reported that 85% of high school students do not have sufficient vigorous physical activity, as compared to 80.6% in Florida at large. This study describes early outcomes seen in patients of the Multidisciplinary Pediatric Obesity Clinic (MPOC) who are compliant with individualized exercise regimens written for them by a Clinical Exercise Physiologist (CEP). The goal of this study is to track laboratory results, dietary and behavioral changes, body composition and physical fitness measures over the course of the one year program.

Methods: The MPOC consists of an expert team of pediatric gastroenterologists, endocrinologists, dieticians, psychologists, and the CEP. Patients from the MPOC were offered the opportunity to participate in this study which is sponsored by a NASPGAHN grant. IRB was approved during the grant submission. Our preliminary pilot group consisted of 2 females and 3 males between the ages of 7-10. Patients were assessed at the pre-program mark, and then 3 months after successful completion of the program.

At their initial visit, participants were evaluated by the CEP, who obtained body composition measurements (total body mass, total fat mass, total lean mass, etc) and body circumferences, and carried out a thorough fitness evaluation. Patients were also assessed by the physician, who ordered laboratory studies, including cholesterol levels, glucose levels, and triglycerides, to screen for possible pathologic comorbidities. After the primary assessment, the CEP outlined short term and long term goals with patients and their families, and wrote an individualized exercise regimen for each participant based on their needs.

These exercise regimens included a 5 minute warm up followed by circuit stations where participants completed exercises for one minute straight with 30 seconds of rest. Circuit exercises included push-ups, sit-ups, squats, lunges, ball toss, fast feet, jumping jacks, and jump rope. A second set of circuit exercises were designed to increase strength and core stability, and included step-ups, ladders, cones, and jump squats. At the end of the 45 minute workout, patients were to complete a 5 minute stretch. CEPs also discussed diet and behavioral changes to make on a daily basis to help improve their outcomes.

Results: Data was recorded and analyzed for participants in the pilot group. Body composition measurements, specifically averages of total and percent fat mass and total and percent lean mass, were noted to have statistically significant changes after the completion of a 3 month exercise program. Total fat mass (kg) decreased a total of 13% ($p = .04$), percent fat mass decreased by 19% ($p = .01$), total lean mass (kg) increased by 31% ($p = .006$), and percent lean mass increased by 10% ($p=.01$) (Image 1). This shows that the use of a holistic multidisciplinary team can have a significant impact on a child's health and well-being. Parents were interviewed and noted that behavioral changes were also being made at home. They reported that their family as a whole had increased their vegetable and fruit intake, incorporating salads and additional vegetables at meals and also making better snack choices. Some participants started bringing their lunches to school and started eating breakfast. In general, participants had also reduced their intake of sugar-sweetened beverages.

Conclusion: The American Academy of Pediatrics, in its latest recommendations on obesity in childhood, reminds us that it is never too early to begin living a healthy lifestyle. They give families simple steps to eating healthier, including buying fewer sweetened beverages or snacks and making high calorie foods less visible in the home. In order to have a better understanding of what the consequences are, children should be involved in their care. The MPOC allows for this kind of interaction, as children are not only told they have to lose weight, but they are given an individualized plan to do so. This description of early outcomes shows that our interventions are resulting in statistically significant change, and we are moving in the right direction as we continue to work with this pilot group

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throughout the year and as we include more participants in this study.

	Pre	Post	Pre	Post	Pre	Post	Pre	Post
PT ID	Total Fat Mass (kg)		% fat mass		Total Lean Mass		% lean mass	
RA	20.8	16.5	35.3	26.7	38	45	64.7	73.3
JA	29.2	26.6	45.1	38.3	37.6	42.9	54.9	61.7
KB	33.5	27.4	51.1	40.2	32.1	40.9	48.9	59.8
SB	19.1	15.3	37.1	28.9	32.3	37.7	62.9	71.1
FM	21.1	22.8	38.5	39.7	33.6	34.6	61.5	60.3
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	24.74	21.72	41.42	34.76	34.72	40.22	58.58	65.24
Standard Deviation	5.607352316	5.014140006	5.863241424	5.759027696	2.570136	3.699405	5.863241	5.759028
t test, p>0.008	0.041022588		0.01624212		0.006561		0.016242	
% change	-13.90%		-19.16%		31.34%		10.21%	

Percent change in total and percent fat and lean masses after a 3 month exercise program with corresponding p-values

395 ***THE ROLE OF REGULAR WEIGHT MONITORING IN CHILDHOOD OVERWEIGHT AND OBESITY.*** *Avani Ganta*, *Aayush Gabrani*, *Susan Proum*, *Joseph Schwab*, *Iona Monteiro*, *Hanan Tanuos.*
Pediatrics, *Rutgers New Jersey Medical School*, *Newark*, *NJ*

Background: Childhood obesity is an increasing epidemic in the United States and puts children and adolescents at high risk for poor health outcomes. Data from the Centers for Disease Control and Prevention (CDC) shows that it affects about 13.7 million children and adolescents, and this trend is steadily increasing both in adults and children. Studies in adults show that regular monitoring of weight, caloric intake and water consumption over a period of 12 months has a positive impact on weight loss. Other studies done in the adult population found a significant impact of self-weighing to enhance behavioral weight loss programs. Studies on such interventions for control of childhood obesity are lacking, though there are studies which show that comprehensive behavioral interventions have been effective.

Objective: This study is designed to evaluate the effect of regular weight monitoring in childhood overweight and obesity.

Design/ Methods: The study was a prospective randomized control trial with 51 children aged 13- 17 years, conducted over a period of 6 months. The CDC definitions of overweight or obese were used as an inclusion criterion “Overweight is defined as a Body Mass Index (BMI) at or above the 85 percentile and below the 95 percentile for children and teens of the same age and sex. Obesity is defined as a BMI at or above the 95 percentile for children and teens of the same age and sex”.
For both, the study and control groups, BMI was recorded at the initial visit. Both received diet and exercise counseling at the time of enrollment and were provided a copy of “A Parent’s Guide to Childhood Obesity”. Both groups also received education in person at month 0, and over phone sessions at 2 and 4 months. The study group, in addition, was instructed to log in their weight weekly and were provided with a weighing scale. Children with endocrine, syndromic or comorbid conditions and those who were already on a weight control program were excluded. Changes in BMI from baseline were measured at the end of the 6month study period for each group. Descriptive statistics were used. p-value <0.05 was considered significant.

Result: Over the 6month period, 24/51 (47.05%) eligible subjects completed the study until the end. Mean age of patients in the study group was 14±1.2 years, while it was 14.4 ± 1.2 years in the control group. For the study group (N=15), mean BMI on the first visit at the time of enrollment was 34.1±6.3 and at the 6month visit was 34.04 ± 6.3 (p-value= 0.28). For the control group (N=9), mean BMI on the first visit at the time of enrollment was 32.1±7.9 and at the 6-month visit was 32.8± 7.9 (p-value= 0.35) (Table 1). Upon stratification based on gender, there was no statistical difference in BMI at enrollment vs at 6month follow-up.

Conclusion: Initiating and maintaining weight loss in overweight and obese patients is challenging, however, regular weight monitoring has been successful in adults. We duplicated this approach in our pediatric population and

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did not obtain statistically significant results. This may have been due to our small sample size. However, based on the adult studies we would like to propose the importance of patient education and weight monitoring in improving clinical outcomes for the emerging epidemic of pediatric obesity. Regular weight monitoring with periodic education (in person or over the phone) might have the same beneficial effect, as observed in adults and further pediatric studies with larger sample size are needed.

TABLE 1:

VARIABLE	*STUDY GROUP*	*CONTROL GROUP*	*P-VALUE*
MEAN AGE	14 ± 1.2	14.4 ± 1.2	0.40795
FEMALES	9	5	
BMI AT ENROLLEMNT	34.1 ± 6.3	32.1 ± 7.9	0.27818
BMI AT THE END OF THE STUDY	34.04 ± 6.3	32.8 ± 7.9	0.3534

396 ***TIME TO REGAIN BIRTH WEIGHT AS A PREDICTOR OF POOR NEONATAL GROWTH.*** *Calvin Gao[2], Marium Khan[1], Marieke Jones[4], Jeremy Middleton[1], Brooke Vergales[3], Sana Syed[1]. [1]Department of Pediatrics, Division of Gastroenterology, Hepatology & Nutrition, University of Virginia, Charlottesville, VA; [2]School of Medicine, University of Virginia, Charlottesville, VA; [3]Department of Pediatrics, Division of Neonatology, University of Virginia, Charlottesville, VA; [4]Health Sciences Library, University of Virginia, Charlottesville, VA*

Background: Despite ubiquitous efforts to achieve optimal growth in premature infants, post-natal growth failure (PNGF) continues to affect babies leaving the neonatal intensive care unit. PNGF is often associated with prematurity and low birth weight, and poor neonatal growth velocity (g/kg/day) has been shown to be associated with adverse neurodevelopmental outcomes. We aimed to investigate neonatal growth outcomes by identifying the variables associated with newborn growth (with outcomes defined as 1- post-natal growth failure and 2- neonatal growth velocity at our institution).

Methods: 340 neonates ≥30 weeks gestational age and/or ≥1250 grams at birth were identified and were grouped into PNGF (n = 100) and non-PNGF (n = 240). PNGF was defined as discharge weight <10th percentile on the Fenton 2013 curve regardless of birth weight percentile. Growth velocity was calculated by dividing change in weight from birth to discharge divided by average weight and hospital length of stay (g/kg/day). To assess growth velocity, 204 neonates from our cohort were further selected based on hospital length of stay >14 days to allow for normal patterns of early weight gain. These individuals were grouped into 4 quartiles based on their calculated velocities. Multivariate regression models were used to identify predictors of growth velocity.

Results: As compared with non-PNGF infants, PNGF patients had lower mean birth weights (35 ± 3 vs. 34 ± 3 weeks, p-value = 0.03) and higher mean growth velocities (9.2 ± 3.9 vs. 8.0 ± 4.1 g/kg/day, p = 0.03). Our growth velocity analysis demonstrated that the mean birth weight was lower in patients with higher growth velocities (2474 ± 677, 2000 ± 297, 1715 ± 285, and 1533 ± 332 grams for growth velocity quartiles 1-4, respectively, p-value < 0.005, adjusted R^2 = 0.40). The time to regain birth weight (days) was identified as the most consistent predictor for growth velocity in the overall patient cohort (β [SE] = -0.292 [0.034], p < 0.005), PNGF subgroup (β [SE] = -0.212 [0.081], p = 0.01), and lowest growth velocity quartile subgroup (β [SE] = -0.328 [0.044], p < 0.005). Results from our multivariable linear regression models for our overall sample, PNGF sample, and lowest growth velocity quartile sample are shown in Table 1.

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Conclusions: Increased time to regain birth weight is a predictor of decreased neonatal growth velocity, including in our poor growth velocity sample and in our PNGF sample. This suggests that there is a special significance in this early period of a neonate's life that has implications for subsequent neonatal growth. Further work could aim to better elucidate the potential mechanisms at play during this period, including early differences in metabolomics and gut microbiome that may be targeted for therapy to abolish poor postnatal growth.

Table 1
Multivariate associations with growth velocity (g/kg/day) for neonates with hospital lengths of stay > 14 days.

	Beta	SE	t	p-value
Total Sample (n = 196)				
Male sex	0.830	0.332	2.50	0.013
Birth weight (g)	-0.003	0.001	-6.01	<0.005
Gestational age (weeks)	-0.217	0.146	-1.25	0.139
Days to regain birth weight	-0.292	0.034	-7.68	<0.005
Age at start of enteral feeds (days)	0.061	0.101	0.54	0.545
Days to reach 110 ml/kg of enteral feeds	-0.170	0.107	-1.91	0.114
Days with parenteral feeds	0.039	0.096	0.78	0.685
Days with respiratory support	-0.068	0.019	-3.65	<0.005
Hospital length of stay (days)	0.098	0.022	4.49	<0.005
Oxygen resuscitation at birth	0.541	0.437	1.34	0.218
Diagnosis of respiratory distress	-0.316	0.487	-0.93	0.517
Prenatal diagnosis of IUGR	0.831	0.501	1.61	0.099
Post-natal Growth Failure (n = 67)				
Male sex	1.174	0.6392	1.84	0.072
Birth weight (g)	-0.007	0.001	-5.19	<0.005
Gestational age (weeks)	0.458	0.324	1.97	0.163
Days to regain birth weight	-0.212	0.081	-2.33	0.011
Age at start of enteral feeds (days)	-0.024	0.214	-0.36	0.910
Days to reach 110 ml/kg of enteral feeds	-0.253	0.171	-1.60	0.144
Days with parenteral feeds	0.199	0.136	1.76	0.150
Days with respiratory support	-0.064	0.037	-2.14	0.092
Hospital length of stay (days)	0.030	0.038	1.22	0.438
Oxygen resuscitation at birth	-0.634	0.953	-0.63	0.509
Diagnosis of respiratory distress	1.104	0.980	1.03	0.265
Prenatal diagnosis of IUGR	0.664	0.706	0.79	0.351
Growth Velocity Quartile 1 (n = 45)				
Male sex	0.480	0.602	0.80	0.431
Birth weight (g)	-0.001	0.001	-0.94	0.421
Gestational age (weeks)	-0.960	0.297	-3.24	<0.005
Days to regain birth weight (days)	-0.328	0.044	-6.71	<0.005
Age at start of enteral feeds (days)	0.723	0.306	2.34	0.024
Days to reach 110 ml/kg of enteral feeds (days)	0.105	0.123	0.47	0.399
Days with parenteral feeds	-0.396	0.132	-2.46	0.005
Days with respiratory support	0.019	0.070	0.23	0.783
Hospital length of stay (days)	0.198	0.069	2.79	0.007
Oxygen resuscitation at birth	1.012	0.555	1.91	0.077
Diagnosis of respiratory distress	-0.828	0.597	-1.51	0.175
Prenatal diagnosis of IUGR	2.117	1.034	2.08	0.049

SE = standard error. IUGR = intrauterine growth restriction. Models constructed as follows: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 \ldots \beta_nX_n$ where Y represents growth velocity, and β_n represents the marginal effect of the nth predictor, X_n. Predictors were selected based on clinical relevance and low co-linearity with other predictors.

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397 ***A PROSPECTIVE, OPEN-LABEL, LONG-TERM SAFETY AND EFFICACY STUDY OF TEDUGLUTIDE IN PEDIATRIC PATIENTS WITH SHORT BOWEL SYNDROME–ASSOCIATED INTESTINAL FAILURE: 6-MONTH INTERIM ANALYSIS (SHP633-304).*** *David Mercer[1], Beth Carter[2], Susan Hill[3], Simon Horslen[4,5], Stuart Kaufman[6], Samuel Kocoshis[7], Russell Merritt[2], Mikko Pakarinen[8,9], Robert Venick[10], MinJung Yoon[11], Andrew Grimm[11]. [1]University of Nebraska Medical Center, Omaha, NE; [2]Children's Hospital Los Angeles, Los Angeles, CA; [3]Great Ormond Street Hospital for Children NHS Foundation Trust, London, United Kingdom; [4]Seattle Children's Hospital, Seattle, WA; [5]University of Washington School of Medicine, Seattle, WA; [6]MedStar Georgetown University Hospital, Washington, ; [7]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [8]Children's Hospital, Helsinki, Finland; [9]Helsinki University Central Hospital, Helsinki, Finland; [10]Mattel Children's Hospital UCLA, Los Angeles, CA; [11]Shire Human Genetic Therapies, Inc., a member of the Takeda group of companies, Lexington, MA*

This study evaluated the long-term safety and efficacy of teduglutide in pediatric patients with short bowel syndrome (SBS). Patients who completed a core phase III TED-C14-006 24-week study (NCT02682381 EudraCT 2015-002252-27), were eligible to enroll in this prospective, long-term, open-label study (NCT02954458, EudraCT 2016-000849-30). We present an interim analysis in which most patients had completed ≥6 months (data cut-off: Feb 4 2018) in the study.

Patients could enroll whether they had been treated with teduglutide or received standard of care in the core study. For patients who had received teduglutide in the core study, additional teduglutide treatment was provided only if their parenteral support (PS) requirements had plateaued or deteriorated after prior teduglutide treatment ended. When indicated, treatment was provided in 24-week cycles of teduglutide 0.05mg/kg subcutaneous once daily followed by a 4-week follow-up period. Patients not receiving teduglutide were followed up every 12 weeks and could be evaluated at any time for requiring teduglutide treatment. This interim analysis focuses on patients who received teduglutide in both the core study and extension study (TED/TED); for these patients, baseline was the baseline of the core study. Data for efficacy endpoints were from patient diaries. Results are reported as mean±SD unless indicated otherwise.

At time of data cut-off, 44/55 patients had enrolled in the TED/TED group. Of these, 29 had reached cycle 1 week 24 (C1W24; 48 weeks of cumulative teduglutide treatment) at the data cut. Treatment-emergent adverse events (TEAEs) were reported by 41/44 patients (93.2%); most were mild or moderate in severity. The most frequently reported TEAEs in TED/TED patients were vomiting (29.5%), pyrexia (25.0%), abdominal pain (18.2%) and alanine aminotransferase increased (18.2%). Ten TED/TED patients had a TEAE considered related to TED; all were single events in single patient except 2 events of injection site erythema in 1 patient. No polyps or neoplasia were identified. One patient discontinued teduglutide due to elevated bilirubin related to iatrogenic iron overload. One patient discontinued treatment and withdrew from the study owing to lack of response and later died after complete withdrawal of nutritional and fluid support; the event was assessed as not related to teduglutide. Anti-teduglutide antibodies were reported by 6/44 TED/TED patients (13.6%) at cycle 1 day 1 (C1D1) and 14/26 patients (53.8%) at C1W24. No patient at C1D1 and 1/26 patient (3.8%) at C1W24 had neutralizing antibodies. There were no clinically meaningful changes in *z* scores for weight, height or body mass index. In TED/TED patients, PS volume decreased during cycle 1 (**Table**). The change in PS calories from baseline was –42.4±29.19% at C1D1 (n=33), and –49.6±32.57% at C1W24 (n=25). The change from baseline in the number of days per week of PS was –1.0±1.89 at C1D1 (n=33) and –1.4±2.62 at C1W24 (n=25). From the beginning of the core study, 7/44 TED/TED patients (15.9%) achieved enteral autonomy by C1W24.

The safety profile of teduglutide was consistent with prior pediatric studies and previous experience with teduglutide in adult patients with SBS–IF. Teduglutide 0.05mg/kg subcutaneous once daily was associated with sustained PS reductions in patients who had previously received 24 weeks of teduglutide 0.025 or 0.05mg/kg. Most patients who received teduglutide in the core study required additional teduglutide in the extension study indicating that long-term continuous dosing is needed to maintain treatment effect of teduglutide in many children with SBS.

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Table. Percent Reduction in PS During Cycle 1, TED/TED (N=44)

	PS Volume*	n
Baseline, mL/kg/day	61.3±27.56	39
Change from baseline, %		
C1D1	–33.7±33.27	33
C1W1	–34.0±33.44	38
C1W2	–35.0±34.51	37
C1W4	–34.7±33.91	35
C1W6	–35.7±33.00	36
C1W9	–37.0±33.09	36
C1W12	–39.1±32.22	34
C1W16	–35.4±34.33	34
C1W20	–42.2±36.81	30
C1W24	–40.0±36.91	25

C1D1=cycle 1 day 1; C1W1–24=cycle 1 week 1–24; PS=parenteral support. *Data are mean ± SD

398 ***COW'S MILK ALLERGIC INFANTS ON ELEMENTAL FORMULA MAINTAIN ADEQUATE MINERAL STATUS DESPITE THE USE OF ACID-SUPPRESSIVE MEDICATION.*** *Bryan Harvey[1], Simone Eussen[2], Ardy Helvoort[2,3], Lucien Harthoorn[2]. [1]Children's Investigational Research Program, LLC (ChiRP), Bentonville, AR; [2]Nutricia Advanced Medical Nutrition, Danone Nutricia Research, Utrecht, Netherlands; [3]NUTRIM School of Nutrition and Translational Research in Metabolism, Maastricht University, Maastricht, Netherlands*

Objectives: We recently published data showing that cow's milk allergic infants who received an amino acid-based formula (AAF) for 16 weeks as oral feeding had adequate mineral status(1). One factor that may negatively affect mineral solubility and bioavailability and hence mineral status, is a high gastric pH(2). Therefore, we performed a post hoc analysis to evaluate serum concentrations of phosphorus, calcium and magnesium in a subgroup of infants on AAF receiving acid-suppressive medication.

Methods: We analyzed retrospectively the data of infants (0-8 months) with cow's milk allergy who were randomized between 2008 and 2012 in a double-blind fashion to either an AAF (Neocate) with or without synbiotics(3). This clinical trial was registered as NCT00664768. Serum concentrations of phosphorus, calcium and magnesium were determined at baseline (n=82) and after 16 weeks (n=66) on AAF and compared to age-specific reference ranges. Subgroup analysis was performed for infants who were receiving acid-suppressive medication (proton-pump-inhibitors/H_2-antagonists). Between-group comparisons were made by two-tailed Student's t-tests. P-values>0.05 were considered as not significant.

Results: Approximately one-third (35%) of the infants received acid-suppressive medication, mainly H_2-antagonists. Serum concentrations of phosphorus, calcium and magnesium for the total population and for the subgroups of infants receiving or not receiving acid-suppressive medication are presented in Table 1. After 16 weeks, mineral concentrations of all infants were within the reference range.

Conclusion: Although doses, compliance and the neutralizing effect of the acid-suppressive medication were not measured in this subgroup analysis, our data indicate that cow's milk allergic infants orally fed with AAF for 16 weeks maintain target serum concentrations of phosphorus, calcium and magnesium even when receiving acid-suppressive medication. Regular review of the ongoing need for acid-suppressive medication remains recommended.

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Table 1. Serum concentrations (mean, 95% CI) of phosphorus (P), calcium (Ca) and magnesium (Mg) and number (n, %) of infants having P, Ca and Mg concentration below the lowest range of the reference value at baseline (Table 1A) and after 16 weeks intervention with an amino acid-based formula (Table 1B).

Table 1A

				Acid suppressive drugs							
	Total population (n=82)			Users (n=29)			Non-users (n=53)			*P-value: users vs non-users*	
	Mean	95% CI	n (%)	Mean	95% CI	n (%)	Mean	95% CI	n (%)		
P (mmol/l)	2.05	2.00 - 2.11	1(1%)	2.10	2.00 - 2.19	0	2.03	1.96 - 2.10	1(2%)	*ns*	
Ca (mmol/l)	2.67	2.64 - 2.70	1(1%)	2.67	2.63 - 2.71	0	2.66	2.62 - 2.71	1(2%)	*ns*	
Mg (mmol/l)	0.95	0.93 - 0.96	0	0.95	0.93 - 0.97	0	0.94	0.93 - 0.96	0	*ns*	

Table 1B

			Acid suppressive drugs							
	Total population (n=66)			Users (n=25)			Non-users (n=41)			*P-value: users vs non-users*
	Mean	95% CI	n (%)	Mean	95% CI	n (%)	Mean	95% CI	n (%)	
P (mmol/l)	1.96	1.91 - 2.01	0	1.95	1.88 - 2.03	0	1.97	1.90 - 2.04	0	*ns*
Ca (mmol/l)	2.62	2.59 - 2.65	0	2.63	2.59 - 2.68	0	2.61	2.58 - 2.65	0	*ns*
Mg (mmol/l)	0.95	0.94 - 0.97	0	0.96	0.94 - 0.99	0	0.95	0.92 - 0.97	0	*ns*

ns: not significant. Reference ranges – P: 1.36-2.62 (<1 years) and 1.03-1.97 (≥1 years) mmol/l; Ca: 2.25-2.74 mmol/l; Mg: 0.70-0.98 (<30 days), 0.66-1.03 (males, ≥30 days) and 0.78-0.98 (females, ≥30 days) mmol/l

399 ***REAL-WORLD EVIDENCE INVESTIGATION OF CLINICAL CHARACTERISTICS AND TOLERANCE OUTCOMES OF ENTERAL PEPTIDE-BASED DIETS IN ADOLESCENT PATIENTS IN POST-ACUTE CARE IN THE UNITED STATES.*** *Aimee Henrikson[4], Chris LaVallee[1], Prafulla Seelam[2], Santosh Balakrishnan[2], Cynthia Lowen[4], Bill Kesting[3], Krysmaru Araujo Torres[4]. [1]Health Outcomes Research, Decision Resources Group, Boston, MA; [2]Analytics, Decision Resources Group, Boston, MA; [3]Market Access, Nestle Health Science, Bridgewater, NJ; [4]Medical Affairs, Nestle Health Science, Bridgewater, NJ*

OBJECTIVES: Enteral tube feeding (ETF) is a medical nutrition therapy used to help meet nutritional requirements in patients who have inadequate volitional intake. Inadequate ETF may also be secondary to malassimilation of nutrients associated with disease activity. ETF typically starts in the hospital setting and is continued as part of post-acute care, as needed. The objective is to describe demographic, clinical, and treatment characteristics of children receiving enteral nutrition peptide-based diets (PBDs) in the home care setting.

METHODS: Data were obtained from the Decision Resources Group Real World Evidence Data Repository US database. Using medical claims data, the cohort of treated children (aged 1-17 years) was defined by patients receiving PBDs through ETF for any condition after hospital discharge between Q1-2013 and Q4-2017. Patients were observed up to 1-year post initiation of PBDs after hospital discharge. Patient tolerance and healthcare utilization outcomes, such as, outpatient visits, inpatient visits, ER visits were observed. Univariate descriptive statistics, including means, standard deviations, and proportions were calculated for study variables.

RESULTS: Average age of the 2,289 patients in the study cohort was 6.8 (SD 5.0) years and 47.0% of patients were female. The top 5 medical conditions and systems included as diagnosis were relative to the digestive system (31.6%), respiratory system (26.8%), nervous system (25.6%), endocrine nutritional and metabolic diseases (25.2%), and congenital malformations, deformations and chromosomal abnormalities (21.6%). Patients had an average of 1.5 (SD 0.8) comorbid conditions and an average Charlson Comorbidity Index score of 2.2 (SD2.1). Use of PBDs is associated with a statistically significant reduction in gastrointestinal intolerance events observed: nausea and vomiting [942 (41.2%) vs 584 (25.5%), p<0.001], diarrhea [571 (24.9%) vs 390 (17%), p<0.001], constipation [817 (35.7%) vs 635 (27.7%), p<0.001], abdominal distension [370 (16.2%) vs 202 (8.8%), p<0.001], and gastric residuals [58 (2.5%) vs 36 (1.6%), p<0.001]. Furthermore, there was a reduction in the proportion of patients that experienced 2 or more adverse tolerance events after initiation of PBDs [823 (36.0%) vs 495 (21.6%), p<0.001]. An increase in height was observed [41.4 in (SD 12.5) vs 45.2 in (SD 11.6), p=0.007], in line with expected growth rates in children. No statistically significant change in weight or BMI was observed. In the home-care setting and 30-days post initiation of PBDs, 718 (31.4%) patients had ≥1 inpatient visit (mean 3.9, SD 4.8); and 2,281 (99.7%)

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patients had at least one outpatient visit recorded (mean visits 5.5, SD 3.8).
CONCLUSION: This is the first study to report clinical and healthcare utilization outcomes in home-care children with PBDs. This study shows that in children on ETF, use of PBDs leads to a significant improvement in enteral feeding tolerance and suggests adequate assimilation of enteral nutrients as evidenced by an increase in patient height.

400 ***EVALUATION OF SMOFLIPID IN PEDIATRIC INTESTINAL FAILURE PATIENTS.*** *Beatrice Ho[1,2], Stacie Chan[1,2], Anna Faino[1], Melissa Mortensen[1], Nila Williamson[1], Patrick Javid[1,2], Simon Horslen[1,2], Danielle Wendel[1,2]. [1]Seattle Children's Hospital, Seattle, WA; [2]Univeristy of Washington, Seattle, WA*
Background: Mixed oil lipid emulsions have emerged in recent years as an alternative to conventional soybean-oil based lipid emulsions. SMOFlipid is a mixed oil lipid emulsion recently approved for use in pediatric patients in the United States and is believed to safely deliver a more balanced mixture of fatty acids and triglycerides. To date there are only case reports and small studies analyzing the use of SMOFlipid in pediatric patients and its effect on the fatty acid profile.
Purpose: The purpose of this study was to characterize changes in fatty acid profile and liver function in pediatric intestinal failure patients who transitioned from Intralipid alone or in combination with Omegaven to SMOFlipid.
Methods: We conducted a retrospective cohort study of 20 pediatric parenteral nutrition (PN)-dependent intestinal failure patients ages 0 - 21 years of age at Seattle Children's Hospital who were transitioned to SMOFlipid targeting the recommended 2 g/kg/day after September 2016. We assessed demographic variables, anthropometric variables, laboratory values, and nutritional supplementation goals achieved. Linear mixed effect models were used to regress fatty acid levels and clinical outcomes on time since SMOFlipid initiation, current lipid, age at SMOFlipid initiation, interaction between time since SMOFlipid initiation and current lipid, and diagnosis. Right skewed outcome variables were natural log transformed for regression analyses.
Results: We collected 139 time points with complete essential fatty acid (EFA) data in 20 patients, of which 98 time points occurred after SMOFlipid initiation. In our patient population, 14 (70%) reached our goal of 2 g/kg/day and median [IQR] of SMOFlipid at end of study was 2 g/kg/day (95% CI: 1.6-2). After controlling for diagnosis, age, and pre-SMOF lipid type, there was an increase in the omega 6 fatty acid profile to physiologic levels when comparing time at SMOFlipid initiation to 1 year later; mean estimated arachidonic acid increased from 320 (95% CI: 258-382) to 409 nmol/mL (95%CI: 278-540; p=0.03) and mean estimated linoleic acid increased from 1348 (95% CI: 1056-1641) to 1768 nmol/mL (95% CI: 1075-2460; p=0.066). The omega 3 fatty acids increased but remained within normal limits. There was no change in mead acid from 8.9 (95% CI: 6.0-13.3) to 8.7 nmol/mL (95% CI: 4.3-17.8; p=0.9). There were no changes in liver function test or serum triglycerides. The triene:tetraene ratio decreased slightly from 0.03 (95% CI: 0.02-0.04) to 0.02 (95% CI: 0.01-0.04; p=0.20), BMI Z score increased from -0.14 (95% CI: -0.85-0.56) to 0.29 (95% CI: -0.76-1.35; p=0.13), and Length Z score increased from -2.0 (95% CI: -2.8,-1.2) to -1.2 (95% CI: -2.2,-0.1; p=0.02).
Conclusion: SMOFlipid allowed us to provide greater amounts of omega 6 fatty acids along with the same amount of omega 3 fatty acids without causing any adverse hepatic effects and allowed us to provide more lipids and maintain patient growth. This longitudinal study identifies an improved fatty acid profile associated with SMOFlipid use in children with intestinal failure.

401 ***PARENT AND PHYSICIAN PERCEPTIONS REGARDING PLANT-BASED BEVERAGES.*** *Daphna Katz[1], Dianne Pagan[2], Neha Mahajan[1], Partha Chakraborty[1], Cara Axelrod[2], Amanda Fifi[2,1]. [1]Pediatrics, Jackson Memorial Hospital, Miami, FL; [2]University of Miami, Miami, FL*
Background: Plant-based beverages, such as soy, rice, coconut, and almond, have rapidly been gaining popularity. According to market research, the plant-based beverage market is projected to grow from 17.3 billion USD in 2018 to 29.6 billion USD by 2023. The United States Department of Agriculture recommends that children and adults consume 2 to 3 cups of dairy products per day. Substitution of dairy with plant-based beverages marketed for individuals with allergies and intolerance can therefore lead to nutritional deficiencies. Research linking adverse health effects with the exclusive consumption of plant-based beverages in young children resulted in a ban of the use of terms such as milk, butter, and cheese for plant-based products in the European Union in June 2017. To our knowledge, there have been no studies done in the United States to determine why parents and physicians choose alternatives to cow's milk for pediatric patients. The aim of this study is to assess parent and physician perceptions regarding plant-based beverages.

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Methods: Two different surveys were created to assess parent and physician perceptions of cow's milk versus plant-based beverages. Demographic information about parent and physician participants was collected. Both surveys were available in English and Spanish. The parent survey was distributed to the parents of pediatric patients at the University of Miami (UM) and Jackson Memorial Hospital (JMH) outpatient clinics and to those admitted to the inpatient pediatric unit at JMH. The physician survey was distributed to faculty and resident providers at UM/JMH. Surveys were distributed over a period of three months. All surveys were collected anonymously. Statistical analyses were performed using Redcap database.

Results: A total of 68 parents and 71 providers completed the survey. Among parents, 66% were female, 53% were 35 years or younger, and 46% were Hispanic or Latino. Among providers, 77% were female, 70% were 35 years or younger, and 39% were Hispanic or Latino. The majority of parents (32%) had completed only high school. The majority of providers (43%) were senior residents. Among parents, 76% reported giving cow's milk and cow's milk-based formulas as the main type of milk to their children, compared to 22% who give plant-based beverages and formulas routinely. Among providers, 54% reported recommending a plant-based beverage to their patients. The factors that most commonly influenced parents' decisions regarding milk choice were health benefits (57%), taste (55%), and cost (29%). Most parents relied on physician or healthcare recommendations (57%), nutrition labels (51%), and word of mouth (30%) when choosing between cow's milk and plant-based alternatives. The main reasons that physicians recommended a plant-based beverage to patients included cow's milk protein enterocolitis (29%), patient and family dietary restrictions such as veganism (28%), and true IgE mediated milk allergy (22%). The majority of patients indicated that they were not sure how the nutritional content of plant-based beverages compared to cow's milk. In contrast, the majority of providers indicated that they think plant-based beverages on average have fewer calories, protein, fat, calcium, and Vitamin D. However, 55% of providers reported that they do not routinely discuss potential health risks associated with plant-based beverage consumption with their patients. Overall, 44% of parents reported that they believe plant-based beverages are superior to cow's milk and 43% believe that they are the same. In contrast, 48% of providers indicated that they believe plant-based beverages are inferior to cow's milk, compared to 48% who believe them to be equal/comparable.

Conclusion: Based on our results, even though the majority of parents give their children cow's milk, 22% give plant-based beverages. Parents' choice of milk is primarily driven by presumed health benefits. Interestingly, despite not being aware of the nutritional content of plant-based beverages, the majority of parents believe that they are superior or equal to cow's milk. Similarly, while more than half of physicians recommend plant-based beverages to their patients, a large percentage do not discuss potential health risks or provide recommendations regarding nutritional supplementation. Given the fact that parents mainly rely on physicians to choose a type of milk, physicians should become knowledgeable on this subject and help educate parents in light of the growing plant-based beverage market.

402 ***PREVALENCE AND RISK FACTORS OF ANEMIA IN KOREAN CHILDREN AND ADLOSCENTS.***

Kwang Kim. Department of Pediatrics, *Catholic University of Korea, Eunpyeong St. Mary's Hospital*, *Seoul*, *Korea*

Background and objectives: The aim of this study is to determine the prevalence and risk factors for anemia among adolescents in a large population.

Methods: We analyzed 6,801 subjects from Korea National Health and Nutrition Examination Survey III-V (2007-2015). Anemia was defined as hemoglobin <11.5 g/dL at 10-11 years of age; <12.0 g/dL at 12-14 years; 13.0 g/dL in males 15-18 years; <12.0 g/dL in females 15-18 years. Socioeconomic status (SES), nutrition and eating habit were analyzed to identify risk factors of anemia. SES was analyzed by comparing education level and family income by quartile. Nutritional and eating habits surveys were conducted through interviews conducted by trained dietitians. Total energy, fat, protein, carbohydrate, fiber, and serum vitamin D level were evaluated. Eating habit was defined as the number of meals per week for breakfast, lunch, dinner. Multivariable logistic regression analysis was used to determine odds ratios (ORs) and 95% confidence intervals (CI).

Results: The prevalence rate of anemia in adolescents was 3.0% (0.4 % for males and 5.9 % for females). The incidence of anemia in females were significantly higher than males (P<0.01). Adolescents with higher parental education and higher household incomes had lower risk of anemia (P <0.01 and P <0.01, respectively). In terms of nutrition, the risk of anemia was lower in adolescents receiving more protein (ORs: 0.49; CI: 0.26, 0.98) and vitamin D levels were lower in adolescents with anemia (P=0.02). In eating habit, the risk of anemia was lower in

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adolescents who had more number of breakfast per week (ORs: 0.28; CI: 0.08, 0.96).

Conclusion: Gender, education level, household income, protein intake, vitamin D concentration, and the number of breakfast in a week were associated with anemia in adolescents.

403 ***MATERNAL ELIMINATION DIETS VERSUS HYPOALLERGENIC FORMULA ON OUTCOMES OF INFANTS WITH COW'S MILK PROTEIN ALLERGY .*** *Julia Kleinhenz. Division of Gastroenterology, Children's Hospital of Michigan, Detroit, MI*

Background: Hypersensitivity to cow milk proteins is one of the most common food allergies during infancy. Cow's Milk Protein Allergy (CMPA) results from hypersensitivity to cow's milk protein in milk-based formulas and through excretion into breast milk (from maternal dairy intake). The two forms are Ig-E mediated (immediate reaction within 2 hours of exposure) and non- Ig-E mediated (delayed reaction within 48 hours up to 2 weeks of exposure). Presenting symptoms commonly include hematochezia, loose mucousy stools, emesis, fussiness, persistent cough, and reflux. Less common symptoms include failure to thrive (FTT) and eczema. Patients can also experience more severe anaphylactic reactions. The diagnosis varies due to the variety and intensity of symptoms. Skin and blood tests are available, however diagnosis is still primarily clinically based. Dietary manipulation by maternal elimination diet (MED) or hypoallergenic formula (HF) are treatments of choice. There is limited data on superiority of one diet manipulation over the other.

Objective: Evaluate and determine if there is a difference in time to resolution of symptoms in maternal elimination verses hypoallergenic formula diet.

Methods: We retrospectively analyzed a database of patients with ICD-10 diagnosis related to rectal bleeding and allergy to milk. Diagnosis was based on symptoms of diarrhea, mucus, and gross or microscopic blood in stool. In addition, infectious etiology workup was completed in patients where etiology was not clear cut. We included healthy full-term infants (ages 0-6 months) with diagnosis of CMPA and intervention of MED or HF. The two groups were compared in terms of type of dietary manipulation and duration to symptom resolution based on parent report (including hematochezia, positive fecal occult blood test, FFT, loose/mucousy stools).

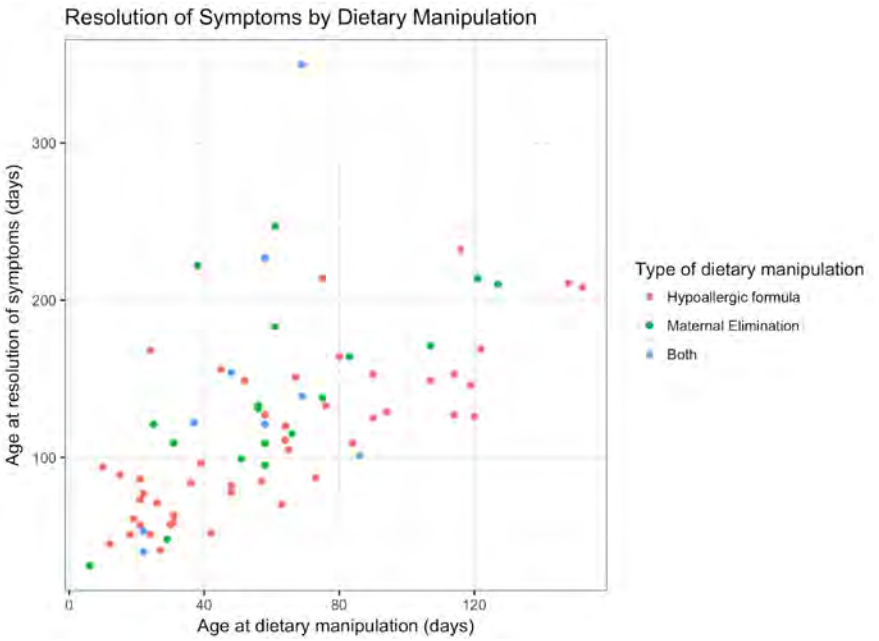
Results: 75 patients met the inclusion criteria. The number of infants who received MED (n=18), HF (n=48) and both dietary manipulations (n=9). The differences in baseline characteristics include size, race, positive FOBT, and acid-suppressant medication use. There is no significant difference in age at intervention and gender. All had resolution of symptoms. A linear regression analysis was used to account for sample sizing. HF compared to MED showed a statistically significant reduction in duration of symptoms by 29 days (p=0.005). HF compared to the combined group revealed 43 day reduction in symptoms (p value= 0.01). The MED group compared to the combined group showed a 13 day reduction, but was not statistically significant (p=0.59). A independent t-test was completed revealing a power of 99%.

Conclusion: In our retrospective chart review there was a statistically significant decreased in duration of symptoms by 29 days in the HF versus the MED group. In addition, our analysis of secondary outcomes revealed patients who started any dietary manipulation earlier had faster resolution of symptoms. Maternal elimination diet & hypoallergenic formula are both standard of treatment, however in setting of severe symptoms (i.e anemia, significant FFT or Ig-E mediated reactions) a patient might benefit from a HF diet due to faster resolution of symptoms. In the setting of mild symptoms, exclusive MED would be preferred due to the immunological, nutritional, non-nutritional, and economic perspective.

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Baseline Characteristics

Characteristics	HF (n=48)	MED (n=18)	Both (n=9)
Male, n (%)	22 (45)	9 (50)	1 (11)
Female, n (%)	26 (54)	9 (50)	8 (89)
Casucasian, n (%)	19 (40)	13 (72)	2 (22)
African American, n (%)	14 (29)	1 (6)	2 (22)
Other/Unknown, n (%)	14 (29)	4 (22)	5 (56)
Acid-Suppressant Use (PPI or H2-RA), n (%)	32 (67)	7 (39)	6 (67)
Positive FOBT, n (%)	12 (25)	5 (28)	2 (22)
Age of dietary manipulation (days), average (range)	62 (10-152)	62 (6-127)	52 (22-86)
Age of resolution (days), average (range)	112 (41-232)	141 (31-247)	123 (40-250)



404 ***THE USE OF TOPIRAMATE IN PEDIATRIC OBESITY AND NON-ALCOHOLIC FATTY LIVER DISEASE.*** *Taisa Kohut, Elizabeth Prout, Jennifer Panganiban. Gastroenterology, Hepatology, & Nutrition, The Children's Hospital of Philadelphia, Philadelphia, PA*

Background: Childhood obesity is a national epidemic with increasing prevalence placing children at increased risk for many serious comorbid conditions such as nonalcoholic fatty liver disease (NAFLD). NAFLD is the most common cause of liver disease in children, and is predicted to be the leading cause of liver transplantation in adults. Lifestyle modification is the primary treatment modality for both but is difficult to achieve and maintain, therefore, adjunctive weight loss medications should be considered. A common off label indication of Topiramate is use as a weight loss agent in adult obesity. Topiramate promotes weight loss by inhibiting carbonic anhydrase, an enzyme involved in lipogenesis, acting centrally to reduce food intake and promote satiety.

Objectives: Primary objective of this study was to determine if there is a reduction or stabilization of BMI z-score in overweight and obese pediatric patients treated with Topiramate. Secondary objective was to identify a subset of overweight and obese pediatric patients with NAFLD and determine if liver enzymes (LFTs) improved with Topiramate therapy.

Methods: A single center retrospective study of overweight and obese pediatric patients seen at the Children's

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Hospital of Philadelphia (CHOP) outpatient Healthy Weight (HW) or NAFLD clinic. Inclusion criteria: males and females ages 2-21 years with BMI ≥85th% seen in clinic from January 1, 2015-December 31, 2018 and prescribed Topiramate by any provider. Exclusion criteria: patients having a primary medical illness that may significantly impact weight, and/or changes in medications after starting Topiramate that could alter appetite, promote weight gain/loss, or cause LFT elevation.

Results: 130 patients met inclusion criteria. Topiramate was primarily prescribed for migraine prophylaxis (65%) then for weight loss (26%). There was a mean reduction in BMI z-score post-Topiramate of -0.012±0.172, p-value=0.042. Thirty-four (26%) patients were identified to have NAFLD. These patients were equally distributed in sex (50 % male), majority white (56%), and had high percentages of other comorbidities, including insulin resistance (97%), type II diabetes (9%), obstructive sleep apnea (53%), hypertriglyceridemia (47%), hypertension (12%), and vitamin D deficiency (82%). Seven NAFLD patients had non-alcoholic steatohepatitis (NASH) diagnosed by liver biopsy, and 6/7 had associated fibrosis. Alanine aminotransferase (ALT) decreased post-Topiramate in NAFLD patients with mean difference of -12.41±52.61, p-value=0.012. The greatest mean decrease in ALT post-Topiramate was seen in pre-adolescent NAFLD patients on Topiramate for <1 to 3 months with a mean difference of -57.43±83.95, p-value=0.018, and BMI z-score remained stable in these patients. NASH patients had the highest pre-topiramate mean ALT of 146.43±135.80 (compared to patients with hepatic steatosis alone 49.12±38.27) with mean decrease in ALT post-Topiramate of -34.43±111.12, although likely underpowered (p=0.50). Adolescent NAFLD patients on Topiramate for <1 to 3 months showed mean weight reduction of -3.64kg±5.17, p=0.043, and had a mean decrease in ALT post-Topiramate of -7.25±10.65, p=0.048. Mean hunger score in NAFLD patients pre-Topiramate was 8 and mean score decreased to 4 post-Topiramate.

Conclusion: Topiramate primarily used for migraine prophylaxis was effective in reducing or stabilizing BMI z-scores in pediatric patients who were overweight or obese. This validates its use as a weight loss agent and adjunct to lifestyle modification in this population. Topiramate may also be beneficial in overweight and obese patients with NAFLD with noted ALT improvement. Further prospective studies are needed evaluating the use of Topiramate in pediatric overweight and obese patients as a weight loss medication and potential treatment for NAFLD. This the first study looking at the use of Topiramate in pediatric NAFLD.

Change in ALT
Post- vs. Pre-Topiramate in NAFLD Patients

	N	ALT Change	SD	p-value
All NAFLD Patients	32	-12.41	52.61	0.012
NAFLD ***age 8-13 years duration <1-3 months***	7	-57.43	83.95	0.018
NASH	7	-34.43	111.12	0.50

ALT decreased post- vs. pre-Topiramate in those with NAFLD

405 ***BREASTFEEDING DURATION IN MOTHERS WHO HAVE A LACTATION ROOM IN THEIR WORKPLACE.*** *Anel Ibarra-Ortega[1], Edgar M Vasquez-Garibay[1], Alfredo Larrosa[1], Jorge Castro-Albarrán[2], Barbara Vizmanos-Lamotte[3]. [1]Instituto de Nutrición Humana, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico; [2]Ciencias de la Salud y Ecología Humana, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico; [3]Coordinación de Investigacion, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico*
Objective: To compare the duration of breastfeeding in mothers who have a lactation room (LR) with those who do not have a LR in their workplace in the metropolitan area of Guadalajara, Jalisco, Mexico.
Methodology: Cross-sectional study of a random sample of 158 worker women whose infants had between six and 35 months of age without problems to start and maintain breastfeeding; 76 had a LR and 82 did not. Twenty-five institutions participated, 12 of them had LR. An *ad hoc* questionnaire designed to evaluate the duration in months of the types of breastfeeding was administered. We compared the breastfeeding duration between groups with Mann-Whitney U test. This comparison was made for overall sample and by infant age groups.

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Results: Women without a LR showed shorter exclusive breastfeeding (p=0.005) and overall breastfeeding (p<0.001) than those with a LR. Additionally, women without a LR utilized human milk substitutes (HMS) longer than those with a LR (p=0.001). When stratified by infant age groups, the same pattern was observed for 6 to 12, and 13 to 24 months for breastfeeding and HMS. For exclusive breastfeeding there were significant differences in the 13 to 24 months group only. No significant differences were observed for any type of feeding in the 25 to 35 months group. Partial breastfeeding duration did not differ between women with and without a LR.
Conclusions: The presence of a LR in the workplace is associated with longer breastfeeding duration and shorter HMS utilization. Therefore, the LR could facilitate breastfeeding practice in working women and lead to economic and health advantages.

PANCREAS/CELIAC/MALABSORPTION

408 ***TIME POINT TO GLUTEN CLEARANCE AFTER INITIATION OF A GLUTEN-FREE DIET IN PATIENTS WITH CELIAC DISEASE.*** *Benny Kerzner[1], Vanessa Weisbrod[1], William Suslovic[2], Ilana Kahn[3], Zachary Kramer[3], Margaret Parker[3], Maegan Sady[3], Shayna Coburn[1]. [1]Gastroenterology - Celiac Disease Program, Children's National Medical Center, Washington, DC; [2]Genetics, Children's National Medical Center, Washington, DC; [3]Neurology, Children's National Medical Center, Washington, DC*
Background: Patients and families with celiac disease (CD) regularly ask how long it takes for gluten to clear the body once they are adhering to a strict gluten-free diet (GFD). Current clinical practice relies heavily on the tissue transglutaminase (tTg-IgA) antibody markers; It is a lagging indicator which can take months to normalize. More hopeful is the available ELISA methodology to detect gluten immunogenic peptide (GIP). It is a more accurate reflection of current gluten consumption and could show how rapidly gluten is cleared from the intestine after engaging in the GFD.

Objective: This pilot study aimed to determine how long it takes for gluten to clear the body of children newly diagnosed with CD after initiation of a strict GFD.

Methods: Our study enrolled ten newly diagnosed cases of pediatric CD based upon elevated tTg-IgA levels or duodenal mucosal biopsy changes. Patients were instructed to collect the first stool sample before initiating the gluten-free diet. Stool samples were collected once weekly for four weeks, then bi-weekly for eight weeks for a total of three months. The gluten content of stool samples was determined using the iVYLISA GIP Stool ELISA Kit(BioMedal). Weeks where stool samples contained GIP levels below the limits of quantification (0.156ug GIP/g of stool) were considered free of gluten.

Results: All patients (n=10) had detectable gluten in their initial stool sample. By the end of the first week, seven had GIP concentrations below the limits of quantification. By week three, nine participants had a stool sample in which no gluten could be detected. One patient had gluten persisting for at least four weeks and then was clear of gluten by week 11, having failed to send stool from weeks five through nine. Only four participants maintained complete gluten clearance from the second week onwards and five others had evidence of gluten re-entering the stool after the initial clearance. The participants self-reported gluten exposures did not correlate with detection of gluten in stool, Spearman (R=0.147).

Conclusions: The GFD is a difficult and lifelong dietary struggle. In this study we showed that it is possible to clear gluten rapidly, possibly within one week of starting a GFD and almost certainly within the first 3 weeks. However, 40% of newly diagnosed pediatric CD patients failed to consistently remove gluten from their diet over the course of the study. We also showed that self-reported compliance does not correlate with gluten detected in the stool and thus should be interpreted with caution. Our study was limited by its small size and short follow up period. In addition, we offer a comprehensive CD education plan that is not widely available to the general CD population and thus our patient population may clear gluten faster then the wider CD population. A larger cohort and longer follow up period will allow for statistical significance and clinical application to the wider CD population.

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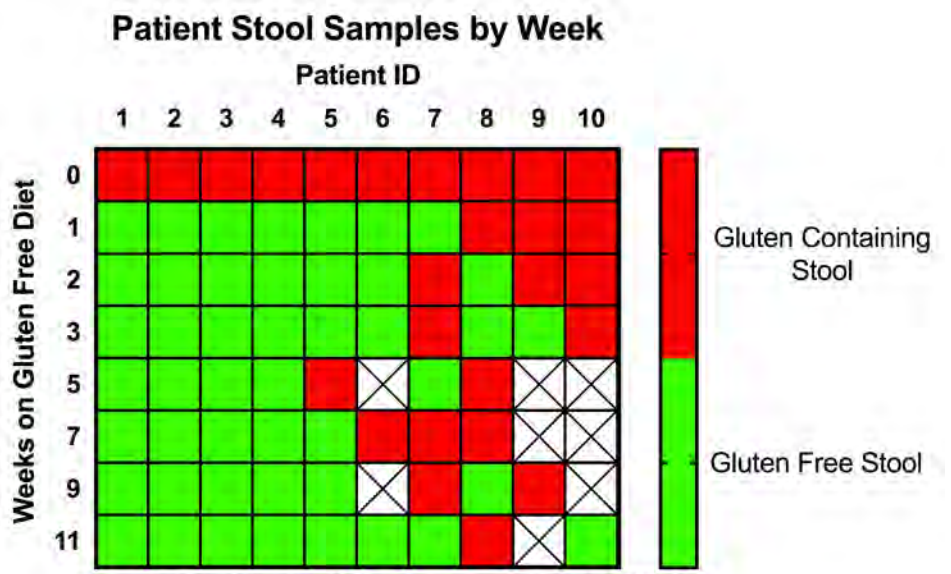


Figure 1. Patient (n=10) stool sample results by week. Stool was considered free of Gluten only if Gluten Immunogenic Peptide(GIP) content was below the limts of quantification for the assay.

410 ***THE UTILITY OF IGA BASED SEROLOGIC MARKERS IN DIAGNOSING CELIAC DISEASE IN CHILDREN ≤24 MONTHS OF AGE; CAN WE DEBUNK THE MYTH IN MODERN ERA?.*** *MUHAMMAD REHAN KHAN[1], Brandon Sparks[2], Zackary Hintze[3], Jocelyn Silvester[3], Ivor Hill[2], Absah Imad[1]. [1]Pediatric Gastroenterology & Hepatology, Mayo Clinic, Rochester, MN; [2]Pediatric Gastroenterology, Nationwide Children's Hospital, Columbus, OH; [3]Pediatric Gastroenterology, Boston Children's Hospital, Boston, MA*

Background: Immunoglobulin A based serologic markers are highly sensitive and considered as the first line screening tests for celiac disease (CD) in both children and adults. However, It has been always thought that in younger children (<24months) serum based IgA and especially TTG IgA are less sensitive and reliable, hence it is recommend to add other markers like combination with either a DGP-IgA-and/or-IgG or an AGA-IgA for screening of CD to increase sensitivity in this specific age group. We conducted a multicenter retrospective study to assess the utility of anti TTG-IgA as a screening test for CD and assess the correlation between TTG IgA value and SBB histologic findings in children ≤24 months of age.

Methods: We conducted a multicenter retrospective study including Mayo Clinic, Nationwide Children's Hospital and Boston Children's Hospital. We reviewed the electronic medical records at Mayo Clinic from 1997 -2017, Nationwide Children's Hospital from 2000-2018 and Boston Children's Hospital from 2008-2018. All children ≤24 months of age who had small bowel biopsy findings suggestive of CD were included in the study. Abstracted data included serologic markers (serum IgA, anti TTG IgA, anti TTG IgG, EMA, DGP IgA, and DGP IgG), HLA genetic testing, and histologic reports. A thorough chart review was done to confirm that children included in the analysis met the diagnostic criteria for CD based on NASPGHAN guidelines. The children who had biopsies suggestive of CD but didn't meet diagnostic criteria were labeled as non CD. These children served as control group (non CD group). The histologic findings on SBB were classified according to modified Marsh classification. There was wide variation in the range of upper normal limits of anti TTG-IgA both across the three institutions as well as over time so for the purpose of analysis, the TTG-IgA levels were standardized to the number of times above the upper limit of normal (ULN). Kruskal-Wallis Test and X^2 tests were used to find the associations of different variables with diagnosis of CD or villous atrophy. A receiver operating characteristic curve (ROC) was generated to determine the correlation of TTG-IgA with villous atrophy and CD diagnosis.

Results: A total of 150 children aged ≤24 months were identified based on clinical presentation and biopsy findings suggestive of CD. Out of these, 45% (n=68) children were from Boston Children's Hospital, 27% (n=41) from Mayo Clinic and 27% (n=41) were from Nationwide Children's Hospital. The median age of diagnosis was 18 months (range 3-24 months) and 51% (n=77) of children were male. The most common presentation leading to diagnostic evaluation was failure to thrive seen in 57%., followed by diarrhea and vomiting seen 17% and 7% respectively, although some children had more than 1 symptoms. TTG-IgA level was available in 134 children and

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median anti TTG-IgA level was 100 (range 0.1-4962. The SBB findings were consistent with Marsh 1 (IEL's) in 3% (5/150), Marsh 3b (partial villous atrophy) in 45% (68/150) and Marsh 3c (complete villous atrophy) in 51% (77/150) of children.
Of the children with histologic findings suggestive of CD on the SBB and available TTG-IgA (n=134), further chart review revealed that 119 (89%) children met the NASPGHAN criteria for CD, while 15 (11%) did not meet the diagnostic criteria for CD (non CD) despite having suggestive histologic findings on the SBB. When comparing these two groups of true CD vs non CD, the median TTG-IgA level was significantly higher in true CD group as compared to non CD group (100 vs 1.2; p-value <0.001). Similarly, the median TTG-IgA> ULN was 7.0 in true CD group as compared to 0.3 in non CD group (p-value <0.001).. Of the children with VA on the SBB (n=145), we did further comparisons between those having partial VA (Marsh 3a; n=68) and total VA (Marsh 3b & 3c; n=77. The median TTG-IgA was 75.0 in patients having partial VA as compared to 100 in children having total VA (p-value= 0.001). Similarly, the median TTG-IgA> ULN was 3.3 in patients having partial VA as compared to 18.6 in children having total VA (p-value <0.001).
In order to determine the correlation of TTG IgA to predict CD diagnosis, a receiver operating characteristic curve (ROC) was generated. It showed that a cut-off value of 0.9 times the upper limit of normal TTG IgA can predict CD diagnosis with sensitivity of 91.6%, specificity of 93.3%, positive predictive value of 99.1% and negative predictive value of 58.3%. The area under the curve (AUC) value was 0.940 (95% CI: 0.901-0.980).
Conclusion: TTG IgA is strongly correlated with the presence of villous atrophy and CD diagnosis, suggesting that IgA based TTG test is reliable in children with measurable IgA and should remain the recommended screening test of choice in all children including ≤24 months of age.

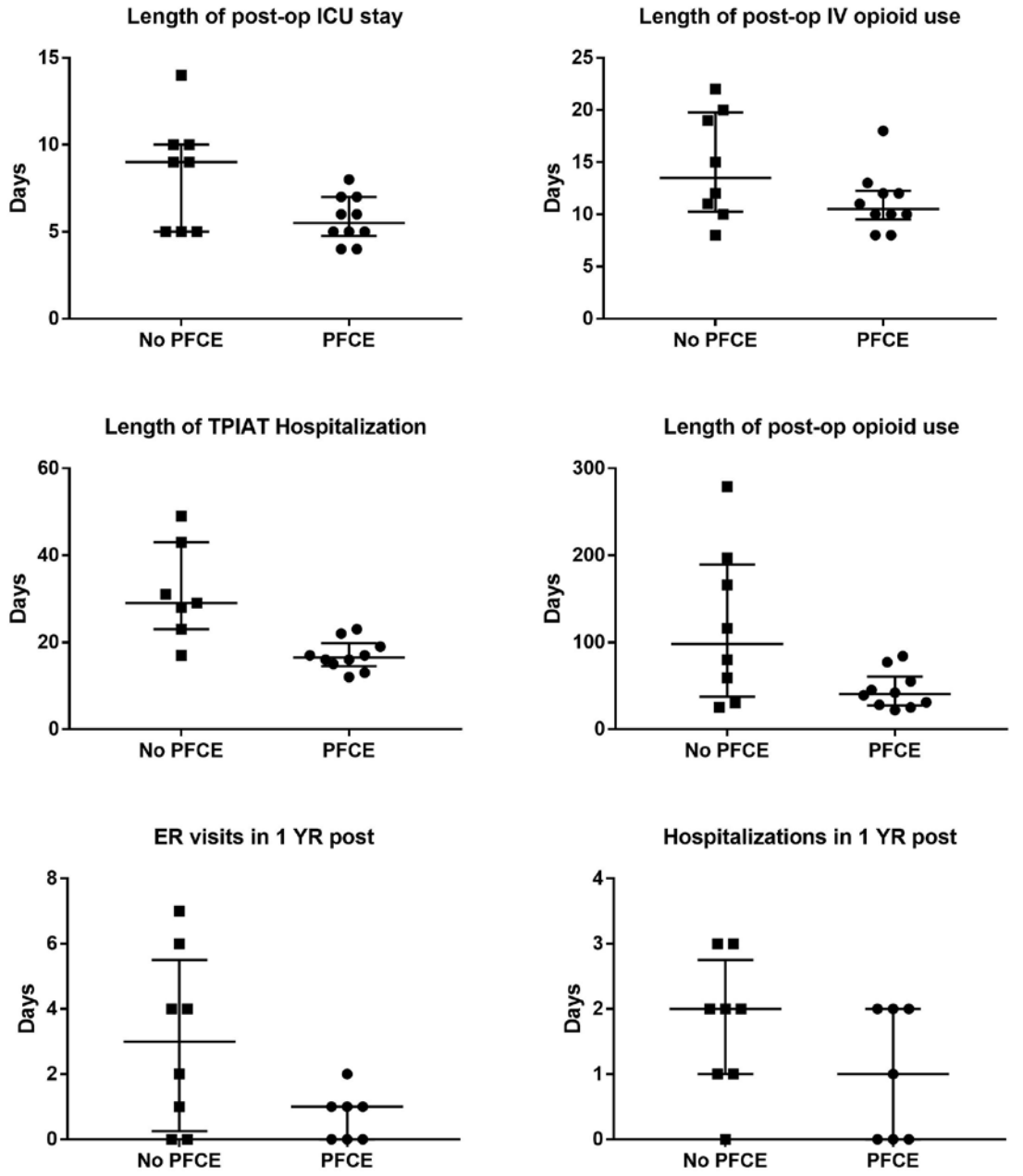
411 ***WITHDRAWN***

412 ***TOTAL PANCREATECTOMY WITH ISLET-AUTO TRANSPLANT (TPIAT) IN PEDIATRIC PATIENTS: OUTCOMES IMPROVE WITH PATIENT AND FAMILY-CENTERED EDUCATION.*** *Michelle Klosterman[1], Zerofsky Melissa[1], Sue Rhee[1], James Ostroff[2], Roger Long[1], Jeanne Buchanan[1], Amber Borucki[1], Karen Sun[1], Gregory Szot[3], Andrew Posselt[3], Emily Perito[1]. [1]Pediatrics, University of California, San Francisco, San Francisco, CA; [2]Medicine, University of California, San Francisco, San Francisco, CA; [3]Transplant Surgery, University of California, San Francisco, San Francisco, CA*
Background: Chronic pancreatitis (CP) in pediatric patients can cause debilitating pain, poor quality of life, and diabetes. TPIAT aims to treat CP-related pain, preserve islet function, and restore quality of life. Almost all patients with CP who are candidates for TPIAT have had frequent hospitalizations and due to the complexity of the surgical treatment (TPIAT), patients may have a complex recovery. Consequently, patients and families may feel anxious and overwhelmed leading to difficulty learning post-operative care and medical management needed prior to discharge from the hospital. Therefore, we developed and implemented a patient and family-centered education (PFCE) program in order to prepare children and their families before TPIAT. We then determined the outcomes of PFCE on post-operative outcomes.
Methods: Single-center, retrospective review of 18 pediatric patients (3-22yrs) with CP who underwent TPIAT 2013-2019. Ten patients received pre-TPIAT PFCE; eight did not. PFCE was provided to primary caregivers and the child. Education included counseling about the peri-operative clinical course from a dedicated pancreas nurse practitioner as well as education from clinicians within each sub-specialty--diabetes education, nutrition education, pain management and coping strategies. Upon completion of the PFCE sessions, all team members developed an individualized post-operative recovery plan for each patient.
Results: Demographics and operative characteristics did not differ in the PFCE and non-PFCE groups. Median age at TPIAT was 13.3yrs; 89% had CP-related mutations (PRSS1, CFTR, SPINK1); 67% were female, 22% Hispanic. Median operative time was 8.3 hrs (IQR, 7.9-8.4). Median islet equivalents per kilogram body weight (IEQ/kg) was 6,892 (IQR 4,294-8,436). During the TPIAT hospitalization, children who received PFCE (n=10) had a significantly shorter median inpatient length of stay (16.5d, IQR 15-19 vs 30d, IQR 25.5-46; p=0.002), and trended towards fewer days in the ICU (5.5d, IQR 5-7d vs 9d, IQR 5-10; p=0.06). The PFCE group also had fewer days receiving patient controlled analgesia (8d, IQR 4-9 vs 12d, IQR 8-19; p=0.10) and were discharged on fewer oral morphine equivalents (OMEs) (PFCE median=60, IQR=30-68 vs non-PFCE median OMEs=166; IQR=59-291; p=0.06) although the differences did not reach statistical significance (p<0.05). Postoperative days to goal enteral nutrition did not differ between groups (overall median=4d, IQR 2-5). Within the first year after TPIAT (n=15 with follow-up through 1 year) , the PFCE group (n=7) had fewer ER visits and hospitalizations (median = 2; IQR 0-3 vs 4; IQR 2.5-7; p=0.04). None of the patients who received PFCE were taking opioids at 1 year post-TPIAT (n = 0 vs n=3;

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37.5%; p=0.07).

Conclusion: PFCE offers patients and families an opportunity to learn about the peri-operative care surrounding TPIAT and allows patients and families to participate with their team in the planning of their individualized treatment plan. PFCE was associated with improved outcomes after TPIAT with shorter ICU and hospital stays, fewer ER visits/hospitalizations during follow-up and no opioid use at 1 year.



Impact of Patient and Family Centered Education on TPIAT Outcomes

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414 ***CLINICAL FEATURES, MOLECULAR GENETICS, AND LONG-TERM OUTCOME IN CONGENITAL CHLORIDE DIARRHEA: A NATIONWIDE STUDY IN JAPAN.*** *Ken-ichiro Konishi[1,2], Tatsuki Mizuochi[1], Tadahiro Yanagi[1], Yoriko Watanabe[1], Kazuhiro Ohkubo[3], Shouichi Ohga[3], Hidehiko Maruyama[4], Ichiro Takeuchi[5], Yuji Sekine[6], Kei Masuda[7], Nobuyuki Kikuchi[8], Yuka Yotsumoto[9], Yasufumi Ohtsuka[10], Hidenori Tanaka[11], Takahiro Kudo[12], Atsuko Noguchi[13], Kazumasa Fuwa[14], Sotaro Mushiake[15], Shinobu Ida[16], Jun Fujishiro[2], Yushiro Yamashita[1], Tomoaki Taguchi[17], Ken Yamamoto[18]. [1]Pediatrics and Child Health, Kurume University School of Medicine, Kurume, Japan; [2]Pediatric Surgery, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan; [3]Pediatrics, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan; [4]Neonatology, National Center for Child Health and Development, Tokyo, Japan; [5]Gastroenterology, National Center for Child Health and Development, Tokyo, Japan; [6]Emergency and General Medicine, Shizuoka Children's Hospital, Shizuoka, Japan; [7]Pediatrics, Doai Memorial Hospital, Tokyo, Japan; [8]Pediatrics, Yokohama City Minato Red Cross Hospital, Yokohama, Japan; [9]Pediatrics, Takatsuki General Hospital, Takatsuki, Japan; [10]Pediatrics, Saga University, Saga, Japan; [11]Pediatrics, Komaki City Hospital, Komaki, Japan; [12]Pediatrics, Juntendo University Faculty of Medicine, Tokyo, Japan; [13]Pediatrics, Akita University Graduate School of Medicine, Akita, Japan; [14]Pediatrics and Child Health, Nihon University School of Medicine, Tokyo, Japan; [15]Pediatrics, Nara Hospital Kinki University, Ikoma, Japan; [16]Pediatric Gastroenterology, Nutrition and Endocrinology, Osaka Women's and Children's Hospital, Osaka, Japan; [17]Pediatric Surgery, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan; [18]Medical Biochemistry, Kurume University School of Medicine, Kurume, Japan*

Background: Clinical and genetic features of congenital chloride diarrhea (CCD) have been reported mostly from 3 high-incidence areas including Finland, Poland, and Arab countries. Whether clinical features and mutations responsible for CCD show ethnic variation remains unclear. We therefore sought to clarify clinical and genetic features of Japanese CCD patients.

Methods: A survey including 616 pediatric centers throughout Japan retrospectively and prospectively identified CCD patients between 2014 and 2018. Mutations involving SLC26A3 were detected by Sanger sequencing.

Results: Fourteen patients met entry criteria. Median age at diagnosis was 2 days. Eleven patients were diagnosed as neonates (79%). Median follow-up duration was 10 years. When studied, 9 patients had under 5 stools daily (64%), while all had fewer than in infancy. Only 1 patient had nephrocalcinosis, while 3 (21%) had mild chronic kidney disease. All patients developed normally; only 1 required special education. Six patients (43%) received sodium, potassium, and chloride supplementation long-term; 2 (14%) had discontinued treatment. Homozygous or compound heterozygous mutations in SLC26A3, including 6 novel mutations, were identified in 13 of 14 patients (93%). The commonest was c.2063-1g>t (7 patients; 50%).

Conclusions: To our knowledge, this is the first East Asian nationwide study of CCD. Early fetal ultrasound diagnosis and prompt long-term sodium, potassium, and chloride supplementation were important in improving outcomes, which were fairly good. Genetic analysis of SLC26A3 provided definitive diagnosis of CCD. In contrast with previously reported localities, c.2063-1G>T might be a founder mutation in East Asia.

416 ***NEUROCOGNITIVE AND BEHAVIORAL FUNCTIONING FOLLOWING INITIATION OF A GLUTEN FREE DIET IN CHILDREN WITH CELIAC DISEASE.*** *Ada Lee[1], Sherin Daniel[1], Denease Francis[1], Lesley Small-Harary[1], Janet Fischel[2], Anupama Chawla[1]. [1]Pediatric Gastroenterology, Stony Brook University Hospital, Stony Brook, NY; [2]Developmental and Behavioral Pediatrics, Stony Brook University Hospital, Stony Brook, NY*

Background: Patients with Celiac Disease (CD) present with various symptoms including, but not limited to, recurrent abdominal pain, diarrhea, vomiting, short stature, and osteoporosis. Additionally, a variety of neurological and behavioral symptoms have been described including headaches, ataxia, hyperactivity and distractibility. However, the evidence for these neurological and behavioral symptoms in children is poor.

Objective: To determine if dietary elimination of gluten in children with CD leads to improved neurocognitive and behavioral functioning.

Methods: This is a prospective study that assesses children's behavior and neurocognition before the initiation of a gluten free diet (GFD) and 6 months later. Patients between 6-18 years old who had both abnormal celiac serology and biopsy proven CD were invited for study enrollment. Three neuropsychological and behavioral assessments were used before and after a GFD:

1) The Kaufman Brief Intelligence Test, Second Edition (KBIT2)

2) The Conners Continuous Performance Test 3rd Edition (CPT3)

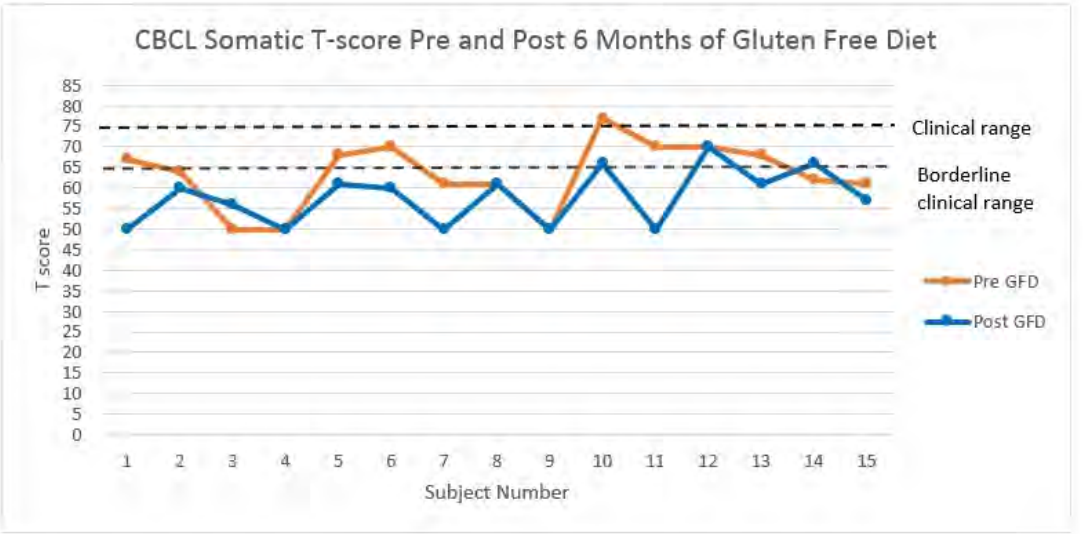
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3) The Achenbach Child Behavior Checklist for Ages 6-18 (CBCL)

At 6 months their serology was reassessed to follow compliance to the GFD and therapy response.

Results: Fifteen patients completed pre and post testing. Using dependent T-tests for analysis, there was neither significant improvement nor worsening of intellectual assessment on the KBIT2 when comparing scores at diagnosis to scores 6 months after initiation of a GFD. Neither were there significant changes in attentional symptomatology (inattentiveness, impulsivity, sustained attention and vigilance) in the same time frame on the four measures of the CPT3. With CBCL, parent ratings provided no significant increase or decrease in T-scores reflective of attentional characteristics consistent with DSM diagnosable ADHD. Somatic symptoms reported by parents improved on the CBCL when comparing symptoms at diagnosis to symptoms after 6 months on the GFD (p=0.051).

Conclusion: This study is consistent with prior studies showing that patients with Celiac Disease demonstrate improvement in somatic symptoms on a gluten free diet. However, in our study we found no effect of a GFD on neurocognitive and behavioral functioning. Our pilot project is the first to evaluate change in neurocognitive and behavioral characteristics prospectively and with several well-established measures both parent reported and direct child assessment.



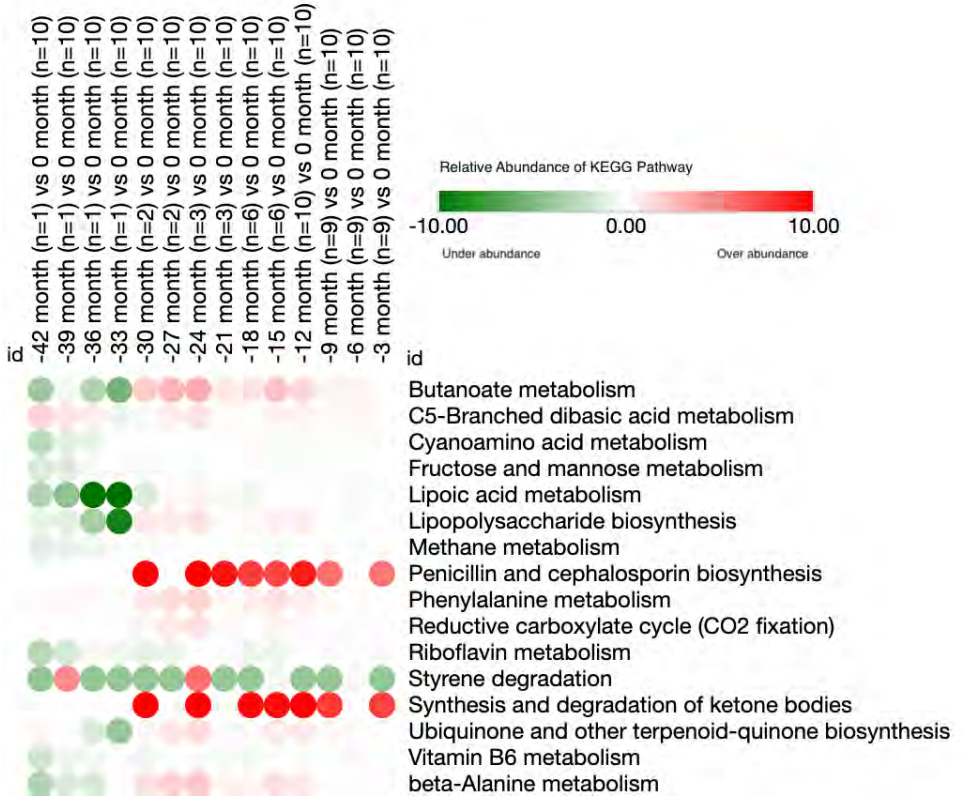
CBCL Somatic T- Score Pre and 6 Months Post Initiation of a Gluten Free Diet p=0.051

417 ***PROSPECTIVE LONGITUDINAL GUT METAGENOMIC ANALYSIS SUGGESTS AN ALTERED COMPOSITION AND FUNCTION IN INFANTS PRIOR TO CELIAC DISEASE ONSET.*** *Maureen Leonard[1], Francesco Valitutti[2], Poorani Subramanian[3], Gloria Serena[1], Victoria Kenyon[1], Stephanie Camhi[1], Pasquina Piemontese[4], Chiara Maria Trovato[2], Celeste Lidia Raguseo[5], Tiziana Passaro[6], Monica Montuori[2], Basilio Malamisura[6], Ruggiero Francavilla[5], Luca Elli[7], Salvatore Cucchiara[2], Hiren Karathia[3], Rita Colwell[3], Nur Hasan[3], Ali Zomorrodi[1], Alessio Fasano[1]. [1]Pediatric GI, MGH, Boston, MA; [2]Pediatric Gastroenterology, Sapienza University of Rome, Rome, Italy; [3]CosmosID, Rockville, MD; [4]NICU, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; [5]Pediatric Gastroenterology, University of Bari, Bari, Italy; [6]Maternal and Child Department, University Hospital of Salerno, Salerno, Italy; [7]Celiac Disease Unit, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy*

Background: Celiac disease (CD) is an autoimmune enteropathy, which occurs in genetically predisposed individuals in response gluten ingestion. However, 97% of patients with compatible genetics and exposure to gluten do not develop the disease, suggesting possible involvement of unknown factor(s) in the loss of tolerance to gluten and pathogenesis of CD. Case control studies have found an altered microbiome in patients with CD compared to healthy individuals, but it is unclear whether alterations in the microbiome occur prior to disease onset. Aim: We

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utilized an ongoing prospective longitudinal birth cohort of infants at-risk of CD to investigate whether infants that develop CD will have an altered intestinal microbiome composition and function prior to loss of tolerance to gluten and development of CD. Methods: As part of a larger ongoing study following infants with a first-degree family member with CD from birth, 10 children who developed CD at or before 48 months of age, and 10 control participants (matched by age, gender, and HLA genetics) were investigated. Serum was tested for celiac autoantibodies every 6 months and HLA genetics were performed at 1 year of age. DNA was extracted from feces collected from birth and every 3 months through the development of CD, or the corresponding time point in control participants. One hundred sixty seven samples underwent shotgun sequencing and subsequent bioinformatics analysis using the CosmosID metagenomics platform for microbial identification at the species level, as well as comparative metagenomic and statistical analysis based on specie alpha diversity, case-control, intra-subject microbiome and functional compositions. Results: Our analysis did not uncover differences in microbiome diversity between cases and controls from birth through CD onset, but demonstrated compositional differences. We identified significant differences in the abundance of microbial species between cases and controls as early as 15 months before disease onset. A decreasing abundance of *Clostridium clostridioforme*, previously associated with ulcerative colitis, was noted in cases 15 months prior to disease onset and an increasing abundance of *Parabacteroides sp20_3*, previously associated with autoimmune disorders including type 1 diabetes was noted 6 months prior to disease onset. Functional analysis identified significant differences between CD cases and controls. Pathways associated with antibiotic biosynthesis and ketone body synthesis and degradation were increased, whereas, pathways associated with styrene degradation were decreased even 2 years prior to CD onset (Figure 1). Conclusion: We identified significant differences in microbial function and species abundance before CD onset suggesting potential role of microbial alterations in CD development. By the time of presentation, the study will be further extended to include the metabolomic analysis in all cases of CD and controls.



418 ***GROWING UP GLUTEN FREE: PILOT STUDY OF DEVELOPMENTAL STAGE SPECIFIC GLUTEN-FREE CLASSES TO RE-ENGAGE PRE-ADOLESCENTS WITH CELIAC DISEASE.*** *Tara McCarthy, Janis Arnold, Sophie Burge, Jocelyn Silvester, Dascha Weir. GI/Nutrition, Boston Children's Hospital, Boston, MA*

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Background: Celiac disease is a life-long immune condition often diagnosed in early childhood. When pediatric patients are diagnosed, gluten-free diet (GFD) education is directed to the caregiver and sometimes to the child, depending on their age. Many families discontinue follow-up after an initial steep learning curve and feeling of proficiency; however, children with celiac disease must acquire the skills to manage a GFD independently as they become more self-sufficient. Both caregivers and pre-adolescents need to remain current on recommendations and work together to empower the pre-adolescent to advocate for themselves.

Aims: 1. To develop a developmental-stage specific GFD refresher class for pre-adolescents aged 11-14.
2. To assess family/pre-adolescent interest in the refresher class and gaps in participant knowledge of a GFD

Methods: A panel of dietitians, physicians and a social worker with expertise in celiac disease and gluten-free diets identified topics of relevance to pre-adolescents who are developing greater independence and responsibility for their GFD. Patients were identified by querying PowerChart (Cerner) using the criteria: ICD-9/10 code for celiac disease, gastroenterology appointment within the last 8 years, and current age between 11-14 years. A gastroenterologist verified the celiac disease diagnosis, then letters were sent inviting families to RSVP for the 90 minute class. As well, classes were advertised through celiac clinics and support group. The RDs and social worker led an interactive presentation with embedded multiple-choice questions that participants responded to anonymously. Pre-adolescents were seated together. The class was directed to the patients, but parents could listen and observe. Parents and patients completed a class evaluation immediately after the class.

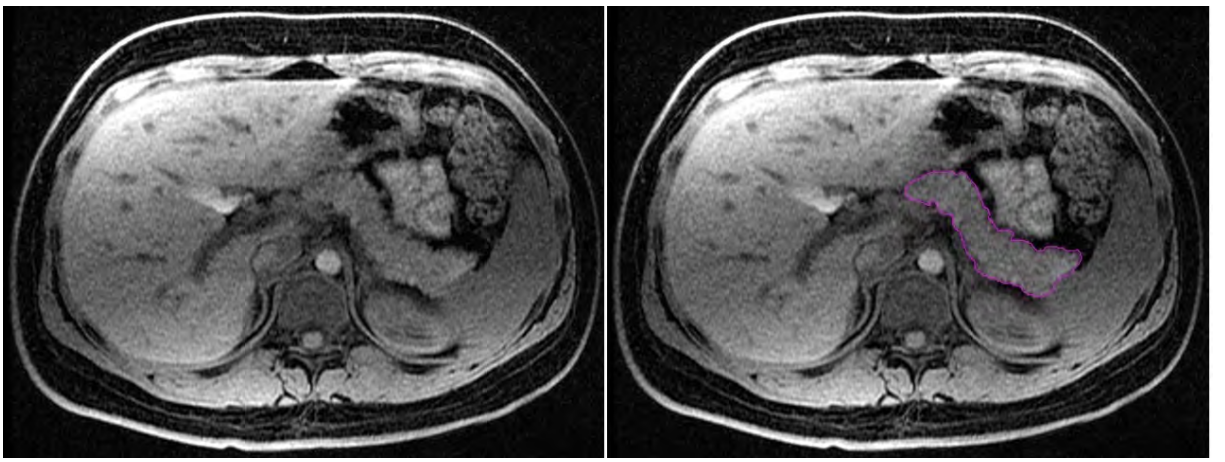
Results: The medical record query yielded 713 unique patients. Of these, 634 (living in the US) were confirmed to have celiac disease and were sent an invitation to the class. Eleven patients registered for the class, and 10 (8 female, 2 male) attended. Barriers to attendance were: illness on the day, location and time of class. The multiple-choice questions revealed knowledge gaps related to: what grains to avoid, different names for barley, how to navigate eating gluten free at restaurants, label reading, cross contact and oats. Evaluations were received from 60% of parents/pre-adolescents, of whom 67% were extremely satisfied and 33% satisfied with the class.

Conclusions: A pre-adolescent refresher class for patients with celiac disease is a way to engage patients, provide education and enhance GFD knowledge. Further studies are needed to evaluate class impact on adherence to GFD and clinical follow up.

419 ***IMAGING PREDICTION OF ISLET YIELD DURING TOTAL PANCREATECTOMY WITH ISLET AUTOTRANSPLANTATION IN THE PEDIATRIC POPULATION.*** *Jaimie Nathan[1,2], Heather Nolan[1,2], Lin Fei[5], Tom Lin[6,7], Deborah Elder[8,7], Maisam Abu-El-Haija[6,7], Andrew Trout[3,4]. [1]Division of Pediatric General and Thoracic Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Department of Surgery, University of Cincinnati College of Medicine, Cincinnati, OH; [3]Department of Radiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Department of Radiology, University of Cincinnati College of Medicine, Cincinnati, OH; [5]Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [6]Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [7]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH; [8]Division of Endocrinology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*
Background: Total pancreatectomy with islet autotransplantation (TPIAT) can be a definitive surgical therapy for debilitating acute recurrent pancreatitis and chronic pancreatitis in children. Predicting islet function and ultimately glycemic control in the pediatric population is important when counseling families and patients about the long-term effects of TPIAT. Currently, the only factor to consistently demonstrate predictive capabilities is islet yield at the time of isolation; however, there are no pediatric studies reporting on preoperative prediction of islet yield and function. Adult studies have shown preoperative imaging can be utilized to predict islet yield.
Objective: The purpose of our study was to evaluate preoperative imaging in children undergoing TPIAT to determine correlation with islet yield and ultimately postoperative insulin requirements.
Methods: Retrospective analysis of our electronic medical record was supplemented with data from our institutional TPIAT database. All patients who underwent TPIAT at our center between April 2015 and December 2018 were assessed. Patients who did not yet have 6-month follow-up data were excluded. Data extracted included demographics, preoperative clinical data, operative data, hospital course, and post-operative follow-up, including insulin requirements. Most recent cross-sectional imaging (computed tomography [CT] or magnetic resonance imaging [MRI]) acquired prior to TPIAT was evaluated by a single board-certified Pediatric Radiologist. The

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pancreas was manually segmented (see Figure) using MIM Software (MIM Software Inc; Cleveland, OH). Data specific to islet isolation included total islet counts (TIC) and total islet equivalents (TIE). Pairwise correlations among variables were assessed using Pearson's correlation coefficient. Logistic and linear regressions, for binary and continuous outcomes respectively, were used for modeling. Associations were considered statistically significant at p-value < 0.05.
Results: 33 patients (21 female), with median age of 13 years (IQR 10, 15) were included. Median segmented pancreatic parenchymal volume was 40 mL (IQR 23.6, 50.5). Median gross pancreatic weight at TPIAT was 42.5 g (IQR 26.8, 63), and median TIE was 310,000 (IQR 200,000, 460,000). Segmented pancreas volume correlated strongly with pancreatic weight (gross r=0.84, p <0.001; net r=0.82, p <0.001) and significantly correlated with TIE (r=0.4, p=0.02). After normalization, segmented pancreas volume per body weight was the most predictive of TIE (p=0.0343). Considering insulin use as a dichotomous variable (on or off insulin at 6-month follow-up), no statistically significantly predictive model could be generated using multiple regression. However, on multiple linear stepwise regression analysis, segmented pancreas volume normalized to body weight (log-scale) was the only significant predictor of total daily dose of insulin per body weight (TDD/kg) at 6-month follow-up (p=0.0005).
Conclusions: In children, pancreas volume on preoperative imaging predicts pancreatic weight at TPIAT and is moderately predictive of TIE, suggesting that not only bulk of pancreatic parenchyma matters but quality of parenchyma is important with regard to islet yield. Segmented pancreas volume by body weight is a significant predictor of insulin use post-TPIAT. Other factors that influence insulin requirements are likely present and need to be elucidated.



Side-by-side comparison of MRI without (left) and with (right) pancreas segmentation as delineated by the purple outline.

420 ***IMPROVING OUTCOMES IN PEDIATRIC PATIENTS WITH ACUTE PANCREATITIS THROUGH AN ELECTRONIC ORDER SET.*** *Patrick Passarelli[1,2], Grant Meyer[1,2], Hannah Wangberg[1,2], Heather Pierce[1,2]*
[1]Pediatrics , UC San Diego, San Diego, CA; [2]Pediatrics, Rady Children's Hospital, San Diego, CA
Background: Recently updated guidelines for acute pancreatitis management from the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) support using isotonic fluids at a rate of 1.5-2x maintenance. Guidelines also recommend against trending lipase and recommend earlier initiation of enteral feeding. Data show providers at Rady Children's Hospital do not consistently adhere to these recommendations. Our primary aim was to increase the use of isotonic fluids by 25% during inpatient admissions for acute pancreatitis over a six-month period. Our secondary aims included decreasing daily lipase levels by 25% and decreasing NPO status by 25%.

Methods: A multidisciplinary team was formed and used Ishikawa diagrams to discover barriers interfering with adherence to guidelines for acute pancreatitis. With IRB approval, baseline data was obtained from records of patients hospitalized with acute pancreatitis at RCHSD for six months prior to the intervention. Cycle 1: We implemented an order set in our EHR to optimize management of pediatric acute pancreatitis according to the NASPGHAN guidelines. Cycle 2: Pediatric residents were educated on use of the order set via email and at teaching

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conferences. Chart review was completed for six months following the EHR order set implementation in July 2018. Our outcome measures included use of isotonic fluids, fluid rate, use of daily lipase, and duration of NPO status. Balancing measures included length of stay or transfer to higher level of care. Process measures included adherence to the order set.

Results: Twenty-six patients met inclusion criteria for analysis prior to implementation of the order set, and 20 patients met criteria for analysis post order set implementation. Prior to use of the order set, 62% of patients were given hypotonic fluids, and only 36% of patients were given a rate of 1.5x maintenance or higher. Following initiation of the order set, 100% of patients were given isotonic fluids, and 60% were given a rate of 1.5x maintenance or higher. Following the initiation of the order set, there was also a decrease in trending of lipase from 77% to 35%, decreased length of stay for patients admitted to the gastroenterology service from five to two days, and reduction in NPO time.

Conclusion: Our aim was achieved with improved adherence to NASPGHAN guidelines following initiation of an acute pancreatitis order set, which successfully decreased variability in care and showed sustainability for 6 months. Quality improvement projects by residents improve high-quality cost-conscious and safe care.

421 ***INSULIN AND OPIOID INDEPENDENCE IN CHILDREN AND ADOLESCENTS ONE YEAR AFTER TOTAL PANCREATECTOMY WITH ISLET CELL AUTO-TRANSPLANT (TPIAT).*** *Emily Perito[1], Michelle Klosterman[1], Roger Long[1], Amber Borucki[1], Gregory Szot[2], Melissa Zerofsky[1], Raphael Meier[2], James Ostroff[3], Karen Sun[1], Sue Rhee[1], Andrew Posselt[2]. [1]Pediatrics, UCSF, San Francisco, CA; [2]Surgery, UCSF, San Francisco, CA; [3]Medicine, UCSF, San Francisco, CA*

Background: For children debilitated by chronic pancreatitis (CP), total pancreatectomy with islet cell auto-transplant (TPIAT) is intended to decrease pain—and reliance on pain medications—and improve quality of life, while preserving islet endocrine function. We evaluated patients' opioid needs and endocrine function at 1 year post-TPIAT at our center.

Methods: Single-center, retrospective review of 15 pediatric patients with CP who underwent TPIAT 2013-2018 at UCSF and had follow-up data available for 1 year or more post-TPIAT.

Results: These 15 patients underwent TPIAT at median age 13.2 years (range 4.0-14.9 years). Median time between CP diagnosis and TPIAT was 2.7 years (range 0.7-11.0 years). Sixty percent were female, and 47% non-Caucasian. Six had genetic mutations in PRSS1, 5 in SPINK1, and 8 in CFTR. Median islet yield was 6,714 islet equivalents/kilogram (interquartile range, IQR, 3,956-8,452). By 1 year post-TPIAT, 80% were off opioids. The three on opioids at 1 year post-TPIAT had been weaned off by 3 months but restarted by 1 year. Two of these three spent more than 15 days on a PCA immediately post-TPIAT; all three were on opioids pre-TPIAT. These three also accounted for 3 of the total 5 patients that were on more than 120 oral morphine equivalents (OME) of opioids at the time of discharge from TPIAT admission. All 3 were taking substantially less oral morphine equivalents at 1 year post-TPIAT (77, 40, 8 OME per day).

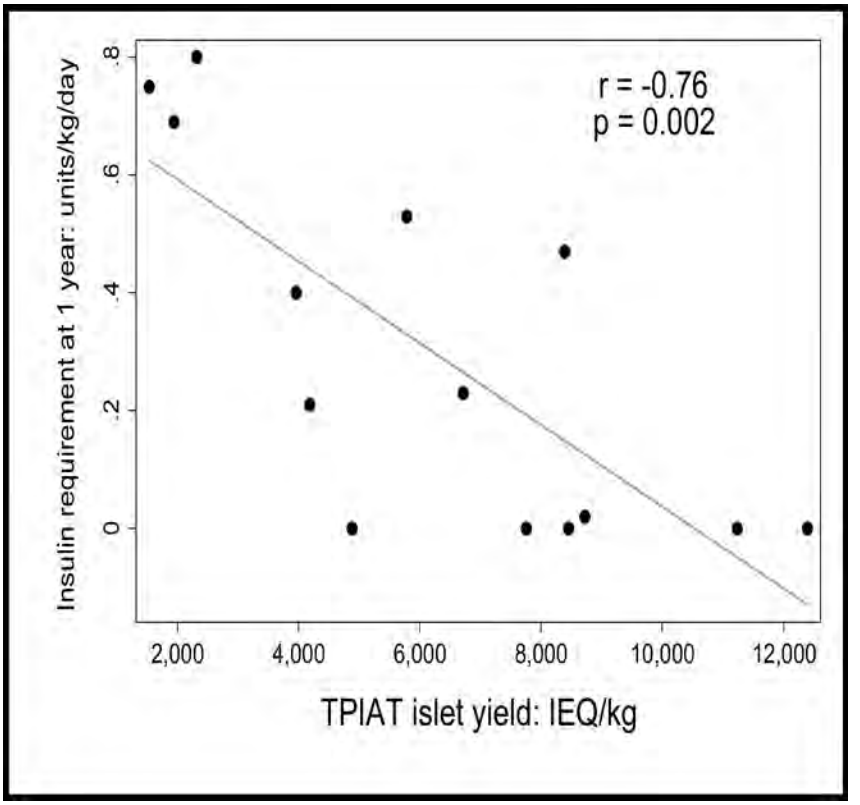
At 1 year post-TPIAT, 33% of patients were off insulin. These 5 all had HgbA1c<7%, and they had a median stimulated C-peptide of 4.3 ng/mL (range 2.2-5.5) and median mixed-meal 2-hour glucose level of 89 mg/dL (range 77-106). Islet yield for these 5 ranged from 4,880 IEQ/kg to 12,391 IEQ/kg. Median hemoglobin A1c at 1 year for all 15 patients was 5.9% (IQR 5.6-6.7%). Of those requiring insulin at 1 year post-TPIAT (n=9 with dose available), three required <0.3 units/kg/day, three required 0.4-0.5 units/kg/day, and three were on >0.6 units/kg/day. Higher islet yield correlated with lower insulin requirement at 1 year (FIGURE; Pearson's r=-0.76, p=0.002).

In the first year post-TPIAT, 47% of the patients had 0-1 hospitalizations; 53% were hospitalized 2-3 times. During that year, 60% had 0-1 emergency room (ER) visits (9 of 15, including only ER visits that did not lead to hospitalization), 27% had 2-4 ER visits, and 13% had >5 ER visits. All 3 of the children on opioids at 1 year had been hospitalized 2-3 times during the 1st year post-TPIAT; all 3 were still on insulin.

Conclusion: In children with debilitating CP, TPIAT can decrease the burden of disease and pain while preserving islet endocrine function. Opioid independence remains our goal for all patients within a year or less TPIAT. Insulin independence was achieved by 1/3 of our patients by 1 year, and several of those still requiring insulin were on low

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doses and still weaning. Ongoing follow-up is essential, particularly of patients with chronic pain and lower islet yields, to help ensure appropriate pain and glucose management.



Higher islet yield at TPIAT associated with lower insulin requirement at 1 year post-TPIAT

425 ***FACTORS ASSOCIATED WITH PROLONGED LENGTH OF STAY IN PEDIATRIC ACUTE PANCREATITIS IN A SINGLE TERTIARY PEDIATRIC CARE CENTER IN MEXICO CITY, MEXICO.***

Yunuen Rivera-Suazo[1,2], RODRIGO VÁZQUEZ-FRIAS[1]. [1]Pediatric Gastroenterology and Nutrition, Mexico's Children Hospital Federico Gomez, Mexico City, Mexico City, Mexico; [2]Pediatric Gastroenterology and Nutrition, Secretaría de la Defensa Nacional, Mexico City, Mexico, Mexico

Background: Acute pancreatitis (AP) is a clinical condition in which injury to the pancreas leads to an inflammatory response either within the pancreas or nearby structures.[1] AP in children is increasing in incidence worldwide.[2] Specific factors have been associated with prolonged length of stay (PLOS) for pediatric AP. [3, 4]

Objective: To identify factors associated with PLOS for pediatric patients hospitalized with AP.

Methods: *Study design.* Data were obtained by retrospective chart review using the retrospective investigation system, of patients discharged from Hospital Infantil de México Federico Gómez with an ICD-10 (K85.9) code for AP from January 1, 2017 to March 31, 2019.
Inclusion criteria. AP was confirmed by manual chart review, as requiring 2 of the following: abdominal pain compatible with AP, serum amylase and/or lipase values $\geq$ 3 times upper limits of normal, and imaging findings of AP, according to the criteria of the INSPPIRE group, in a patient < 18 years of age at the time of admission, discharged with a primary discharged diagnosis of AP.
Exclusion criteria. The exclusion criteria included pancreatic tumors, chart with missing information and AP during hospitalization.
Data collection. Demographic, clinical, nutritional status, laboratory and management data were collected. LOS $\geq$ 7 days was considered as PLOS.
Statistical Analysis. All of the potential factors for PLOS were assessed individually using x^2 or Fisher exact tests for

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qualitative data and Student t test and Mann-Whitney U for continuous variables. Results are expressed as numbers (%) or mean ± SD. P values <0.05 were considered statistically significant. We used multivariate logistic regression analysis to calculate the adjusted odds ratio for the development of PLOS. Data were compiled and analized with SPSS for Windows version 20.0 (IBM Corp, Armonk, NY).

Results: There were 51 admissions that met the inclusion criteria, with 32 patients. The mean LOS was 11.76±13.45 days. The mean age was 10.83±4.42 years. A majority of discharges were female (51%, n=26). The most frequent symptoms were abdominal pain with vomiting (49%, n=25). 62.7% (n=32) cases were mild, 29.4% (n=15) were moderately severe and 7.8% (n=4) were severe. There was one death (1.9%). Common etiologies included: Anatomy/Obstructive (58.8%, n=30), idiopathic (17.6%, n=9), trauma (9.8%, n=5) and toxic (9.8%, n=5). For pain management 49% (n=25) received both non-opioids and opioids. 100% patients were managed NPO on admission. The common modality of nutrition after NPO was clear liquids (76.4%, n=39) and 15.6% (n=8) normal diet. 19.6% (n=10) of cases received parenteral nutrition. Antibiotics were used in 49% (n=25). 21.5% (n=11) received fluid resuscitation on admission, all with lactated Ringer's solution (Table 1).

On our multivariate analysis of factors associated with PLOS, use of antibiotics was the only variable significantly associated with outcome of interest (OR 31.71; 95% CI 2.71-370.65; P = 0.006) and early nutrition (within 72 hours of admission) was independently associated with a decreased LOS (OR 0.05; 95% CI 0.001-0.63; P = 0.02). But no difference were found in age, recurrent, etiology, comorbidity, use of parenteral nutrition and specific biochemical characteristics on admission (creatinine, BUN, total bilirubin, AST, ALT, albumin, LDH, hemoglobin, leukocytes, platelets and calcium) (Table 2).

Conclusions: We have identified that early nutrition showed a protective power against PLOS and who require antibiotics are at the highest risk of PLOS in pediatric patients admitted with acute pancreatitis. These patient populations may benefit from coordination between providers when hospitalized for AP.

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Table 1. Demographic characteristics of pediatric acute pancreatitis episodes discharges in the study population			
	Prolonged length of stay		
	Yes	No	P
n	27	24	
Age, y	9.99 ± 4.67	11.76 ± 4.01	0.15*
Sex			
Male, n (%)	12 (44.4%)	13 (54.2%)	0.48°
Female, n (%)	15 (55.6%)	11 (45.8%)	
Weight, kg	34.08 ± 18.16	38.17 ± 17.04	0.41*
Height, cm	132.9 ± 26.72	140.85 ± 23.84	0.26*
BMI	17.7 ± 4.18	18.3 ± 4.23	0.63*
Recurrent (2 or more episodes), n (%)	13 (48.2%)	19 (79.2%)	0.02°
Severity			
Mild, n (%)	10 (37 %)	22 (91.7%)	0.001°
Moderately severe, n (%)	13 (48.2%)	2 (8.3%)	
Severe, n (%)	4 (14.8%)	0	
Etiology			
Idiopathic, n (%)	6 (22.2%)	3 (12.5%)	0.07°
Anatomy/Obstructive, n (%)	12 (44.4%)	18 (75%)	
Trauma n (%)	2 (7.4%)	3 (12.5%)	
Toxic, n (%)	5 (18.5%)	0	
Toxic/Metabolic, n (%)	2 (7.4%)	0	
Comorbidity, n (%)	16 (59.3%)	21 (87.5%)	0.03°
Complications chronic pancreatitis, n (%)	5 (18.5%)	12 (50%)	0.02°
Chronic pancreatic damage	7 (75%)	12 (100%)	0.25°
Endocrine pancreatic insufficiency	1 (25%)	0	0.25°
Fluid resuscitation, n (%)	11 (40.7%)	0	0.0001°
Pain management, n (%)	25 (92.6%)	22 (91.7%)	1°
Non-opioids, n (%)	7 (28%)	8 (36.4%)	0.23°
Opioids, n (%)	2 (8%)	5 (22.7%)	
Non-opioids/opioids, n (%)	16 (64%)	9 (40.9%)	
Antibiotics, n (%)	20 (74.1%)	5 (20.8%)	0.0001°
Time to nutrition after NPO			
Early < 48 h	5 (18.5%)	16 (66.7%)	0.0001°
Early < 72 h	5 (18.5%)	6 (25%)	
Late > 72 h	17 (63%)	2 (8.3%)	
Modality of nutrition after NPO			
Oral, n (%)	24 (88.9%)	23 (95.8%)	0.61°
Enteral, n (%)	3 (11.1%)	1 (4.2%)	
Type of nutrition after NPO			
Normal	3 (11.1%)	5 (20.8%)	0.61°
Clear liquids	24 (88.9%)	15 (62.5%)	
Low fat	0	4 (16.7%)	
Parenteral nutrition	9 (33.3%)	1 (4.2%)	0.01°°
Lipase, U/L	1634.5 (673.5-5134.7)	3331 (1139-5442)	0.22+
Amilase, U/l	232.5 (102-959.25)	271 (152.5-785.5)	0.71+
Creatinine, mg/dL	0.69 ± 0.34	0.58 ± 0.20	0.14*
BUN, mg/dL	19.93 ± 20.51	11.56 ± 5.19	0.05*
Total bilirubin, mg/dL	1.71 ± 1.59	0.58 ± 0.30	0.001*
AST, U/L	73.5 (22.5-185.75)	21 (16-28)	0.02+
ALT, U/L	95 (28.5-201.5)	25 (18-29)	0.03+
Albumin, g/dL	3.26 ± 0.86	4.08 ± 0.47	0.0001*
Hemoglobin, g/dL	13.12 ± 2.56	14.24 ± 1.85	0.08*
Hematocrit, %	39.45 ± 7.63	42.36 ± 5.61	0.13*
Leukocytes, $10^3/\mu L$	12.12 ± 7.48	11.89 ± 4.60	0.89*
Platelets, $10^3/\mu L$	250.31 ± 130.38	319.0 ± 93.67	0.04*
Calcium, mg/dL	8.98 ± 0.81	9.32 ± 0.51	0.07*
LDH, U/L	396 (232-479)	215 (172.5-303.5)	0.008+

BMI = body mass index; NPO = non per os; BUN = blood urea nitrogen; AST = aspartate aminotransferase; ALT = alanine aminotransferase; LDH = lactate dehydrogenase.

* Student t test; * Chi-square; °° Fisher exact test; + Mann-Whitney U.

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Table 2. Multivariate analysis of factors associated with prolonged length of stay for pediatric patients admitted with acute pancreatitis (adjusted odds ratios and 95% confidence intervals)			
	OR	95% CI	P
Antibiotics	31.71	2.71-370.65	0.006
Early nutrition	0.05	0.004-0.63	0.02
OR = odds ratio; 95% CI = 95% confidence interval; AUC = 0.86; 95% CI 0.76-0.96 p = 0.001; Hosmer-Lemeshow test p= 0.87			

426 ***BOOMING GLUTEN FREE MARKET LEAVES INDELIBLE IMPRINT ON DIETARY CHOICES IN PEDIATRIC CELIAC DISEASE.*** *Joseph Runde*, *Hilary Jericho*, *Stefano Guandalini*. *Pediatric Gastroenterology*, *University of Chicago*, *Chicago*, *IL*

Background: Celiac disease (CeD) is an autoimmune enteropathy based on genetic susceptibility and triggered by the ingestion of gluten. It has a prevalence of 1% worldwide [1]. Though, CeD results in malabsorption and may manifest in growth delay before diagnosis around 40% of adults with CeD are classified as either overweight or obese [2]. While few studies have focused on body mass index (BMI) in children with CeD, some data suggests that BMI also increases in this population following introduction of a gluten-free diet (GFD) [3]. This finding may be related to food choices in patients with CeD. The recent embrace of the GFD in mainstream has led to an emergence of processed gluten free (GF) food options. One report details that GF products increased from 3.4% of the emerging food market in 2003 to 24.3% by 2013. While often marketed as "healthy", GF products may have higher fat and carbohydrate content than gluten containing options [5]. More research is needed to determine if this trend has affected the food choices of children with CeD.

Methods: Pediatric subjects with CeD seen in Celiac clinic from 2015-2018 were contacted via email to participate in an optional 20 question likert survey available on RedCap. Statistical analysis with pairwise comparison was then performed across age groups. The Bonferroni method was used to adjust for multiple comparisons.

Results: The survey was completed for 100 children with CeD. Of the respondents 62.5% were female. The age range of subjects in this cohort was 2-18 years with a mean of 10.5 years. The mean age of diagnosis of CeD was 7.8 years. Across all age groups, 98% of respondents eat processed GF food items at least a few times per week. Additionally, 80% of children consume processed GF at least once per day with over 20% eating processed GF at every meal. In response to why children and their families choose processed GF items 81% identified convenience as their primary motivation. Subset analysis by age groups showed that older children are more likely to prepare their own meals ($p<0.0001$) and are less interested in dietary counseling than younger patients (p 0.0003).

Discussion: This study builds upon data from a similar cohort of pediatric subjects with CeD which demonstrated a trend toward higher BMI in adolescents on a GFD after 2011 [7]. It is a first attempt to explore the relationship between this trend and its association with the expansion of the processed GF market. While more work needs to be done to understand how these food choices may directly affect BMI trends in pediatric CeD, our results indicate that all children with CeD, regardless of age, consume processed GF items multiple times per week. For some, including younger children, these items are consumed exclusively. This study reveals that processed GF options have become a mainstay of the GFD for children with CeD based, in part, on the convenience these options provide. Though, the sample size in our study is small, it suggests that children and their families are less interested in dietary counseling over time. These results highlight the importance of educating children and families at the time of diagnosis not just on the tenets of a GFD but also on healthy GF choices.

Citations:

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GFD Habits By Age-Group	0-6 years (n=11)	7-12 years (n=46)	13-18 years (n=43)	p-value
Female	6 (54.5%)	31 (67.4%)	26 (60.5%)	
Average age at diagnosis CeD	3.45 years	5.97 years	11.12 years	
Average age during study	3.73 years	8.86 years	14.74 years	
Eats processed GFD: Once per week or less	2 (18.2%)	8 (17.4%)	13 (30.2%)	
Most of the time (at least once per day)	6 (54.5%)	27 (58.7%)	24 (55.8%)	0.52
Always (multiple times each day)	3 (27.3%)	11 (23.9%)	6 (14.0%)	
Processed GFD because: Better taste	5 (45.5%)	8 (17.4%)	5 (11.6%)	
Easier to grab and go	6 (54.5%)	35 (76.1%)	35 (81.4%)	0.17
These foods are offered to me	0	3 (6.5%)	3 (7.0%)	
I prepare my own meals: Never	7 (63.6%)	8 (17.4%)	1 (2.3%)	
Sometimes (a few times per week)	4 (36.4%)	33 (71.7%)	26 (60.54%)	<0.0001
Often (most days per week) / Always	0 (0.0%)	5 (10.9%)	14 (32.6%)	
Interested in GFD counseling: Never	1 (9.1%)	4 (8.7%)	9 (20.9%)	
At yearly checkups	3 (27.3%)	30 (65.2%)	32 (74.4%)	0.0003
More frequently than at checkups	7 (63.6%)	12 (26.1%)	2 (4.7%)	

*P-values are from Fisher's exact test

435 ***MEDIAN ARCUATE LIGAMENT SYNDROME: CLINICAL PRESENTATION AND OUTCOMES IN A LARGE PEDIATRIC REFERRAL CENTER.*** *Kaitlin Whaley*, *Todd Jenkins*, *Maisam Abu-El-Haija*, *Andrew Trout*, *Jaimie Nathan*, *Daniel Mallon. Gastroenterology, Hepatology, and Nutrition*, *Cincinnati Children's Hospital Medical Center*, *Cincinnati* , *OH*

Background: Median arcuate ligament syndrome (MALS) is an uncommon cause of abdominal pain and weight loss, and often goes unrecognized or misdiagnosed. Diagnosis requires a high index of suspicion and specific imaging evaluation. Prior reports have demonstrated that not all patients improve with surgical intervention. Furthermore, healthy individuals had been reported to have similar imaging findings without symptoms.
Aim: Describe clinical features and outcomes of patients with clinical diagnosis or imaging findings of MALS treated at our institution.
Methods: This is a retrospective cohort study reviewing patients with a clinical diagnosis or imaging findings of MALS, at our institution from 2008 through 2018. The electronic medical record (EMR) was queried for patients age 0-21 with a diagnosis code (10th revision of International Statistical Classification of Diseases and Related Health Problems, (ICD-10) I77.4, I74.8) consistent with MALS. Our institution's database of imaging reports was also queried using Softek Illuminate software for phrases related to MALS with patients with imaging findings suggestive of MALS included. Electronic medical records were reviewed for clinical, laboratory, imaging, and surgical information. Patients with a MALS ICD-10 code or history of surgery to release the median arcuate ligament were reviewed by three authors to achieve consensus on clinical diagnosis of MALS. . Patients were excluded if they had a diagnosis that shared an ICD-10 code with MALS (e.g. hepatic artery thrombosis), if were diagnosed at a different institution prior to any care at our institution, or all imaging was negative for MALS. A single radiologist reviewed all imaging exams (computed tomography (CT), magnetic resonance imaging (MRI) and Doppler ultrasound (US)) for the study cohort.
Results: The ICD-10 query returned 32 patients. The imaging report query returned 89 patients. There were 55 patients who met inclusion criteria, and 12 patients had a confirmed clinical diagnosis of MALS based on chart review.
Of the 12 patients who had clinical diagnosis of MALS, 12 (100%) had abdominal pain, 10 (83%) had weight loss, and 5 (41.7%) had vomiting (Table). Following their MALS surgery, 9 (75%) patients had resolved pain, 2 (16.7%)

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patients had improvement in pain, and 1 (8.3%) had no change in their pain. Compared to the group with only imaging consistent with MALS, there was a significantly higher number of patients with abdominal pain and weight loss ($p<0.01$) in the group with confirmed clinical MALS.
Conclusion: Clinical presentations of MALS vary. Celiac artery narrowing or compression can be seen in asymptomatic patients without clinical abdominal pain or weight loss. Surgical release of the median arcuate ligament in patients with MALS improved or resolved pain in 92% of our patients.

	Confirmed clinical MALS	Radiology interpretation only	p-value
N	12	43	
Demographic information			
Female, % (n)	58.3% (7)	41.9% (18)	0.32
White race, % (n)	100% (12)	95.3% (41)	0.45
Age (years), mean (SD)	14.9 (2.94)	16.5 (7.73)	0.49
Symptoms			
Abdominal pain, % (n)	100% (12)	58.1% (25)	<0.01
Weight loss, % (n)	83.3% (10)	20.9% (9)	<0.01
Est. weight loss (lbs), N; median (Q1, Q3)	10; 20 (8, 40)	8; 20.5 (12.75, 47.1)	
Nausea, % (n)	75.0% (9)	44.2% (19)	0.06
Vomiting, % (n)	41.7% (5)	30.2% (13)	0.45
Asymptomatic, % (n)	0% (0)	25.6% (11)	0.05
Radiographic information			
Celiac artery on CT/MRI, % (n)			
Normal	0% (0)	38.1% (16)	
Abnormal	100% (12)	62.8% (27)	0.01
US Doppler performed, % (n)	100% (12)	32.6% (14)	
Meets Doppler criteria for MALS	83.3% (10)	50% (7)	0.08
Outcomes			
Median Arcuate Ligament Release, % (n)	100% (12)	N/A	
Resolution of MALS-related pain following surgery, % (n)	75.0% (9)	N/A	
Improvement of MALS-related pain following surgery, % (n)	16.7% (2)	N/A	
No improvement of MALS-related pain following surgery, % (n)	8.3% (1)	N/A	

N/A: Not Applicable

CONCURRENT SESSION II
Friday, October 18, 2019
2:30pm – 4:00pm

Endoscopy: Top to Bottom

436 ***IS CARBON DIOXIDE INSUFFLATION DURING ENDOSCOPY IN CHILDREN AS SAFE AND AS EFFECTIVE AS WE THINK?*** *Chinenye Dike, Riad Rahhal, Warren Bishop. Pediatric Gastroenterology, University of Iowa, Coralville, IA*
Background: Luminal distension is crucial for visualization and endoscope advancement during endoscopic procedures. Air has been the standard insufflation agent in both adults and children. Many adult studies have demonstrated that carbon dioxide (CO_2) is safe and better tolerated than air in a wide range of endoscopic procedures. A few published pediatric studies have also concluded that CO_2 used in colonoscopy causes less abdominal discomfort than air. An increasing number of pediatric centers now use CO_2 for all endoscopic procedures.

Aims: (1) To determine if using CO_2 gas during endoscopy causes less abdominal discomfort and distension in

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children, when compared to air. (2)To determine if CO_2 is as safe and as effective as air when used during both upper endoscopy and colonoscopy in children.

Hypotheses: (1) CO_2 is as safe and as effective as air for endoscopic insufflation. (2) CO_2 causes less abdominal pain and distension when compared to air.

Methods: Double blinded, prospective randomized clinical trial. pO2, pulse, respiration rate, and end-tidal CO_2 ($EtCO_2$) were recorded each minute. The $EtCO_2$ was sampled with a CO_2-sampling nasal cannula for patients undergoing procedural sedation and via the endotracheal tube for those who were intubated. Data was entered into REDCap. Statistical analysis was performed with SAS 9 statistical software (SAS Institute, Cary, NC). A p-value <0.05 was considered statistically significant.

Results: 178 patients were enrolled for 180 procedures, of which 91 procedures were randomized to the CO_2 group and 89 patients to the air group. There was no difference between groups with respect to demographics and ASA status. There was similar mix of procedures between groups and no statistically significant difference between groups in anesthesia type, duration of procedure, or endoscopist-perceived ease of inflation. In contrast to some other studies, groups did not differ with respect to change in abdominal discomfort or girth from baseline to different post procedure time points using the nursing assessment. A significantly higher percent of patients in the CO_2 group had no pain at baseline on the visual analogue pain scale (VAS) and therefore reported no pain when awake after the procedure. There was a statistically significant difference in the percent of patients with transient hypercarbia ($EtCO_2$ > or = 60 mmHg) during upper endoscopy done with procedural sedation (34% (CO_2) vs. 4% (air) p value = <0.0001).

Conclusion: This study raises a potential concern of the safety of CO_2 use in children undergoing upper endoscopy. The occurrence of hypercarbia in a significant number of children may indicate inhalation of eructated CO_2 or excessive absorption of CO_2. Prospective studies using more accurate measures of serum pCO_2 should be done to validate or refute this potential concern.

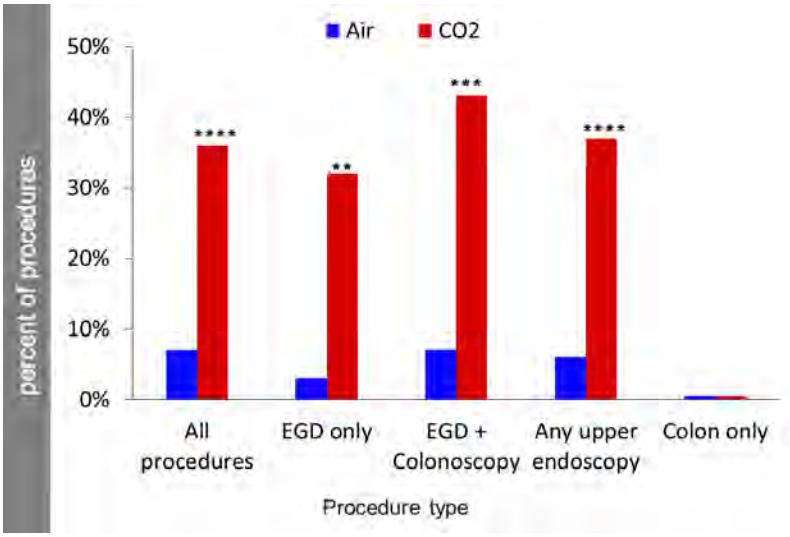
Outcomes

Changes in abdominal girth	Carbon dioxide	Air	p value
Abdominal girth at baseline, cm, median (range)	67 (18.5-130.5) (N=90)	67 (14.5-114.5) (N=89)	0.86
Abdominal girth at end of procedure, cm, median (range)	67 (18.5-133.0) (N=91)	68 (15.0-117.0) (N=89)	0.64
Abdominal girth at discharge from recovery, median (range)	67.5 (18.5-134.0) (N=91)	67 .0(15.0-114.0) (N=89)	0.63
Abdominal girth at home, cm, median (range)	70.0 (18.5-129.7) (N=66)	67.3 (34-110.5) (N=69)	0.90
Change from baseline to end of procedure, cm, median (range)	0.5 (-6.0 – 6.0) (N=90)	1.0 (-3.7 – 13.0) (N=89)	0.13
Change from baseline to discharge, cm, median (range)	0.5 (-7.5 – 12.0) (N=90)	0.5 (-5.0 – 10.5) (N=89)	0.10

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Change from baseline to girth at home, cm, median (range	0.5 (-24.5 – 5.5) (N=65)	0.2 (-25.0 – 12.5) (N=69)	0.96
Changes in FLACC behavioral pain assessment (all patients)			
% Comfortable & relaxed (score 0) on FLACC at baseline	89% (79/89)	83% (74/89)	0.28
% Comfortable & relaxed (score 0) on FLACC upon return to recovery	100% (87/87)	95% (83/87)	0.12
% Comfortable & relaxed (score 0) on FLACC when awake in recovery	90% (77/86)	83% (72/87)	0.20
Changes in Visual Analogue Scale (FACES) (patients > 5 years and developmentally appropriate)			
% No abdominal pain (score 0) on Visual Analogue Scale at baseline	91% (68/84)	60% (49/81)	0.003
% No abdominal pain (score 0) when awake in recovery	78% (63/81)	58% (46/80)	0.006
% No abdominal pain (score 0) at home	43% (21/49)	39% (21/54)	0.68
Endoscopist perceptions			
Endoscopist perception of patient discomfort during procedure % patients with above average discomfort	2% (2/86)	7% (6/85)	0.17
Endoscopist guess of inflation agent % Cannot guess	82% (71/87)	79% (68/86)	0.67
Hypercarbia (defined as procedural peak EtCO2 ≥ 60mmHg			
% Hypercarbia in all procedures	33% (30/91)	3% (3/89)	<0.0001
% Hypercarbia in all procedures with general anesthesia	17% (2/12)	11% (1/9)	1.00
% Hypercarbia with any upper endoscopy with procedural sedation	34% (30/88)	4% (3/83)	<0.0001

N= number of procedures, any upper endoscopy=excludes colonoscopy only, interventional colonoscopy, PEG placement or change. FLACC= Face, Legs, Activity, Cry and Consolability



Percent with elevation in end tidal CO_2 level

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CONCURRENT SESSION II
Friday, October 18, 2019
2:30pm – 4:00pm

Impact of New Technologies on Patient Health

437 ***MACHINE LEARNING MODELS TO PREDICT WAITLIST MORTALITY AMONG PEDIATRIC LIVER TRANSPLANT CANDIDATES: AN UPDATE TO PELD.*** *Sonja Swenson[1], John Roberts[2], Emily Perito[1]*
[1]Pediatrics, University of California, San Francisco, Palo Alto, CA; [2]Surgery, University of California, San Francisco, San Francisco, CA

Background: The Pediatric End-Stage Liver Disease (PELD) score is known to underestimate pediatric waitlist mortality. Since PELD's implementation in 2002, innovative prediction techniques–i.e. machine learning (ML)–have evolved. ML identifies patterns and interactions in data that can improve prediction accuracy. No studies have examined whether ML techniques could improve prediction modeling for pediatric liver transplant candidates.

Methods: UNOS Standard Transplant Analysis and Research (STAR) data used to build and compare 3 waitlist mortality prediction models. 16 objective variables, measured from listing, were evaluated for inclusion. Cohort included all U.S. liver transplant candidates <12 yrs, 2003-17. Excluded were Status 1A, non-cirrhotic liver disease, tumor, multiple listings (n=3,045). Data randomly split into 2/3 training and 1/3 testing subsets, with equal mortality rates (death or waitlist removal for "too sick").

(1) A Refit PELD was built with a multivariate Cox Proportional Hazards (PH) model using current PELD components. (2) PELD+ was derived by backward stepwise regression as an expanded Cox PH model. (Variables with $p<0.1$ were retained from univariate analysis and final variables retained if $p<0.05$ in multivariate analysis.) (3) A Random Survival Forest (RSF) model was built using all 16 predictors. RSF is a ML model that creates many independent decision trees—each from a unique data subset—to collectively to determine the final model. RandomForestRSC (Rv.3.5.3) used to produce 1000 trees grown under log-rank competing risks splitting.

Each model's concordance (C-index)–a measure of its accuracy in classifying individuals—assessed at 12 timepoints in the testing subset.

Results: Among the 6,273 children listed, 8% died on the waitlist within 6 months.

RSF's C-index was significantly higher than that of Refit PELD or PELD+ at 15, 30, 45, 60, 75, 90, and 135 days after listing (FIG 1A). C-indices for all models decreased over time. At 180 days, all 3 C-indices converged at 0.79. C-indices of Refit PELD and PELD+ overlapped at all timepoints, indicating that PELD+'s 3 additional predictors did not significantly improve concordance.

In Refit PELD, age, bilirubin, albumin, INR, and height z-score were significant predictors of waitlist mortality. PELD+ included original PELD components plus ascites, creatinine, portal vein thrombosis. RSF's most important predictors were bilirubin, INR, height z-score, age, albumin, creatinine, ascites and weight z-score. (FIG 1B)

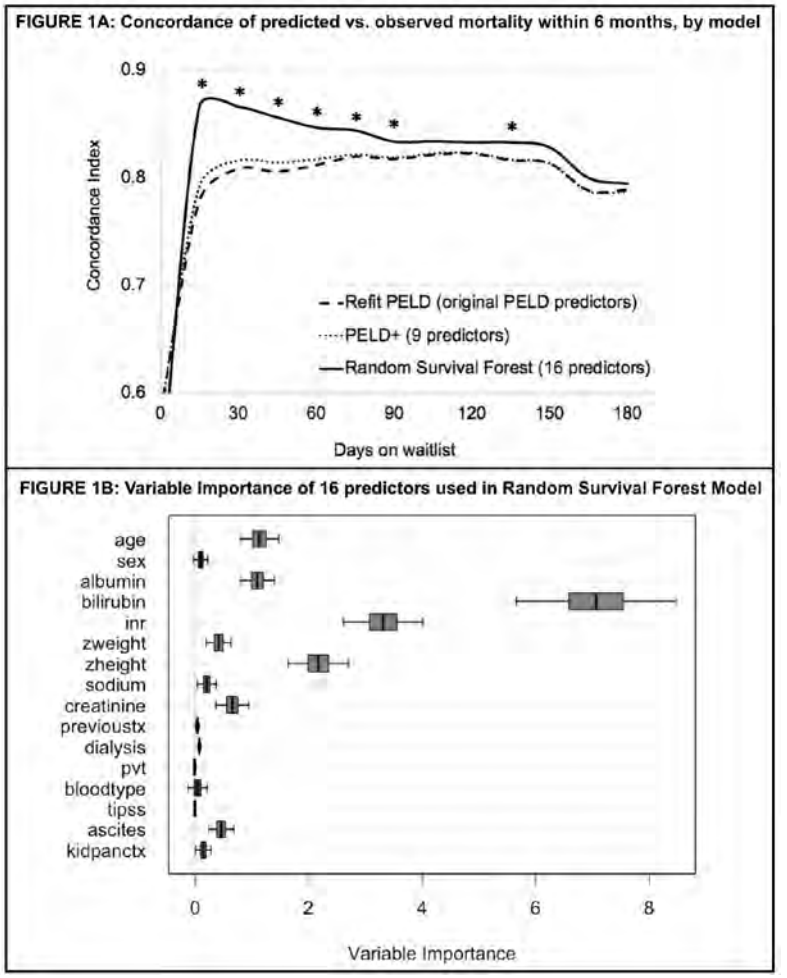
Conclusion: ML techniques could improve mortality predictions for children awaiting liver transplant; this could minimize preventable deaths.

Legend
FIGURE 1A: Concordance (C-index) of predicted vs. observed waitlist mortality events over 6 months, by prediction model. Refit PELD model included only variables currently used in PELD (age, bilirubin, albumin, INR, weight-for-age z-score and height-for-age z-score). PELD+ model included 9 predictors (all predictors in Refit PELD plus creatinine, ascites, and portal vein thrombosis). Weight z-score was retained in both due to its current inclusion in PELD but did not reach statistical significance in either model. Random Survival Forest (RSF) model included 16 predictors. RSF achieved a higher C-index than either Refit PELD or PELD+ at 15, 30, 45, 60, 75, 90 and 135 days after listing, indicating improved overall discrimination. Asterisks indicate timepoints at which 95% confidence intervals (CI) for RSF do not overlap with 95% CIs for either Refit PELD or PELD+. CIs not shown.

FIGURE 1B: Variable importance in RSF model of 6 month waitlist mortality among pediatric liver transplant

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candidates. Higher importance indicates greater contribution to mortality predictions in RSF. (zweight=weight z-score; zheight=height z-score; previoustx=1 or more prior liver transplants; pvt=portal vein thrombosis; tipss=transjugular intrahepatic portosystemic shunt; kidpanctx=also listed for kidney, pancreas or islet cell transplant.)



CONCURRENT SESSION III
Saturday, October 19, 2019
8:30am – 10:00am

Video Abstracts

438 ***ENDOSCOPIC RE-PEG TECHNIQUE FOR BURIED BUMPER SYNDROME.*** *Karlo Kovacic, Alfonso Martinez, Diana Lerner. Pediatrics , Medical College of Wisconsin , Milwaukee, WI*

Buried bumper syndrome (BBS) has been described in 1988 as a migration of the internal bumper into the gastric abdominal wall after percutaneous endoscopic gastrostomy (PEG) tube placement. It is estimated that approximately 0.3%-2.4% of patients who undergo PEG tube placement suffer from BBS. In some pediatric case series reported incidence was almost 22%. One of the main reasons for this complication is attributed to excessive compression of the tissue between the external and internal fixation device of the gastrostomy tube. Typical symptomatic triad includes loss of ability to insert the canula, loss of patency and leakage around the PEG tube. Secondary symptoms include erythema, pain, edema and purulent drainage. Complications of BBS can be fatal and include gastrointestinal bleeding, perforation and peritonitis among others. Even though gastroscopy is indicated when BBS is suspected, imaging modalities such as gastrostomy contrast study, transabdominal ultrasound and computed

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tomography can be used to estimate the depth of disc migration which can be very important for future therapy. Pending the position of the migrated bumper as well as patient's ability to tolerate the procedure endoscopist can choose to cut the tube and leave it, extract it or push it inside. Most of the times a new gastrostomy set can be placed directly through the same stoma.

Case

Our patient was an 8-year-old child with complex medical history including Russel-Silver Syndrome, 33-week prematurity, malrotation s/p Ladd's procedure, gastroparesis with TPN dependence and J tube for trophic feeds who presented with severe abdominal pain at an established gastrostomy tube site. A CT scan was obtained and confirmed the diagnosis.

Procedure

Given the findings on CT imaging we planned to use endoscopic re-peg technique to remove the buried bumper and replace the tube.

The patient was sedated in the operating room and a standard 20-French G tube kit was opened. The end of the original external tubing was cut. We attempted to pass the guidewire from the PEG kit but it was not able to enter the stomach due to occlusion of the bumper opening by gastric mucosa. Biopsy forceps were able to enter the stomach due to increased stiffness. The forceps were used to pull the wire through the buried bumper into the stomach. The endoscopist was then able to grab the gastric wire with biopsy forceps via the endoscope and remove it from the mouth as is usually done in the standard PEG technique. The wire was then attached to the PEG tube externally and pulled back into the stomach. The new tube was pulled out at the skin level and by traction this removed the prior buried bumper. As you can see the gastrostomy site already shows gastric prolapse prior to removal of the buried bumper. The position of the new tubing was visualized by the endoscopist.

Post procedure

Patient recovered with significantly improved pain and was discharged to home in the next 24 hours. Unfortunately given gastric prolapse and buried bumper her peristomal leakage worsened in the following 72 hours. Gastrostomy tube was removed in order to help shrink the stoma. This resulted in complete occlusion of the site and she required a new PEG placement.

439 ***USE OF ENDOFLIP IN A PEDIATRIC PATIENT WITH DYSPHAGIA.*** *Kenneth Ng. Pediatrics, Johns Hopkins School of Medicine, Baltimore, MD*

Introduction: The Endo Functional Lumen Imaging Probe (FLIP) system uses high-resolution impedance planimetry to measure key GI luminal parameters during volume-controlled distension. This system was recently approved by the FDA for use in children 5 years and older. The 1.0 system gives the diameter, cross-sectional area (CSA), compliance, pressure, and distensibility index (D.I., a calculated value based on the smallest CSA divided by pressure) in real time. The 2.0 topography system re-displays the information from the 1.0 system over time, which may be used to complement manometry studies. In the attached video, I demonstrate the use of EndoFLIP in a 17-year-old male with a history of eosinophilic esophagitis s/p treatment who returned to our pediatric gastroenterology clinic with dysphagia symptoms. Method: The patient underwent an elective EGD with biopsy and EndoFLIP. The procedure was performed under general anesthesia, in our endoscopy suite at Johns Hopkins Children's Center. The video reviews the EndoFLIP technique and demonstrates some of the key features described above. Results: The patient had EndoFLIP measurements taken at 20ml, 30ml, and 40ml per our protocol, which is based off of published adult data. At 20 ml: diameter 10 mm, CSA 76 mm^2, pressure 13.5 mmHg, distensibility index 5.7 mm^2/mmHg, and compliance 136 mm^3/mmHg. At 30 ml: diameter 10.2 mm, CSA 83 mm2, pressure 19.4 mmHg, distensibility index 4.3 mm^2/mmHg, and compliance 115 mm^3/mmHg. At 40 ml: diameter 15.2 mm, CSA 182 mm2, pressure 47 mmHg, distensibility index 3.9 mm^2/mmHg, and compliance 89 mm^3/mmHg. Biopsies showed eosinophils in the mid (up to 10 eos/hpf) and distal (up to 5 eos/hpf) esophagus, while the stomach and duodenum biopsies were normal. D.I. values (at LES) were above 2.7 at all 3 inflation settings which would suggest against achalasia. Normal appearing repetitive anterograde contractions (R.A.C.) were noted on the 2.0 system at 40ml inflation. The pathologist felt findings were consistent with active eosinophilic esophagitis (despite <15 eos/hpf). The patient tolerated the procedure well without any complications. No fluoroscopy was used. Conclusion: The EndoFLIP system was a helpful addition to the standard EGD with biopsy in this case as it showed a normal LES (based on D.I.) which, in conjunction with normal repetitive anterograde contractions, made a motor-based issue unlikely. The patient's symptoms were likely due to active eosinophilic esophagitis and treatment was restarted.

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440 ***ROLE OF THERAPEUTIC ERCP IN MANAGEMENT OF PANCREATOBILIARY ANOMALIES.***
Karen Queliza, Douglas Fishman. Pediatric Gastroenterology, Hepatology and Nutrition, Baylor College of Medicine, Houston, TX
Background: There is a wide range of anatomic variants and anomalies that can form during embryologic development of the pancreas and biliary tree. While some are found coincidentally, others can be detected early in childhood due to symptom occurrence. Endoscopic retrograde cholangiopancreatography (ERCP) with cholangioscopy and pancreatoscopy are advanced techniques that can be utilized in children for management of clinically significant malformations.

Case Series: We highlighted several pediatric cases at our institution where therapeutic endoscopy was performed for pancreatobiliary anomaly-associated complications:

Pancreas divisum is a potential risk factor for chronic pancreatitis and ductal obstruction. A patient with cystic fibrosis, pancreas divisum and chronic pancreatitis had an 8mm stone in the dorsal pancreatic duct seen on magnetic resonance cholangiopancreatography (MRCP). He subsequently underwent ERCP with pancreatoscopy and electrohydraulic lithotripsy. A stent was then placed for further fragmentation of stones and drainage.

Anomalous pancreatobiliary junction, or long common channel, is formed when the pancreatic and bile ducts join outside the duodenal wall. Complications arise secondary to inadequate drainage. A patient with suspected long common channel on MRCP had an ERCP with cholangioscopy that confirmed the diagnosis and assisted in removal of a stone in the pancreatic duct.

Choledochal cysts are congenital anomalies characterized by biliary tree dilation, and can cause stone formation, cholangitis and ductal strictures. ERCP with sphincterotomy was performed in several symptomatic patients to facilitate drainage.

Conclusions: Differentiation between normal variants and clinically significant anomalies of the pancreas and biliary tree is important to guide management. Therapeutic ERCP is appropriate for use in children to address sequalae associated with these congenital malformations.

441 ***LAPAROTOMY AND INTRAOPERATIVE ENTEROSCOPY IN A TEEN WITH A SEVERE GASTROINTESTIMAL BLEEDING.***
Amornluck Krasaelap[1], Jonathan Wong[1], Amy Wagner[2], Katherine Flynn-O'Brien[2], James Southern[3], Nghia Vo[4], Diana Lerner[1]. [1]Division of Pediatric Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Medical College of Wisconsin, Milwaukee, WI; [2]Division of Pediatric Surgery, Department of Surgery, Medical College of Wisconsin, Milwaukee, WI; [3]Division of Pediatric Pathology, Department of Pathology and Laboratory Medicine, Medical College of Wisconsin, Milwaukee, WI; [4]Department of Radiology, Medical College of Wisconsin, Milwaukee, WI
Introduction: There has been a challenge in the management of an obscure gastrointestinal (GI) bleeding due to the relative inaccessibility of small bowel to standard endoscopic evaluation. With the use of deep enteroscopy, video capsule endoscopy (VCE) and radiologic interventions, the role of intraoperative enteroscopy (IOE) has been reduced significantly.

Case presentation: We presented a case of a 16-year-old female who presented with a massive, painless rectal bleeding resulting in hemorrhagic shock. After resuscitation, an exploratory laparoscopy, an upper endoscopy, an un-prep colonoscopy, and a mesenteric angiography were performed but unable to identify the bleeding site. After a bowel clean-out, a single balloon enteroscopy and a colonoscopy were performed. Apart from a large amount of old blood up to the terminal ileum, no bleeding site was identified. A hemostatic clip was deployed at furthered reached bowel by anterograde enteroscopy and retrograde push enteroscopy. These areas were also tattooed.
VCE done on the same day showed luminal blood within 10 minutes past the proximal clip but no specific source site was identified. We proceeded with a provocative angiography which also failed to localize the bleeding site. A laparoscopy-assisted enteroscopy (without overtube) was attempted and was subsequently converted to an open laparotomy. An enterotomy was made 10 cm proximal to the anterograde clip (mid-jejunum). Old clots were manually stripped by the surgery team and evacuated via the enterotomy. An actively bleeding Dieulafoy's lesion was seen near the proximal clip. Due to the severity and location of the lesion, it was resected rather than treated endoscopically. No further bleeding was observed.

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Discussion: There has been no consensus guideline on how to evaluate an obscure gastrointestinal bleeding especially in children. We propose an algorithm which incorporates an IOE as a part of the evaluation. IOE is likely to be indicated for a small bowel lesion which is not reachable by conventional endoscopy or enteroscopy, or inability to localize or manage by a radiologic intervention.

Conclusion: IOE is an effective procedure for localizing obscure GI bleeding in pediatric small bowel bleeds when other modalities fail to stop the bleeding.

442 ***USING COMBINED ANTEGRADE-RETROGRADE RENDEVOUS TECHNIQUE TO DILATE NEAR COMPLETE DISTAL ESOPHAGEAL STENOSIS.*** *Abdul Shahein, J. Antonio Quiros, R'celle Boyd, Alida Dempsey, Analina Bayag, Ricardo Arbizu. Pediatric Gastroenterology, Medical University of South Carolina, Charleston, SC*

Case presentation: our patient is 12-year-old male with history of medulloblastoma treated by chemotherapy and spinal irradiation. He presented with insidious onset complete oral aversion and difficulty handling oral secretions. Patient had a G-tube for nutrition and feeding purposes. He received esophagogram that showed near complete stenosis of the distal esophagus, mostly secondary to spinal irradiation and chronic esophagitis. Our patient completed a successful combined antegrade retrograde rendezvous dilation (CARD) of the distal esophagus. The procedure was well tolerated and followed by monthly conventional per oral upper endoscopy assisted balloon dilation. He was able to consume oral soft diet after the third esophageal dilation. **Conclusion:** Combined antegrade retrograde rendezvous dilation (CARD) offers a safe and viable alternative to high-risk surgery and blind isolated antegrade dilation in patient with near complete distal esophageal stenosis.

443 ***SEVERE NECROTIZING PANCREATITIS SECONDARY TO HYPERTRIGLYCERIDEMIA MANAGED WITH PLASMAPHERESIS AND LUMEN APPOSING METAL STENT.*** *Russell Zwiener[1], Thu Pham[1], Patrick Reeves[2], Jeremy Stewart[3], Chris Moreau[4], Javier Monagas[1], Sandeep Patel[4], Adam Noel[1]*
[1]Pediatric Gastroenterology, Baylor College of Medicine - San Antonio, San Antonio, TX; [2]Pediatric Gastroenterology, Walter Reed Army Medical Center, Bethesda, MD; [3]Department of Pediatrics, Baylor College of Medicine - San Antonio, San Antonio, TX; [4]Transplant and Advanced Endoscopy, UT Health San Antonio, San Antonio, TX

The patient is a 15 year old morbidly obese (Body Mass Index=35) male with a known history of hepatic steatosis, Insulin dependent type 2 diabetes mellitus, hypertension (on lisinopril), asthma, and hypertriglyceridemia (on gemfibrozil) who presented to an outside emergency department with a 3 day history of nausea, vomiting, and epigastric pain. In the ED, he had an abdominal computed tomography, amylase (785 U/L), and lipase (1,509 U/L), anion gap of 22 and CO2 of 12 mmol/L which were consistent with acute pancreatitis and diabetic ketoacidosis.

Insulin drip and aggressive fluid hydration were initiated which required progressive escalation of his insulin infusion from 0.1 units/kg/h up to 0.3 units/kg/h. Initial triglyceride level of 2,500 mg/dL later increased to 3,800 mg/dL on Day 2. He developed hypotension, respiratory distress, and Severe Inflammatory Response Syndrome leading to respiratory and renal failure. The patient was intubated and a hemodialysis catheter was placed in order to trial plasmapheresis to treat the hypertriglyceridemia induced severe acute pancreatitis.

The patient received therapeutic plasma apheresis using Spectra Optia® Apheresis System. The order was proceeded as the following: "Type of Apheresis: Total plasma exchange; Frequency Once; Anticoagulant Citrate Dextrose Solution, Solution A; Volume to be exchanged 1.5x total body fluid; Fluid balance 100%; replacement Fluid 5% Albumin, 4000 mL."

Following therapeutic plasma exchange the patient's triglycerides decreased to 400 mg/dL. To assist with reduction in hypertriglyceridemia and to decrease risk for thrombosis, Heparin was initiated. An abdominal CT was repeated at72 hours with three phase pancreas protocol scan to provide a better idea of sequelae of severe acute pancreatitis revealing a necrotizing pancreatitis and early pancreatic cyst formation. Later, magnetic resonance cholangiopancreatography (MRCP) confirmed cyst architecture of now walled off necrosis. Nasogastric tube feeds were initiated for digestive support. 8 weeks after discharge, the advanced endoscopy team obtained imaging with an endoscopic ultrasound and placed a lumen apposing metal stent creating a cyst gastrostomy to assist in drainage of the necrotic pancreatic cyst. Serial necrosectomy sessions removing necrotic debris are on going in order to

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slowly collapse the necrotic cavity. The patient continues to improve.

444 ***ENDOSCOPIC MUCOSAL RESECTION IN CHILDREN.*** *David Vitale*, *Laith Jamil*, *Kenneth Park*, *Quin Liu. Gastroenterology*, *Cedars-Sinai Medical Center*, *Los Angeles*, *CA*

Endoscopic mucosal resection (EMR) for removal of large polyps is well established in adults. Large, generally sessile polyps are lifted by the injection of solution into the submucosa and snare resection is completed above the muscularis propria safely. The other commonly used EMR technique involves "underwater" EMR, filling the intestinal lumen with water to facilitate safe resection without a submucosal injection. As the expertise and availability of EMR technique has evolved, patients are more frequently referred for endoscopic resection of large, benign polyps, rather than surgical resection.

EMR technique in the pediatric population is less utilized. Experience is limited due to the much lower incidence of large intestinal polyps in pediatrics and only a few case reports exist. The aim of this study is to retrospectively review all pediatric EMR cases at a single, tertiary care referral center with adult and pediatric interventional endoscopic expertise.

A chart review via search of computerized medical records at Cedars-Sinai Medical Center was conducted with review from January 2012 to May 2019. Charts were reviewed to determine pre-procedure diagnosis, technical and clinical outcomes and complications.

Twelve pediatric (<18 years old at time of procedure) EMR procedures were identified in 8 patients during the study period (4 male, 4 female). Diagnosis was most frequently rectal bleeding with discovery of large polyp on prior endoscopy, but also included one procedure for intussusception related to large Peutz-Jeghers polyps and one procedure for a large polyp discovered on magnetic resonance imaging. The size of polyps removed ranged from 9 mm to 60 mm and pathology was consistent with juvenile polyps in 6 patients. One patient had pathology consistent with Peutz-Jeghers polyps and another with a sessile, serrated adenoma. Technical success (complete removal or successful debulking of desired polyp or polyps) was achieved in 11 of 12 (92%) of EMRs. One procedure was not deemed a technical success due to a portion of polyp tissue unable to be adequately lifted for removal due to scarring from prior attempted resection. Clinical success (desired clinical outcome, e.g. cessation of rectal bleeding, resolution of intussusception) was achieved in all 11 cases where follow up was available. There were no procedure related adverse events.

This study identifies a small case series of pediatric patients who underwent EMR at a single tertiary care center. Overall, the need for utilization of EMR in pediatrics is far less than in the adult population, however this series demonstrates successful EMR in children and shows a high technical and clinical success rate with a low complication rate. More investigation into EMR in pediatric patients is necessary.

445 ***RENDEZVOUS TECHNIQUE (ERCP AND PTC) IN PEDIATRIC PATIENTS.*** *Karen Queliza*[1], *Alex Chau*[2], *J. Alberto Hernandez*[2], *Douglas Fishman*[1]. [1]*Pediatric Gastroenterology, Hepatology and Nutrition*, *Baylor College of Medicine*, *Houston*, *TX*; [2]*Baylor College of Medicine*, *Houston*, *TX*

Background: Endoscopic retrograde cholangiopancreatography (ERCP) is a minimally invasive procedure that is utilized in children for management of biliary disorders. However, there are challenging situations (e.g. anatomic variations) that preclude repair by retrograde access alone. Rendezvous procedure combines endoscopic retrograde and percutaneous transhepatic anterograde techniques and is a valuable tool that is not well reported in the pediatric literature.

Case Series: We identified 15 patients over 10 years (2008 to 2018) with biliary obstruction requiring treatment by both endoscopic and percutaneous approaches at a single institution. Procedures included Rendezvous technique and choledochoscopy via percutaneous transhepatic catheter. Rendezvous technique was attempted in 9 patients who previously had a percutaneous transhepatic cholangiogram (PTC) and internal-external (IE) biliary drain(s). Seven (77.8%) had successful conversion to internalized biliary stent. Choledochoscopy through a percutaneous transhepatic catheter (+/- ERCP) was performed in 6 patients; three involved intraductal biopsies and one involved serial laser lithotripsy for impacted stones. In this video, we highlighted two cases that required combined efforts of the gastroenterology and interventional radiology (IR) subspecialties.

Conclusion: A multidisciplinary approach should be considered in difficult cases of bile flow disruption. Rendezvous technique requires detailed coordination between the endoscopic and IR teams and allows for management using less invasive means compared to major surgery. Additional research is needed to evaluate

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clinical outcomes among children undergoing these combined procedures.

446 ***APPLICATION OF UNIQUE STENTING TECHNIQUE FOR DRAINAGE OF WALLED OFF PANCREATIC NECROSIS WITH CYST - CYSTOSTOMY.*** *Russell Zwiener[1], Chris Moreau[2], Javier Monagas[1], Sandeep Patel[2], Adam Noel[1]. [1]Pediatric Gastroenterology, Baylor College of Medicine - San Antonio, San Antonio, TX; [2]Transplant and Advanced Endoscopy, UT Health San Antonio, San Antonio, TX*

The patient is a 17 year old morbidly obese female who presented with a one week history of fever and cough. Laboratory values concluded leukocytosis, anemia, and thrombocytopenia. Circulating blast cells were confirmed. She was diagnosed with B-cell acute lymphoblastic leukemia and started on chemotherapy. Her regimen included PEG-asparaginase, which is associate with an increased risk to cause acute pancreatitis.

Initial abdominal computed tomography (CT) showed interval development of pancreatitis including enlargement and heterogeneity with surrounding fluid and within three weeks showing a well defined acute necrotic collection within and surrounding the pancreas measuring 28 x 12 x 9 cm. She developed altered mental status, increasing abdominal pain and fever. Decision made to have interventional radiology place a percutaneous drain. She had immediately relief in her abdominal pain. Ten weeks after her presentation CT scan showed rim enhancing walled off necrosis with two distinct collections separated by a fistulous tract. Given these findings along with her increased pain and drainage around the drain site, decision was made to place a lumen apposing metal stent (LAMS) creating a cyst gastrostomy to assist in drainage of the necrotic pancreatic cyst. A wire was guided through the fistulous tract under fluoroscopic guidance to access the inferior collection. A double pigtail stent was placed to connect the inferior and superior collections of the cyst - cystomstomy. Serial necrosectomy sessions removing necrotic debris were completed in order to slowly collapse the necrotic cavity. CT scan obtained three weeks after placing the LAMS showed near complete resolution of the necrotic collection. All stents were removed and the patient continues to improve.

447 ***UTILITY OF ENDOSCOPIC ULTRASOUND IN PEDIATRIC PANCREATIC NEOPLASMS: REPRESENTATIVE CASES.*** *Jacob Mark[1,2], Carrie Marshall[3]. [1]Section of Pediatric Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Digestive Health Institute, Children's Hospital Colorado, Aurora, CO; [2]Pediatrics, University of Colorado School of Medicine, Aurora, CO; [3]Pathology, University of Colorado School of Medicine, Aurora, CO*

Endoscopic ultrasound (EUS) is a technique which can provide high definition transmural imaging in the mediastinum, upper abdomen, and perirectal/perisigmoid areas. It is widely used in adult gastorenterology for multiple indications, including diagnostic imaging and biopsy, and therapeutic indications such as pancreatic pseudocyst/walled off necrosis drainage. However, EUS is not commonly used in pediatrics, in part because of few pediatric providers trained in the technique, and unfamiliarity of pediatric providers with EUS and potential applications. One application which has been described in small case series is EUS with ultrasound-guided needle biopsy of pancreatic neoplasms. We present 3 representative cases of EUS used for pancreatic neoplasms which highlight the utility of this technique for select pediatric patients.

Case 1 is a 15-year-old male with a solitary pancreatic solid neoplasm found initially by transabdominal ultrasound, and further delineated by MRI to be a single lesion in the pancreas without obvious abdominal metastases, favoring solid pseudopapillary tumor.

EUS was performed which found a 21 x 15 mm solid pancreatic mass as well as 5 small pancreatic cysts in the body and uncinate process (largest of these 5.4 x 6 mm). Fine needle biopsy confirmed diagnosis of a neuroendocrine tumor. Further investigation after this revealed a diagnosis of MEN1 syndrome with hyperparathyroidism and prolactinoma.

Case 2 is a 17-year-old female with innumerable pancreatic cysts found incidentally on CT scan. Follow up MRI revealed interval growth in some of the cysts. Concern for multiple pancreatic cysts with interval growth for intraductal papillary mucinous neoplasms (IPMNs) with malignant potential. EUS was performed. Utilization of a 19-gauge aspiration needle allowed fluid analysis and trans- biopsy of the cyst wall of the largest cyst with micro forceps through the needle. Fluid analysis showed carcinoembryonic antigen (CEA) very low at 1 ng/mL and amylase of 55 U/L, consistent with histology showing an absence of mucin, giving a diagnosis of a benign serous cystadenoma.

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Case 3 is an 11-year-old female who presented with painless jaundice and was found to have an obstructing pancreatic head mass on MRI. EUS with fine needle biopsy was performed which revealed a B cell lymphoma. ERCP was performed at the same session for biliary decompression with stent placement. Appropriate chemotherapy was initiated with excellent initial response of the lymphoma.
These cases illustrate that EUS is a valuable diagnostic tool for evaluating pancreatic neoplasms in pediatrics. Further studies are needed to delineate the role of EUS in other uses in pediatric solid neoplasms in other areas which are amenable to the technique, such as the mediastinum, upper abdomen, and areas adjacent to the rectum and sigmoid colon.

448 ***ADVANCED ENDOSCOPIC THERAPY FOR REFRACTORY ESOPHAGEAL EAR GAUGE FOREIGN BODY STRICTURES.*** *Robert Kramer[1,2]. [1]Pediatrics, University of Colorado, Aurora, CO; [2]Digestive Health Institute, Children's Hospital Colorado, Aurora, Co*
Two cases of severe esopahgeal stricture following prolonged exposure to silicone ear gauges ingested and retained in the esophagus are presented. These ear gauges may represent a new foreign body risk to young children with particular propensity to causes severe strictures due to their bright colors chewy consistency, bi-flanged shape, central opening and radiolucent nature. Ingestions are therefore difficult to detect and may present after a prolonged period of time. This creates a "double" stricture, usually close to the upper esophageal sphincter, that can be very difficult to manage. The cases presented illustrate a range of endoscopic interventions that were required to maintain esophageal patency.

449 ***PAI-1 AS AN EPITHELIAL MARKER OF DISEASE SEVERITY IN PEDIATRIC EOSINOPHILIC ESOPHAGITIS.*** *Prerana Williamson[1,2,3], Ranjan Dohil[1,2,3], Maheen Hassan[1,2,3], Armen Gharibans[3,4,5], Jacqueline Barsamian[3], Lucas Dohil[1,8], Robert Newbury[3,6], Hayat Mousa[1,2,3], Seema Aceves[3,7,8]. [1]Department of Pediatrics, University of California San Diego, San Diego, CA; [2]Division of Pediatric Gastroenterology, University of California San Diego, San Diego, CA; [3]Rady Children's Hospital, San Diego, CA; [4]Department of Surgery, University of Auckland, Auckland, New Zealand; [5]Auckland Bioengineering Institute, University of Auckland, Auckland, New Zealand; [6]Department of Pathology, University of California San Diego, San Diego, CA; [7]Department of Medicine and Pediatrics, University of California San Diego, San Diego, CA; [8]Division of Allergy and Immunology, University of California San Diego, San Diego, CA*
Rationale: Eosinophilic esophagitis (EoE) is characterized by clinical and histologic consequences of immune-mediated inflammation. Subepithelial fibrosis of the lamina propria (LP) and epithelial remodeling occur in EoE pathogenesis. Clinically, disease progression leads to gross findings of esophageal furrowing, plaques, erosions and exudate. In addition, esophageal function can become compromised and ongoing fibrosis can create stenoses. Plasminogen activator inhibitor-1 (PAI-1) has previously been shown to be part of the EoE fibrotic cascade, and can distinguish distinct groups of fibrotic severity. Immunohistological patterns of epithelial staining for PAI-1 in the esophageal epithelium were investigated as potential markers of epithelial remodeling, as well as for correlation with severity of gross endoscopic findings (endoscopy score) and esophageal compliance as determined by endoluminal functional lumen imaging probe (EndoFLIP). The relationships between these parameters were evaluated.
Methods: Esophageal tissue biopsies from children with no histologic disease, inactive and active EoE were stained with PAI-1 (n=45). The degree of active staining was quantified using ImageJ, a Java-based image processing program developed at the National Institutes of Health. A previously established histologic scoring method was applied to quantify epithelial remodeling scores and basal zone hyperplasia scores. EndoFLIP was used to measure esophageal compliance in 20 patients. Standardized endoscopy scores (maximum score =15) and histology scores were calculated in patients who underwent EndoFLIP. The relationship between epithelial remodeling, esophageal compliance, endoscopy score and PAI-1 was evaluated.
Results: Epithelial PAI-1 was significantly higher in active versus inactive EoE ($p=0.001$) and significantly correlated with the epithelial remodeling score ($p < 0.0001$) and basal zone hyperplasia score ($p < 0.0001$). Panesophageal average PAI-1 had negative correlation with overall, proximal and middle esophageal compliance ($p=0.0006$, $p=0.012$ and $p=0.006$ respectively). PAI-1 throughout the esophagus positively correlated with middle, distal and total endoscopy scores ($p < 0.05$ for all). Proximal, middle and total esophagus endoscopy scores negatively correlated with overall compliance ($p < 0.01$ for all), proximal compliance ($p < 0.01$ for all), and middle compliance ($p < 0.05$ for all).

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Conclusions: Epithelial staining patterns for PAI-1 in the esophagus can distinguish disease activity in EoE, and correlates with epithelial remodeling in the diseased esophagus. There is a significant trend of decreasing compliance as epithelial PAI-1 increases. In addition, higher endoscopy scores correlated with increased epithelial PAI-1, and decreased compliance. Thus, PAI-1 may potentially be a predictive marker of disease severity in children with EoE.

CONCURRENT SESSION IV
Saturday, October 19, 2019
10:30am – 12:00pm

Treating the Entire IBD Patient

450 ***OPEN SHARING OF AN EHR HEALTH MAINTENANCE CHECKLIST TO IMPROVE MONITORING OF CHILDREN WITH INFLAMMATORY BOWEL DISEASE.*** *Jeannie Huang[1,2], Rusvelda Cruz[2], Ryan Yueh[2], Steven Miller[4], Jeremy Screws[3]. [1]Gastroenterology, Rady Children's Hospital San Diego, San Diego, CA; [2]Pediatrics, University of California San Diego, La Jolla, CA; [3]Pediatric Gastroenterology, Erlanger Health System, Chattanooga, TN; [4]Pediatric Gastroenterology, Johns Hopkins School of Medicine, Baltimore, MD*

Background: Open source software has revolutionized software development. By publicly releasing software, multiple designers can collaboratively iterate and rapidly improve the product. With widespread adoption of electronic health record (EHR) systems, the potential exists for a similar collaborative model to improve workplace efficiencies in healthcare.

Currently, EHR systems are proprietary and customized to the needs of adopting institutions. Institutions build their own templates for data entry, clinical decision support, etc. While such customizations enable functionality within a given institution, they do not readily enable sharing across institutions, limiting the ability for institutions to learn from one another and improve functionality.

EPIC, a widely used EHR system, has begun to incorporate successful templates/builds into their system-wide (Foundation Build (FB)) updates across institutions. This opens new possibilities in healthcare to improve workplace efficiencies and potentially standardize care using previously demonstrated successful tools that can be further improved by users *en masse.*

Inflammatory bowel disease (IBD) afflicts >70,000 youth across North America treated at health centers serviced by EHR systems. Published guidelines promote scheduled monitoring of youth with IBD for nutrition deficiencies, bone pathology, ocular and skin diseases, and infectious complications, as well as performance of various interventions for health and well-being. We developed an EPIC EHR activity to remind physicians of necessary screenings and health interventions for youth with IBD that will be released at an upcoming Epic update.

Objective: We developed an EHR activity to automate reminders to physicians to perform recommended screenings/interventions for pediatric IBD patients that will be released at an upcoming EPIC update. The EHR activity was evaluated at a pediatric, tertiary care institution serving a metropolitan catchment of 1 million children.

Methods: The IBD Health Maintenance Activity (IBD HMA) further customizes the Health Maintenance Activity in EPIC FB to account for recommended nutrition (iron, vitamin D, vitamin B12, folate), bone pathology (DEXA scan and bone age), ocular and skin disease (referrals to ophthalmology and dermatology), and infectious disease (tuberculosis, hepatitis, and varicella) screenings at specific time intervals. IBD HMA also includes prompts for transition skill assessment (checklist), skill achievement (via a practicum), and resource delivery on an annual basis.

IBD HMA launched in 2018. Prior to this, pre-visit chart review was manually performed by a nurse to determine which screenings and/or interventions were due. Compliance with recommended screening/intervention schedules for a convenience sample of 40 patients was evaluated before and after IBD HMA launch by calculating number of recommendations (out of 10) met in a given patient and averaging across the group. Group means were compared using the paired t-test, with statistical significance set at $p<0.05$.

Results: Figure 1 provides a snapshot of IBD HMA and its functionalities. Specifically, IBD HMA displays

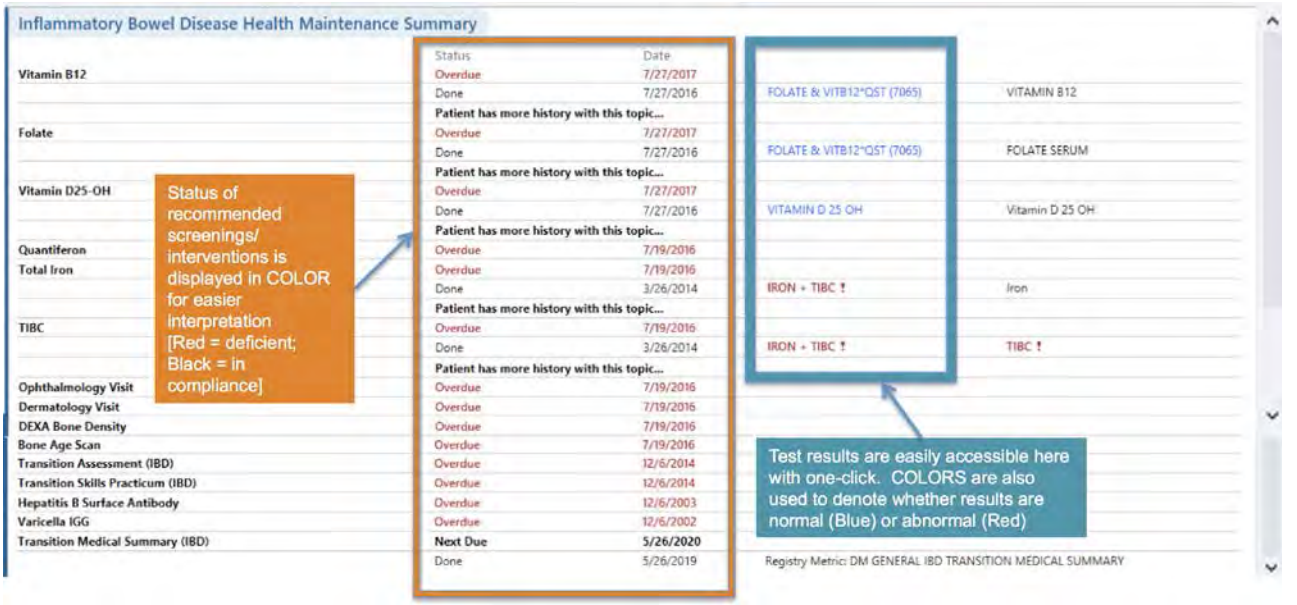
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performance and deficiencies of recommended screenings/interventions in a tabular format that also allows ready access to prior results.

Prior to IBD HMA launch (where staff performed pre-visit chart review), average compliance was with 5 (3) [mean (standard deviation)] of the ten recommended guidelines among pediatric IBD patients. In comparison, average compliance with 7 (3) recommendations was achieved after IBD HMA launch, a 20% increase and statistically significant improvement from that previously observed ($p<0.02$).

Required personnel time for pre-visit chart review prior to IBD HMA launch was 20 hours/week. In contrast, since launch of IBD HMA, no pre-visit chart review time has been necessary.

Discussion: We demonstrate the efficacy of an EHR activity to remind physicians caring for pediatric IBD patients to perform recommended screenings and interventions. Compliance with published guidelines resulting from the IBD HMA was superior to that resulting from pre-visit manual chart review at one institution. The tool holds great promise and will undergo further iteration via a committee comprised of pediatric gastroenterologists prior to release in an upcoming EPIC FB update. FB release will enable widespread use of a potentially useful tool across the current 151 EPIC sites and enable its further utility evaluation and improvement.



451 ***VALIDATION OF THE UCEIS AND MAYO ENDOSCOPIC SUB-SCORE IN PEDIATRIC ULCERATIVE COLITIS.*** *Amanda Ricciuto[1], Nicholas Carman[2], Eric Benchimol[2], Anne Griffiths[1], Thomas Walters[1], Peter Church[1]. [1]Gastroenterology, Hospital for Sick Children, Toronto, ON, Canada; [2]Gastroenterology, Children's Hospital of Eastern Ontario, Ottawa, ON, Canada*

Background: The target in treating IBD has shifted to endoscopic remission. Endoscopic scoring indices are critical for the objective assessment of endoscopic response to IBD therapies over time. The Ulcerative Colitis (UC) Endoscopic Index of Severity (UCEIS) (range 0-8) and Mayo Endoscopic Sub-score (MES) (range 0-3) are the two most widely used endoscopic tools in UC. However, they were developed for use in adults and neither has been validated in children. Furthermore, both are traditionally applied to only the worst affected region of the rectosigmoid colon in adults, which may be suboptimal in children given their predilection for extensive, often pancolonic disease. We therefore sought to validate and assess the reliability of the UCEIS and MES in pediatric UC, including the original rectosigmoid scores as well as modified versions that incorporate disease extent.

Methods: We performed a prospective study at SickKids in Toronto, Canada. Colonoscopies performed on consecutive pediatric UC patients were videotaped and scored by 3 blinded and independent pediatric IBD experts,

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using: 1) the traditional rectosigmoid UCEIS and MES; 2) total colonic UCEIS and MES, derived by applying the UCEIS and MES to the 5 colonic segments (rectum, sigmoid, descending, transverse, right colon) and taking an average; and 3) worst segment UCEIS and MES, derived by scoring the worst affected colonic segment. Inter-rater reliability was assessed with intraclass correlation coefficients (ICCs) (two-way mixed, agreement, single measure) and weighted/unweighted kappa, as appropriate. Construct validity was assessed 1) with Spearman correlations between UCEIS/MES and global endoscopic lesion severity (GELS) on a 0-100 visual analogue scale (VAS), serum markers, fecal calprotectin (FCP) and clinical activity (PUCAI score assigned by a blinded investigator at time of colonoscopy), and 2) by examining the ability of the different endoscopic scores to discriminate between disease activity categories. ROC curves were used to determine optimal UCEIS cut-offs.

Results: Based on an a priori power size calculation, 60 children were included (53% M, median age at IBD diagnosis 11.9 years, 35% diagnostic colonoscopy, 60% moderate/severe PUCAI, 18% FCP <250 µg/g, median VAS GELS 47, range 0-95). The median rectosigmoid UCEIS (4, IQR 2-5) and MES scores (2, IQR 1-3) were identical to the median worst segment UCEIS and MES so worst segment scores were not examined further. The median pancolonic UCEIS and MES were 2.8 (IQR 0.8-4.2) and 1.4 (IQR 0.5-2), respectively. Inter-rater reliability was very good for all endoscopic scores but numerically greater for the pancolonic variations (pancolonic UCEIS ICC 0.92, 95% CI 0.88-0.95; rectosigmoid UCEIS ICC 0.88, 95% CI 0.82-0.92; pancolonic MES ICC 0.91, 95% CI 0.86-0.94; rectosigmoid kappa 0.63, 95% CI 0.54-0.72). The bleeding and vascularity UCEIS sub-items displayed the worst and best inter-rater agreement, respectively. Correlations between the rectosigmoid and pancolonic versions of the UCEIS/MES and GELS VAS were excellent and similar (r=0.85-0.94). The pancolonic variations displayed slightly numerically greater correlations with PUCAI (r=0.72 vs. 0.65) and CRP (r=0.6 vs 0.5). Correlations with FCP were similar and fair (r=0.60). Weaker correlations were seen with albumin, hemoglobin and ESR. As shown in Figure 1, the pancolonic UCEIS performed better at discriminating between patients with moderate vs. severe clinical activity. The optimal pancolonic UCEIS thresholds for distinguishing global endoscopic severity (measured categorically) were 0 – endoscopic remission; 1-2 – mild; >2-4 – moderate; and >4-8 – severe.

Conclusions: The UCEIS and MES display very good inter-rater reliability in pediatric UC when applied by IBD experts. They also show excellent construct validity in this population. The pancolonic variations perform marginally better than the traditional rectosigmoid tools, but it is unclear whether this is clinically significant. An important future step is assessment of responsiveness.

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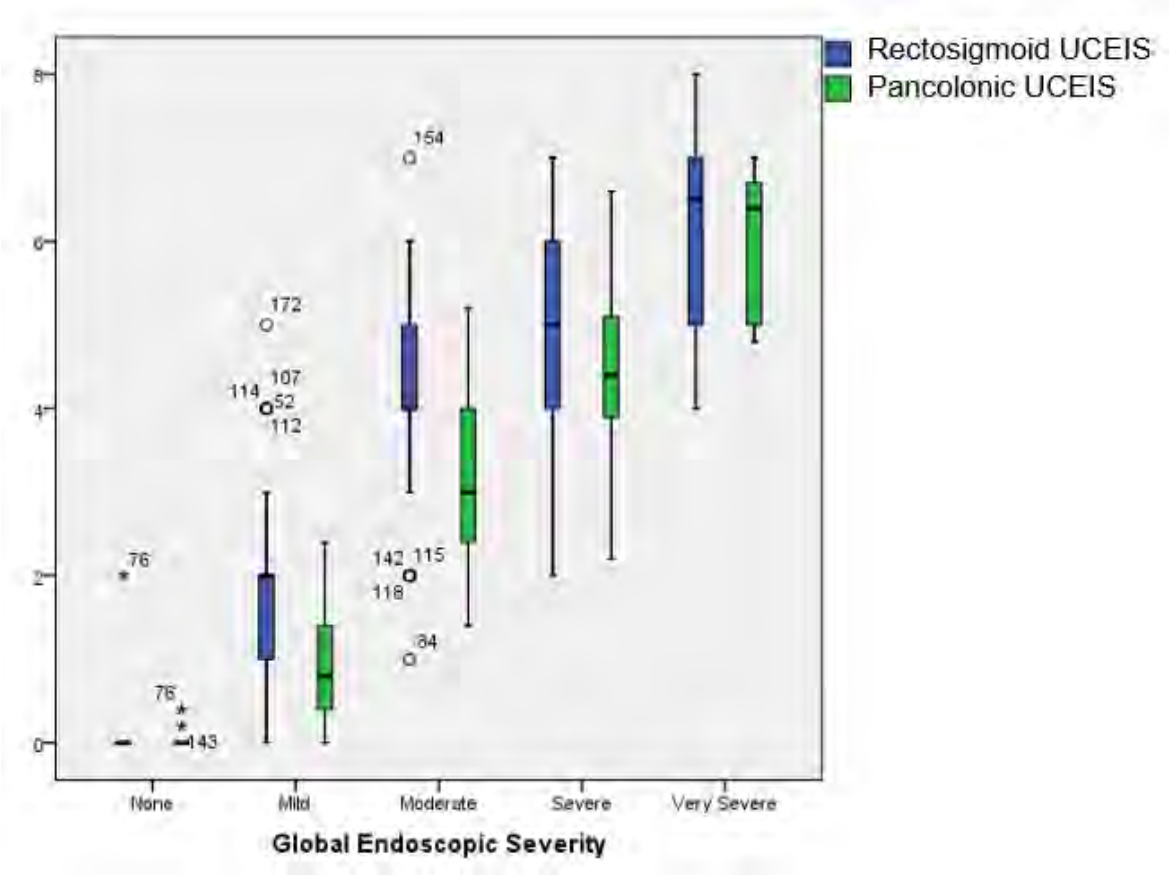


Figure 1. Pancolonic and rectosigoid UCEIS in relation to global endoscopic severity

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POSTER SESSION III
Saturday, October 19, 2019
12:00pm – 2:30pm

APGNN – EVIDENCE BASED PRACTICE/QI/NURSING RESEARCH

452 ***AN INITIATIVE TO IMPROVE PARENTAL KNOWLEDGE AND COMPETENCY IN NASOGASTRIC TUBE CARE FOR PEDIATRIC PATIENTS.*** *Kathleen Carr[1], Julia Perkins[1], Maireade McSweeney[1,2], Susanna Huh[1,2]. [1]Gastroenterology, Boston Children's Hospital, Boston, MA; [2]Pediatrics, Harvard Medical School, Boston, MA*

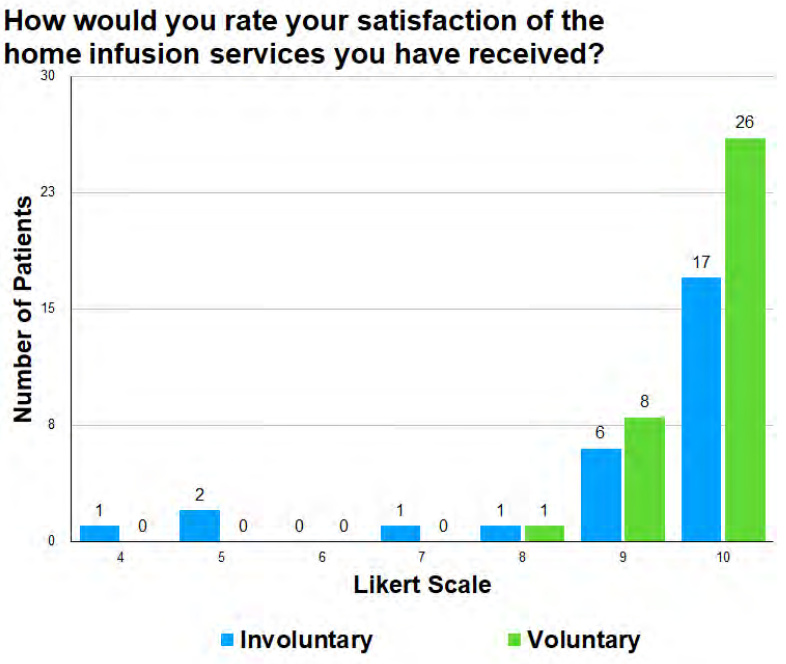
Background: To master the knowledge and skills required to safely care for a pediatric patient with a nasogastric tube in the home, national guidelines recommend parent education using a standardized discharge process. At Boston Children's Hospital, the lack of a hospital-wide standardized discharge plan led to inconsistencies in parental education, placing parents at risk of poor competence in NG tube care, increased parental stress, and higher risk of unnecessary outpatient and ER visits.
Objectives: The purpose of this pilot QI project was to evaluate the effect of a standardized discharge protocol on parental knowledge, skill, and stress levels among children discharged home after nasogastric (NG) tube insertion.
Methods: The discharge protocol, modeled after a gastrostomy tube discharge protocol, consisted of: 1) assessment of baseline parental knowledge and parental stress prior to the education session; 2) an education session reviewing written family education information sheets with a GI nurse practitioner (NP); 3) caregiver viewing of designated educational videos; 4) a 1:1 hands-on education session with a GI NP. At 1-3 weeks post-discharge, the GI NP conducted in-person reinforcement of the same education topics. We assessed parental knowledge and skill in NG tube care through an 11-item self-administered written questionnaire developed by a multidisciplinary team of experts, and by return skill demonstration: a trained nurse practitioner (NP) completed a skills checklist while directly observing parental skill demonstration. We assessed parental stress using validated self-administered Parental Stress Scale surveys (range 18-90, higher score indicating more stress). Parental knowledge, skill, and stress were assessed at multiple time points: during admission both prior to and following the inpatient education session, and at 1-3 weeks and 6-8 weeks post-discharge. Parents completed the Quality of Discharge Teaching Scale and Readiness for Hospital Discharge Study, at the time the inpatient education was presented and then retrospectively after discharge at the 1-3 week follow up visit.
Results: Between December 2016 to April 2017,11 parents participated. At hospital discharge and at 1-3 weeks post-discharge, 100% demonstrated competence in return skill demonstration. Compared with admission, the mean proportion of correct answers on the 11-item knowledge questionnaire improved over time: 55% at admission, 82% post-education inpatient session, 78% at 1-3 weeks post-discharge. Two parents completed the knowledge test at 6-8 weeks post-discharge and both scored >90% on the questionnaire. The proportion of parents correctly identifying all required times for tube flushing decreased after discharge (9% admission, 88% post-education inpatient session, 38% 1-3 weeks post discharge). The proportion of parents correctly identifying the clinician to call if the tube became dislodged decreased after discharge (73% admission, 75% post-education session, and 50% at 1-3 weeks post-discharge). While inpatient, parents rated the quality of discharge teaching highly, but at 1-3 weeks post-discharge parental ratings for the QDTS decreased slightly. Mean parental stress scores were stable over time: 30 at admission (range 18-41), 29 after inpatient education session (range 19-44), 31 at 1-3 weeks post-discharge (range 18-44), and 34 at 6-8 weeks post-discharge (range 21-47).
Conclusion: Parental knowledge and skill in caring for nasogastric tubes acquired after a standardized discharge protocol was sustained at 6-8 weeks post-discharge, but knowledge retention varied by topic. Knowledge tests may help identify areas to focus on for review during education sessions. Education alone may not improve parental stress. Our findings should be confirmed in a larger prospective study.

453 ***FAMILY SATISFACTION WITH HOME INFUSION THERAPY FOR PEDIATRIC IBD.*** *Nancy Salmeri, Gabriele Hunter, Annette Langseder, Mary Kennedy, Maria Perez, Joel Rosh*
Pediatric Gastroenterology, Goryeb Children's Hospital/Atlantic Health Systems, Morristown, NJ

Background: Biologic agents have become a mainstay in the treatment of pediatric inflammatory bowel disease (IBD). These agents include those delivered intravenously (IV) and the total cost of such therapy is significantly influenced by the site of care. In many markets, third party payers are demanding a change from hospital to home-based infusion. There is little published data regarding pediatric IBD patients' satisfaction with home-based infusion.

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Aim: To evaluate patient and caregiver satisfaction with home infusion services of biologic therapies for pediatric IBD.
Methods: IBD patients ages 6-21 years receiving IV biologic therapy at the Pediatric Inflammatory Bowel Disease Center of Goryeb Children's Hospital who had transitioned from hospital to home-based infusion services were identified and invited by mail to complete a one-time questionnaire. The completing individual (caregiver or patient if > 18 years) was noted. Demographics including patient's age, sex, type of IBD, and length of time since diagnosis, start of biologic therapy and start of home infusion were collected. Respondents were asked whether the change to home infusions was voluntary and whether they would recommend home infusion to another patient. Initial feelings about the site change and overall satisfaction with home infusion were queried using a Likert scale.
Results: 82 eligible patients completed 63 (77%) questionnaires. 23 patients were female (37%) and 48 (76%) had Crohn's disease. Mean age was 17.14 years. Questionnaires were mostly completed by caretakers (44 = 70%). Time since diagnosis was > 2 years in 48 (76%), one-two years in 11 (17%) and less than one year in 4 (6%). Home infusion was used for less than 3 months in 11 (17%), 3-6 months in 10 (16%), 6-12 months in 19 (30%) and more than 12 months in 23 (37%). On a Likert scale of 1-10 with 10 being completely happy, overall satisfaction with home infusion was scored as 10 in 43 (68%) of families at the time of survey. 59 (93%) would recommend home infusion services to another patient. 17 of 28 (61%) of patients switched by insurance mandate rated their current level of satisfaction as 10. Voluntary switch to home-infusion occurred in 35 patients and 26 (74%) of these rated overall satisfaction as a 10. Costs of infusion are negotiated between hospitals, free-standing facilities, home infusion providers and insurance companies. This made an analysis of the medical costs not feasible for this study.
Conclusion: Home based infusion services provide a satisfying option for pediatric IBD patients. Despite whether instituted by the insurance company or a voluntary patient/caregiver choice, most patients and/or caregivers report being highly satisfied and would recommend home infusion therapy to others.



454 ***IMPLEMENTING UNIVERSAL FOOD INSECURITY SCREENING INTO A SPECIALITY WEIGHT MANAGMENT PROGRAM.*** *Goldie Markowitz, Saba Khan, Garcia Iliana. Healthy Weight Program, The Children's Hospital of Philadelphia, Philadelphia, PA*
The association between food insecurity and poor health outcomes is well established. The 2015 American Academy of Pediatrics' position statement addressed the need for universal screening for food insecurity in the medical home. However, limited information exists on the ability to successfully implement universal food insecurity screening in a specialty clinic.
Objective: The objective is to screen all patients at every visit for food insecurity at a hospital-based pediatric

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weight management program. The specific aim is achieve a food insecurity screening rate of 95% within one year of implementation.
Methodology: A quality improvement subcommittee composed of clinical and administrative staff involved in implementation utilized a Plan-Do-See-Act (PDSA) process improvement framework to trial three tests of change. Screening rates were determined by calculating the proportion of total clinic visits during which the food insecurity screening questions were answered and entered into EPIC. Food insecurity screening rates were compared during three cycles: i) screening by the medical assistant only; ii) screening by the medical assistant plus the referral to a food pharmacy program; iii) screening using an iPad plus referral to a food pharmacy program.
Results: The screening rates improved from 72.9% to 97.9%. We attribute this increase wtih the introduction of our Food Pharmacy Program and with the use of IPADs for added privacy for the parents.
Discussion: We were able to achieve the aim of >95% screening rates with the administration of the screening on an electronic device and the presence of a targeted clinical intervention. PDSA data suggest that the introduction of a specific initiative to address food insecurity may increase screening rates when the screening is administered by clinical staff; whereas the administration of the screening on the iPad may help to address logistical barriers to universal screening in a pediatric setting. Next steps aim to identify factors necessary to sustain successful food insecurity screening practices in diverse clinical settings, and to examine impact of targeted food intervention program in this speciality population.

Fig 1. Food Insecurity Screening Rates Over a 15 Month Quality Improvement Initiative



Food Insecurity Screening Rates in a Pediatric Weight Management Clinic

455 ***TO EAT OR NOT TO EAT? PREVALENCE OF FOOD INECURITY IN HOUSEHOLDS WITH CHILREN EXPERIENCINCING FEEDIING DIFFICULTIES.*** *Goldie Markowitz[3], Amy Dean[1], Christine Sullivan[2]. [1]Clnical Nutrition, The Children's Hospital of Philadelphia, Philadelphia, PA; [2]Clinical Nutrition, The Children's Hospital of Philadelphia, Philadelphia, PA; [3]Healthy Weight, The Children's Hospital of Philadelphia, Philadelphia, PA*
Background: It is widely recognized that food insecurity is a growing problem in America**.** According to the United States Department of Agriculture (USDA), food insecurity affected 13.66% of US households from 2013 to 2015. The region served by a specialized feeding program experienced slightly lower prevalence, including 12.37% of households in Pennsylvania, 11.1% of households in New Jersey, and 11.9% of households in Delaware. Food insecurity is the absence of food security, which is defined as access by all people at all times to enough food for an active, healthy life.[1] Feeding disorders can be described as the refusal or inability to feed at all or to take adequate

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volume or variety of foods to meet nutritional needs for optimal health and growth. There is a lack of research into the coexistence of food insecurity and children with feeding disorders in the same household. We hypothesized that food insecurity is prevalent within this specialty population. A secondary aim was to describe the nutritional status of children experiencing feeding disorders and food insecurity, as well as the family participation in food assistance programs. **Methods:** A retrospective chart was review performed between 11/1/2016 to 11/30/2017 using a convenience sample of children presenting to a specialized feeding program for initial evaluation who screened positive on the validated 2-item food insecurity screen. **Results:** A total of 51 patients, 39 males and 16 females, and median age 36 months, met the inclusion criteria. A prevalence rate of 17.7% was identified. Although 76.5% of the children presented were enrolled in food assistance programs, WIC and SNAP, they continued to experience food insecurity. Additionally, a majority received their nutrition orally (86%) or through enteral nutrition via a G-tube (29.4%). **Conclusion:** Our findings suggest that households with children with feeding disorders are more likely to experience food insecurity than other households in the region served by the feeding center, and that despite 74% of the children being enrolled in food assistance programs, food insecurity remained a prevalent concern to be identified in children with feeding difficulties. A limitation of this study was a lack of complete data necessary to examine impact on weight status. **Implication:** Future research is needed to examine the relationship between food access and the family's ability to provide healthy food options in children experiencing feeding issues. Identifying gaps in food assistance resources and family knowledge would help develop better practice guidelines in this patient population. Awareness of food security status is necessary to prioritize initiatives to support the needs of affected patients and families. To achieve this, food insecurity screening should be the standard of care for all specialty clinics, including feeding programs.

456 ***IMPLEMENTATION OF STANDARDIZED DOSING FOR VITAMIN D SUPPLEMENATATION ACHIEVED NORMAL SERUM VITAMIN D LEVELS IN CHOLESTATIC BILIARY ATRESIA PATIENTS 2 YEARS OF AGE AND YOUNGER.*** *Annette McCoy. Gastroenterology/Liver, Children's Hospital Colorado, Aurora, CO*

Background: Many centers, including our center, do not have standardized dosing guidelines for administration of vitamin D. Baseline data for our program showed less than 40% of this population had normal serum vitamin D levels.

Per Childhood Liver Disease Research Education Network (ChiLDREN) in Pediatrics Journal 2012, Infants with Biliary Atresia are at risk for malabsorption of fat-soluble vitamins, including vitamin D, due to insufficient intraluminal bile acid concentration, or inadequate bile flow from the liver to the intestines. Nearly all infants with Biliary Atresia and a total bilirubin over 2 had vitamin D deficiency per ChiLDREN. Small incremental changes in vitamin D dosing did not normalize serum vitamin D levels for many of these patients leaving them at risk for osteoporosis, fractures, and rickets. Osteopenia and bone fractures are significant causes of morbidity in children with cholestatic liver disease, per Loomes in Hepatology Jan 2019.

Objective: This liver quality project was designed to implement standardized guidelines using a consistent over the counter vitamin D3 supplement, monitor serum vitamin D levels by quarterly chart audits, in Biliary Atresia Patients under the age of 2, with total bilirubin above 2, and documented serum vitamin D deficiency, with a goal of achieving normal serum vitamin D levels in 70% of the population.

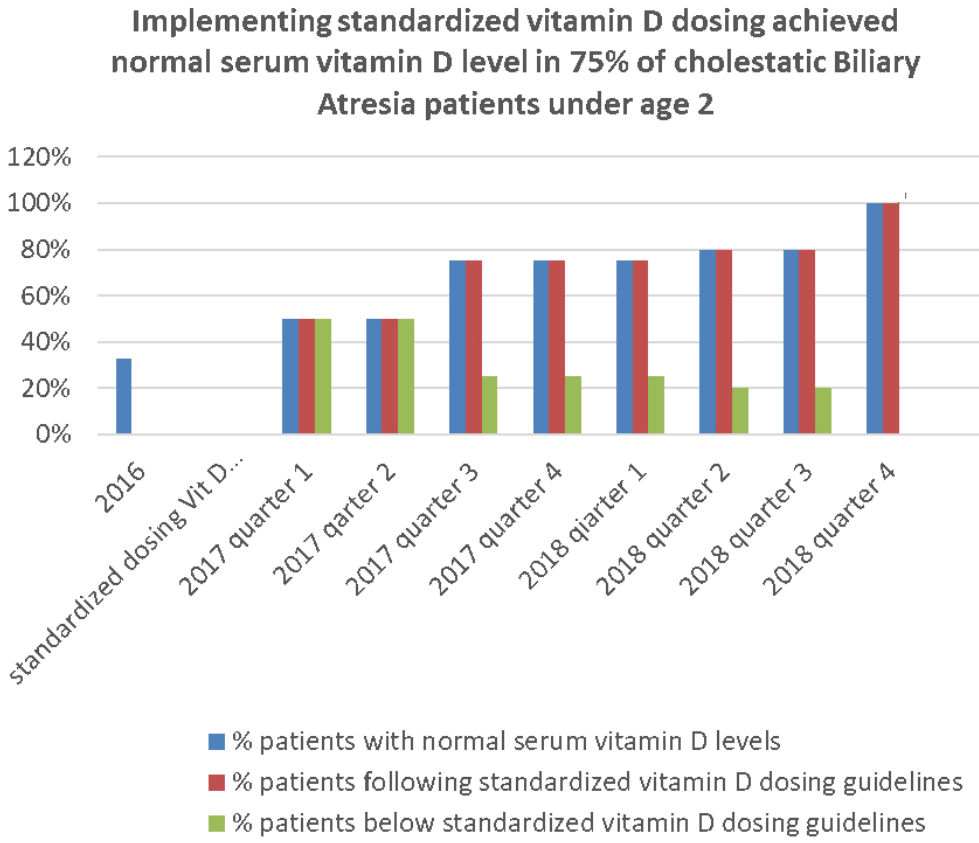
Methodology: Multidisciplinary team at Children's Hospital Colorado developed standardized dosing ranges for vitamin D administration for this population after 2016 baseline data showed only 33% had normal serum vitamin D levels. The team selected an over the counter vitamin D3 product for taste, purity in ingredients, availability to obtain, and ease for families to administer. Dosing of over the counter vitamin D3 was listed on the patient's electronic chart under medications for tracking of dose given. Chart audits for serum vitamin D levels were completed quarterly in this population along with documented vitamin D dosing. Supplementation dosing was assessed for being within the standardized dosing guideline range. Nurses developed handouts with pictures of the supplementation and written dosing recommendations to assist families with ordering the over the counter products on line for vitamin D 3 supplementation. Clinical social workers worked with families to assist with financial reimbursement of over the counter vitamin D 3 products.

Results: Total of 20 patients followed with total bilirubin above 2 at age 2 years and younger for 3 years. 75% of patients achieved normal serum vitamin D levels following the standardized dosing guidelines for vitamin D. The 25% of patients below normal serum vitamin D levels were below the recommended standardized vitamin D

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guidelines.

Conclusion: Adherence to dosing guidelines for vitamin D supplementation, using a consistent over the counter vitamin D3 product, and monitoring serum vitamin D levels quarterly achieved normal serum vitamin D levels in 75% of cholestatic Biliary Atresia patients at the age of 2 years and younger.



457 ***TELEPHONE TRIAGE GUIDELINES FOR NURSES IN THE DIGESTIVE HEALTH INSTITUTE.***

Charlotte Montero. *Digestive Health Institute*, *Children's Hospital of Colorado*, *Denver*, *CO*

Background: Ambulatory nursing requires frequent telephone triage (TT) assessments of patients. This practice reflects a growing trend to provide patient care via telehealth. Components of TT include: a focused nursing assessment, sorting the information and then providing a safe disposition. Telephone triage is one of the most difficult types of nursing because the nursing assessment can be difficult over the phone. Nurses are not able to see or touch patients via the phone. Nurses must rely on a focused and detailed assessment to obtain pertinent data. TT is also difficult because the nurse must then use that assessment to direct the patient to the appropriate level of care based on symptoms. Therefore, a nurse requires education and resources perform safe telephone triage.

Purpose: There are limited TT guidelines specific to pediatric gastroenterology (GI), therefore, development or creation of new pediatric GI specific TT guidelines is necessary to provide structure, consistency of advice and improve disposition of care by nurses with the goal to improve patient outcomes. Currently we have five pediatric GI TT guidelines, which were created to address the most common pediatric GI triage phone calls. These include abdominal pain, reflux, constipation, bleeding in the liver patient, and fever in the high risk GI patient.

Methods: To develop a TT guideline, a current hospital approved template is used. TT guidelines are based on evidence based practice, current literature and or research. The guidelines include background information or history

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and important assessment parameters which prompt nursing staff to ask appropriate questions. The guidelines also provide symptom based advice and disposition of care which include: emergent, urgent and non-urgent categories. All newly developed TT guidelines are reviewed by the clinical nurse specialist, the medical directors and sent to the telephone triage guideline committee for approval. Once approved, we use staff meetings and huddle to disseminate the information to the nursing staff.

Results: Nursing staff now have access to 5 TT guidelines as a resource for directing patient care. The goal is to provide standards of care to improve patient outcomes through the use evidence based practice. Guidelines support the nursing process and make the telephone triage process systematic, consistent and standardized.

Conclusion: These TT guidelines provide structure for nurses to ask the important questions, gather the correct information, make an informed decision and give a safe disposition to patients and families. The nurse using these TT guidelines understands the importance these tools bring to assuring safe, accurate care will be provided through the support and collaboration of the digestive health team

458 ***NEUROGENIC BOWEL DYSFUNCTION: AN EVIDENCE-BASED STEP UP PLAN FOR BOWEL MANAGEMENT.*** *Fiona Paul*, *Sandra Wooldridge*, *Samuel Nurko*. *Gastroenterology*, *Boston Children's Hospital*, *Boston*, *MA*

Background: Neurogenic bowel dysfuntion (NBD) is a loss of normal bowel function as a result of nerve injury, neurological disease, or congenital defects of the nervous system (e.g. myelomeningocele, tethered cord, spinal cord injury, multiple sclerosis). NBD can result in difficulties with colonic transit, anorectal function, sensation and control. The resulting constipation and fecal incontinence have been associated with a reduced quality of life, social and academic concerns, and secondary medical complications.

Methods: An extensive search of the literature using EBSCO Host Medline, Cumulative Index to Nursing and Allied Health Literature (CINHAL), was performed from 2012- present. Search terms used included: neurogenic bowel dysfunction, treatment, pediatric patients, and quality of life. Articles were critically appraised and the findings synthesized to make recommendations for a step up treatment plan for NBD (see figure I).

Findings:

1. Interventions should be tailored to meet the patient's developmental stage, individual goals, and patient/family preferences
2. Patients may benefit from conservative interventions. These interventions should be considered first
3. Transanal irrigations (TAI) and antegrade colonic enemas (ACE) are effective in achieving social continence and independence
4. Sacral nerve stimulation (SNS) has been demonstrated to significantly reduce fecal incontinence when compared to medical management in NBD
5. The creation of a diverting ostomy is the last option in the treatment of refractory patients who have failed more conservative management. This can lead to improvement in quality of life and independence

Conclusion: The goals of bowel management change depending on the patient's age and developmental stage. Early intervention should be aimed at preventing constipation and impaction. As the child approaches school age the focus should be on social continence. Older children and adolescents will want independence. A stepwise approach using evidence-based interventions starting with the most conservative interventions and increasing to more invasive interventions as needed should be implemented in the care of patients with NBD.

459 ***A QUALITY IMPROVEMENT INITIATIVE: USE OF TELEMEDICINE VISITS FOR POST-OPERATIVE FOLLOW-UP AFTER ENTERAL TUBE PLACEMENT.*** *Julia Perkins*, *Lori Parker-Hartigan*, *Sarah Connearney*, *Megan Dube*, *Jennifer Lawlor*, *Laura Capuccio*, *Kathryn Vukson*, *Mandy Yu*, *Ann Bizak*, *Maireade McSweeney. Gastroenterology*, *Boston Childrens Hospital*, *Franklin*, *MA*

BACKGROUND: Routine surgical placement of enteral tubes is increasingly common within the field of pediatrics. At Boston Children's Hospital (BCH) approximately 250-300 infants and children undergo new enteral tube placement each year. Unfortunately, post-operative complications are frequent and may be characterized as those which are minor and require outpatient clinic evaluation and treatment (e.g. leakage, erythema, granulation tissue, or localized cellulitis), to those which are major and require hospital readmission or repeat procedures under anesthesia (e.g. severe infection, peritonitis, bowel perforation, tube dislodgment or migration). Previous work done by our Gastroenterology division has shown that 10-12% of children experience a major complication of the tube

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within the first year of placement; 13% of patients will seek emergency care at BCH within the first six weeks of placement. Effective outpatient management of enteral tubes tube may help reduce Emergency Department (ED) visits. Telemedicine is a novel method for allowing closer provider-to-patient communication and monitoring of patients' health without having to require an in-person visit. Studies have reported on the benefits of using telemedicine as a way of decreasing post-operative costs and allowing for remote tracking of various post-operative outcomes.
OBJECTIVE: The primary aim of this project was to pilot the use of telemedicine as a means of improving the post-discharge monitoring of patients after surgical enteral tube placement in an effort to reduce ED visits by 10% in the first 30 days after discharge home. Secondary aims included: (a) assessment of care coordination needs met during the telemedicine visit, (b) assessment of clinician and caregiver experience with the telemedicine visit.
DESIGN/METHOD: Patients undergoing primary gastrostomy (GT) or gastrojejunostomy (GJ) tube placement at Boston Children's Hospital between July 9, 2018 and February 28, 2019 were recruited for telemedicine enrollment. Patients with follow up care outside of BCH system; being transferred to an inpatient rehabilitation facility; or a prior history of GT or GJ placement within the past year were excluded.
RESULTS: A total of 214 patients underwent enteral tube placement; 33 patients were enrolled in telemedicine versus 100 patients who followed our current practice. Telemedicine patient demographics included: median age of 15 months (IQR 4, 60.5), 45.5% male, 97% with English as primary language. Median time between enteral tube placement and hospital discharge was 3 days (IQR 2, 4.75). 1/33 (3%) of patients enrolled in the telemedicine group had an ED visit within 30 days of discharge as compared to 8/100 (8%) of patients in the current practice group. 1/33 (3%) of patients enrolled in the telemedicine group required hospital readmission as compared to 6/100 (6%) of patients in the current practice group. Despite the lower rates of ED visits and hospital readmissions in the telemedicine group, the number of phone calls and GI clinic visits per patient were comparable between the two groups (Table 1). The top three care coordination needs met during the telemedicine visit included: (1) familial advice on home management, (2) general anticipatory guidance/parental support, and (3) review of diagnostic results. Qualitative reports by clinicians regarding their experience with the telemedicine visit noted positive patient interactions, ease of use with telemedicine technology, and efficiency of visit. Qualitative reports by caregivers included convenience due to less time out of work/school, increased access to care and increased efficiency of visit.
CONCLUSION: Telemedicine visits successfully decreased the use of emergency room visits by patients within the first 30 days of discharge after enteral tube placement. In addition, the telemedicine visits were viewed positively by both clinicians and caregivers making this a worthwhile endeavor to continue to consider as part of standard enteral tube post-operative care. Future studies are needed to see if telemedicine visits may be beneficial for longer term follow-up in patients who are enteral tube dependent.

	Current Practice (n=100)	Telemedicine Patients (n=33)
ED Visits	8/100 (8%)	1/33 (3%)
Rehospitalizations	6/100 (6%)	1/33 (3%)
GI Clinic visits	48 (48%) patients 81 visits (1.6 visits/pt)	20 (61%) patients 31 visits (1.5 visits/pt)
GI phone calls*	31 (31%) patients 54 calls (1.7 calls/pt)	8 (24%) patients 15 calls (1.8 calls/pt)

Table 1

460 ***TRANSITION READINESS IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE.*** *Tiffany Smith*
Gastroenterology, Children's Hospital Colorado, Aurora, CO
As patients with chronic diseases become older and face the time when they must transfer care to adult providers, their pediatric providers have a responsibility to ensure successful transition. This is not simply a one-step act but rather a continuous process that ideally should begin in early adolescence with the goal of completion before they transfer care. If the transition is not successful, it may have detrimental effects such as non-adherence, poor health outcomes, increased ER visits, hospitalizations and patients lost to follow up, low patient satisfaction and possibly increased morbidity and mortality.

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While most pediatric gastroenterologists agree that all patients should have a successful transition, literature reports that 80% of adult gastroenterologists state that their newly transferred young adults lack the knowledge and skills to manage their disease independently. Of the estimated 4.5 million adolescents in the US who require special healthcare needs, only 40% received some type of transitional service. It is cited that 55% of patients with Inflammatory Bowel Disease (IBD) lack knowledge of their own medical history and 69% report not completely understanding their treatment plans. Clearly this body of work should be addressed and prioritized as a national healthcare metric.

Besides programs not having a structured transition process, there are many other barriers to successful transition. A meta-analysis cites 57 articles demonstrating these real and/or perceived barriers: complexity of disease (unstable and remission have both been shown as barriers), lack of knowledge/skills, unstable living conditions, lower parental education, older age when starting the transition process, inability to find a specialist nearby, insurance/financial barriers, beliefs about adult provider being less caring or less experienced, and current relationships between patient, family and pediatric care team. Although parents and providers want the best outcomes for the patient, they sometimes play a role in obstructing the patient's successful transition. Over-protective parents and over-accommodating providers do not hold the patient accountable for self-management as he/she ages.

The IBD Center cares for three-fourths of the 500 patients with Crohn's Disease and Ulcerative Colitis seen at Children's Hospital Colorado. In the past year, of the patients in the IBD Center who are 14 years of age and above, 46% were approached to complete the Transition Readiness Assessment for Youth. This is a tool created by Got Transition, a program of The National Alliance to Advance Adolescent Health. Of the patients in that age group, ten were ineligible due to developmental disability. Eighty-seven patients answered the questionnaire - 55 (63%) with Crohn's, 24 (28%) with Ulcerative Colitis (8 s/p colectomy), and 8 (9%) with Indeterminate Colitis. There were 42 (48%) males and 45 (52%) females with 51 (59%) between 14-16 years of age and 38 (43%) are 17 years and older. Two patients were counted in both age categories as they completed the tool in each age group during two different clinic visits. Fifteen patients (17%) had concomitant diseases seen in patients with IBD.

The Transition Readiness Assessment tool measures the importance and confidence adolescents possess regarding transition. These concepts are measured using a Likert scale from 0-10. There are also 23 statements related to transition with the first section describing knowledge of their own health needs and the second section investigating healthcare navigation.

Patient data analysis revealed the following. The data shows that most of the patients' deficiencies were in the healthcare navigation section while three indicated they lacked knowledge about their own health. The older group scored higher in importance, confidence and knowledge/skills. Older youth rated 7.2/10 in importance and confidence while the younger group rated 6.5/10 in both categories. The older group scored a 17.3/23 in knowledge and skills compared to the younger group with a 13.8/23.

Once gaps in knowledge are identified from the transition readiness tool, a personalized transition plan will be initiated. Resources include information about insurance, how to refill medications, how to find an adult GI, what it legally means to turn 18, among others. Many of these are available in print and some include links to online resources. Patients will be asked to complete another transition readiness questionnaire annually to assess improvement with the hope that by the time they leave the proverbial nest, they will be armed with the knowledge and skills to successfully navigate and thrive in adult healthcare.

In conclusion, successful transition leads to improved health outcomes for patients with chronic diseases and programs equipped with the resources to provide this care will be leaders of this national initiative.

461 ***EDUCATIONAL CURRICULUM FOR PRIMARY CARE PROVIDERS REGARDING FOCUSED WEIGHT MANAGEMENT PROGRAMS.*** *Donna Garner[1,2], Nicole Triggs[1,2], Ryan Himes[3]*
[1]Pediatrics, Division of Gastroenterology, Hepatology, and Nutrition, Baylor College of Medicine, Houston, TX; [2]Gastroenterology, Hepatology, and Nutrition, Texas Children's Hospital, Houston, TX; [3]Pediatrics, Division of Gastroenterology, Hepatology, and Nutrition, Ochsner Health System, New Orleans, LA

Introduction – Childhood obesity is a growing epidemic throughout the United States and worldwide. As the number of children afflicted by obesity has grown, so too have the number of children with obesity complicated by one or more comorbidities. These include cardiovascular disease, dyslipidemia, hypertension, fatty liver disease, orthopedic problems, and obstructive sleep apnea. Moreover, pediatric obesity is the harbinger of adult obesity, underscoring the importance of early intervention with effective treatment programs tailored to pediatric patients.

Taken together, the data highlight an urgent need to treat children with obesity early, using focused and intensive

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programs: “Most experts agree that the treatment of obesity should begin while patients are young and lifestyles and behaviors are easier to change.” The current recommended treatment for obesity is family-based lifestyle weight management programs. Primary care providers are uniquely poised on the front lines to promote these programs to their patients and families. In spite of an increasing number of pediatric Focused Weight Management Programs (FWMPs) available to help children with obesity, primary care providers are often unaware of these resources and do not refer patients to them.

Increasingly, data support the efficacy of FWMPs; according to a study by Nemet, *et al*., treating childhood obesity with a multidisciplinary FWMP was superior to conventional, office-based counseling. We aim to improve the care of obese children by increasing the rate of referral to FWMPs, from primary care providers, through an educational curriculum including didactic presentation, creation of enduring educational materials and hardwired decision support in the electronic medical record.

Methods – Using both in-person, enduring educational material, and EPIC technology solutions, our team educated Texas Children’s Pediatrics (TCP) primary care providers (MDs and NPs) about the breadth of FWMPs available and importantly, how and when to refer children to them.
We selected 6 key TCP Community Care Programs in which to pilot this effort based on the following criteria : (1) serving a diverse population (2) higher than average predicted rates of obesity in the practice (3) presence of physician/NP partners in the practice who can serve as local champions.

The intervention began with an in-person, CME-granting, educational session delivered once at each location, during the lunch hour. Participants were educated regarding the obesity epidemic, the evidence for FWMPs, and the role for the pediatric primary care provider in impacting this chronic disease. Printed materials and toolkits were reviewed and left with the participants including bound resource guides in English and Spanish. This curriculum will be based on the Cognitive Constructivism Theory. We also provided the criteria for multidisciplinary obesity-related subspecialty referrals and FWMPS offered at Texas Children’s. In addition, we reviewed the updated EPIC ambulatory Obesity Smart Set with providers.

In the second phase of our project, we utilized the Epic medical record platform to hardwire point-of-care reminders for clinicians to prompt referral to FWMPs, for patients who met criteria for overweight or obesity. This “best practice advisory” was designed to alert for children over age 3 years, during well-child visits, when the BMI is in excess of 85%.

Results – From January 2018 – June 2018, medical providers at 6 selected primary care sites utilized the EPIC Obesity Smart Set on a total of 75 eligible patients. In the 6 months after our educational intervention, medical providers at the 6 selected primary care sites utilized the EPIC Obesity Smart set on a total of 193 eligible patients. Over the 6 month time period post intervention there was an approximately 2.5-fold increase in the utilization of the EPIC Obesity Smart Set.

From January 2018-June 2018, medical providers at 6 selected primary care sites referred to TCH FWMPs 59 times. In the 6 months after our educational intervention, medical providers referred to TCH FWMPs 88 times.

Conclusions – While availability and accessibility to FWMPs can be barriers in some instances, lack of awareness of these resources turns out to be an important, and readily modifiable barrier. Therefore, by educating primary care providers on availability of existing pediatric FWMPs we armed them with pediatric obesity tools to use in practice, and by hardwiring decision support into the electronic medical record, we have driven an approximately 2.5- fold increase in the utilization of the EPIC Obesity Smart Set while only a small increase in referrals to FWMPs at intervention practices. The limited physical locations of our FWMPs may have hindered referrals to them. The program may be beneficial not only for NAFLD patients but also for patients and families with other obesity related health problems.

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ENDOSCOPY/QI/EDUCATION

477 ***IMPLEMENTING ANNUAL DEPRESSION SCREENING FOR ADOLESCENTS WITH IBD USING THE PHQ-9A TOOL.*** *Priya Raj[1], Lauren Ivanhoe[2], Kelly Fegan-Bohm[3], Madilyn Zbranek[2]. [1]Division of Gastroenterology, Hepatology, and Nutrition, Baylor College of Medicine, Texas Children's Hospital, Houston, TX; [2]Texas Children's Hospital, Houston, TX; [3]Division of Diabetes and Endocrinology, Baylor College of Medicine, Texas Children's Hospital, Houston, TX*

Background: Depression rates in adolescents with Inflammatory Bowel Disease (IBD) are reported to be as high as 25%. Studies have shown subsequent improvement in quality of life and disease control measures along with decreased healthcare related costs related to appropriately treated depression in patients with chronic medical conditions.

Objectives: To undertake a quality improvement initiative to increase the annual depression screening rate from 0 to 75% within a 3 month period, in English speaking patients who are 12 years and older with an established diagnosis of Inflammatory Bowel Disease (IBD), who present for follow up care to the Texas Children's Hospital - West Campus Gastroenterology outpatient clinic.

80% of eligible patients who screen positive for depression and/or will receive a Social Worker assessment on the same day.

Methods: Timeline: The team collected data on screening rates and social work consultations from December 4, 2018 through March 1, 2019, during which the various Plan-Do-Study-Act (PDSA) cycles were implemented.

PDSA 1: Creation of standard operating procedure for depression screening in the West Campus GI clinic for IBD patients

PDSA 2: Staff training and stake-holder buy-in

PDSA 3: Update SOP to ensure correction identification of eligible patients based on staff feedback

PDSA 4: Updated SOP to include all patients over 12 and creation of materials in Spanish for Spanish-speaking parents/guardians

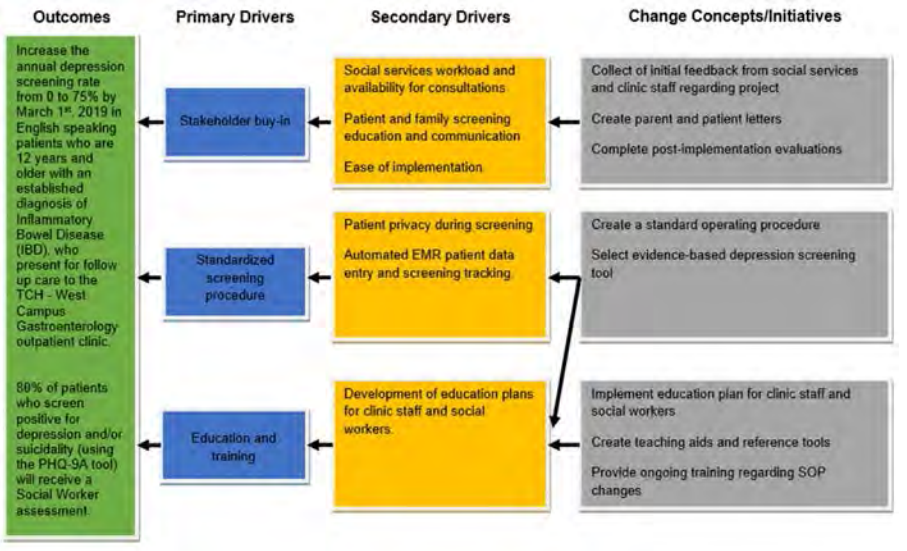
PDSA 5: Survey Monkey sent to West Campus GI Clinic Staff and social work. Data analyzed to evaluate balancing measures.

Results: A total of 56 IBD patients were screened resulting in a 77% screening rate by March 1, 2019. Of the 56 eligible patients,13 (23.2%) patients had positive depression screens and 6 (10.7%) screens were positive for suicidality. 95% of eligible patients who screened positive for depression and/or suicidality received a Social Worker assessment

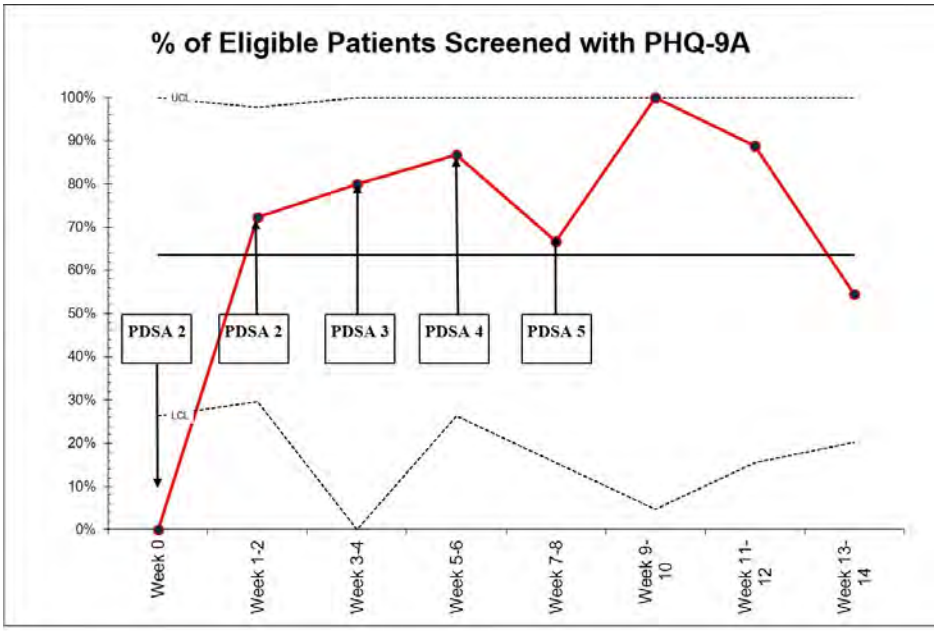
Lessons Learned: Implementation of depression screening in IBD patients in the outpatient setting can be successful with key stake-holder buy-in and a systematic standard operating procedure.

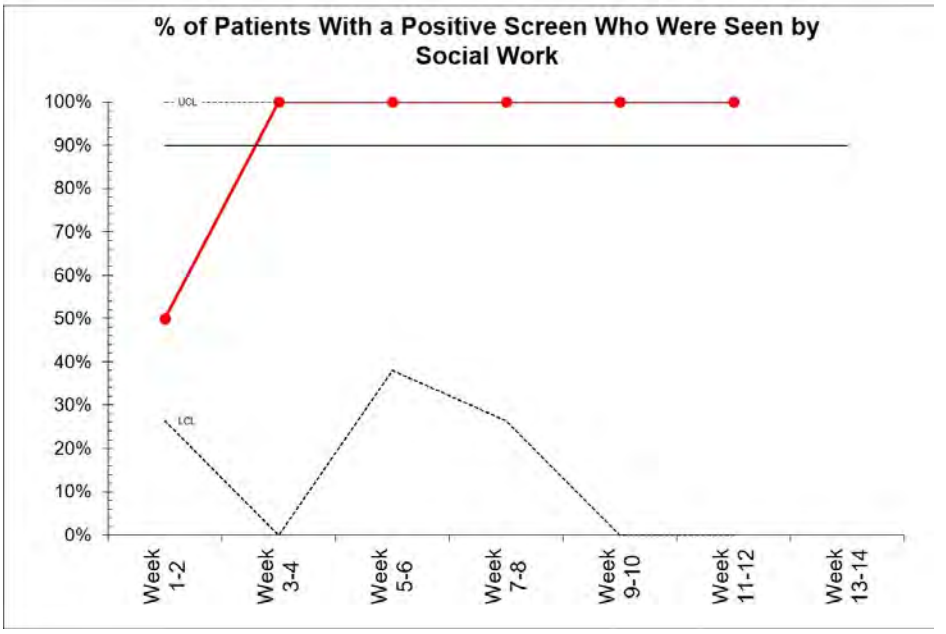
Increasing screening rates provides better care for patients, but can increase utilization of social services.

Future direction: Creation of automated EMR alerts to identify patients who need screening is important to ensure sustainability.



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479 ***CONTROVERSIAL ASPECTS OF PEDIATRIC FOREIGN BODY INGESTIONS: A SINGLE TERTIARY REFERRAL CENTER EXPERIENCE.*** *Wenly Ruan[1,4], Sohail Shah[2,3], Douglas Fishman[1,4]. [1]Pediatric Gastroenterology, Baylor College of Medicine, Houston, TX; [2]Michael E. DeBakey Department of Surgery, Baylor College of Medicine, Houston, TX; [3]Department of Pediatric Surgery, Texas Children's Hospital, Houston, TX; [4]Pediatrics, Texas Children's Hospital, Houston, TX*

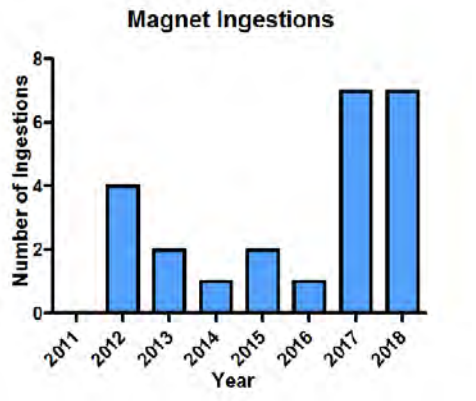
Background: Pediatric foreign body ingestions are a significant source of morbidity and mortality. Most foreign bodies pass spontaneously; however, certain ingestions pose a higher risk of adverse outcomes. NASPGHAN released recommendations on the management of these objects in 2015; however, controversial areas remain. We evaluated the experience of pediatric foreign body ingestions at a single tertiary referral center and assessed the management of certain population subsets.

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Methods: Electronic Medical Records were queried for foreign body related endoscopies from 2011-2018 for children from age 0-21. A retrospective chart review was performed. Specific patient populations and foreign body ingestions were evaluated by statistical comparison of binomial proportions.

Results: There were 1296 cases of foreign body ingestions requiring endoscopic intervention at Texas Children's Hospital from 2011-2018 (Table 1, Figure 1). Time to endoscopic removal from time of initial imaging was not statistically different among gastroenterology (7.8±5.7 hours), otolaryngology (ENT) (7.9±6.0 hours), and pediatric surgery (7.3±6.4 hours) for all patients ($p>0.05$). Of the total observed population, 31.8% were under the age of 2, which is significantly different from the expected value of 9.5% if patient age were a randomly distributed independent variable ($p<0.01$). This youngest subgroup is more likely to ingest coins than older children ($p<0.01$). All other foreign bodies were statistically similar between the two groups ($p>0.05$). Children less than 2 are more likely to present with symptoms ($p<0.05$). When evaluating food impactions, GI performs a statistically significantly higher percentage of extractions (44.4% GI, 28.1% ENT, 27.4% surgery, $p<0.01$). Of these patients, GI obtains more biopsies (78% GI, 16% Surgery and ENT, $p<0.01$) and diagnoses more patients with eosinophilic esophagitis (EoE) (45% GI, 5% ENT, 13% surgery, $p<0.01$). A 45% diagnosis rate falls within the 95% confidence interval of EoE diagnosis in esophageal food impactions from a previous study. In addition, it has been observed that magnet ingestions and specifically Buckyball ingestions have been on the rise since the law prohibiting the sale of these small magnets was overturned in 2016 (Figure 1). Sharp object ingestions of the entire population were found to be evenly distributed among esophagus, stomach, and intestine. 7.8% of these ingestions required surgical laparotomy and 9.8% of these patients required hospitalization and closer monitoring

Conclusions: Endoscopy remains an important modality for foreign body management among several subspecialties. Further studies are needed to evaluate the role of existing recommendations. Given that children under 2 with small anatomy are more likely to ingest foreign bodies, they may require specific management recommendations that differ from children older than 2. Biopsy and eosinophilic esophagitis diagnostic rates are higher among pediatric gastroenterologists compared to other subspecialists so there is room for improvement in the management of esophageal food impactions. This study also demonstrates that multiple magnet/Buckyball ingestions have been on the rise since overturning the law that prohibited the sale of Buckyballs. Given this recent increase, it is important to continue to advocate for the safety of children and for the discontinuation of the sale of these magnets.



481 ***ACCURACY OF MEDICAL RECORD COMPARED TO SELF-REPORTED SOCIODEMOGRAPHIC INFORMATION.*** *Joann Samalik[1], Sally Eder[3], Ila Moncion[2], Emily Fredericks[3,5], Caren Goldberg[4], Jeremy Adler[2,3].*
[1]General Pediatrics, University of Michigan, Ann Arbor, MI; [2]Pediatric Gastroenterology, University of Michigan , Ann Arbor, MI; [3]Susan B. Meister Child Health Evaluation and Research Center, University of Michigan, Ann Arbor, MI; [4]Congenital Heart Center, University of Michigan, Ann Arbor, MI; [5]Pediatric Psychology, University of Michigan, Ann Arbor, MI

Background: Racial and ethnic disparities are found broadly in healthcare. Race is often associated with disease outcomes. Social determinants of health are commonly stronger predictors of outcomes than other prognostic indicators. Population-based studies into these disparities commonly rely on the accuracy of sociodemographic information recorded in the electronic health record (EHR). There is little evidence about the accuracy of EHR information, and none in pediatric gastroenterology (GI). If sociodemographic data are inaccurately recorded (compared to self-report) then the real impact on outcomes may be widely mischaracterized. It is important to have accurate information to inform efforts to reduce health disparities. We aimed to determine the accuracy of sociodemographic information in the EHR compared to self-report.

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Methods: We included patients who were prospectively enrolled in 2 studies in the University of Michigan (UM) pediatric GI division (10/2014-1/2019); a colonoscopy study (N=100), and a study of liver clinic patients (N=62). Patients and/or guardians self-reported their sociodemographic information. The colonoscopy study further queried Middle-Eastern ethnicity and smoking status. Sociodemographic information and smoking status were abstracted from corresponding EHR by researcher blinded to self-reported information. We compared self-reported information to the EHR. We used descriptive statistics for overall findings. Kappa statistic was used to determine agreement between self-report and EHR data. Self-reported information was considered the "gold standard" for comparison.
Results: 162 patients were identified (38% inflammatory bowel disease [IBD], 38% liver disease, 24% other GI conditions), 43% female, age 11.0 ±6.4 yr. The age distribution was bimodal, with peaks at 1 and 15 years, due to the two study populations. Overall, self-reported race was 75% white, 11% black / African American, 7% Asian, 4% multiracial, and 2% missing. Ethnicity was reported as 4% Hispanic / Latino, 88% non-Hispanic/Latino, and 7% missing. 7% self-identified as Middle-Eastern ethnicity (N=98). 6% self-reported smoking, and 23% reported living with smokers (70% of whom smoke outside the house). Agreement between self-reported and EHR documented race was substantial (Kappa 0.75, $p<0.0001$; Table 1). Race did not match among 10% (N=15). Hispanic/Latino ethnicity also had strong agreement (Kappa 0.87, $p<0.0001$). Among the 9 patients who were identified in the EHR as Hispanic/Latino, 5 self-reported white race, 1 Asian, and 1 multiracial, and 2 did not answer. Middle Eastern ethnicity was not recorded in the EHR. Among those who self-identified as Middle Eastern (N=9), 4 self-identified as white, 2 Asian, 1 multiracial, and 2 other. Among those who self-reported either Hispanic/Latino or Middle-Eastern ethnicity (N=16), the EHR less accurately reflected self-reported race (Kappa 0.30, p= 0.031; Table 2). Race did not match among 43%, and 2 did not self-report race. Self-reported smoking was also inaccurately recorded in the EHR. One self-reported never smoking, who was identified as former smoker in the EHR. 6 reported currently smoking, 4 of whom were documented as never-smokers in the EHR.
Conclusions: We found that self-reported race and Hispanic/Latino Ethnicity were generally accurately recorded in the EHR at our institution. However, among the subgroup of those who self-reported as belonging to an ethnic minority group, the EHR less accurately reflected their self-reported race. Accurate sociodemographic information is important for identifying and understanding disparities that may impact patient care and outcomes. Reliable information is critically needed for developing mitigation strategies to improve healthcare disparities. This study supports the use of EHR documented race, however we found evidence to suggest EHR documented race may be less reliable in populations with higher prevalence of ethnic minority groups. Larger multicenter studies are needed to better understand these findings.

Table 1. Self-Reported vs. EHR Documented Race

Self-Report Race \ Race in Electronic Health Record	White	Black	Asian	Multiracial	Other	Total
White	111	0	0	0	5	**116**
Black	0	17	0	0	0	**17**
Asian	0	0	9	0	2	**11**
Native Hawaiian, Pacific Islander	2	0	0	0	0	**2**
Multiracial	1	2	2	1	1	**7**
Total	**114**	**19**	**11**	**1**	**8**	**153**

*EHR, Electronic health record

Table 1. Self-Reported vs. EHR Documented Race

Table 2. Self-Reported vs. EHR documented Race Among Ethnic Minorities*

Self-Report Race \ Race in Electronic Health Record	White	Black	Asian	Multiracial	Other	Total
White	6	0	0	0	2	**8**
Black	0	0	0	0	0	**0**
Asian	0	0	1	0	1	**2**
Multiracial	1	0	0	0	1	**2**
Other	1	0	0	0	1	**2**
Total	**8**	**0**	**1**	**0**	**5**	**14**

*Ethnic minority includes self-reported Hispanic/Latino or Middle-Eastern

Table 2. Self-Reported vs. EHR documented Race Among Ethnic Minorities

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482 ***PATTERNS AND SAFETY OF ESOPHAGOGASTRODUODENOSCOPY IN CHILDREN AND YOUNG ADULTS WITH CYSTIC FIBROSIS.*** *Deepthi Sankepalli[1,2], Ramy Sabe[1,2], Senthilkumar Sankararaman[1,2], Ali Khalili[1,2], Thomas Sferra[1,2]. [1]Pediatric Gastroenterology, Hepatology & Nutrition, UH Rainbow Babies & Children's Hospital, Cleveland, OH; [2]Pediatrics, Case Western Reserve University School of Medicine, Cleveland, OH*

Introduction: Cystic Fibrosis (CF) patients have numerous gastrointestinal manifestations including abdominal pain, constipation, diarrhea, vomiting, reflux, and variceal bleeding. Endoscopic procedures are frequently required to evaluate these signs and symptoms. These procedures are commonly performed under monitored anesthesia care or general anesthesia. However, there is limited published data regarding the indications for, findings during, and safety of esophagogastroduodenoscopy (EGD) in patients with cystic fibrosis.

Aims: To evaluate the patterns, outcomes, and safety of EGD in patients with CF.

Methods: We conducted a retrospective chart review of patients with CF who were evaluated by a member of the Division of Pediatric Gastroenterology, Hepatology & Nutrition at UH Rainbow Babies and Children's Hospital, Cleveland Ohio, between January 2013 and February 2019. During this period of time pediatric gastroenterology consultation occurred following a specific request by the managing pediatric pulmonologist for evaluation of gastrointestinal symptoms or nutrition concerns. We identified those patients who were ≤22 years of age at the time of the medical evaluation and who subsequently under an EGD. Patient demographics, BMI, indications for the procedure, endoscopic and histological findings, and complications or hospitalizations after the procedure were extracted from the medical records. Additionally, the results of pulmonary function tests most proximate to the procedure, prior to and after, was obtained.

Results: During the period of the study, 117 CF patients ≤22 years of age were evaluated by pediatric gastroenterology of these 40 (34.2%) underwent at least one EGD, 15 patients underwent more than one EGD for a total of 72 EGDs. The most common overall indications were abdominal pain (29.0%), esophageal varices (16.6%), eosinophilic esophagitis (13.8%), and gastroesophageal reflux (13.8%). Excluding repeat EGDs for varices and eosinophilic esophagitis the most common indications were abdominal pan (29.0%), gastroesophageal reflux (13.8%), dysphagia (8.3%), and failure to thrive (8.3%). Other less common indications included nausea and gastrointestinal bleeding. At the time of the EGD, patients were 13.0 years of age (median, interquartile range, IQR, 4.0, 18.0); the male-to-female ratio was 1.4; the BMI percentile was 38.0 (median, IQR 6.8, 60). EGDs were performed under general anesthesia with airway intubation 51.4% (N=31) of the time. Most common reasons for airway intubation were for treatment of esophageal varices (N=12) and young age (≤2 years of age, N=11). There were no EGD-related gastrointestinal complications. Admission to the hospital occurred in 12 patients in whom the EGD was performed as an outpatient (N=54 EGDs). Three of these were admitted for observation for respiratory compromise, each of those cases had a bronchoscopy under the same anesthesia as the EGD. The other cases were admitted for observation for post-variceal banding (N=7), performance of an esophageal pH/impedance study (N=1), and care post-surgical placement of a gastrostomy (N=1). There was no overt evidence of short-or long-term respiratory deterioration post-EGD. There was no difference in the FEV1 post-EGD (75.4±21.7%; mean, standard deviation) as compared to the pre-EGD (74.1±24.0%; mean, standard deviation) measurement (N=37 cases, P=0.319, paired t test). Abnormal endoscopic findings were present in 61.1% of EGDs and abnormal histologic findings in 57.9% of procedures in which biopsies were obtained (N=57).

Conclusion: Patients with CF frequently require an EGD for diagnostic and therapeutic purposes. Our data indicates that these procedures can be performed safely and do not appear to affect respiratory function. Moreover, the abnormalities of the proximal gastrointestinal tract are frequently found during these procedures.

483 ***PEDIATRIC WEB-BASED VIDEO CAPSULE ENDOSCOPY CURRICULUM PILOT STUDY.*** *Corey Scherer[1], Nan Du[2], Joel Friedlander[3], Uma Phatak[1]. [1]Pediatric Gastroenterology and Hepatology, Yale, New Haven, CT; [2]Pediatrics, Yale, New Haven, CT; [3]Digestive Health Institute, Colorado Children's Hospital, Aurora, CO*

Introduction: Video capsule endoscopy (VCE) is a less invasive method providing visualization of the entire small bowel. The US Food and Drug Administration approved use of VCE in children 10-18 years of age in 2003 and over 2 years of age in 2009. The North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) and American Society for Gastrointestinal Endoscopy (ASGE) agree VCE should be performed by individuals who are trained and competent. However, minimum training requirements have not been validated and are based on expert opinion. In addition, formal pediatric VCE training courses are not routinely available. We hypothesized that a structured web-based pediatric VCE curriculum would be accessible, improve comfort and knowledge of VCE among pediatric gastroenterology fellows and faculty.

Aims:

Aim 1: Develop a structured web-based pediatric VCE curriculum consisting of a combination of assigned readings, multiple choice questions, and VCE cases with immediate feedback to the participant.

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Aim 2: Evaluate the knowledge retained from the curriculum by comparison of pre- and post- multiple choice tests.

Aim 3: Demonstrate an interest for a web-based pediatric VCE curriculum among pediatric gastroenterology fellows and faculty.

Methods: A web-based VCE curriculum was created using the REDCap database. An email calling for participants was sent to pediatric gastroenterology fellows and attendings using the Pediatric GI Bulletin Board <PEDGI@list.uvm.edu>. Baseline comfort level and knowledge with performing VCE were measured with a survey and pre-test consisting of written and photo multiple choice questions. Participants were provided with feedback to multiple choice questions after completion of the pre-test. Links were provided with information on VCE software, NASPGHAN capsule endoscopy clinical report and a sample VCE report. Following this, providers completed 10-15 video cases with immediate feedback. Participants completed a post-test and survey at the end. The curriculum required approximately 15-30+ hours to complete, varying on rate at which participants viewed the cases. The mean scores for survey questions and pre- and post-tests were compared with a t-test.

Results: A total of 143 pediatric gastroenterology fellows and attendings responded and inquired about participation in the curriculum, in response to our email. 52 of 143 providers began the curriculum. Of the 52 people who began the curriculum, 12 (23.1%) completed, 37 (71.2%) partially completed and 3 (5.8%) withdrew from the study. We saw significant improvement on the survey self-reported mean comfort level in explaining the indications ($p=0.0097$) and contraindications ($p=0.0036$), managing complications ($p=0.0048$), using Rapid Reader software ($p=0.00035$), and interpreting and reporting VCE findings ($p=0.00015$). Participants showed significant improvement in the on-line knowledge test ($p=0.041$) and photo recognition test ($p=0.015$). All 12 subjects who completed the curriculum thought it was helpful and reported that they would recommend it to others. Participants reported difficulties with information technology (IT) such as downloading software and cases, inability to download Rapid Reader on a Macintosh, and requested continuing medical education (CME) or maintenance of certification (MOC) credit for completion of the course. Of the 3 participants that withdrew, 2 reported IT difficulties and 1 reported limitations with time as a reason for withdrawal from the study.

Conclusion: Our new VCE curriculum demonstrated a need and interest for pediatric VCE education amongst providers in pediatric gastroenterology. A web-based curriculum is accessible internationally and can significantly improve comfort and knowledge with performing VCE. Further technical support and resources would help make a web-based curriculum easier to navigate and complete. Creation of a CME or MOC course would provide an opportunity for pediatric gastroenterologists to obtain training in VCE and help establish competency among those performing VCE in pediatric patients.

485 ***OPTIMIZING THE NUMBER OF CORRECTLY DRAWN TACROLIMUS LEVELS IN SOLID ORGAN TRANSPLANT RECIPIENTS.*** *Victoria Shakhin*, *Amanda Wenzel*, *Valeria Cohran*. *Gastroenterology, Hepatology, and Nutrition*, *Lurie Children's Hospital of Chicago*, *Chicago*, *IL*

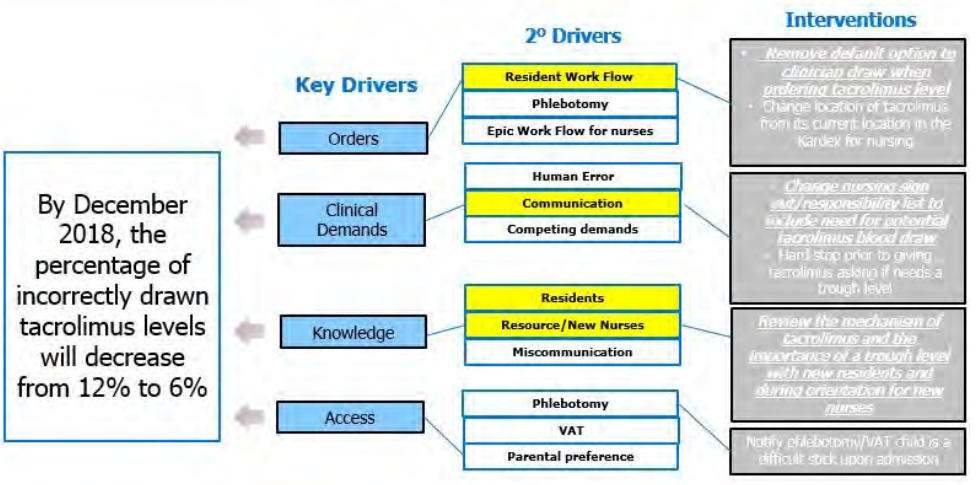
Background: The widespread use of tacrolimus in the mid 1990's as an immunosuppressant agent following solid organ transplantation resulted in marked improvement in rates of patient and graft survival following transplant. By reducing rates of rejection, tacrolimus supplanted cyclosporine as the primary immunosuppressant of choice. It is important to note, however, that tacrolimus is associated with significant adverse effects. Specifically, side effects of tacrolimus include nephrotoxicity, hypertension, electrolyte derangements, neurotoxicity, and increased susceptibility to infection. Given the need to balance risk of rejection and side effects, monitoring of trough tacrolimus levels (level drawn approximately one hour prior to dose administration) is an integral component of post-transplant medical management. At our center, we found that only 88% of all tacrolimus levels were drawn correctly (Table 1), leading to compromised patient care and costs to the hospital amounting to $112,000. The aim of this project was to increase the rate of correctly drawn trough tacrolimus levels from 88% to 94%.

Methods: Focus groups were held and a key driver diagram was generated to identify potential reasons for incorrectly drawn tacrolimus levels (Figure 1). Patients were identified for analysis through the Lurie Children's Hospital solid organ transplant registry. Any patient who had received a solid organ transplant was included; stem cell transplant patients were excluded. The primary outcome was a correctly-timed tacrolimus trough level, defined as a level drawn 30 minutes to one hour prior to dose administration. Levels drawn at any other time were considered non-trough levels. Subgroup analyses were performed based on inpatient unit, transplanted organ, primary transplant admission versus subsequent admission, and clinician draw (drawn by bedside nurse in patients with central venous lines) versus lab (phlebotomy) draw. Interventions focused on three primary domains: EMR-based interventions, nursing sign-out, and provider education on proper order

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placement. These interventions were implemented in September 2018 and data was collected between October 2018 and January 2019.
Results: At baseline, 88% (n=1363) of all tacrolimus levels were drawn correctly After the first PDSA cycle (October 2018 to January 2019), the percentage of correctly drawn levels increased to 92% (n=421) overall (Table 2). When analyzed by inpatient unit, the number of correctly drawn tacrolimus levels increased in all units except the pediatric ICU (baseline, 90%; post-PDSA cycle, 84%). When stratified by organ type, the majority of incorrectly drawn levels in the PICU were obtained in kidney transplant recipients. Intestinal transplants were the only population found to have an decrease in the overall number of correctly timed trough levels across all inpatient units (baseline, 91%; post-PDSA cycle, 87%).
Conclusions: We identified an increase in the rate of correctly drawn trough tacrolimus levels using quality improvement methodology. The pediatric ICU, and specifically kidney transplant patients, continue to be a source of incorrectly drawn levels. This may be a reflection of differences in preferred timing of trough levels in kidney transplant patients compared to other transplant recipients. This may be a focus of future interventions.
PDSA Cycle #1 All Post-Tx Inpatient Stays (Oct 2018 - Jan 2019)

Organ	# of Lab Draws	# Correct (%)	# Wrong (%)
Heart	144	131 (91)	13 (9)
Intestine	40	35 (88)	5 (13)
Kidney	209	196 (94)	13 (6)
Liver	65	59 (91)	6 (9)
Total	458	421 (92)	37 (8)



487 ***DESIGN AND IMPLEMENTATION OF AN OUTPATIENT BLOCK BASED CURRICULUM FOR PEDIATRIC GASTROENTEROLOGY TRAINEES.*** *Aliza Solomon[2], Jennifer DiPace[1], Susan Bostwick[1]. [1]Pediatrics, Weill Cornell Medicine, New York, NY; [2]Pediatric Gastroenterology and Nutrition, Weill Cornell Medicine, New York, NY*
ACGME requirements for training in pediatric gastroenterology specify training length of 3 years including both clinical training and scholarship. In 2013, NASPGHAN leadership and Training Committee, recommended that at least 15 months, and up to 24 months, be devoted to clinical training in inpatient and ambulatory settings; noting that since clinical practice is largely in the outpatient setting, a significant component should be provided in this area. In addition, the NASPGHAN Task Force, in conjunction with the ABP, developed EPAs; which include care for infants, children, and adolescents with common outpatient complaints. However, traditionally, most clinical experience for trainees is acquired primarily in year 1 in the inpatient setting and continuity clinic of one half day per week with a large component of years 2-3 consisting of scholarly activity, which is not reflective of post-training practice.
Locally, based on a review of data, such as the fellow ACGME survey and the annual program evaluation, our program evaluation committee determined that our outpatient training was not achieving the goal of preparing trainees for ambulatory practice. In addition, supplemental half-day clinic sessions were causing strain on their protected time for

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scholarly activity since it was scattered throughout years 2-3. Therefore, we sought to use Kern's 6 Step process for curriculum design to improve our curriculum. We defined the goal as developing an educational program for trainees in outpatient care that more closely resembled post-training practice while providing improved dedicated time to complete meaningful scholarly activity. Next, a needs assessment was conducted by using a focus group of fellows to discuss potential options on how to improve the current system. The outcome was the development of a recurrent one week outpatient block every 8 weeks during years 2-3. Goals and objectives for the new block were created, including: to develop knowledge and skills necessary for the management of pediatric gastroenterology ambulatory patients, acquire skills sufficient to diagnose, follow, and treat patients with common GI disorders, as well as the care of complex GI outpatients. Trainees were given the NASPGHAN Curricular Resources on Common Outpatient GI and liver online to read during these blocks.
The curriculum was implemented for second and third year trainees in July 2018. Assessment of trainee's competencies as well as feedback of the overall program were collected at multiple time points. Thus far, trainees have commented that the rotation is a good replication of the workload and responsibilities of a clinical practitioner, and their self-perceived knowledge of common GI problems increased. Trainees did not feel that time for scholarly activity was negatively impacted since there was ample time during the remaining months to accomplish their individual goals with fewer interruptions. Assessment of fellows' knowledge will continue to be tracked through in-training scores over time as well as achievement of milestones on outpatient rotations. Program evaluation will also include monitoring ACGME annual survey, program evaluation scores on outpatient training and protected research time, and post-graduate surveys assessing how well prepared graduates felt for ambulatory practice.
In summary, the development of an outpatient block rotation was feasible to implement in second and third year pediatric GI trainees. Future evaluation on how this impacts knowledge and competency assessments, as well as scholarly achievement and fellow satisfaction will be collected.

488 ***THE ROLE OF DEPRIVATION INDEX AS A CAUSAL FACTOR IN EMERGENT GASTROINTESTINAL PROCEDURES.*** *Eve Thau*, *Kristin Brown*, *Giselle Podkameni*, *Linda Franklin*, *Harpreet Pall. Pediatrics*, *St Christopher's Hospital for Children*, *Philadelphia, PA*

Background: Within the field of pediatric gastroenterology, there is limited utilization data comparing care for gastrointestinal (GI) conditions between inpatient and outpatient settings. Emergent inpatient procedures are less cost effective than those performed in ambulatory settings. Few efforts have been made to identify factors driving utilization of emergent care within the realm of pediatric gastroenterology.

Aims: In the current study, we aimed to identify forces driving emergent vs. non-emergent GI procedures. We wanted to specifically examine: 1) health disparity factors associated with emergent procedures, 2) deprivation indices as a measure of socioeconomic status (SES) and 3) deprivation indices in our population using geocoding, or geospatial mapping, as a means to identify high risk patient groups. We hypothesized that patients with lower SES (via lower deprivation indices), were at higher risk of having emergent procedures performed.

Methods: We performed a retrospective chart review and compared health disparity variables for emergent versus non-emergent GI procedures. Data collected included age, gender, insurance type, race and language. Deprivation indices were calculated using patients addresses which were then linked to census tracts. Logistical regression, generalized linear mixed models and chi-square analyses were performed on health disparity variables comparing emergent vs non-emergent groups. Generalized linear mixed model was performed for geocoded data.

Results: A total of 2,546 patient records with 807 unique census tracts were utilized in our study. 286 (11.2%) patients had an emergent GI procedure performed. Age groups most likely to seek emergent care were those youngest (<5 years) and oldest (18-21 years), with a chi-square of $p<0.001$. Unpaired t-test showed significance between age groups with a p-value of 0.022. Logistical regression [OR for emergent procedure, 95% CI] showed that patients most likely to seek emergent care were those oldest (18-21 years) [1.234, 0.76-1.99] when compared to the youngest group as a reference. Other variables found to have higher odds of emergent procedures included patients with Medicaid insurance [1.696, 1.27-2.26], African American or "other" race (including non-African American, non-Caucasian and non-Hispanic patients) [2.438, 1.48-2.90 and 2.438, 1.77-3.36, respectively] as well as "other" language including non-English and non-Spanish speaking patients [2.134, 1.14-3.99]. Gender was the only variable without a significant relationship with emergent procedures. A multivariate analysis with all variables showed similar results as when performed individually. Geocoding results using deprivation indices will be available shortly.

Conclusions: This study enabled us to identify patients at higher risk of undergoing emergent procedures. Our results

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indicate that patients most likely to undergo emergent GI procedures include those at extremes of age (< 5 years, 18-21 years), being of African American race, having Medicaid insurance, and speaking neither English nor Spanish. We now have a unique opportunity to plan targeted interventions to these high-risk groups to improve both access and quality of care in our urban population. Additionally, we hope to expand upon this study by implementing a prospective, survey-based approach to identify factors influencing decisions to seek emergent care for pediatric gastrointestinal conditions.

489 ***DEVELOPING A CONCEPTUAL FRAMEWORK FOR TEACHING COLONOSCOPY: A QUALITATIVE, INTERPROFESSIONAL APPROACH.*** *Amy Turner[1], Kathleen Huth[2], Donna Luff[2], Alan Leichtner[1]. [1]Gastroenterology, Hepatology, & Nutrition, Boston Children's Hospital, Boston, MA; [2]General Pediatrics, Boston Children's Hospital, Boston, MA*

Background: Few pediatric gastroenterology training programs in the U.S. have faculty specifically trained to teach colonoscopy and as a result, colonoscopy training may be suboptimal. The aim of this qualitative study was to explore the current perceptions of colonoscopy training among attending physicians, fellows, and procedural unit nurses. Topics discussed included best and worst teaching practices and barriers to effective teaching, with the goal of developing a conceptual framework for teaching colonoscopy and ultimately, a standardized "train the trainer" curriculum.

Methods: Four focus groups (2 with attending physicians who teach colonoscopy, 1 with fellows, and 1 with procedural unit nurses) and 3 interviews with advanced endoscopists were conducted within the Division of Gastroenterology, Hepatology and Nutrition at Boston Children's Hospital, an academic tertiary care center, between March 2018 and June 2018. Focus group discussions and interviews were recorded, transcribed by a professional transcriptionist, reviewed, and de-identified. Thematic analysis was performed using an approach based on grounded-theory and qualitative analysis software (Dedoose™ 8.1.8).

Results: Twenty-eight individuals participated in the focus groups and interviews, including 13 attending physicians, 6 fellows, 6 procedural unit nurses, and 3 advanced endoscopists. Three major themes emerged related to teaching colonoscopy: 1) teaching behaviors that promote a learner's performance, 2) the need for standardization and professional development, and 3) barriers to promoting performance and to standardization and professional development.

Teaching behaviors to promote a learner's performance were separated into prior, during, and after a training session (Table).

Attending physicians, fellows, and nurses all recognized the large variability in both techniques favored by different faculty and their teaching approaches, and agreed on the critical need for standardized methods of performing colonoscopy and teaching colonoscopy.

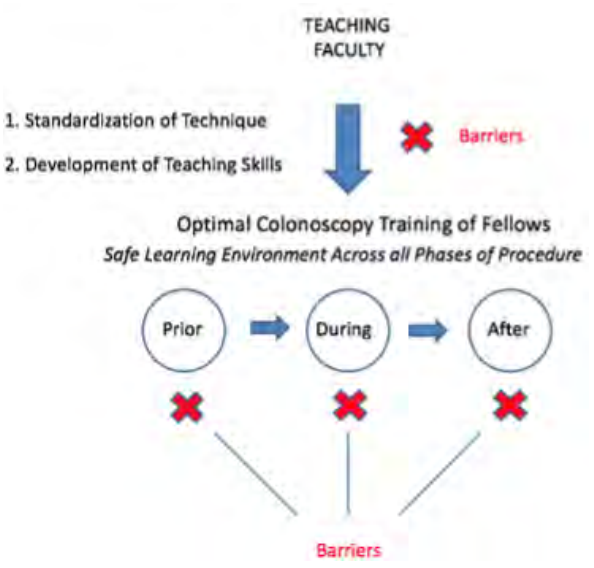
Barriers to promoting performance included time constraints in scheduling, competing interests of other patients and members of the health care team, and the balance of safe patient care and teaching. Barriers to standardization were variation in the attending physician's own training and the large number of attending physicians teaching colonoscopy.

A conceptual framework was developed (Figure). To reach the goals of standardization of both procedure performance and teaching, limiting the number of faculty teaching colonoscopy and assigning each fellow a faculty coach to discuss overall progress in learning were suggested.

Conclusions: Colonoscopy training is not uniform across faculty due to lack of standardization in performing the procedure and limited faculty development opportunities. Through thematic analysis we identified teaching behaviors that promote a learner's performance which were used to develop a conceptual framework for teaching colonoscopy. This framework can be used to develop a "train the trainer" curriculum with the goal of standardizing colonoscopy education. In order for this to be successful, we will need to recognize and address barriers that occur throughout the process of teaching and standardization.

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Prior To a Training Session
Fellow's preparation for training by: 1. Reviewing patient's history 2. Obtaining consent
Discussion of fellow's perceived skill level and fellow's goals
Joint setting of expectations between faculty member and fellow
Reviewing physical set up of endoscopy room
During a Training Session
Appropriate faculty intervention (how and when)
Verbalization of steps either by fellow or faculty member
Division of procedure into stages and associated targeted maneuvers
Ensuring progression of skills, with increasing complexity
Faculty modeling of good communication with endoscopy staff, patients, and family members
After a Training Session
Formative feedback with creation of a plan for future training sessions
Throughout a Training Session
Creating a psychologically safe learning environment



492 ***ENDOSCOPIC INCISIONAL THERAPY AND OTHER NOVEL STRATEGIES FOR TREATMENT OF CONGENITAL ESOPHAGEAL STENOSIS.*** *Jessica Yasuda[1], Steven Staffa[3], Susannah Clark[2], Peter Ngo[1], Russell Jennings[2], Michael Manfredi[1]. [1]GI, Boston Children's Hospital / Harvard, Boston, MA; [2]Surgery, Boston Children's Hospital / Harvard, Boston, MA; [3]Anesthesia, Boston Children's Hospital / Harvard, Boston, MA*

Background: Management of congenital esophageal stenosis (CES) often involves dilation with reversion to myotomy, stricture resection, or esophageal replacement in refractory cases. Some centers have reported surgical intervention rates as high as 71%,[1] noting the often recalcitrant nature of CES to dilation alone. However, surgery often fails to produce durable response, with anastomotic strictures requiring ongoing dilation and stenotic symptoms plaguing more than half of patients in published series.[2]

Methods: We retrospectively reviewed the medical records of all patients with CES treated by our tertiary care center who had at least one endoscopy between July 2007 and October 2018. Success was defined as full when diet included all age-

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appropriate textures with dysphagia once per month or less, or partial when diet included most textures with dysphagia at most 1–2 times per week.
Results: Thirty patients with CES had at least one endoscopic intervention at their CES (Table 1). All patients had balloon dilation(s) and at least one other therapy such as endoscopic incisional therapy (EIT), steroid injection, or stenting. Esophageal vacuum assisted closure (EVAC) was used for treatment or prevention of esophageal leak.
Of patients who had EIT at their CES (N = 18), 14 (77.8%) achieved full (N = 13) or partial (N =1) success with endoscopic therapy alone; 3 (16.7%) required surgery to achieve full (N = 3) success; 1 non-surgical patient does not yet eat by mouth due to oral aversion. Of patients who did not undergo EIT at their CES (N = 12), 5 (41.7%) achieved full success with endoscopic therapy alone; 7 (58.3%) required surgery (2 full success, 4 partial success, and 1 does not eat by mouth due to airway comorbidities). Rate of surgical intervention was significantly lower in the group who received EIT (Fisher's exact test, $p = 0.045$). While there was a trend toward higher rates of feeding success with endoscopic therapy alone in patients who received EIT compared to patients who did not, this trend did not reach statistical significance (Fisher's exact test, $p = 0.095$).
Twenty-five endoscopies (8.9%) were associated with complications including esophageal leak (N = 21) or stent migration (N = 4). Of endoscopies with a complication, 16 (64%) involved EIT. Odds of complications after therapeutic endoscopies involving EIT were significantly higher than those without EIT (odds ratio 6.15; 95% confidence interval (2.44, 15.52); $p < 0.001$). Our rates of esophageal leak significantly decreased over time as our use of EVAC increased ($p = 0.003$; Figure 1).
Conclusion: EIT shows promise as an alternative to surgery in CES; however, further study is needed. Complementary endoscopic techniques such as injection, stenting, and EIT broaden the toolbox of the treating physician and may allow for avoidance of surgery in CES.

References
1. Amae et al. Clinical characteristics and management of congenital esophageal stenosis: A report on 14 cases. J Pediatr Surg 2003.
2. Michaud et al. Characteristics and management of congenital esophageal stenosis: Findings from a multicenter study. Orphanet J Rare Dis 2013.
Clinical characteristics of CES cohort (N = 33)

Clinical Data	*Median (IQR) or n (%)*
Male gender	18 (54.5%)
History of esophageal atresia	20 (60.6%)
Age at CES diagnosis, months	12 (2–17)
Endoscopic ultrasound of CES performed -- Fibromuscular -- Tracheobronchial remnant	24 (77.4%) 22 (91.7%) 2 (8.3%)
Length of follow up, days	370 (150–806)
Number of endoscopies per patient, total	7 (5–12)
Number of endoscopies per patient with at least one therapeutic maneuver -- Dilation -- EIT -- Corticosteroid injection -- Stent placement -- EVAC placement or replacement	5 (2–7) 4 (1–7) 1 (0–2) 1 (0–2) 1 (0–1) 0 (0–1)

Table 1. Clinical characteristics of CES cohort. Thirty-three patients with CES had 282 endoscopies at our institution; 30

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patients had therapeutic endoscopic interventions at their CES. Therapeutic endoscopies are not necessarily independent events and some endoscopies involved more than one therapeutic intervention.

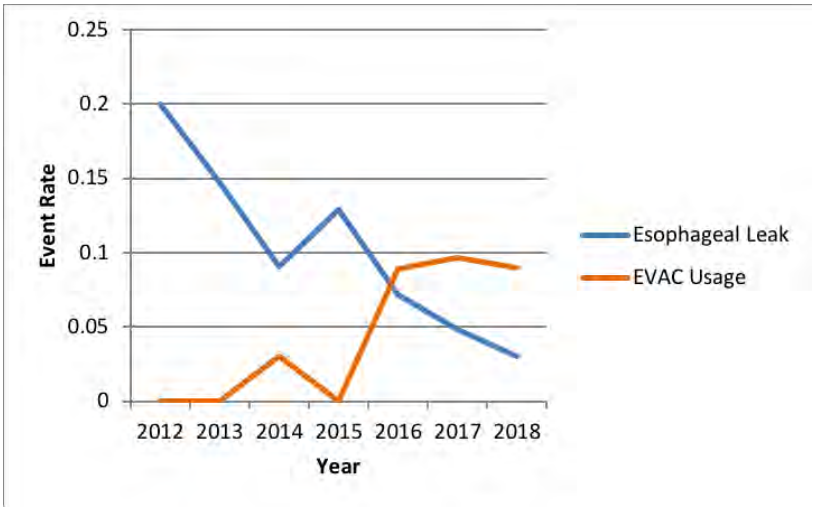


Figure 1. Esophageal leaks and unique episodes of esophageal vacuum assisted closure (EVAC) usage, normalized to total number of endoscopies performed in CES patients per year. Spearman's ρ correlation coefficient for paired esophageal leak rate each year versus EVAC usage rate each year is -0.93 ($p = 0.003$). Statistical significance is denoted by boldface type and an asterisk.

493 ***PROPHYLACTIC ENDOSCOPIC ESOPHAGEAL VACUUM (EVAC) THERAPY OF HIGH RISK ESOPHAGEAL ANASTOMOSES IN PEDIATRIC SURGICAL PATIENTS.*** *Jessica Yasuda[1], Wendy Svetanoff[2], Steven Staffa[3], Peter Ngo[1], Susannah Clark[2], Charles Smithers[2], Michael Manfredi[1]. [1]GI, Boston Children's Hospital / Harvard, Boston, MA; [2]Surgery, Boston Children's Hospital / Harvard, Boston, MA; [3]Anesthesia, Boston Children's Hospital / Harvard, Boston, MA*

Background: Esophageal anastomotic leak (EAL) is a potentially severe complication of surgical procedures of the esophagus. Anastomotic ischemia and tension are contributing factors towards developing EAL. Negative pressure wound therapy (i.e. vacuum-assisted closure or VAC® therapy) is increasingly used in the treatment of EAL, with observational studies suggesting it is a highly effective method for esophageal defect closure.[1,2] Esophageal VAC (EVAC) placement at the time of new anastomosis creation may improve blood flow and healing, potentially leading to fewer EALs. We sought to evaluate the initial efficacy of prophylactic EVAC placement for high risk esophageal anastomoses.

Methods: Between July 2015 and November 2018, patients who underwent surgery that resulted in a new esophageal anastomosis and were deemed to be high risk for anastomotic complications had a prophylactic EVAC placed at the time of surgery. We have previously described our method of EVAC placement.[2] Retrospective review of similar surgical procedures without prophylactic EVAC placement from January 2014 to November 2018 was performed for comparison.

Results: Thirteen patients had prophylactic EVAC placement at the time of esophageal repair at median age of 7 months (interquartile range (IQR) 4–19 months). Procedures prompting EVAC placement included primary repair of long-gap esophageal atresia (LGEA) by the Foker technique (N = 7), stricture resection after repaired long-gap esophageal atresia (LGEA) (N = 3) or type C esophageal atresia (N = 1), and stricture resection after delayed identification of a retained esophageal foreign body (N = 2).

Three of 13 patients who had prophylactic EVAC placement (23.1%) experienced EAL in the post-operative period. Two patients were found to have technical failure of their EVAC leading to absence of suction, and one patient experienced delayed EAL 12 days after removal of the EVAC. One of these patients had surgical leak repair; the other two had EVAC replacement with continued EVAC therapy leading to successful closure. In comparison, post-surgical EAL occurred in 13 of 58 patients who had the Foker procedure for LGEA and in 8 of 31 patients who had esophageal stricture resection without prophylactic EVAC placement. The rates of EAL in the prophylactic EVAC group were not significantly different from rates of EAL in either the post-surgical Foker (23.1% vs 22.4%, $p = 0.999$), post-stricture resection (23.1% vs 25.8%, $p = 0.999$), or combined post-Foker and stricture resection (23.1% vs 23.6%, $p = 0.999$) groups by Fisher's exact test.

Conclusions: Prophylactic EVAC placement does not carry increased risk of EAL compared to standard post-surgical care; however, further device refinement is needed to reduce technical failure. Additional prospective study is needed to better

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establish safety profile and efficacy of EVAC.

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EOE/GERD/AERODIGESTIVE

505 *EOSINOPHILIC ESOPHAGITIS HISTOLOGIC SCORING SYSTEM PROVIDES NEW INSIGHTS INTO EOE.*

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Introduction: Past and present guidelines relevant to eosiniophilic esophagitis (EoE) have restricted the focus of histologic evaluation to the peak eosinophil count (PEC). However, pathologic features seeminlgy independent of eosinophilic inflammation such as basal zone hyperplasia (BZH), dilated intercellular spaces (DIS), and thickened lamina propria fibers (LPF) are commonly seen. The eosinophilic esophagitis histology soring sytem (EoEHSS), is a more comprehensive, objective instrument developed by Collins and coworkers, that was validated in their patient population. The EoEHSS was employed to analyze mid and distal esophageal biopsies in different stages of EoE, among various aged children at a second center. .

Methods: Three cohorts enrolled in an IRB approved protocol designed to study EoE were compared: Active EoE (EoE-A) as determined by consensus guidelines (n=36; 76 esophageal biopsies, 39 distal, 37 mid); EoE treated until clinical, endoscopic, and histopathologic (<15eos/hpf) remission (EoE-R) was achiebed (n=12; 24 esophageal biopsies, 12 distal, 12 mid); and patients with symptoms of esophageal dysfunctioin but no endosocpic or histologic features of EoE (controls) (n=37; 74 esophageal biopsies, 37 distal, 37 mid). All eight of the EoEHSS components were determined independently by two pathologists (BL, RG) maximum eosinophil count/hpf, basal zone hyperplasia, eosinophil abscesses, eosinophil surface layering, dilated intercellular spaces, surface epithelial alteration, dyskeratotic epithelial cells, and lamina propria fibrosis. Severity (grade) and extent (stage) of abnormalities were scored using a 4-point scale (0 = normal; 3 = maximum abnormality) and total grade and stage scores were calculated

Results: The median total grade and total stage scores were significantly higher in EoE-A patients compared to both EoE-R and to controls. The median total grade score in EoE-A patients correlated with their PEC (r=0.781). EoE-A patietns >10 years had higher grade scores in their distal esophagus compared to EoE-A < 10 years. While EoE-R had median total grade scores in distal esophageal biopsies similar to controls (p=0.3), total grade scores in the mid esophageal biopsies were significantly greater (p=0.008). Individual grade scores for features independent of eosinophil count (BZH,DIS, and fibrosis) were also significantly higher in EoE-A compared to EoE–R and to controls. In EoE-A patients, BZH and DIS were more prominent in the distal esophagus compared to the mid esophagus. Conversely, fibrosis was more severe in the mid esophagus.

Conclusions: The instructions published by its creators allows the EoEHSS to be adopted by remote pathologists. This permits a more robust, quantitative characterization of distinct populations with EoE. Recognition of additional histopathologic features can yield insights beyond those derived from the PEC alone.. Our data demonstrates that the prevalence and extent of specific features can vary between the mid and distal esophagus in active EoE, that older children with EoE have an increased severity of inflammation, and that EoE disease activity and healing between the mid and distal esophagus are not necessarily synchronized.

506 *THE IMPACT OF THE TRANSITION FROM PEDIATRIC TO ADULT CARE ON PATIENTS WITH EOSINOPHILIC ESOPHAGITIS: INSIGHTS FROM A PATIENT PERSPECTIVES SURVEY.*

Jane Robinson[1], Glenn Furuta[1], Emily McGowan[2], Nandini Hadker[3], Irana Kolev[3], James Williams[4], Salomé Juethner[4], Gary Falk[5] [1]Children's Hospital of Colorado, University of Colorado School of Medicine, Aurora, CO; [2]University of Virginia School of Medicine, Department of Internal Medicine, Division of Allergy and Clinical Immunology, Charlottesville, VA; [3]Trinity Partners, LLC, Waltham, MA; [4]Shire, a Takeda company, Lexington, MA; [5]Division of Gastroenterology, University of

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Pennsylvania Perelman School of Medicine, Hospital of the University of Pennsylvania, *Philadelphia*, *PA*
Introduction: Eosinophilic esophagitis (EoE) is a chronic immune-mediated condition that frequently presents in childhood. Adolescents with chronic conditions must transition from child-centered to adult-oriented healthcare systems, which can be challenging for patients. Previous studies have demonstrated a profound lack of knowledge regarding this healthcare transition in patients with EoE. The objective of this study was to understand patient experiences of the transition from pediatric to adult care and to identify resources that could be utilized during transition.

Methods: We developed a self-administered, online survey for patients with EoE to gain insight into patient perspectives, using a Likert scale. Patients aged 18–26 years, were recruited by leveraging existing website survey links and via physician referrals of eligible candidates. Patients were questioned about symptom frequency and severity, as well as about the impact EoE had on quality of life before, during, and after transition. Patients were further asked about the aspects of disease management that they felt they could handle well, and what resources would be helpful during transition. Cochran's Q test with *post hoc* multiple comparisons was used to assess differences between before, during, and after transition.

Results: A total of 67 patients with EoE completed the survey, all of whom were currently transitioning or had completed transition into adult care (**Table 1**). Most patients (>95%) were on some form of elimination diet to manage disease throughout the transition period. The proportion of patients using acid lowering medications increased from 51% before transition to 67% during and 64% after transition (p=0.01; p<0.01, respectively). During transition, some symptoms (e.g. regurgitating food after eating) became more frequent, and others (e.g. food blockages in the esophagus) were reported as being more impactful, relative to the period before transition. Patients reported that symptoms of EoE tended to be both less frequent and less impactful following completion of transition (**Figure 1**). Aspects that patients struggled with most during transition were planning meals, shopping for the right food and cooking/finding EoE-friendly foods (proportion of patients who struggled significantly or somewhat: 46%, 44%, 38%, respectively). Although most patients (82%) reported confidence in having the knowledge to manage their EoE, 47% also reported that they were worried about managing their EoE effectively in the future. Approximately 1 in every 5 patients considered the support of a transition coordinator potentially helpful.

Conclusions: While the frequency and impact of some EoE symptoms increased during transition of care, there was a notable decrease in both symptom frequency and impact on quality of life following completion of transition. Resources useful to patients with EoE undergoing transition could include information on strategies to manage diet and medication, and appropriate methods for dealing with an anticipated temporary increase in symptom frequency or impact during transition. The patient population sampled here was unique due to restrictions imposed by internet access, which may limit the generalizability of the findings presented.

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Table 1. Patient demographics and characteristics.

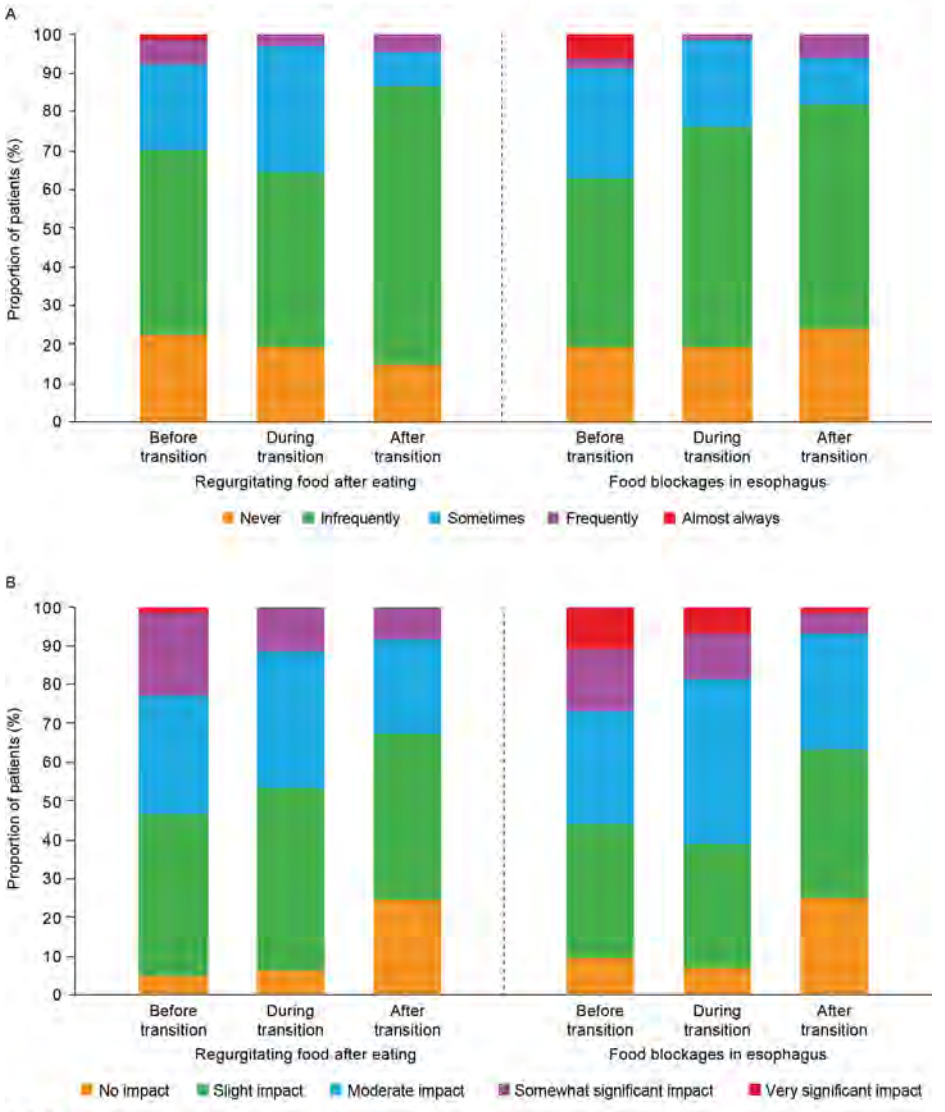
	Patients with EoE (N=67)
Age range, years	18–26
Mean age at survey completion (SD), years	22.7 (2.2)
Mean age at diagnosis (SD), years	15.9 (4.6)
Gender, n (%)	
Female	33 (49.3)
Male	33 (49.3)
Transgender male	1 (1.5)
Race / ethnic origin, n (%)	
White/Caucasian (non-Hispanic)	42 (62.7)
Black or African American	14 (20.9)
Latino or Hispanic	8 (11.9)
Asian	3 (4.5)
Current living situation, n (%)	
Independently (not in college or at home)	45 (67.2)
In a college dorm or similar	13 (19.4)
At home with caregiver	9 (13.4)
Current diet and medication, n (%)	
Both diet therapy and medication	50 (74.6)
Diet therapy only	14 (20.9)
Medication only[a]	3 (4.5)
Current healthcare, n (%)	
Under adult care doctor	61 (91.0)
Transitioning from pediatric to adult care doctor	6 (9.0)

[a]This includes patients who were on acid lowering medications and/or steroid medication.
EoE, eosinophilic esophagitis; SD, standard deviation.

Table 1

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Figure 1. Proportion of patients with EoE (N=67) reporting (A) the frequency and (B) the impact on quality of life of regurgitating food after eating or food blockages in the esophagus before, during and after transition to adult care.



EoE, Eosinophilic esophagitis.

Figure 1

507 ***MOST CHILDREN DIAGNOSED WITH EOSINOPHILIC ESOPHAGITIS DO NOT GET APPROPRIATE FOLLOW-UP: LOW ENDOSCOPY RATES ACROSS A LARGE, POPULATION-BASED COHORT.*** *Amber McClain[1], Molly O'Gorman[1], Raza Patel[1], Amy Lowichik[2], Stephen Guthery[1], Kathryn Peterson[3], Jacob Robson[1]. [1]Pediatrics, Gastroenterology, University of Utah / Primary Children's Hospital, Salt Lake City, UT; [2]Pathology, University of Utah, Salt Lake City, UT; [3]Internal Medicine, University of Utah, Salt Lake City, UT*

Background and Aims: Eosinophilic esophagitis (EoE) is a chronic, immune-mediated condition that is becoming more widely recognized in children. EoE treatment is targeted towards symptoms; however, a subset of children have persistently active EoE despite feeling better on therapy. Since length of time with active EoE is directly correlated with esophageal fibrostenosis, all recent EoE consensus guidelines recommend close follow-up endoscopy to ensure histologic disease response to treatment, regardless of symptomatic response. Despite these recommendations, time to first follow-up endoscopy and overall surveillance endoscopy rates have not been studied on a large scale. With high endoscopy-associated out of pocket medical costs and variable patient counseling from diagnosing providers, we hypothesized follow-up endoscopy rates would be well below the 100% goal.

Methods: We analyzed a previously identified cohort of 1,060 Utah children diagnosed with EoE over a recent 5-year span.

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All patients were diagnosed by endoscopy with biopsy, had comprehensive health records available for review in the Intermountain Healthcare system, and had at least 18 months of follow-up from EoE diagnosis. We examined return endoscopy rates and EoE activity at that follow-up, classified as >14 esophageal eosinophils in a high-power microscopy field. Using mixed effects regression modeling to control for within group variation, we compared pediatric gastroenterologists (PGIs) at an academic children's medical center to health system-affiliated PGIs, private practice PGIs and other endoscopists (surgical endoscopists and adult gastroenterologists) performing procedures on children.

Results: 41.7% (N=443) of children had a surveillance upper endoscopy with biopsy at any point after EoE diagnosis. Of those that had a follow-up endoscopy, about half (49.7%, N=220) had a close follow-up endoscopy (defined as within 6 months of diagnosis and presumed treatment initiation). Patients diagnosed by a PGI in any practice type had better odds of getting a repeat endoscopy than those diagnosed by a non-PGI endoscopist (OR: 0.42, 95% CI: 0.25-0.71, p=0.001). The majority of patients had active disease at follow-up, regardless of follow-up timing, but those that had close follow-up had 1.58 times the odds (95% CI: 1.08-2.31, p=0.018) of being in histologic remission compared to those studied more than 6 months after diagnosis.

Conclusions: Across a large, population-based pediatric EoE cohort, we showed that EoE activity surveillance, via endoscopy with histology, was lacking across all EoE diagnosing provider types. Low disease remission rates also raise cause for concern. That children who had close follow-up had lower EoE activity rates raises key questions for further study, focusing on long-term treatment adherence, treatment-associated costs, treatment trends across managing provider types and expected time to mucosal healing with different treatment modalities. While treating to symptom improvement is a key goal for children with EoE, so too is ensuring histologic resolution via follow-up endoscopy, so that treatment adjustments can be prescribed to those with active EoE, with a goal of preventing esophageal strictures and need for dilations. As EoE is diagnosed with greater frequency, adherence to recommendations for EoE follow-up endoscopy is a key target for future quality improvement initiatives. Further research is needed to identify risk factors for loss to follow-up and whether there are barriers to repeat endoscopy at the patient (cost, perceived risk, feeling better on therapy, lack of disease understanding) and/or provider (poor patient education, lack of knowledge of EoE guidelines) level.

Follow-Up Endoscopy Rates and EoE Activity by Diagnosing Provider Type

	Academic/ Tertiary Center PGIs (10 providers)	Health System-Affiliated PGIs (2 providers)	Private Practice PGIs (2 providers)	Other Endoscopists (Non-PGIs) (75+ providers)	Total
Any Repeat Endoscopy with Biopsy	N (%)				
No	309 (54.5)	99 (48.8)	127 (70.9)	82 (73.9)	617 (58.2)
Yes	258 (45.5)	104 (51.2)	52 (29.1)	29 (26.1)**	443 (41.8)
Repeat Endoscopy with Biopsy Within 6 Months of Diagnosis	N (%)				
No	147 (57)	24 (23.1)	37 (71.2)	12 (41.4)	220 (49.7)
Yes	111 (43)	80 (76.9)*	15 (28.8)	17 (58.6)	223 (50.3)
EoE Activity By Timing of First Follow-Up Endoscopy with Biopsy	Active EoE/Total Endoscopies (% Active)				
Within 6 Months of EoE Diagnosis	44/111 (39.6)	56/80 (70)	3/15 (20)	12/17 (70.6)	115/223 (51.6)†
More than 6 Months After EoE Diagnosis	99/147 (67.4)	14/24 (58.3)	19/37 (51.4)	6/12 (50)	138/220 (62.7)

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	* p<0.05, ** p<0.01 by mixed effects regression modeling
	† p<0.05 by logistic regression modeling

508 ***QUANTITATIVE ASSESSMENT OF SUBEPITHELIAL FIBROSIS IN PEDIATRIC EOSINOPHILIC ESOPHAGITIS: A PILOT PROJECT USING NOVEL BIOPSY FORCEPS AND IMMUNOFLUORESCENCE IMAGING.*** *Jacob Robson[1], Molly O'Gorman[1], Stephen Guthery[1], Kathryn Peterson[3], Amy Lowichik[2], Yang Li[4,5]. [1]Pediatrics, Gastroenterology, University of Utah / Primary Children's Hospital, Salt Lake City, UT; [2]Pathology, University of Utah, Salt Lake City, UT; [3]Internal Medicine, University of Utah, Salt Lake City, UT; [4]Biomedical Engineering, University of Utah, Salt Lake City, UT; [5]3Helix, Salt Lake City, UT*

Background and aims: Eosinophilic esophagitis (EoE) is a chronic inflammatory disease of the esophagus. Despite increasing incidence, there are aspects of EoE which remain poorly understood. One such area is lamina propria (LP) fibrosis in children with EoE. With adequate LP obtained in under 50% of esophageal biopsies (Wang, *GIE*, 2018), LP fibrosis has not been utilized as an EoE activity index. A recent study of adults with EoE showed that use of static jaw, side opening forceps led to procurement of esophageal LP tissue in 90% of cases, with no adverse events (AEs) (Bussmann, *Endoscopy*, 2016). In this abstract, we present our experience using these forceps in a pilot sample of pediatric EoE patients. We also present data on fibrosis quantification, utilizing collagen hybridizing peptides (CHPs) and immunofluorescence signal measurements.

Methods: Using Olympus (Center Valley, PA) forceps (Model: FB-45Q-1), up to four esophageal biopsies were taken and were sectioned per hospital histopathology protocol. Endoscopic scoring was done via the endoscopic reference score (EREFS). Maximal esophageal eosinophil counts were recorded per high-power field (HPF). A senior pathologist graded whether LP was present and scored esophageal LP fibrosis on a 1-3 scale (1=LP is not fibrotic; 2=Moderate, fibrosis is present but not severe; 3=Severe, features of notable fibrosis). An additional unstained slide was prepared and AlexaFluoro647-labeled CHPs were added. ImageJ software was used to provide a digitally quantified fluorescence signal for each biopsy.

Results: In the three patients that have been fully enrolled to date, there were no complaints of significant post-operative pain and there were no AEs. Clinical details, including presenting symptoms, treatments used, endoscopy findings, and fibrosis scores, are presented in Table 1. All biopsies obtained with the Olympus FB-45Q-1 forceps had at least one section with adequate, well-oriented LP for evaluation. The contiguous sections with most abundant, well-preserved LP are displayed in Figure 1, as are immunofluorescence images and fibrosis quantification scores.

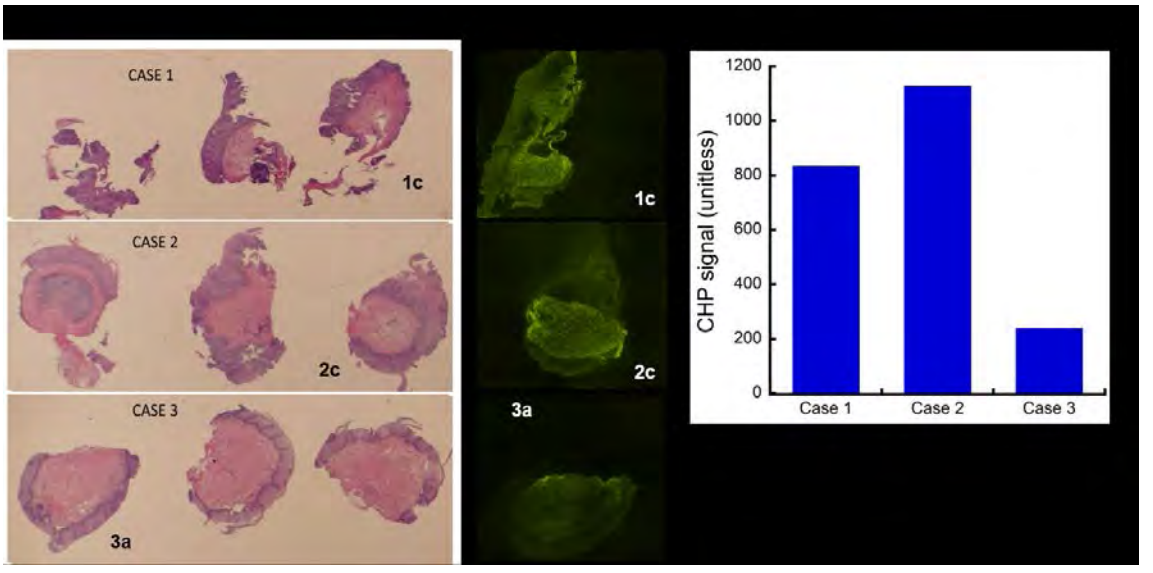
Discussion: Peak esophageal eosinophil counts per HPF are the benchmark for EoE disease activity, but are poorly correlated with pediatric EoE symptoms after treatment. LP fibrosis may prove to better a correlate with certain EoE symptoms, such as dysphagia and food impactions. With the newly available biopsy forceps and immunofluorescence imaging techniques, we posit that analysis of LP from esophageal biopsies is worth further investigation. Our findings support data from Bussmann et al using static jaw forceps; in a small sample, it appears that contiguous foci of LP, with minimal crush/compression artifact, can be safely and reliably obtained during pediatric EoE endoscopy. Static jaw forceps are reusable and of reasonable baseline cost. With high yield of LP from esophageal biopsies, whole slide imaging using immunofluorescence with fibrosis quantification has great potential as a clinical measure. This fibrosis imaging technique provides a quantitative fibrosis score, allowing for analysis of fibrosis as a continuous variable (preserving statistical richness) and avoiding interpathologist disagreement. We have shown that in situ immunofluorescence imaging of esophageal biopsies using CHPs is feasible and appears to correlate with pathologist's fibrosis grade and furrows/stricture on EREFS. CHP imaging is of similar cost to typical immunostaining and rapid clinical turnaround (8-24 h). A larger, prospective cohort study of pediatric EoE patients will be crucial to confirm the safety and efficacy of static jaw forceps and to discern the clinical and research value of immunofluorescence fibrosis imaging, as well as the correlation with other esophageal luminal measurement techniques.

*The NASPGHAN Innovations in Clinical Care Grant was used to purchase the forceps used in this project
**Dr. Yang Li is the founder of 3Helix and maintains a commercial interest in this company, which is a purveyor of CHPs.

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Clinical Patient Data

Age at EoE Diagnosis (years)	Presenting Symptoms	Age at Follow-up Endoscopy (years)	Indication for Follow-up endoscopy	Food Protein Eliminations at Study Biopsies	PPI at Study Biopsies	Steroid at Study Biopsies	EREFS Major Criteria at Study Biopsies	Max Eos/HPF at Study Biopsies	Pathologist Assigned LP Fibrosis Score	Quantitative Fibrosis Score
9	Dysphagia, esophageal food impactions	11	Ongoing dysphagia (mild), assess response to treatment	Milk, egg, peanuts, tree nuts	No	Swallowed Flovent (440 mcg qD)	6 E 1 R 1 E 2 F 2 S 0	>100	3	825
9	Dysphagia, esophageal food impactions	11	Ongoing dysphagia (severe)	Milk, soy, wheat + supplemental elemental formula via gastrostomy	Yes	Swallowed QVAR (240 mcg BID)	8 E 3 R 0 E 2 F 2 S 1	75	3	1150
1	Vomiting, oral aversion	3	Asymptomatic, assess response to treatment	Milk, soy + multiple other anaphylaxis/IgE triggers + supplemental elemental formula via gastrostomy	No	No	0 E 0 R 0 E 0 F 0 S 0	48	1	250



In situ imaging using collagen hybridizing peptides and measures of fibrosis via quantitative fluorescence signals

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509 ***LONG-TERM OUTCOME IN CHILDREN TREATED WITH EOSINOPHILIC ESOPHAGITIS TREATED WITH PRIMARY ELEMENTAL DIET THERAPY: WHERE ARE THEY AND WHAT HAVE WE LEARNED ABOUT THE ROLE OF ELEMENTAL DIET?.*** *Sally Schwartz[1], Maria Manuel-Rubio[2], Kaitlin Keeley[2], Joyce Chesniak[2], Joshua Wechsler[3,4], Amir Kagalwalla[3,4,5].[1]Clinical Nutrition, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [2]Department of Nursing, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [3]Department of Pediatrics, Division of Gastroenterology, Hepatology & Nutrition, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [4]Northwestern University Feinberg School Medicine, Chicago, IL; [5]Pediatrics, John H. Stroger Hospital of Cook County, Chicago, IL*

Background: Elemental diet treatment (EDT) induces remission in more than 95% of children with eosinophilic esophagitis (EoE). However, long-term outcomes of children treated with EDT are not well known.

Objectives: To determine the long-term outcome(s) in children managed with EDT.

Methods: Children diagnosed with EoE based on consensus guidelines treated with exclusively EDT between 2002 to 2018 demonstrating histological remission (<15 eos/hpf) were included in this retrospective analysis.

Results: Fifty-one children (male 80%, Caucasian 69%, mean age 4.7 years) met the inclusion criteria. Average duration of EDT was 37.2 months. At the time of diagnosis, sixteen (31%) subjects presented with malnutrition, twenty seven (53%) were referred for feeding evaluations and fourteen (33%) referred to psychology. Multiple IgE- mediated food allergies were present in 35 (69%). Fifty-one required a gastrostomy tube to administer the elemental formula and 49% took the formula orally. Eleven subjects (22%) successfully reintroduced foods back in their diet and had specific food antigens identified. Single food antigens were identified in 82%, two food antigens in 9% and three or more foods in 9%. Cow's milk and wheat were the two most common antigens identified in this group. Twenty-one (42%) subjects continue on EDT and of these 86% have IgE-mediated food allergies. Of the remaining 20 subjects who discontinued EDT, 70% transitioned to topical steroid therapy, and 30% to elimination diet therapy. Overall, children on EDT had improved weight for age, height for age and BMI for age z-scores from when they started EDT.

Conclusion: Treatment with EDT is not easy and although remission is achieved in most subjects, subsequent reintroduction of foods leading to identification of specific food antigens is achieved in less than a third of subjects with the most subsequently transitioning to other treatment modalities. Although diet therapy for EoE over the past decade has evolved from EDT to multiple food elimination diets, EDT has a role in the management of nutritionally at risk children who are on restricted diets, feeding dysfunction and malnutrition.

510 ***RELATIONSHIPS BETWEEN CLINICAL CHARACTERISTICS, TREATMENT, AND HISTOLOGICAL REMISSION IN A PEDIATRIC EOSINOPHILIC ESOPHAGITIS COHORT.*** *Monica Shukla Udawatta[1], Lauren Gunderman[2], Brett Klamer[3], Danielle Orsagh-Yentis[1], Anne Trout[1], Brendan Boyle[1], John Russo[1], Elizabeth Erwin[4] [1]Pediatric Gastroenterology, Nationwide Children's, Columbus, OH; [2]Pedatric Residency, Nationwide Children's, Columbus, OH; [3]Biostatistics, Ohio State University, Columbus, OH; [4]Allergy & Immunology, Nationwide Children's, Columbus, OH*

Background: Eosinophilic Esophagitis (EoE) is a chronic immune mediated esophageal disease, characterized by symptoms related to esophageal dysfunction and histologically by eosinophilic predominant inflammation. Diagnosis of eosinophilic esophagitis (EoE) has increased by 64-75% at our institution since 2010, and there were 162 new patients in 2017. Therapeutic goals in children with EoE include resolution of esophageal symptoms, mucosal healing, and restoration of proper esophageal caliber, but individual patient responses to treatment vary.
Aim: To identify if there are any demographic or clinical factors that are associated with histologic remission on first follow up esophageal biopsy.
Methods: A retrospective chart review was performed on all children who were diagnosed and treated for EoE between December, 2015 and September, 2017 at Nationwide Children's Hospital in Columbus, OH who had a repeat esophageal biopsy within 6 months. Data collected included patient demographics, initial presenting symptoms, details of treatment, results of repeat esophageal biopsy during treatment, and food allergy status. Patients were treated with proton pump inhibitors, swallowed steroids, cow's milk elimination diet, or a combination of treatments.
Results: Over an 18 month period, 102 patients had a repeat esophagogastroduodenoscopy within six months of diagnosis. There were 59 males (58%), 97 were white (95%), and the median age was 12 years (range 1-23). The median peak esophageal eosinophil count at initial diagnosis was 50 eosinophils/high power field (eos/hpf) (range 10-110). Food impaction was the most frequent symptom (30%) followed by vomiting (20%), dysphagia (21%), and pain (20%). At first follow up esophageal biopsy, 35 patients (34%) were in histologic remission with <=15 eos/hpf. Firth's logistic regression

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model was used to evaluate the effects of age, sex, history of food impactions, treatment, and food allergy on remission status. Compared with PPI treatment, the odds of remission with swallowed steroids or a combination of treatments was 19.6 ($p<0.001$) and 11.1 ($p=0.001$) respectively. Remission in females was estimated to be 74% less likely ($p=0.02$) than males. Patients with food allergies had an estimated 63% decrease ($p=0.11$) in the odds for remission compared to patients without food allergies.
Conclusion: Together a few simple clinical characteristics and treatment may explain variability in response to treatment. Recognition of these factors that may relate to treatment outcomes provides a basis for future studies.

512 ***BARRIER DYSFUNCTION IS ASSOCIATED WITH MAST CELL ACTIVATION IN EOSINOPHILIC ESOPHAGITIS.*** *Amanda Wenzel[1], Lorena Ostilla[1], Ming Wang[1], Brooke Boyer[1], Kaitlin Keeley[1], Amanda Muir[3], Amir Kagalwalla[1], Barry Wershil[1], Piper Robida[2], Bruce Bochner[2], Kathryn Hulse[2], Marie-Pier Tetreault[2], Joshua Wechsler[1]*
[1]Pediatrics, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [2]Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL; [3]Pediatrics, Children's Hospital of Philadelphia, Philadelphia, IL
Introduction: The histopathology of Eosinophilic Esophagitis (EoE) involves epithelial barrier dysfunction. Mast cells are increased in the esophageal epithelium in EoE. They have been implicated in esophageal contractility, fibrostenosis and nerve signaling. However, a pathogenic role in barrier dysfunction remains unclear. We previously identified a correlation between mast cell counts, endoscopic furrows and histologic basal zone hyperplasia and dilated intercellular spaces suggesting a role for mast cells in mucosal abnormalities. While tryptase is ubiquitously expressed, esophageal mast cells are notable for high expression of carboxypeptidase A3 (CPA3), but low chymase. Tryptase and chymase function via the Protease-Activated Receptor (PAR2), while the epithelial target(s) of CPA3 is unknown. The effect of these proteases on the stratified esophageal epithelial barrier is unknown. We hypothesize that activated mast cells release proteases which act to disrupt the esophageal epithelial barrier via PAR2 leading to dilation of intercellular spaces through alteration in cell junctions.

Methods: We performed semi-automated microscopy on esophageal biopsies stained for tryptase by immunohistochemistry (IHC) using a previously reported pediatric cohort of EoE patients with inactive disease (<15 eosinophils per high powered field) and non-EoE controls. Imaging was performed on a Nikon 80i with a mechanized Prior stage. Stitching of individual 40x images and quantification was performed with NIS-Elements to determine intra-epithelial mast cell density for the whole biopsy. 3-D air-liquid interface (ALI) culture of immortalized human esophageal epithelial cells (EPC2-hTERT) are utilized to model the epithelial barrier. On day 13 (fully formed barrier), protease (carboxypeptidase A3, tryptase, or chymase) or IL-13 is added to the basal chamber. To evaluate the effect of human mast cell (HuMC) degranulation, HuMCs are isolated from surgical skin specimens or CD34-derived PBMCs and cultured to yield a pure population of mast cells (confirmed by flow cytometry). Conditioned media is generated from HuMCs activated for 3 hours with IgE/anti-IgE or EoE-relevant stimuli (eg. IL-4,). Transepithelial electrical resistance (TEER) is measured at baseline and 24 hours following exposure to protease or conditioned media. Specific pathways (eg. PAR2) will be assessed by pre-treatment with receptor blockers. Conditioned media will be assessed for protease concentration. Histologic assessment of H&E-stained sections will be performed to quantify basal zone hyperplasia and dilation of intercellular spaces. Readouts will include IHC and immunofluorescence (IF) for structural/barrier proteins and tight junctions including Desmoglein-1 and E-cadherin, along with markers of cell turnover and differentiation. Epithelial cells will be assessed for gene expression changes via RNA sequencing to determine candidate pathways affected by protease stimulation; qRT-PCR will be performed for validation. Protease stimulation will similarly be assessed in EoE and control patient derived primary epithelial cell generated 3-D cultures. Separately, RNA sequencing of single cell suspensions of esophageal biopsies utilizing the 10x Genomics platform is being performed to identify transcriptomic differences of individual mast cells associated with treatment. Analysis performed with R-Studio (1.2.1335) using Seurat (v3).

Results: Whole biopsy mast cell density had a moderate correlation with peak mast cell counts ($r=0.56$-0.72, $p<0.001$). Among children with inactive EoE, those with mucosal abnormalities such as furrowing, basal zone hyperplasia or dilated intercellular spaces had increased mast cell density (24 [14,58] MC/mm2) compared to those with normal mucosa (11 [7,19] $p<0.05$) and Non-EoE controls (7 [2,15], $p<0.01$). In preliminary ALI experiments, TEER was significantly reduced in response to media conditioned from IgE/anti-IgE skin mast cell activation along with IL-13. ALI experiments are ongoing with regards to basal stimulation by individual proteases. We identified a distinct mast cell cluster by single cell RNA-Sequencing characterized by tryptase and CPA3 expression. We found similar RNA levels of tryptase but reduced CPA3 among individual mast cells from patients treated with diet elimination (n=1), but not swallowed steroids (n=3), compared to patients with active EoE (n=2).

Conclusion: We developed a methodology for whole biopsy mast cell quantification, which correlated with peak counts.

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Mast cells are increased in EoE patients with mucosal abnormalities despite low eosinophils. Mast cell activation leads to mediator release which contributes to barrier dysfunction in the mucosa. We are assessing the contribution and downstream targets of individual proteases. CPA3 may be a marker of mast cell activation and appears to be uniquely downregulated among mucosal mast cells in response to diet elimination.

513 ***COWS MILK ELIMINATION IMPROVES EOSINOPHILIA AND MASTOCYTOSIS IN CHILDREN WITH EOSINOPHILIC ESOPHAGITIS.*** *Joshua Wechsler[1], Sally Schwartz[1], Nicoleta Arva[2], Lorena Ostilla[1], Kwang-Youn Kim[3], Elizabeth Gray[3], Melanie Makhija[1], Maria Manuel-Rubio[1], Ronda Shaykin[1], Kaitlin Keeley[1], Katie Amsden[1], Scott Bolton[5], Hector Melin-Aldana[2], Barry Wershil[1], Amir Kagalwalla[1,4]. [1]Pediatrics, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [2]Pathology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [3]Preventive Medicine, Northwestern University, Chicago, IL; [4]Pediatrics, John H. Stroger, Jr. Hospital of Cook County, Chicago, IL; [5]Pediatrics, Cincinnati Children's Hospital, Cincinnati, OH*

Background: Eosinophilic esophagitis (EoE) is mediated by food antigen(s). The inflammatory infiltrate consists of eosinophils and mast cells. Our recent work identified four food elimination as efficacious treatment that improves eosinophila, endoscopic abnormalities and symptoms. The improvement of eosinophilia and mastocytosis with cow's milk, the leading trigger of EoE, is unknown.

Aims: The primary objective for this prospective study was to assess the efficacy of single food milk elimination (ME) diet in inducing eosinophilic remission in children with EoE. The effect of cow's milk elimination on mastocytosis was assessed as a secondary objective.

Methods: Children with a diagnosis of EoE, based on 2011 consensus guidelines were enrolled in this prospective study. Families were educated on the elimination of cow's milk from their diet, and after 6-8 weeks of ME, patients underwent upper endoscopy with biopsies to determine treatment response. Symptoms were assessed prior to elimination of cow's milk and at the time of endoscopy. Endoscopy features and the EoE histologic scoring system (EoE-HSS) were assessed pre and post-treatment from proximal, mid and distal esophageal biopsies. Histologic remission was defined as peak eosinophil count <15 eosinophils per high power field (eos/hpf) as determined by a GI pathologist. Immunofluorescence was performed for tryptase, carboxypeptidase A3, and CD63 on archived slides, imaged with a Nikon Ti2 microscope, and quantified with NIS-Elements.

Results:41 children (76% male, 9+/-4 years, 88% white) underwent endoscopy with biopsy after 8 weeks of ME. Histologic remission was demonstrated in 21 (51%) children with a decrease in esophageal eosinophil count from 50 [IQR 35,70] eos/hpf to 1 [IQR 0,6] eos/hpf ($p<0.0001$). Mast cells were significantly reduced in histologic responders ($p<0.001$) and non-responders ($p<0.001$). A significant improvement was noted in epithelial and eosinophil scores using the EoE-HSS. Mast cell density correlated with basal zone hyperplasia ($r=0.64$, $p<0.001$), dilated inter-cellular spaces ($r=0.49$, $p<0.01$), and furrows (231 cells/mm^{2}vs 108, $p=0.051$). Exudates improved in 58% ($p< 0.001$), furrows in 31% ($p<0.003$), and edema in 31%, ($p<0.02$). There was a 25% reduction in the overall number of symptoms ($p<0.03$), particularly, chest pain (70%, $p<0.05$), dysphagia (65%, $p<0.004$), and pocketing/spitting out food (70%, $p<0.05$).

Conclusions: Empiric single food elimination of cow's milk is effective in children with EoE and induces clinical and histological remission, along with improvement in mast cell inflammation. ME diet is a viable option for children interested in diet elimination but find exclusion of multiple foods too restrictive and impractical.

514 ***INTERLEUKIN-13-MEDIATED RELEASE OF MITOCHONDRIAL DNA FROM ESOPHAGEAL EPITHELIAL CELLS: A NOVEL NONINVASIVE BIOMARKER FOR EOSINOPHILIC ESOPHAGITIS.*** *Mary Grace Murray[1], Julie Gang[1], Reshu Saxena[1], Alain Benitez[2], Maureen DeMarshall[3], Gary Falk[3], Amanda Muir[2], Kelly Whelan[1]. [1]Fels Institute for Cancer Research & Molecular Biology, Temple University, Philadelphia, PA; [2]Children's Hospital of Philadelphia, Philadelphia, PA; [3]University of Pennsylvania, Philadelphia, PA*

Introduction: Eosinophilic esophagitis (EoE) diagnosis and management rely upon endoscopy which is costly and requires anesthesia, substantiating the need for identification of noninvasive disease biomarkers. Genetic evidence supports a role for mitochondria in EoE; however, the significance of mitochondria in EoE pathobiology and disease management remains elusive.

Methods: Mitochondrial content in esophageal biopsies was evaluated by transmission electron microscopy (TEM) and immunohistochemistry (IHC) for mitochondrially-encoded cytochrome oxidase I (MTCO1) in active EoE or control subjects with normal pathology. Circulating mitochondrial DNA (mtDNA) was evaluated in serum from patients with active EoE, inactive EoE or gastroesophageal reflux disease (GERD) as well as control subjects by quantitative PCR for the mitochondrially-encoded gene *ND1*. Mitochondrial DNA level and release was determined in immortalized esophageal keratinocytes, primary human EoE and non-EoE epithelial cultures, and the food allergen-mediated MC903/Ovalbumin

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(OVA) murine EoE model.

Results: Increased MTCO1 expression was detected in esophageal epithelium of active EoE patients (n=29) as compared to controls (n=7; $p<0.05$). TEM corroborated increased mitochondria in epithelium of active EoE patients and revealed extracellular structures consistent with mitochondria in the inter-epithelial cell space. Evaluation of serum demonstrated that active EoE patients (n=13) display a significant increase in circulating mtDNA as compared to controls (n=9) and inactive EoE (n=9) or GERD patients (n=3; $p<0.01$). To investigate mechanisms underlying release of mtDNA from esophageal epithelial cells, immortalized esophageal keratinocytes were stimulated with the EoE-relevant cytokines, tumor necrosis factor (TNF)-a, Interleukin (IL)-4, IL-5, IL-13 or IL-1b. Upregulation of mtDNA was uniquely identified in IL-13-stimulated cells (n=6; $p<0.05$) and correlated with increased oxidative stress and mtDNA release into culture medium. Increased mtDNA level was further demonstrated in primary cell cultures from EoE patients and mice with MC903/OVA-induced EoE.

Conclusions: These studies demonstrate for the first time that EoE features increased mitochondria in esophageal epithelium and peripheral circulation. Our findings support circulating mtDNA as a novel non-invasive biomarker for EoE with great potential to improve patient diagnosis and monitoring. These data suggest that IL-13 in the EoE inflammatory milieu uniquely facilitates upregulation and release of mtDNA. As increased mtDNA is recapitulated in a murine model of EoE, primary EoE cell cultures and in IL-13-stimulated esophageal keratinocytes in vitro, future studies will use this comprehensive experimental platform to define the detailed molecular mechanisms underlying this phenomenon and its contribution to EoE pathobiology.

515 ***ESOPHAGEAL COMPLIANCE CAN REFLECT THE SEVERITY OF FIBROSIS AND EPITHELIAL REMODELING IN PEDIATRIC EOSINOPHILIC ESOPHAGITIS.*** *Prerana Williamson[1,2,3], Armen Gharibans[3,4,5], Jacqueline Barsamian[3], Ranjan Dohil[1,2,3], Robert Newbury[3,6], Seema Aceves[3,7,8], Hayat Mousa[1,2,3]. [1]Department of Pediatrics, University of California San Diego, San Diego, CA; [2]Division of Pediatric Gastroenterology, University of California San Diego, San Diego, CA; [3]Rady Children's Hospital, San Diego, CA; [4]Department of Surgery, University of Auckland, Auckland, New Zealand; [5]Auckland Bioengineering Institute, University of Auckland, Auckland, New Zealand; [6]Department of Pathology, University of California San Diego, San Diego, CA; [7]Department of Medicine and Pediatrics, University of California San Diego, San Diego, CA; [8]Division of Allergy and Immunology, University of California San Diego, San Diego, CA*

Rationale: Eosinophilic esophagitis (EoE) is an immune-mediated allergic disease that often manifests clinically with dysphagia, strictures and food impactions. Ongoing inflammation in EoE results in epithelial remodeling and fibrosis of the esophagus. Fibrosis in EoE has been measured by evaluating the lamina propria (LP) layer of esophageal tissue biopsies. In cases where LP is not obtained, epithelial remodeling and bazal zone hyperplasia can help to quantify severity of disease. EndoFLIP (endoluminal functional lumen imaging probe) is a tool that can measure esophageal compliance and distensibility. We aimed to investigate the relationship between esophageal compliance and esophageal fibrosis, epithelial remodeling, and patient and parent reported symptoms.

Methods: We analyzed 70 EndoFLIP studies done on 54 patients while undergoing upper endoscopy with biopsies (EGD). Active EoE, inactive EoE and controls were defined as having average panesophageal eosinophilia > 15 eos/hpf, < 15 eos/hpf and 0 eos/hpf respectively. Segmental esophageal compliance as well as average panesophageal compliance were calculated for each patient and at each setting. We quantified LP fibrosis and epithelial remodeling scores (ERS) on esophageal mucosal biopsies. Prospectively, we obtained Pediatric Eosinophilic Esophagitis Symptoms Scores (PEESS v2.0) as reported separately by parents and patients. Spearman's correlation was used to determine the association between compliance and fibrosis, ERS and PEESS.

Results: 35 patients were male and 19 were female. Patient ages ranged from 4 years old to 18 years old. 9 patients underwent repeat EndoFLIP studies. At the time of procedure, 30 subjects were found to have active EoE, 22 with inactive EoE and 18 with no esophageal eosinophilia (controls). There was significant difference between compliance in active EoE and control patients when measured in the proximal esophagus and overall ($p=<0.01$ for both). Overall compliance correlated negatively with proximal and average fibrosis scores ($p<0.05$ for both), as well as proximal ($p=0.015$), middle ($p=0.004$) and average ERS ($p=0.008$). Compliance in the proximal esophagus negatively correlated with middle and distal fibrosis scores ($p=0.01$ and 0.005 respectively), and average and segmental ERS ($p<0.05$ for all). Compliance in mid-esophagus correlated negatively with proximal fibrosis score and average, proximal and mid-esophagus ERS ($p<0.05$ for all). Distal compliance did not significantly correlate with fibrosis, ERS or PEESS. Symptom scores reported by parents had a weak positive correlation with compliance.

Conclusions: Panesophageal and proximal esophageal compliance can distinguish between active EoE patients and control. Activity of EoE disease does not alter compliance. Lower overall, proximal and middle compliance reflected higher fibrosis

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scores and epithelial remodeling scores measured in at least one level of the esophagus. Total symptom scores reported by either parent or patient did not correlate with abnormal compliance. These data suggest that impaired esophageal compliance may point towards worsening fibrosis and epithelial remodeling in patients with EoE, and reported symptoms likely do not accurately mirror esophageal function as assessed on EndoFLIP.

516 ***ANTI-SIGLEC-8 ANTIBODY REDUCES EOSINOPHIL AND MAST CELL INFILTRATION IN A MOUSE MODEL OF EOSINOPHILIC GASTRITIS: A NOVEL THERAPEUTIC APPROACH FOR EOSINOPHILIC GASTROINTESTINAL DISEASES.*** *Bradford Youngblood*, *Emily Brock*, *John Leung*, *Christopher Bebbington*, *Nenad Tomasevic. Allakos Inc*, *Redwood City*, *CA*

RATIONALE: Mast cells and eosinophils are known for their effector roles in driving inflammation and allergic disease. Pathologic accumulation and over-activation of mast cells and eosinophils have been implicated in certain chronic inflammatory diseases in the GI tract including eosinophilic esophagitis, gastritis, gastroenteritis, and colitis. Collectively termed as eosinophilic gastrointestinal disorders (EGIDs), these medical conditions can lead to reduced quality of life due to debilitating symptoms like dysphagia, abdominal pain, nausea, vomiting and diarrhea. Treatment options for EGIDs have limited efficacy, significant side effects, and are often inappropriate for chronic use. Siglec-8 is an inhibitory receptor selectively expressed on human eosinophils and mast cells. Previous studies have demonstrated that anti-Siglec-8 monoclonal antibodies (mAbs) deplete blood and tissue eosinophils and inhibit mast cell activation. This study examines the activity of an anti-Siglec-8 mAb in a mouse eosinophilic gastritis (EG) model.

METHODS: The activity of an anti-Siglec-8 mAb was tested in an ovalbumin (OVA) induced EG mouse model in Siglec-8 transgenic mice. This model is characterized by an increase in eosinophils, mast cells, and inflammatory markers in the stomach. Mice were systemically sensitized with OVA for 28 days followed by 6 intra-gastric challenges with OVA every 2 days starting on day 28. An anti-Siglec-8 or isotype-matched control mAb was dosed therapeutically on day 32. The study was terminated after the final OVA challenge on day 39. At study termination, local and systemic inflammation was measured by flow cytometry, Luminex (Millipore) and gene expression analyses.

RESULTS: Systemic sensitization and intra-gastric challenge using OVA induces EG-like phenotype. OVA-sensitized and challenged mice also displayed eosinophil and mast cell infiltration in the mesenteric lymph nodes (MLNs) when compared to the sham treated group. Therapeutic treatment with an anti-Siglec-8 mAb significantly reduced the number of eosinophils and mast cells in the stomach (Figure 1A and B) and MLNs compared to the isotype control mAb. In addition, mice treated with an anti-Siglec-8 mAb had reduced levels of inflammatory mediators in gastric tissue and blood compared to isotype control treated mice.

CONCLUSIONS: Therapeutic treatment with anti-Siglec-8 mAb significantly reduced EG in mice as evidenced by a reduction in gastric eosinophils, mast cells, and inflammatory mediators in the stomach. These data provide a strong rationale for evaluating the effect of an antibody to Siglec-8 in patients with EGIDs and other inflammatory GI diseases.

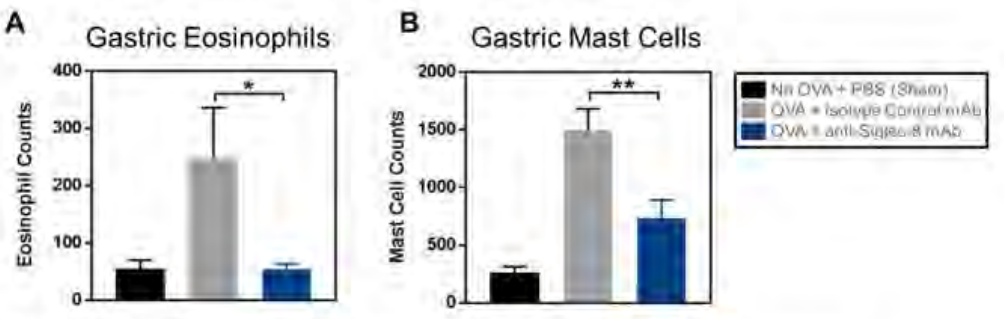


Figure 1: Mice sensitized and challenged intra-gastrically with OVA displayed increased numbers of mast cells and eosinophils in the stomach (gray) compared to Sham treated animals (black). Anti-Siglec-8 treated animals (blue) displayed significantly reduced eosinophils (A) and mast cells (B) in the gastric tissue compared to isotype treated control mice (gray). Gastric eosinophils and mast cells were analyzed by flow cytometry at study termination on day 39. P values were generated using a Mann Whitney U test (Graph Pad Prism) * = $p<0.05$; ** = $p<0.01$

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517 ***EOSINOPHILIC ESOPHAGITIS AND GASTRITIS PATIENT BIOPSIES HAVE HIGH LEVELS OF ACTIVATED EOSINOPHILS AND MAST CELLS THAT ARE INHIBITED BY AK002.*** *Bradford Youngblood[1], Emily Brock[1], Christopher Bebbington[1], Nenad Tomasevic[1], Henrik Rasmussen[1], Kathryn Peterson[2]. [1]Medical Affairs, Allakos Inc, Redwood City, CA; [2]University of Utah, Salt Lake City, UT*

BACKGROUND: Patients with eosinophilic gastrointestinal diseases (EGIDs) have debilitating symptoms including dysphagia, abdominal pain, and diarrhea. While the pathogenesis of EGIDs is primarily thought to be driven by eosinophils, there is increasing evidence for the involvement of mast cells. Siglec-8 is an inhibitory receptor selectively expressed on eosinophils and mast cells. AK002 is a humanized, non-fucosylated IgG1 monoclonal antibody to Siglec-8. Here we characterize the immune cell population & activation state of EGID tissue and evaluate the effects of AK002 on EGID tissue.

METHOD: Single-cell suspensions were prepared from patients diagnosed with eosinophilic esophagitis (EoE) and gastritis (EG). Flow cytometry was performed to characterize eosinophils and mast cells. The *ex vivo* activity of AK002 was evaluated against eosinophils and mast cells in dissociated EGID biopsies.

RESULTS: EoE and EG biopsies had significantly increased mast cells and eosinophils levels compared to non-diseased control samples. Siglec-8 was highly expressed on all mast cells and eosinophils. EoE and EG mast cells and eosinophils also displayed increased expression of activation and degranulation markers, indicative of an activated state. Consistent with the atopic nature of EGIDs, mast cells from EoE and EG patient biopsies displayed high levels of surface-bound IgE and increased FcεRI expression. Lastly, AK002 inhibited FcεRI-IgE mediated mast cell activation in *ex vivo* dissociated EGID biopsies.

CONCLUSION: The high levels of activated eosinophils and mast cells found in EoE and EG biopsies suggest that these cells both play a pathogenic role in EGIDs. Targeting eosinophils and mast cells with AK002 represents a novel approach to treat EGIDs.

518 ***COMPARING OUTCOMES FOR FEEDING TUBE-DEPENDENT CHILDREN WITH AND WITHOUT ORAL AVERSION IN AN INTENSIVE INTERDISCIPLINARY TREATMENT PROGRAM.*** *Nancy Bandstra[1,2], Parker Huston[3,4], Kate Zvonek[1], Carly Heinz[1], Emily Piccione[1]. Intensive Feeding Program, Helen DeVos Children's Hospital, Grand Rapids, MI; [2]Departments of Psychiatry and Pediatrics & Human Development, Michigan State University, East Lansing, MI; [3]Comprehensive Pediatric Feeding Program, Nationwide Children's Hospital, Columbus, OH; [4]Department of Pediatrics, The Ohio State University, Columbus, OH*

INTRODUCTION: Feeding challenges in children are common, at times reaching a severity that requires the placement and initiation of enteral feedings. In addition to decreasing children's natural exposure to typical eating experiences, use of enteral feedings has also been shown to increase children's resistance to oral feedings. Furthermore, children with a long history of unpleasant or painful feeding experiences (e.g., coughing, gagging, reflux, frequent emesis) often develop strong negative associations with mealtimes, and eventually become conditioned to fear, and thus avoid, the presentation of any stimuli associated with food or drink (e.g., feeding utensils). In milder cases, children with this type of history develop what could be described as *food aversion*, exhibiting distress and resistance when presented with food or liquid or even when placed within the mealtime context (e.g., in a highchair). In more severe cases, children may also develop *oral aversion*, exhibiting defensive behavior and a high degree of distress not just with the presentation of oral feeding expectations, but also in response to *non-nutritive* extra- or intra-oral stimulation (e.g., face-washing, teethbrushing). As a result, oral aversion can become a significant treatment barrier for tube-dependent children. Unfortunately, there has not yet been a distinction made between children who present with food aversion and those that present with the additionally complicating barrier of oral aversion in the research to date. While the greater pediatric feeding literature supports behavioral-based interdisciplinary intervention to address a broad array of feeding challenges, including food aversion, it remains unclear whether these positive clinical outcomes are applicable to the subset of children who also present with oral aversion. The present study seeks to fill this gap by describing and comparing the clinical outcomes of tube-dependent children with and without oral aversion during and following intensive interdisciplinary intervention.

METHODS: The current study compares the treatment outcomes between 18 feeding tube-dependent children with significant oral aversion (9 boys; mean age = 46.7 months, SD = 20.0 months, range 11.4 – 89.3 months) and 29 non orally-averse clinical controls (19 boys; mean age = 45.5 months, SD = 28.7 months, range 19.9 – 173.0 months). All children completed intensive interdisciplinary feeding treatment, receiving three daily therapeutic feeding sessions, completed 5 days per week across a 6- to 8-week day treatment admission.

RESULTS: Analyses revealed significant improvements in all measured treatment outcomes for both patient groups, including children's behavioral rates of acceptance and maladaptive mealtime behavior. Significant increases in oral intake

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were also observed across both groups, with tube utilization decreasing, on average, by 76.2% for orally-averse and by 64.3% for non orally-averse children by program discharge. Post-hoc analyses were completed with the subset of children who were 100% tube-weaned by discharge, as differences were observed across patient groups. While 61.1% of the orally-averse children (n = 11) completely tube-weaned by discharge, only 27.6% of the non orally-averse children (n = 8) achieved the same outcome (p = 0.049).
CONCLUSIONS: Results demonstrate the effectiveness of intensive interdisciplinary intervention for both groups of children, highlighting that orally-averse children, believed to be an especially challenging subset of pediatric feeding patients, demonstrate similarly-positive treatment responses. In fact, orally averse children demonstrated significantly greater reductions in tube utilization following discharge when compared with their non orally-averse clinical peers in the present study. Possible reasons for this enhanced treatment response, as well as clinical implications of the findings, will be discussed. A case example will also be included in the presentation.

519 ***THE EFFECT OF POST-DISCHARGE TELEMEDICINE SESSIONS FOLLOWING TREATMENT IN AN INTENSIVE MULTIDISCIPLINARY FEEDING PROGRAM.*** *Jazmine Bustos[1], Robyn Robinson[1], Cindy Kim[2], Jessica Brown[3], Elisa Ornelas[1], Mitchell Katz[1]. [1]Gastroenterology/Nutrition, CHOC Children's, Orange , CA; [2]Psychology, CHOC Children's, Orange, CA; [3]Clinical Nutrition, CHOC Children's, Orange, CA, Jazmine Bustos, NP, Robyn Robinson, NP, Cindy Kim, PhD, Jessica Brown, RD, Elisa Ornelas, BA, and Mitchell Katz, MD, CHOC Children's Hospital, Orange, California*
Background: Parents frequently report increased stress when transitioning from an intensive inpatient feeding program to the home environment. Previous telemedicine studies have described sustained outcomes from hospital care to home, greater satisfaction with care received and more consistent support from the hospital team. This study evaluates transitional stress scores and the effect of telemedicine as a post-discharge intervention following a three week inpatient feeding admission.

Methods: This is a prospective study among patients discharged from the CHOC Children's Multidisciplinary Feeding Program between March and August 2019.

Two groups of families were recruited during the admission. Because of licensure requirements, the experimental group is a convenience sample of families who reside in the state of California. They agreed to three follow up sessions within one month conducted over Zoom© communication software. These sessions last between 25-45 minutes focusing on two disciplines at a time including psychology, social work, occupational therapy, speech pathology, registered dietitians and nurse practitioners. The control group is comprised of non-California residents who did not receive telemedicine follow up.

Both groups agreed to complete the Post-Discharge Pediatric Coping Difficulty Scale (PCDS) at one week and three months following discharge. In addition, the telemedicine group also completed a post-telemedicine satisfaction survey.

Additional patient variables were collected from both groups including age, gender, current diagnoses and nutritional anthropomorphic measurements.

Statistical Methods: Scores from the PCDS and the satisfaction survey were analyzed with analysis of variance tests using SPSS software. Descriptive statistics were used to obtain mean and standard deviations of demographic variables.

Results: At this time six families have completed the study, four in the experimental group and two controls. Combined PCDS scores at 1-week post-discharge indicated moderate stress (6.0 out of 10), need for emotional support (5.0 out of 10), and at-home adjustment was rated (6.5 out of 10). The 3-month post-discharge collection of PCDS scores and telemedicine satisfaction ratings are in progress.

520 ***THE POSSIBLE EFFECT OF MESENTERIC TISSUE OXYGENATION DURING THE FIRST ENTERAL FEEDING ON DEVELOPMENT OF NECROTIZING ENTEROCOLITIS IN PRETERM INFANTS .*** *Merih Cetinkaya Neonatology, Health Sciences University, Kanuni Sultan Suleyman Training and Research Hospital, Istanbul, Turkey*
Aim: Necrotizing enterocolitis (NEC) is an important cause of morbidity and mortality in preterm infants. Prematurity, abnormal bacterial colonization and feeding were reported as the main risk factors in the multifactorial pathogenesis. There is limited data about the role of splanchnic oxygenation status during the first enteral feeding. Therefore, the aim of this study was to determine the mesenteric tissue oxygen saturation values before, during and after the first enteral feeding and to evaluate the effect of these values on development of NEC in preterm infants.

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Methods: A total of 105 preterm babies with ≤ 32 gestational weeks were included in this prospective study. The continuous monitoring of the mesenteric tissue oxygenation status was performed before, during and 3 hours after the first feeding by using near-infrared spectroscopy (NIRS). Infants with hemodynamically significant patent ductus arteriosus, hypotension, severintraventricular bleeding, and congenital anomalies were excluded from the study.
Results: The mean gestational week and birth weight of the study group were 28.8±2.1 weeks, and 1215±387 g, respectively. The first enteral feeding was started at 2.4±1.4 days with breast milk in the 85% of infants. A total of 17 infants (16%) developed NEC (53% stage 1, 35% stage 2 ad 12% stage 3). The demographic and feeding characteristics of the infants with and without NEC were similar. The mean mesenteric tissue oxygen saturation levels of the infants that developed NEC were significantly lower both before and one hour after feeding (56.1±3.4 vs. 34±8.8, and 47.4±3.3 vs 37.8±10.9, respectively) compared with infants that did not develop NEC.
Conclusions: Lower mesenteric tissue oxygenation values measured before, and one hour after enteral feeding was associated with subsequent NEC development. We suggest that lower mesenteric tissue oxygenation during continuous monitoring of first enteral feeding may be used to predict NEC development during follow-up, especially in the infants with risk factors.

521 ***PEDIATRIC FEEDING DISORDER IN CHILDREN WITH SHORT BOWEL SYNDROME.*** *Vikram Christian[1], Megan Van Hoorn[2], Cassandra Walia[2], Alan Silverman[1], Praveen Goday[1]. [1]Pediatrics, Medical College of Wisconsin, Milwaukee, WI; [2]Clinical Nutrition, Children's Hospital of Wisconsin, Milwaukee, WI*
Introduction: Short Bowel Syndrome (SBS) is the most common cause for pediatric intestinal failure. While commonly encountered in practice, difficulty in advancing oral feeding in this population has not been described in the literature. We aimed to characterize the nutrition support provided to these patients and to study the prevalence of pediatric feeding disorder (PFD) in this population over time. We also aimed to study the impact various factors may pose on the persistence of PFD.

Methods: This was a single-center retrospective study. We studied patients who met criteria for diagnosis of SBS (residual small bowel length <25% of that predicted or the need for parenteral nutrition support for >42 days after intestinal resection) within the first six months of life and were followed by our tertiary care Gastroenterology Clinic for at least one year after the initial diagnosis was made.
At our facility, the standard of practice with SBS is to provide continuous enteral nutrition (EN) and increase the volume until enteral autonomy is attained. Oral feedings are simultaneously provided and advanced as tolerated. Although initially run continuously, as adaptation occurs, we transition delivery of EN to bolus feeds. As oral skills advance, EN is gradually weaned and discontinued. Patients who require parenteral nutrition support (PS) or EN are seen more frequently in our clinic than parents who are fed orally.
In our study, patient charts were reviewed, and data collected in 3-month intervals through 2 years of age, and every 6 months through 4 years of age. In addition to baseline demographic information, anthropometric data, and details regarding nutrition support were recorded and analyzed.

We defined PFD disorder based on recently established criteria:
- Reliance on enteral feeds to sustain nutrition
- Reliance on oral supplements to sustain nutrition
- Feeding skill dysfunction resulting in not consuming an age-appropriate diet

Results: A total of 28 patients were studied, of which 13 (46.4%) were female. Twenty-three patients (82.1%) were premature and 16 (57.1%) had an underlying etiology of necrotizing enterocolitis (NEC). Median small bowel remaining was 25% of expected length for age (IQR: 16.6, 33.9). Eleven (39.2%) patients had significant vomiting and/or required post-pyloric feeds. Five (17.9%) patients had presumed food allergies.

Of the 28 patients, 4 are deceased (all on parenteral nutrition support [PS] at the time of death). Twenty-one patients were successfully weaned off PS; 3 remain on PS at the time of the study. The median age of discontinuation of PS was 10.8 months (IQR: 6.0, 18.4).

Of the 21 patients who were weaned off PS, 57.1%, 81.0%, 90.5% and 100.0% achieved this by 12, 24, 36, and 48 months of age, respectively.

Of the 21 patients who were weaned off PS, 3 transferred care while on EN, 3 remain on EN under our care, and 15 were successfully weaned to an oral diet. The median age of discontinuation of EN was 15.7 months (IQR: 11.3, 42.0).

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Of the 15 patients who were weaned off EN, 26.7%, 60.0%, 66.7% and 100.0% achieved this by 12, 24, 36, and 48 months, respectively.
Throughout the study, across all age intervals median weight Z-score was -1.1 (IQR: -1.9, -0.3), median length/height Z-score was -2.0 (IQR: -2.7, -1.1), and median weight-for-length/BMI Z score was 0.2 (IQR: -0.5, 0.7).

Prevalence of PFD using all three criteria was 100.0%, 76.5%, 68.8% and 70.0% at 1, 2, 3, and 4 years of age, respectively. Since enteral feeding can be considered iatrogenic in this population, the prevalence of feeding disorders using only the other two criteria (reliance on oral supplements or failure to consume an age-appropriate diet) was 80.0%, 70.6%, 62.5%, and 50.0% at 1, 2, 3, and 4 years of age, respectively.

Conclusion: PFD is prevalent in children with SBS. While the prevalence does decrease over time, it is likely that children with PFD will continue to require more medical attention than children that do not. We are assessing the role of associated factors such as prematurity, history of significant emesis and history of food allergies in children with SBS who present with PFD.

	1 year	2 years	3 years	4 years
Patients seen in this interval	25	17	16	10
N of patients with FD	25	13	11	7
Prematurity - n (%)	84.0%	69.2%	81.8%	71.4%
Completed weeks of gestation - median (IQR)	30 (25-34.3)	32 (25-35)	25 (25-32.8)	29 (25-33.8)
Underlying etiology - NEC - %	56.0%	53.9%	63.6%	42.9%
% SB left based on age - median % (IQR %)	24.8 (16.1-28.7)	26.6 (14.9-34.7)	21.7 (14.9-29.0)	18.8 (14.9-29.8)
Colon and ICV - intact - %	44.0%	46.2%	45.5%	42.9%
Food allergies - %	16.0%	15.4%	18.2%	28.6%
Significant vomiting/requirement of post-pyloric feeding - %	40.0%	38.5%	27.3%	14.3%
Underwent STEP procedure - %	20.0%	15.4%	18.2%	28.6%
FD Criteria Met				
Criteria 1: Tube fed - n	21	10	7	5
Criteria 2: On oral calorie supplement/Not on developmentally appropriate diet - n	20	12	10	5

Characteristics of patients with feeding disorders

525 ***UTILIZING THE INTERNATIONAL DYSPHAGIA DIET STANDARDIZATION INITIATIVE (IDDSI) FLOW TEST TO ASSESS THICKENED FEEDING FOR INFANTS.*** *Andrea Armellino[5], Carolyn Kryzer[4], Molissa Hager[1], Beth Ruechel[2], Laura Steinauer[3], Erin Alexander[1], Rayna Grothe[1]. [1]Department of Pediatric Gastroenterology and Nutrition, Mayo Clinic, Rochester, MN; [2]Department of Pediatric Gastroenterology and Nutrition, Mayo Clinic, Rochester, MN; [3]Department of Pharmacy, Mayo Clinic, Rochester, MN; [4]Nutrition, United Hospital District, Blue Earth, MN; [5]Department of Endocrinology, Diabetes and Nutrition, Mayo Clinic, Rochester, MN*

Introduction: Thickened feeds are a common therapy for the treatment of gastroesophageal reflux (GER) and dysphagia-associated aspiration/penetration in infants. Thickened feeds have been associated with adverse effects in the infant. There is a lack of a consensus on the protocol for thickening feeds for infants, including the specific thickener, time from thickening to feeding, and amounts needed to achieve the desired response. Liquids designated as honey thick or nectar thick based upon National Dysphagia Diet (NDD) specifications have been shown to have widely variable viscosities. The International Dysphagia Diet Standardization Initiative (IDDSI) was developed to formulate standardized terminology and definitions to describe thickened foods and liquids for use in all age groups. The IDDSI flow test is a gravity flow test that classifies liquids based on their rate of flow. This technique provides a standardized measuring tool that can be used to assess liquid thickness and is easily performed by providers in the clinical setting.

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Objective: The goal of this study is to utilize the IDDSI flow test to evaluate commonly used thickeners in the infant population with the following objectives: 1) Assess for consistency of flow rate over time after mixing the thickener with the liquid, and 2) Use these flow rate tests as an example to educate prescribing providers in the use of the IDDSI flow test.
Methods: Flow rates of thickened liquids were obtained using the IDDSI flow test. To complete this flow test, the evaluator's finger is positioned over the standard 10 mL syringe nozzle and then the syringe is filled with 10 mL of the thickened liquid. The finger is then removed from the nozzle at the same time as a stopwatch is started. After 10 seconds, the finger is replaced to stop the flow of liquid from the syringe, and the amount of remaining liquid in the syringe is assessed. The scoring system is based on the amount of fluid remaining in the syringe after 10 seconds and is as follows: Level 0-THIN- defined as all liquid has flowed through the syringe; level 1- SLIGHTLY THICK- there is between 1 and 4 mL remaining; level 2-MILDLY THICK- there is 4 to 8 mL remaining; level 3-MODERATELY THICK- there is more than 8 mL remaining and level 4-EXTREMELY THICK- no liquid flows through. To perform the IDDSI flow test standard term formula mixed from powder at 20 kcal / ounce was assessed using three common thickeners: pulverized infant oat cereal (PIOC), a starch-based commercial thickener (SBCT), and a gum-based commercial thickener (GBCT). Human milk was assessed using only a GBCT. Flow tests were done at 5, 15, 25, and 60 minutes after thickening the formula. The average of 5 tests for each thickener at each time interval was determined. Manufacturer directions were used to thicken the formula with the GBCT and SBCT products. The formula recipe with PIOC was obtained after reviewing general consensus on the Ped RD listserv. The recipe used for formula and SBCT was 2 ounces of formula with 1.5 teaspoons thickener. The GBCT recipe used was 3 ounces formula or human milk mixed with 2 scoops (from manufacturer) thickener. The PIOC recipe was 2 ounces formula with 1 tablespoon thickener. The thickener products were added to the formula and shaken for 15 seconds, which is the recommendation of the SBCT product. Human milk mixtures were mixed gently for 15 seconds due to the concern for the effect of shaking on the integrity of the milk.
Results: The mixtures of formula with PIOC were moderately thick at all time intervals tested. The mixtures of formula with SBCT were mildly thick at 5 and 15 minutes then increased to moderately thick at 25 minutes and increased further to extremely thick by 60 minutes. The mixtures of formula with GBCT were slightly thick at 5 minutes and increased to mildly thick at 15, 25 and 60 minutes. The mixtures of human milk with GBCT were thin at 5 minutes, slightly thick at 15 minutes and increased to mildly thick by 25 minutes and remained mildly thick at 60 minutes. There were no mixtures that met mildly thick criteria across all time intervals measured. All samples thickened with PIOC were noted to be heterogeneous in appearance and there was intermittent clogging of the syringe with PIOC. There was no significant variability between the flow rates of each of the 5 tests done at each time interval with all three of the thickeners tested.
Conclusion: This study demonstrates the time sensitivity of commonly used thickeners in the infant population. The IDDSI flow test is an easily reproducible test that can be done to consistently describe the flow rate and thickness of a liquid feeding. In order to standardize feed thickener therapy for dysphagia and GER, additional research aimed at developing a consensus protocol for thickening infant feeds needs to be established.

528 ***FEEDING PRACTICES FOLLOWING ESOPHAGEAL BUTTON BATTERY REMOVAL: A 10 YEAR, SINGLE CENTER REVIEW.*** *Elizabeth Sinclair[1], Matthew Santore[2], Cary Sauer[1], Erica Riedesel[3]. [1]Pediatric Gastroenterology, Emory University/CHOA, Decatur, GA; [2]Pediatric Surgery, Emory University/CHOA, Atlanta, GA; [3]Pediatric Radiology, Emory University/CHOA, Atlanta, GA*
Background: The number of patients with esophageal impaction of button batteries has dramatically increased in our area, echoing data from the National Capital Poison Control Center. In 2015, NASPGHAN published national guidelines regarding initial management with recommendations on battery removal, imaging, and early clinical management. However, there is little data regarding when and how to provide nutrition to this population following battery extraction.

Objective: To characterize nutrition modality and timing following esophageal button battery extraction over the past 10 years. To assess timing of imaging in this patient population.

Design/Methods: Retrospective chart review of esophageal button batteries from 2009-2018.

Results: A total of 44 patients presented with esophageal button battery impaction at our institution from 2009-2018. All button battery diameters were >19mm and were endoscopically removed except one in a patient with a known esophageal stricture. 27 cases prior to 2017 and 17 cases 2017-2018 were reviewed and compared modality of nutrition following extraction including PICC/TPN, NG/NJ feeding, G-tube/GJ-tube placement, or oral feeding (Figure 1 & Table 1). Total time to oral diet increased in 2017-2018. Two patients were tube-fed at baseline (Figure 2 & Table 2).

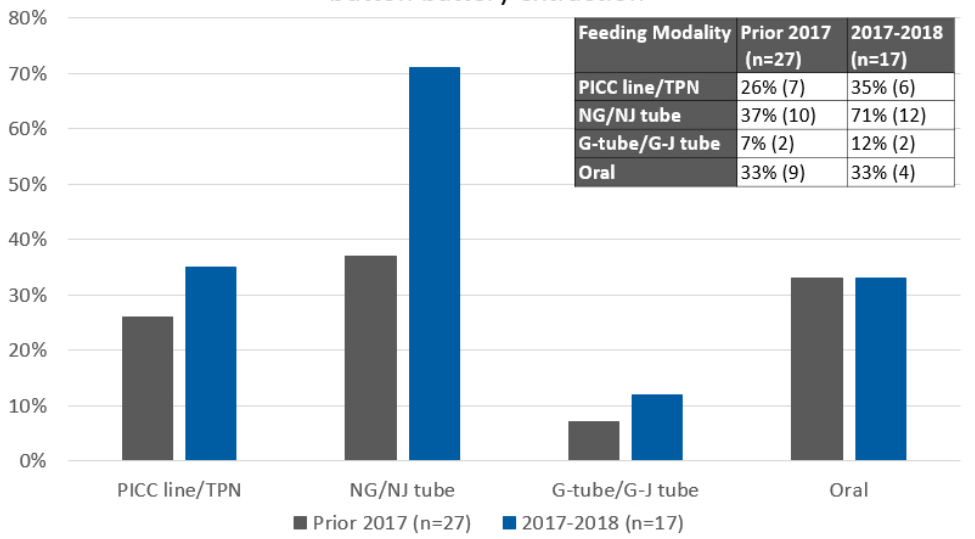
Additionally, initial imaging was compared. Prior to 2017, CTA/MRI was performed in 1 patient in the first 48 hours and 25 patients underwent esophagram in the first 7 days following battery removal. After 2017, CTA/MRI was performed in

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the first 48 hours in 13 patients and esophagram was performed in the first 7 days in 10 patients and >10 days in 4 patients. Prior to 2017, 3 patients developed severe complications (TE Fistula). No patients have developed severe complications since our change in practice.

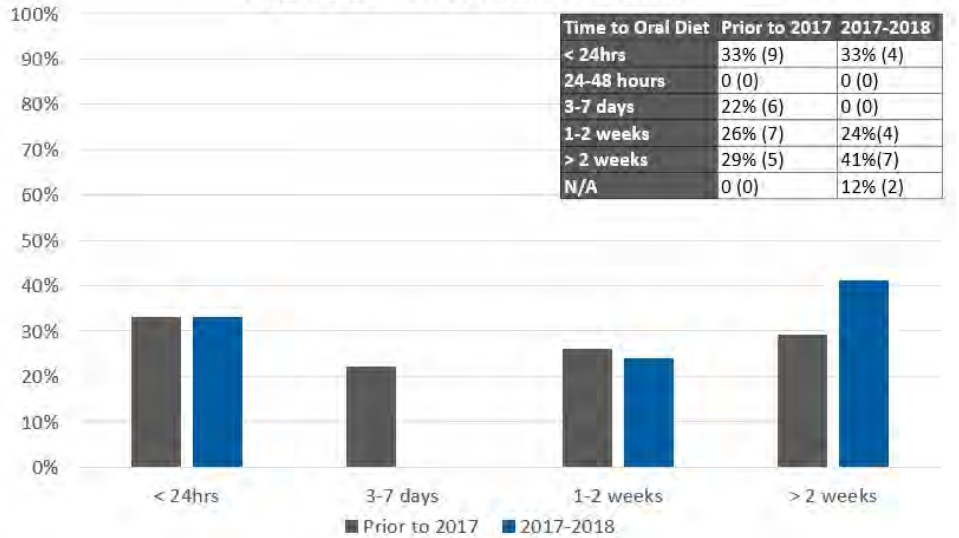
Conclusion: Prior to advanced imaging, initiation of oral feeding was based on mucosal findings during EGD and esophagram findings. Since the adoption of early MRI imaging at our center, oral feeding has been delayed because MRI often initially demonstrates mediastinal and esophageal wall inflammation/edema that was previously not visualized. These findings then delay the initial esophagram resulting in an increased percentage of patients with PICC line/TPN and NG/NJ tube feeding. No patients have developed severe complications since adoption of early MRI imaging and resulting delayed oral feeding, suggesting this may improve long term outcomes. However, overall sample size is small with only short-term follow-up available. Thus, the overall impact of delayed oral feeding is not yet clear and further investigation and long-term follow up is needed in order to improve guidelines for nutrition following esophageal button battery removal.

Figure 1 & Table 1: Feeding modality following esophageal button battery extraction



Feeding Modality	Prior 2017 (n=27)	2017-2018 (n=17)
PICC line/TPN	26% (7)	35% (6)
NG/NJ tube	37% (10)	71% (12)
G-tube/G-J tube	7% (2)	12% (2)
Oral	33% (9)	33% (4)

Figure 2 & Table 2: Time to oral diet



Time to Oral Diet	Prior to 2017	2017-2018
< 24hrs	33% (9)	33% (4)
24-48 hours	0 (0)	0 (0)
3-7 days	22% (6)	0 (0)
1-2 weeks	26% (7)	24%(4)
> 2 weeks	29% (5)	41%(7)
N/A	0 (0)	12% (2)

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FUNCTIONAL/MOTILLITY

531 ***GASTRIC ELECTRICAL STIMULATION FOR CHILDREN WITH SEVERE NAUSEA AND VOMITING: LONG-TERM OUTCOMES AND PATIENT SATISFACTION BASED ON A TEN-YEAR EXPERIENCE.*** *Peter Lu[1], Kelsey Ryan[1,2], Danielle Orsagh-Yentis[1], Karen Diefenbach[3], Steven Teich[4], Hayat Mousa[5], Neetu Bali[1], Karla Vaz[1], Desalegn Yacob[1], Carlo Di Lorenzo[1]. [1]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]The Ohio State University College of Medicine, Columbus, OH; [3]Center for Colorectal and Pelvic Reconstruction, Nationwide Children's Hospital, Columbus, OH; [4]Department of Pediatric Surgery, Levine Children's Hospital, Charlotte, NC; [5]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, University of California, San Diego, Rady Children's Hospital, San Diego, CA*

Background: Gastric electrical stimulation (GES) is a promising therapy for children with severe functional nausea and vomiting refractory to conventional medical treatment. There is, however, a limited understanding of long-term outcomes in children and which patient factors are likely to predict response. Our primary objective is to evaluate the long-term efficacy and safety of GES in the treatment of children with nausea and vomiting. Our secondary objectives are to identify predictors of response and to describe patient benefit and satisfaction.

Methods: Using a prospective patient registry, we identified patients up to 21 years of age with nausea and vomiting who were treated with either temporary or permanent GES at our institution between 2009-2018. We reviewed baseline characteristics. Encounters were selected at baseline prior to GES and at follow-up at 1 month, 12 months, and the most recent visit after GES. We compared route of nutrition and medication usage at baseline to each follow-up time point. We evaluated for baseline factors associated with the ability to stop supplemental tube feeding or parenteral nutrition (PN). We recorded complications and need for battery replacement. In addition, we contacted families by phone to administer the Glasgow Children's Benefit Inventory (GCBI) and a parent satisfaction questionnaire.

Results: We included 80 children (70% female; median age 16 years at start of GES, range 2-19 years) with a median duration of follow-up of 4.3 years. Baseline gastric emptying scintigraphy was delayed in 35/57 (61%) and baseline antroduodenal manometry was abnormal in 27/40 (66%). 13 children (16%) had been diagnosed with postural orthostatic tachycardia syndrome (POTS). Of the 80 children who underwent a trial of temporary GES, 74 (93%) underwent permanent stimulator implantation following positive response and 64 (80%) had the stimulator in place at most recent follow-up. As shown in **Table 1**, use of tube feeding or PN decreased after GES from 73% at baseline to 31% at most recent follow-up ($p<0.001$). Medication use remained stable over this time period. Ability to stop supplemental nutrition at 1 month was associated with higher baseline vomiting severity scores ($p<0.05$). Response was not associated with age, sex, abdominal pain severity or frequency, delayed gastric emptying or abnormal antroduodenal manometry, prior diagnosis of POTS, or prior abdominal surgery. 29 patients (35%) required battery replacement. 14 patients (19%) had complications requiring surgery, primarily because of discomfort related to the stimulator. 10 patients (14%) had the stimulator removed: 7 due to a lack of response and 3 because of sustained resolution of symptoms even after the stimulator had been turned off. 45 children (56%) completed phone questionnaires a median of 5.6 years after starting GES. Median GCBI was +52.1 (IQR 22.9-68.8) and 43 (96%) reported GCBI scores >0, indicating health-related benefit. Nearly all families (98%) said they would still proceed with GES if given the chance to change their decision and 91% would recommend GES to other families. A summary of family responses is presented in **Table 2**.

Conclusion: In this evaluation of long-term outcomes of children with nausea and vomiting treated with GES, we found that children experienced significant and durable improvement in their ability to tolerate oral nutrition and decrease their need for tube feeding and PN. Children appear to respond regardless of the presence of delayed gastric emptying or abnormal antroduodenal manometry. Although over a third of patients required at least one additional surgery, nearly all would repeat the procedure and recommend it to others.

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Table 1: Outcomes of GES treatment for children with nausea and vomiting.

	Baseline (n=80)	1 month (n=80)	12 months (n=52)	Most recent follow-up (n=80)
All oral intake (n, %)	22 (28%)	48 (60%)***	35 (67%)***	55 (69%)***
Tube feeding (n, %)	52 (65%)	28 (35%)***	15 (29%)***	20 (25%)***
Parenteral nutrition (n, %)	15 (19%)	6 (8%)*	8 (15%)	8 (10%)***
Ability to tolerate oral nutrition (n, %)	65 (81%)	77 (96%)***	51 (98%)***	75 (93%)***
Number of GI medications (median, IQR)	3 (2-5)	4 (3-5)**	4 (2.25-5)*	3 (2-4)

*denotes $p<0.05$, **$p<0.01$, ***$p<0.001$ when compared to baseline

Table 2: Summary of family responses to phone survey (n=45).

Positive comments	Improved quality of life	22
	Improved oral nutrition	20
	"Life changing" or "a blessing"	11
	Improved school attendance	11
	Improved nausea	10
	Improved vomiting	10
	Made meals easier	7
Negative comments	No improvement	3
	No improvement in oral nutrition	3
	Symptoms returned	3
	Harder to play sports	3
	Abdominal pain	2

532 *PROSPECTIVE COMPARISON OF ANAL SPHINCTER BOTULINUM TOXIN INJECTION FOR CHILDREN WITH HIRSCHSPRUNG DISEASE AND FUNCTIONAL CONSTIPATION.* *Alexandra Hallagan[1,2], Devin Halleran[3], Danielle Orsagh-Yentis[1], Marc Levitt[3], Richard Wood[3], Neetu Bali[1,3], Karla Vaz[1,3], Desalegn Yacob[1,3], Carlo Di Lorenzo[1,3], Peter Lu[1,3]. [1]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]The Ohio State University College of Medicine, Columbus, OH; [3]Center for Colorectal and Pelvic Reconstruction, Nationwide Children's Hospital, Columbus, OH*

Background: Anal sphincter botulinum toxin (Botox) injection is commonly used for children with severe defecations disorders, including Hirschsprung disease (HD) and functional constipation (FC). However, most of the available studies on clinical outcomes following anal sphincter Botox injection in children are limited to retrospective reviews. Our objective is to prospectively compare the outcomes of anal sphincter Botox injection in children with HD and FC.

Methods: We performed a prospective cohort study of patients with HD or FC undergoing anal sphincter Botox injection from July 2018 to December 2018. We recorded bowel movement frequency, fecal incontinence frequency, abdominal pain severity (Wong-Baker FACES Pain Rating Scale), stool form (Bristol Stool Form Scale, BSFS), pain or straining with bowel movements, medications, and parents' perceived benefit from Botox injection at baseline, 2 weeks, 2 months, and 4 months post-injection. Responses were compared between patients in both groups and within each group across each follow-up time point.

Results: 47 patients (HD=26, FC=21) were included in the study. Baseline characteristics are shown in **Table 1**.Patients with HD were younger than patients with FC ($p<0.01$). The majority of patients in the HD and FC groups were on a laxative-based regimen (57.7% and 66.7%, respectively). Patients with HD had higher bowel movement and stool accident frequency at baseline compared to patients with FC (both $p<0.05$). Most children in both groups had pain and straining with bowel movements. **Table 2** shows outcomes of anal sphincter Botox injection for children with HD and FC over the study

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period. No differences were seen in bowel movements per week, stool accidents per week, or proportion of patients with abdominal pain after Botox injection. For patients with HD, the rate of pain and straining with bowel movements decreased at 2 weeks post-injection, but this response was not sustained at 2 or 4 months. Those with FC had a sustained improvement in pain and straining with bowel movements at 2 and 4 months. 80% of parents of children with HD reported a benefit from Botox at 2 weeks, which decreased to 60% at 2 months. 64% of parents of children with FC reported a benefit at 2 weeks and 2 months.

Conclusion: Anal sphincter Botox injection appears to have a shorter duration of effect in children with HD while the effect is more sustained in children with FC. The majority of parents perceive benefit from anal sphincter Botox injection. Further studies are needed to establish practice guidelines for the use of Botox in children with severe defecation disorders.

Table 1: Baseline characteristics of children with HD and FC.

	HD (n=26)	FC (n=21)	p-value
Male (n, %)	16 (62%)	11 (52%)	0.20
Age (median, IQR)	3.4 (2.0, 5.8)	7.2 (4.0, 10.7)	<0.01
Treatment			
Laxatives	15 (57.7%)	14 (66.7%)	
Rectal enemas	5 (19.2%)	3 (14.3%)	
Antegrade continence enemas	6 (23.1%)	4 (19.0%)	
Symptoms			
Bowel movements per week (median, IQR)	8 (4.5, 8)	4 (2, 6)	<0.01
Stool accidents per week (median, IQR)	2.5 (0, 7.8)	0 (0, 2)	0.04
Abdominal pain severity (median, IQR)	4 (2-5)	6 (4.5, 9.5)	0.02
Pain with bowel movements (n, %)	13 (50%)	14 (67%)	0.76
Straining with bowel movements (n, %)	17 (65%)	17 (81%)	0.98

Table 2: Outcomes of anal sphincter Botox injection for children with HD and FC at baseline, 2 weeks, 2 months, and 4 months post-injection.

	Baseline	2 weeks	2 months	4 months
Children with HD				
Bowel movements per week (median, IQR)	8 (4.5, 8)	8 (7, 8)	8 (7, 8)	8 (7, 8)
Stool form (BSFS; median, IQR)	6 (6, 6)	6 (5, 6)	6 (4, 6.25)	6 (6, 6)
Stool accidents per week (median, IQR)	2.5 (0, 7.8)	1 (0, 7.5)	1.5 (0, 7.25)	2 (1, 5)
Abdominal pain severity (median, IQR)	4 (2, 5)	3 (1.5, 5)	5 (1.8, 6)	3 (2, 6)
Pain with bowel movements	50.0% (13/26)	26.1% (6/23)	55.0% (11/20)	38.5% (5/13)
Straining with bowel movements	65.4% (17/26)	30.4% (7/23)	70.0% (14/20)	38.5% (5/13)
Botox has been helpful		80.1% (17/21)	60.0% (13/20)	92.3% (12/13)
Very or extremely effective		28.6% (6/21)	23.5% (4/17)	38.5% (5/13)
Slightly or moderately effective		52.4% (11/21)	52.9% (9/17)	38.5% (5/13)
Not at all effective		19.0% (4/21)	23.5% (4/17)	38.5% (5/13)
Children with FC				
Bowel movements per week (median, IQR)	4 (2, 6)	4 (2.25,7)	7 (3, 7.75)	7 (5.25, 7)
Stool form (BSFS; median, IQR)	4 (2, 6)	5 (3,6)	6 (3, 6)	5 (4.25, 6)
Stool accidents per week (median, IQR)	0 (0, 2)	0 (0, 2.75)	0 (0, 2)	0 (0, 2)
Abdominal pain severity (median, IQR)	6 (4.5, 9.5)	4.5 (3, 6)	4 (2.25, 5.75)	

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Pain with bowel movements	66.7% (14/21)	66.7% (12/18)	50.0% (9/18)	50% (5/10)
Straining with bowel movements	81.0% (17/21)	72.2% (13/18)	50.0% (9/18)	60% (6/10)
Botox has been helpful		64.3% (9/14)	64.3% (9/14)	90% (9/10)
Very or extremely effective		7.1% (1/14)	14.3% (2/14)	30% (3/10)
Slightly or moderately effective		57.1% (8/14)	50.0% (7/14)	50% (5/10)
Not at all effective		35.7% (5/14)	35.7% (5/14)	20% (2/10)

533 ***GASTROINTESTINAL MOTILITY IN PREMATURE INFANTS WITH AND WITHOUT PATENT DUCTUS ARTERIOSUS (PDA).*** *Sherief Mansi[1], Rinarani Sanghavi[1], Larry Brown[2], Eric Ortigoza[1]. [1]Pediatrics, UT Southwestern Medical Center, Dallas, TX; [2]Parkland Hospital/UT Southwestern Medical Center, Dallas, TX*

Background: Premature infants with patent ductus arteriosus (PDA) can have poor feeding tolerance in the Neonatal Intensive Care Unit (NICU) leading to delayed time to achieve full enteral feeds. Causes for this delay have not been fully elucidated. Intestinal hypo-perfusion has been described in premature babies with moderate to large PDAs. Physicians often delay or stop feeds in babies with PDA based on subjective, clinical criteria that lead to an increased need for parenteral nutrition (PN) and central line use, PN related liver disease, and increased hospital stay and costs. Subjective clinical measures are commonly used in the NICU for evaluation of feeding tolerance, such as gastric residuals, time to full feeds, and abdominal girth. However, no objective measure of gastrointestinal (GI) motility has been described in these babies. Electrogastrography (EGG) is a noninvasive tool that measures the myoelectrical activity of the stomach and has been validated as an objective measure of gastric motility in children. The dominant power or amplitude of the dominant frequency can be measured pre- and post-prandially to calculate the dominant power ratio (PR), a measure of motility and response to feeds. We hypothesized that premature babies with PDA have worse motility and a PR of less than 1, indicating poor response to feeds. Our aim was to compare EGG dominant power ratio and time to full feeds in preterm babies with and without PDA. Methods: In a prospective observational study, we used EGG weekly on babies in the NICU (n=34, 29 preterm, 5 term). Average gestational age at birth was 29.2 weeks. Average birth weight was 1429.7 grams. After filtering for motion artifacts, power spectral analysis of the EGG data was done using Matlab. Results: We found no difference in PR between premature babies with and without PDA, regardless of postmenstrual age (Figure 1). The average time to achieve full feeds was 18.5 days for the PDA group and 9.5 days for non-PDA group, $p<0.001$ (Figure 2). Treatment of the PDA had no effect on this difference. Babies with a PDA also had less tachygastria. Conclusion: Although time to reach full feeds was delayed in the PDA group, gastric motility was the same in premature babies with or without a PDA. The delay in time to full feeds may have been related to provider hesitation to advance feeds in the presence of a PDA. The use of objective criteria to measure motility may help guide advancement of feeds in the preterm population.

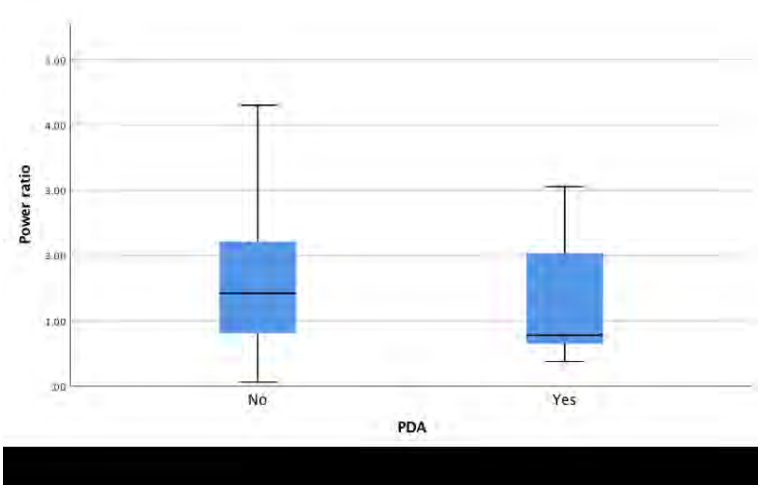


Figure 1: Boxplot showing no significant difference in dominant power ratio (PR) in babies with and without PDA, p=0.46 (Independent Samples Mann-Whitney U Test). N=34.

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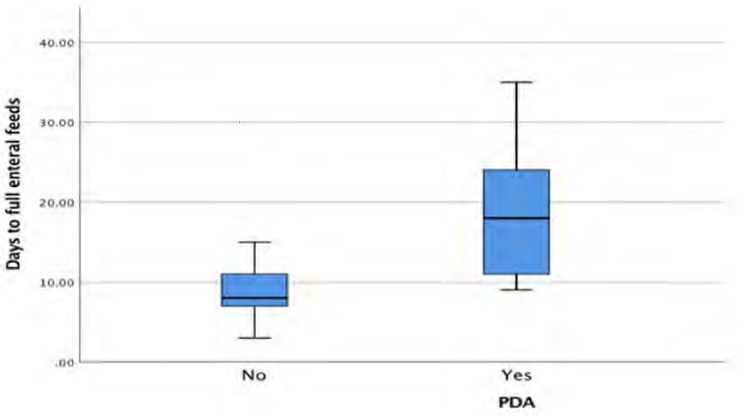


Figure 2: Boxplot showing difference in days to achieve full enteral feeds in babies with and without PDA, p<0.001 (Independent Samples Mann-Whitney U Test). N=34.

534 ***ROLE OF BIOFEEDBACK IN IMPROVING ENCOPRESIS IN PATIENT WITH FUNCTIONAL CONSTIPATION.*** *Vijay Mehta*, *Yamen Smadi*, *Devendra Mehta*, *Shaista Safder. Pediatric-GI*, *Arnold Palmer Hospital for Children*, *Orlando*, *FL*

Background: Dyssynergic defecation is common, and affects up to half of patients with chronic constipation. This acquired behavioural problem is due to the inability to coordinate the abdominal and pelvic floor muscles to evacuate stools (Rao and Pratcharatrakul 2016). Randomized controlled trials have shown that biofeedback therapy is more effective than laxatives and other modalities, both in the short term and long term (more than 2 years), without side effects (Chiarioni et al. 2006). Biofeedback therapy has been recommended as the first-line of treatment for dyssynergic defecation (Rao and Pratcharatrakul 2016). The goals are to correct the dyssynergia or incoordination of abdominal and pelvic floor muscles during evacuation, and to improve perception of rectal filling in patients with imparied rectal sensation (Lee, Jung, Myung 2013). Its treatment efficacy is 70-80% in randomised controlled trials (RCTs) and it is more effective than sham therapy, polyethylene glycol or diazepam (Rao et al. 2007). Balloon expulsion test (BET) has previously been examined, and showed to be useful as a screening tool for dyssynergic defecation, with no significant difference between bedside commode and left lateral decubitus (shah et al. 2018)

Aim: Evaluate role of ARM/Biofeedback in improving encopresis in patients with functional constipation, and compare BET and ARM parameters prior to and after biofeedback sessions

Method:retrospective chart review of all patients who underwent Biofeedback training at our institution with multiple providers over 7 years.

Inclusion criteria: Functional constipation with encopresis who has failed traditional therapy with stool softeners, laxatives, scheduled toileting, diet and lifestyle modifications

Exclusion criteria: All organic causes including neurogenic, anatomical, and developmental delay.

Our Protocol: Patient baseline resting pressure at the anal sphincter, RAIR, rectal sensation, urge, squeeze, push, BET and biofeedback parameters were evaluated.

BET: In this test, a manometry catheter balloon filled with 30 mL of air, placed in the rectum. After placement, the patient is asked to expel the balloon in left lateral position or bedside commode.

Biofeedback Therapy: Based on instrument-based “operant conditioning” technique. This consists of improving recto anal coordination during defecation followed by simulated defecation training.

Statistics used include Paired T-test, and McNemar’s test and Chi-Square test.

Results: 71/99 (72%) of patients following ARM/biofeedback had resolution of encopresis, 70% (p=<0.01) of which had balloon expulsion at the last study. 5 patients had Botox during ARM sessions. Of those that received botox during ARM sessions 4 had resolution of encopresis. 2 had gone from negative to positive BET.

Conclusion: In our study the majority (72%) of patients had improvement in clinical response with resolution of encopresis, while BET was positive in 70%(p<0.01). Other ARM/biofeedback parameters including sensory and urge threshold, peak push and peak relaxation improved from first to last session (p<0.01).

Discussion: Encopresis in the pedaitric population has significant educational and social impact on themselves as well as family members (Olaru et al. 2016). Patients with encopresis typically suffer from dyssynergia leading to chronic constipation. In addition, 50-60% of patients also demonstrate an impaired rectal sensation (Rao and Patcharatrakul 2016). Our study shows significant improvement in balloon expulsion, which served as a function of improved dyssynergia, and is

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associated with resolution of encopresis ($p<0.01$). This cohort shows utility in combining ARM/biofeedback with balloon expulsion test, along with continued bowel regiment for resolution of encopresis in patients with functional constipation.

RESULTS:

Total Patients	97
Male	66
Female	31
Age	10yrs +/-3
Number of sessions	4 +/- 2

Table 1. Demographics of patients and number of sessions

Balloon Expulsion		Total	P-value
First Study	Last study		
No	Yes	37	
No	No	40	
Yes	Yes	20	<0.01

Table 2. Result of balloon expulsion test at first and last study.

	First Study	Last Study	P-value
Sensation (ml) (76)	129 +/-91	63 +/-57	<0.01
Urge (ml) (61)	169 +/-95	95 +/- 54	<0.01
Squeeze (mmHg) (38)	122 +/-63	137 +/-47	0.2
Peak Push (mmHg) (24)	79 +/-33	125 +/- 40	<0.01
Push% relaxation (17)	40 +/- 16	52 +/- 25	<0.01

Table 3. Comparison of parameters tested in the first and last study.

Balloon Expulsion	Resolution of Encopresis	No resolution of Encopresis	Total	
Yes	50	7	57	88%
No	21	19	40	48%
Total	71	26	97	
	70%	73%	P-value	<0.01

Table 4. Outcome of BET and encopresis at end of ARM/Biofeedback sessions

535 ***PLACEBO WITHOUT DECEPTION IS EFFECTIVE IN THE TREATMENT OF CHILDREN WITH FUNCTIONAL GASTROINTESTINAL DISORDERS.*** *Samuel Nurko[1,2], Miguel Saps[1,9], Joe Kossowsky[3,4], Sean Zion[5], Karla Vaz[6], Kelsey Hawthorne[2], Rina Wu[2], Carlo Di Lorenzo[6], Steven Ciciora[6], John Rosen[7], Ted Kaptchuk[8]*
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A significant placebo effect has been observed in clinical studies in children with functional gastrointestinal disorders (FGIDs) . It is widely believed concealment or deception is required to elicit a placebo response, but recent studies in adults suggest that the open administration of a placebo treatment (non-deceptive, non-concealed) can yield positive effects. The **aim** of the present study was to study the efficacy of an open placebo (OP) in the treatment of children with FGIDs.
Methods: This was a multicenter prospective cross-over trial of OP in children 10-21 years of age with functional abdominal pain (FAP) or irritable bowel syndrome (IBS). Eligible patients completed 1 week of observation prior to randomization to one of two arms: a) OP for 3 weeks, followed by a control period (CP) of 3 weeks, or b) CP for 3 weeks, followed by OP for 3 weeks. During the OP phase, subjects were given an inert liquid placebo dose of 1.5 ml TID in a bottle labeled placebo. A standardized method for explaining the placebo and mind-body connection was used at all sites, and the interaction with providers was kept the same during both phases of the study. Throughout both OP and CP phases,

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hyoscyamine was allowed as a rescue pain medication. The primary outcome was symptomatic improvement assessed using Clinical global improvement. Secondary outcomes were improvement in pain intensity (Word-Graphic-Scale), use of rescue medication, change in disability (Functional Disability Inventory FDI), anxiety (RCADS) and quality of life before and after the placebo or the control period. Paired t-tests, or repeated measure statistics were used as applicable to compare the baseline before each treatment with the scores after each treatment.
Results: A total of 31 patients were randomized and 30 patients completed the study. The mean age of subjects was 14.1 ± 3.2 years, 81% female. The primary diagnoses were FAP (52 %) and IBS (48 %). Prior to enrollment, the mean duration of symptoms was 3.3 ± 2 years and 33% reported moderate/severe disability, and 45% reported high anxiety scores . 44% of subjects expected the placebo would have a good or excellent effect, as compared to the control period in which only 12% thought the pain would get better ($p<0.05$). Placebo treatment demonstrated superiority to control phase as measured by global improvement and pain scores compared to their baseline (See Table).There was a significant improvement in disability in the placebo group with 75% having no or minimal disability at the end of OP ($p=0.04$). Both groups demonstrated significant improvement in quality of life. Using multivariate analysis, the presence of baseline anxiety was the only predictor associated with a lack of response.
Conclusions: The use of placebo without deception is more efficacious than a control intervention in the treatment of children with FGIDs. Open label placebo also reduces use of rescue medication in children with FGIDs

	After placebo	After control	
Feel better by global measure at the end of treatment (Success)	41%@	31%	@ p= 0.004
Mean baseline pain before treatment	45.2 ± 2.9	45.5 ± 2.8	N.S.
Mean pain during treatment	40.2 ± 3.4* @	44.9 ± 2.7	* p= 0.04 ; @ p= 0.04
Mean Pain last week of treatment	38+7± 5.2*@	42.9± 3.5	* p = 0.05 ; @ p= 0.04
Delta change in pain improvement	5.0 ± 2.9	-0.8 ± 2.8	@ p= 0.013
Mean # of Hyoscyamine tablets used over the treatment period	1.9 ± 0.5*	5.6 ± 1.7	@ p= 0.03
Values: mean ± SE ; @ placebo vs control; * baseline vs end of treatment			

536 ***IMPACT OF TRANSANAL IRRIGATION (TAI) DEVICE (PERISTEEN®, COLOPLAST) IN MANAGEMENT OF PEDIATRIC PATIENTS WITH CHRONIC FECAL INCONTINENCE AND CONSTIPATION.*** *Samit Patel*, *Puanani Hopson*, *Jeffrey Bornstein*, *Shaista Safder*. *Pediatric Gastroenterology*, *Arnold Palmer Hospital*, *Orlando*, *FL*
Introduction: Children who have chronic fecal incontinence and constipation can be classified into three groups: chronic functional constipation with overflow soiling, neurogenic bowel dysfunction related to spinal cord defects, or outlet abnormalities secondary to congenital anorectal malformations. Quality of life is significantly decreased in each group due to lack of bowel continence and stooling difficulties requiring most patients to be diapered despite use of conservative approaches. The TAI device works by injecting water into the colon through a rectal catheter with an inflatable balloon to promote controlled evacuation of bowel contents. In 2012, it was approved by the FDA for use in the US. This unique enema system uses a pump rather than gravity to instill water as a colonic irrigant and utilizes balloon occlusion of the rectum.

The objective of our study was to evaluate the effectiveness of TAI Peristeen® device in children who failed to respond to conservative measures for stool incontinence and constipation.

Methods: Retrospective review of 97 patients who were prescribed TAI for bowel management. Data collected included demographic information, prior bowel regimen treatment, and symptoms before and after initiating TAI Peristeen device.

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Results: Of the 97 patients, 76 are currently using Peristeen (16 lost to follow up and 6 discontinued use). Prior to initiation of Peristeen, multiple bowel regimens were trialed and failed, these included; cecostomy (n=6), cone enema (n=34), and laxatives (n=90). Of the 8 patients who had cecostomy prior to Peristeen, none used their cecostomy since, and 2 had cecostomy reversal. The majority of our patients (n=65) using Peristeen have neurogenic bowel secondary to spina bifida. Other patient populations using Persiteen included anorectal abnormalities (n=13) and chronic constipation (n=19). Of the patients with spina bifida, 17 patients were 5 years old or younger when they initially started using Peristeen, and continue to use this method (average time 1.4 years) without need for surgical cecostomy or appendicostomy. For all patients, there was significant response to use of Peristeen in terms of improved encopresis and constipation ($p<0.001$). Abdominal pain improved significantly in spina bifida and chronic constipation groups, however the response was not as robust in the congenital anorectal malformation group ($p=0.19$).

Conclusion: We provide a single-center review of a large pediatric population using a TAI device for management of fecal incontinence and constipation. This TAI device offered significant improvement in bowel continence and constipation in patients with neurogenic bowel related to spina bifida, chronic constipation, and congenital anorectal malformations.

537 ***WHEN ANTEGRADE ENEMAS GO RETROGRADE: SIGNIFICANCE OF RETROGRADE FLOW WITH ANTEGRADE CONTINENCE ENEMAS IN CHILDREN WITH CONSTIPATION.*** *Haley Pearlstein[1], Lyon Wang[2,1], Benjamin Thompson[3], Marc Levitt[4], Richard Wood[4], Neetu Bali[1,4], Karla Vaz[1,4], Desalegn Yacob[1,4], Carlo Di Lorenzo[1,4], Peter Lu[1,4]. [1]Division of Gastroenterology, Hepatology, and Nutrition, Department of Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]The Ohio State University College of Medicine, Columbus, OH; [3]Division of Pediatric Radiology, Nationwide Children's Hospital, Columbus, OH; [4]Center for Colorectal and Pelvic Reconstruction, Nationwide Children's Hospital, Columbus, OH*

Background: Antegrade continence enemas (ACE) are used for children with constipation refractory to conventional treatment. For children with a poor response to ACE or symptoms associated with ACE administration, a fluoroscopic study with contrast administered via appendicostomy or cecostomy can help us understand the physiology of the child's antegrade flush, particularly the possibility of retrograde flow into the small intestine. Our objective was to investigate the significance of retrograde flow with ACE in children with constipation.

Methods: We performed a retrospective review and identified all fluoroscopic studies performed at our institution from 2013-2018 with contrast administered via appendicostomy or cecostomy in children treated with ACE. Studies demonstrating retrograde flow of contrast into the small intestine were identified. We recorded demographic information, medical and surgical history, clinical information, any intervention resulting from the study, and outcome.

Results: We identified 162 studies with contrast administered via appendicostomy (68%) or cecostomy (23%) in patients treated with ACE. Patients were 52% male with a median age of 10.7 years (range 2-18). Patients had constipation secondary to anorectal malformation (38%), spinal cord anomaly (26%), functional constipation (24%), colonic motility disorder (18%), and Hirschsprung disease (12%). Of the 162 studies, 59 (36%) showed some degree of retrograde flow of contrast into the small intestine (54% male, median age 9.5, range 2-17). Among patients with retrograde flow, 28 (48%) were not responding to their antegrade flush and 21 (36%) had symptoms with flush administration (13 nausea, 12 abdominal pain, 11 vomiting, 1 diaphoresis). Patients with retrograde flow were more likely to have symptoms with flushes (21/59, 36%) compared to patients without (16/109, 15%, $p<0.01$). An intervention was used in 13 patients as a result of the finding of retrograde flow, including administering flushes more distally in the colon (4/9 responded), changing to oral laxatives (2/2 responded), changing patient positioning during flushes (1/1 responded), and slowing flush administration (1/1 responded). One patient thought to have a cecostomy was found to have a tube placed in the ileum and symptoms resolved with conversion to appendicostomy. Retrograde flow was associated with a younger age ($p<0.01$) but not with sex or underlying diagnosis.

Conclusion: Identifying retrograde flow into the small bowel during fluoroscopic studies with contrast administered via appendicostomy or cecostomy can be useful for children with a poor response to ACE or symptoms associated with ACE administration. In some patients, an intervention to deliver flushes more distally in the colon can improve response and decrease associated symptoms.

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538 ***DEMOGRAPHIC AND PSYCHOSOCIAL CHARACTERISTICS OF YOUTH WITH GASTROPARESIS: A 5-YEAR RETROSPECTIVE REVIEW OF PATIENTS MANAGED BY GASTROENTEROLOGY AND PSYCHOLOGY.***

Kelly Rodriguez[1,2], Kari Baber[1,2], Alain Benitez[1], Svetlana Ostapenko[3], Ritu Verma[1]. [1]Division of Gastroenterology, Hepatology & Nutrition, Children's Hospital of Philadelphia, Philadelphia, PA; [2]Department of Child & Adolescent Psychiatry and Behavioral Sciences, Children's Hospital of Philadelphia, Philadelphia, PA; [3]Department of Biomedical and Health Informatics, Children's Hospital of Philadelphia, Philadelphia, PA

Background: There is limited information regarding the clinical presentation and treatment outcomes of gastroparesis in youth. Given symptoms of vomiting, abdominal pain, and nausea that can lead to interference with adequate oral intake and weight gain, gastroparesis has the potential to impact health-related quality of life in ways similar to other pediatric chronic health conditions (i.e., impairments in psychological, social, and school functioning). Taken together with multidisciplinary team clinical experience suggesting that youth with gastroparesis often present with significant associated disability, the importance of understanding and treating pediatric gastroparesis within a biopsychosocial framework is underscored. Yet, there is a paucity of empirical information regarding psychosocial aspects of pediatric gastroparesis. The aim of the present study was to describe demographic and psychosocial characteristics of youth with gastroparesis seen by both gastroenterology and integrated psychology in an outpatient pediatric gastroenterology clinic.

Methods: Retrospective data was extracted from the EMR database for 1147 patients diagnosed with gastroparesis during an outpatient pediatric gastroenterology visit at Children's Hospital of Philadelphia in the past 5 years (January 2013-January 2018). Data was extracted under an IRB-approved protocol. Extracted data included demographic information and encounter information for gastroenterology (GI) and integrated psychology (GI Psychology) outpatient visits. Additional chart review for psychosocial information (behavioral health history, school functioning) was conducted for patients diagnosed with gastroparesis and seen by GI Psychology for an initial psychological evaluation (*N*= 199).

Results: Of the 1147 patients diagnosed with gastroparesis in outpatient pediatric gastroenterology in the 5 year period, included in the present study were the 199 patients (17.4%) referred to GI Psychology and seen for initial psychological evaluation. Patients with gastroparesis seen by GI Psychology were majority female (72.4%) and Caucasian (83.4%); 19 patients identified race as Other (9.6%), 6 as Black (3.0%), 5 as Multiple (2.5%), 2 as Asian (1.0%), and 1 as Native Hawaiian or Other Pacific Islander (0.5%). Of the 199 patients, 17 patients (8.5%) identified ethnicity as Hispanic or Latino. Patients with gastroparesis seen by GI Psychology ranged in age from 0.25-18 years of age (*M*= 12.1) at first diagnosis of gastroparesis in an outpatient GI encounter and 3-21 years of age (*M*= 12.6) at time of GI Psychology initial evaluation. Of the patients with gastroparesis seen by GI Psychology**,** 91 (45.7%) had a history of past or current psychotherapy services prior to GI Psychology initial evaluation and 48 (24.1%) also had a history of past or current psychiatric medications prior to GI Psychology initial evaluation. Of the patients with gastroparesis seen by GI Psychology**,** 52 (26.1%) were not attending brick and mortar school at the time of the GI Psychology initial evaluation and 39 (19.6%) had a history of past or current homebound instruction. Patients diagnosed with gastroparesis attended a range of 1-58 outpatient visits (*M*= 6.3) in GI Psychology.

Conclusion: Almost 1 in 5 youth with gastroparesis seen by both gastroenterology and integrated psychology in an outpatient pediatric gastroenterology clinic had a history of homebound instruction due to medical condition, suggesting the potential for significant impairment in daily functioning associated with pediatric gastroparesis. Further investigation regarding the health-related quality of life patients with gastroparesis and the relationship of psychosocial factors to clinical presentation and treatment outcomes in this patient population is warranted. Clinically, assessment of psychosocial functioning and possible referral for behavioral health services should be considered for youth with gastroparesis.

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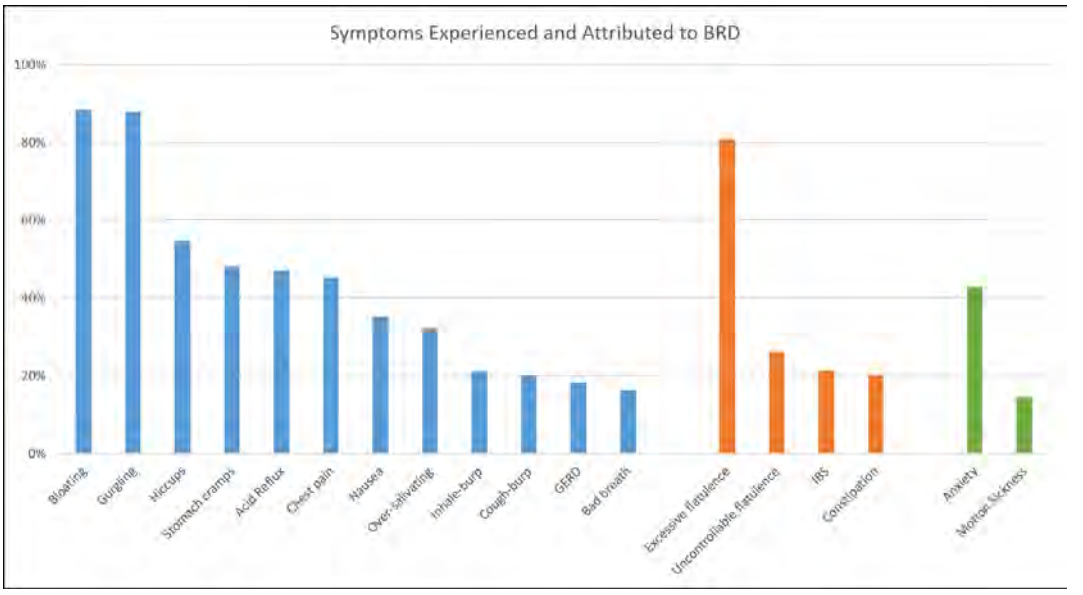
539 ***BELCH REFLEX DYSFUNCTION – A PATIENT INITIATED INTERNATIONAL SURVEY OF THE INABILITY TO BURP.*** *Samantha Olthof[3], Christina Low Kapalu[2,1], John Rosen[1]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, The Children's Mercy Hospital, Kansas City, MO; [2]Developmental and Behavioral Sciences, The Children's Mercy Hospital, Kansas City, MO; [3]Queen's University, Kingston, ON, Canada*

Inability to belch (Belch Reflex Dysfunction – BRD) is rarely reported in the medical literature and unlike functional disorders of excessive belching there are not specific diagnostic criteria. A single center experience was recently described (Bastien OTO-OPEN 2019), but little is known about characteristics of patients with this disorder.

Utilizing the Reddit social-media website, patients with the shared symptom experience of inability to belch initiated a discussion regarding symptoms, medical and behavioral treatments, and potential medical partners. Crowdsourced health data contributed to the creation of an electronic survey, with iterative refinement based on online community member recommendations. The survey was open, voluntary, and anonymous, collecting data in January 2019.

Survey participants (n=789) were from 36 countries with most from North America (69%) and Europe (25%). There was equal gender distribution (52% female) and 83% were between 25-44 years. Inability to burp was usually life-long (85%), and typically worsened throughout the day. Bloating (89%), gurgling (88%), and excessive flatulence (81%) were the most commonly associated symptoms (FIGURE 1). Themes identified included avoiding dietary triggers of carbonated or alcoholic beverages and self-induced "air vomiting" for acute symptom relief. Despite reporting associated significant social, romantic, and professional impairment, only 32% brought their concerns to a general physician and 3% to a medical specialist. Few patients seen by a general physician felt their concerns were taken seriously (20%) and very few were offered treatment (6%).

Patients with BRD conducted community-based participatory research which validated disorder presentation and demonstrated world-wide prevalence. Efforts to increase patient and physician awareness of this disorder are warranted and will be complemented by further research identifying an optimal diagnostic approach and treatment options.



540 ***INABILITY TO BURP AS A PRIMARY GASTROINTESTINAL SYMPTOM IN CHILDREN.*** *John Rosen[1], Samantha Olthof[3], Christina Low Kapalu[3,1]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, The Children's Mercy Hospital, Kansas City, MO; [2]Queen's University, Kingston, ON, Canada; [3]Developmental and Behavioral Sciences, The Children's Mercy Hospital, Kansas City, MO*

Inability to burp is an infrequently reported disorder, with no prior description of pediatric disease experience. Unlike functional disorders of excessive belching or aerophagia, symptom patterns in Belch Reflex Dysfunction (BRD) are poorly defined. A community-based patient-initiated survey was conducted to identify patient-reported outcomes of BRD.

The survey was created based on patient input through an iterative process, using social media comments and voting

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(Reddit, r/NoBurp) to determine final question design. Reddit membership is limited to those ≥ 13 years old. The survey was open, voluntary, and anonymous, collecting data in January 2019.

Forty-nine subjects between age 13-18 participated. Subjects were predominantly male (55%) and Caucasian (83%), with median BMI 22 (IQR 19.2-23.6, range 13.8-34.3). They lived in 9 different countries (including 55% USA, 16% UK, 13% Canada). 71% reported lifelong symptoms, but 12% report onset in last 5 years, and 10% in last 5-10 years. Symptoms generally worsened throughout the day and were associated with bloating (82%) or excessive gurgling (76%). Over half of patients also reported hiccups, stomach cramps, and excessive flatulence, as well as ill effects on their social, romantic, and professional lives. Themes of self-treatment included avoidance of carbonated drinks, lying prone, and gag or cough induced "air-vomit". Only 18% sought care from their primary medical practitioner and none felt their concerns were taken seriously or underwent diagnostic testing. A single subject reported being offered treatment recommendations.

Belch Reflex Dysfunction is an underrecognized condition of inability to burp whose symptoms are clearly distinguished from currently defined functional and motility disorders. Further evaluation of this patient population is warranted in order to define physiologic underpinnings and to determine optimal interventions that may provide symptom relief.

541 ***R/NOBURP – EXPLORING THE PROCESS OF PATIENT INITIATED SOCIAL MEDIA RESEARCH IN DISORDER DISCOVERY.*** *Christina Low Kapalu[2,1], Samantha Olthof[3], John Rosen[1]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, The Children's Mercy Hospital, Kansas City, MO; [2]Developmental and Behavioral Sciences, The Children's Mercy Hospital, Kansas City, MO; [3]Queen's University, Kingston, ON, Canada*

Social media and crowdsourcing are utilized for disease surveillance, tracking outbreaks of known diseases, and promotion of public health interventions and initiatives (Kass-Hout & Alhinnawi, 2013). This data capture method also holds the potential for disease discovery; offering wide reach, access to global patient populations, and quick participant response. Patient initiated social media-based research bypasses the academic-centered scientific process and involves community members in the design and implementation.

Inability to belch is an infrequently described symptom and little scientific literature is available to characterize this disorder. Utilizing the Reddit social-media website, patients with a shared symptom experience of inability to burp initiated a discussion regarding symptoms, medical and lifestyle treatments, and potential medical partners. Crowdsourced health data contributed to the creation of an electronic survey, with iterative refinement based on online community member experiences. A gastroenterologist seeking to better understand a patient's symptom pattern and not finding adequate information in the medical literature discovered the patient-initiated survey. A partnership between the survey creator and medical clinician-researchers was formed to analyze and distribute survey data, thereby increasing medical knowledge of this condition and patient care. This partnership developed through steps of proof of identity, identification of shared goals, and development of a post-survey research plan including methods of data-dissemination that would satisfy the social media and scientific community needs.

Social media community-based participatory research allowed shared experience and validation of symptoms, focus on patient-reported outcomes important to the community, and a data-driven partnership with the medical community to spur additional research and potentially improve patient care of a previously under recognized disorder.

542 ***FUNCTIONAL LUMINAL IMAGING PROBE (FLIP) ASSESSMENT OF POST-FUNDOPLICATION EGJ DISTENSIBILITY CHANGES MANAGEMENT BEYOND HIGH RESOLUTION MANOMETRY.*** *Rachel Rosen[1], Jose Garza[2], Samuel Nurko[1]. [1]Gastroenterology, Boston Children's Hospital, Wellesley, MA; [2]Emory University, Atlanta, GA*

Background: Assessments of esophageal obstruction in fundoplication patients includes high resolution esophageal manometry with impedance (HRIM) but there is an imperfect relationship between the results of these technologies and which patients will respond to therapeutic interventions. The goal of this study is to determine: 1) the distensibility of post-fundoplication patients compared to control patients and achalasia patients, 2) the relationship between EGJ distensibility and HRIM results, and 3) the relationship between EGJ distensibility and outcomes.

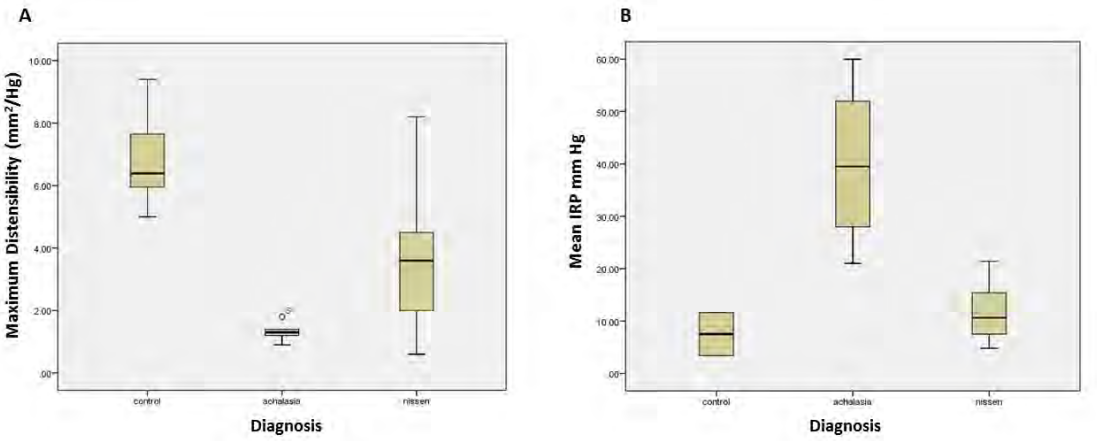
Methods: We reviewed the FLIP tracings of 19 fundoplication patients and compared them to those of 5 achalasia patients and 7 control patients. We then compared between groups the HRIM tracings of the patients (IRP, bolus transit abnormalities, peristaltic abnormalities) to the distensibility measurements. Lastly, we determined the degree to which HRIM affected clinical decision making compared to FLIP. Means were compared using t tests. Proportions were compared using Chi-squared analysis. Continuous variables were compared using correlation coefficients.

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Results: There were no differences in the ages between patient groups with the mean age of fundoplication, achalasia and control patients was 10.1±1.5, 13.6±2.5, and 14.2±1.2 years respectively (p-=0.2. The presenting symptoms for the fundoplication patients was dysphagia (61% of patients), feeding difficulties (53% of patients) and respiratory symptoms (68% of patients). Distensibilites varied by diagnosis with significant differences between fundoplication, achalasia and control patients (Figure 1A). There were similar variations in IRP by diagnosis (Figure 1B). While there was a significant correlation between balloon volume and distensibility (r=0.39, p=0.03) and EGJ diameter and distensibility (r=0.86, p=0.0001) in control and fundoplication patients, there was no significant correlation between FLIP pressures and distensibilities (r=-0.21, p=0.2) in these groups. Within diagnoses, there was no clear relationship between IRP by HRMI and distensibility (Figure 2A) but there was a clear relationship between bolus transit by HRMI and distensibility (Figure 2B). In the patients with fundoplication, 52% of patients had an intervention (Dilation or LES BoTox injection) based on FLIP or HRIM. Intervention in fundoplication patients was driven by both IRP (No intervention group mean IRP: 9.49±1.3 mm Hg vs. Intervention group mean IRP: 15.1± 2.3, p=0.04) and FLIP (No intervention group mean distensibility: 4.9±0.9 mm^2/Hg vs. Intervention group mean distensibility: 2.2±0.3 mm^2/Hg, p=0.00001). In fundoplication patients undergoing intervention, 72% experienced improvement in the primary symptom.

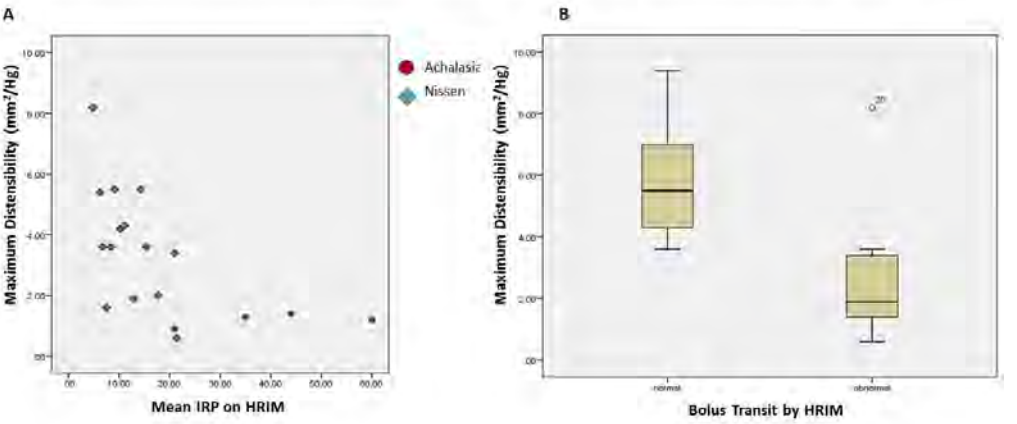
Conclusion: Distensibility of the EGJ is highly correlated with EGJ diameter and effective bolus transit in fundoplication patients. In fundoplication patients, measurement of EGJ distensibility resulted in a significant change in management and correlated with effective bolus clearance.

Figure 1: Relationship between Diagnosis and Maximum Distensibility (A) and IRP (B)



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Figure 2. Relationship between Distensibility and IRP (A) and Bolus Transit (B) measured by HRIM



543 ***NOVEL USE OF TIMED BARIUM ESOPHAGRAM PROTOCOL FOR ASSESSMENT OF ESOPHAGEAL FUNCTION IN CHILDREN.*** *Kent Rosenwald[1,2], Kari Hayes[2,3], Jaime Belkind-Gerson[1,2], Calies Menard-Katcher[1,2]*
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BACKGROUND: Esophageal emptying disorders, including achalasia and esophagogastric junction outflow obstruction (EGJOO), are considerations in the evaluation of dysphagia, regurgitation, and refractory heartburn in children. High-resolution esophageal manometry (ESMO) is the gold standard tool for diagnosis of these conditions. Timed Barium Esophagram (TBE) is a fluoroscopic modality that has seen recent widespread acceptance as an adjunctive tool in adults, both for establishment of the diagnosis of esophageal emptying disorders and for following physiologic response to treatment. However, there are no reports to date evaluating TBE for its utility as a functional test of impaired esophageal emptying in the pediatric population. A novel TBE protocol has been implemented at our institution for use in suspected esophageal emptying disorders.

OBJECTIVE: To investigate the feasibility of the current TBE protocol at a pediatric tertiary referral hospital, and to provide a first report of the potential value of TBE for assessment of esophageal emptying in the pediatric population.

METHODS: Retrospective chart review of all pediatric patients at our institution who underwent TBE in the past 18 months.

RESULTS: Sixteen patients underwent a total of 19 TBE studies from Oct 2017-Mar 2019. (Table 1) These patients were largely female (13/16, 81%) with mean age 12.2 years (range 8-17). 11/17 (50%) TBE studies received 150 mL barium volume per protocol. Only 5/12 patients (42%) could tolerate barium within 20s per protocol. There was no significant difference in ingestion time or volume between individuals eventually diagnosed with EGJ outflow obstruction and others ($p>.05$). Commonly reported reasons for non-adherence to protocol were patient difficulty with fluid volume and sense of possible regurgitation. 8/19 (42%) TBE studies were judged to be positive per standard adult criteria of 1cm standing barium column at 5 min timepoint. 9/16 (56%) of individuals had ESMO performed, which identified 3 cases of achalasia type III, 1 EGJOO, 4 ineffective esophageal motility, and 4 TEF site stenoses. We evaluated diagnostic utility of TBE vs ESMO in n=9 individuals that received both assessments. In this series, the sensitivity of standard adult TBE criteria (1 cm height of standing barium column at 5 min) to detect emptying disorder (achalasia or EGJOO) was 100%, specificity 40% ($p=0.44$ by Fisher exact). A modified diagnostic cutoff of 1.5 cm height at 5 min offered 100% sensitivity, 80% specificity ($p=0.04$ by Fischer exact), and barium column width of 1 cm at 1 minute offered 100% specificity and 100% specificity ($p=0.02$). Three individuals with positive TBE underwent esophageal dilation with subsequent normal TBE post-treatment.

CONCLUSION: This represents the first description of a TBE protocol in a pediatric population with suspected esophageal emptying disorders. TBE is feasible and holds promise as an adjunctive noninvasive diagnostic assessment for impaired esophageal emptying in children. There was heterogeneous adherence to protocol for timing and volume of barium, but TBE results were reliable even when such protocol criteria were not met. Modifications may need to be made in a pediatric protocol to increase feasibility of adherence. TBE may be particularly well-suited to objective functional

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reassessment of recurrent symptoms post-intervention in achalasia. Results from this small cohort also suggest that this population may benefit from different diagnostic cutoffs than adults. We suggest radiologists and gastroenterologists use clinical judgment regarding diagnostic cutoffs for pediatric TBE until larger series can be completed.

Table 1. Patient Characteristics (n=16 individuals)	
Age, years (mean, SD)	12.2 ± 3.3
Female gender, n (%)	13 (81%)
Presence of symptoms, n (%)	
Dysphagia	16 (100%)
Chest pain	8 (50%)
Vomiting/Regurgitation	8 (50%)
Weight loss	7 (44%)
Impaired appetite	2 (13%)
History of TEF-EA repair, n (%)	5 (31%)
History of prior idiopathic esophageal stricture, n (%)	2 (13%)
TBE Characteristics (n=19 TBE)	
Volume of Barium administered, mL (mean, SD), n=17	129.4 ± 52.0
Duration of Barium ingestion, sec (median, IQR), n=12	37.5 (20, 60)
Duration of fluoroscopy, sec (median, IQR), n=18	41.0 (27.5, 84.3)
Abnormal esophageal motility, n (%)	10 (53%)
Abnormal esophageal anatomy, n (%)	6 (32%)
Stenosis at site of TEF-EA repair, n (%)	4 (21%)
Esophageal stricture, n (%)	1 (5%)

544 ***EFFECTS OF POLYETHYLENE GLYCOL 3350 ON BEHAVIOR IN MICE.*** *Salman Salman[1], Kent Williams[1,2], Michael Bailey[2,3], Ross Maltz[1,2,3]. [1]Pediatric GI, Nationwide Children's Hospital, Columbus, OH; [2]Pediatrics, The Ohio State University College of Medicine, Columbus, OH; [3]Center of Microbial Pathogenesis, Abigail Wexner Research Institute at Nationwide Children's Hospital, Columbus, OH*

Background: Polyethylene Glycol 3350 (PEG-3350) is an over the counter laxative commonly used to treat constipation in pediatric populations. Anecdotal reports of anxiety, lethargy, aggression, mood swings and obsessive compulsive behavior after administration of PEG 3350 have led to parental concerns. However, behavioral problems are common in children with constipation like anxiety, aggression, depression and increased emotional reactivity, and no data have linked PEG 3350 to behavioral changes.

Aim: Determine if PEG-3350 leads to anxiety-like behavior in male and female mice.

Methods: Outbred CD1 mice (8 weeks old) were divided into 6 groups: received PEG-3350 either at 1g/kg or 4 g/kg, magnesium citrate either at 450mg/kg or 600 mg/kg or water via daily oral gavage for two weeks; in addition there was an unhandled control group which were undisturbed. Males and females were used (n=9 per group) for a total of 108 mice. Stool consistency was assessed 4-6 hours after gavage and is recorded on a scale from 0-3 with 0 is normal hard pellets, 1 mildly soft stool, 2 very soft stool, and 3 watery stool. Mice weighed daily during gavage period and twice weekly while off gavage. Behavioral changes were assessed with the Light/Dark test, open field test, and elevated plus maze prior to gavage, after 2 weeks of gavage, and 2 weeks after a washout period post gavage. Behavioral tests intended to look for anxiety like behavior and locomotor activity.

Results: PEG-3350 and magnesium citrate significantly changed stool consistency compared to water and control groups. However, there were no statistically significant differences in any of the behavioral measures including latency to enter, time spent in the dark, and number of transitions between light and dark chambers (Light/Dark test), time spent in the center/periphery, resting time, and distance traveled (open field task), and number of entries, time spent in the open arm, and time spent in the closed arm (elevated plus maze) across all 6 groups in both males and females.

Conclusion: Daily administration of PEG-3350 does not significantly affect anxiety-like behavior or locomotor activity in

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male and female mice despite a sufficient laxative affect.

545 ***OVERCOMING RECRUITMENT CHALLENGES TO INVESTIGATING THE GASTROINTESTINAL EFFECTS OF CHRONIC MARIJUANA USE IN ADOLESCENTS.*** *Matthew Shields*, *Justin Lopez*, *David Appelbaum*, *Jenifer Lightdale*. *Pediatric Gastroenterology*, *University of Massachusetts Medical Center*, *Worcester*, *MA*

Background: There remain gaps in understanding the prevalence and incidence of known and suspected gastrointestinal health effects of chronic marijuana use in adolescents. Although there is widespread marijuana use in this high-risk population, their recruitment to participate in studies on risky health related behaviors, such as smoking or drug use, can be challenging, which is likely a contributing factor in the ongoing paucity of data on this issue. In addition, it is well known that adolescents may be reluctant to report marijuana use and fear negative stigma. Investigators seeking to study the effects of marijuana on the digestive tract should be prepared to encounter barriers to recruitment.

Aim: To describe our experience with recruitment of adolescents engaged in chronic marijuana use for participation in a study of gastrointestinal health effects.

Methods: We obtained IRB approval (1/31/17) to conduct an anonymous survey of 30 adolescents between 16 and 18 years of age who were scheduled for a routine healthcare visit in the UMASS Memorial Adolescent and Young Adult Medicine Clinic. The intention of the survey was to investigate the prevalence of gastrointestinal symptoms in this population beyond cannabinoid hyperemesis syndrome, including nausea, vomiting and abdominal pain. Scheduled patients were identified by a member of the adolescent health clinic team (either the physician or the nurse) to have previously reported smoking marijuana. We excluded patients with gastrointestinal symptoms explained by another diagnosis; patients with cigarette smoking greater than 1 pack or equivalent amount of tobacco per day; as well as those using other illicit drugs. In our IRB application, we anticipated recruitment challenges in our timeline, and estimated that 12 months would be required to meet target enrollment. Upon IRB approval, we began identifying and approaching prospective study participants for their participation in a survey at the time of their clinic visit. On 10/30/18, we dedicated a research coordinator to work with the adolescent health care team for a total of 4 hours per week (1 clinic session) with the goal of identifying patients ahead of time and improving recruitment.

Results: In the first 28 months following IRB approval, a total of 15/30 (50%) of targeted recruits (40% male; median age 17 years) have agreed to participate in our study, yielding an overall subject recruitment rate of approximately 0.54 patients per month. An additional 2 patients who were approached declined to participate leading to a 15/17 (88%) success rate in targeted recruitment. Thirteen of 15 recruited subjects were established patients in the adolescent medicine clinic. Pre-post analysis of recruitment success before and after including a dedicated research coordinator in our investigative team suggests improvement (1/15 vs. 14/15, $p<0.01$). This equates to a 0.05 patient/month enrollment rate prior to our study coordinator and a 2 patient/month enrollment rate after the study coordinator began ($p<0.05$). 100% of patients recruited by the dedicated research coordinator were proactively referred by providers ahead of their clinic visit, and all completed the survey in its entirety.

Conclusions: Recruiting adolescent patients to participate in a study designed to investigate the incidence and prevalence of GI symptoms associated with chronic marijuana use is challenging. As we have experienced at our institution, underestimated barriers to recruitment in this high-risk population may prolong a study timeline. Dedicating a study coordinator for recruitment may be helpful to meeting study targets, especially if they work with providers well known to the study population. Responsibilities of the coordinator can include prompting providers to proactively identify potential subjects ahead of clinic sessions, helping subjects to complete questionnaires and ensuring that the questionnaires are completed thoroughly. We have found that if we approach patients, they are likely to participate and complete their questionnaires. Despite challenges in recruitment, we also believe that persisting in this research question is critical to pediatrics in an era of widespread marijuana use. To date, no studies have been published investigating the incidence and prevalence of gastrointestinal symptoms in pediatric patients using marijuana.

546 ***INTEROBSERVER AND INTRAOBSERVER VARIATION IN INTERPRETATION OF FECAL LOADING ON ABDOMINAL RADIOGRAPHS IN CHILDREN.*** *Narendra Yallanki*[1], *Lucia Stephanie Milla*[2], *Lesley Small-Harary*[1], *Anupama Chawla*[1]. [1]*Peds Gastroenterology*, *Stony Brook University Hospital*, *Stony Brook*, *NY*; [2]*Renaissance School of Medicine*, *Stony Brook*, *NY*

Background: History taking and physical examination constitute the most important steps in the diagnosis of functional constipation. However, when the diagnosis is doubtful, several tests have been used to distinguish between the presence or

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absence of constipation, one which is abdominal radiography. Current North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) guidelines do not support the use of abdominal radiography in establishing the diagnosis of constipation. Despite these recommendations, abdominal radiography is often performed. In many cases aggressive laxative therapy is initiated and referrals to gastroenterology are made based on results of the radiograph.
Objectives: The primary aim of this study is to evaluate the interobserver and intraobserver variation between multiple providers in interpretation of fecal loading on abdominal radiographs in children.
Study Design and Methods: This is a retrospective research study done at Stony Brook Children's Hospital. The electronic medical records of 100 children seen for abdominal pain and/or constipation who had an abdominal radiograph performed in ER were consecutively selected (from years 2014-2018) and radiographs were downloaded for review. Four physicians from each specialty including Pediatric GI, Radiology and Pediatric Emergency Medicine (total of 12 interpreters from 3 specialties) interpreted the radiographs independently. Initially subjective interpretations were obtained, later the same physicians were asked to interpret the same radiographs to measure intraobserver variation. Each observer reported interpretation findings as normal, mild, moderate or severe constipation. Consistency between interobserver and intraobserver ratings of radiographs interpretation were evaluated using the Kappa coefficient (ranges from 0 to 1.0 (no agreement to perfect agreement).
Results: Kappa Coefficient values showed a free margin kappa of 0.21 and 40% overall agreement among12 observers. Intradepartmental comparisons showed an overall agreement of 41.5%, 36.7% and 47.3% in GI, EM and Radiology respectively. Intraobserver Kappas to look for reproducibility showed significant variability ranging from 0.11 to 0.64 with 33.3% to 73.4% agreement.
Conclusion: Kappa coefficients showed only poor to fair agreement among the 12 observers (40 %) and poor consistency with significant variability among providers when same X-rays were presented again. Our study supports the current recommendation of NASPGHAN of not to rely on abdominal x-rays for establishing the diagnosis of constipation. Reliability of X-rays for diagnosis and grading the degree of constipation is questionable given only poor to fair agreements for both interobserver and intraobserver comparisons.

KAPPA COEFFICIENT VALUES	INTEROBSERVER AGREEMENT AMONG ALL PROVIDERS	INTRADEPARTMENTAL INTEROBSERVER AGREEMENT Radiology Peds GI Peds EM		
Overall agreement	40.8%	47.3%	41.5%	36.7%
Free margin kappa	0.21 (0.18 - 0.24)	0.30 (0.23-0.37)	0.22 (0.15-0.29)	0.16(0.09-0.22)
Fixed margin kappa	0.18 (0.17-0.20)	0.26 (0.2 - 0.31)	0.21 (0.16-0.25)	0.11(0.06-0.17)

547 ***CLINICAL CHARACTERISTICS, COMORBID CONDITIONS AND OUTCOMES OF PEDIATRIC HOSPITALIZATIONS WITH CYCLICAL VOMITING SYNDROME. A POPULATION-BASED ANALYSIS..*** *Aravind Thavamani[1,2], Krishna Kishore Umapathi[1,2], Jasmine Khatana[1], Katja Kovacic[3,5], Thangam Venkatesan[4], Sanjay Bhandari[4]*
[1]Pediatrics, Metro Health Medical Center, Parma, OH; [2]Case Western Reserve Unversity, Cleveland, OH; [3]Pediatrics, Medical College of Wisconsin, Wisconsin, WI; [4]Medical College of Wisconsin, Milwaukee, WI; [5]Pediatrics, Children's Hospital of Wisconsin, Milwaukee, WI
Introduction: Cyclical Vomiting Syndrome (CVS) is a chronic functional GI disorder characterized by recurrent, self-limiting episodes of nausea & vomiting in the absence of positive lab, imaging or endoscopic findings. Prevalence of CVS ranges from 0.04 to 1.9% in children and the incidence rate is almost 3 per 100,000. There is a lack of population level data on CVS & its comorbid conditions among children and thus we sought to do this study.

Methodology: We analyzed KID database which is an aggregated collection of stratified random samples across USA, between the years 2003 and 2016. To accurately include the CVS patients, we only included hospitalizations with a primary diagnosis of Cyclical Vomiting Syndrome. Among patients who did not have a diagnosis of CVS in any of the primary or the secondary diagnosis columns, we selected 1:5 age and gender matched controls. We also excluded common mimickers of CVS such as hydronephrosis, malrotation, eosinophilic esophagitis, rumination syndrome, hydrocephalus, metabolic disorders along with post-operative, pregnancy associated and psychogenic causes of emesis. We then analyzed the discharge record of these patients for other co morbid conditions which are known to be associated with CVS, using ICD 9 & 10 codes. Total costs were calculated using the cost to charge ratio (CCR) variable provided in the KID datasets.

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Results: Total number of CVS related hospitalization were 12,624 and number of age and gender matched controls = 60,735. The mean age of patients with CVS - 10.4±6.7 years. Patients with CVS were predominantly females and of Caucasian race (Table.1). Fifty-six patients (0.4%) with CVS had a concomitant diagnosis of abdominal migraine. CVS patients had more GI procedures than controls, p<0.001 (Table.2). Patients leaving against medical advice (AMA) were higher among CVS group, p <0.001. Multiple logistic regression analysis showed CVS is associated with Caucasian Race, private insurance. Further, hospitals with larger bed size were associated with 20% decrease in hospitalization of CVS patients when compared to hospitals with smaller bed size, OR – 0.80, CI: 0.75-0.85, p<0.001. Similarly, Urban hospitals were less likely to be associated with CVS hospitalization than rural hospitals,OR-0.81,p<0.001 (Table.3). All the comorbid conditions including IBS, migraine, dysautonomia, GERD showed significant association with CVS. The association is stronger for gastroparesis and dyspepsia. CVS was associated with increased marijuana use (OR-5.47, CI: 4.82-6.19) and decreased alcohol use than controls (OR-0.31, CI-0.25-0.41), p<0.001. Anxiety disorder and stress reaction showed significant associations with CVS hospitalizations, p<0.001.

Conclusion: Our study showed that CVS is associated with several comorbid conditions and leads to significant health expenditure in pediatric population. Efforts to improve management of CVS and its comorbid condition will lead to better quality of life and reduced health care expenditure.

Table.1 Demographics of the study population.

Demographics	CVS N=12624	Controls N=60735	P Value
Age	10.49±6.7	10.61±7.8	0.15
Sex			
Male	5452(43.2%)	26115(43%)	0.73
Female	7172(56.8%)	34619(57%)	
Race			
White	6262(49.6%)	25739(42.4%)	<0.001
AA	1504(11.9%)	8526(14%)	
Hispanic	1653(13.2%)	11376(18.7%)	
Others	3206(25.3%)	15094(24.9%)	
Insurance			
Public	5055(40%)	29042(47.8%)	<0.001
Private	6473(51.3%)	26256(43.2%)	
SP/Uninsured/others	1096(8.7%)	5437(9%)	
Bed size of Hospital			
Small	1695(13.7%)	7408(12.5%)	<0.001
Medium	3557(28.8%)	15236(25.6%)	
Large	7083(57.5%)	36851(61.9%)	
Location/Teaching status			
Rural	1512(12.3%)	6392(10.7%)	<0.001
Urban – Non teaching	2911(23.6%)	17,914(30.1%)	
Urban Teaching	7913(64.1%)	35,189(62.3%)	
Elective hospitalizations	1260(10%)	10,465(17.3%)	<0.001

Table.2 Demonstrates various procedures and outcome measures associated with CVS.

Procedures/outcomes	CVS N=12624	Controls N=60735	P Value
EGD	1333(10.6%)	489(0.8%)	<0.001
Colonoscopy	138(1.1%)	207(0.3%)	<0.001
Nuclear Scan	33(0.3%)	IS*	<0.001
cholecystectomy	IS* (<0.1%)	245(0.4%)	<0.001
Length of stay	3.06±0.03	3.79±0.03	<0.001
Total Charges	14426±198	21207±272	<0.001
Total cost	5028±71	6935±88	<0.001
Discharge			
Routine	11784(93.3%)	56905(93.7%)	0.13
AMA	160(1.3%)	191(0.3%)	<0.001
Mortality	IS(<0.1%)	144(0.4%)	<0.001

*IS- Information Suppressed.

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Table.3 Multiple Logistic Regression showing OR and CI of various factors associated with CVS.

Parameters	Odds Ratio	Confidence Interval	P value
Race			
White	Ref	Ref	Ref
AA vs White	0.87	0.81-0.93	<0.001
Hispanic vs White	0.72	0.67-0.77	<0.001
Others vs White	0.99	0.94-1.04	0.72
Insurance			
Public	Ref	Ref	Ref
Private vs public	1.25	1.20 – 1.31	<0.001
SP/Insured vs public	1.06	0.97- 1.14	0.15
Hospital Bed size			
Small	Ref	Ref	Ref
Medium vs Small	1.01	0.94-1.08	0.78
Large vs Small	0.80	0.75-0.85	<0.001
Teaching status			
Rural	Ref	Ref	Ref
Urban nonteaching vs rural	0.63	0.58-0.67	<0.001
Urban teaching vs rural	0.81	0.75-0.86	<0.001
Location			
Northeast	Ref	Ref	Ref
Midwest vs Northeast	0.77	0.72-0.82	<0.001
South vs Northeast	0.79	0.74-0.84	<0.001
West vs Northeast	1.02	0.96-1.09	0.42
Irritable bowel syndrome	3.02	2.16-4.22	<0.001
Migraine	6.87	6.03-7.83	<0.001
Dysautonomia	10.01	5.87-17.02	<0.001
GERD	6.75	6.23-7.31	<0.001
Gastroparesis	13.77	10.23-18.53	<0.001
Dyspepsia	11.40	8.50-15.29	<0.001
Alcohol use	0.31	0.25-0.41	<0.001
Marijuana use	5.47	4.82-6.19	<0.001
Smoking	1.15	1.02-1.30	0.01
Depression	0.54	0.48-0.61	<0.001
Anxiety	4.60	4.13-5.13	<0.001
Stress Reaction	3.76	2.15-6.56	<0.001
PTSD	0.63	0.48-0.82	0.001
Bipolar Disorder	0.38	0.31-0.47	<0.001

548 ***IRRITABLE BOWEL SYNDROME IN CHILDREN AND ROME IV. WE CHANGED THE QUESTIONNAIRES AND THEN WHAT HAPPENED?.*** *Carlos Velasco-Benitez[1,2], priscila Lisboa[4], Miguel Saps[3]. [1]Pediatria, Universidad del Valle, Cali, Colombia; [2]Universidad de Granada, Granada, Spain; [3]University of Miami, Miami, FL; [4]Faculdade de Medicina de Marilia, Sao Paulo, Brazil*

The diagnosis of functional abdominal pain disorders (FAPDS) relies on the Rome criteria (RC). The pediatric RC had multiple iterations, last one in 2016 (Rome IV). Each version included a diagnostic questionnaire (Questionnaire of Pediatric Gastrointestinal Symptoms- QPGS). RCIV established diagnostic changes to irritable bowel syndrome (IBS). The QPGS- RCIV excluded from IBS diagnosis, cases of supraumbilical abdominal pain (S-AP) exclusively associated with meals or infraumbilical AP (I-AP) that only occurs during menses or resolves with cleanouts. Studies from US and Colombia found significant contradictory changes in IBS prevalence using QPGS-RCIV while comparing with previous local historical data that used the QPGS-RCIII. While the US study found increased IBS prevalence, the Colombian study found decreased prevalence. Reasons for changes and variations are unclear. Historical comparisons do not account for possible changes in "real" prevalence across time or variations related to comparing different samples. We conducted a study in order to understand whether the new questions on the QPGS- RCIV could have explained the differences in prevalence between RCIII and RCIV. **METHODS:**Per Rome guidelines, we translated QPGS-RIII and QPGS-RIV into Spanish followed by reverse translation. Schoolchildren/adolescents from private and public schools completed QPGS-RCIII and half-hour later QPGS-RCIV. **RESULTS:**1377 schoolchildren/adolescents 10-18 years (13.5 +/- 2.5) participated (35% children, 65% adolescents) (Table 1). All completed QPGS-RIII and QPGS-RIV. The 2 new exclusions criteria questions did not impact diagnosis because: 1- no children reported IBS resolution with constipation medications; 2- although 9 girls reported I-AP limited to menses what would exclude them from IBS diagnosis, all of them also had S-AP. Therefore, I-AP limited to menses did not influence IBS prevalence; 3- No children that otherwise met RC-IV diagnosis for IBS, reported S-AP that was only associated to meals. **CONCLUSION**: QPGS-RCIV changes did not significantly

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influence IBS prevalence. Changes in prevalence comparing with previous studies may reflect “real” local changes in prevalence. Future longitudinal studies should investigate the stability of prevalence of IBS in the same population across time, as changes in prevalence in the same population were not previously reported.

Demographics

Age (10-18 y.o)	Mean:13.5+/-2.5
Age group	
School age	484 (35.1)
Adolescent	893 (64.9)
Sex	
Female	688 (50,0)
Male	689 (50.0)
Education	
Public	1266 (91.9)
Private	111 (8.1)

549 ***RISK FACTORS IN CHILDREN UNDER 4 YEARS OF AGE WITH FUNCTIONAL GASTROINTESTINAL DISORDERS ACCORDING TO THE ROME IV CRITERIA.*** *Carlos Velasco-Benitez[1,2], Eder Villamarin-Betancourt[1], Jorge Mejia-Lopez[1]. [1]Pediatria, Universidad del Valle, Cali, Colombia; [2]Universidad de Granada, Granada, Spain*

Introduction. The prevalence of functional gastrointestinal disorders (FGIDs) according to the Rome III Criteria in Colombian children <4 years, is greater in single children, firstborns and with separated / divorced parents. **Objective.**Determine according to the Rome IV Criteria if some variables are risk factors in children <4 years with FGIDs. **Material and methods.**Descriptive observational study type prevalence in healthy children <4 years of age from 3 Colombian cities. The Spanish version of the Roma IV Pediatric Digestive Symptoms Questionnaire was made to the caregivers of these children and they were asked about sociodemographic variables such as age, sex and race; and nutritional such as feeding with breast milk, complementary milk, cow's milk and dairy products. The statistical analysis included measures of central tendency, bivariate and multivariate analysis with calculation of the OR and their respective 95% CI, being a p <0.05 significant. **Results**. We analyzed 1298 children <4 years of age (24.9 ± 15.1 months); 51.2% of the female gender; 50.1% mestizo race; fed with breast milk in 29.3%; with complementary in 89.4% and with cow's milk and dairy products in 79.0%. The prevalence to present at least 1 FGIDs was 32.1%; being the main FGIDs in <1 year, regurgitation in 16.7%, functional constipation (FC) in 7.9%, colic in 5.4% and dizchezia in 2.9%; and in children between 1-4 years, the FC in 29.5%, the rumination in 1.8%, the cyclic vomiting syndrome in 1.7% and the functional diarrhea in 0.4%. There was a predominance of FGIDs in children between 1-4 years (OR = 1.59 CI95% = 1.20-2.11 p = 0.0007), of mixed race (OR = 1.32 CI95% = 1.04 -1.68 p = 0.0185); without breastfeeding (OR = 2.23 CI95% = 1.65-3.02 p = 0.0000) and fed with complementary (OR = 2.52 CI95% = 1.55-4.25 p = 0.0001) and milk from cow and dairy products (OR = 1.63 CI95% = 1.18-2.27 p = 0.0020). The risk factors to present some FGIDs was the non-feeding with breast milk (OR = 1.96 CI95% = 1.41-2.71 p = 0.000) and the race (OR = 1.16 CI95% = 1.03 -1.31 p = 0.011). **Conclusion.**More than a third of children <4 years of age have some FGIDs, being the most frequent in <1 year, regurgitation, FC and colic; in children between 1-4 years old, FC, rumination and cyclic vomiting syndrome; and with a higher prevalence in children between 1-4 years old, of mixed race, without breastfeeding and fed with complementary milk, cow's milk and dairy products; being the risk factors, not feeding with breast milk, and the mestizo race.

550 ***VALIDITY OF CRITERIA OF THE ROME IV CRITERIA FOR THE DIAGNOSIS OF FUNCTIONAL GASTROINTESTINAL DISORDERS IN SCHOOLCHILDREN AND ADOLESCENTS.*** *Carlos Velasco-Benitez[1,2], Lina Gomez-Oliveros[3], Lina Rubio-Moreno[3], Jose Tovar-Cuevas[3], Miguel Saps[4]. [1]Pediatria, Universidad del Valle, Cali, Colombia; [2]Universidad de Granada, Granada, Colombia; [3]Universidad del Valle, Cali, Colombia; [4]Universidad de Miami, Miami, FL*

Introduction: To test the Questionnaire for Digestive Symptoms in Schoolchildren and Adolescents of Rome IV (QPGS-IV), it must be reliable and have an adequate performance in the various categories that establish its validity. **Objective:**To determine the validity of criteria of the QPGS-IV by means of studies of diagnostic accuracy. **Methodology:**We included children between 10 and 18 years of age with some functional gastrointestinal disorder (FGID) according to the QPGS-IV, which were paired with other children without FGID. Both groups received a medical consultation to diagnose FGID

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through a medical history and physical examination. Sensitivity, specificity and positive predictive value (PPV) and negative predictive value (NPV) of the QPGS-IV were estimated using a Bayesian approach.**Results:**181 children of 13.1 (SD = 1.3) years of age were analyzed, with a higher percentage of females. There was a higher prevalence to present some FGID during the medical consultation versus the QPGS-IV (66.3% vs. 49.3%, p = 0.001); being the main FGID functional constipation. Sensitivity was estimated (72.4% with CI95% 65.3% - 79.0%), specificity (90.3% CI95% 86.4% - 93.4%), PPV (85.8% CI95% 80.8% - 89.7%) and the NPV (79.9% CI95% 75.9% - 83.6%) using statistical methods that consider in the criterion validation, the absence of a test considered gold standard. **Conclusion:**This study suggests that the QPGS-IV has an adequate diagnostic accuracy, which allows health professionals its application in daily clinical work when identifying children who may have a FGID, as well as in the development of future investigations.

552 *BEDSIDE ANORECTAL MANOMETRY TO GUIDE MANAGEMENT IN PEDIATRIC PATIENTS WITH DEFECATION DISORDERS.*

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Background: Anorectal (AR) manometry is used to diagnose and guide management of disorders of defecation such as chronic constipation or fecal soiling. AR manometry testing is often performed in procedure centers. Bedside AR manometry devices are highly mobile and utilize disposable catheters, which facilitates testing in a clinic setting. This may result in substantial time and cost savings for patients. There are no studies outlining implementation of bedside AR manometry device use in a pediatric clinic care model. This study describes application of bedside AR manometry testing in a pediatric Motility Disorders Program, including diagnostic findings and outcomes.

Methods: Electronic medical record review was performed of pediatric patients ages 6-18 years who had bedside AR manometry testing using a highly mobile device for defecation disorders in Primary Children's Hospital Motility Disorders Clinic between 3/2018 and 2/2019. Patients were treated with high dose stimulant laxatives or large volume enemas (LVE). Those with dyssynergia were referred to physical therapy (PT) for pelvic floor rehabilitation. Demographics, diagnostic findings, and outcomes are described.

Results: 50 patients (male=24), ages 10.1±3.3 years (mean±SD), had bedside AR manometry testing. 62% (n=31) had fecal soiling at presentation. A rectoanal inhibitory reflex (RAIR) was present in 80% (n=40) of patients. 80% (n=8) of those lacking a RAIR had known diagnoses to account for absent RAIR. Rectal biopsy was performed in 10% (n=1) of patients with an absent RAIR. No new diagnoses of Hirschsprung disease were made. 48% (n=24) were treated with high dose laxatives. 52% (n=26) were treated with LVE. 74% (n=23) of those previously soiling were continent following treatment. 13% (n=4) continued to soil. 13% (n=4) were lost to follow-up. 78% (n=39) had dyssynergic stooling patterns. 58% (n=22) had at least one PT pelvic floor rehabilitation session, of which 45% (n=10) completed pelvic rehabilitation therapy. 90% (n=9) of patients soiling at presentation that completed pelvic floor rehabilitation were continent after therapy.

Conclusions: Bedside AR manometry is a feasible testing modality to guide management of pediatric patients with defecation disorders, while potentially providing time and cost savings for patients.

553 *POSSIBLE RISK FACTORS FOR FUNCTIONAL GASTROINTESTINAL DISORDERS IN SALVADORAN CHILDREN UNDER 4 YEARS OF AGE.*

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Introduction: In Latin America according to the Rome III Criteria (RIII), in 40.5% of children <4 years, they have Functional Gastrointestinal Disorders (FGIDs). **Objective:** To determine the prevalence and possible risk factors to present FGIDs in children <4 years according to RIV Criteria. **Methodology:** Observational type prevalence study performed on legal representatives of Salvadoran infants <4 years old, who answered the Questionnaire for Pediatric Digestive Symptoms in Spanish version RIV to identify FGIDs. Sociodemographic, perinatal, family, clinical and nutritional variables were taken into account. Univariate and bivariate analyzes were performed, a p <0.05 being significant. **Results:** 202 children of 18.2 ± 14.4 months were included; 44.1% <12 months; 55.4% male; 94.6% white; 64.4% born by caesarean section; 29.2% preterm; 58.4% children only; 59.4% firstborns; 10.4% with separated/divorced parents; 27.7% with a history of previous diarrhea; fed with breast milk 35.2%, with bottle 68.8%, supplementary feeding 74.7% and with dairy products 57.4%. 26.7% had at least 1 FGIDs: 13.4% functional constipation (FC); 12.4% regurgitation (<12 months), 9.0% dyschezia (<9 months), 4.7% colic (<4 months), 2.0% cyclical vomiting syndrome, and 1.5% functional diarrhea. There was no rumination. There was greater opportunity to present FC in children with separated/divorced parents (OR = 3.04 95%CI =

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0.86-9.44 p = 0.0305) and older (OR = 5.43 95%CI = 1.74-22.33 p = 0.0010). **Conclusion:** The prevalence of FGIDs in Salvadoran children <4 years is low compared to previous Latin American results; being a possible risk factor for presenting FC, having separated/divorced parents and being between 1 and 4 years of age

INFLAMMATORY BOWEL DISEASE

554 *STEADY-STATE TROUGH CONCENTRATIONS AND THEIR RELATIONSHIP TO SELECTED DEMOGRAPHIC AND CLINICAL RESPONSE MEASURES IN ETRASIMOD-TREATED PATIENTS WITH MODERATELY-TO-SEVERELY ACTIVE ULCERATIVE COLITIS.*

D. Alexander Oh, *Caroline Lee*, *Yong Tang*, *Christopher Cabell*, *John Grund. Arena Pharmaceuticals*, *San Diego*, *CA*

Background: Etrasimod is a once–daily, oral, selective, sphingosine-1-phosphate receptor modulator in clinical development for the treatment of immune-mediated inflammatory disorders. We examined etrasimod steady-state plasma trough concentrations ($C_{ss,trough}$) and their relationships to demographics and clinical responses in patients with moderately–to–severely active ulcerative colitis (UC).

Methods: Etrasimod $C_{ss,trough}$, demographics, and clinical responses were obtained in a randomized, double-blind, parallel-group, 12-week, Phase 2 study evaluating once–daily treatment with etrasimod 1mg (n=52), 2mg (n=50), or placebo (n=54) in patients with moderately–to–severely active UC, defined as a modified Mayo Clinic Score (mMCS) of 4–9 with an endoscopic subscore of ≥2 (with absence of friability) and a rectal bleeding subscore of ≥1. We measured etrasimod $C_{ss,trough}$ in pre-dose blood samples drawn at weeks 1, 2, 4, 8, and 12, averaged across weeks ($C_{ss,avg\ trough}$), and summarized by treatment and gender. The relationships of dose-normalized $C_{ss,avg\ trough}$ values with patient age (range: 21–67 years) and total body weight (TBW; range: 47–130 kg) were assessed using linear regression. For exposure-response (E-R), the relationship between $C_{ss,trough}$ values at week 12 (including placebo patients whose $C_{ss,trough}$ values = 0) and evaluated clinical response measures of change from baseline in mMCS and lymphocyte count at week 12 were assessed using Spearman's rank correlation and a locally weighted regression line fit.

Results: For each etrasimod dose level, arithmetic mean $C_{ss,trough}$ values at weeks 1, 2, 4, 8, and 12 were similar (range: 31.8–42.5 ng/mL and 64.1–71.1 ng/mL for 1 mg and 2 mg dosing, respectively), indicating that steady-state was achieved in week 1. $C_{ss,avg\ trough}$ values were dose-proportional (geometric means of 33.96 for 1 mg and 65.48 ng/mL for 2 mg), with moderate between-subject variability (Table 1). Geometric mean $C_{ss,avg\ trough}$ values were approximately 30% higher in women than men. Statistically significant linear relationships, with shallow negative slopes, were seen for dose-normalized $C_{ss,avg\ trough}$ values versus patient age (slope −0.359, P=0.035) and TBW (slope −0.379, P=0.006). Exploratory E-R relationships between $C_{ss,trough}$ and clinical responses (change from baseline to week 12 in mMCS and lymphocyte counts) were statistically significant and suggest that the greatest response is typically seen with $C_{ss,trough}$ levels of at least 45–50 ng/mL for mMCS (Figure 1A) and 30–60 ng/mL for lymphocyte counts (Figure 1B).

Conclusions: Dose-proportional etrasimod steady-state plasma trough concentrations were achieved and maintained from weeks 1 to 12 in patients with moderately–to–severely active UC. Modest gender, age, and TBW effects contributed to variability in trough exposure, but not to a clinically meaningful extent. Exploratory E-R relationships were generally consistent with findings of a previously reported dose-response relationship in the Phase 2 study, and support selection of an etrasimod 2-mg once–daily dosing regimen for Phase 3 testing.

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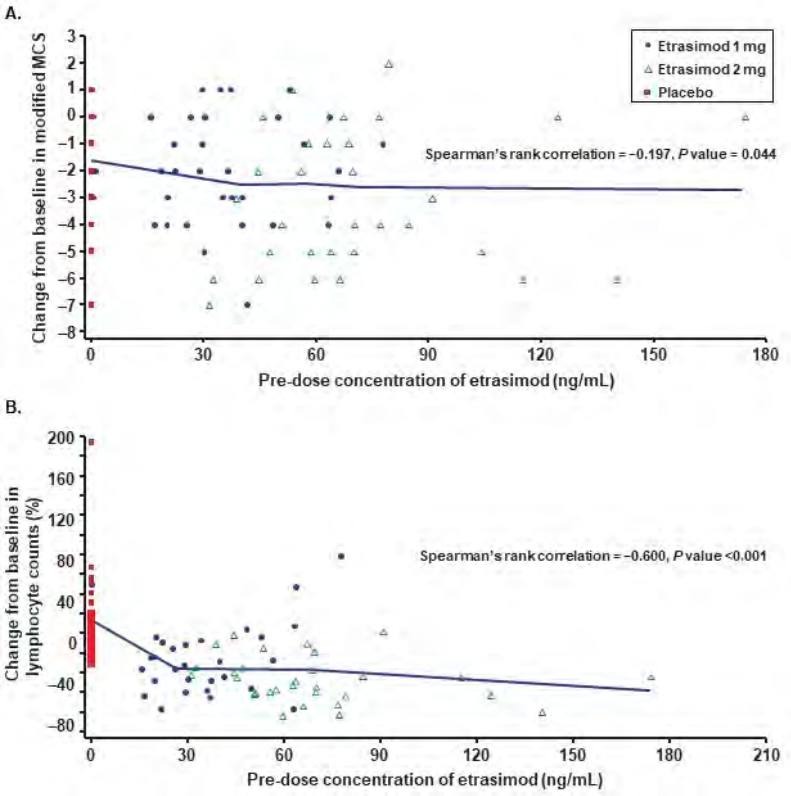


Figure 1A: Scatter plot of change from baseline in modified Mayo Clinic Score vs etrasimod pre-dose concentration (Css,trough) at week 12. **1B:** Scatter plot of percentage change from baseline in lymphocyte counts (%) vs etrasimod pre-dose concentration (Css,trough) at week 12. Lines shown are locally weighted regression fits.

Summary Statistic	Treatment Group					
	Etrasimod 1 mg			Etrasimod 2 mg		
$C_{ss\ avg\ trough}$ (ng/mL)	Male (N = 30)	Female (N = 22)	Overall (N = 52)	Male (N = 26)	Female (N = 22)	Overall (N = 48)
Geometric Mean	29.96	40.27	33.96	57.91	75.71	65.48
Geometric % CV	46.80	58.22	53.85	36.59	38.01	39.55

Abbreviation: CV = coefficient of variation.

Table 1: Summary of etrasimod $C_{ss\ avg\ trough}$ by treatment (overall and by gender). Placebo treated patients not shown.

555 ***IMPACT OF INDUCTION WITH STEROIDS VS. EXCLUSIVE ENTERAL NUTRITION ON HEALTH-RELATED QUALITY OF LIFE IN A LARGE CANADIAN PEDIATRIC IBD INCEPTION COHORT: IS THERE AN IMPACT ACROSS GENDER? .*** *Anthony Otley[1], Claire Humphrey-Pond[1], Thomas Walters[2], Kevan Jacobson[3], Jennifer deBruyn[4], Hien Huynh[5], WAEL EL-MATARY[6], Kevin Bax[7], Mary Sherlock[8], David Mack[9], Colette Deslandres[11], Jeff Critch[12], Anne Griffiths[2], Ernest Seidman[10], Amy Grant[1]. [1]Pediatrics, Gastroenterology, IWK Health Centre, Halifax, NS, Canada; [2]Hospital for Sick Children, Toronto, ON, Canada; [3]BC Children's Hospital, Vancouver, BC, Canada; [4]Pediatrics, University of Calgary, Calgary, AB, Canada; [5]Pediatrics, University of Alberta, Edmonton, AB, Canada; [6]Pediatric Gastroenterology, University of Manitoba, Winnipeg, MB, Canada; [7]Western University, London, ON, Canada; [8]McMaster University, Hamilton, ON, Canada; [9]University of Ottawa, Ottawa, ON, Canada; [10]Research Institute McGill University Health Center, McGill University, Montreal, QC, Canada; [11]Service de gastro-entérologie, CHU Sainte-Justine, Montreal, QC, Canada; [12]Memorial University, St. John's, , Canada*

The IMPACT is the only validated pediatric inflammatory bowel disease (IBD) disease-specific health-related quality of

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life (HRQOL) questionnaire. As one form of a patient-reported outcome, HRQOL is an increasingly important measure of treatment effectiveness and adverse effects in pediatric patients with Crohn's disease (CD). We investigated the impact of induction therapy on HRQOL, as measured by IMPACT-III, in pediatric patients with CD over a six-month follow-up period. The influence of demographic (age, gender) and disease related factors (disease location, disease severity) that can affect HRQOL were also explored.

Data was obtained from the Canadian Children IBD Network (CIDsCaNN) inception cohort study, which is a multi-centre, prospective study of children aged ≤17 years with IBD. Data was extracted for patients ≥8 years old with CD who received steroids or exclusive enteral nutrition (EEN) as induction therapy. IMPACT is reported as both total and domain scores (well-being, social, emotional, and body image). IMPACT data was collected at baseline (within 60 days of initiating treatment) and at 6-months (152-244 days post induction). A higher score on IMPACT indicates a better HRQOL. Pearson bi-variate correlations were run to explore associations between variables. Differences were compared between groups using Analysis of Co-variance (ANCOVA), Mann-Whitney U tests, or chi-square tests, as appropriate.

At the time of this analysis, 170 patients with CD, age ≥8 had received steroids (N=135) or EEN (N=135) as initial induction therapy. Patients in both groups were similar in age (15.0±3.0 years), and gender distribution (approximately 41% female). Preliminary analysis found that, at baseline, those who began EEN had significantly lower disease activity as measured by the Pediatric Crohn's Disease Activity Index (54.5±24.5) compared to those on steroids (64.8±24.0) ($p<0.05$), however there was no difference in disease activity at the 6-month follow up ($p>.05$). The two groups did show a significant difference in disease location ($p=0.03$); there was a greater proportion of patients receiving steroids with L2 disease compared to those on EEN ($p=0.03$). Conversely, there was a greater proportion of patients receiving EEN with L1 disease than those on steroid induction ($p=0.03$). There was no significant relationship between age and HRQOL at baseline, or follow-up in this sample ($p>.05$).

HRQOL scores were similar across EEN and Steroid induction patients at baseline (see table). However, at the 6-month follow-up period there were significant differences in HRQOL across patients who initiated therapy with EEN (n = 51; 32 male) vs. Steroids (n =49; 31 male) even after controlling for baseline differences in PCDAI. These differences were significant for IMPACT-III total scores and domain scores including well-being, social, and emotional functioning (all $p < .02$), but not body image ($p = .29$) (see table). There were also significant differences across gender, with females having significantly lower HRQOL compared to males on total and all domain scores (all $p < .03$) except body image ($p = .06$) (see table).

For pediatric patients with CD receiving either EEN or steroids for induction therapy, there was a significant difference in disease location and PCDAI at baseline. Although there was similar HRQOL at baseline, there were significant differences in HRQOL over time, with an effect of both type of induction therapy and gender on IMPACT-III scores. Previous research has found lower HRQOL in adult female patients with IBD, however, research in pediatric patients has found no differences in HRQOL across gender or has found trends for higher HRQOL among females. Further research around differences in HRQOL over time as a function of induction therapy, IBD-type, age, and gender is needed.

IMPACT-III scores across gender and induction therapy (EEN vs. Steroid)

	EEN	Steroid
Impact total: male	78.1±8.8	71.7±12.4
Impact total: female	71.9±10.0	63.7±13.4
Well-being: male	79.2±12.8	72.0±13.1
Well-being: female	72.1±11.8	65.4±16.3
Social: male	83.0±6.0	77.9±12.3
Social: female	76.2±9.9	68.6±11.2
Emotional: male	75.1±16.0	64.3±23.1
Emotional: female	68.4±13.6	53.4±20.7
Body-image: male	79.3±14.4	72.1±19.3
Body-image: female	69.1±17.8	68.1±18.9

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556 ***NOVEL TREATMENT OF ITCH DEFICIENCY IN VERY EARLY-ONSET INFLAMMATORY BOWEL DISEASE WITH HEMATOPOIETIC STEM CELL TRANSPLANTATION.*** *Trusha Patel[1], Maire Conrad[1], Emily Moser[4], Natania Field[5], Kelly Maurer[2], Noor Dawany[3], Claudio Giraudo[11], Sarah Henrickson[2], E Wherry[10], Marcella Devoto[9], Nancy Bunin[8], Jason Freedman[8], Jennifer Heimall[2], Danielle Arnold[2], Jonathan Markowitz[6], Paula Oliver[7,4], Kathleen Sullivan[2], Judith Kelsen[1]. [1]Pediatric Gastroenterology, Children's Hospital of Philadelphia, Philadelphia, PA; [2]Immunology, Children's Hospital of Philadelphia, Philadelphia, PA; [3]Department of Biomedical and Health Informatics, Children's Hospital of Philadelphia, Philadelphia, PA; [4]Cell Pathology Division, Children's Hospital of Philadelphia, Philadelphia, PA; [5]Cell and Molecular Biology Program, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA; [6]Pediatric Gastroenterology, University of South Carolina School of Medicine - Columbia, Greenville, SC; [7]Department of Pathology and Laboratory Medicine, University of Pennsylvania, Philadelphia, PA; [8]Blood and Marrow Transplant Program, Children's Hospital of Philadelphia, Philadelphia, PA; [9]Department of Biostatistics, Epidemiology & Informatics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA; [10]Department of Systems Pharmacology and Translational Therapeutics, University of Pennsylvania, Philadelphia, PA; [11]Microbiology, Thomas Jefferson University, Philadelphia, PA*

BACKGROUND: Itch is an E3 ubiquitin-protein ligase that serves as a key regulatory component of the immune response through down-regulation of inflammatory signaling. Mutations in *ITCH* can lead to systemic autoimmunity and immunodeficiency. However, little mechanistic insight has been generated on the extent of immune dysregulation that leads to the human phenotype. Specifically, while enteropathy has been reported, the etiology and degree of intestinal disease in Itch deficiency is poorly characterized, and the relationship to inflammatory bowel disease has not been elucidated. Together, the lack of insight into the mechanism and extent of disease has resulted in a paucity of therapeutic options for this potentially fatal disease.

OBJECTIVES: The objectives of this study were to: (1) expand the understanding of the intestinal phenotype of human Itch deficiency, including very early onset IBD (VEO-IBD) (2) further characterize the immune dysregulation in human Itch deficiency and (3) report the first successful targeted therapy using hematopoietic stem cell transplantation (HSCT) in a patient with Itch deficiency.

METHODS: Multidisciplinary clinical phenotyping was performed. *ITCH* gene mutation was identified on whole exome sequencing (WES) with trio analysis, and functional validation was performed, including mRNA expression and western blot analysis. Assessment of lymphoid and myeloid subsets was performed with flow cytometry and mass cytometry (CyTOF), as well as cytotoxicity and degranulation assays, to further delineate the immunophenotype associated with Itch deficiency.

RESULTS: A 2-year-old male presented with systemic autoimmunity, with pan-colonic VEO-IBD, severe arthritis and uveitis. The disease course progressed to include type 1 autoimmune diabetes, hypoparathyroidism, interstitial lung disease, allergic asthma, mild steatohepatitis and severe growth failure. Due to refractory disease, genetic and immunologic evaluation were performed. WES identified novel compound heterozygous mutations in *ITCH* (c.337+2T>C (splice donor) and c.772C>T, p.Arg258* (stop gain)). EBV-transformed B cell mRNA analysis demonstrated less than 50% expression of control *ITCH* mRNA. Western blot of EBV-transformed B cells from the patient demonstrated completely absent Itch protein Immunologic evaluation demonstrated immune dysregulation involving both lymphoid and myeloid lineages. Pneumococcal vaccine titers were low, and while he had quantitatively normal total B lymphocytes, he had decreased switched-memory B-cells. T lymphocyte subset analysis demonstrated T-cell lymphopenia, with mildly decreased T follicular helper cells and low T_H2 subset. There was also an increase in NKT cells. CD107a degranulation assay and a cell killing assay were performed to evaluate effector CD8 cell function and showed partially reduced function (66% of control). NK cell functional analysis for CD107a degranulation demonstrated a partially-reduced function (59% of control). Total monocytes were low with increased non-classical monocytes and decreased classical monocytes. Due to the refractory nature of the disease and severe immune dysregulation in the setting of Itch gene mutation, which is known to be expressed in hematopoietic cells, this child underwent matched-sibling bone marrow transplantation at 16 years of age. Post-transplant, he experienced resolution of his intestinal disease, arthritis, uveitis and psoriasis. He also had marked improvement in his diabetes while weaning chronic steroid therapy. His overall engraftment was very high (98%), with 100% engraftment in the myeloid compartment. At 6 months post-transplant, he had 81% T-cell reconstitution and 100% B-cell reconstitution, with normal production of IgA, IgG and IgM. Currently, at 9 months post-transplant, he remains well, with good control of arthritis, uveitis, psoriasis, diabetes and IBD without any chronic immunosuppressive medications.

CONCLUSIONS: Although Itch deficiency has previously been associated with autoimmunity, this is the first reported case of pan-colonic VEO-IBD, severe arthritis and uveitis in the context of multi-system autoimmunity. We characterized the immune dysregulation of Itch deficiency that may involve both lymphoid and myeloid lineages. In the setting of

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immune dysregulation with severe systemic autoimmunity, HSCT may be an effective, and potentially curative, therapy for Itch deficiency. The identification of a causal gene defect, with subsequent definitive targeted therapy, highlights the critical need for precision medicine approaches in children with VEO-IBD.

557 ***PERCEIVED IMPACT OF PEDIATRIC INFLAMMATORY BOWEL DISEASES ON ACADEMICS, COLLEGE PLANS, AND COLLEGE ADJUSTMENT.*** *Jill Plevinsky[1], Michele Maddux[3,4], Rachel Greenley[2]*
[1]Behavioral Medicine & Clinical Psychology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Psychology, Rosalind Franklin University of Medicine and Science, North Chicago, IL; [3]Clinical Psychology, Developmental & Behavioral Medicine, Children's Mercy Hospital, Kansas City, MO; [4]Pediatrics, University of Missouri-Kansas City School of Medicine, Kansas City, MO

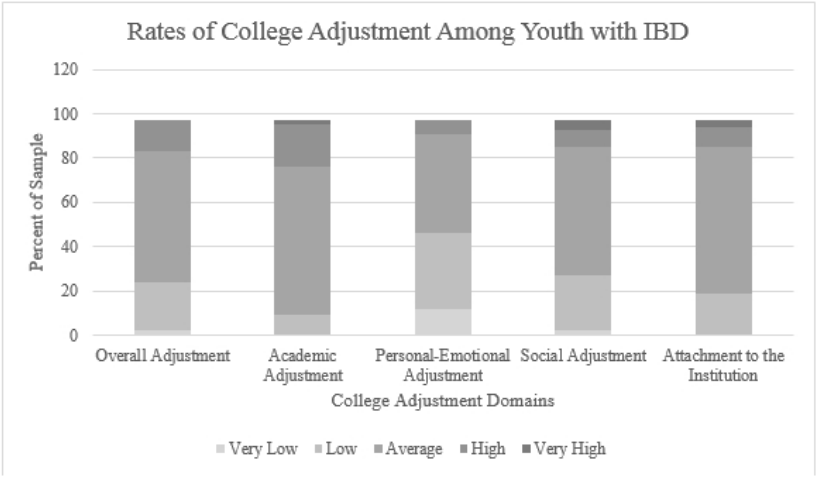
Background: College students with inflammatory bowel diseases (IBD), are at risk for poor college adjustment. Previous research demonstrates that IBD can disrupt both health-related quality of life and academics, social adjustment, emotional adjustment, and school attachment in high school and college. However, existing studies have not examined the role of perceived impact of IBD on academics and college plans by remission status. The current study aimed to 1) describe college adjustment in a sample of youth with IBD; 2) describe the perceived impact of IBD on academics and college plans; and 3) examine how perceived impact of IBD on academics and college plans contributes to college adjustment differently among those with active disease and those in remission.

Methods: Ninety-seven college students with IBD completed the Student Adaptation to College Questionnaire (SACQ), which consists of the following domains: Academic Adjustment, Social Adjustment, Personal-Emotional Adjustment, and Attachment to the Institution. Questions assess how well participants perceive their adaptation to the demands of college life in these areas. Participants also completed study-developed questions assessing the impact of IBD on academics and college plans, validated measures of disease activity, and demographic information.

Results: Across all domains of college adjustment except Personal-Emotional Adjustment, most participants reported average functioning (Academic Adjustment: 69%; Social Adjustment: 60%; Attachment to the Institution: 68%; Overall Adjustment: 61%). However, nearly a quarter of participants reported low Overall Adjustment and most notably, 47% and 28% reported very low to low Personal-Emotional Adjustment and Social Adjustment, respectively. Almost half of participants reported that IBD had an impact on their choice of college (49%) and grades during the last academic year (47%), while roughly a quarter indicated IBD impacted when they started college (24%), whether they attend college full- or part-time (24%), and whether they live at home during college (20%). For those with active disease, Overall Adjustment was significantly lower when they perceived that IBD delayed graduation from high school, impacted their grades, affected whether they attended college full- or part-time, or influenced their living situation (p's < .05). Notably, all participants reporting living at home endorsed that IBD impacted this decision, and they all reported significantly lower Social Adjustment, Attachment to the Institution, and Overall Adjustment compared to those living on/off campus alone/with roommates (p's < .05). There were no differences in college adjustment based on the perceived impact of IBD on academics and college plans in participants reporting inactive disease (p's > .05).

Conclusions: No studies to date have explored the impact of IBD on academics and college plans, and how that may influence college adjustment differently depending on disease activity. Findings suggest that those with active disease who perceive IBD as impacting their academics and college plans may demonstrate greater difficulty with school attachment, as well as academic, social, and overall college adjustment. Future directions include exploring constructs affecting emotional adjustment for college students with IBD, especially given that nearly half of our sample (46%) scored within the very low and low range in this domain.

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558 ***PERIPHERAL BLOOD EOSINOPHILIA AND LONG TERM SEVERITY IN PATIENTS WITH PEDIATRIC- AND ADULT-ONSET INFLAMMATORY BOWEL DISEASES.*** *Krishnapriya Marangattu Prathapan[1], Claudia Ramos Rivers[2], Sandra Kim[1], Ioannis Koutroubakis[3], Xiaoqing Tan[3], Gong Tang[3], Dmitriy Babichenko[3], Marc Schwartz[2], Siobhan Proksell[2], Elyse Johnston[2], Jana Al Hashash[2], Michael Dunn[2], Annette Wilson[3], Alyce Anderson[3], Arthur Barrie[2], Janet Harrison[2], Douglas Hartman[3], David Binion[2]. [1]Pediatric Gastroenterology, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]Division of Gastroenterology, Hepatology and Nutrition, University of Pittsburgh Medical Center, Pittsburgh, PA; [3]University of Pittsburgh, Pittsburgh, PA*

Background: Pediatric-onset inflammatory bowel disease (IBD) has been found to be more extensive and severe compared to the adult-onset IBD patients. Peripheral blood eosinophilia (PBE) identifies a subgroup of adult patients with IBD who had extensive disease involvement, higher disease activity and higher healthcare utilization over multiple years. PBE is associated with higher disease activity at the time of diagnosis in pediatric-onset IBD. At present, the role of PBE in contributing to the long-term severity of pediatric-onset IBD is not known.

Aim: To determine the prevalence of PBE and its impact on multi-year severity in patients with pediatric- and adult-onset IBD.

Methods: We conducted an analysis of a consented, prospective, natural history IBD registry at a tertiary center from 2009 to 2017. We included patients with IBD (Crohns disease (CD) and Ulcerative Colitis (UC)) who had blood counts measured at least once in 2009-2017, who were diagnosed by 2014 and had at least one clinical encounter every year from 2014-2017. PBE was defined as absolute eosinophil count $\geq 0.4 \times 10^9$/L. Prevalence of PBE was characterized in patients with both pediatric-onset (PO) and adult-onset (AO) IBD. Healthcare financial charge data included all healthcare charges for both inpatient and outpatient services, excluding pharmacy charges. Demographics, clinical characteristics, disease activity, healthcare utilization, and annual healthcare financial charges were compared between patients with pediatric vs. adult-onset IBD as well as between the subgroups with and without PBE. Comparisons between groups were done using Pearson χ^2 test and non-parametric Wilcoxon rank-sum test.

Results: We identified 1525 patients (AO: 78%; n=1195 and PO: 22%; n=330) from the IBD registry who met our inclusion criteria. 79% of PO IBD patients had CD compared to 58% of AO IBD patients ($p<0.001$). PO IBD patients had extensive disease compared to AO. In our cohort, disease activity, as defined by higher rates of inflammatory marker elevation and disease activity scores were similar in patients with both PO and AO IBD. PO patients had higher rates of hospitalizations, ER visits and had higher average annual financial charges compared to AO patients. PBE was found in 39.7% of PO and 27.6% of AO patients. Both PO and AO IBD patients with PBE had higher healthcare utilization, higher disease activity and higher average annual financial charges compared to IBD patients without PBE. PO and AO IBD patients with PBE have similar healthcare utilization, disease activity and average annual financial charges.

Conclusion: PBE is a readily available and relatively inexpensive biomarker, which identifies a subgroup of IBD patients with a severe multi-year disease course in patients with adult-onset IBD as well as patients with pediatric-onset IBD patients who have been followed into adulthood. PBE is more prevalent in patients with pediatric-onset IBD and may contribute to the intrinsic severe phenotype, which persists into adulthood.

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Table 1: Adult-onset IBD vs Pediatric-Onset IBD

	PO (n=330)	AO (n=1195)	p-value
Healthcare utilization, Median (IQR)			
Telephone encounters	20 (26)	19 (25)	0.38
Hospitalization	0 (2)	0 (1)	**0.001**
ED visits	1 (3)	0 (2)	**0.006**
Clinic visits	12 (16)	13 (16)	0.84
Radiology	1 (2)	0 (2)	0.11
Endoscopy	3 (2)	2 (3)	0.42
Disease activity			
SIBDQ, median (IQR)	57(16)	56 (17)	0.14
HBI, median (IQR)	2.3 (4.2)	2.67 (4.6)	0.49
UCAI, median (IQR)	1.7 (7)	2 (4)	0.95
n (%)			
CRP elevation, %	152 (47.5)	504 (45.2)	0.42
ESR elevation, %	79 (35.7)	257 (34.5)	0.78
Financial charges per year			
Average Charges (USD), median (IQR)	10,501.35 (26,818.98)	6032.88 (21,033.84)	**0.03**

Table 2: Adult-onset IBD with PBE vs No PBE

	PO PBE (n=131)	PO No PBE (n=199)	p-value
Healthcare utilization, Median (IQR)			
Telephone encounters	23 (35)	18 (24)	**0.02**
Hospitalization	1 (3)	0 (1)	**<0.001**
ED visits	1 (5)	0 (2)	**<0.001**
Clinic visits	13 (19)	12 (13)	0.06
Radiology	1 (3)	0 (2)	**0.002**
Endoscopy	2 (2)	3 (2)	0.99
Disease activity			
SIBDQ, median (IQR)	55 (17)	58 (15)	0.08
HBI, median (IQR)	3 (5)	2 (4.3)	**0.04**
UCAI, median (IQR)	1 (7.4)	2 (6.7)	0.41
n (%)			
CRP elevation, %	68 (59.1)	70 (39.8)	**0.002**
ESR elevation, %	40 (45)	39 (29.3)	**0.02**
Financial charges per year			
Average Charges (USD), median (IQR)	17,440.06 (42,615.69)	7045.22 (19,494.21)	**<0.001**

Table 3: Pediatric-onset IBD with PBE and No PBE

	PO PBE (n=131)	PO No PBE (n=199)	p-value
Healthcare utilization, Median (IQR)			
Telephone encounters	23 (35)	18 (24)	**0.02**
Hospitalization	1 (3)	0 (1)	**<0.001**
ED visits	1 (5)	0 (2)	**<0.001**
Clinic visits	13 (19)	12 (13)	0.06
Radiology	1 (3)	0 (2)	**0.002**
Endoscopy	2 (2)	3 (2)	0.99
Disease activity			
SIBDQ, median (IQR)	55 (17)	58 (15)	0.08
HBI, median (IQR)	3 (5)	2 (4.3)	**0.04**
UCAI, median (IQR)	1 (7.4)	2 (6.7)	0.41
n (%)			
CRP elevation, %	68 (59.1)	70 (39.8)	**0.002**
ESR elevation, %	40 (45)	39 (29.3)	**0.02**
Financial charges per year			
Average Charges (USD), median (IQR)	17,440.06 (42,615.69)	7045.22 (19,494.21)	**<0.001**

Table 4: Adult-onset IBD with PBE vs Pediatric-onset IBD with PBE

	PO PBE (n=131)	PO No PBE (n=199)	p-value
Healthcare utilization, Median (IQR)			
Telephone encounters	23 (35)	18 (24)	**0.02**
Hospitalization	1 (3)	0 (1)	**<0.001**
ED visits	1 (5)	0 (2)	**<0.001**
Clinic visits	13 (19)	12 (13)	0.06
Radiology	1 (3)	0 (2)	**0.002**
Endoscopy	2 (2)	3 (2)	0.99
Disease activity			
SIBDQ, median (IQR)	55 (17)	58 (15)	0.08
HBI, median (IQR)	3 (5)	2 (4.3)	**0.04**
UCAI, median (IQR)	1 (7.4)	2 (6.7)	0.41
n (%)			
CRP elevation, %	68 (59.1)	70 (39.8)	**0.002**
ESR elevation, %	40 (45)	39 (29.3)	**0.02**
Financial charges per year			
Average Charges (USD), median (IQR)	17,440.06 (42,615.69)	7045.22 (19,494.21)	**<0.001**

559 ***COLON IL-33 IS PRIMARILY PRODUCED BY MYOFIBROBLASTS AND DIFFERENTIALY INDUCED DURING ACUTE AND CHRONIC COLITIS IN MICE.*** *Amanda Waddell[1], Jefferson vallance[1], Sejal Fox[1], Michael Rosen[1,2]. [1]Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH*

Background & Aims: IL-33 is increased in the colon of patients with ulcerative colitis. We and others have demonstrated a protective role of IL-33 in acute chemically-induced acute murine colitis models. However, the role of IL-33 during chronic colitis, as well as the primary cellular sources and regulation of IL-33 during colitis, remain in question. We aimed to determine the role of IL-33 in chronic IL-10$^{-/-}$ colitis, which cell types express IL-33 in the colon, and how IL-33 is induced.

Methods: We compared colitis development between IL-10$^{-/-}$IL-33$^{-/-}$ and IL-10$^{-/-}$IL-33$^{+/+}$ littermate mice. DSS was added to the drinking water in some experiments to induce colitis in WT and IL-10$^{-/-}$ mice. IL-33$^{citrine/+}$ reporter mice were studied to determine the cellular sources of IL-33. We stimulated a murine colon myofibroblast cell line with IL-1β and measured IL-33 expression by qRT-PCR.

Results: IL-10$^{-/-}$IL-33$^{-/-}$ and IL-10$^{-/-}$IL-33$^{+/+}$ littermates developed colitis of similar severity beginning at approximately 12 weeks of age. There were no differences in weight gain or histopathologic severity between the two strains. Although colon *Il33* expression was induced 7-fold in WT mice with DSS-induced colitis ($P < 0.01$), there was no induction of *Il33* in IL-10$^{-/-}$ mice with colitis by 25 weeks. However, DSS administration in 12-week old IL-10$^{-/-}$ mice induced colon mucosal *Il33* 50-fold compared to unchallenged IL-10$^{-/-}$ mice ($P < 0.01$). Immunofluorescence microscopy of tissue from IL-33$^{citrine/+}$ mice revealed that IL-33 was expressed by α-smooth muscle actin positive myofibroblasts (Figure 1). By flow cytometry, we did not detect citrine^{+} epithelial cells from unchallenged or DSS-treated mice. Citrine^{+} IL-33-expressing cells were all CD45^{-} (not immune cells) by flow cytometry and 40-50% were also CD90^{+}, which identifies fibroblasts. The mean fluorescent intensity of citrine^{+} cells was increased 1.7-fold in DSS-treated compared to untreated mice ($P<.001$). *Il1b* was significantly increased in WT mice given DSS compared to untreated IL-10$^{-/-}$ mice (50-fold, $P < 0.05$), and DSS induced *Il1b* in IL-10$^{-/-}$ mice 140-fold ($P < 0.01$). IL-1β induced *Il33* expression in WEHI-YH2 colon myofibroblasts ($P < 0.05$).

Conclusions: Colon mucosal IL-33 is not induced during chronic colitis, and IL-33 deficiency does not alter the severity of

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colitis in IL-10$^{-/-}$ mice. Marked induction of mucosal *Il33*upon DSS exposure in both WT and IL-10$^{-/-}$ mice suggests that epithelial damage triggers colon IL-33 expression and that IL-33 induction is not limited by IL-10 deficiency itself. Myofibroblasts are the primary source of IL-33 in the colon, and *Il1b* induces IL-33 expression in colon myofibroblasts in vitro. Higher induction of IL-1β following epithelial damage from DSS may explain the differential regulation of IL-33 in IL-10$^{-/-}$ compared to DSS-induced colitis.

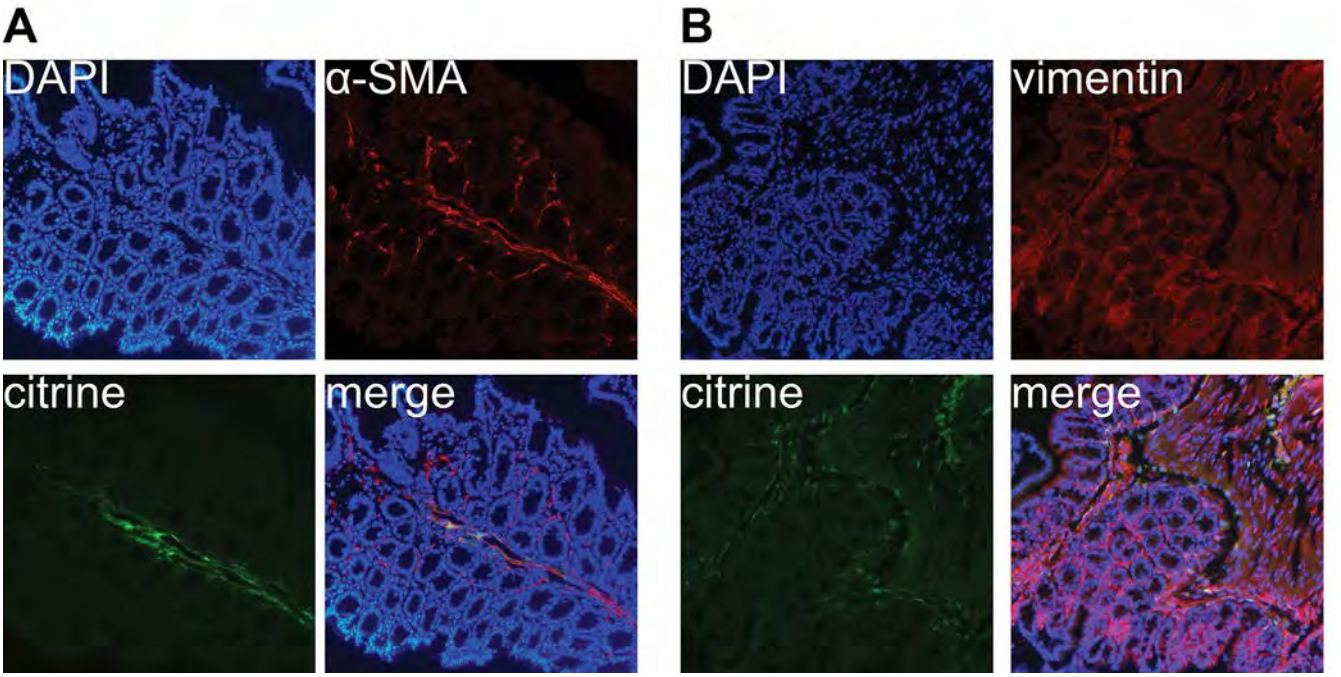


FIGURE 1. Colon myofibroblasts express IL-33 in control and DSS-treated mice. (A) Representative immuno-staining of alpha-smooth muscle actin (SMA) and (B) vimentin in the colon of IL-33^{Citrine} reporter mice.

560 ***OBESITY IN PEDIATRIC INFLAMMATORY BOWEL DISEASE: PREVALENCE AND DISEASE ASSOCIATIONS IN THE ERA OF BIOLOGIC THERAPY.*** *Patrick Rowland*, *Candi Jump*, *J. Antonio Quiros*, *Johanna Palmadottir*, *Courtney Vaughn*, *Molly Stone*, *Keri Walker. Pediatrics , Medical University of South Carolina , Charleston, SC*

Background: Therapy in the management of pediatric inflammatory bowel disease (IBD) has shifted to a 'top-down' approach over the past several years. A study completed 10 years ago demonstrated an association between being overweight, history of surgery in Crohn's Disease (CD) patients, African American race (AA), and Medicaid insurance. The prior study was done with the majority of patients on immunomodulators (IMM) (46.5%) and fewer on biologic therapy (21%). Currently, at our institution, 62.2% of our patients are on a biologic agent and (18%) are on IMM. The primary aim of our study was to examine the point prevalence of obesity in pediatric IBD patients and compare to both a historical population of an earlier treatment era and to the prevalence of pediatric obesity in South Carolina. Secondary aims were to identify disease characteristics and patient demographics that were associated with overweight or obesity in our IBD population.

Methods: A retrospective chart review was performed of all patients aged 2-19 years with CD or colitis (Ulcerative Colitis or Indeterminate Colitis) evaluated at the Medical University of South Carolina (MUSC) multidisciplinary IBD clinic between March 1, 2016 and March 31st 2019. Clinical characteristics, patient demographics, and body mass index (BMI) percentile at the most recent clinic visit were obtained. Bivariate analysis was used to compare variables from the chart review by weight status including overweight (OW, 85% for BMI) obese (OB, 95% BMI) status and non-OW/non-OB status. Multivariate logistic regression modeling was then used to determine which factors independently affected weight status.

Results: The study population consisted of 249 patients (Table 1). The overall prevalence of OW was 27.7% with no significant difference between CD and colitis groups (26.4% vs. 30%). OW status was significantly associated with longer

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disease duration (OR 1.02 p<0.05), BMI percentile at diagnosis (OR 1.06 p<0.05), and AA race (OR 2.86 P<0.05). A positive association was also noted between overweight status and biologic therapy (OR 2.96, p<0.05). All other disease characteristics including disease phenotype, medications, and lab values were not associated with overweight or obese status.

Discussion: The prevalence of overweight pediatric obesity in our cohort of patients was 27.7, which was comparable to children in the state of South Carolina aged 10-17 (27.7 vs 33.7, p = 0.05) (7) and the historical cohort (27.7 vs 23.6, p=0.15). The prevalence of OW pediatric patients with colitis remained stable compared to the historical cohort (30% vs 30.1% p=0.98). However, for patients with CD, there has been an increase in the prevalence of OW patients (26.4% vs 20% p<0.05). There is a positive association between biologic use and overweight status that was not evident in the patient population of the prior study. Over the past decade, pediatric IBD management has shifted to more frequent and early use of biologic therapies. The shift has been in part due to the findings that biologic therapies increase rates of remission and improve growth when utilized early in puberty.(6) We theorize that with biologic therapy in select patients, inflammation is adequately controlled and is no longer contributing to malnutrition and poor weight gain. As such, the prevalence of OW in these patients should move towards that of the general population, with our study showing no difference in the rate of pediatric OW compared to the general population. With this shift, it becomes more important to provide IBD patients with nutritional counseling aimed at preventing excessive weight gain and OB not only for the metabolic risk factors associated with OB but also because of increased morbidity associated with OB in IBD including more frequent disease flares, hospitalizations, perianal disease, and loss of response to biologic medications. (1,2)

Table 1. Demographics, Disease Characteristics, and Mean Lab Values of Children with IBD by Overweight/Obese Status

	Overweight/Obese		Not Overweight/Obese		
Characteristic	**n**	**Mean (SD) or %**	**n**	**Mean (SD) or %**	***P* value**
Age (years)	69	15.39 (±0.47)	180	14.83	0.24
Gender (% female)	32	46.4	84	46.7	0.97
Race					
Caucasian	41	59.4	141	78.3	<0.01
African American	25	36.2	31	17.2	<0.01
Other	3	4.34	8	4.44	0.97
Primary insurance Medicaid	28	40.6	66	36.7	0.57
BMI % at Diagnosis	66	74.79 (27.8)	174	32.49 (26.6)	<0.01
Disease Classification					
CD	42	60.9	117	65	0.55
Colitis	27	39.1	63	35	0.55
Disease duration[a]	69	3.76 (2.68)	180	2.865(2.44)	<0.05
Medication					
Steroids[b]	20	29	60	33.3	0.51
Immunomodulator[c]	15	21.7	30	16.7	0.36
Any Biologic Therapy[d]	45	65.2	110	61.1	0.55
Anti-TNF α	36	52.2	100	55.6	0.63
Vedolizumab	7	10.1	6	3.3	<0.05
Ustekinumab	2	2.9	4	2.2	0.75
Surgery Related to IBD	12	17.4	27	15	0.64
Laboratory Markers					
WBC	69	7.74 (2.66)	177	7.54 (2.91)	0.62
Hgb	69	12.7 (1.98)	177	12.78 (1.85)	0.77
Plt	69	333.44 (96.26)	177	309.25 (97.12)	0.08
CRP	65	0.95 (2.00)	168	1.3 (3.22)	0.41
Albumin	69	3.87 (0.42)	176	3.89 (0.49)	0.77
Vit D	63	23.35 (8.31)	165	29.25 (13.03)	0.001

Conventional descriptive statistics and non-parametric tests were performed for continuous variables. Results are expressed as mean values±SEM as indicated. Proportions were compared using chi-squared and Fisher's exact test.

[a] Disease duration as a continuous variable in years

[b] Any Steroid use required in the 1-year period prior to the most recent clinic visit

[c] Immunomodulator group includes 6-mercaptopurine, azathoprine, methotrexate

[d] Any biologic therapy includes anti-TNF (adalimumab and infliximab), vedolizumab, ustekinumab

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561 ***LACTOBACILLUS REUTERI SECRETES γ-GLUTAMYLCYSTEINE TO SUPPRESS PRO-INFLAMMATORY DRIVEN REACTIVE OXYGEN SPECIES IN HUMAN INTESTINAL EPITHELIUM.*** *Wenly Ruan[1,2], Melinda Engevik[3,4], Anne Hall[3,4], Alexandra Chang-Graham[5], Heather Danof[5], Robert Britton[5], Joseph Hyser[5], James Versalovic[3,4]*
[1]Pediatric Gastroenterology, Baylor College of Medicine, Houston, TX; [2]Pediatrics, Texas Children's Hospital, Houston, TX; [3]Pathology, Texas Children's Hospital, Houston, TX; [4]Pathology and Immunology, Baylor College of Medicine, Houston, TX; [5]Molecular Virology and Microbiology, Baylor College of Medicine, Houston, TX

Background: The intestinal epithelium is continually exposed to potential inducers of reactive oxygen species (ROS), including pro-inflammatory cytokines and microbial stimuli. Normally, ROS levels in epithelial cells are maintained at low levels via antioxidant compounds such as γ-glutamylcysteine and glutathione. However, dysregulation of ROS can lead to intestinal inflammation and contribute to inflammatory bowel disease (IBD). Many factors contribute to ROS levels including the gut microbiome. Some gut microbes possess the enzymatic machinery to produce antioxidants whereas others can dysregulate levels of ROS. Our model microbe, *Lactobacillus reuteri* (ATCC PTA 6475), has been demonstrated to reduce intestinal inflammation in mice models. It contains the genes encoding two distinct GshA-like glutamylcysteine ligases (GshA and GshA2). We hypothesize that *L. reuteri* can secrete γ-glutamylcysteine to suppress ROS, minimize NFκB activation and regulate secretion of epithelial cytokines.

Methods & Results: *L. reuteri* was grown in a fully defined media LDM4, and conditioned media was analyzed with liquid chromatography-mass spectrometry (LC-MS). *L. reuteri* was found to generate γ-glutamylcysteine, with the greatest quantities measured after 16 hours of incubation. Consistent with LC-MS results, *L. reuteri* had increased expression of *gshA* and *gshA2* mRNA after 16 hours incubation. To determine if *L. reuteri* secreted products can enter the intestinal epithelial cells, all cysteine containing products including γ-glutamylcysteine were fluorescently tagged and then incubated with HT29 cell monolayers. γ-glutamylcysteine was demonstrated to enter intestinal epithelial cells based on microscopy. In addition, glutathione levels were examined via a ThiolTracker assay, and we demonstrate that *L. reuteri* secreted γ-glutamylcysteine is able to increase the amount of intracellular glutathione levels. To determine if *L. reuteri* secreted products or γ-glutamylcysteine alone could suppress pro-inflammatory cytokine driven ROS and IL-8 secretion, human colonic HT29 cells were treated with IL-1β or hydrogen peroxide. *L. reuteri* metabolites significantly suppressed IL-8 production in a dose-dependent manner. IL-8 was also suppressed by γ-glutamylcysteine and N-acetylcysteine. *L. reuteri* secreted products also reduced activity of the NFκB promoter as determined by a luciferase reporter assay in HT29 cells. In addition, we examined the ability of *L. reuteri* conditioned media to mitigate ROS in MA-104 cells (monkey kidney epithelial cell line) transfected with the pHyPer-dMito mitochondria-localized ROS sensor. *L. reuteri* as well as γ-glutamylcysteine and glutathione suppressed ROS activation by hydrogen peroxide. We generated γ-glutamylcysteine deficient mutants by targeted mutagenesis of GshA genes, and these mutant *L. reuteri* strains had a diminished ability to suppress IL-8 production and ROS. To confirm the ability of *L. reuteri* metabolites to suppress pro-inflammatory cytokines, we also examined IL-1β and hydrogen peroxide driven IL-8 production in human jejunum enteroid monolayers. WT *L. reuteri* metabolites, but not *ΔgshA, ΔgshA2* or ΔgshA/A2 mutants, suppressed IL-8 in human enteroids.

Conclusions: Together these data indicate that *L. reuteri* secretes γ-glutamylcysteine which can enter the intestinal epithelial cells and modulate epithelial cytokine production. It acts through suppression of ROS and NFκB which then decreases IL-8 production. We are able to demonstrate this in both HT 29 cells and human jejunum enteroids which are more physiologically relevant. These experiments highlight a prominent role for ROS intermediates in microbiome:mammalian cell signaling processes involved in immune responses and intestinal inflammation.

562 ***MICROBIAL COMMONS OF EXCLUSIVE ENTERAL NUTRITION ACROSS DISTINCT GUT ENVIRONMENTS: A THOUGHT EXPERIMENT.*** *Joseph Runde[1], Murat Eren[2,3], Andrea Watson[4]. [1]Pediatric Gastroenterology, Univeristy of Chicago, Chicago, IL; [2]Department of Medicine, University of Chicago, Chicago, IL; [3]Marine Biology Laboratory, Joseph Bay Paul Center for Comparative Molecular Biology and Evolution, Woods Hole, MA; [4]Committee on Microbiology, University of Chicago, Chicago, IL*

Introduction: Crohn's disease (CD), a form of inflammatory bowel disease (IBD) that can occur in any part of the gastrointestinal tract and cause life-threatening complications, affects up to 1 in 300 people in industrialized countries. A complete understanding of the etiology of CD is lacking and a cure does not exist. However, one well-established dietary intervention, exclusive enteral nutrition (EEN), has been shown to ameliorate symptoms and, in children, induce mucosal healing better than other treatment modalities. Changes in gut microbial communities have been hypothesized to play a role in EEN-derived restoration of gut homeostasis. Here we investigate microbial population dynamics of children with CD on EEN by constructing metagenome-assembled genomes (MAGs) derived from stool samples. We then sort each MAG into distinct phenotype collections based on changes in abundance before, during and after EEN. These phenotypes can then be mapped in gut environments of critical interest allowing us to characterize taxonomic and functional hallmarks of

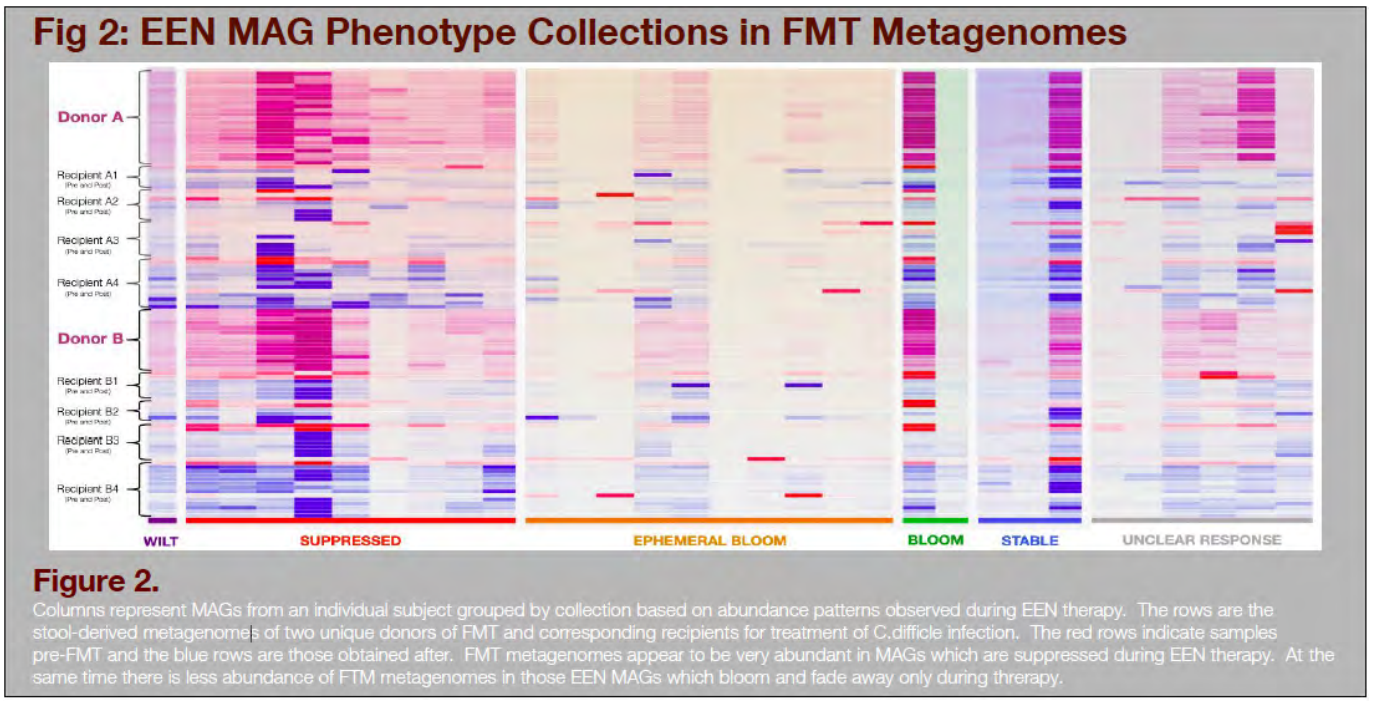
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successful EEN.

Methods: We apply genome-resolved metagenomics and metagenomic read recruitment strategies to an existing EEN dataset in order to reconstruct MAGs and characterize their genome-wide distribution patterns across EEN subjects. We also utilize gut metagenomes of fecal microbial transplantation (FMT) recipients currently being analyzed in our lab, a previously published cohort of mother/infant gut metagenomes throughout the first year of life and publicly available gut metagenomes of healthy donors to investigate abundance of our MAGs in these cohorts.

Results: We reconstructed a total of 279 near-complete MAGs from 57 gut metagenomes generated from a cohort of 12 pediatric subjects who were sampled four to five times before, during, and after EEN. We observe, as previously proposed in the literature, significant alterations to the microbial residents of the gut ecosystems as a function of EEN. We also define clear patterns in microbial population response to therapy. For instance, some residents bloom only during EEN, while others emerge only after resuming a regular diet. We also find populations that are significantly suppressed by EEN and those that remain stable. Based on these discreet responses we are able to classify each MAG into a phenotype collection. Critically, these collections are able to be matched to responses in the other gut ecosystems we have analyzed. For instance, some of the microbial populations that emerge after the completion of EEN are identified as successful colonizer populations observed in our FMT study.

Conclusions: Understanding microbial determinants of healthy gut ecosystems is one of the most significant quests of medical microbiology. Here we explore the mechanism of EEN in pediatric CD via application of metagenome-resolved metagenomics. Shifts in population abundance before, during and after EEN allow us to define clear patterns of resident response and consider distinct MAG phenotypes in the context of other critical gut environments. Through on-going work, we hope to define how disruption of key populations flourishing in a dysbiotic environment prior to EEN may allow an opportunity for suppressed communities to bloom, thus, restoring gut ecosystem homeostasis.



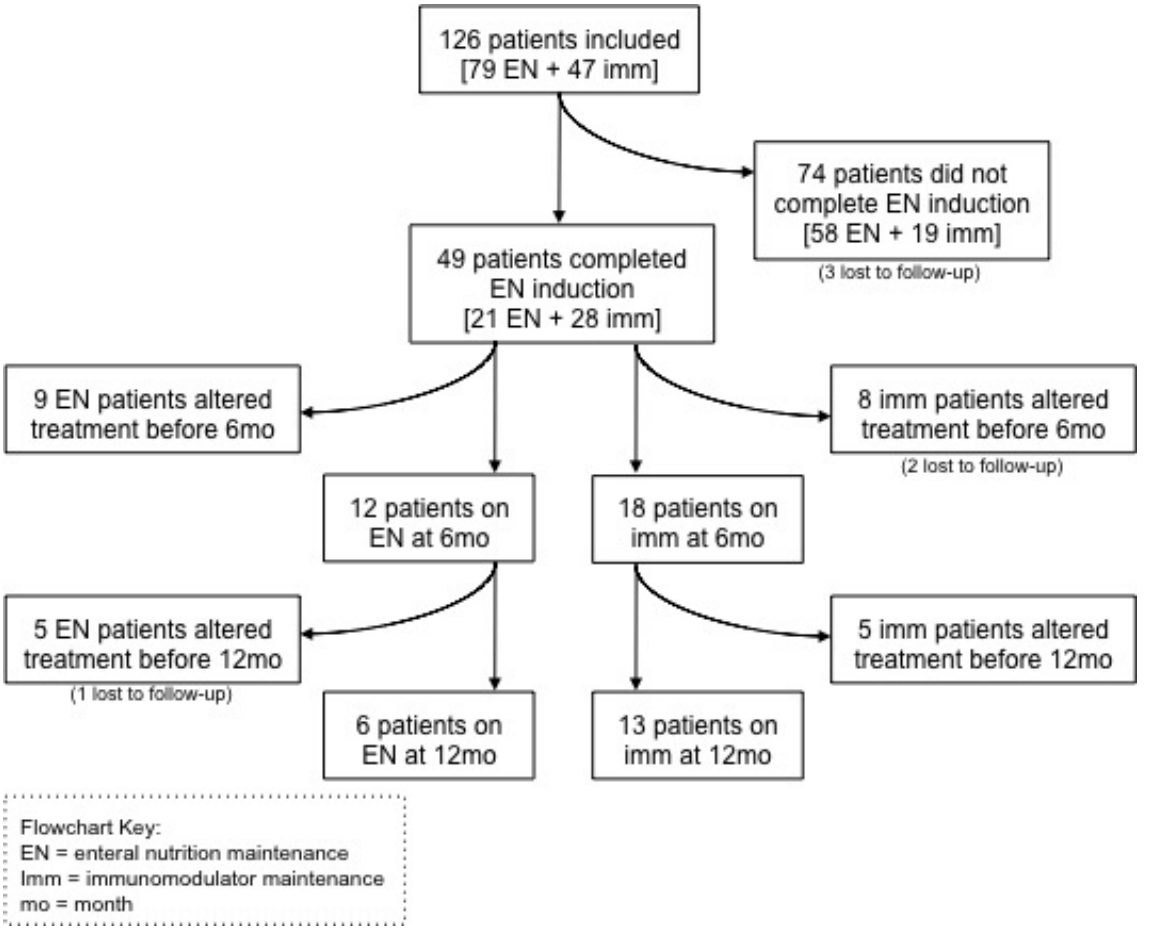
563 ***12 MONTH OUTCOMES AFTER INDUCTION THERAPY WITH ENTERAL NUTRITION IN PEDIATRIC CROHN'S DISEASE.*** *Jessica Rutsky[1,2], Nicole Davidson[1,2], Josh Bricker[3], Ross Maltz[4], Jennifer Dotson[4], Jennifer Smith[4], Brendan Boyle[4]. [1]Pediatrics, Nationwide Children's Hospital, Columbus, OH; [2]Pediatrics, The Ohio State University College of Medicine, Columbus, OH; [3]The Center for Innovation in Pediatric Practice, The Research Institute, Nationwide Children's Hospital, Columbus, OH; [4]Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Nationwide Children's Hospital, Columbus, OH*

Introduction: Enteral nutrition (EN) can be used as induction and maintenance therapy in the treatment of pediatric

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Crohn's disease. Studies describing long-term outcomes after EN induction are limited. In this single center study, we aimed to evaluate clinical course and outcomes at 6 and 12 months after completion of EN induction in children with Crohn's disease. We compared clinical data for patients continuing EN monotherapy for maintenance to patients using immunomodulator maintenance therapy (azathioprine, 6-mercaptopurine, methotrexate) after EN induction.
Methods: All patients aged 3 to 20 years with Crohn's disease treated with EN for induction between 2013 and 2018 were retrospectively reviewed. EN induction was defined as utilizing EN for 90% of caloric needs and 10% from a typical diet for 8 to 12 weeks. Patients treated with anti-tumor necrosis factor (anti-TNF), treated with steroids and EN, or adhering to partial EN were excluded. Demographic, clinical (physician global assessment (PGA), short pediatric Crohn's disease activity index (sPCDAI)), and laboratory data was recorded at baseline, 6, and 12 months. Patients requiring an unplanned change in induction or maintenance therapy, including the addition of steroids, anti-TNF, or other alternative therapy, were considered treatment failures. Outcomes for the total population and comparisons for patients treated with EN maintenance versus immunomodulator maintenance at 6 and 12 months were described.
Results: In total, 126 patients met criteria for study inclusion (54 female, 43%). Seventy-seven of 126 patients (62%) did not complete EN induction, including 3 patients lost to follow-up. Reasons for failure to complete EN induction included need for steroids (n=39, 50%), anti-TNF (n=24, 31%), non-compliance/unable to reach goal (n=6, 8%), surgery (n=4, 5%), and alternative diet (n=1). In total, 49 patients completed EN induction and among them, 21 remained on maintenance EN (43%) and 28 were started on an immunomodulator (57%). Patients who failed EN maintenance between EN induction and 6 months required steroids (n=4), anti-TNF (n=1), changed therapy due to patient preference (n=2) or stopped due to intolerance/non-compliance (n=2). Patients who failed immunomodulator therapy between EN induction and 6 months were most commonly changed to anti-TNF (n=4), steroids (n=3), or stopped due to intolerance/non-compliance (n=1). Two patients in the immunomodulator group were lost to follow-up between induction and 6 months. At 6 months, 12 patients of 21 (57%) remained on EN and 18 patients of 28 (64%) remained on immunomodulator maintenance. PGA, sPCDAI, and laboratory values were similar between both groups at 6 months. Among 30 total patients remaining on therapy at 6 months, 22 (73%) were in remission by PGA. By 12 months, only 6 patients (28.5%) remained on EN and 13 patients (46%) remained on immunomodulator maintenance. One patient was lost to follow-up between 6 and 12 months. The most common reasons for maintenance failure between 6 and 12 months in the EN group were lack of response to therapy leading to steroids (n=2), anti-TNF (n=2), and intolerance/non-compliance (n=1). Among patients in the immunomodulator group, reasons for failure between 6 and 12 months included lack of response requiring change to anti-TNF (n=4) and re-induction with EN (n=1). Among 19 total patients remaining on therapy at 12 months, 13 (68%) were in remission by PGA.
Conclusions: Long term outcomes after EN induction in this single center found that a change in the treatment plan was common. In patients that completed EN induction, 63% required an unplanned change in therapy within 12 months, most often a course of steroids or change to anti-TNF. No differences in clinical outcomes (PGA, sPCDAI) were identified in those using EN as maintenance compared to EN induction to immunomodulator therapy. Further research is needed to investigate optimal approaches in patient selection to determine predictors of long-term success with EN induction versus patients who should use alternate induction or maintenance therapy.

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564 ***PEDIATRIC PATIENT AND PARENT EXPERIENCE WITH THE CROHN'S DISEASE EXCLUSION DIET: BARRIERS ANF FACILITATORS FOR NUTRITION THERAPY IMPLEMENTATION.*** *Angela Sandell[1], Debra Bogen[2], David Keljo[1], Stacey Zettle[1], Judy Chang[3], Sandra Kim[1]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]General Academic Pediatrics, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA; [3]Obstetrics and Gynecology, University of Pittsburgh School of Medicine, Pittsburgh, PA*

Background: Genetic and environmental factors, such as diet, influence pediatric Crohn's disease (CD) activity. While exclusion diets, such as the Crohn's disease exclusion diet (CDED), are effective treatment for CD, patient and parent experience affecting implementation is not well documented. Qualitative approaches help to understand these perspectives.

Aims: We aimed to describe barriers and facilitators to CDED implementation, when used as adjunct to medical therapy, for treatment of active CD in pediatric patients.

Methods: Patients aged 6-21 years with active CD who opted into adjunct CDED therapy and one of their parents were prospectively included. Parents completed a demographic survey prior to CDED initiation describing patient race, parent education and work status, household income, weekly grocery bill, and number in household. A follow-up survey discerned grocery bill changes and number of weeks (out of 12) that CDED was attempted. Retrospective chart review evaluated patient age, sex, insurance, race, and indication for CDED. Patient clinical status indicated by Pediatric Crohn's Disease Activity Index (PCDAI), along with parent and patient quality of life (QOL), were evaluated prior to and following a trial of CDED. The Pediatric Inventory for Parents (PIP) and the IMPACT-III measured QOL for parents and patients, respectively. Descriptive statistics were used to analyze demographic and other data. Semi-structured qualitative interviews that were conducted after CDED trial were recorded, transcribed verbatim, and coded to identify themes of barriers and facilitators to CDED implementation.

Results: Parents (all mothers) and patients (n=18 dyads) were enrolled and 15 interviews were completed. Parent and patient demographic characteristics are shown in **Table 1**. 77% of patients had new onset CD. On average, dyads completed

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9 weeks of CDED (53% completed a 12-week course). Weekly grocery bills increased for 75% of participants. PCDAI and parent and patient QOL increased over the study period. Barriers to diet implementation were lack of financial access, inability to conceptualize diet, poor cooking skills, social isolation, cultural difference in food experience, negative emotions toward diet, and that the diet was inconvenient/time consuming. Facilitators were resilience, empowerment, rational thinking, cooking creativity, organizational aptitude, food literacy, and community engagement. Selected quotations from interview transcripts are shown in **Table 2.**

Conclusions: Families opting into CDED have high socioeconomic status. Over the period of CDED attempt, patients and parents have increased QOL and patients have improved clinical status. Barriers and facilitators to implementation of CDED should be considered in addition to effectiveness when using nutrition therapy.

Table 1: Baseline Demographic Characteristics for Patients and Parents (
Exclusion Diet Therapy*

Characteristic	n=18
Patient Age in Years; mean (SD)	14.1 (2.7)
Male sex	44
Patient Race (% Caucasian)	100
Commercial Insurance	83.3
Gross Household Income	n=15
$0-50,000	6.7
$50-100,000	60
>$100,000	26.7
Prefer not to answer	6.7
Average grocery bill per week	
$100-200	60
$200-300	33.3
>$300	6.7
Number in household (average)	4
Mother Education	
High School	13.3
Some College	26.7
College or postgraduate	60
Mother Job Status	
Working Full Time	86.7
Parent 2 Education	n=13
High School	15.4
Some College	15.4
College or post-graduate	69.2
Parent 2 Job Status	n=14
Working Full Time	100

*Values in percentages unless indicated otherwise

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Table 2: Qualitative Interview-Derived Themes for Barriers and Facilitators for Crohn's Disease Exclusion Diet Implementation

Topic	Category	Theme	Illustrative Quotation from Transcript
Barrier	Financial	Lack of financial access	*There are more options in the summer. Time of year played a role in that as well—of available options…blueberries are like $10. And then, she obviously had to drink the formula drinks or whatever. Those are pretty expensive.*
	Diet Competence	Inability to conceptualize diet Poor cooking skill	*…because I tried to make the homemade sauce and it was like a fail.*
	Social limitation	Social isolation Cultural difference in food experience	*Like right now [patient's] birthday is in like 10 days and we're like struggling with foods and desserts…I'm struggling.*
	Emotional distress	Negative emotions toward diet	*But he loves to eat, he's an adventurous eater…I think he got kind of, you know, disappointed a little bit. I don't know like sad a little, depressed*
	Logistical	Inconvenient/time-consuming	*Yeah and then he stays for after school and sometimes there's basketball practice. So, I have to pack food in the morning to last until 6 at night.*
Facilitators	Psychological state	Resilience Empowerment Rational thinking	*I felt like, um, like even thought I might not like the foods, I'll get better if I do this anyways*
	Innovation	Cooking creativity Organizational aptitude	*We were trying the different side dish options to try to change things. We actually bought an air fryer…That way we were taking potatoes, we would peel them and slice them and do them in the air fryer like a French fry* *I went to the dollar store and I bought like a dry-erase magnetic calendar…I would put like breakfast, lunch, and dinner on there so like we were all on the same page*
	Food literacy	Comfort reading food materials (e.g. menus, labels, recipes)	*That's what we did a lot, we just Googled his ingredients.*
	Community	Community engagement	*I mean I guess it's helpful, too, when the rest of the family isn't sitting around eating pizza in front of the person…if everyone in the family is able to support the person going through it—the child will get through it.*

565 ***AGE-RELATED CHANGES IN MAST CELLS AND DISEASE SEVERITY IN PEDIATRIC ULCERATIVE COLITIS.*** *Jes Sanders[1], Ming Wang[2], Joshua Wechsler[2,3]. [1]Surgery, Northwestern University Feinberg School of Medicine, Chicago, IL; [2]Pediatrics, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; [3]Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL*

Background: Ulcerative colitis (UC) is a subtype of inflammatory bowel disease (IBD) characterized by intense periods of abdominal pain and bloody diarrhea intermixed with times of remission. The pathogenesis of UC involves both innate and adaptive immunity, and a number of immune cell types have established roles in the development of and progression of the disease. Mast cells (MCs) reside in intestinal lamina propria and we have shown they have a role in recruiting innate immune cells. In adults, increased numbers of MCs have been observed in patients with UC compared with controls and are accepted as drivers of disease pathology through release of preformed granules. However, little, if any, data is available concerning MC counts in pediatric patients with UC.

Methods: We previously reported a cohort of newly diagnosed pediatric UC patients and matched controls with 1 year of follow-up, well-documented symptoms and labs. Formalin-fixed paraffin-embedded rectal specimens were stained with mouse, anti-human mast cell tryptase (39 UC, 22 controls). Stitched images were acquired at 60x-oil immersion using the Nikon A1R confocal microscope at the Nikon Imaging Core at The Northwestern University Feinberg School of Medicine. Automated, area thresholding analyses were used to count the number of tryptase-positive cells per 1mm^2. Mann-Whitney student t-tests and Spearman Rank correlation methods were carried out using GraphPad Prism software v. 8.0.

Results: In the UC cohort, 24 patients (60%) had clinically established pancolitis (Paris Classification (PC) 4), 7 (17.5%) had disease to the hepatic flexure (PC 3), 3 (7.5%) with disease to the splenic flexure (PC 2), and 5 (12.5%) with disease limited to the rectum (PC 1). Age showed an inverse relationship with disease extent, which neared significance (Spearman= -0.309, p= 0.056). Additionally, disease extent was correlated with CRP (Spearman= 0.338 , p= 0.038) and platelets (Spearman= 0.515 , p= 0.001), and inversely correlated with albumin (Spearman= -0.366, p= 0.039). UC patients had fewer MCs compared to controls (83/mm^2 v 130/mm^2; p= 0.006), but MCs increased with age in a statistically significant manner in the UC cohort (Figure 1). ESR and platelets were associated with MCs in UC patients and approached statistical significance.

Conclusion: MCs are decreased in the colon of pediatric UC patients and increase in the colonic mucosa in an age-related

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fashion. Although the power of this study was limited by cohort size, younger age may be associated with greater extent of disease, markers of disease of severity, and decreases in mucosal MC count in children. Collectively, these data suggest MCs may be involved in both destruction and recovery of mucosa in pediatric UC. Future studies should focus on further defining the effect of age on phenotype of MCs, their distribution, and interactions with other cell types.

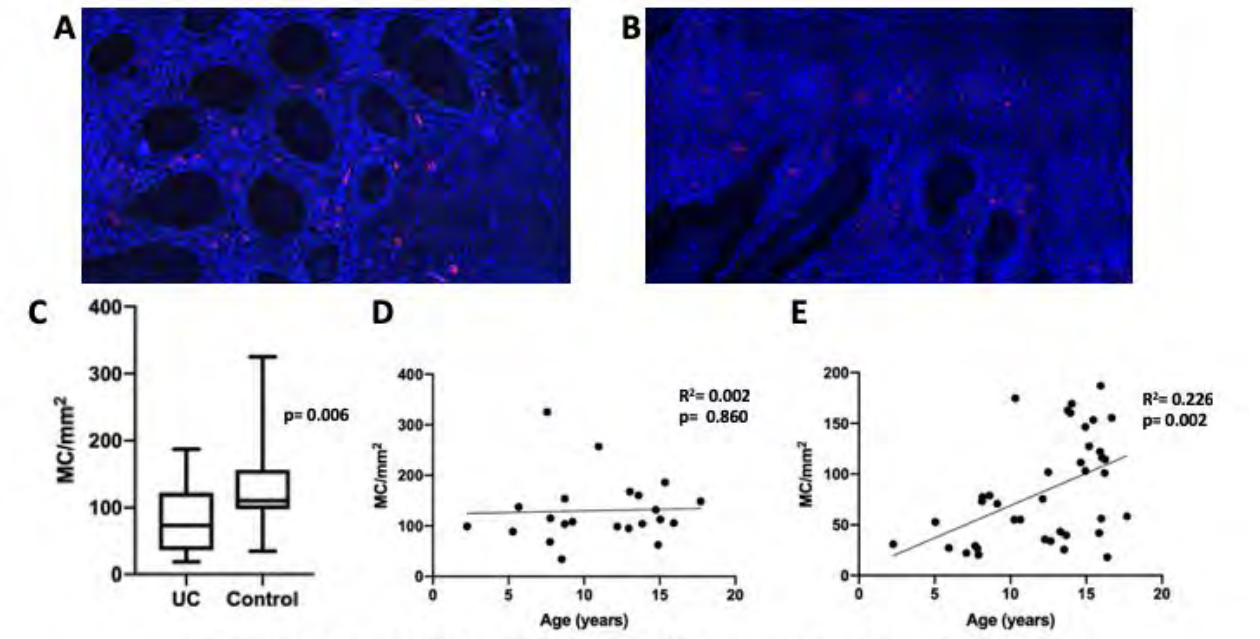


Figure 1: Mast-cell tryptase in colonic mucosa of A) control and B) UC patient. C) Decreased MCs in mucosa of UC patients compared with controls. Age-associated changes in mucosal MC count in D) Healthy controls and E) UC patients.

566 ***MENTAL HEALTH SCREENING IN A PEDIATRIC IBD CLINIC.*** *Rachel Schenker, Sonia Milbank, Jennifer Burgis, Sofia Verstraete. Pediatrics, UCSF, San Francisco, CA*

Background: Anxiety and depression symptoms are common in pediatric Inflammatory Bowel Disease (IBD) patients and may worsen during adolescence. The prevalence of pediatric IBD patients with anxiety symptoms ranges from 6-27% and with depression symptoms ranges from 6-24%. Identifying patients that may benefit from mental health services to improve their quality of life is a challenge in clinical settings. Our aim was to evaluate the feasibility of using mental health screening forms to understand the needs of a pediatric IBD population in a tertiary care center.

Methods: Between October 2018 and May 2019, we screened 58 patients who presented to UCSF Pediatric IBD clinic, all ages 11 and older, for anxiety and depression. We used the General Anxiety Disorder-7 Scale (GAD-7) to evaluate for anxiety and either the Center for Epidemiological Studies Depression Scale (CES-DC) or the Depression Screen to evaluate for depression. Our social worker then met with all patients who had a score of 10 or greater on the GAD-7 or a score of 15 or greater on the CES-DC to ensure that they were receiving appropriate mental health services or to refer them to the applicable resources. In some cases, where the screen was negative, patients were still evaluated if the team found any answers to be concerning.

Results: We identified 21/58 (36.2%) patients who had concerning screens and required mental health follow up at their appointment. Of those 21 patients, 4 (19.05%) were referred to an appropriate long-term mental health resource, 9 (42.86%) had previously established mental health care, 2 (9.52%) denied mental health referrals, and 6 (28.57%) were determined to not need any further mental health follow up. One patient reported suicidal ideation and was assessed immediately. We stratified need for mental health follow up by type of IBD (CD, IC, UC), history of surgery for IBD, gender ,biologic use, and race. A significant difference in need for mental health follow up was noted between patients who required surgery for IBD management as compared to those who did not (100% as compared to 34.55%, p=0.023) and between white patients, black patients, and patients of all other races (50%, 0%, 14.29%, p=0.045). There were no significant differences in need for immediate mental health follow up according to gender, type of IBD, or biologic use.

Discussion: Our data suggests that performing mental health screening on all adolescents in IBD clinic is feasible and valuable in identifying patients with unmet mental health needs and referring them to appropriate providers and resources.

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While the entire adolescent population in IBD clinic warrants screening, we have found that the need is particularly high for patients who have required surgical management. As we continue to perform yearly mental health screening on all adolescent IBD patients, we will be able to determine if our mental health referrals improve mental health outcomes.

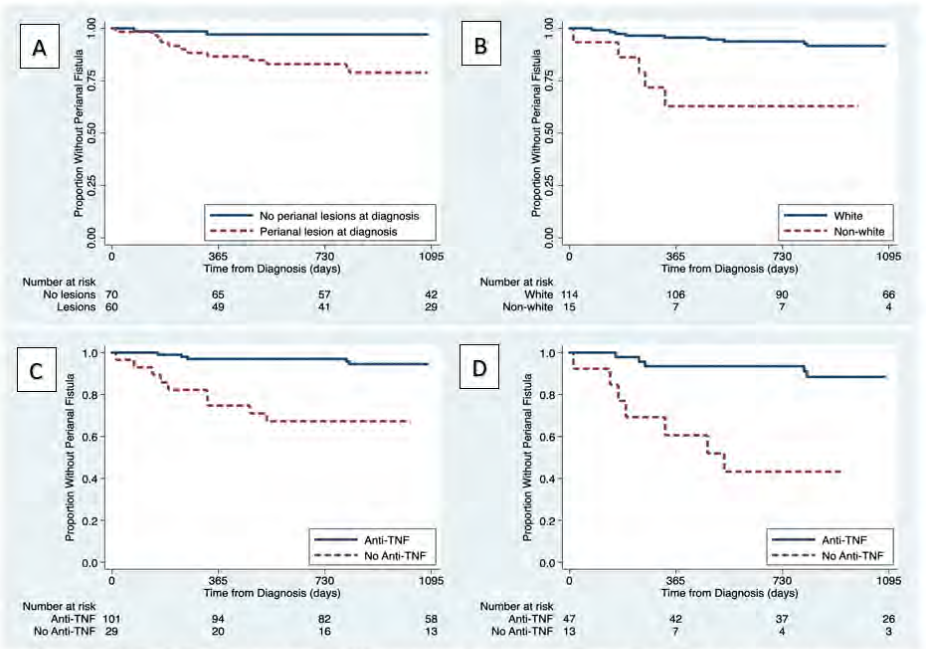
567 ***PREDICTING AND PREVENTING PERIANAL FISTULAE IN PEDIATRIC CROHN'S DISEASE.*** *Andrew Singer[1], Jeremy Adler[1,2]. [1]Pediatric Gastroenterology, University of Michigan, Ann Arbor, MI; [2]Susan B. Meister CHEAR Center, University of Michigan, Ann Arbor, MI*

Background: Perianal fistulae are among the most severe complications of Crohn's disease (CD). They are a major cause of morbidity and have significant negative impact on quality of life. Perianal fistulae are difficult to treat, commonly recur, and lead to increased healthcare costs. Despite the detrimental impact of perianal fistulae, little data exist on their development and no evidence-based preventive strategies exist. We sought to identify risk factors for perianal fistula development among pediatric CD patients. **Methods:** We reviewed the records of all pediatric patients newly diagnosed with CD between January 2005 and December 2015 who were followed at the University of Michigan (UM). Inclusion required diagnosis at UM or transfer to UM less than one month after CD diagnosis and prior to starting any therapy. To ensure accurate identification of occult fistulizing perianal CD, we required patients to have undergone pelvic cross-sectional imaging within one month of CD diagnosis. Obtaining pelvic cross-sectional imaging is standard of care at our institution. Patients with penetrating perianal disease at diagnosis were excluded. Patients were followed for up to three years after diagnosis with the primary outcome of perianal fistula development. Identification of perianal fistulae was based on both physical exam and cross sectional imaging results. The frequency of follow-up visits, perianal exams, and medical imaging was at the discretion of the individual provider and was not standardized. Variables including non-penetrating perianal lesions (skin tags, fissures), disease location, age, race, sex, inflammatory markers, steroid use, and medication were analyzed. Time to fistula development was described using Kaplan-Meier plots and analyzed with both bivariate and mutlivariate Cox proportional hazard models. **Results:** In total, 130 patients met inclusion criteria. The cumulative incidence of perianal fistulae at 12, 24, and 36 months after CD diagnosis was 7.5%, 9%, and 11%, respectively. Development of perianal fistulae was associated with the presence of non-penetrating perianal lesions (hazard ratio [HR], 8.74, 95%; confidence interval [CI] 1.87–40.84) and non-white race (HR 5.37, 95% CI 1.46–17.77). Treatment with anti-TNFα medications was associated with decreased perianal fistula formation compared to other treatments in the entire study population (HR 0.10, 95% CI 0.03–0.34) and in the cohort with non-penetrating perianal lesions at diagnosis (HR 0.13, 95% CI 0.04–0.43). **Conclusions:** Non-penetrating perianal lesions at diagnosis and non-white race are strong risk factors for perianal fistula development among pediatric CD patients. Treatment with anti-TNFα medication prevents perianal fistulae. The increased risk of non-penetrating perianal lesions is modifiable with anti-TNFα treatment. Starting anti-TNFα treatment early among individuals at high-risk for perianal fistula will help prevent these devastating complications.

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	Bivariate HR (95% CI)	Multivariate HR (95% CI)
Patient demographics		
Female sex	1.07 (0.36-3.20)	-
Higher BMI at diagnosis (per kg/m^2)	2.66 (0.58-12.16)	-
Non-white race	5.7 (1.91–17.28)*	**5.37 (1.46-19.77)***
Older age at diagnosis (per year)	0.97 (0.82-1.13)	0.89 (0.75-1.06)
Lower GI Paris classification	0.97 (0.54-1.75)	-
Presence of upper GI involvement via Paris classification	1.16 (0.39-3.45)	2.47 (0.70-8.72)
Non-penetrating perianal disease	7.50 (1.68-33.55)*	**8.74 (1.87-40.84)***
Laboratory Values		
C-reactive protein	1.05 (0.96-1.16)	-
Erythrocyte sedimentation rate	1.02 (0.99-1.04)	-
Treatment		
Anti-TNFα use	0.13 (0.04-0.39)*	**0.01 (0.03-0.34)***
Corticosteroid use	1.39 (0.48-4.01)	0.54 (0.15-1.92)
* p<0.05; HR = Hazard Ratio; CI = Confidence interval; BMI = Body mass index;		

Predictors Of Perianal Fistula Formation



A. Perianal fistula development stratified by presence of non-penetrating perianal lesion at diagnosis
B. Perianal fistula development stratified by race
C. Perianal fistula development stratified by treatment with TNFα inhibitor
D. Perianal fistula development stratified by treatment with TNFα inhibitor in those with non-penetrating perianal disease at diagnosis

Development of Perianal Fistulae

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568 ***DIFFERENCES IN THE CLINICAL PRESENTATION OF EOSINOPHILIC ESOPHAGITIS IN PEDIATRIC PATIENTS WITH ULCERATIVE COLITIS AND CROHN'S DISEASE .*** *Judy Splawski[1,2], Atiye Aktay[1,2], Sharon Perry[1], Virginia Baez Socorro[1,2], Thomas Sferra[1,2], Jonathan Moses[1,2]. [1]Pediatrics, UH Rainbow Babies & Children's Hospital, Cleveland, OH; [2]Pediatrics, Case Western Reserve University School of Medicine, Cleveland, OH*

Differences in the Clinical Presentation of Eosinophilic Esophagitis in Pediatric Patients with Ulcerative Colitis and Crohn's Disease. Judy Splawski, Atiye Aktay, Sharon Perry, Virginia Baez-Socorro, Thomas Sferra and Jonathan Moses.

Introduction. Eosinophilic Esophagitis (EoE) is an inflammatory condition characterized by increased eosinophil infiltration into the esophageal mucosa. It has been associated with Celiac disease and other autoimmune conditions. Ulcerative Colitis (UC) and Crohn's Disease (CD) are inflammatory gastrointestinal conditions with different clinical presentations and immune profiles. UC is associated with more Th2 cytokines and CD more Th1. Given that EoE can be food induced and is associated with atopic disease, we hypothesized that there might be differences in the association of EoE with UC and CD.

Methods. We utilized ICD 9 and 10 codes to generate lists of patients with the diagnosis of inflammatory bowel disease (IBD) either CD or UC and a diagnosis of EoE. The diagnosis of IBD was confirmed and we defined EoE as any esophageal biopsy with greater than 15 eosinophils per high power field (eos/hpf). We collected demographic, clinical, laboratory, endoscopic and histological data on these patients.

Results. 30 out of 365 (8.2%) IBD patients had EoE. 17 of the 30 (56.7%) IBD/EoE patients had UC. 70.5% of the UC/EoE patients had pan colitis and 70.5% were male. 11 of 17 (64.7%) UC/EoE patients had EoE and UC at diagnosis. 7/17 (41.2%) were diagnosed with UC and then EoE and no patients were diagnosed with EoE followed by UC. 8 of 17 UC/EoE patients were on biologics, but no UC patient was on a biologic at the diagnosis of EoE. No UC/EoE patient was on prednisone at the time of EoE diagnosis. 13 of 30 (43.3%) IBD/EoE patients had a diagnosis of CD. 12 of the 13 CD/EoE patients were male. 10 of 13 (75.9%) CD/EoE patients were diagnosed with CD before their diagnosis of EoE. This contrasts with UC where the majority of patients had EoE and UC diagnosed at the same time. Only 2 CD/EoE patients were diagnosed with EoE and CD at the same time. 1 CD/EoE patient was diagnosed with EoE prior to their diagnosis of IBD. Of note, 11 of 13 CD/EoE patients were on biologics and 10 were on biologics before EoE was diagnosed. All of the patients on biologics were on infliximab. Most of CD/EoE patients had mild disease or were in remission at the time of EoE diagnosis. The mean ESR at diagnosis of CD was 44.5 mm/hr and the mean ESR at EoE diagnosis was 22 mm/hr. The mean CRP at CD diagnosis was 3.4 mg/dL and at EoE diagnosis the mean CRP was 0.74 mg/dL. The mean albumin was 3.0 g/dL at CD diagnosis and 4.14 g/dL at EoE diagnosis. This contrasts with the majority of the UC/EoE patients having active disease at the time of EoE diagnosis. 33% of our IBD patients have UC and 66.7% have CD. A greater portion of the UC patients had EoE than the CD patients (p=0.0084-chi square, Yates correction).

Conclusion: A greater portion of UC patients had EoE than CD patients. EoE was more common at diagnosis of UC than CD. In CD, induction of disease remission with infliximab appears to be associated with the development of EoE. More studies need to be done to determine if this is related to anti-TNF induced remission or it is specific to this biologic. In addition, the association of EoE with the onset of UC diagnosis, in the absence of medications, contrasts with the delayed development in CD and suggests a difference in the immunology of UC vs CD. The results of this single center study will need to be confirmed in larger studies.

572 ***DIET MODIFICATION AS TREATMENT FOR PEDIATRIC IBD: A RETROSPECTIVE CHART REVIEW.*** *Katherine Tribble, Emily Daniel, Daphne Say. Pediatrics, University of California, Davis, Sacramento, CA*

Background: Inflammatory Bowel Disease (IBD) is the most common serious gastrointestinal disease affecting youth in North America. At UC Davis, three to five new pediatric patients are diagnosed with IBD per month. Studies show that nutrition may play a role in pathogenesis and treatment of disease, with promising results for particular regimens. However, other than exclusive enteral nutrition (EEN), there are no pediatric clinical guidelines for nutritional therapies. The goal of this study was to investigate the effectiveness of nutritional therapy in our IBD patients.

Methods: EMR query identified patients 0-21yrs treated in the UC Davis Pediatric GI clinic from 1/1/06-12/31/16 with ICD codes related to IBD. We selected patients that used nutritional therapy for at least four weeks and excluded patients with cancer or on nutritional therapy prior to IBD diagnosis. Data collection included age, weight, diet adherence, medication use, disease activity scores, and lab findings before and 6 months after start of therapy. Each round of nutritional intervention, even if by the same patient, was treated as separate data. Descriptive statistics were used to show population characteristics. Means and proportions of characteristics and pre and post clinical data were compared with *t* tests, X^2 tests, Fisher exact tests, contingency exact tests, and one-way Anova tests.

Results: 21 patients qualified, with 35 rounds of nutritional intervention overall. There were no significant differences between groups in sex, age, or timing of therapy, but those with Crohn's disease were more likely to have used EEN or

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partial enteral nutrition therapy (PEN). There were no significant differences in adherence, but those following EEN more strictly had significant changes in ESR. Within groups, we saw a significant decrease in medication use with PEN and significant weight gain after EEN and PEN.

573 ***THE VISCERAL SENSITIVITY INDEX: A NOVEL TOOL FOR MEASURING GI-SYMPTOM SPECIFIC ANXIETY IN INFLAMMATORY BOWEL DISEASE.*** *Kimberly Trieschmann[1], Emeran Mayer[2], Bruce Naliboff[2], Swapna Joshi[2], Lin Chang[2]. [1]Pediatric Gastroenterology, Hepatology, and Nutrition, UCLA Mattel Children's Hospital, David Geffen School of Medicine, Los Angeles, CA; [2]G Oppenheimer Center for Neurobiology of Stress and Resilience at UCLA, Vatche and Tamar Manoukian Division of Digestive Diseases, David Geffen School of Medicine, Los Angeles, CA*

Background: Irritable Bowel Syndrome (IBS) and Inflammatory Bowel Disease (IBD; Crohn's Disease [CD] and Ulcerative Colitis [UC]) are chronic gastrointestinal (GI) disorders. GI symptom-specific anxiety (GSA) is the cognitive, affective, and behavioral response stemming from fear of GI symptoms, and the context in which these symptoms occur. The Visceral Sensitivity Index (VSI) is a 15-item patient based self-report questionnaire which measures GSA and is validated in IBS, but it may also be a useful measure in IBD. Incorporating ways to treat GSA may improve treatment response and HRQOL in IBD. The aim of this study was to assess and compare VSI scores in IBD, IBS and healthy controls (HCs).

Methods: We administered the VSI to adult IBD patients and compared VSI scores to age and sex matched Rome III-IV positive IBS patients and HCs. Using validated questionnaires, we also measured current anxiety symptoms (HAD), trait anxiety (STAI-trait), and health related quality of life (HRQOL, SF-12). In IBD patients, IBD disease activity (Powel Tuck Index for UC [PTIUC] and the CD Activity Index [CDAI]) was measured. After controlling for HAD-anxiety as a confounding variable, multiple linear regression was used detect differences in VSI scores between the groups. Spearman correlation was used to measure the association of VSI and IBD activity, anxiety and HRQOL.

Results: We recruited 74 IBD (51 UC, 23 CD; mean age 29 yrs, 40%F) patients, 74 IBS (mean age 29.3 yrs, 40%F), and 74 HC (mean age 29.1 yrs, 40%F) subjects. IBD and IBS patients had significantly higher VSI scores compared to HCs (all p's<3.86e-11, **Figure 1**). However, VSI scores were significantly lower in IBD compared to IBS (4.04e-06). VSI scores did not differ between CD and UC patients (P=0.59). Cronhach's a= 0.86 in IBD patients, which is similar to a= 0.93 seen previously in IBS patients. In IBD patients, the VSI had a significant but modest correlation with HAD-anxiety (R=0.35, P=0.002) and trended toward correlation with trait anxiety (R=0.22, P=0.06). There was also a significant correlation between the VSI and the physical component of HRQOL (R=-0.45, P=0.0001, **Figure 2**), but less so with the mental component of HRQOL (R=-0.23, P=0.05). 25 IBD patients (CD N=12, UC N=13) completed disease activity indices with CDAI mean= 46.83 ± 50.19 and PTIUC mean= 3.85 ± 2.4. There was no significant correlation between VSI and IBD disease activity.

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Conclusion: The VSI shows reliability in IBD patients and is similar to its performance in IBS patients. IBD patients have increased GSA compared to healthy subjects and this increased GSA, as measured by the VSI, is associated with decreased physical related HRQOL. VSI scores were lower in IBD patients compared to IBS patients. This could be explained by the relatively milder disease activity in the IBD patients compared to the moderate-severe disease in the IBS group. Like its performance in IBS patients, The VSI in IBD patients is related to but separate from state and trait general anxiety. The lack of correlation of VSI and IBD disease activity may be due to the small sample size and milder disease activity. VSI appears to be a useful measure in IBD, however, future larger studies are needed to further validate VSI in IBD and to assess its correlation with disease activity. Further studies are needed to assess the performance of the VSI in the pediatric IBD population. Long term longitudinal studies would be useful to evaluate the VSI scores and their relationship to symptoms, disease activity, and HRQOL in IBD patients over time.

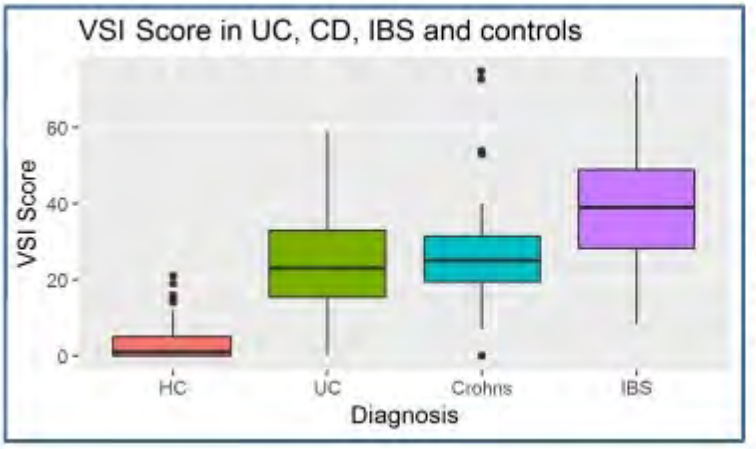


Figure 1: *VSI scores are higher in UC (n=51, p= 5.03E-17), CD (n=23, p= 3.86E-11), and IBS (n=74, p = 1.97E-25) compared to healthy controls (HC) (n=74).*

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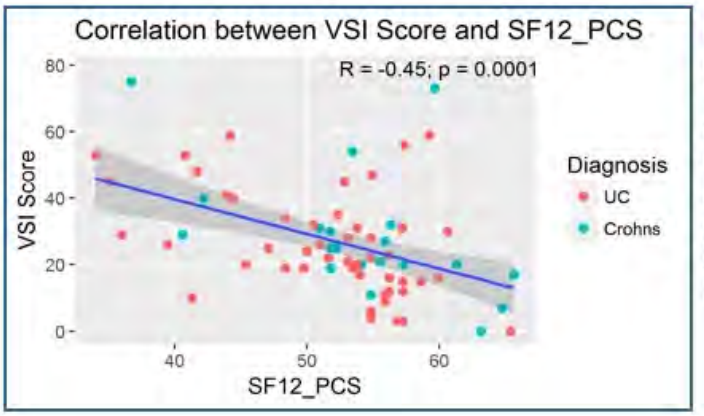


Figure 2: *Correlation of VSI and SF12-PCS (a measure of patient's self assessment of physical well being) in adult IBD patients.*

574 ***EFFECT OF THE TRADITIONAL CHINESE MEDICINE (TCM), PIEN TZE HUANG (PZH) ON EXPERIMENTAL INTESTINAL INFLAMMATION AND ASSOCIATED CHANGES IN LYMPHANGIOGENIC GROWTH FACTORS.*** *Sujithra Velayuthan[1,2], Liya Liu[1,2,3], Youqin Chen[1,2], Jun Peng[3], Thomas Sferra[1,]. [1]Pediatric Gastroenterology Hepatology and Nutrition, UH Rainbow Babies and Children's Hospital, Cleveland, OH; [2]Department of Pediatrics, Case Western Reserve University School of Medicine, Rainbow Babies and Children's Hospital, Cleveland, OH; [3]Fujian University of Traditional Chinese Medicine, Minhou Shangjie, Fugian, China*

Background: The currently available therapies for inflammatory bowel diseases are inadequate due to lack of response in some patients and potential for significant side effects such as immunosuppression. Hence, the development of additional effective and safe therapies can improve patient care. Complementary medicine is gaining popularity due to reported low side effects and potential therapeutic benefits. PZH is a TCM that is commercially produced and widely used in China to treat various inflammatory conditions. Our group has demonstrated that PZH is an effective therapeutic in experimental colorectal carcinoma, mediating this effect, in part, by reducing angiogenesis. Lymphangiogenesis occurs in IBD, but whether it plays a protective or pathogenic role is unclear.

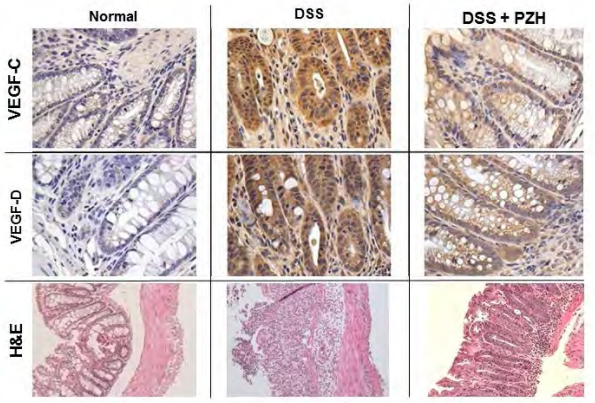
Aim: To evaluate the effect of PZH on experimental intestinal inflammation and to study the associated changes in lymphangiogenic growth factors

Methods: BALB/cJ mice (6-8 weeks of age) were used for this study. Colitis was induced with 3% dextran sodium sulfate (DSS) in drinking water on experimental days 1 – 7 followed by regular water on days 8 – 14. PZH was administered at 234 mg/kg/day via gavage on experimental days 1 – 14. Three groups of mice (n = 5 mice per group) were evaluated: (1) DSS-alone (colitis, no treatment), (2) DSS+PZH (colitis, +treatment), (3) control (no colitis, no treatment). Mice were weighed daily and a disease severity index (weight loss, rectal bleeding and stool consistency) determined every 48 hours. Mice were euthanized on experimental day 15. The colons were harvested, measured, and processed for histologic assays (H&E stain, immunohistochemistry for VEGF-C, VEGF-D, VEGFR2, VEGFR3, NRP1, and NRP2).

Results: PZH administration ameliorated the degree of colonic inflammation induced by DSS. On the last day of the experimental period, the DSS+PZH group had a lower mean DSI than the DSS-alone group (4.0±0.7 vs. 10.4±1.7, $P < 0.05$). The colon length in the DSS+PZH group approached that of the control mice (7.7±0.3 cm) and was significantly longer than the DSS-alone mice (3.6±0.4 vs. 6.06±0.4 cm, $P < 0.05$). The DSS+PZH mice had less inflammation and greater preservation of the mucosal architecture as compared to the DSS-alone mice. DSS treatment induced a robust expression of the evaluated angiogenic factors and this expression was reduced by PZH treatment.

Conclusion: The results of this study demonstrate that PZH reduces intestinal inflammation in experimentally-induced colitis and PZH might directly or indirectly affect lymphangiogenesis. PZH alleviates histological damages and also reduces the expression of lymphangiogenic factors in mice colon with DSS induced colitis

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577 ***SINGLE-CELL ANALYSIS OF T CELL PATHOGENESIS IN PEDIATRIC INFLAMMATORY BOWEL DISEASE.*** *Hengqi Zheng[1], Jose Ordovas-Montanes[2], Benjamin Doran[2], Alison Yu[3], Victor Tkachev[4], David Suskind[1], Ghassan Wahbeh[1], Dale Lee[1], Alex Shalek[2], Leslie Kean[4]. [1]Pediatric Gastroenterology, Seattle Children's Hospital, Seattle, WA; [2]Broad Institute, Cambridge, MA; [3]Research Institute, Seattle Children's Hospital, Seattle, WA; [4]Boston Children's Hospital, Boston, MA*

Background: Inflammatory bowel disease (IBD) is chronic complex autoimmune condition characterized by inflammation of the gastrointestinal tract. Pediatric IBD diagnosed in patients younger than 20 years of age comprises 30% of all diagnosed IBD. There is significant data to suggest that IBD may represent an inappropriate T-cell mediated immune response towards self-antigens and commensal microbiota in a genetically susceptible host. To understand the T cell-mediated pathogenesis in pediatric IBD we performed scRNA-seq analysis and concurrent flow cytometric analysis on mucosal biopsies from the multiple locations along the gastrointestinal tract and paired peripheral blood lymphocytes in pediatric IBD and compared these to matched samples from patients with pediatric Functional Gastrointestinal Disorders (FGID). ScRNA-seq allows us to use a systematic approach to the classification of T cell subsets to understand the pathogenesis behind disease development and progression.

Methods: Patients were enrolled on the PREDICT trial (Clinicaltrials.gov# NCT03369353) at Seattle Children's Hospital, Seattle WA, and peripheral blood as well as endoscopic biopsies were obtained. We performed scRNA-seq on cells from the epithelium and lamina propria from biopsies of duodenum, terminal ileum and colon, and paired peripheral blood T cells (magnetically separated using a Miltenyi CD3 negative-selection column) of treatment naïve pediatric IBD patients and age-matched endoscopic and histologically normal tissue from pediatric FGID comparisons. ScRNA-seq was performed using the 3' 10x Genomics platform and flow cytometry was performed on a BD Fortessa and analyzed using FloJo analysis software.

Results: 24 pediatric crohn's disease (CD) patients, 10 pediatric ulcerative colitis (UC), and 20 pediatric FGID patients have been enrolled on PREDICT thus far. To date, we have performed scRNA-seq on 59,393, 75,954, and 66,336 cells from the lamina propria layer of the duodenum, terminal ileum, and colon respectively from 8 children (n=5 CD, n=3 FGID comparisons). (Figure 1) ScRNASeq has identified distinct cellular clustering in CD versus FGID and has identified unique activation markers as well as transcriptional regulators in CD patients. We track how T cell states exist and contribute to disease phenotype in various locations of the gastrointestinal tract, as well as in peripheral blood in order to uncover potential biomarkers. These differences in local and distributed immune response provide key insights into disease-specific tissue remodeling, and give new understanding into the genetic components responsible for driving pathogenic T cell states.

Conclusions: Single cell evaluation of pediatric IBD patients in PREDICT has identified unique pathways and disease-specific transcriptional regulators when compared to normal histologically normal gastrointestinal disorders.

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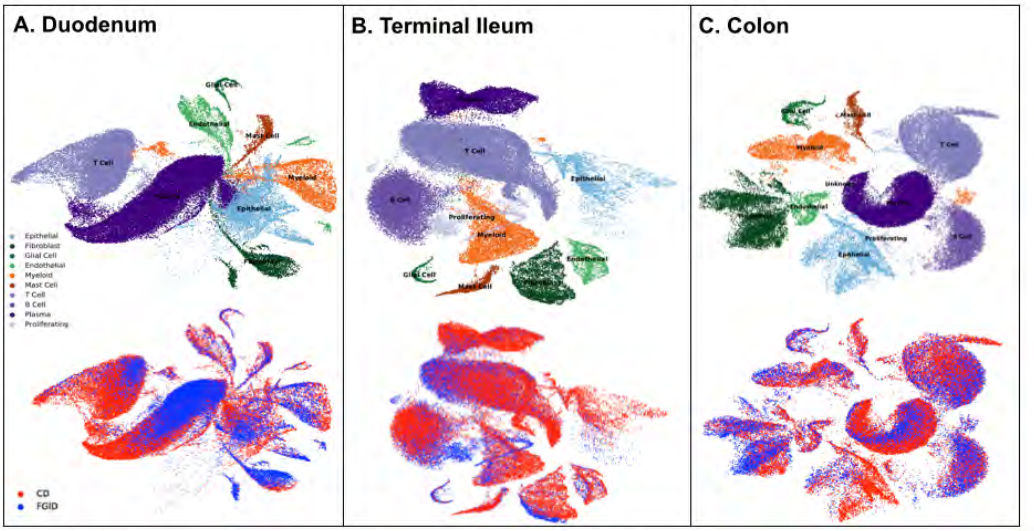


Figure 1. Uniform manifold approximation and projections (UMAPs) of lamina propria single cells using unbiased clustering: (A) 59,393 cells from the duodenum colored by cell type (T cells in lavender) in panel above and by disease states of Crohn's Disease (CD, in red) and Functional Gastrointestinal Disorders (FGID, in blue) in panel below; (B) 75,954 cells from the terminal ileum colored by cell type in panel above and by disease states below; (C) 66,336 cells from the colon with colored by cell type in panel above and by disease states below.

578 ***THE ASSOCIATION BETWEEN POSTOPERATIVE ENDOSCOPIC RECURRENCE BY RUTGEERTS SCORE AND CLINICAL RECURRENCE IN CHILDREN WITH CROHN'S DISEASE.*** *Lori Zimmerman[1], Knox Young[1], Kimberly Greco[2], Robert Shamberger[3], Jill Zalieckas[3], Brent Weil[3], Athos Bousvaros[1]. [1]Gastroenterology, Boston Children's Hospital, Boston, MA; [2]Institutional Centers for Clinical and Translational Research, Boston Children's Hospital, Boston, MA; [3]Surgery, Boston Children's Hospital, Boston, MA*

Intro: Though many children with Crohn's disease (CD) require surgical management, the optimal strategy to prevent postoperative recurrence is largely unknown. Adult studies have validated the Rutgeerts score to stage endoscopic recurrence (ER) as a predictor of clinical recurrence (CR). The routine use of endoscopic surveillance and Rutgeerts score to optimize therapy has not been evaluated in children. The current study aims to evaluate the association between ER based on Rutgeerts score and CR in children who undergo postoperative endoscopic surveillance.

Methods: We identified 83 children with CD who underwent endoscopic surveillance colonoscopy within 25 months of ileocecal or ileocolonic resection. Procedure images were reviewed to determine presence of ER (defined as Rutgeerts score 2-4). CR was defined as symptoms of flare as supported by clinical laboratory and radiologic parameters. Patients were followed until time of CR or loss of follow-up. Chi-squared analysis examined the association between exposure to post-operative TNF inhibitor and ER.Time to CR as stratified by ER was estimated using Kaplan-Meier curves.

Results: Average age at bowel resection was 16.4 years. Postoperative colonoscopy was performed at a mean of 10.3 months (range 2.0-25.3 months) from time of surgery. Median follow-up time was 2.6 years. Among the 18 patients that experienced ER, 9 (50.0%) had CR during the study period. Among the 65 patients that did not experience ER, 25 (38.46%) had CR. By 2 years, 33% of patients had CR. Time to CR was not statistically associated with ER (p=0.8159) or with the co-occurrence of ER and change in medical therapy (p=0.3742). Postoperative treatment with a TNF-inhibitor did not affect ER (p=0.19). ER was associated with escalation of medical therapy (p=0.01).

Conclusions: In this pediatric cohort, endoscopic recurrence was not predictive of clinical recurrence. The times to endoscopic and clinical recurrence were shorter than have been observed in historical and adult cohorts. The findings suggest the need for a prospective validated study to determine if Rutgeerts scoring is predictive of post-surgical outcomes in children with Crohn's disease who undergo bowel resection.

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579 ***PHENOTYPE OF INFLAMMATORY BOWEL DISEASE IN ASIAN CHILDREN.*** *Wenjing Zong[1], Amit Patel[2], Lindsey Albenberg[1]. [1]Gastroeneterology, Children's Hospital of Philadelphia, Philadelphia, PA; [2]Rowan University School of Osteopathic Medicine, Stratford, NJ*

Over the last decade, children of immigrants from Asian countries to Western countries have been observed to develop inflammatory bowel disease (IBD) at a similar rate as their Western counterparts (Benchimol et al. *Am J Gastroenterol* 2015). However, there is limited literature on their phenotype and response to standard treatment regimen (Carroll et al. *Inflamm Bowel Dis* 2016). Asian children who are first or second generation immigrants represent a diverse population with distinct genetic, environmental and cultural factors impacting their condition. We report the first single-center retrospective study in the U.S. characterizing the disease phenotype, response to therapy, and dietary practices in Asian children with IBD.

Method: Retrospective chart review was conducted on pediatric patients meeting the inclusion criteria of race identified as Asian, Indian, or Pacific-island, having a diagnosis of IBD, and receiving care for IBD at our children's hospital between 1/1/2013-12/31/2018. Charts were reviewed and extracted for demographic, disease information, therapies, vitamin D deficiency, complementary/alternative medication use, and dietary exclusions. Data was analyzed on Excel.

Results: About 110 patients meeting inclusion criteria were identified and 70 patients were analyzed. 33 were female (47%). 55 (79%) were South Asian descent, 10 (14%) were East Asian, 1 (1%) was Southeast Asian, and 4 (6%) were of mixed Asian race. The mean age of diagnosis was 9.8 years. 15 (21%) patients were diagnosed less than 6 years of age, making them very early onset IBD patients. 40 (57%) patients had Crohn's disease, 16 (23%) patients had UC and 14 (20%) patients with IBD-U. Disease location revealed predominance of colonic disease (85% of the patients). 9% had esophagus involvement, 29% stomach, 9.3% duodenum, 9.3% jejunum, and 61% TI involvement. Penetrating disease was present in 12.5% of our cohort, stricturing disease in 20%, and perianal disease in 12.5%. In UC patients, 53% had pancolitis compared to 23% with left-sided disease and 23% with proctitis only. Extra GI manifestation was relatively rare. Only 1 patient reported uveitis (1.4%), 3 (4.3%) joint disease, and 1 (1.4%) with erythema nodosum. 13% presented with mild malnutrition on diagnosis, 9% moderate, 3% severe, and 11% had growth failure.

34 out of 70 (49%) patients required an anti-TNF medication such as infliximab or adalimumab. 13/34 (38%) patients failed an anti-TNF, and within this group, 5 (38%) patients failed a second biologic, such as vedolizumab or ustekinumab. Interestingly, an overwhelming 93% of the patients had documented complementary and/or alternative medicine use. The most commonly used product was probiotics at 40%, followed by fish oil at 12%, and B complex at 5%. 17 patients (26%) also followed a self-prescribed food exclusion diet. Top three exclusions were gluten, dairy and egg. On the other hand, only 2 patients were on a medical diet for their IBD. 6 patients were on complete enteral nutrition and 14 on partial enteral nutrition. All patients had their vitamin D level measured. 34% had vitamin D deficiency (<20 ng/mL) and 39% had vitamin D insufficiency (20-30 ng/mL).

Conclusion: This study characterized the phenotype in Asian children treated for IBD in a single-center cohort. Majority of the patients descended from South Asian countries compared to other parts of Asia, in keeping with epidemiology studies from Canada. They show similar proportions in disease behavior and disease location as their Western counterparts. Interestingly, this study also revealed unique dietary and complementary practices that may impact therapy approach. Specifically, the percentage of patients using complementary and alternative medicine is extremely high and many tend to follow a self-prescribed elimination diet. Finally, the significant percentage of patients with hypovitaminosis D may suggest the need for better screening and treatment practices.

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Table 1. Demographics

N=70	
Female n, (%)	33 (47%)
Asian ethnicity n, (%)	
South	55 (79%)
East	10 (14%)
Southeast	1 (1%)
Mixed	4 (6%)
Disease subtype n, (%)	
Crohn's	40 (57%)
UC	16 (23%)
IBD-U	14 (20%)
Age of diagnosis in years mean (range)	9.8 (2-17)
<6 years old at diagnosis n, (%)	15 (21%)

Demographics

580 ***THE IMPACT OF PARENTING STYLE ON SELF-EFFICACY AND IBD TRANSITION READINESS.*** *Lynsey Zuar[1], Kimberley Chien[1], Jennifer Lentine[1], Victoria Cooley[2], Elizabeth Mauer[2], Linda Gerber[2], Laurie Keefer[3]. [1]Pediatric Gastroenterology, New York Presbyterian Cornell, Lindenhurst, NY; [2]Department of Healthcare Policy and Research, Weill Cornell Medicine, New York, NY; [3]Gastroenterology, Mount Sinai Hospital, New York, NY*

Background: Successful transition to adult care requires adolescent patients with IBD to acquire a set of independent self-management skills. This can be affected by the maturity & cognitive development, but may also be influenced by parenting style. Parenting style has been studied with regard to other chronic diseases, but not in the context of transition readiness in adolescents with IBD. This is a novel study that investigates the role of Baumrind parenting styles on self-efficacy & the acquisition of transition-care skills. Given that authoritative parenting style is associated with high levels of expectations with high support & warmth, we hypothesize that an authoritative parenting style would be the most associated with increased transition readiness.

Methods: This is a prospective cohort survey study. Participants 16-23yo, diagnosed with Crohn's Disease (CD), Ulcerative Colitis (UC), or IBD-U, & their parent were recruited from an urban pediatric academic medical center in New York City. Participants completed the IBD-Self-Efficacy Scale- Adolescent questionnaire (IBD-SES-A), Transition Readiness Assessment Questionnaire (TRAQ), & Parenting Styles & Dimensions Questionnaire (PSDQ), & demographic questions. The PSDQ classifies parent scores as authoritarian (high expectations/control), authoritative (high expectations/support) & permissive (responsive, low expectations). Paris classifications, & disease activity were collected from the chart. Descriptive statistics using N (%) and mean, standard deviation, median, min, & max were utilized to generate summary information of demographic & clinical characteristics. Wilcoxon rank sum tests were used to compare median TRAQ & IBD-SES total sum scores across gender, age group, & parenting style groups. Statistical significance was evaluated at the 0.05 alpha level. All analyses were performed in R (3.5.1) for Windows.

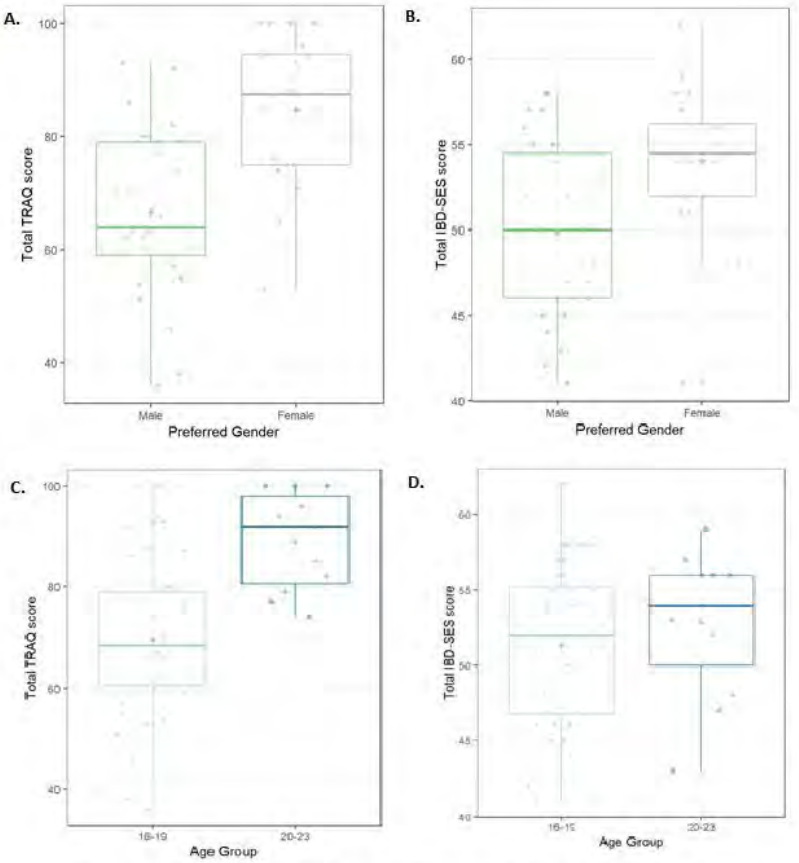
Results: Currently 49 participants, ages of 16-23, diagnosed with CD, UC, or IBD-U completed all surveys. The mean age was 18yo, and mean age at diagnosis was 13yo. Of these participants 86% are Non-Hispanic White, 2% Hispanic, 2% African-American, 4% Asian/Pacific-Islander, & 6% Other. 59% of patients are male, & 29% of patients also have a 1st degree relative with IBD. Parent's yearly household income showed the highest percentage (88%) of families making $100,000 or more. The 2 most common parental education levels were Masters degree (35%) and a Bachelors degree (33%).The preliminary data show there are significantly higher IBD-SES-A scores & TRAQ scores within participants who have a female gender preference (Figure 1A & 1B). It also supports previous studies showing that increased TRAQ scores are related to age, whereas IBD-SES-A score is not (Figure 1C & 1D). Currently all parents scored highest as authoritative on their PSDQ, so we used the 2nd highest score (either permissive or authoritarian) to define the subjects into the two parenting style groups. At this time we have not found significant differences between permissive & authoritarian groups for either IBD-SES-A or TRAQ scores.

Conclusion: Currently all parents scored highest as authoritative on their PSDQ, and this may partly be due to social desirability bias or recall bias. This study also highlights that there may be other protective factors for transition readiness such as female preferred-gender. Data collection and participant recruitment are is still ongoing. Further analysis will be

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needed to identify specific questions within the parenting dimensions that can be related to higher or lower self-efficacy and TRAQ scores. These questions could potentially be used as screening questions for adolescents with IBD, in order to best direct their needs for transition readiness.

Figure 1



A. Wilcoxon Rank Sum Test and a 5% level of significance, a p-value of 0.0002 is obtained. Sufficient evidence to conclude that the median total TRAQ score differs between male and female. **B.** Wilcoxon Rank Sum Test and a 5% level of significance, a p-value of 0.0088 is obtained. Sufficient evidence to conclude that the median total IBD-SES score differs between male and female. **C.** Wilcoxon Rank Sum Test and a 5% level of significance, a p-value of 0.0004 is obtained. Sufficient evidence to conclude that the median total TRAQ score differs between the 16-19 & 20-23 age groups. **D.** Wilcoxon Rank Sum Test and a 5% level of significance, a p-value of 0.3512 is obtained. Insufficient evidence to conclude that the median total IBD-SES score differs between the 16-19 & 20-23 age groups.

LIVER

588 ***SERUM ATYPICAL CHOLESTANOIC ACIDS (C_{27}) IN PEROXISOMAL BIOGENESIS DISORDERS.***

Kenneth Setchell[1], Wujuan Zhang[1], Monica Narvaez Rivas[1], James Heubi[2]. [1]Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Department of Pediatric Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Background: Peroxisomes play a key role in bile acid synthesis, being critical to side-chain oxidation of C27 cholestanoic acid intermediates in the biosynthetic of cholic and chenodeoxycholic acids. Zellweger spectrum disorders (ZSD) and single enzyme defects in peroxisomal beta-oxidation present as a broad phenotype including neurological disease, developmental delay, ataxia, vision and hearing loss, and liver disease. Differential diagnosis requires a battery of biochemical tests, including the detection of elevated levels of potentially hepatotoxic atypical C27 cholestanoic acids. Urine analysis by FAB-MS has proven a powerful tool for the diagnosis of bile acid synthesis disorders, including peroxisomopathies, but in the latter case only when there is liver involvement. An elevation in serum C27 cholestanoic

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acids is a more consistent and sensitive feature of impaired side-chain oxidation and provides a highly sensitive indicator of a peroxisomal disorder. We describe a new assay for the determination of C27 cholestanoic acids in small volumes serum using tandem mass spectrometry that is also capable in a single analysis of separating the 25R and 25S- diastereoisomers, thereby permitting definitive discrimination of the 2-methylacyl-CoA racemase (AMACR) deficiency from other peroxisomopathies. We have established pediatric normal ranges for the first time for serum individual and total C27 cholestanoic acids.
Methods: Serum C27 cholestanoic acids, after protein precipitation with acetonitrile, were separated and quantified by electrospray ionization (ESI) HPLC tandem mass spectrometry using stable isotope dilution analysis. Optimized HPLC conditions permitted the separation of all 8 diastereoisomers of unconjugated, glycine and taurine conjugated forms of trihydroxy-cholestanoic (THCA) and dihydroxy-cholestanoic (DHCA) acids. The assay was validated according to CAP/CLIA guidelines and conducted under GLP standards. The serum C27 cholestanoic acid assay was linear up to 2500 ng/mL, with a limit of detection of 20 ng/mL, and the intra- and inter-assay imprecision (% CV) and accuracy (% bias) was <15% for all for 8 analytes. Reference ranges were determined from adults (n=20) and children (n=8) not being investigated for liver disease for use as controls. Reference ranges for C27 cholestanoic acids were established using serum from pediatric patients evaluated for underlying liver disease that were non-cholestatic based on a normal total serum C24 bile acid (sTBA) concentration (n=10, ages 4 mo - 18 years), those with mild/moderate cholestasis with sTBA of 10-100 mmol/L (n=10, age 4 mo - 17.7 y), patients with severe cholestasis with a sTBA concentration of >100 mmol/L (n=9, age 4 mo - 18 y), and in patients with genetically confirmed peroxisomal disorders (n=10). Serum from 4 patients with genetically confirmed AMACR deficiency were also analyzed.
Results: Total serum C27 cholestanoic acid concentrations were undetectable or barely detectable in the disease control adults and pediatric patients with no significant differences between groups. In pediatric patients with liver dysfunction whose sTBA concentration was normal the serum total C27 bile acid concentrations were similar to controls (mean ± SEM, 0.015 ± 0.011 mmol/L vs 0.007 ± 0.004 mmol/L). The total serum total C27 cholestanoic acids in pediatric patients with severe cholestasis was low (0.985 ± 0.249 mmol/L) and slightly higher than patients with mild/moderate cholestasis (0.129 ± 0.033 mmol/L). In all, controls and patients with cholestasis had significantly lower serum total C27 bile acids than patients with genetically confirmed peroxisomal disorders (14.06 ± 2.78 mmol/L). The assay permitted clear differentiation of patients with impaired peroxisomal disorders from patients with other liver diseases. Furthermore, in all 4 patients with AMACR deficiency the total serum C27 cholestanoic acids concentrations (11.38 ± 13.06 mmol/L) were also elevated, and unlike ZSD was characterized by the presence of only the 25R- enantiomers of DHCA and THCA acids permitting the differential diagnosis of AMACR deficiency from other ZSD and single enzyme defects in a single analytical run.
Conclusions: We developed a novel assay for the quantification of total and individual C27 cholestanoic acids in serum that is applicable to the diagnosis of peroxisomal biogenesis disorders. Negligible levels of C27 cholestanoic acids were found in disease control pediatric and adult patients while ZSD patients had consistently and significantly higher serum levels. The assay may be applicable to the monitoring of the therapeutic response to primary bile acid therapy in patients peroxisomal disorders.
Sponsorship: Retrophin, Inc
Disclosures
JEH: Consultant, Alnylam, Nordmark, Shire, Retrophin, Mirum, Friesland Campina; Equity interest, Asklepion.
KDRS: Consultant, Retrophin; Equity interest, Asklepion.
WZ: No conflicts to report.
MNR: No conflicts to report.

589 ***VARIABILITY IN LIVER COMPOSITION IN CHILDREN PARTICIPATINF IN PHARMACOKINETIC STUDIES OF PROTON PUMP INHIBITORS.*** *Valentina Shakhnovich[1,3], Sherwin Chan[2], Neil Mardis[2], Alec Friesen[4], Jansynn Radford[5], J Steven Leeder[2]. [1]Pediatrics, University of Missouri Kansas City School of Medicine, Kansas City, MO; [2]Children's Mercy Kansas City, Kansas City, MO; [3]Children's Mercy Kansas City, Kansas City, MO; [4]University of Kansas School of Medicine, Kansas City, KS; [5]Kansas State University, Manhattan, KS*
Background: Hepatic impairment is known to affect hepatic drug clearance; however, in spite of the obesity epidemic, the impact of hepatic fat infiltration on drug metabolism remains unknown. We previously demonstrated decreased apparent drug clearance for pantoprazole, a proton pump inhibitor and a substrate for hepatic cytochrome P450 (CYP) 2C19, in children with obesity, compared to those without obesity. The aim of this ongoing prospective investigation is to quantify variability in liver adiposity in children with and without obesity, in order to test the hypothesis that hepatic fat fraction, determined by magnetic resonance (MR) imaging, influences hepatic drug clearance of proton pump inhibitors (PPIs).

Methods: Children enrolled in a pharmacokinetic study of PPIs had hepatic volume and hepatic fat fraction (HFF) measured using MR spectroscopy (MRSFF) and MR proton density fat fraction (PDFF); LiverLab, Siemens Healthcare.

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Obesity was defined by body mass index (BMI) ≥95th percentile for age. Patient demographics, anthropometrics, laboratory values and LiverLab outcomes were compared between obese and non-obese individuals, using independent student t-test, and associations with previously published data of pantoprazole clearance explored via Spearman's correlation (ρ); SPSSv24, α=0.05.

Results: Of the 33 children enrolled, 32 (7-20 years; 63% obese) had evaluable MR data. Liver volume (cm^3) was significantly higher in obese vs. non-obese children (1578 ± 368 vs. 1322 ± 239; p=0.02), as was HFF (%) via MRSFF (7.2 ± 7.6 vs. 3.4 ± 2.3; p=0.003) and PDFF (7.6 ± 6.4 vs. 4.0 ± 1.6; p=0.01). The two groups were comparable for age (13.9 ± 2.7 vs. 14.9 ± 3.5 years; p=0.6) and alanine aminotransferase (ALT) level (37 ± 16 vs. 29 ± 8 U/L; p=0.2). Pharmacokinetic data for pantoprazole were available for a subset of children (n=10) who were participants in a previous study. For the eight children with the same CYP2C19 normal metabolizer genotype, apparent oral clearance of pantoprazole decreased with increasing HFF (ρ= -0.7, p=0.047; Figure 1).

Conclusion: Compared to non-obese children, obese children have larger livers with significantly higher fat content. Our preliminary pharmacokinetic data (Figure 1) suggest that increased liver fat may explain previous observations of decreased CYP2C19-mediated hepatic drug clearance of pantoprazole in obese children.

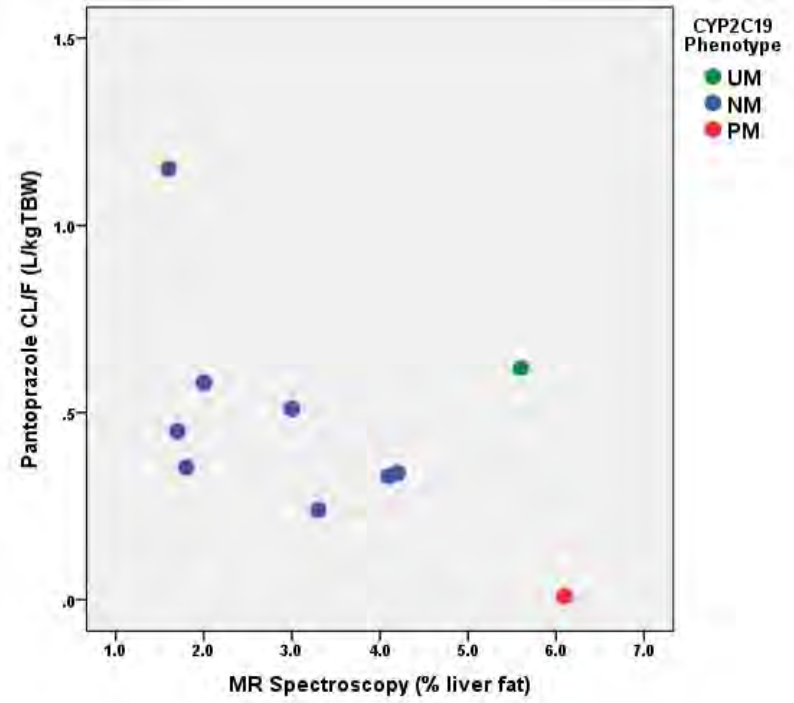


Figure 1. Apparent clearance (CL/F) of pantoprazole in children decreases as their hepatic fat increases. UM (ultra rapid), NM (normal), PM (poor) metabolizer, based on CYP2C19 genetics; TBW (total body weight).

591 ***TEMPORAL TREND, MICROBIOLOGY AND CLINICAL CHARACTERISTICS OF PYOGENIC LIVER ABSCESS AMONG CHILDREN IN THE UNITED STATES. A POPULATION-BASED ANALYSIS..*** *Aravind Thavamani*, *Krishna Kishore Umapathi*, *Jasmine Khatana*, *Aparna Roy. Pediatrics*, *Metro Health Medical Center*, *Parma*, *OH*

Introduction: Pyogenic liver abscess (PLA) in children is a relatively rare but serious problem with significant morbidity and hospital expense. The case fatality rate varies 3 to 30%. Despite the advent of newer modalities of imagining and antibiotics, studies in adults have shown a significant increase in the incidence of PLA recently. There is very limited data on the incidence, pathogenic bacteria and risk factors for PLA among children.

Methodology: We analyzed non overlapping years of National Inpatient Sample (NIS) and KID databased between 2003 and 2014. We included all patients between1 and 20 years of age and with a diagnosis of Pyogenic Liver Abscess (PLA) using ICD 9 code (572.0). All patients who did not have a diagnosis of Liver abscess served as controls for comparison. We

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excluded all patients with a diagnosis of Amebic and Candidal liver abscesses. Based on previous literature, we preidentified 8 risk factors (cirrhosis/chronic liver disease, biliary Disease, liver transplant, malignancies, chronic kidney disease (CKD), diabetes mellitus (DM), primary immune deficiency disorder, Inflammatory bowel disease) analyzed for its association with PLA, in an a priori manner. Incidence rate and trend were calculated during the study period. We also evaluated clinical characteristics, incidence trends and outcome measures including the procedures, length of stay and mortality associated with PLA.

Results: Total no. of PLA=4074. The mean age of the population = 13±6.1 years. Predominant of the patients were males (61%) and Caucasians (42.3%). Figure.1 shows an upward trend of PLA incidence from 2003 (9/100,000) to 2014 (15/100,000). Almost 4.7% of PLA had a positive culture. Staph and strep contributes to almost 20% and relative contributions are described in table.1. Multivariate logistic regression analysis showed that males, Hispanics, private insurance, larger bed sized, and teaching hospitals were significantly associated with PLA hospitalizations, $p<0.001$ (Table.2). All risk factors were at increased odds being associated with PLA except DM and CKD. Almost 45% of the patients with PLA underwent percutaneous aspiration. Liver resection was done in 4.1%. Cholecystectomy and ERCP were done in 3.2% and 0.9% respectively. The mean length of stay was 14.26±0.32 days and the mean total hospital charges were $103,744±2962 for PLA.

Conclusion: The incidence of PLA is increasing among pediatric population. Knowledge about these risk factors is vital for prompt diagnosis and timely management of PLA in at risk patients.

Figure.1 Incidence rate of Pyogenic Liver Abscess.

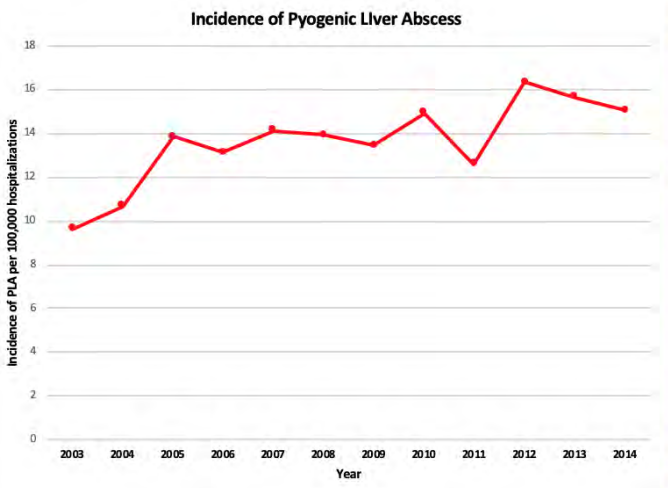


Table.1 Microbiology of Pyogenic Liver Abscess.

Microbiology of cultures	Percentages
Gram Positive Bacteria	
- Streptococcus	10.8%
- Staphylococcus	9.2%
- Pneumococcus	0
Gram Negative Bacteria	
- E. Coli	5.4%
- Klebsiella	5.4%
- Pseudomonas	1.9%
- Hemophilus	0.2%
- Proteus	0.1%
- Serratia	0.1%
- Other Gram Negatives	3.9%
Anaerobes	4.1%
Other Bacteria (Not specified)	9.8%

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Table. 2 Multivariate logistic regression showing odds ratio of various factors associated with Pyogenic Liver Abscess (PLA).

Parameters	Odds Ratio	Confidence Interval	P value
Age	1.042	1.036 – 1.047	<0.001
Female vs Male	0.42	0.39 – 0.44	<0.001
Race			
White	Ref	Ref	Ref
AA vs White	0.79	0.71 – 0.88	<0.001
Hispanic vs White	1.16	1.06 – 1.26	0.001
Others vs White	0.92	0.85 – 1.003	0.06
Insurance			
Public	Ref	Ref	Ref
Private vs Public	1.14	1.07 – 1.23	<0.001
SP/No Charge/Others vs Public	1.41	1.28 – 1.56	<0.001
Bed Size of Hospital			
Small	Ref	Ref	Ref
Medium vs Small	0.98	0.87 – 1.11	0.80
Large vs Small	1.30	1.17 – 1.44	<0.001
Teaching Location			
Rural	Ref	Ref	Ref
Urban Nonteaching vs rural	1.78	1.48 – 2.15	<0.001
Urban Teaching vs Rural	3.55	2.98 – 4.23	<0.001
Cirrhosis	2.95	2.42 – 3.59	<0.001
Liver Transplant	24.32	21.35 – 27.71	<0.001
Biliary Disease	5.20	4.58 – 5.90	<0.001
Malignancy	2.75	2.48 – 3.05	<0.001
Immunodeficiency disorders	2.16	1.70 – 2.74	<0.001
CKD	0.51	0.33 – 0.79	0.003
Inflammatory Bowel disease	3.46	2.95 – 4.07	<0.001
Diabetes Mellitus	0.76	0.61 – 0.94	0.01

592 ***DEVELOPMENT OF PATIENT- AND OBSERVER-REPORTED OUTCOME MEASURES FOR PAEDIATRIC CHOLESTATIC LIVER DISEASES.*** *Richard Thompson[1], Chad Gwaltney[2], Jean Paty[2], Jan Mattsson[3], Kristina Torfgård[3]. [1]Institute of Liver Studies, King's College London, London, United Kingdom; [2]IQVIA, New York, NY; [3]Albireo AB, Gothenburg, Sweden*

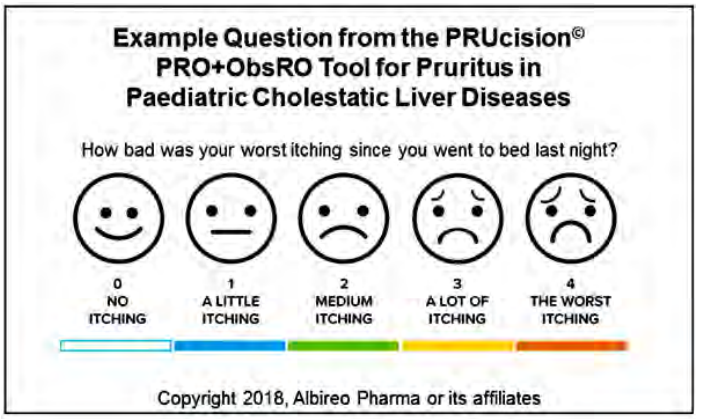
Background and Aims: Paediatric cholestatic liver diseases (CLDs; e.g., progressive familial intrahepatic cholestasis [PFIC], Alagille syndrome [ALGS], biliary atresia [BA], and primary sclerosing cholangitis [PSC]), are associated with debilitating pruritus and sleep disturbance. Reliable and sensitive patient- and observer-reported outcome (PRO and ObsRO) measures that capture the severity of these clinical symptoms are needed to develop novel therapies. This study was designed to develop CLD-specific measures of pruritus and sleep disturbance and to test patient and caregiver comprehension of PRO and ObsRO measures.

Methods: PRO and ObsRO items were based on information from published literature and interviews with patients, caregivers, and clinical experts. Cognitive interviews were conducted with patients and their caregivers to ensure comprehension of training materials, instructions, items, and response scales. Telephone interviews with caregivers were conducted in English for patients 1-5 years old (n = 12), in-person interviews with patients and caregivers for patients 6-12 years old (n = 17), and telephone interviews with patients 13-17 years old (n = 7). The sample included patients with PFIC (n = 17), ALGS (n = 10), BA (n = 3), and PSC (n = 6). Qualitative responses were reviewed following each wave of interviews and adjustments made to the PRO and ObsRO measures where necessary.

Results: The draft PRO and ObsRO measures were designed as diaries completed twice daily: at the end of the day to capture daytime symptoms and in the morning to capture overnight symptoms and sleep disturbance. Caregivers were asked to report on observable patient behaviors, such as scratching. Seven waves of interviews (N = 36 sessions) were conducted with 24 patients and 29 caregivers. Based on the interviews, it was determined that patients below the age of 8 had difficulty understanding the PRO measure. A 5-point (0-4) pictorial FACES response scale with numeric, color-coded, and verbal anchors was chosen (**Figure**). Patients were able to place the pictorial responses in order of severity, indicating comprehension. Patients and caregivers understood the final versions of the PRO and ObsRO measures as intended.

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Conclusion: This study confirms the content validity of the CLD-specific PRO and ObsRO measures. These measures of pruritus and sleep disturbance can be used to evaluate treatment efficacy in clinical trials of paediatric CLD.



593 ***COMPARISON OF ADULT VS. JUVENILE ONSET PRIMARY SCLEROSING CHOLANGITIS ASSOCIATED WITH INFLAMMATORY BOWEL DISEASE.*** *Stefani Tica*, *Bonsa Nemera*, *Yumirle Turmelle*, *Janis Stoll*, *Sakil Kulkarni* . *Pediatric Gastroenterology, Hepatology, Nutrition*, *St. Louis Children's Hospital, Washington University in St. Louis*, *Saint Louis*, *MO*

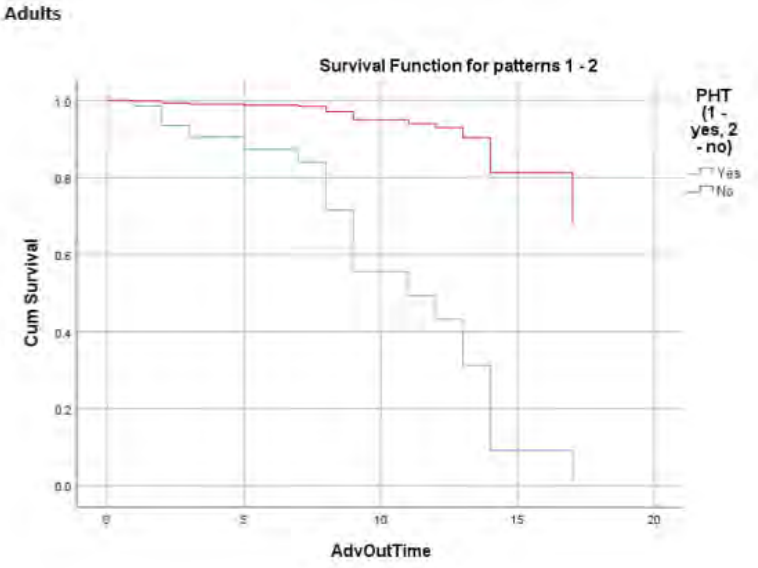
Background: Patients with pediatric or juvenile-onset PSC have distinct characteristics compared with adult-onset PSC. Two possible explanations of these differences include a different pathogenesis in adults, and/or longer disease duration.

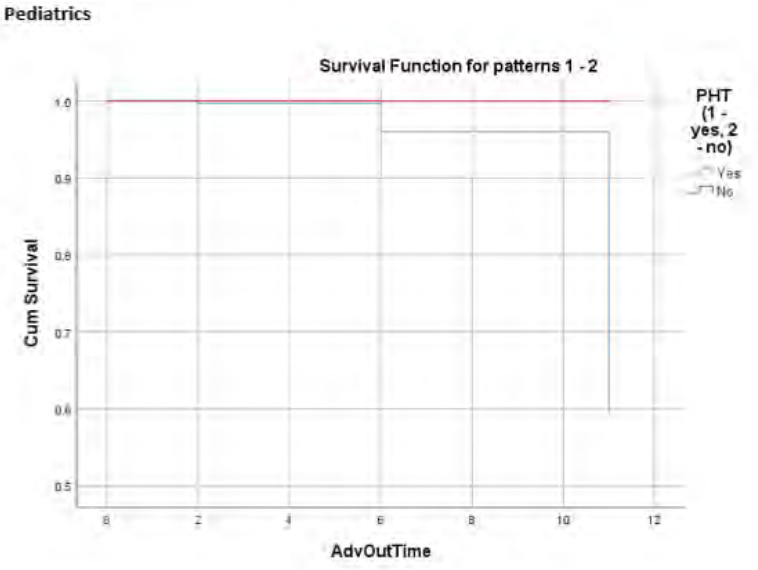
Methods: We conducted a retrospective review of PSC with inflammatory bowel disease patients between 2000-2013. Diagnosis of large duct PSC, overlap syndrome (AIH/PSC) and small duct (SD) PSC was based on cholangiographic and histologic findings. We compared patients based on age at diagnosis. We compared pediatric (N= 20) vs. adult age (N= 48) groups; and age groups 0-20 vs. 21-40 vs.41-60. We collected laboratory (lab) data at the time of PSC diagnosis, 1 year post diagnosis, and prior to outcome (death, liver transplant or final follow-up). GGT and ALP expressed as "times upper limits of normal" were used as the lab biliary marker for pediatric and adult age groups respectively. Demographic, clinical, lab data, outcomes and predictors of outcomes were compared amongst the aforementioned groups using Chi square, ANOVA, Kaplan Meier (KM) analyses and Cox Regression (CR) analyses.

Results: Pediatric patients were more likely to have SD-PSC or overlap compared to adults (31.6% vs 8.2%, $p = 0.02$). Adult patients more likely developed complications like upper GI bleeding ($p = 0.04$), ascites ($p < 0.01$), cholangitis ($p = 0.04$) and biliary strictures ($p = 0.007$). No other differences were found between the groups. KM analysis showed worse outcomes for adults (death or liver transplant), compared with pediatric patients ($p = 0.04$). Outcomes of patients in 21-40 age group were significantly worse compared to the age group 0-20 ($p=0.04$), but were comparable to the age group 41-60 ($p = 0.74$). CR analyses identified portal hypertension or PHT (HR = 11.5, 95% C.I 1.6 – 84.5, $p = 0.016$) and biliary marker at 1 year post diagnosis (HR = 1.5, 95% C.I 1.1 – 2.1, $p = 0.017$) as significant predictors of poor outcome in adults, but not in children. Duration of IBD was not a predictor of outcome in either group.

Conclusion: Even though adults had worse outcomes and more complications, older age of diagnosis during adulthood did not impact outcomes. Development of PHT and BM at 1 year after diagnoses were significant predictors of outcome in adults only; duration of IBD was not. This raises the provocative hypothesis that worse adult outcomes may be due to differing pathophysiology, rather than duration of disease.

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596 ***IDENTIFYING SMALL MOLECULES TO CORRECT ABNORMAL PROTEIN TRAFFICKING OF ALANINE-GLYOXYLATE AMINOTRANSFERASE (AGT) IN A HUMAN CELL MODEL OF PRIMARY HYPEROXALURIA TYPE I TO AVOID NEED FOR LIVER TRANSPLANTATION.*** *Jordan Whatley[1,2], Eric Torres[3], Janos Steffen[3], Mark Hanudel[4], Elizabeth Marcus[1], Martin Martin[1], Carla Koehler[3]. [1]Pediatric Gastroenterology, University of California Los Angeles, Los Angeles, CA; [2]Intercampus Medical Genetics, University of California Los Angeles, Los Angeles, CA; [3]Chemistry and Biochemistry, University of California Los Angeles, Los Angeles, CA; [4]Pediatric Nephrology, University of California Los Angeles, Los Angeles, CA*

Introduction: Primary hyperoxaluria type I (PH1) is an autosomal recessive metabolic disorder caused by mutations in the AGXT gene encoding the hepatocyte-specific peroxisomal enzyme alanine-glyoxylate aminotransferase (AGT). Deficiency in this enzyme results in excess oxalate formation, which leads to recurrent renal and urinary tract stones, renal failure, and deposition of calcium oxalate throughout the body. At present, the only curative therapy for PH1 is liver transplantation, which effectively replenishes the hepatocyte-specific enzyme. The most common mutation is the G170R mutation, which causes the mutated functional AGT enzyme to be incorrectly directed to the mitochondria instead of the peroxisomes where the substrate for the enzyme resides.

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Hypothesis: The Food and Drug Administration approved small molecule, dequalinium chloride (DECA), will redirect the G170R mutant AGT from the mitochondria to the correct location, the peroxisomes, in a HeLa cell model. MitoBloCK compounds (small molecules that block mitochondrial import) will also redirect the mutant AGT to the peroxisomes.

Methods: A split green fluorescent protein (GFP) system developed by Ruth Belostotsky was used to evaluate redirection of AGT to the peroxisomes in a HeLa cell model. A GFP11 tag was attached to the AGT enzyme and a GFP1-10 tag was attached to a peroxisomal targeting sequence. These GFP components fluoresce when linked together, which allowed for direct visualization of AGT import into peroxisomes. HeLa cells were transiently transfected with either the wild type (WT) or G170R mutant AGT with the split GFP system. DECA and the MitoBloCK compounds were added to the media of cells transfected with the G170R mutant AGT for 24 hours. Cells were then fixed and viewed under fluorescent microscopy.

Results: Cells transfected with the WT AGT showed strong GFP fluorescence in a punctate peroxisomal pattern indicating WT AGT localization to the peroxisomes as expected (Fig. 1). A co-transfection with WT AGT and a peroxisomal marker (pmScarlet-Peroxisomes) confirmed the peroxisomal location of the WT AGT enzyme. Cells transfected with the G170R mutant AGT showed no fluorescence as the mutant AGT enzyme is incorrectly trafficked to the mitochondria instead of the peroxisomes (Fig. 1). Application of DECA (at 0.5 μM) to cells transfected with mutant AGT resulted in strong GFP fluorescence in a peroxisomal pattern indicating redirection of the mutant AGT to the peroxisomes in the presence of DECA (Fig. 2). Application of 11 of the 12 MitoBloCK compounds (each at 2μM) to cells transfected with mutant AGT also resulted in strong GFP fluorescence in a peroxisomal pattern (Fig. 3).

Discussion: In this study, DECA and 11 of the 12 MitoBloCK compounds were shown to correct the abnormal cellular trafficking of the G170R mutant AGT enzyme in a human cell model of PH1. Further studies in human cells are needed to screen additional small molecules that may also redirect the G170R mutant AGT back to the peroxisomes thus rejoining this still functional enzyme to its substrate. This may lead to novel therapeutic agents for PH1 thereby avoiding the need for liver transplantation.

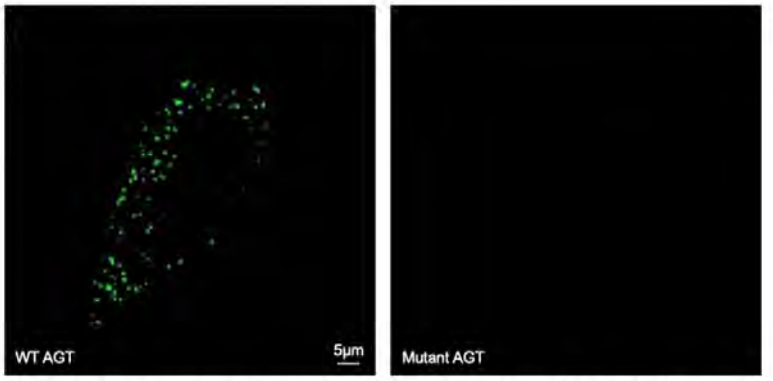


Fig 1. WT AGT fluoresces in punctate peroxisomal pattern. Mutant AGT does not fluoresce.

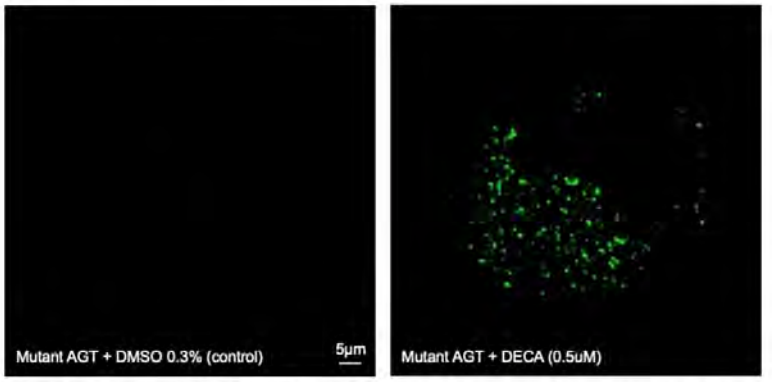


Fig 2. Application of DECA to mutant AGT results in fluorescence in punctate peroxisomal pattern compared to DMSO control (no fluorescence).

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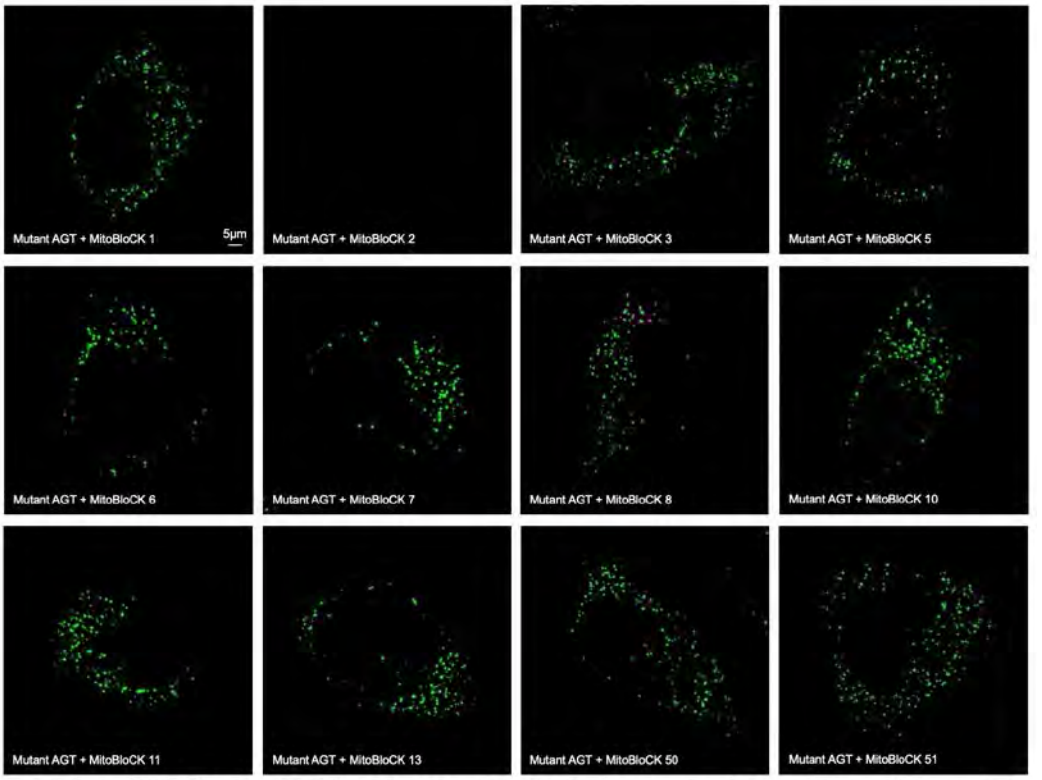


Fig 3. Application of MitoBloCK 1, 3, 5, 6, 7, 8, 10, 11, 13, 50, and 51 to mutant AGT results in fluorescence in punctate peroxisomal pattern. No fluorescence with addition of MitoBloCK 2.

599 ***PREVALENCE AND OUTCOMES OF SARCOPENIA IN PEDIATRIC LIVER TRANSPLANTATION.*** *Jessica Woolfson[1], Manuela Perez[2], Eberhard Lurz[1], Claudia Quammie[1], Derek Stephens[3], Govind Chavhan[2], Binita Kamath[1], Vicky Ng[1,4]. [1]Division of Gastroenterology, Hepatology and Nutrition, The Hospital for Sick Children and The University of Toronto, Toronto, ON, Canada; [2]Division of Radiology, The Hospital for Sick Children and The University of Toronto, Toronto, ON, Canada; [3]Department of Biostatistics, Design and Analysis, The Hospital for Sick Children and The University of Toronto, Toronto, ON, Canada; [4]Division of Transplant and Regenerative Medicine Centre, The Hospital for Sick Children and The University of Toronto, Toronto, ON, Canada*

Background: Sarcopenia, a decrease in muscle mass, is prevalent in adults with end stage liver disease (ESLD) and associated with poor post liver transplantation (LT) outcomes including prolonged hospital stay, and increased infection. Muscle mass can be estimated by cross-sectional area measurement of bilateral psoas muscle area (tPMA) on computed tomography (CT). Recently developed age and gender specific pediatric reference ranges and Z-scores (unpublished) provide the opportunity to ascertain prevalence and impact of sarcopenia on pediatric LT.

Methods: This single-center retrospective study with institutional REB approval included patients between 1-18 years of age with abdominal CT within 3 months of isolated LT at the Hospital for Sick Children between 2000-2016. Multi-visceral transplantation, intestinal failure-associated liver disease, and conditions without ESLD (i.e. malignancy) were excluded. tPMA (mm^2) was measured at L4-5 level and sarcopenia was defined as tPMA Z-score less than -2. Patient demographic and outcome data were recorded. Primary outcome was morbidity 1year post LT, including time to discharge, time in intensive care unit (ICU), intubation duration, number of culture-positive infections, graft rejection and loss. Descriptive statistics compared variables between those with and without sarcopenia. Linear regression correlation analysis compared traditional anthropometrics with tPMA.

Results: CT images from a total of 26 children (61.5% female, 23.1% biliary atresia (BA), 73.1% live graft, median age 5.58 (IQR 3.75, 11.33) years) were reviewed. The median tPMA Z-score was -1.56 (IQR -2.71, -1.10)). Sarcopenia was identified in 11 (42.3%) patients and was significantly associated with lower weight (-1.33 (IQR -2.47,-0.97) vs. 0.40 (IQR -0.88,1.18) p=0.006) and height Z-scores (-2.33 (IQR -2.95,-1.53) vs. 0.73 (IQR -0.524,1.97) p=0.015)); however anthropometrics did not correlate strongly with tPMA Z-scores (weight z-score R^2 0.380, p=0.001; height z-score R^2 0.025, p=0.407). There were no other differences in patient or graft factors, including gender, age, graft type, biochemical markers of liver function or presence of ascites (Table 1). There was no difference in 1-year outcomes except sarcopenic patients

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had a longer duration of ICU stay (3 days (IQR 3,6) vs. 2 (IQR 2,3.5) p=0.0134).

Conclusion: Sarcopenia is prevalent in 42.3% of a pediatric population undergoing LT and is associated with longer duration of ICU stay in this pilot study. Multi-center studies are needed to further explore long and short term effects of sarcopenia post pediatric LT.

Table 1. Characteristics of study population and patients with and without sarcopenia.

	Sarcopenic (n=11)	Non-Sarcopenic (n=15)	P value
Female [n(%)]	9 (81.8)	7 (46.7)	0.069
Age at CT (y) [median (IQR)]	6.25 (3.25,11.33)	5.50 (3.96, 9.67)	0.697
Live donor graft [n(%)]	7 (63.6)	12 (80.0)	0.407
PELD/MELD [median (IQR)]	8 (6.5,9.5)	8 (-0.5,10.0)	0.796
Conjugated bilirubin [median (IQR)]	73 (12.0,147.5)	6 (10.0,119.0)	0.243
Platelet [median (IQR)]	211 (69.0, 293.0)	95 (65.0,155.5)	0.243
Ascites [n(%)]	4 (36.3)	3 (20.0)	0.407
tPMA Z-score [median (IQR)	-2.99 (-3.51,-2.63)	-1.18 (-1.46,-0.48)	0.005

600 ***CLINICAL SIGNIFICANCE OF AUTOIMMUNE ANTIBODIES IN CHILDREN WITH NON-ALCOHOLIC FATTY LIVER DISEASE.*** *Toshifumi Yodoshi[1], Sarah Orkin[1], Syeda Meryum[1], Ana Catalina Arce-Clachar[1,3], Kristin Bramlage[1], Danielle Paquette[2], Stavra Xanthakos[1,3], Marialena Mouzaki[1,3], Pamela Valentino[2]*
[1]Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Section of Gastroenterology and Hepatology, Department of Pediatrics, Yale University School of Medicine, New Haven, CT; [3]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH

Background: Autoantibodies are frequently positive in adult patients with non-alcoholic fatty liver disease (NAFLD) in the absence of autoimmune hepatitis; however, the clinical significance of this finding is unknown. Moreover, pediatric studies on this topic are limited. The objectives of this study were to: (1) determine the prevalence of autoantibody positivity (antinuclear antibody: ANA, anti-smooth muscle antibody: ASMA, anti-liver-kidney microsomal antibody: LKM) in children with biopsy-confirmed NAFLD, and (2) investigate the association between autoantibody positivity and histologic disease severity.

Methods: Multicenter, retrospective study of patients ≤18 years with biopsy-confirmed NAFLD, followed from 2009-2018 at Cincinnati Children's Hospital Medical Center and Yale-New Haven Children's Hospital. Patients with secondary causes of hepatic steatosis (e.g. genetic or medication-induced), NAFLD activity score (NAS) ≤1, evidence of other/concurrent liver diseases and history of weight loss surgery were excluded. Clinical and laboratory data were collected within 3 months at the liver biopsy. Each biopsy was assigned a score for steatosis (0-3), lobular inflammation (0-3), hepatocyte ballooning (0-2) and fibrosis (0-4), and the NAS was calculated, as per Kleiner *et al.*Chi-square testing was used for normal categorical variables, Mann–Whitney U test for continuous data, and multivariable logistic regression was used for binary or ordinal outcomes.

Results: A total 136 children with NAFLD were included in this study. The median age at the time of biopsy was 14 years (range 5-18), 40% of the patients were female, 32% Hispanic and the median body mass index (BMI) z-score was 2.5 (interquartile range 2.2, 2.6). Positive ANA, ASMA, LKM, or any combination autoantibodies (ANA or ASMA or ALKM) were observed in 22%, 14%, 0%, and 33% of patients, respectively.

The proportion of females was significantly higher in the group with positive autoantibodies (53%, P=0.022). No patients with type 2 diabetes mellitus (T2DM) had any positive autoantibodies. There were no differences in the remaining demographic and clinical characteristics of the patients with and without positive autoantibodies (**Table 1**). Patients with positive autoimmune antibodies had significantly lower ALT (P=0.009), AST (P<0.001), cholesterol (P=0.041), and LDL levels (P=0.004) at time of biopsy than those with negative autoantibodies.

The proportion of patients with moderate-to-severe steatosis (steatosis score ≥ 2) was significantly higher in those with positive ANA compared to those with negative ANA (90% vs. 72%, respectively; p=0.045). The severity of steatosis, ballooning, lobular/portal inflammation and NAS were not statistically different between the groups. After controlling for

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age, sex, ethnicity, BMI *Z*-score and the presence of T2DM, positive ANA was associated with increased odds of moderate-to-severe steatosis (adjusted odds ratio, 5.91; 95% confidential interval, 1.50 – 23.26).

Conclusion: Positive ANA and ASMA were commonly encountered in this large pediatric NAFLD cohort; however, anti-LKM positivity was not seen. ANA positivity was independently associated with increased likelihood of moderate to severe steatosis, in the context of lower ALT levels and in the absence of common risk factors, such as T2DM.

Table 1. Comparison of the clinical, laboratory and histology findings between patients grouped by Autoimmune antibody status.

Variable	Autoantibody Positive (N=45)	Autoantibody Negative (N=91)	p value
Age	14 (11, 16)	14 (11, 15)	0.780
Female sex; n (%)	24 (53%)	30 (33%)	0.022
Hispanic ethnicity; n (%)	14 (31%)	29 (32%)	0.929
BMI *Z*-score	2.4 (2.1, 2.6)	2.5 (2.2, 2.7)	0.082
T2DM; n (%)	0 (0%)	7 (7.7%)	0.056
Laboratory investigations			
ALT (U/L)	84 (60, 127)	118 (85, 191)	0.009
AST (U/L)	48 (30, 68)	69 (43, 104)	<0.001
GGT (U/L)	43 (32, 71)	54 (389, 85)	0.081
Direct bilirubin (mg/dL)	0.05 (0.05, 0.1)	0.05 (0.05, 0.1)	0.452
HbA1c (%) (n=110)	5.3 (4.95, 5.45)	5.3 (5.0, 5.65)	0.390
Serum insulin (nU/L) (n=99)	24.1 (15.9, 37.9)	27.8 (20.1, 33.2)	0.422
Albumin (g/dL)	4.2 (4, 4.5)	4.3 (4, 4.6)	0.262
Prothrombin -INR	0.99 (0.95, 1.02)	0.99 (0.96, 1.03)	0.737
Cholesterol (mg/dL) (n=112)	158 (138, 173)	171 (143, 197)	0.041
LDL (mg/dL) (n=110)	90 (73, 103)	103 (81, 118)	0.004
HDL (mg/dL) (n=112)	39 (31, 43)	37 (31, 42)	0.231
Triglyceride (mg/dL)	141 (105, 199)	147 (112, 214)	0.447
Immunoglobulin G elevated; n (%)	1/25 (4%)	2/28 (7%)	0.621
Histology data			
Steatosis	2 (2, 3)	2 (1, 3)	0.480
Patients with Steatosis ≥ 2; n (%)	37 (82%)	67 (74%)	0.266
Lobular inflammation	1 (1, 2)	1 (1, 2)	0.363
Ballooning	1 (0, 1)	1 (0, 1)	0.147
NAFLD activity score (NAS)	4 (3, 5)	4 (3, 5)	0.143
Patients with NAS ≥ 5, n (%)	16 (36%)	44 (48%)	0.157
Portal inflammation	1 (0, 1)	1 (0, 1)	0.403
Fibrosis stage	1 (0, 2)	1 (0, 2)	0.374
Patients with Fibrosis ≥ 2, n (%)	14 (31%)	31 (34%)	0.730

Data are presented as N (%) for categorical variables, and medians and interquartile ranges.

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601 ***SARCOPENIA IS ASSOCIATED WITH LIVER DISEASE SEVERITY IN PEDIATRIC NAFLD.*** *Toshifumi Yodoshi[1], Sarah Orkin[1], Andrew Trout[2,3], Syeda Meryum[1], Ana Catalina Arce-Clachar[1,4], Kristin Bramlage[1], Qin Sun[4,5], Lin Fei[4,5], Andrew Beck[4,7,8,6], Stavra Xanthakos[1,4], Marialena Mouzaki[1,4]*
[1]Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Department of Radiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Department of Radiology, University of Cincinnati College of Medicine, Cincinnati, OH; [4]Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH; [5]Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [6]Division of General and Community Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [7]James M. Anderson Center for Health Systems Excellence, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [8]Division of Hospital Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Background: Sarcopenia is associated with histologic liver disease severity in adults with non-alcoholic fatty liver disease (NAFLD); however, this association has not been explored in children. The objectives of this study were to: (1) investigate the association between muscle mass and histologic liver disease severity in a pediatric cohort with biopsy confirmed NAFLD, and (2) investigate the association between sarcopenia and hepatic steatosis and liver stiffness in a cohort with presumed NAFLD based on magnetic resonance imaging (MRI)-evidence of hepatic steatosis and a negative work up for other liver diseases.

Methods: Retrospective study of patients <20 years with NAFLD, followed from 2009-2018. Muscle mass was assessed through MRI-based total psoas muscle surface area (tPMSA) measurements.tPMSA was measured at the L2/3 interval disc level and was corrected for height, generating the tPMSA index (tPMSA/height^2). In the biopsy-confirmed cohort, histology was scored per Kleiner et al. and patients were included if they had had an abdominal MRI that allowed the measurement of tPMSA within 12 months of the biopsy. MRI examinations were reviewed to collect liver volume (ml), liver fat fraction by MRI-proton density fat fraction (PDFF; %), and liver stiffness (MR elastography; kPa). Demographic and clinical characteristics were collected from the electronic medical record. Socioeconomic status (SES) was assessed using the Deprivation Index (DI) linked to each patient's home census tract. Proportional odds model was used in logistic regression when response variables were ordered in categories. Variables found to be significantly associated with NAS, liver PDFF or liver stiffness in the univariable logistic regression analyses were included in a multivariable stepwise model selection. Final models from linear regression were selected based on cross-validation error criteria.

Results: Histology cohort
Of the 100 children with biopsy-confirmed NAFLD, median age was 14 years (interquartile range (IQR) 12-16); 65% were male and 23% were Hispanic. The majority had severe (> class I) obesity (n=84; 84%). Type 2 diabetes mellitus (T2DM) was present in 8% of patients at the time of biopsy.

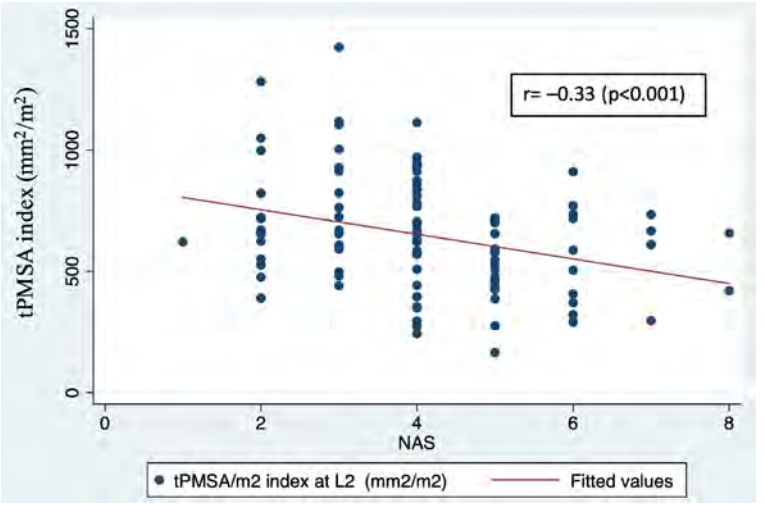
tPMSA index and NAS were weakly negatively correlated (r=-0.33, p <0.001; **Figure 1**). In univariate logistic regression analyses with proportional odds, higher NAS was significantly associated with lower tPMSA index (OR 0.67; 95%CI, 0.52 – 0.86, p=0.002) and higher DI (OR 35.3; 95%CI, 1.8 – 683.6, p=0.018).In multivariable logistic regression analyses with step-wise selection, the only significant predictors of NAS were tPMSA index (OR 0.68; 95%CI, 0.52-0.91, p=0.008) and DI (OR 33.5; 95%CI, 1.7-664.1, p=0.021). Also, in multivariable logistic regression analyses, lower tPMSA index was significantly associated with higher odds of histological steatosis (OR 0.73; 95%CI, 0.56 – 0.96, p=0.023).

Liver stiffness cohort
The median age of the 263 children with presumed NAFLD and MR elastography data available was 13 years (IQR 11-16); 68% were male and 25% were Hispanic. The majority of patients had severe obesity (n=203; 77%). T2DM was present in 6% of patients at the time of MRI. In univariate regression analyses, liver stiffness was associated with ethnicity, BMI z-score, presence of T2DM and serum insulin levels, but not with the tPMSA index.

PDFF cohort
The median age of the 95 children with presumed NAFLD and MRI-PDFF data available was 14 years (IQR 11-16); 77% of the patients were male and 23% were Hispanic. T2DM was present in 7% of patients at the time of MRI. In univariate regression analyses, liver PDFF was associated with ethnicity and the DI. Using general linear model, based on stepwise model selection with 5-fold cross validation criterion, liver PDFF was significantly associated with the tPMSA index (p=0.029), sex (p=0.019), and the DI (p=0.005).

Conclusion: Sarcopenia was associated with histological steatosis score and NAS in a pediatric cohort with histologically confirmed NAFLD, as well as with liver fat fraction in a cohort with MRI evidence of hepatic steatosis.

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602 ***COST-UTILITY ANALYSIS OF THE TREATMENT OF PAEDIATRIC CHRONIC HEPATITIS C WITH NEW DIRECT-ACTING ANTIVIRALS. .*** *Emma Greenaway[1,2], Alexander Haines[3], Simon Ling[1,2], Murray Krahn[3]. Division of Gastroenterology, Hepatology and Nutrition, The Hospital for Sick Children, Toronto, ON, Canada; [2]Department of Pediatrics, University of Toronto, Toronto, ON, Canada; [3]Toronto Health Economics and Technology Assessment Collaborative, University of Toronto, Toronto, ON, Canada*

Background: Chronic hepatitis C virus (HCV) infection is a major global health concern with an estimated 71 million infected persons worldwide. In children, chronic HCV is slowly progressive and severe outcomes such as cirrhosis are rarely seen before adulthood. However, infected children often experience stigmatization and impaired quality of life. The availability of highly curative direct acting antiviral (DAA) therapies now provides an opportunity for the eradication of HCV. These drugs are expensive and regulatory approvals for use in children, particularly young children, may be delayed by discussions of affordability that require cost-effectiveness evidence.

Methods: A state-transition model of chronic HCV mono-infection was developed using TreeAge Pro 2018 software to support a cost-utility analysis comparing 2 treatment strategies - treatment at age 6 years vs delaying treatment until age 18 years. Model inputs for fibrosis progression and utilities were derived from recently conducted systematic reviews. Probabilities for transition to advanced liver disease and mortality were taken from the published literature and government statistics. Medical care costs were obtained from a recently conducted costing study using linked population level laboratory and administrative data (Ontario, Canada). Treatment costs were based on wholesale acquisition estimates. Outcomes are expressed in expected quality adjusted life-years (QALYs) and costs (CAD). Analysis included validation of the model against other published models, base-case analysis to estimate the expected value using deterministic calculations and one-way and probabilistic sensitivity analyses to evaluate the impact of the uncertainty of the model inputs.

Results: The incremental cost-utility ratio of early treatment compared to delayed treatment was $11,166.36/QALY gained. This is considered cost effective under a $50,000/QALY gained willingness to pay threshold. After 20 years, 0.27% of the cohort in the early treatment arm developed cirrhosis and 0.1% died with a diagnosis of decompensated cirrhosis or hepatocellular carcinoma, vs 3.5% and 0.42% respectively, in the delayed treatment arm. If DAA costs were 72% lower in 12 years' time, delayed treatment would be the more cost-effective option. Model results were robust to significant changes in fibrosis progression rates and disease phase-based costs. The model was sensitive only to major changes in utilities.

Conclusion: Delaying treatment until age 18 may result in an increased and potentially unacceptable lifetime risk of late stage liver complications. Early treatment in children also appears to be cost effective using conventional cost effectiveness thresholds. Our work supports clinical and health policies that broaden treatment access for HCV infection to young children.

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611 ***GUT MICROBIOTA CHARACTERISTICS IN CHILDREN AFTER THE USE OF PROTON PUMP INHIBITORS*** **.** *Lila Simakachorn[1], Suwanee Chanprasertyothin[2], Supranee Thongpradit[2], Pornthep Tanpowpong[1]*
[1]Pediatrics, Faculty of Medicine Ramathibodi hospital, Bangkok, Thailand; [2]Office of Research Academic and Innovation, Faculty of Medicine Ramathibodi Hospital, Bangkok, Thailand

Background: Proton pump inhibitor (PPI) is the most potent acid blocker for the treatment of peptic ulcer disease, dyspepsia, and gastroesophageal reflux disease in children and adolescence. Gastric acid suppression has been shown to cause dysbiosis which may lead to increased risk of small intestinal bacterial overgrowth, enteric and respiratory tract infection by promoting colonization and growth of the pathogenic organisms. However, most studies on PPIs affecting the diversity of gut microbiome have been performed in adults, but studies in children are limited. Therefore, we aimed to assess the gut microbiota characteristics in children after the use of PPI.

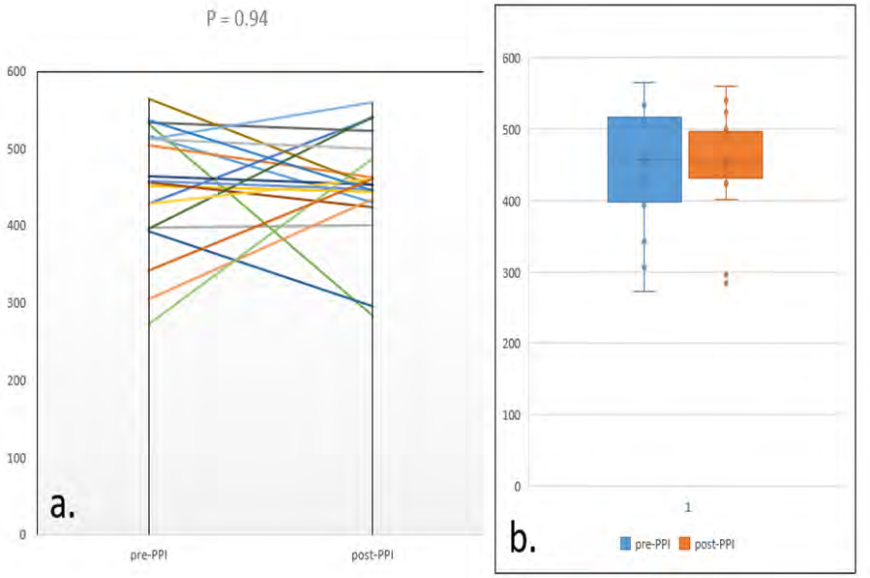
Methods: Children and adolescence aged 1-18 years who underwent oral PPI therapy were included during April-December 2017. We excluded children who had a previous use of antibiotics or acid blocker, history of acute gastroenteritis or specific food avoidance within one month prior to the enrollment. Demographic and baseline data, type and duration of PPI use and infection-related adverse effects were collected. The stool samples before and after continuous PPI use for 4-8 weeks were collected by rectal swab technique. DNA extraction, sequencing 16s ribosomal RNA by Illumina MiSeq^{TM}, and the microbiota profiles were analyzed using Quantitative Insights Into Microbial Ecology (QIIME) software. Alpha and beta diversity of gut microbiota and relative abundances were compared between pre and post PPI use.

Results: We initially enrolled 33 children in the study, but 12 patients lost to follow up. An error in DNA extraction occurred in one specimen. Therefore, we completed stool collection for gut microbiota profiles in 20 children (median age of 5.8 years and 40% were male). We noted 25% with overweight or obese, and 45% resided in Bangkok and the suburban area. Most common indication for PPIs therapy was gastritis or erosion and omeprazole was the most use PPI (55%) as a once daily dose. There were four parent-reported infections (two children with upper respiratory tract infection and the other two children with diarrhea).

After the PPI use, we observed non-significant changes of gut microbiota with regards to the total number of species-level taxonomy categories (Figure 1) as well as the alpha and beta diversity (Figure 2). The predominant phylum was Bacteroidetes in both pre- and post-PPI period. The subgroup analyses were performed with regards to various factors such as age group, gender, overweight/obese, area of residence, and PPI data which again showed no significant change in the gut microbiota diversity. However, the trend of increase in the proportion of phylum Firmicutes were noted in children living in urban area (P = .07) and among males (P = .11). In the four children who had infection-related adverse effects, we found no significant increase in phylum Firmicutes (P = .14).

Conclusions: Even the total number, diversity and predominant gut microbiota do not significantly change after 4-to 8-week course of PPI, we noted the trend of increased ratio of Firmicutes in some subgroups of children.

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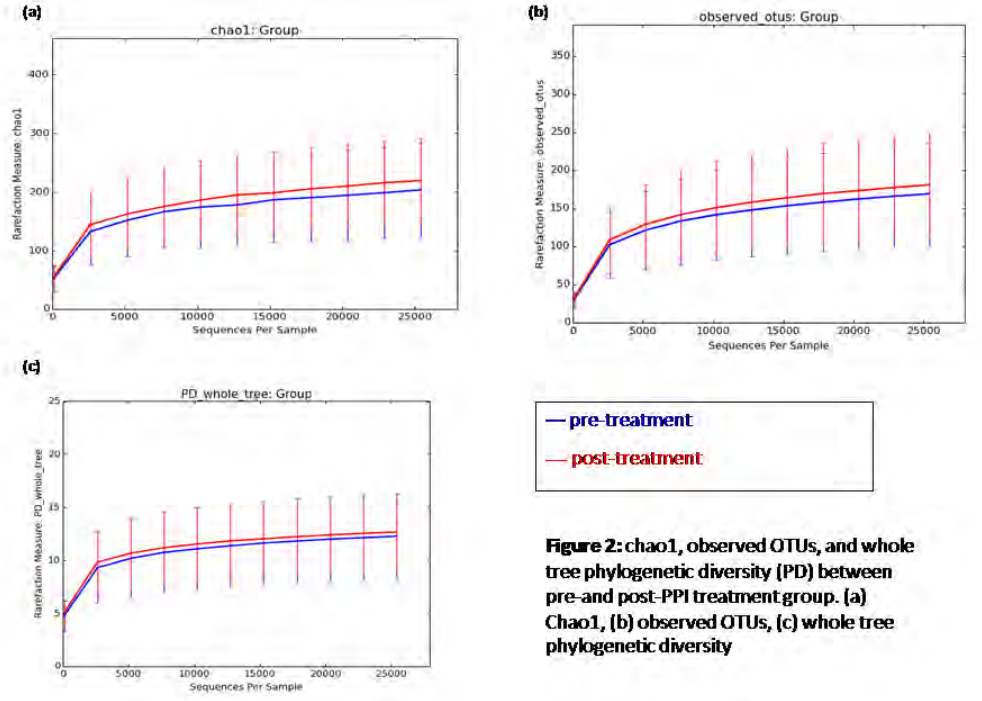


Figure 2: chao1, observed OTUs, and whole tree phylogenetic diversity (PD) between pre-and post-PPI treatment group. (a) Chao1, (b) observed OTUs, (c) whole tree phylogenetic diversity

612 ***ENDOSCOPIC FINDINGS AND DIAGNOSIS TEST IN H. PYLORI INFECTION IN CHILDREN.*** *Omaha Celestino Perez[1], Ericka Montijo[1], Carolina Romo[2], Ana Lara Ibarra[1], Josefina Cázares Méndez[1], Jose Cadena Leon[1], Erick Toro Monjaraz[1], Flora Zarate Mondragon[1], Karen Ignorosa Arellano[1], Roberto Cervantes Bustamante[1], Jaime Ramirez Mayans[1]. [1]Pediatric Gastroenterology and Nutrition, Instituto Nacional de Pediatria, Mexico City, Mexico City, Mexico; [2]Bacterial Experimental Laboratory, Instituto Nacional de Pediatria, Mexico City, Mexico City, Mexico*

Introduction: *Helicobacter pylori* (*H. pylori*) infection is a worldwide public health issue, and is considered one of the

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most common and persistent bacterial infections worldwide. In Mexico, infection rate increases with age, from 24.5% in children younger than 4 years, to 65% in adolescents. Clinical presentation and typical endoscopic findings are not well established until now, so this diagnosis is not always suspected. Nowadays, international guidelines consider *H. pylori* infection with positive histopathology report, however molecular test as PCR are now more available and offer more accuracy to make the diagnosis. It is important to determine if any symptoms or endoscopic findings suggest the diagnosis and justify more tests, as well as to evaluate the diagnosis tests to choose the better one considering cost and allowing early diagnosis and adequate treatment.

Objective: To determine association between symptoms and endoscopic findings with *H. pylori* infection. To determine if PCR is more accurate than histopathology to make the diagnosis.

Methods: A cross-sectional study was performed. From January 2015 to March 2019, diagnostic workup for *H. pylori* infection was carried out for 174 patients with gastrointestinal symptoms who were seen at the Instituto Nacional de Pediatria, Mexico City. All patients underwent endoscopy with biopsies, obtaining histopatology report, culture, rapid urease test, ureC gene and 16s-RNA PCR. Statistical analysis was performed using SPSS 21.0. We considered *H. pylori* infection with one positive molecular test. We looked for association between symptoms and endoscopic findings, between both of them and diagnosis of *H. pylori* infection, and we evaluated diagnostic validity of each test.

Results: Out of 174 patients, 55% were female, median of age was 130 months (interquartil range 88.5 months). The most predominant symptoms were in order of frecuency: abdominal pain 66% (epigastric localization 72%), vomiting 29.3%, pyrosis 27.6%, nausea 26.4%, bloating 21.3%, early satiety 16%, dysphagia 12%, burping 8.6%, upper GI bleeding 6.9%, low GI bleeding 5.8%, regurgitation 4% and weight loss 2.9%. Among endoscopic findings in antrum the most common symptom was nodularity (30.5%), followed by erythema 25.9%, edema 2.3% and ulcers 1.1%. In the gastric body we found erythema 25.9%, ulcers 5.2% and edema 2.3%; in duodenum: nodularity 20.1%, erythema 16.1% and ulcer 2.9% respectively. There wasn't any significant association between symptoms and endoscopic findings with H. pylori infection. Rapid urease test was perfomed in 75 patients (43%) with positive report en 35 cases (46.7%), we found 25 cases with positive culture (14.4%), by histopathology 58 positive results (33.3%), positive PCR 16S 47 patients (17%) and PCRUreC 70 cases (40.2%). In the evaluation of diagnostic validity we found for culture sensibility (S) of 29.7% and specificity (E) of 97%, positive predictive value (PPV) 62.86% and negative predictive value (NPV) of 67.5%; for rapid urease test S 62.8% and E 67.5%, PPV 62.8% and NPV 67.5% and for histopathology S 54.05%, E 82%, PPV 68.9% and NPV 70.6% respectively.

Analysis: As expected there are not specific symptoms statistically associated to *H. pylori* infection. Opposite as we thought, no endoscopic findings showed statistical association to the diagnosis, so we cannot guide the *H. pylori* research on this. About the diagnostic test, it is evident that culture has high specificity but low sensibility, due to the technical difficulties in the performance, so contrary to other infections cannot be considered the gold standar. International guidelines consider positive histopathology enough to make the diagnosis, but PCR has to be consider in the guidelines at least in countries where it is available, because there are some false positives in histopathology maybe corresponding to *non H. pylori helicobacters* and false negatives due to inexpertise of pathologists giving it low sensibility and reliable specificity. Rapid urease test has lower sensibility and specifity so it is not enough to make diagnosis, but it could be useful if available. Finally a molecular test is more reliable and accurate than histopathology so maybe it has to be consider as new first election test to make the *H. pylori* infection diagnosis.

Conclusion: There are not symptoms neither endoscopic findings than can reliable suggest *H. pylori* infection. Sensibility of histopathology is not good enough to make diagnosis, so PCR test has to be consider as first election test in future international guidelines.

Diagnostic test	PCR			S (CI 95%)	E (CI 95%)	PPV (CI 95%)	NPV (CI 95%)	LR+ (CI 95%)	LR – (CI 95%)
	Yes	No	Total						
Rapid urease test	22	13	35	62.86% (45.42-80.29%)	67.5% (51.74-83.26%)	62.86% (45.42-80.29%)	67.5% (51.74-83.26%)	1.93 (1.16-3.23%)	0.55 (0.34-0.89%)
	13	27	40						
	35	40	75						
Culture	22	3	25	29.73% (18.64-40.82%)	97% (93.16-100%)	88% (73.26-100%)	65.1% (57.11-73.09%)	9.91 (3.08-31.87%)	0.72 (0.62-0.84%)
	52	97	149						
	74	100	174						
Histo-pathology	40	18	58	54.05% (42.02-66.08%)	82% (73.97-90.03%)	68.97% (56.2-81.73%)	70.69% (61.98-79.4%)	3.0 (1.88-4.8%)	0.56 (0.34-0.95%)
	34	82	116						
	74	100	174						

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614 ***30% ETHANOL-2.8% CITRATE IS AS EFFECTIVE AS 70% ETHANOL IN PREVENTING CATHETER-RELATED BLOODSTREAM INFECTIONS IN PEDIATRIC INTESTINAL FAILURE.*** *Oriana Vanegas Calderon[1], Riad Rahhal[1,2]. [1]Pediatrics, University of Iowa, Iowa City, IA; [2]Pediatric Gastroenterology, Hepatology, Pancreatology and Nutrition, University of Iowa, Iowa City, IA*

PURPOSE: Complications related to central venous catheters (CVCs) are common in intestinal failure (IF) including catheter-related bloodstream infections (CRBSIs). Replacing heparin with 70% ethanol locks can reduce infection rates, however concerns were raised about potential negative effects on catheter integrity. We hypothesized that a lower ethanol concentration combined with citrate would prevent catheter related complications including CRBSIs.

METHODS: This was a retrospective cohort study in pediatric IF patients assessing the rates of CRBSIs, catheter repair, catheter placement and use of thrombolytics (alteplase) for suspected catheter related thromboses while on heparin, 70% ethanol and 30% ethanol-2.8% citrate locks.

RESULTS: 6 patients satisfied the inclusion criteria with a total of 8777 catheter days. All patients utilized silicone single lumen CVCs for venous access. The rate of CRBSIs was highest with heparin at 13.9 events per 1000 catheter days which significantly dropped to 1.6 per 1000 catheter days on 70% ethanol (p= 0.02) and remained significantly low at 0.4 per 1000 catheter days when transitioned to 30% ethanol-2.8% citrate locks as compared to heparin (p= 0.01). No statistically significant differences were noted among the groups in rates of catheter repair, catheter placement and alteplase use.

CONCLUSION: This is the first study showing evidence that a lower ethanol lock concentration is effective in maintaining a low rate of CRBSIs in pediatric IF patients using silicon CVCs. Although this study did not show significant positive impact on catheter integrity and survival, benefits of using lower ethanol concentrations include reduced systemic ethanol exposure to patients.

NUTRITION/OBESITY

617 ***SALIVAL CORTISOL COCENTRATION PREDICTS GROWTH AND BODY COMPOSITION IN NEWBORNS.*** *Jesua Villanueva-Hernández[1], Alfredo Larrosa[1], Sebastian Villanueva-Martinez[2], Edgar Vasquez-Garibay[1], Anel Ibarra-Ortega[1], Jocelyn González-Toribio[1], Perla García-Espinosa[1]. [1]Instituto de Nutrición Humana, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico; [2]Biología de la Reproducción, Instituto de Ciencias Médicas y Nutrición Salvador Zubirán, Ciudad de México, Ciudad de México, Mexico*

Objective: Our aim was to evaluate the correlation and determination coefficients between the concentration of salivary cortisol in newborns and anthropometric indicators of growth and body composition.

Methods: Forty healthy full-term newborns with normal pregnancy and delivery and with adequate weight at gestational age were studied. The concentration of cortisol in saliva was determined by ELISA. Samples were taken with a swab between 7-8 AM 24-hours after birth. Anthropometric measurements included weight, length, cephalic circumference, middle arm circumference; triceps and subscapular skinfolds. Statistics: Pearson linear correlation and simple linear regression.

Results: The salivary cortisol concentration was 10.9±0.34 nmol/L. The distribution of anthropometric measurements with respect to the WHO (2006) and Sann (1988) parameters had normal distribution between -2 and +2 SD. The determination coefficients (R^2) between anthropometric measurements and z-scores were: length 0.124 (p=0.26); cephalic circumference 0.233 (p=0.002); weight 0.364 (p<0.001); medium upper arm circumference 0.233 (p<0.001); triceps skinfold 0.814 (p<0.001); arm muscle area 0.277 (p<0.001) and arm fat area 0.947 (p<0.001). The correlations between salivary cortisol and z-scores of all anthropometric indicators showed similar results regarding the direction, degree and statistical significance.

Conclusions: The positive and significant correlations and the extent of the determination coefficients indicate that cortisol may be a systemic factor for growth and body composition in the final stage of pregnancy and newborn period.

618 ***PREDICTORS OF WEIGHT LOSS AND ATTENDANCE FOR "WAY OF LIFE PROGRAM" IN A PEDIATRIC GASTROENTEROLOGY DIVISION.*** *Gilad Hampel[1], Carmen Mikhail[1,2], Manuel Croitoru[3], Aviva Rogozen[1], Tamir Miloh[1,2]. [1]GI, Baylor College of Medicine , College Park, MD; [2]GI, Texas Children's Hospital, Houston, TX; [3]Rice University, Houston, TX*

Background: Non-alcoholic fatty liver disease is the most common chronic liver disease in children and adults leading to significant comorbidities and progressive liver disease. To date, the only intervention is lifestyle modifications with underwhelming results. Weight loss intervention is resource-consuming and challenging. The aim of this study was to assess whether psychological questionnaires at initial patient screening for weight loss program was predictive of program

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participation and weight loss.
Methods: Children participating in the Weigh of Life Program, a 15-session multidisciplinary weight loss program in Texas Children's since 2016 were screened with Weight Loss Readiness (WLR), Sizing Them Up (STU), Pediatric Symptom Checklist (PSC), Family Nutrition Physical Activity (FNPA), Body Self-Esteem (BSE), and Sizing Me Up (SMU). The program emphasized self-monitoring, stimulus control, contingency management, cognitive restructuring, dietary education, and an exercise plan. Subjects were provided with treatment manuals and given weekly homework assignments. Primary outcomes were program completion (0, 1-3, and >4 sessions) and BMI change at last session (significant decrease defined as a BMI change >-0.5, insignificant BMI 0 to -0.5 and weight gain). Statistical analysis included logistic regression, ANOVA, and linear regression.
Results: 336 patients participated in the program, 170 (51%) did not show up to second session. 53 of 166 (32%) lost more than 0.5 BMI over a median follow up of 3 sessions. 32 of 166 (19%) lost some weight, though less than 0.5, and 70 of 166 (42%) increased BMI. 159 of the total 336 participants (47%) were female and median age was 11 years. Data is presented in table 1. WLR was significant in describing attendance using a linear model with a coefficient of 0.27 p=.05 and FNPA was significant, with a coefficient of 0.05 p=0.05. The probability of attending at least 1 follow-up session was related to WLR. Age had a significant positive relationship with attendance (the older the patient, the likelier they are to attend more follow-up sessions). Gender differences were only significant in PSC, where females had a lower average test score than males p=0.01. Gender differences were not meaningful for BMI change. The probability of losing weight (dBMI < -0.5) is significantly and positively related to attendance p = 0.001, after controlling for other variables. Weight loss was significantly (and negatively) related with SMU p = 0.05, while significantly and positively related with WLR p=0.01. Age is also significantly related to probability of losing weight, where the older the patient, the likelier they are to lose weight p=0.05.
Conclusions: WLR, which is a simple 4-question quiz, seems to be the only test that is predictive of both program attendance and weight loss. This simple quiz could be useful in determining commitment to the program and may affect policy changes in resource utilization. Additionally, greater program attendance is associated with an increase the probability that weight will be lost and was related to greater child age: Lastly, SMU can be used as another predictor for whether weight will be lost.

TABLE 1

Test	Avg score for 0 attendance	Avg score for attendance	p	Avg score for significant weight loss	Avg score for no weight loss	p
STU	69.112	66.742	NS	66.876	66.724	NS
BSE	10.298	8.971	NS	8.847	9.149	NS
SMU	65.651	62.563	NS	61.047	63.279	0.05
WLR	18.742	19.386	0.05	19.679	19.229	0.01
FNPA	52.530	52.622	0.05	53.883	51.946	NS
PSC	19.545	21.635	NS	21.467	21.917	NS

NS=not significant

619 ***EARLY OUTCOMES OF 30% ETHANOL LOCK PROTOCOL FOR PREVENTION OF CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTION IN PEDIATRIC PATIENTS UNDERGOING MULTIDISCIPLINARY INTESTINAL REHABILITATION AT FIRST (FLORIDA INTESTINAL REHABILITATION SUPPORT AND TREATMENT).*** *Anisha Mohandas[1], Melissa Jalil[2], Alejandro Isava-Quintero[3], Debora Duro[4]. [1]Graduate Medical Education, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL; [2]Pediatric Gastroenterology Nurse Practitioner, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL; [3]Pediatric Infectious Disease, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL; [4]Program Director of Pediatric Gastroenterology and Nutrition, Medical Director of FIRST, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL*
INTRODUCTION: Intestinal failure (IF) can be defined as dependence on parenteral nutrition (PN) for >90 days to meet minimum nutritional needs for growth and development and the leading cause is short bowel syndrome (SBS). IF patients are reliant on central venous catheters (CVC), which puts them at risk of developing complications such as central line associated bloodstream infection (CLABSI), catheter breakage or thrombosis. The most common pathogens include: *Staphylococcus aureus, Escherichia coli, Enterococcus spp.,* and*Klebsiella spp*. The use of 70% ethanol lock has been studied for prevention of CLABSI in patients with CVC; however, it has shown to cause increased risk of systemic effects

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of ethanol and compromise catheter integrity. There is currently no literature to support the efficacy of 30% ethanol locks in the pediatric IF population. The objective of this study is to describe early outcomes of patients undergoing Intestinal rehabilitation (IR) at FIRST with the implementation of a 30% ethanol lock protocol for CLABSI prophylaxis.The rates of inpatient admission for suspected CLABSI, positive blood cultures from the CVC, and CVC breakage with use of 30% ethanol are reported.
METHODS: Retrospective chart review was done after IRB approval of 9 patients starting from initiation of IR at FIRST, earliest from July 2015 concluding in May 2019, who began 30% ethanol lock therapy from October to December 2018. Data was collected in regards to demographics of the patient population. All 9 patients had a silicone Broviac CVC, 8 patients with a size 4.2 French (Fr), 1 with a 6.6 Fr. The patients initiated had previous history of at least one CLABSI or caregivers reported a need to change central line dressings at least biweekly to maintain adequate CVC securement and hygiene. Patients received 30% ethanol locks in the CVC 3 days a week (Monday, Wednesday, and Friday) for a 4 hour dwell time which was after aspirated and followed by a 0.9% sodium chloride flush and a 10 unit/mL heparin flush or their parenteral nutrition was initiated. The ethanol lock administration volume was determined with the minimum fill volume for the patient's size catheter as indicated by the manufacturer and/or measured by aspirating from the CVC with an empty syringe until initial blood return was obtained. 30% ethanol lock administration was held during inpatient admissions during sepsis work up or CLABSI, while receiving intravenous (IV) antibiotics, or with CVC malfunction.). Also CVC compromise occurring after initiation of care at FIRST was recorded.
RESULTS: The patients reviewed were 67% female (6) and 33% male (3) with an age range of 2-5 years. The average weight was 15.17 kg with an average z score of -0.97 and an average height of 92cm. The primary diagnoses included: Necrotizing Enterocolitis (3), Intestinal atresia (2), Gastroschisis (2), Hirschsprung (1), and Incomplete Malrotation (1). The average time of PN administration was 10.33 hours, 7 days a week. Three of the 9 patients (33%) had zero CLABSI admissions and zero positive central line cultures after initiation of the protocol. Statistical analysis of T-testing was conducted with a p value of 0.08. The total number of positive central line cultures decreased 76%, (t=0.4232) with 25 positive cultures noted prior to initiation and 6 positive cultures afterwards (Figure 1). The most common bacteria were Klebsiella spp. , S. epidermidis , and Enterococcus spp. There were zero positive cultures for S. epidermidis after initiation. The positive cultures after initiation of locks were noted to be Klebsiella spp. (2), Corneybacterium spp., S. haemolyticus, and Enterococcus spp. The total number of admissions for sepsis work up and CLABSI decreased 60% from 55 to 17 (t=0.0766). The total number of admissions for compromise of the CVC decreased 54%. (t=1.2917) (Figure 2) therefore, patients being cared for at FIRST for longer periods demonstrated a higher number of events. No patients were noted to have side effects of ethanol administration.
CONCLUSIONS: The early outcomes of the 30% Ethanol Locks Protocol at FIRST indicate the efficacy of this method for CLABSI prophylaxis. The data demonstrates that upon initiation of the ethanol locks, patients had decreased rate of admission for suspected CLABSI, decreased rate of positive bacterial culture from the CVC, and decrease rate of compromised CVCs. This study cannot report that 30% ethanol is the sole reason for decreased rate of CVC breaks; however, it shows that there was no increase in rate of CVC compromise indicating a difference in efficacy when compared to 70% ethanol locks. This could have been due to other factors including line care education provided to caregivers and scheduled bacteria overgrowth regimen using FIRST protocols. For this patient population ethanol 30% locks provided beneficial outcomes.

620 ***ANEMIA OF INFLAMMATION IN INTESTINAL FAILURE.*** *Shweta Namjoshi[1], Christina Farkas[2], Nicholas Jackson[3], Laurie Reyen[4], Pamela Baldivia[4], Jorge Vargas[1], Robert Venick[1], Patricia Weng[2], Mark Hanudel[2], Tomas Ganz[5], Laura Wozniak. [1]Pediatric Gastroenterology, UCLA, Los Angeles, CA; [2]Pediatric Nephrology, UCLA, Los Angeles, CA; [3]Department of Medicine & Biostatistics, UCLA, Los Angeles, CA; [4]Nursing, UCLA, Los Angeles, CA; [5]Medicine & Pathology, UCLA, Los Angeles, CA*
Background: Anemia is common in intestinal failure (IF), but it is unknown if anemia in IF is due to iron deficiency or another etiology. Understanding iron status is important, as deficiency and overload are both associated with multisystem morbidity and mortality.

Objective: The objective was to determine the etiology of anemia in a cohort of patients with IF and characterize iron status with multisystem outcomes.

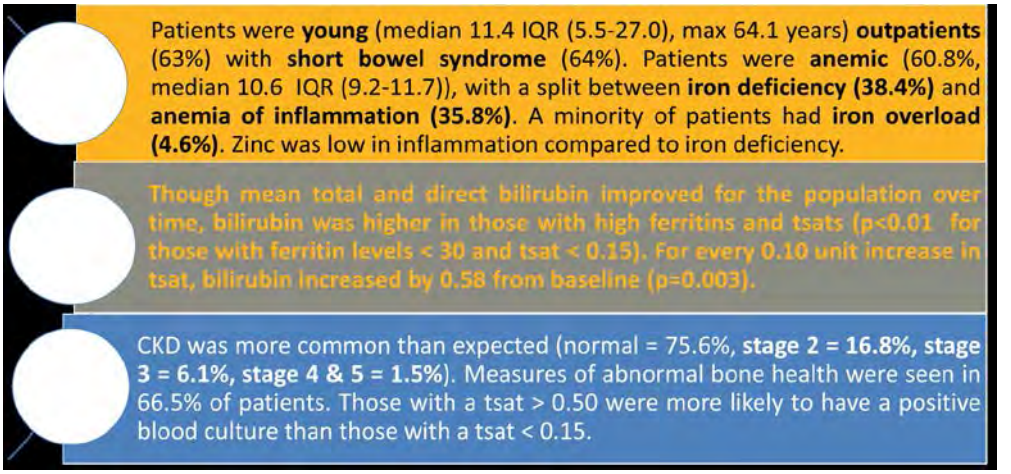
Design: Single center retrospective chart review of iron parameters from August 1998 to March 2018 in 54 IF patients (355 person-years).

Results: Thirty-eight percent of measurements showed iron deficiency, 36% anemia of inflammation, 21% indeterminate iron status, and 5% suggested iron overload. Mean direct and total bilirubin were elevated when ferritin was greater 200

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ng/mL and in inflamed and overloaded patients compared to iron deficient patients. For every 10% increase in Tsat, bilirubin increased by 0.58 mg/dL from baseline (p=0.003). Tsat > 50% had a mean positive culture probability of 60%. The probability of renal disease increased over time and average GFR decreased over time (-3.14 +/- 1.37 mL/min per 1.73 m^2), and nearly one in five patients in this study had chronic kidney disease (CKD).

Conclusions: Patients with IF are at risk for both iron deficiency anemia as well as anemia of inflammation, with at a portion of patients with anemia of inflammation and overload having elevated risk of cholestasis, CKD, and infection compared to their peers. Careful assessment of inflammation, risk of infection, and renal function should be performed prior to dosing iron to ensure safe and effective delivery of this essential micronutrient. Future directions include determination of extra-renal sources of inflammation in IF.



621 ***ROLE OF INFLAMMATION IN CROHN'S DISEASE ON VITAMIN D METABOLISM.*** *Stephanie Oliveira[1], Xueheng Zhao[2], Heidi Kalkwarf[1], Kenneth Setchell[2], James Heubi[1]. [1]Pediatric Gastroenterology, Cincinnati Children's Hospital, Cincinnati , OH; [2]Clinical Mass Spectrometry, Division of Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

Introduction: Vitamin D deficiency is more prevalent in patients with inflammatory bowel disease (IBD) compared to the general population. Why serum 25-(OH) vitamin D concentrations are lower is unknown, but we speculated that inflammation affects vitamin D metabolism. We studied IBD as a model to assess how the absorption and metabolism of vitamin D is impacted by an active inflammatory state. We compared the absorption of vitamin D3 and synthesis of 25-(OH)D3 in patients with active or quiescent Crohn's Disease (CD) and in healthy children.

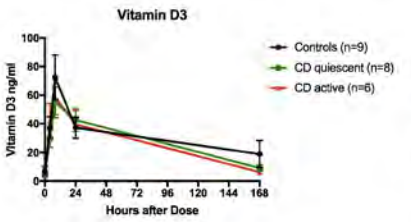
Methods: Three groups of subjects (ages 10-25 years old) were studied: healthy controls (n=9), quiescent CD (n=8) (defined as PCDAI score less than 10 for at least 4 weeks prior to the study visit) and active CD (n=6) (defined as PCDAI score >25 at least once within 4 weeks of the first visit). Patients with prior small bowel resection and history of primary sclerosing cholangitis were excluded to exclude conditions that could affect vitamin D absorption. After an overnight fast, participants received a single dose of 50,000 IU vitamin D3. Blood was collected at 0, 4, 8, 24 hours and 7 days post-dosing. Serum concentrations of vitamin D3 and 25-(OH)D3 were measured by liquid chromatography-mass spectroscopy.

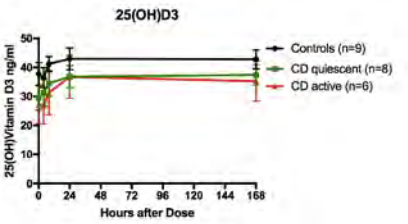
Results: In all groups, peak serum vitamin D3 concentration occurred at 8 hours and peak serum 25-(OH)-D3 at 24 hours. The change in vitamin D3 concentrations between 0 and 8 hours was similar among groups, (range 3.9 to 79.6 fold) (p=0.54).

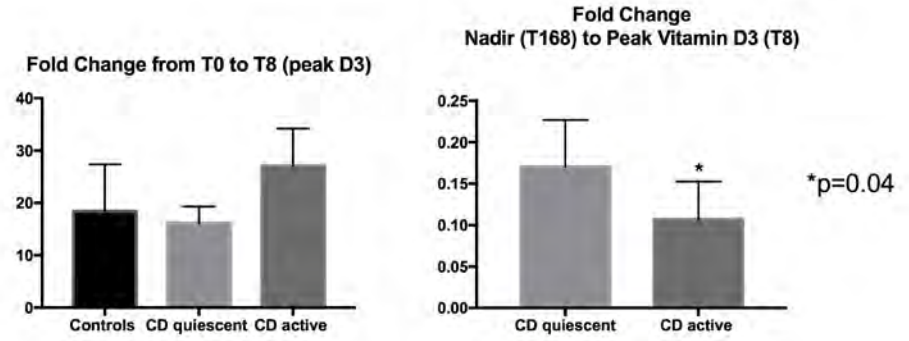
By day 7, the mean change in serum 25(OH)D3 concentrations from peak were not statistically significantly among groups. The decline in vitamin D3 concentrations from peak (24 hours) to day 7 was greater in active CD compared to quiescent CD groups (p=0.04).

Summary/Conclusion: There were no differences in absorption of vitamin D or conversion to 25-(OH)D among controls, quiescent CD and active CD groups. However, the more rapid clearance of vitamin D3 in patients with active CD may play some role in their observed lower serum 25-(OH)D concentrations.

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622 ***COMMUNITY SOCIOECONOMIC DEPRIVATION AND NON-ALCOHOLIC FATTY LIVER DISEASE SEVERITY.*** *Sarah Orkin[4], Cole Brokamp[2,3], Toshifumi Yodoshi[4], Syeda Meryum[4], Stuart Taylor[5], Christoper Wolfe[2], Rachel Sheridan[3,6], Aradhna Seth[7], Mohammad Bhuiyan[2], Sanita Ley[3,8], Ana Catalina Arce-Clachar[1,4], Kristin Bramlage[4], Robert Kahn[3], Stavra Xanthakos[4,3], Andrew Beck[5,3,9,10], Marialena Mouzaki[4,3]. [1]Department of Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH; [4]Division of Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [5]James M. Anderson Center for Health Systems Excellence, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [6]Division of Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [7]Division of Digestive Diseases, University of Cincinnati, Cincinnati, OH; [8]Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [9]Division of General and Community Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [10]Division of Hospital Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

Background: Non-alcoholic fatty liver disease (NAFLD) is linked to obesity. Obesity is associated with lower socioeconomic status (SES), however it is currently unknown whether SES is similarly linked to NAFLD severity.

Objective/Hypothesis: The objective of this study was to determine the distribution of socioeconomic deprivation, measured via an area-level proxy, in two cohorts with NAFLD and to determine whether deprivation was associated with disease severity. Our hypothesis was that socioeconomic deprivation was associated with NAFLD severity.

Methods: This was a retrospective study of patients <21 years with radiographic and/or histologic NAFLD, followed from 2009 to 2018. Data collection included patient demographics, street address and a range of clinical characteristics from within 90 days of liver biopsy or magnetic resonance imaging (MRI). Using Health Insurance Portability and Accountability Act-compliant software, the patients' address was mapped to a census tract, which in turn was linked to a measure of community deprivation calculated from variables available publicly in US Census databases. This Community Deprivation Index (CDI) ranged from 0 to 1, with higher values representing higher deprivation.

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Results: Two cohorts were studied; one with histologic confirmation of NAFLD (n=245), and another with MRI and/or Magnetic Resonance Elastography (MRE) findings of NAFLD (n=334). Across both cohorts, the majority of patients were male (66%) and non-Hispanic (78% and 77% respectively). The cohorts were characterized as severely obese in 80% and 79% of patients, and just over half of patients were publicly-insured (56% and 55% respectively). The median CDI for both cohorts was 0.36 (range: 0.15-0.85, **Figures 1 a&b**). The cohorts were then divided along the median CDI and characteristics of those above and below the median were compared. Patients living in communities above the median CDI were significantly more likely to be younger at both initial visit and time of biopsy (12±4 vs. 13±3, p=0.03 and 13±4 vs. 14±3 years, p=0.03, respectively). They were also more likely to be publicly-insured (histology cohort: 80% vs. 38%, p<0.01, imaging cohort: 65% vs. 35%, p<0.01). Clinical, biochemical, histologic characteristics, and MR- measures of fat fraction and stiffness were not different between the high and low deprivation groups.

Conclusions: In two large cohorts of children with NAFLD, patients were found across the spectrum of deprivation. Children living in more deprived communities presented at a younger age with similar histologic and radiographic disease severity as their counterparts living in less deprived communities, suggesting that community deprivation may be associated with disease progression and warrants further investigation.

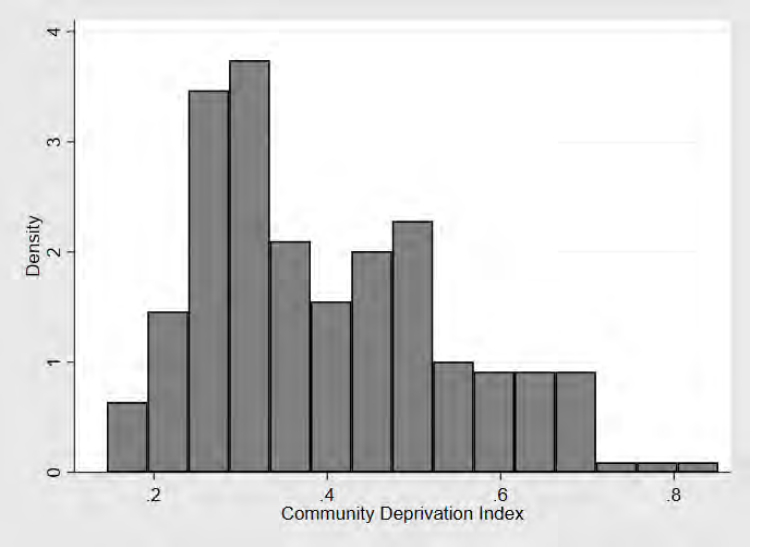


Figure 1a. Community Deprivation Index at the time of liver biopsy.

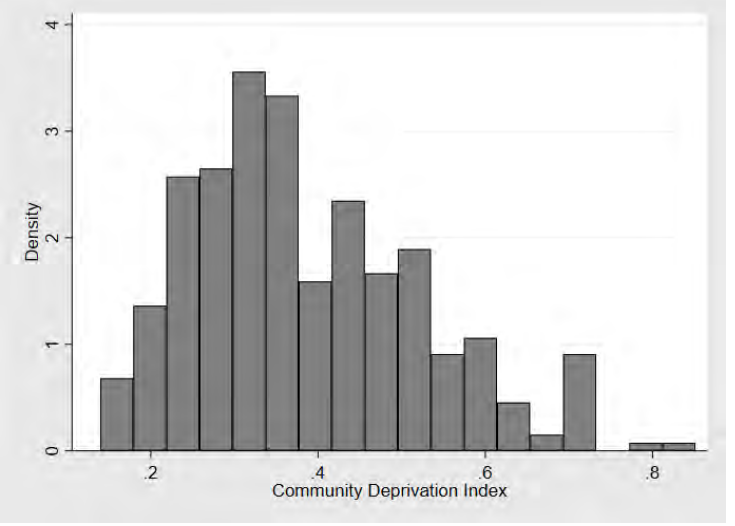


Figure 1b. Community Deprivation Index at the time of imaging.

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623 ***DIETARY HABITS IN 689 INFANTS FROM 0 TO 18 MONTHS IN MEXICO.*** *Carlos Oyervides[1], Fidel Cardona[2], Claudia Barajas[3], Jesus Mellado[4]. [1]Gastroenterologia, Hospital del Niño "Federico Gómez", Saltillo, Coahuila, Mexico; [2]Pediatria, Hospital del Niño Federico Gomez, Saltillo, Coahuila, Mexico; [3]Enfermeria, Hospital del Niño federico Gomez, Saltillo, Coahuila, Mexico; [4]Facultd de mercadotecnia, Universidad Autonoma de Coahuila, Saltillo, Coahuila, Mexico*

INTRODUCTION: We know well the impact of the behaviors and habits that are inculcated on children, specifically in the field of their nutrition. Knowing the regional reality in this regard provides specific tools to establish behaviors that impact on the health of our children.

OBJECTIVES: Know the characteristics of the feeding habits for infants from 0 to 18 months of age in a population of Mexico. Know the anthropometric effect of these habits. Know the effect that the level of education of the mother may have on the eating habits of this group.

MATERIAL AND METHODS: Prospective, cross-sectional, descriptive study (Survey) between December 2017 and August 2018. Children 0 to 18 months of age were included who attended the outpatient clinic of the "Federico Gómez" Children's Hospital, Saltillo, Coahuila, Mexico. Chronic, metabolic or any other condition that forced them to modify their eating habits on a regular basis were excluded.

RESULTS: Included 689 children, 50.94% female. 88.24% were given some type of lactation, 11.76% were fed only milk formula. Figure 1 shows the frequencies by age of lactation and mixed feeding and its comparison with the Mexican National Health and Nutrition Survey (ENSANUT) 2012. Mean age at which the formula began was 2.58 months (range 0-10). Of the children who received formula, the preparation was adequate in 69.3%, inadequate in 30.7%. The error in the preparation: 87.3% inadequate dilution, 12.7% add other component. Ablactation had mean of initiation at 5.42 months (range 2-12), the average start of different food groups was 5.37 to 12.58 months (tables 1, 2). The average start of non-recommended foods was from 6.75 to 10.81 months. Of the 406 children who ate cookies, 79.8% were sweet and 20.2% salty. Of the 123 children who ate snacks, 95.1% were Cheetos ® and 4.9% chips. The relationship between the degree of schooling of the mother, breastfeeding, adequate preparation of the formula and the use of non-recommended foods was analyzed.The results shown in the table 3. To analyze the effect of eating habits on the nutritional status, weight, Z deviation of the body mass index (BMI) was considered. The results shown in the table 4.

DISCUSSION: In general the dietary habits of this group of infants are bad. The deterioration of continuous breastfeeding and exclusive feeding with human milk is alarmingly low. The age at which the ablactation began is adequate and the food groups provided are generally adequate, although 10.3% started before the minimum recommended age and 11.1% after the maximum. The late introduction of some foods, makes lose their nutritional wealth in this stage of life. The introduction of harmful foods occurred from alarmingly early ages and a significant percentage of these infants consumed them as part of their usual diet. The degree of study of mothers has a clear influence on these habits, but a better education was not always a guarantee of good habits.

Breastfeeding showed a effect in the anthropometry of this group, which may be the earliest manifestation of the protection of the risk of overweight and obesity. The introduction of harmful foods early also showed a significant effect on the anthropometry of the group, which may be the earliest manifestation of the activation of epigenetic factors for the development of overweight and obesity. In this study, some important aspects were not analyzed, such as the age of the parents, the existence of siblings or the consideration of other anthropometric variables, such as the cephalic and brachial perimeters, so there is an open door to improve it.

CONCLUSION: The habits and customs that we find to feed an infant are a red flag for the future health of our children. The education of parents by the doctor is a cornerstone to modify this story in which fate is reaching us.

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Graphic 1 Breastfeeding and mixed feeding (Compared with ENSANUT 2012)

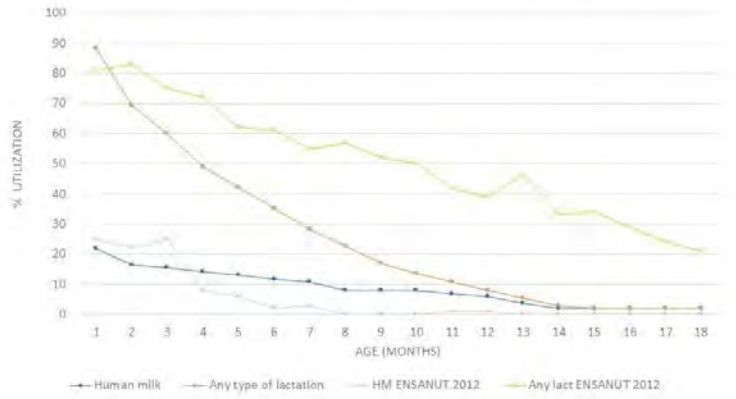


Table 1. Age of introduction of different food groups

n= 486

Food	n	average	Range	S. D.
Fruits	451	5.37	2-12	1.255
Vegetables	468	5.45	2-12	1.279
Cereals	332	6.31	2-12	1.987
Meals	262	8.1	5-12	2.034
Leguminous	263	7.39	2-13	2.415
Dairy products	190	8.73	3-18	3.225
Egg	257	9.13	2-13	2.799
Fish	89	12.58	7-18	3.493

Table 2. Age of introduction of non-recommended foods (n=489)

n= 486

Food	n	average	Range	S. D.
Baby juice	341	6.75	3-14	2.443
Juice	207	8.84	4-18	2.903
Cookies	406	7.24	2-18	2.835
Petite Suisse	275	8.39	2-18	3.554
Snack	123	9.201	3-14	3.128
Soda	121	10.81	4-18	3.657

Table 3. Some dietary habits and level of education of the mother

Level of school education	$\bar{x}$ (n=689)							
	Lactation	Proper preparation of formula	Cookies	Snack	Baby juice	Juice	Petit Suisse	Soda
Elementary	0.63	0.65	0.63	0.31	0.69	0.46	0.41	0.22
Middle	0.88	0.69	0.64	0.16	0.47	0.38	0.37	0.19
High	0.84	0.68	0.51	0.14	0.35	0.13	0.35	0.15
Tecnic	1.00	0.76	0.49	0.15	0.68	0.34	0.68	0-15
College	1.00	0.71	0.57	0.21	0.37	0.22	0.42	0.17
p	0.000	0.788	0.540	0.300	0.000	0.000	0.020	0.736

Table 4. Z deviation for BMI and use of some foods

		n	$\bar{x}$	p	I. C.
Lactation	Si	608	0.98	0.000	-1.107 a -0.433
	No	81	0.21		
Proper preparation of formula	Si	373	0.76	0.694	-0.277 – 0.403
	No	165	0.82		
Cookies	Si	407	0.85	0.606	-0.242 a -0.415
	No	282	0.94		
Snakes	Si	123	0.57	0.030	0.38 – 0.744
	No	566	0.96		
Soda	Si	121	0.19	0.000	0.484 – 1.201
	No	568	1.04		
Baby juice	Si	341	0.82	0.380	-0.169 – 0.442
	No	348	0.96		
Juice	Si	207	0.58	0.003	0.155 – 0.739
	No	482	1.02		
Petite Suisse	Si	275	0.73	0.085	-0.036 – 0.560
	No	414	0.99		

624 ***ATTITUDES REGARDING BMI IN PARENTS OF SCHOOL-AGED CHILDREN.*** *Mora Puertolas[1], Amanda Fifi[2]. [1]Pediatric Gastroenterology, University of Chicago, Chicago, IL; [2]Pediatric Gastroenterology, UM/Jackson Memorial Hospital, Miami, FL*

Introduction: BMI (Body Mass Index) is a measure of overall health that takes into account a person's weight and height. Healthcare professionals, and now public schools in Miami Dade County, are using BMI to categorize students. There is limited research on how much parents know about BMI and what (if anything) they would change depending on the result, but available research does suggest parents underestimate their children's BMI and are at the same time concerned about it.

Methods: Institutional Review Board approval was obtained. One hundred parents of school-aged students participated in a 10-question survey regarding their knowledge and attitudes toward BMI in their children.

Results: When asked if they knew what BMI meant, 59% of surveyed parents said yes, 26% said no and 15% said sort of. When asked if they would change their child's eating habits if the BMI was too high, 68% of parents said yes, 17% said no and 15% said unsure. When asked if they would be interested in attending a school-based nutrition class, 74% said yes and 26% said no. If their child's BMI was found to be high, 84% of parents said they would be interested in attending a nutrition clinic and 16% said they would not be interested.

Conclusion: BMI is largely being used as a screening tool for healthy weight. Many parents do not know what BMI means

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but realize it is important and would be interested in addressing it and learning more about it. Healthcare providers need to do a better job of explaining BMI and its significance to parents. There may be a role for schools to provide nutrition counselling for children with elevated BMI's.

625 ***COST-EFFECTIVENESS OF PARENTERAL OR ENTERAL IRON SUPPLEMENTATION IN CHILDREN WITH INTESTINAL FAILURE: A MICROSIMULATION STUDY.*** *Vikram Raghu[1], Jeffrey Rudolph[1], Hawre Jalal[3], Kenneth Smith[2]. [1]Pediatrics, Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]Medicine, University of Pittsburgh, Pittsburgh, PA; [3]Health Policy and Management, University of Pittsburgh, Pittsburgh, PA*

BACKGROUND: Children with intestinal failure have a high prevalence of anemia, leading to frequent blood transfusions. A major contributing factor is the lack of iron in parenteral nutrition recipes. Microsimulation models compare interventions in heterogenous simulated cohorts to produce results that mimic clinical trials. This analysis uses retrospective data in a microsimulation model to determine the cost-effectiveness of parenteral, enteral, and no iron supplementation on preventing blood transfusions.

METHODS: A chart review was conducted of a cohort of 67 children with intestinal failure on chronic parenteral nutrition followed at UPMC Children's Hospital of Pittsburgh from June 2017 to June 2018. A multivariate mixed effects linear regression was used to estimate hemoglobin values at the next month based on data from the prior month. A mixed effects logistic regression on hemoglobin was used to predict the probability of receiving a blood transfusion in a given month. These regressions were incorporated into an individual-based state transition model of pediatric intestinal failure. Cost was measured in US dollars and effectiveness was measured in the number of blood transfusions avoided. The model was simulated over a cohort of 10,000,000 individuals over a 1-year time horizon. Model output included cost, blood transfusions received, and hemoglobin trend. Strategies tested in the model included no iron supplementation, daily enteral iron supplementation, and monthly parenteral iron supplementation. Sensitivity analyses were performed on all regression coefficients.

RESULTS: Enteral iron and parenteral iron supplementation reduced the number of blood transfusions required per patient by 0.21 and 0.23 transfusions respectively. The number needed to treat was 5 patients to avoid a single transfusion. Enteral iron cost $900 less per patient than parenteral iron. The cost per blood transfusion avoided for enteral supplementation was $100. Parenteral iron cost an additional $45,063 per blood transfusion avoided. Probabilistic sensitivity analysis of regression parameters favored no iron in 80% of iterations, enteral iron in 19% of iterations, and intravenous iron in less than 1% of iterations. The average cost of enteral iron in each iteration was $120 less than no iron and $1010 less than parenteral iron.

CONCLUSIONS: Enteral iron therapy is a cost-saving intervention in the management of iron deficiency in children with intestinal failure over one year. Within the scope of the model, parenteral therapy seems to be cost prohibitive. However, in situations in which enteral iron therapy cannot be used, parenteral therapy does reduce the utilization of blood products. Future work should aim to identify subpopulations of patients that may benefit from each form of iron therapy.

626 ***COST-EFFECTIVENESS OF TEDUGLUTIDE IN PEDIATRIC PATIENTS WITH INTESTINAL FAILURE USING MARKOV MODELING.*** *Vikram Raghu[1], Jeffrey Rudolph[1], Kenneth Smith[2]. [1]Pediatrics, UPMC Children's Hospital of Pittsburgh, Pittsburgh, PA; [2]Medicine, University of Pittsburgh, Pittsburgh, PA*

BACKGROUND: Teduglutide is a GLP-2 analog that has shown promise as a treatment for intestinal failure by promoting intestinal adaptation. Unfortunately, teduglutide is expensive with an estimated cost of over $400,000 per year. The current study evaluated the cost-effectiveness of using teduglutide in pediatric patients with intestinal failure.

METHODS: A Markov model was used to evaluate the costs (in US dollars) and effectiveness (in quality-adjusted life years or QALYs) of treatment with a presumed starting age of 1 year. Parameters were obtained from published data or estimation. The primary effect modeled was the increased likelihood of achieving enteral autonomy when using teduglutide, leading to greater quality of life and lower daily parenteral nutrition costs. This likelihood was estimated from the 12-week, open-label multicenter clinical trial examining teduglutide effect on pediatric patients with irreversible intestinal failure (1). Strategies included whether or not to use teduglutide and whether or not to transplant. Future costs and utilities were discounted at 3% per year. Extensive sensitivity analyses were performed. Analyses were performed on a lifetime time horizon in which costs and effects after the first 10 years of life were assumed to be equivalent between groups.

RESULTS: In the base scenario, offering neither teduglutide nor transplant was dominated (more expensive and less effective). Compared to the least expensive option, transplant but no teduglutide, offering teduglutide cost an additional $64,874/QALY gained. Only offering teduglutide without the option of transplant cost an additional $114,297/QALY gained. Two-way sensitivity analysis varying both probability of transplantation and short bowel syndrome mortality found that all values favored offering both teduglutide and transplantation. Figure 1 shows the cost-effectiveness acceptability

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curve from probabilistic sensitivity analysis. These results favored transplant without teduglutide in 44% of iterations and with teduglutide in 28% of iterations.
CONCLUSIONS: Teduglutide provides a cost-effective addition to the management of children with short bowel syndrome. Sensitivity analyses suggest that not using teduglutide is often optimal but that many may not benefit from this strategy. Further work should ascertain teduglutide effects in children and identify patients with the greatest likelihood of achieving enteral autonomy.

1 Carter BA, Cohran VC, Cole CR, et al. Outcomes from a 12-Week, Open-Label, Multicenter Clinical Trial of Teduglutide in Pediatric Short Bowel Syndrome. J Pediatr 2017;181(102-11 e5.

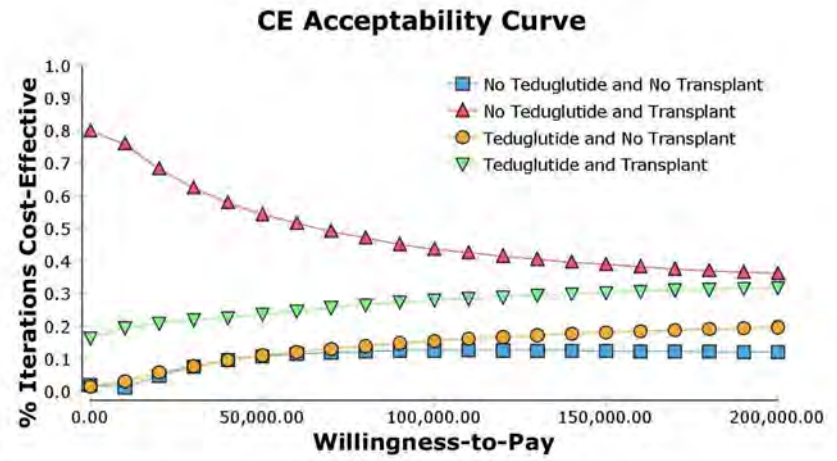


Figure 1. Cost-effectiveness acceptability curve from probabilistic sensitivity analysis.

628 ***A WEIGHTY RISK FACTOR FOR OBESITY: ANTIHISTAMINE USE IN A SINGLE CENTER STUDY.***
Michelle Saad[1], Anatoliy Gashev[3], Vera Okwu[2], Ashok Jain[2], Maheen Ilyas[2], Sabeen Syed[2]. [1]Department of Medical Education, Driscoll Children's Hospital- Texas A&M College of Medicine, Corpus Christi, TX; [2]Gastroenterology, Driscoll Children's Hospital, Corpus Christi, TX; [3]Texas A&M Health Science Center, Killeen/Temple, TX
Introduction: Incidence of non-alcoholic fatty liver disease and metabolic syndrome in the pediatric population has been on the rise, with obesity being the leading etiology. A notable overlap exists between regions with the highest rates of obesity in the US and those with atopy, often requiring antihistamines. Those factors combined alarmed our co-authors and ultimately resulted in a large study in rats involving desloratadine. Histamine was shown to have a crucial role on mesenteric lymphatic tone through the effect of nitric oxide, with rats that were given antihistamines demonstrating more weight gain, higher triglycerides, HDL, fasting glucose and hepatic steatosis.

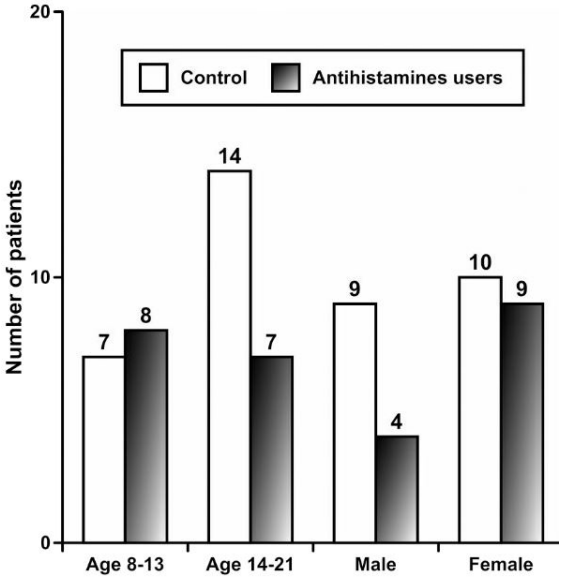
Objectives: Our primary objective was to determine an association between antihistamine use and obesity. Our secondary objective was to look for an association between antihistamine use and laboratory features of metabolic syndrome: i.e glucose, HDL and triglycerides.

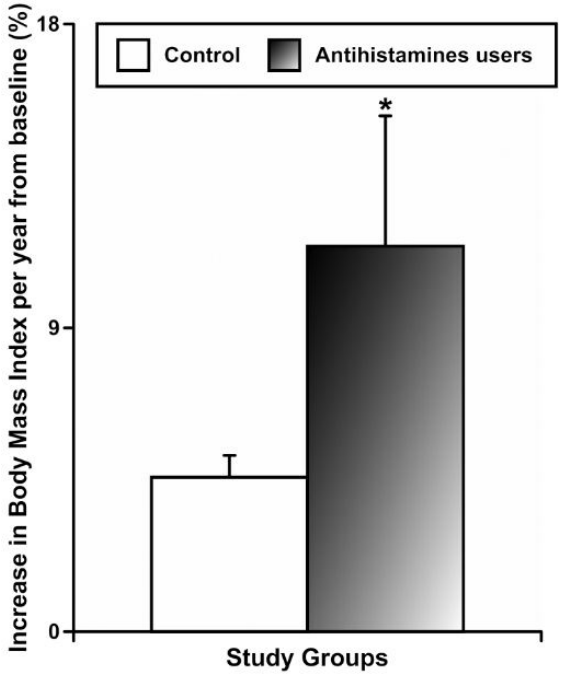
Methods: We retrospectively reviewed 41 patients followed in the pediatric gastroenterology clinic at Driscoll Children's Hospital for fatty liver disease, ages 8-21, between January 2018 and April 2019, of which 9 were excluded due to presence of other identifiable etiologies for steatosis. The control group had no antihistamine use, whereas the case group (AH) had current or previous antihistamine use. Demographics, growth charts, lipids, metabolic panels as well as current and prior medications were reviewed. Data was analyzed for change in BMI percent over time, fasting glucose, triglycerides, HDL, LDL and liver enzymes AST and ALT.

Results: Our patient population was incidentally entirely Hispanic. Antihistamine users had a higher mean of BMI percentage increase above baseline per year compared to non-antihistamine users with fatty liver disease (p= 0.044). AH group had lower total cholesterol compared to controls (p= 0.0313), lower LDL (p= 0.0056) and a strong tendency for HDL to be higher in AH males (p= 0.057). No difference was found in triglycerides, fasting glucose and ALT between the two groups.

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Conclusion: A higher rate of BMI increase was noted in patients who have used antihistamines at some point in their life, thereby reflecting a correlation between obesity and antihistamine use, consistent with recently performed animal studies by our co-authors. No statistically significant difference in laboratory markers for metabolic syndrome was found between the two groups, however antihistamine users surprisingly had lower total cholesterol and lower LDL compared to controls. To our knowledge, this is the first pediatric study looking into antihistamine use and obesity. We were unable to assess for a correlation between antihistamine use and steatosis due to our patient population with already established non-alcoholic fatty liver disease. Further studies are needed with larger number of patients and prospective models to further support the changes seen in children related to antihistamine use.





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630 ***TO EAT OR NOT TO EAT: IS FOOD INSECURITY PREVALENT IN HOUSEHOLDS WITH CHILDREN EXPERIENCING FEEDING DIFFICULTIES?*** *Amy Dean*, *Goldie Markowitz*, *Christine Sullivan*, *Anne Marie Florio*, *Andrea Mattie*. *Children's Hospital of Philadelphia*, *Philadelphia*, *PA*

Background: It is widely recognized that food insecurity is a growing problem in America**.** According to the United States Department of Agriculture (USDA), food insecurity affected 13.66% of US households from 2013 to 2015. The region served by a specialized feeding program experienced slightly lower prevalence, including 12.37% of households in Pennsylvania, 11.1% of households in New Jersey, and 11.9% of households in Delaware. Food insecurity is the absence of food security, which is defined as access by all people at all times to enough food for an active, healthy life.[1] Feeding disorders can be described as the refusal or inability to feed at all or to take adequate volume or variety of foods to meet nutritional needs for optimal health and growth. There is a lack of research into the coexistence of food insecurity and children with feeding disorders in the same household. We hypothesized that food insecurity is prevalent within this specialty population. A secondary aim was to describe the nutritional status of children experiencing feeding disorders and food insecurity, as well as the family participation in food assistance programs.

Methods: A retrospective chart was review performed between 11/1/2016 to 11/30/2017 using a convenience sample of children presenting to a specialized feeding program for initial evaluation who screened positive on the validated 2-item food insecurity screen.

Results: A total of 51 patients, 39 males and 16 females, and median age 36 months, met the inclusion criteria. A prevalence rate of 17.7% was identified. Although 76.5% of the children presented were enrolled in food assistance programs, WIC and SNAP, they continued to experience food insecurity. Additionally, a majority received their nutrition orally (86%) or through enteral nutrition via a G-tube (29.4%).

Conclusion: Our findings suggest that households with children with feeding disorders are more likely to experience food insecurity than other households in the region served by the feeding center, and that despite 74% of the children being enrolled in food assistance programs, food insecurity remained a prevalent concern to be identified in children with feeding difficulties. A limitation of this study was a lack of complete data necessary to examine impact on weight status.

Implication: Future research is needed to examine the relationship between food access and the family's ability to provide healthy food options in children experiencing feeding issues. Identifying gaps in food assistance resources and family knowledge would help develop better practice guidelines in this patient population. Awareness of food security status is necessary to prioritize initiatives to support the needs of affected patients and families. To achieve this, food insecurity screening should be the standard of care for all specialty clinics, including feeding programs.

Statistics for 2013-15

https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/interactive-charts-and-highlights/#State

631 ***BLENDERIZED GASTROSTOMY FEEDING (BGF) ENHANCES ENTERAL TOLERANCE IN CHILDREN WITH SHORT BOWEL SYNDROME (SBS).*** *John Thompson*, *Amanda Abou-Fadel*, *Macy Carobene*, *Irina Strogach*. *Division of Pediatric Gastroenterology, Hepatology and Nutrition*, *Children's Hospital at Montefiore*, *Bronx*, *NY*

Children with intestinal failure are routinely fed an elemental formula as continuous or bolus infusion via gastrostomy tube (GT). This approach has been advocated to eliminate antigen exposure to the compromised bowel as well as optimize absorption. Often, these children develop profound feeding disorders and remain on elemental diet beyond 12 months of age. We hypothesized that a complex diet would enhance enteral tolerance by several potential mechanisms including increased transit time, alterations in microbiome, and enhanced intestinal adaptation.

Methods:

Children followed in the Intestinal Failure program at Children's Hospital at Montefiore were routinely transitioned from elemental amino acid formula to blenderized feed (BGF) via GT or PO, starting in 2015. BGF was prepared with 30% chicken, 30% sweet potato, 30% carrot or pumpkin (1 oz each + 1 oz broth/water)--> blended and strained. To each 4 oz, 1/2 tspn coconut oil added to provide 29 kcal/oz and 2.6 g prot/oz. BGF is then given via GT by gravity over 25-40 min. In patients who didn't tolerate 3 food recipe or with ultra short gut a modified feed of 50% chicken + 50% orange vegetable was provided at the beginning then other ingredients added, supplemental calcium was added to BF. Stool consistency grading from 1-8 was developed with 1 being most watery. Data were collected at time of initiation for BF (at least two feeds BGF per day) and then at 1 and 6-8 months after BGF. Weight and Height Z scores, % parental (%PN) and enteral

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(%EN) calories, oral intake, stool number and consistency were analyzed.
Results: 17 patients with SBS were placed on BGF, age 4 months to 11 years. Diagnosis was NEC 8, atresia 4, gastroschisis 2, volvulus 2 and congenital short gut 1. 4/17 children with SBS were weaned off PN at time of BGF and 2 more children were off PN at 6-8 months. Enteral intake of 8/17 children were exclusively GT at start of BF. At 6-8 months, all 8 of these children were taking oral feeds, 4 of these were taking substantial oral feeds. Stool frequency mean was 5.6 per day at baseline (range 2-12), at 1 month mean 3.1 (range 1-5), at 6-8 months mean 2.3 (range 1-4). % PN calories at baseline 42% mean (range 0-93), at one month 34% (range 0-78), at 6-8 months 25% (range 0-75). Stool consistency mean was 2.2 (range 1-6) at baseline, at 1 month mean 4.5 (range 1-7) and at 6-8 months mean 5.6 (range 3-8). Height and Weight z scores were unchanged during the study period.
Conclusion: BGF were well tolerated by children with SBS. Stool frequency, % PN and stool consistency all improved 1 and 6-8 months after starting BGF. BGF appears to enhance enteral tolerance in SBS patients and should be studied in larger cohort of SBS patients.

633 ***A COMPARISON OF TWO GLUCAGON LIKE PEPTIDE 2 ANALOGUES IN NEONTAL PIGLET MODELS OF SHORT BOWEL SYNDROME WITHOUT ILEUM.*** *Justine Turner[1], Pamela Wizzard[1], Mirielle Pauline[1], Tong Wu[1], Nation Patrick[2], Violetta Dimitriadou[3], Paul Wales[4,1]. [1]Pediatrics, University of Alberta, Edmonton, AB, Canada; [2]Anatomical Pathology, University of Alberta, Edmonton, AB, Canada; [3]Therachon AG, Basel, Switzerland; [4]General and Thoracic Surgery, Hospital for Sick Children and Research Institute, University of Toronto, Toronto, ON, Canada*
Introduction: Given increasing survival of neonates with short bowel syndrome (SBS) a priority should be to improve patient quality of life and reduce costs of care. Both can be achieved by promoting autonomy from parenteral nutrition (PN). Trophic treatments that enhance innate adaptation have the potential to achieve that outcome. A long acting glucagon like peptide-2 (GLP-2) analogue (Teduglutide) has been approved for use in adults with SBS, decreasing total PN fluid volumes. Recently studied in children, this treatment decreased both PN fluid volume and energy requirements. We previously studied a longer acting GLP-2 analogue (Apraglutide) and confirmed trophic benefit. The purpose of this study was to directly compare the trophic effects of Teduglutide to Apraglutide in neonatal piglets with SBS.
Methods: Neonatal piglets 3-5 days old were randomized to the following treatments: daily saline (CON; n=8), daily Teduglutide (TED: 0.05mg/kg/dose; n=8) or twice weekly Apraglutide (APRA 5mg/kg/dose; n=8). All piglet had 75% distal small intestinal resection, including entire ileum and part of cecum, with a jejunocolic anastomosis. All treatments were given by subcutaneous injection. Piglets were maintained for 7 days on 100% of nutrient requirements by PN and given trophic enteral nutrition (20% requirements). On day 7, terminal laparotomy was performed, the small intestine weighed and measured and jejunal tissue collected for a veterinary histopathologist, blinded to treatments, to measure villus height and crypt depth. Data is presented as mean (SD); comparisons use one-way ANOVA with post hoc tukey (* indicates different to control).
Results: On trial, all piglets were healthy and gained equivalent weight (kg) [CON: 1.3 (0.3), TED: 1.3 (0.2), APRA: 1.2 (0.2); p=0.82]. Both treatments increased total small bowel weight (g) [CON: 25.1 (4.1), TED: 27.9 (3.5), APRA*: 33.1 (6.2); p=0.008] and length (cm) [CON: +0.7 (6.8), TED: +14.4 (6.6), APRA*: +20.8 (12.6); p=0.001]. Compared to saline and Teduglutide, the Apraglutide treatment significantly increased villus height (μm) [CON: 0.65 (0.01), TED: 0.58 (0.01), APRA*: 0.90 (0.01); p=0.001]. Neither treatment was associated with differences in crypt depth (μm) [CON: 0.17 (0.03), TED: 0.16 (0.02), APRA: 0.15 (0.01); p=0.008].
Conclusion: In neonatal piglets without ileum, which as we have previously shown have limited potential for innate adaptation or linear intestinal growth, treatment with trophic factors increased small intestinal weight and linear growth. Treatment with Apraglutide was associated with greater histological adaptation. As Apraglutide treatment has a lower dose frequency and, based on this data, appears to exhibit potentially greater trophic benefits than the currently available GLP-2 analogue, further studies in the pediatric population of Apraglutide are warranted.

634 ***EVALUATION OF IRON-DEFICIENCY ANEMIA TREATMENT IN INTESTINAL FAILURE PATIENTS ON PARENTERAL NUTRITION.*** *Anna Tuttle[1,2], Iris Jo[2,3], Annebel Dahlberg[2], Corkins Mark[2,3], Linda Lazar[2,3], Anushree Algotar[2,]. [1]Nutrition Therapy, Le Bonheur Children's Hospital, Memphis, TN; [2]Division of Pediatric Gastroenterology, Hepatology, and Nutrition, Le Bonheur Children's Hospital, Memphis, TN; [3]Department of Pediatrics, The University of Tennessee Health Science Center, Memphis, TN*
Background: Children with intestinal failure (IF) and more specifically those with short bowel syndrome (SBS) are prone to micronutrient deficiencies. Many of these patients are on parenteral nutrition due to the inability to meet nutritional needs on enteral therapy alone. Iron deficiency anemia (IDA) and other micronutrient deficiencies have been well reported in patients on parenteral nutrition [1,2]. Proposed theories on the etiology of anemia in this population include malabsorption secondary to bowel length and remaining anatomy, excessive lab draws, and gut losses [3].

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IDA can be treated with oral iron or iron infusions. Oral iron is the preferred route of supplementation; however, it can lead to gastrointestinal symptoms such as constipation, diarrhea, nausea and abdominal pain [4]. Due to these side effects, patients are frequently noncompliant with taking the supplement on a regular basis. At times, despite compliance with oral supplementation, IF patients have persistent anemia, necessitating initiation of parenteral iron infusions. Addressing and treating an underlying nutrient deficiency such as IDA is especially important in medically fragile pediatric patients such as those with IF as this can lead to poor growth. Currently, there are no set guidelines for the treatment and monitoring of iron deficiency in this patient population.

Description: The Children's Intestinal Rehabilitation Center at Le Bonheur Clinic (CIRCLe) is a multidisciplinary outpatient clinic based at Le Bonheur Children's Hospital for patients requiring specialized nutritional support due to IF. We focused on twelve SBS patients who are on parenteral nutrition and require additional iron therapy due to IDA. The etiologies of SBS for these patients were necrotizing enterocolitis
(34%), gastroschisis (33%), jejunal atresia (17%), volvulus (8%), and long-segment Hirschsprung's disease (8%). They were further classified based on residual bowel length at the time of their last resection into those with <50 cm (58%), 50 to 100 cm (17%), and >100 cm (25%). None of these patients had intact ileocecal valves. Ages of these patients ranged from one to nine years of age. Of the twelve patients, four were on intravenous iron and eight were on daily oral iron.

Oral iron was given in the form of ferrous sulfate with dosages ranging from 0.65 to 3.97mg/kg/day of elemental iron. Iron infusions were given as sodium ferric gluconate to three patients and one on iron dextran at a frequency of every two to four weeks and a dosing range of 0.18 to 19.9 mg/kg/dose. These patients were started on infusions for failed oral therapy in the setting of continued anemia lasting five to thirty two months, except for one who was started on initial infusion therapy due to lack of intestinal continuity.

Response to therapy were followed with a CBC and/or iron studies that includes iron, ferritin, transferrin, and total iron binding capacity. Overall we saw an increase in hemoglobin when comparing levels before initiation of therapy, six to twelve months after initiation, and the most recent levels. On average, we saw a 2.25 g/dL increase in hemoglobin and 59.8 mcg/dL increase in iron.

Discussion: A standard of care for management and monitoring of IDA in pediatric IF patients are lacking. Close monitoring of the CBC and iron studies at the start of treatment and appropriate intervals during treatment can help determine the best dosing, frequency, route of administration to achieve normal hemoglobin levels and prevent overload. It is expected that treatment would be highly individualized in this population correlating to their bowel anatomy and etiology of IF. However, a standardized protocol or set guidelines for the treatment and management of IDA in IF can help with achieving normal range values in a timely manner which will ultimately contribute to the overall health of these complex patients.

References:

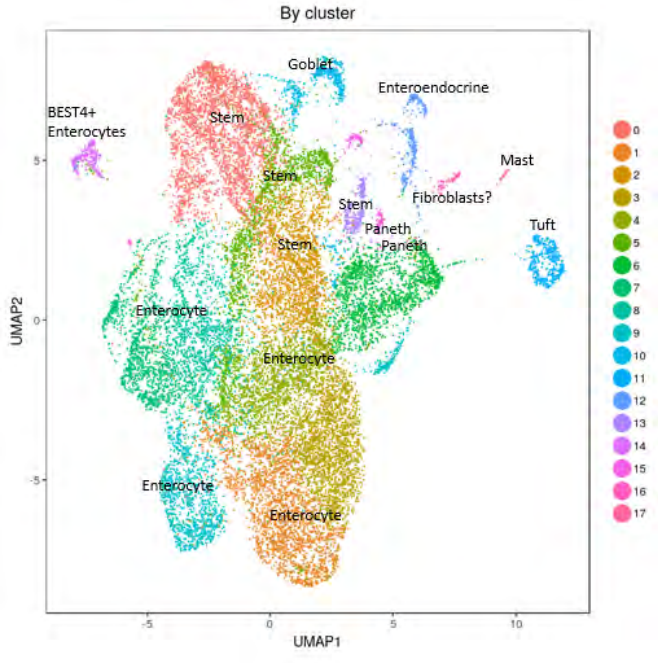
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635 ***ACCESIBLE-OMICS: CREATION OF A SMALL INTESTINAL SCRNA TRANSCRIPTIONAL ATLAS OF ENVIRONMENTAL ENTEROPATHY PATIENTS IN A DEVELOPING WORLD SETTING DEMONSTRATES SUBSTANTIAL CHANGES IN TUFT CELL ACTIVITY AND INTESTINAL EPITHELIAL CELLULAR ENVIRONMENT.***

Thomas Wallach[1], Conner Kummerlowe[5], Travis Hughes[6], Zev Gartner[2], Alex Shalek[6], Paul Kelly[3,4]. [1]Pediatric Gastroenterology, University of California San Francisco, San Francisco, CA; [2]Pharmaceutical Chemistry, University of California San Francisco, San Francisco, CA; [3]Gastroenterology, Queen Mary University of London, London, United Kingdom; [4]Gastroenterology, University Teaching Hospital, Lusaka, Zambia; [5]Computational Biology, Massachusetts Institute of Technology, Cambridge, MA; [6]Chemistry, Massachusetts Institute of Technology, Cambridge, MA

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The intestinal epithelium comprises a diverse population of cells that must collaborate to maintain gut function. Understanding the normal cellular composition of this population, and how it might differ between the developing and developed worlds, is key for addressing poorly understood non-focal conditions such as Environmental Enteropathy (EE). EE is characterized by poor growth and increased intestinal permeability, and typically found in areas with poor access to clean water. EE is suspected to impact up to 1/4thof the pediatric population of the world, and is thought to be the primary source of stunted growth worldwide. Its effects persist into adulthood, with persistent intestinal epithelial changes and increased risk of infection and metabolic syndrome. Its restriction to low-income regions of the world has limited application of cutting-edge molecular profiling techniques until the recent advent of Seq-Well. Seq-Well is a massively-parallel single-cell RNA-Seq platform that leverages advances in materials technology to allow for on-site, simple processing without complicated peripherals, facilitating creation of cDNA libraries anywhere. This allows for shipment of cDNA to facilities with the equipment for sequencing and associated computational approaches. We have successfully demonstrated single cell analysis of both duodenal and jejunal epithelium obtained from biopsies from 15 Zambian adults residing in high EE risk regions. Using these samples we have isolated and characterized the cellular microenviroment of the adult EE intestinal epithelium. Our results show successful characterization of Tuft cells and Enteroendocrine cells, and have observed abnormalities in Paneth cell behavior that could either represent metabolic shift in Paneth cell activity or significant changes in Paneth cell population density. We have identified significant variation in tuft cell populations in comparison with US samples with FGID, specifically substantial increase in cell populations and substantial increase in IL-25 and SUCNR1 expression relative to US comparison samples. We also demonstrated a substantial increase in epithelial tissue resident blood cells, with T cells being two times more prevalent in EE samples. We have also been able to characterize the transcriptome of an HIV positive patient, demonstrating significant differences between intestinal epithelial function with and without HIV, and have analysis pending on two patients with acute starvation secondary to acid ingestion and esophageal stricture. Further work will characterize any changes in small intestinal cell populations for patients with EE, identifying the key aberrant pathways and providing possible correlations with small intestinal bacterial populations obtained via 16s sequencing of aspirate. This data will further be enhanced by comparison with control data from US samples. This data will allow for identification of changes in behavior on a single cell level, as well as correlation with associated shifts in microbial populations. Characterization of these pathways can be used for identification of not only novel basic science findings for intestinal function, such as the wide plasticity of EECs in producing various paracrine/endocrine signaling factors, but also novel mechanistic understanding of disease and new possibilities for non-invasive disease assessment, monitoring, and treatment modalities allowing for prevention or amelioration of stunted growth in the developing world.



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636 ***LACTOFERRIN PROMOTES EPITHELIAL BARRER FUNCTION BY INHIBITING TGF-β MEDIATED EPITHELIAL TO MESENCHYMAL TRANSITION.*** *Thomas Wallach[1], Vasudha Srivastava[2], Efren Reyes[3], Zev Gartner[2,4,5]. [1]Pediatric Gastroenterology, University of California San Francisco, San Francisco, CA; [2]Pharmaceutical Chemistry, University of California San Francisco, San Francisco, CA; [3]Tetrad Graduate Program, University of California San Francisco, San Francisco, CA; [4]Chan Zuckerberg Biohub, San Francisco, CA; [5]Center for Cellular Construction, University of California San Francisco, San Francisco, CA*

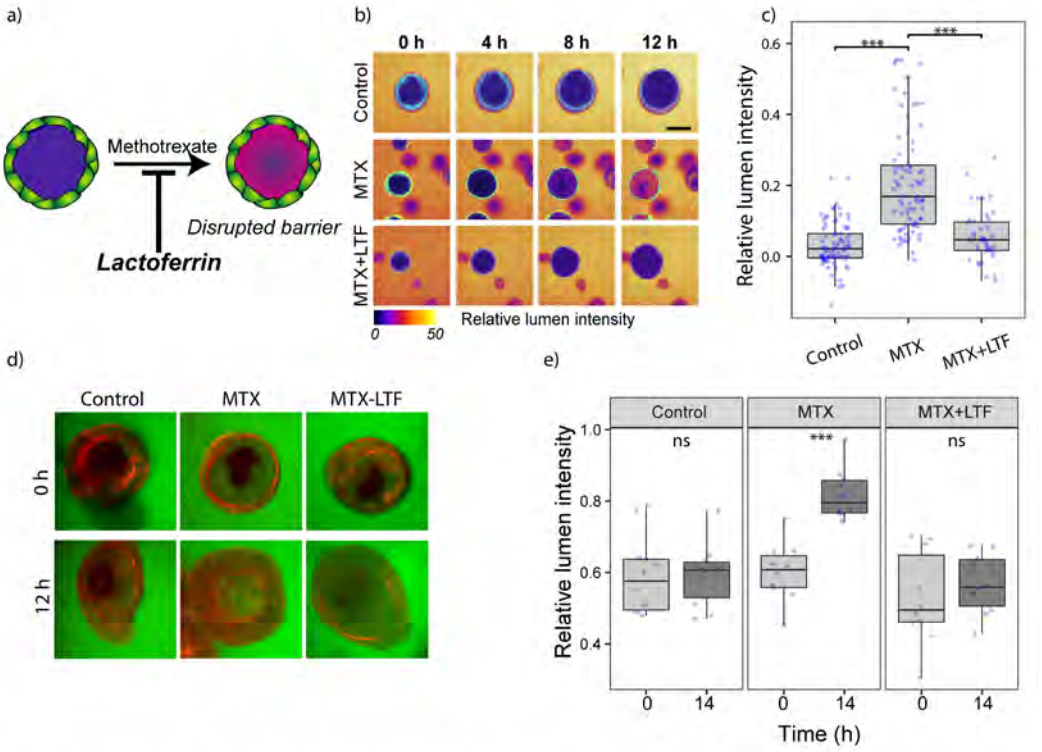
Background: Defects in intestinal barrier function have been implicated in diseases from inflammatory bowel disease to diabetes, but rarely present as a clinically urgent issue. As a widespread but low-acuity issue, low-cost solutions with a robust safety record are highly desirable. Clinical studies have suggested that lactoferrin, one of the most abundant proteins in human breast milk, can promote gut health and improve barrier function. The specific activity of lactoferrin in the gut remains unknown, but it has been hypothesized to act through the microbiome, the immune system, or through more direct transcriptional regulatory effects downstream of the lactoferrin receptor. The objectives of this study were to determine the mechanism of lactoferrin's activity on intestinal epithelial barrier function.

Methods: We used a murine enteroid model and Caco2 spheroids to measure flux of basolateral-administered fluorescent dextran into the lumen over time. Barrier dysfunction was induced using methotrexate or lipopolysaccharide at a concentration of 220 nM and 20nM, respectively. Human lactoferrin was added at concentrations spanning 1 uM to 100 uM to measure activity, and 10 μM for mechanistic studies.

Results: Lactoferrin blocks methotrexate-induced barrier dysfunction in murine organoids independent of intestinal microbiota or an intact immune system. Similar results were obtained using methotrexate or LPS-induced barrier dysfunction in CaCo2 spheroids, but not barrier dysfunction induced by inhibition of cellular contractility though ML7. RNA sequencing revealed activation of TGF-b response genes and an epithelial-mesenchymal transition (EMT) by methotrexate, which was normalized in the presence of lactoferrin. These data suggested a role for autocrine TGF- β signaling in barrier dysfunction downstream of methotrexate and blockade of the TGF- β-induced signal by lactoferrin. Consistent with this notion, administration of 20 nM TGF-β also induced barrier dysfunction in CaCo2 spheroids that was blocked by concurrent administration of lactoferrin. Direct TGF- β receptor inhibition using RepSox also blocked methotrexate induced barrier dysfunction in CaCo2 spheroids, supporting the notion that blockade of TGF-β receptor signaling downstream of lactoferrin is a key driver of lactoferrin's effects.

Conclusions: Methotrexate induces barrier dysfunction by activation of an EMT program driven by autocrine TGF-β signaling, which can be inhibited by lactoferrin. Lactoferrin is also protective of barrier function in an LPS-induced model. This suggests that the mechanism for lactoferrin-mediated stabilization of epithelial barrier function is through blockade of EMT programs induced by TGF-β. In conjunction with previously identified antimicrobial and immunomodulatory effects, these findings illustrate a new potential mechanism of lactoferrin's gut-protective effect.

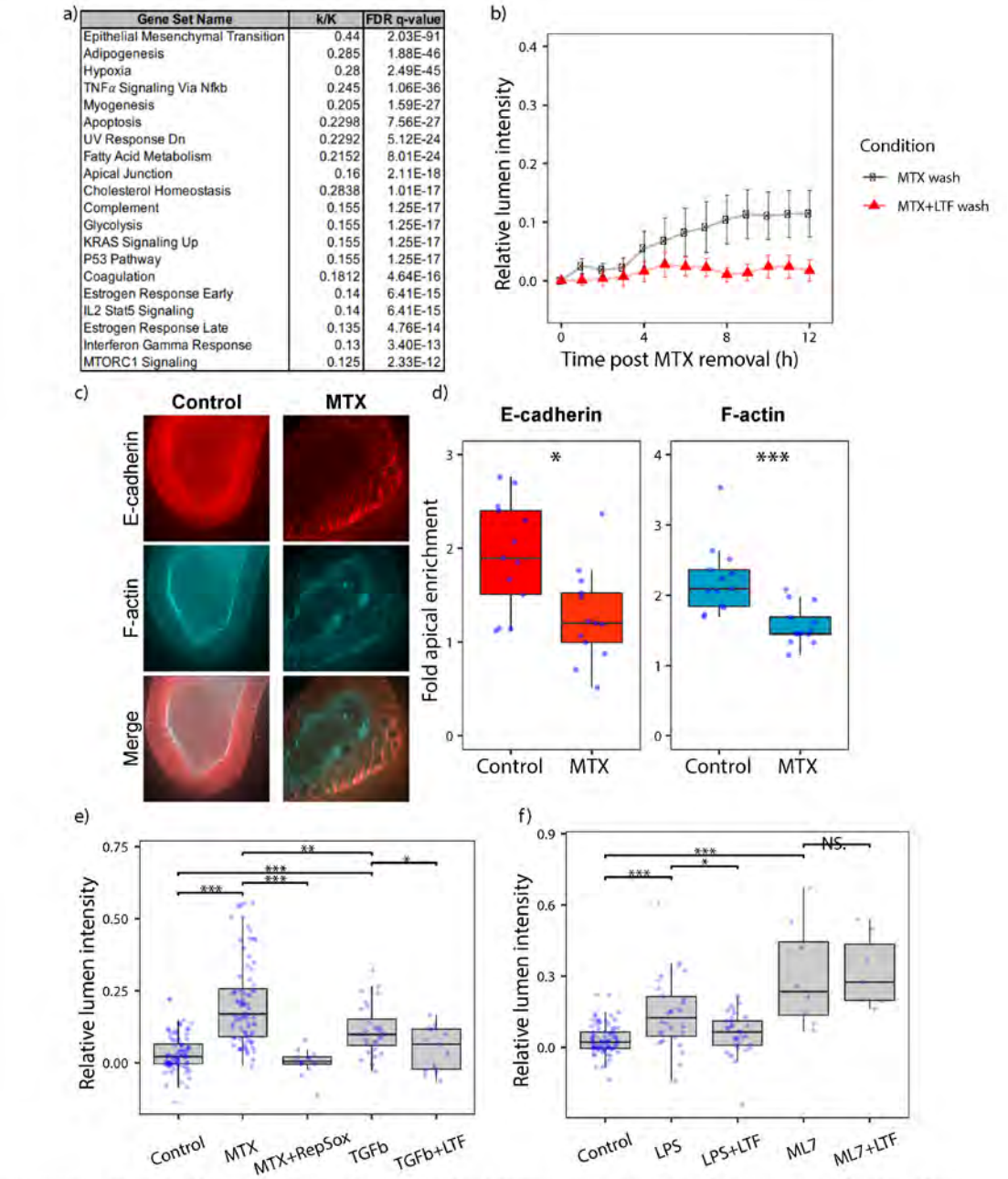
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a) Flow diagram of experimental model. b) microscopic images of caco2 spheroids demonstrating change in relative lumen intensity during exposure to 220 nM methotrexate or methotrexate and 10 μM lactoferrin. Orange represents 3kd texas red dye, green GFP. c) Change in intraluminal intensity measuring flux of 3kd texas-red labeled dextran into lumen of Caco2 spheroids with methotrexate or methotrexate-lactoferrin exposure as previously described. d) visual images of murine organoid endpoint assay of exposure to methotrexate or methotrexate-lactoferrin at same concentrations as previously described. Red represents TD-tomato labeling of murine cells, green 3kd 488-labeled dextran e) change in intraluminal intensity of organoid measuring flux of 3kd 488 labeled dextran at endpoints of 12 hour methotrexate or methotrexate-lactoferrin exposure.

Figure 1.

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Gene Set Name	k/K	FDR q-value
Epithelial Mesenchymal Transition	0.44	2.03E-91
Adipogenesis	0.285	1.88E-46
Hypoxia	0.28	2.49E-45
TNFα Signaling Via Nfkb	0.245	1.06E-36
Myogenesis	0.205	1.59E-27
Apoptosis	0.2298	7.56E-27
UV Response Dn	0.2292	5.12E-24
Fatty Acid Metabolism	0.2152	8.01E-24
Apical Junction	0.16	2.11E-18
Cholesterol Homeostasis	0.2838	1.01E-17
Complement	0.155	1.25E-17
Glycolysis	0.155	1.25E-17
KRAS Signaling Up	0.155	1.25E-17
P53 Pathway	0.155	1.25E-17
Coagulation	0.1812	4.64E-16
Estrogen Response Early	0.14	6.41E-15
IL2 Stat5 Signaling	0.14	6.41E-15
Estrogen Response Late	0.135	4.76E-14
Interferon Gamma Response	0.13	3.40E-13
MTORC1 Signaling	0.125	2.33E-12

a) gene ontology of Caco2 spheroids exposed to methotrexate demonstrating high level of EMT programmatic activation b) graphical representation of relative luminal fluorescence after exposure and removal of methotrexate vs. exposure removal of methotrexate and addition of lactoferrin after initial exposure. Error bars represent SEM, 20 spheroids assessed per condition. c) immunofluoresence staining for e-cadherin and f-actin in murine organoids demonstrating reversal of apical polarity in methotrexate condition. d) box plot summary of relative fluoresence of apical vs. basolateral aspect. e) box plot demonstrating signifcant protective effect of repsox against methotrexate, as well as ability of TGF-beta to induce barrier dysfunction. f) box plot demonstrating barrier dysfunction induction of LPS and ML7, with protective effect of lactoferrin in LPS but not in ML7.

Figure 2.

637 ***MONITORING TRENDS IN LIVER FUNCTION, NUTRITIONAL SUPPORT, AND GROWTH IN PATIENTS WITH INTESTINAL FAILURE TREATED WITH SMOFLIPID® AT "FIRST"(FLORIDA INTESTINAL REHABILITATION SUPPORT AND TREATMENT) PROGRAM.*** *Jessica Wassef[1], Melissa Jalil[2], Elizabeth Lipkin[3], Debora Duro[4]. [1]Kiran C Patel College of Osteopathic Medicine, Fort Lauderdale, FL; [2]Pediatric Gastroenterology Nurse Practitioner, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL; [3]Clinical Nutrition Support Pharmacist, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL; [4]Program Director of Pediatric Gastroenterology and Nutrition, Medical Director of FIRST, Salah Foundation Children's Hospital at Broward Health Medical Center, Fort Lauderdale, FL*

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Introduction: Smoflipid® (SMOF) is a unique combination of soybean oil (30%), olive oil (25%), medium chain triglycerides (30%), and fish oil (15%) indicated for prevention of cholestasis in adults on parenteral nutrition (PN) but is not yet well described in pediatric cases. The objective of this study is to describe the trends of liver profiles, micronutrients, nutritional data, and growth for pediatric Intestinal Failure (IF) patients undergoing Intestinal Rehabilitation (IR) at FIRST (Florida Intestinal Rehabilitation Support and Treatment) after SMOF initiation with a goal of providing up to 30% of calories from lipids.

Methods: After IRB approval, medical records of 14 patients with IF (duration of PN >90 days) were reviewed retrospectively from July 2015 to May 2019 to obtain patient demographics, diagnoses, nutrition and laboratory data. Gestational age, weight and length at birth, Z scores for weight and height, using CDC growth curve if ≥2 years of age (YOA) and CDC WHO's growth curve if <2 YOA, weight for length if <2 YOA and body mass index (BMI) if ≥2 YOA were recorded. Patients were seen at FIRST monthly for IR and the following values were documented: aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin, nutritional support regimen, and growth z scores. Additionally, triene:tetraene ratio (TTR) to screen for essential fatty acid deficiency (EFAD), micronutrients, and trace elements were monitored and recorded every 3 months. Values from date of SMOF initiation to end of study date on May 1st, 2019 were then compared.

Results: The group consisted of 9 females and 5 males. At initiation of SMOF, the average age was 3.6 YOA (range: 0-14). The primary diagnoses included: intestinal atresia (5), necrotizing enterocolitis (4), gastroschisis (2), Hirschsprung's disease (1), tufting enteropathy (1), and incomplete rotation with Ladd's bands (1). The average course from date of SMOF initiation to May 2019 was 12.6 months (range: 2 - 27). Mean changes in Z scores and ranges from date of SMOF initiation to May 2019 in growth are shown in Table 1. In May 2019, weight Z scores increased 70% for patients <2 YOA and 31% for ≥2 YOA. BMI Z scores decreased to slightly below average and weight for length z scores increased to above average. Height z scores remained stable for patients <2 YOA and increased by 41% for ≥2 YOA. At time of SMOF initiation, all 14 patients were receiving PN 7 days a week for an average of 16.4 hours per day (range: 10-24) and 91% of total nutrition was received solely from PN (range: 53%-100%). By May 2019, the mean PN hours per day was 12.2 (range: 7-16) representing a 25.6% decrease. Total nutrition received from PN decreased to 60% (range: 27%-76%), a 34% change. The power (p) of the study was set to be >0.08. AST decreased by 25.2%, p =0.15, ALT by 21.1%, p=0.15, and total bilirubin by 73.3%, p=0.1. The average direct bilirubin prior to SMOF initiation was 3.5 (range: 0.2-12.2) which normalized in every patient. TTR remained stable in all 14 patients with no EFAD reported (> 0.2). The most common micronutrient deficiencies were: Vitamin A, 25 Hydroxy Vitamin D, Copper, and Selenium which remained the same before and after SMOF initiation. There was 0% mortality.

Discussion: The evidence of this study demonstrates the benefits after initiation of SMOF for pediatric IF patients at FIRST. There were statistically significant improvements in ALT, AST and total bilirubin therefore the amount of kcals given daily was increased to match the appropriate recommended dietary intake of up to of 30% calories from lipids, positively impacting patients' z scores and allowing patients to achieve increased enteral autonomy. No patient progressed to cholestasis and there was 0% mortality supporting use of SMOF to avoid intestinal failure-associated liver disease in pediatric IF patients and to promote proper growth and development.

Table 1 Patient Growth 14 patients –Means	At SMOF Initiation	May 2019 *mean period of 12.6 months after SMOF initiation (range:2 – 27)
Weight Z score <2 YOA	-1.6: (range: -4.4 - 0.5)	-0.5 (range: -2.1 - 0.4)
Weight Z score ≥2 YOA	-1.3 (range: -2.4 - -0.7)	-0.9 (range: -2.5 - 0.1)
Height Z score <2 YOA	-1.2 (range: -3.2 - 0.12)	-1.1 (range: -2.5 - 1.6)
Height Z score ≥2 YOA	-2.7 (range: -3.4 - -2.2)	-1.6 (range: -3.3 - -0.1)
Weight for Length < 2 YOA	-1.6 (range: -4.3 - 1.4)	0.07 (range: -0.73 - 0.85)
BMI ≥ 2 YOA	0.64 (range: -0.27 - 1.6)	-0.1 (range: -1.8 - 0.94)

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638 ***INFANT FORMULA DESIGNED TO PROMOTE STOOL SOFTENING IS WELL-TOLERATED AND ASSOCIATED WITH SOFTER AND MORE FREQUENT STOOLS IN INFANTS WITH STOOLING DIFFICULTY.***
Steven Wu[1], *Cheryl Harris*[1], *Kelly Walsh*[2], *Jennifer Wampler*[1], *Weihong Zhuang*[1]. [1]*Clinical Research*, *Mead Johnson Nutrition*, *Evansville*, *IN*; [2]*Nutrition Science*, *Mead Johnson Nutrition*, *Evansville*, *IN*
Background: Parental report of difficult stooling is common in infants throughout the first year. The onset of hard or infrequent stools in infants is often temporally associated with the transition from breastfeeding to formula feeding or introduction of solid foods. Formula composition, including protein type and content of prebiotics, lactose and magnesium (Mg), may influence stool patterns.

Objective: To evaluate stool consistency in infants with reported hard stools receiving an infant formula designed to promote stool softening.

Methods: In this multi-center, double-blind, controlled study, eligible infants (28 to 300 days of age at enrollment) were randomized to receive one of two study formulas over a 14-day feeding period: a partially hydrolyzed cow's milk protein formula (PH-INV, 75% carbohydrate as lactose; 12 mg Mg/100 kcal; n=49) or a routine intact protein cow's milk-based infant formula (Control, 92% carbohydrate as lactose; 8 mg Mg/100 kcal; n=51). Both formulas had a prebiotic blend of polydextrose and galactooligosaccharides (4 g/L; 1:1 ratio). A daily diary was used to collect parent-reported stool consistency (hard, 1; formed, 2; mushy, 3; unformed or seedy, 4; watery, 5) and other measures of formula tolerance (stool frequency, fussiness, behavior during stooling, and intake). Endpoint stool consistency (mean score over last three days of study formula feeding) was the primary outcome (analyzed by ANOVA). Adverse events (AEs) were recorded throughout the study period.

Results: Baseline stool frequency (mean ±SE; Control: 1.0±0.1, PH-INV: 1.2±0.1) and consistency (Control: 1.4±0.1, PH-INV: 1.4±0.1) were similar between groups; the majority of participants were reported to have hard (n=61, 64%) or formed (n=30, 32%) stools. Stool consistency became softer in both groups over Day 1-3 (Control: 2.5 ±0.1, PH-INV: 2.6 ±0.1), and mean consistency remained similar from Day 4-6 through study end (post-hoc analysis). Endpoint stool consistency was significantly softer (Control: 3.0±0.1, PH-INV: 3.4±0.1; P=0.019) and frequency significantly higher (Control: 1.0±0.1, PH-INV: 1.5±0.1; P=0.002) for the PH-INV group. Behavior during stooling (crying, fussing, appearance of pain) decreased from Baseline (Control: 42, 82%: PH-INV: 45, 92%) to study end (Control: 12, 24%: PH-INV: 13, 27%) in both groups. No significant differences were detected between study groups for formula intake, infant fussiness or incidence of adverse events.

Conclusions: An infant formula designed to promote stool softening was well-tolerated and associated with softer and more frequent stools in a population of infants with reported hard stools.

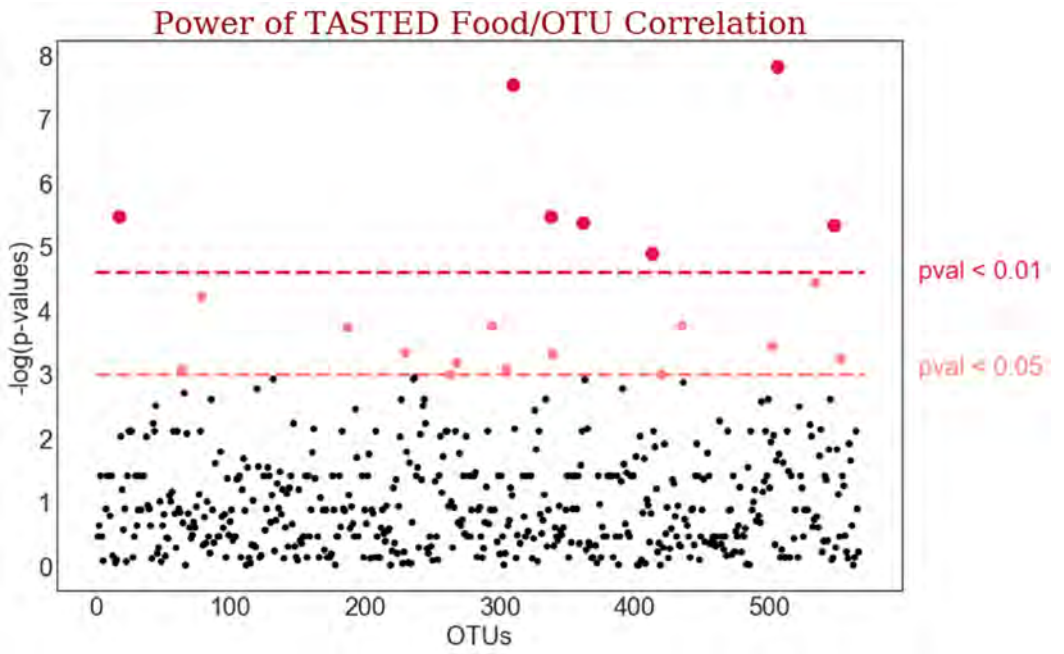
640 ***INTESTINAL MICROBIAL ABUNDANCE IS ASSOCIATED WITH OBESITY-RELATED EATING BEHAVIORS IN ADOLESCENTS.*** *Yanjia Zhang*, *Camilla Richmond*. *Gastroenterology*, *Boston Children's Hospital*, *Boston*, *MA*
Background: Specific eating-related behaviors such as craving, satiety, food addiction, and food choice can distinguish individuals with obesity from those without. Recent studies support the contribution of the intestinal microbiome in the bidirectional communication between the digestive tract and the brain, the "gut-brain axis." Relatively little is known, however, about the microbial influence on eating-related behaviors.

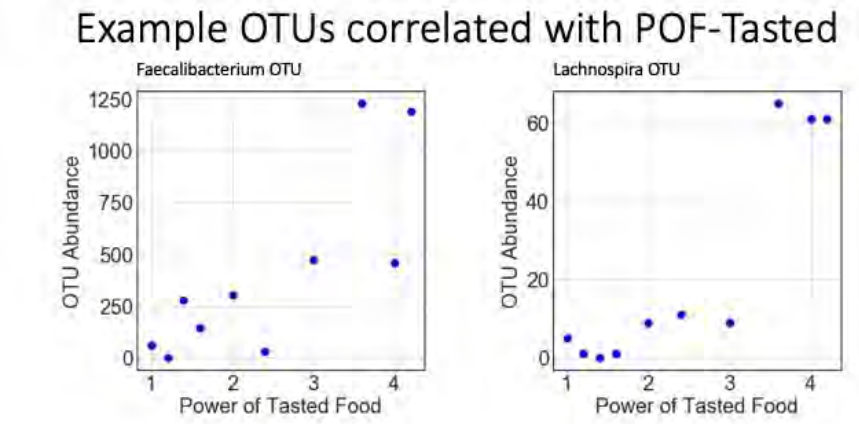
Methods: We conducted a cross sectional study of adolescents with severe obesity (8 female, 6 male, ages 16-21, all BMI > 95thpercentile) seeking bariatric surgery. Demographic and anthropomorphic data, stool for microbiome sequencing, adolescent-validated questionnaires including the Yale Food Addiction Scale for Children (YFAS), the Food Craving Index, the Three Factor Eating Questionnaire (TFEQ) and the Power of Food Scale, and 72-hour dietary recalls were collected. Our primary aim was to describe the relationship between microbial diversity and specific microbial abundance with pathologic eating behaviors.

Results: Preliminary analysis of 14 patients demonstrated a wide range of eating behaviors. Symptom scoring was broad in both the YFAS and TEFQ. 43% (6/14) met criteria for food addiction. Several bacterial genera and operational taxonomic units (OTUs) were associated with eating-related behaviors. The TEFQ Emotional Eating factor had the highest number of associated bacterial OTUs, including three members of the family *Lachnospiracae* ($q < 0.01$) whose abundances were negatively correlated with Emotional Eating.

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Conclusion: In this preliminary analysis, gut microbial abundance was associated with several eating-related behaviors in a cohort of adolescents with severe obesity. Analysis of a larger cohort is needed to confirm these findings. This study supports the growing body of evidence suggesting a microbial influence on eating behavior in obesity.





641 ***PERSPECTIVES OF GASTROINTESTINAL CARE IN MULTIDISCIPLINARY CYSTIC FIBROSIS CLINICS.*** *Meghana Sathe[1], Baha Moshiree[2], Steven Freedman[3], Sonya Heltshe[4], Umer Khan[4], Sarah Jane Schwarzenberg[5], Carmen Ufret-Vincenty[4], Alvin Freeman[6]. [1]Pediatric Gastroenterology, UTSW / Children's Health, Dallas, TX; [2]University of North Carolina, Atrium Health, Charlotte, NC; [3]Beth Israel Deaconess Medical Center, Boston, MA; [4]TDNCC, Seattle, WA; [5]University of Minnesota, Minneapolis, MN; [6]Emory University School of Med/Children's Healthcare of Atlanta, Atlanta, GA*

Background: Addressing gastrointestinal (GI) manifestations of Cystic Fibrosis (CF) is integral to improving the daily lives of people with CF. The majority of CF care occurs in a multidisciplinary setting of a single CF center that may or may not independently address GI manifestations with a GI specialist. Many CF professionals including providers, dietitians, and nurses are involved in treating the various GI manifestations of CF; acid reflux, nausea, constipation and pancreatic

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insufficiency (PI).

Aims: The GALAXY study team developed a survey to understand heterogeneity in GI care and the impact of the CFF's DIGEST program on the CF community.

Methods: Specialty specific surveys were developed for providers, dietitians, and nurses to gather information about the evaluation and management of GI symptomatology in people with CF as well as utilization of GI specialists, both DIGEST and non-DIGEST. A total of 2125 surveys were sent out by the TDNCC to CFF care centers within the US.

Results: A total of 590 (28%) of the surveys were completed in full. While 92% of providers stated they were comfortable with the management of constipation, most were not comfortable with laxatives beyond PEG (clean out: PEG 86%, magnesium citrate 20%; maintenance: PEG 93%, magnesium formulations 7%, lactulose 33%). For diagnostic testing for constipation, 98% of respondents used abdominal radiograph, 2% radiopaque markers to test transit (Sitzmarkers®), and 3% anorectal manometry. Similar findings were noted for management of GERD, gas and SIBO; as although treatments were initiated, care takers were not often comfortable with advanced management. While most were comfortable with management of gas (77%), only 23% of providers were comfortable with managing SIBO. Surprisingly, the most common empirically prescribed medications or medical foods, were metronidazole (87%), probiotics (76%), rifaximin (44%), and amoxicillin-clavulanate acid (34%). The surveys also captured dietitians' management of GI symptoms and nursing perceptions of GI care within the multidisciplinary setting. Half of all survey respondents felt that the GI needs of people with CF are not being met. Improving staffing was most important factor (42%), followed by development of guidelines for management (35%), and increased educational opportunities (26%).

Conclusion: The GALAXY surveys revealed that while assessment of GI manifestations of CF in routine clinic visits is ubiquitous (assessed 98% of the time by providers and dietitians), management is often limited to the basics of GI care. The availability of in-depth, specialized GI care is lacking. There continues to be a need for improving the care by improving staffing and developing evidence-based, multi-center research and education to the entire multidisciplinary team through programs such as the CFF's DIGEST programs.

642 ***IMPACT OF ACUTE PANCREATITIS ORDER SET IMPLEMENTATION ON PEDIATRIC CLINICAL OUTCOMES.*** *Meera Shah[1], Traci Leong[2], Alvin Freeman[3]. [1]Pediatrics, Emory University, Atlanta, GA; [2]Rollins School of Public Health, Emory University, Atlanta, GA; [3]Department of Pediatric Gastroenterology, Hepatology and Nutrition, Emory University, Atlanta, GA*

Background: Acute pancreatitis (AP) is increasingly recognized in the pediatric population with an incidence of approximately 3-13 cases per 100,000 children yearly. The approach for treating AP was previously predominantly derived from adult practice. However, recently NASPGHAN developed and updated pediatric specific guidelines for treatment of AP. These guidelines have not yet been evaluated in their impact on clinical outcomes including length of stay and opiate use in the pediatric population. Thus, this study seeks to evaluate the impact of these guidelines through the implementation of a pancreatitis order set implemented on January 1st, 2018 as compared to 2017.

Methods: Patients admitted to a Children's Healthcare of Atlanta hospital for isolated AP were included in our study. Patient demographic data, year of admission, hospital of admission, use of order set and AP treatment variables (fluid type and rate, diet timing and type and narcotic use), length of stay, PICU admission and 30-day readmission were collected. Continuous variables were compared by year using a two-sample t-test or Wilcoxon test; dichotomous characteristics were compared using a Chi Square test or Fishers Exact when appropriate. Mixed effects modeling was utilized to determine the impact of the order set on length of stay in order to control for patients with multiple admission and variations between hospitals.

Results: A total of 175 pancreatitis encounters were studied between 2017-2018. After institution of the order set, there was a statistically significant increase in LR use versus NS use between 2017 to 2018 (17% to 44%, $p<0.001$). There were no differences among IVF rate, diet, timing of feed initiation, and narcotic use between years. However, among the 119 patients who received some narcotic, there were significantly more doses prescribed in 2017 than in 2018 ($p=.0310$). Among the 50 encounters with a narcotic in 2017, the median (MAD) was 5 (2.97). In contrast, the median (MAD) was 3 (2.97) in 2018. Accounting for variations in hospital care and multiple admissions for a single patient, there was a 20.7% decrease in median length of stay between 2017 and 2018, $p=0.0267$. There were very few readmissions for either year, but these changes did not impact hospital readmission rates in the subsequent 30 days ($p=0.13$).

Conclusions: The implementation of the pancreatitis order set based on NASPGHAN AP guidelines demonstrates decreased length of stay and total narcotic use in pediatric patients with AP. Although the numbers were small, these changes did not result in an increase in readmission rates within 30 days after discharge.

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643 ***NORMATIVE VALUES FOR POTENTIAL NECROTIZING ENTEROCOLITIS BIOMARKERS ACROSS GESTATIONAL AGES.*** *Darla Shores[1], Jennifer Fundora[2], Mitzi Go[3], Fauzia Shakeel[3], Sandra Brooks[3], David Hackam[4], Allen Everett[2]. [1]Pediatric Gastroenterology, Johns Hopkins, Baltimore, MD; [2]Pediatrics, Johns Hopkins, Baltimore, MD; [3]Pediatrics, Johns Hopkins All Children's Hospital, St. Petersburg, FL; [4]Pediatric Surgery, Johns Hopkins, Baltimore, MD*

Background - Necrotizing enterocolitis (NEC) is a highly morbid and potentially fatal condition for infants. Early detection continues to be challenging and new biomarkers have been proposed to aid in diagnosis. Fatty acid binding protein (FABP), an intestinal injury marker, and S100 A8/A9 (serum calprotectin), an inflammatory marker, are potential biomarkers of NEC. We hypothesized variability exists in preterm control infants across gestational ages (GA) as the intestine matures that may influence clinical interpretation.

Objective – To determine the normative values of FABP and S100 A8/A9 by GA in the first week of life and post-menstrual age (PMA) over time.

Methods – We collected remnant blood (from routine clinical tests) from 121 non-septic control infants (GA 24-42 weeks) during the first week of life, and 4-5 longitudinal samples throughout hospitalization from 19 preterm infants (GA 25-29 weeks). Commercial assays were used for FABP and S100 A8/A9. As data were not normally distributed, Kruskal-Wallis test compared multiple medians by GA in the first week and mixed effects multiple linear regression equations compared longitudinal samples. Previously reported cut-points for NEC have been FABP 4-11 ng/ml and S100 A8/A9 3,000 ng/ml.

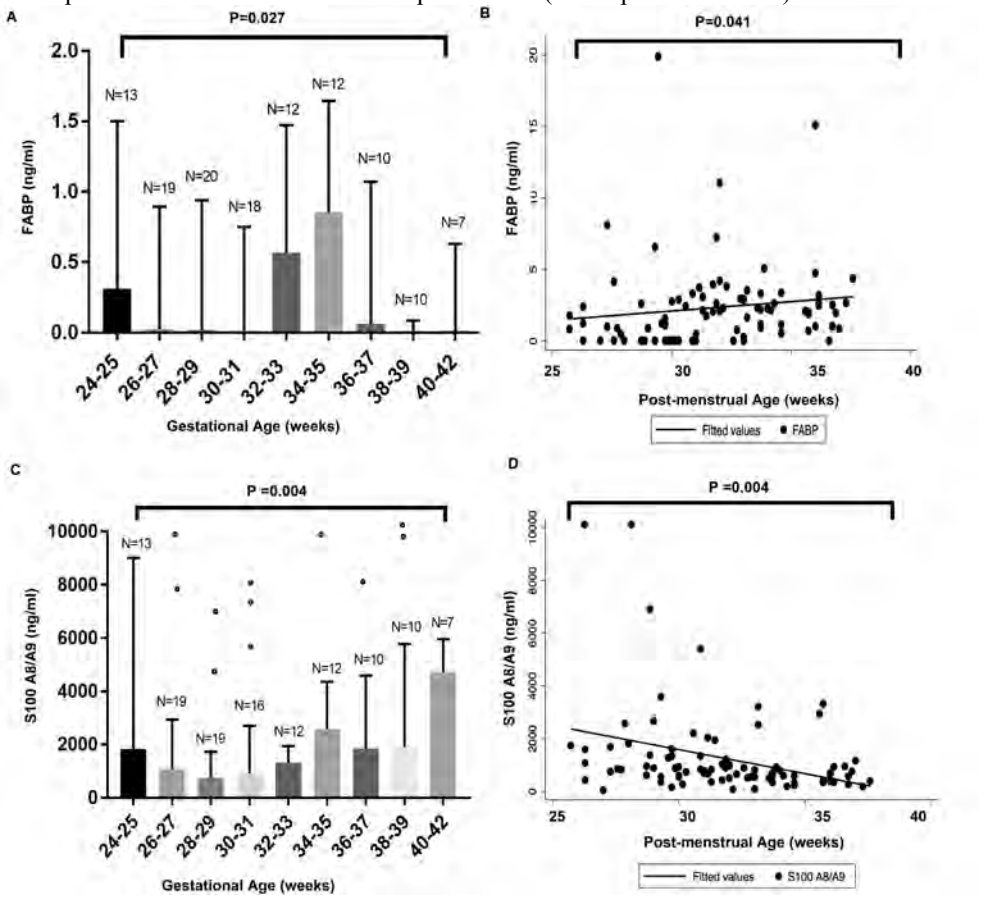
Results –During the first week of life, >50% of infants had undetectable FABP, but levels were higher between 32-35 weeks GA (median ranges 0.01-0.9 ng/ml, P=0.027; Fig 1A). Among longitudinal samples, levels generally rose over time (coefficient 1.2 ng/ml per PMA week, CI 1.1-1.4, P=0.041; Fig 1B), with a peak between 31-36 weeks PMA (2.0-2.6 ng/ml). Multiple controls had levels >4ng/dl. S100 A8/A9 was more variable in the first week of life, with higher levels among higher GA (range of medians 909-1915 ng/ml, P=0.004; Fig 1C). Levels slightly decreased over time (coefficient 0.91 ng/ml per PMA week, CI 0.86-0.96; P=0.004, Fig 1D). Multiple controls had levels >3,000ng/ml.

Conclusions – FABP is generally low in the first week of life, but rises in subsequent weeks among preterm infants. Levels were highest between 31-36 weeks PMA, which is also the most likely time to develop NEC. More variability was seen in S100 A8/A9 during the first week of life, and over time levels generally decreased. Many preterm control subjects would have met proposed cut-off criteria for NEC for both biomarkers. These biomarkers may be clinically useful for monitoring for NEC as part of a panel of tests, but the high variability in preterm controls during 31-36 weeks PMA decreases clinical utility as a sole screening test.

Figure 1. A: FABP median (IQR) levels during the first week of life by gestational age. **B:** Repeat FABP levels over hospitalization (N=19 preterm infants). **C:** S100 A8/A9 median (IQR) levels during the first week of life by gestational age.

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D: Repeat S100 A8/A9 levels over hospitalization (N=19 preterm infants).



644 ***DERMATITIS HERPETIFORMIS IN CHILDHOOD AND LINKING DERMOPATHY TO ENTEROPATHY.***

Lydia Ramharack, *Aisha Sattar*, *Lionola Juste*, *Arunjot Singh. Pediatric Gastroenterology*, *Children's Hospital of Philadelphia*, *Philadelphia*, *PA*

Objective: Dermatitis herpetiformis (DH) is a rare, gluten-sensitive dermopathy that remains poorly characterized in children. Our aim is to measure the incidence of pediatric DH and improve understanding of the clinical presentation along with its natural history to celiac disease (CD).

Methods: This retrospective cohort study included patients from 2007-2019 at the Children's Hospital of Philadelphia. Patients were identified using ICD-9 codes for DH and included in analysis if there was histologic confirmation of DH by skin biopsy. Data gathered included demographics, pathology reports, celiac serologies, symptoms, diet and medications. Descriptive statistics and paired t-test using Microsoft Excel was used for analysis.

Results: Twenty patients were identified with DH through the query of which 11 met inclusion criteria. Majority identified as non-Hispanic white (82%), female (73%) with ages 5-19 years at diagnosis. The primary gastrointestinal symptom reported is abdominal pain, and extra-intestinal, joint pains. In DH cases with celiac serologies performed (n=10), five had a positive screen. In those positive, four had severe intestinal damage (Marsh 3a or greater) on endoscopy and one had normal pathology. All serology negative cases with endoscopy (n=3) had unremarkable duodenal histology. Limitations include starting a gluten-free diet or pharmacotherapy (steroids/dapsone) prior to celiac testing. Mean time between diagnosis of DH and endoscopy was 168 days.

Conclusion: DH can present in children of all ages, although the low incidence and diagnostic challenges impede our clinical understanding.There may be a stronger correlation between symptoms of CD in this DH cohort than previously reported. Specificity of celiac serology may also differ in DH patients, although there remains a strong association with CD that needs to studied further classified to enhance diagnostics and prospective drug trials.

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PANCREAS/CELIAC/MALABSORPTION

645 *THE IMPACT OF A MULTIDISCIPLINARY CELIAC DISEASE CLINIC ON PATIENT COMPLIANCE .*

Arunjot Singh, Yuchen Zhang, Lydia Ramharack, Lionola Juste, Patricia Bierly, Lisa Fahey, Ann Farrara, Kara Feigenbaum, Karen Hlywiak, Janel Steinhoff, David Piccoli. Pediatric Gastroenterology, Children's Hospital of Philadelphia, Philadelphia, PA

Introduction: Patient compliance is a key indicator for evaluating success in chronic disease management. Celiac disease guidelines recommend annual follow up by physicians and dieticians to monitor dietary compliance, address nutritional deficiencies and ensure resolution of symptoms. Recent studies report a significant loss to follow up after the diagnosis of celiac disease, leading clinicians to question the optimal pediatric care model for management. This study compares the efficacy of a multidisciplinary celiac disease clinic versus general gastroenterology clinic and its effect on patient compliance and disease outcomes.

Methods: This is a retrospective study of pediatric patients (<18 years of age) with a new histologic diagnosis of celiac disease between May 1, 2013 – May 31, 2018 at the Children's Hospital of Philadelphia. Patients were identified by ICD-9 codes of celiac disease and electronic medical records were queried for basic demographics, celiac serology, pathology reports and ambulatory visit types. Patients followed in the general GI clinic were compared to those in the multidisciplinary Center for Celiac Disease, which is comprised of gastroenterology, nutrition, psychology and a nurse educator. Statistical analysis was performed using Microsoft Excel software.

Results: A total of 972 patients met inclusion criteria with majority (99.1%) receiving follow up care for celiac disease following endoscopy. 726 patients were treated at the multidisciplinary celiac disease clinic versus 242 in the general GI clinic. Patients receiving multidisciplinary care had a mean of 4.6 clinician visits after diagnosis and were more likely to receive gluten-free counseling by a dietician at 96% versus 18.7% treated in general GI clinic ($p<0.01$). Celiac disease surveillance was also significantly higher in families cared for through the multidisciplinary celiac clinic with 83.1% adhering to follow up guidelines versus 61% ($p<0.01$) at 18 months observation period post-diagnosis. Compliance rates also varied based on age at diagnosis with adolescents being at highest risk for being lost to follow up.

Discussion: Multidisciplinary clinics appear clinically valuable in serving children with celiac disease and reducing loss to follow up. Given that gluten-free dietary adherence in childhood is highly predictive of maintaining follow-up and dietary compliance into adulthood, cost benefit studies are needed to validate the public health impact pediatric centers can have by implementing similar care models across the nation.

646 *MUTANT EPCAM ACTIVATES THE UNFOLDED PROTEIN RESPONSE IN MURINE MODEL OF CONGENITAL TUFTING ENTEROPATHY.*

Barun Das[2], Kevin Okamoto[2], John Rabalais[2], Maho Niwa[3], Soumita Das[4], Mamata Sivagnanam[1]. [1]Pediatrics, UCSD/Rady Children's Hospital, La Jolla, CA; [2]Pediatrics, UCSD, La Jolla, CA; [3]Biology, UCSD, La Jolla, CA; [4]Pathology, UCSD, La Jolla, CA

Congenital Tufting Enteropathy (CTE) is a rare autosomal recessive disease of infancy characterized by severe intestinal failure and profuse diarrhea. Mutations in Epithelial Cell Adhesion Molecule (*EPCAM*) were identified to be directly associated with this disease. Based on the mutation found on a subset of CTE patient (deletion of EPCAM exon 4), we have developed a murine CTE model that pathologically and functionally recapitulates human CTE. Mutant EpCAM was found to be retained in the cytoplasm instead of cell membrane in the mutant model. We hypothesized that the mutation results in accumulation of EpCAM in ER and activates Unfolded Protein Response (UPR) by specific identifiable pathways.

In order to confirm the accumulation of mutant EPCAM in ER, we performed electron microscopy and immune-fluorescent study of the intestinal tissue section of both healthy (Control) and diseased (Mutant) mice postnatally. To evaluate the ER stress, activation of Ire1 pathways was checked by the presence of spliced X-box binding RNA and mRNA levels of *BLOS1*and *SCARA3*. PERK mediated pathway was evaluated by evaluating the protein expression of PeiF2a and ATF4. The involvement of ATF6 mediated pathways was studied through immune-fluorescence. T-84 human colonic adenocarcinoma cell line treated with ER stress inducer Thapsigargin was used as positive control for all the experiments to study UPR signalling pathways.

The ultrastructure of ER was found to be significantly dilated in the mutant mice when compared to the control mice. Co-localization of mutant EpCAM along with ER lumen residing marker BiP confirms the accumulation of mutant EpCAM in ER. Significantly decreased mRNA expression of *BLOS1*and SCARA3 ($p<0.01$, $n=8$) indicates the involvement of IRE1 dependent mRNA decay in the mutant tissue. However, *sXBP1*was not observed in the mutant mice which might suggest an alternate downstream pathway activation of IRE1. Significant induction ($p<0.05$, $n=8$) of P-eIF2a and ATF4 expression in

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mutant mice than the control mice suggested the involvement of PERK mediated pathway in UPR activation. The significant increased ATF6 expression and presence of ATF6 in the nuclei of the mutant tissue section indicated the active role of ATF6 mediated arm in UPR signalling.
We conclude that UPR pathways are activated in the CTE murine model to mitigate the ER stress caused by the accumulation of mutant EpCAM that compromises the homeostasis of ER. Further studies are required to understand the mechanism of how UPR activation leads to structural and functional abnormalities in the intestinal epithelium that ultimately results in the CTE. This study further establishes the role of ER stress in maintaining the gastro-intestinal homeostasis and disease pathophysiology. Deeper clarity into CTE pathophysiology will contribute to the much needed expansion of therapeutics for this vulnerable population.

647 *CELIAC KIDS INTERNET DIET SURVEY (CELIACKIDS): A MULTICENTER CONSORTIUM USING THE MODIFIED DELPHI METHOD TO CREATE A GLUTEN EXPOSURE ASSESSMENT TOOL*

. *Mary Shull[2], Marisa Stahl[2], Hilary Jericho[3], Vanessa Weisbrod[4], Daniel Mallon[5], Norelle Reilly[6], Maureen Leonard[7], Absah Imad[8], Tracy Ediger[9], Dale Lee[11], Ritu Verma[3], Edwin Liu[1], Benny Kerzner[4], Amy Hale[10], Jocelyn Silvester[10].*
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Background: Self-reported rates of adherence to the gluten-free diet (GFD) are highly variable, and there is increasing evidence that the presence of symptoms, serologic markers of celiac disease, and mucosal healing often do not correlate. Currently, the dietitian assessment of adherence remains the gold standard, but even this is an imperfect marker of exposures which impact mucosal healing. Furthermore, dietitians or educators with expertise in the GFD are not widely available in many communities. Celiac Kids Internet Diet Survey (CeliacKIDS) is a multicenter, multidisciplinary consortium that is collaborating to develop a self-administered standardized assessment of gluten exposure risk completed by children with celiac disease and/or their parents. We report the results of the modified Delphi technique used to reduce the pool of questions to a reasonable size to be used for subsequent measure development to ultimately create a tool to assess patient knowledge of the GFD as well as potential exposures.

Methods: The twelve participating institutions in CeliacKIDS provided copies of currently used questionnaires for children with celiac disease on a GFD. These questions were compiled and categorized as relating to the following domains: purposeful and accidental gluten intake, knowledge and food-label reading skills, cross contact at home, use of gluten-containing medications/cosmetics, behaviors while dining out at restaurants, and gluten exposure in school/other social settings. An expert consensus panel consisting of 15 physicians, 18 dietitians or GFD educators, 4 nurses or nurse practitioners, 6 psychologists, 1 social worker, and 6 family representatives completed 3 rounds of the modified Delphi process. The first round rated question wording and content with a Likert scale. In the second round, members were guided to rate questions by usefulness in detecting gluten exposure risk. Questions that were voted to be included by 55% or more were reviewed by 3 members of the group including a psychologist with expertise in survey design. This subgroup edited questions based on comments from Round 2 to make questions more readable and to limit redundancy. The third round of the Delphi further reduced the number of questions to those that were rated highest among experts on our consensus panel.

Results: Our 50 participants on the expert consensus panel have completed the modified Delphi process. In Round 1, 134 questions were reviewed by the panel and 82 questions were considered for Round 2. After Round 2, 57 questions met the 55% approval threshold and were included in Round 3. Based upon ≥75% agreement from our expert consensus panel, consideration of comments on specific questions, and ensuring sufficient items for the pre-defined domains, during Round 3 we were able to construct a 36 question survey that will be used in Phase I of our study.

Conclusions: Using a 3 phase modified Delphi method, we were able to reduce a pool of 134 questions to a 36 question survey to enhance clinical utility and limit the risk of survey fatigue. This survey will be used to assess GFD knowledge and adherence for children with celiac disease and their families in Phase I of the CeliacKIDS study in which we focus on item development and initial psychometrics with the ultimate goal of verification and validation of this tool in Phase II.

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648 ***MEASURES OF HEALTHY PANCREATIC SIZE IN PEDIATRICS.*** *Andrew Trout[1,2,3], Brendan McCleary[1], Jonathan Dillman[1,2], Lin Fei[4], Qin Sun[4], Maisam Abu-El-Haija[5,3]. [1]Radiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Radiology, University of Cincinnati College of Medicine, Cincinnati, OH; [3]Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH; [4]Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [5]Gastroenterology, Hepatology and Nutrition, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

Purpose: Pancreatic atrophy, or loss of parenchymal bulk, is a finding of chronic pancreatitis and is typically defined qualitatively. Recently, normal values (and associated standard deviations [SD]) for linear thickness of the pancreas at four locations (head, neck, body, tail) have been established by CT for children. These values might serve as a quantitative means to identify atrophy but they have not been validated in a separate population and have not been validated for MRI. Even if validated, linear measurements may not be an ideal measure of parenchymal bulk given variability in the shape of the pancreas. In this context, volumetric measurements of the entire pancreas may provide a better measure of parenchymal bulk. The purposes of this study were to: 1) Validate previously defined normal pancreatic thickness measurements in a separate population and for MRI; 2) Define normal pancreatic parenchymal volume in a group of children.

Material and Methods: This study was IRB approved and HIPAA compliant. On axial images from 50 MRI exams prospectively obtained in children (6-16 years old) without pancreatic disease, a single observer measured linear thickness of the pancreas at the four previously defined segments. The same observer also volumetrically segmented (Vitrea, Vital Images) the pancreas on the same images. Linear measurements were compared to previously defined values and standard deviations (Trout et al. 2018). Parenchymal volumes were correlated (Pearson) with age, height, weight, and body surface area (BSA). Student's t-test was used to compare means. Quantile regression was used to define the 5th and 95th percentiles for parenchymal volume by BSA.

Results: Using previously defined values for linear pancreatic thickness, 34 healthy participants (68%) had a segmental thickness value below the defined range (mean +1 SD) for one segment and 14 (28%) had thickness values below the defined range for two or more segments.
Mean (±SD) parenchymal volume for our 50 healthy children was 46.0 ± 18.8mL. There was no significant difference in parenchymal volume by sex. There were statistically significant correlations between parenchymal volume and age ($r = 0.51$, $p=0.002$), height ($r=0.67$, $p<0.0001$), weight ($r=0.75$, $p<0.0001$) and BSA ($r=0.75$, $p<0.0001$). The 5th percentile for parenchymal volume by BSA could be calculated as:
$= - 4.97 + 24.66 * (BSA)$

Conclusion: Previously defined normal pancreas thickness values on CT for children are likely too restrictive, or may not apply to MRI. Better measures of pancreas bulk such as parenchymal volume are needed. To this end, we have defined pancreatic volumes on MRI for 50 healthy children, and have shown that these values vary with patient age and size. We have also defined the 5th percentile for parenchymal volume by BSA, below which atrophy might be considered to be present as a feature of chronic pancreatitis.

Reference:
Trout AT, et al. Normal pancreatic parenchymal thickness by CT in healthy children. Pediatr Radiol. 2018 Oct;48(11):1600-1605.

649 ***AN EVALUATION OF PANCREATIC FUNCTIONS IN CASES OF PRIMARY AND SECONDARY MALNUTRITION.*** *Gokhan Tumgor[1], Mahmut Tuluce[1], Sibel Yavuz[1], Mehmet Agin[1], Salih Cetiner[2]. [1]Ped. Gastroenterology, Cukurova University Medical Faculty, Adana, Turkey; [2]Medical Microbiology, Cukurova University Medical Faculty, Adana, Turkey*

Aim: This study assessed pancreatic functions by investigating fecal elastase levels in stool specimens from cases of primary and secondary malnutrition and investigated the effect of fecal calprotectin and inflammation on those levels.
Material and Method: One hundred forty-four patients admitted to the Cukurova University Faculty of Medicine Department of Pediatrics and outpatients consulted with the Pediatric Gastroenterology, Hepatology and Nutrition Clinics and 23 healthy children were included in this study. Patients' demographic characteristics and laboratory data were investigated. The fecal elastase and fecal calprotectin levels of the patients and healthy subjects were assayed.
Results: Seventy of the 144 patients were female (48.6%) and 74 were male (51.4%). Forty-four patients were diagnosed with cystic fibrosis (30.6%), 51 with primary malnutrition (35.4%), 12 with celiac disease (8.3%), and five with inflammatory bowel disease (3.5%). The remaining 32 (22.2%) secondary malnutrition cases included various diagnoses (neurological diseases, congenital heart disease, nephrotic syndrome, metabolic diseases, malignancies etc.). Although the

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mean fecal calprotectin value of the primary malnutrition patients was lower than that of the cystic fibrosis patients, the difference was not statistically significant. In agreement with the literature, fecal calprotectin levels of patients with cystic fibrosis, celiac disease and irritable bowel syndrome were significantly higher than those in the control group. Fecal elastase levels in patients with cystic fibrosis, primary malnutrition, and celiac disease, and other patients with secondary malnutrition were significantly lower than those in the control group. A negative relation was determined between length of maternal education and Waterlow classification. A significant relation was also observed between duration of breastfeeding and malnutrition.
Conclusion: Pancreatic enzymes are used due to pancreatic failure in cases of cystic fibrosis, and patients benefit considerably from treatment. This study shows that pancreatic failure may also occur in cases of primary and secondary malnutrition apart from cystic fibrosis. We think that pancreatic enzyme support may be useful in terms of pancreatic failure developing secondarily in cases of primary malnutrition.

650 ***INTERNATIONAL STUDY GROUP OF PEDIATRIC PANCREATITIS: IN SEARCH FOR A CURE (INSPPIRE 2) COHORT STUDY: DESIGN AND RATIONALE FROM THE CONSORTIUM FOR THE STUDY OF CHRONIC PANCREATITIS, DIABETES, AND PANCREATIC CANCER (CPDPC).*** *Aliye Uc[1], Savitri Appana[2], Maisam Abu-El-Haija[3], Bradley Barth[4], Melena Bellin[5], Kate Ellery[6], Douglas Fishman[7], Cheryl Gariepy[8], Matthew Giefer[9], Praveen Goday[10], Tanja Gonska[11], Mel Heyman[12], Sohail Husain[13], Asim Maqbool[14], Maria Mascarenhas[14], Brian McFerron[15], Veronique Morinville[16], Tom Lin[3], Quin Liu[17], Jaimie Nathan[3], Keith Ooi[18], Emily Perito[12], John Pohl[19], Sarah Jane Schwarzenberg[5], Zachary Sellers[13], Jose Serrano[20], Uzma Shah[21], David Troendle[4], Michael Wilschanski[22], Yuhua Zheng[23], Ying Yuan[2], Mark Lowe[2].[1]Stead Family Department of Pediatrics, University of Iowa, Iowa City, IA; [2]The University of Texas M.D. Anderson Cancer Center, Houston, TX; [3]Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [4]Children's Health/UT Southwestern Medical Center, Dallas, TX; [5]University of Minnesota, Minneapolis, MN; [6]Children's Hospital of Pittsburgh of UPMC, Pittsburgh, PA; [7]Texas Children's Hospital, Houston, TX; [8]Nationwide Children's Hospital, Columbus, OH; [9]Seattle Children's Hospital, Seattle, WA; [10]Medical College of Wisconsin, Milwaukee, WI; [11]The Hospital for Sick Children, Toronto, ON, Canada; [12]UCSF, San Francisco, CA; [13]Stanford University, Palo Alto, CA; [14]CHOP, Philadelphia, PA; [15]Indiana University, Indianapolis, IN; [16]Montreal Children's Hospital, Montreal, QC, Canada; [17]Cedars-Sinai Medical Center, Beverly Hills, CA; [18]Sydney Children's Hospital, Sydney, New South Wales, Australia; [19]Primary Children's Hospital, Salt Lake City, UT; [20]NIH/NIDDK, Bethesda, MD; [21]MGH Children's Hospital, Boston, MA; [22]Hadassah University Hospital, Jerusalem, Israel; [23]CHLA, Los Angeles, CA; [24]Washington University, St Louis, MO*
Background: Pediatric acute recurrent pancreatitis (ARP) and chronic pancreatitis (CP) are rare diseases of childhood that can be best approached through large cohorts and multicenter studies. **IN**ternational **S**tudy Group of **P**ediatric **P**ancreatitis: **I**n search for a cu**RE**(INSPPIRE) was the first and largest multicenter and multinational pediatric pancreatitis cohort. The INSPPIRE Study has enrolled over 500 children with ARP or CP and begun to define the risk factors, natural history, disease burden, and outcome of pediatric ARP and CP but its longitudinal contribution was limited.

Objective: INSPPIRE 2 is designed to create a longitudinal cohort study of well-phenotyped patients and biological samples to comprehensively characterize the pediatric population with ARP and CP and to determine predictors of pediatric CP and its sequelae including disease burden, exocrine pancreatic insufficiency, and diabetes.

Methods: Patient and physician questionnaires are used to collect information on demographics, and clinical information. Health-related quality of life, depression, and anxiety are measured with validated questionnaires. INSPPIRE 2 data is managed by Consortium for the Study of Chronic Pancreatitis, Diabetes and Pancreatic Cancer's (CPDPC) Coordinating and Data Management Center (CDMC). Biosamples are collected for DNA isolation, analysis of pancreatitis-associated genes and biomarkers.Continuous variables are summarized by mean and standard deviation (SD) with p-values from an ANOVA (or t-test) test of mean differences between groups. Categorical variables are summarized by frequency (n) and percent (%), with p-values from Chi-square test of proportions between groups. Fisher's exact test is utilized when any count was < 5.

Results: Twenty-two sites (18 in United States, 2 in Canada, and 1 each in Israel and Australia) participate in the INSPPIRE 2 study. Between July 1, 2017 and April 1 2019, sites have enrolled 366 (216 ARP, 150 CP) subjects into the INSPPIRE 2 database. Children with CP were diagnosed at a younger age with first AP attack than children with ARP (8 ±4.2 y/o vs 9.3 ±4.2 y/o, p=0.0152). CP was more common than ARP in females (62.7% vs. 50.9%, p=0.0261) **(Table 1)**. *PRSS1* variants (19.3% vs. 37.1%, p=0.0011) or obstructive risk factors (21.1% vs. 31.8%, p=0.034) were significantly associated with CP compared to ARP. There was no alcohol use and smoking exposure was negligible in INSPPIRE 2 cohort **(Table 2)**.

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Conclusions: INSPPIRE 2 shows similarities to the INSPPIRE Cohort Study with its demographics and risk factors. Advantages of INSPPIRE 2 are its longitudinal nature, ability to collect biosamples and develop biomarkers, conduct ancillary studies and test the impact of psychosocial factors on disease behavior. In this preliminary analysis of the cohort, an increased risk for CP in females requires further study.

Table 1. Demographics of INSPPIRE 2 Study

Characteristic		ARP N = 216	CP N = 150	p-Value
Age at Enrollment	**Mean (SD)**	11.9 (4.0)	12.4 (3.9)	0.2249
Sex	**Female (%)**	110 (50.9)	94 (62.7)	**0.0261**
Ethnicity	**Hispanic (%)**	59 (27.3)	30 (20)	0.1087
Race	**White (%)** **Black (%)** **Others (%)**	163 (75.5) 13 (6.0) 40 (18.5)	117 (78) 4 (2.7) 29 (19.3)	0.3252
Age at ARP Diagnosis	**Mean (SD)**	9.3 (4.2)	8.0 (4.2)	**0.0152**
Age at CP Diagnosis	**Mean (SD)**	11.6 (3.6)	9.9 (4.2)	0.1500

Table 2. INSPPIRE 2 Risk Factors

Characteristic	ARP N = 216 (%)	CP N = 150 (%)	p-Value
GENETIC FACTORS			
PRSS1	28/145 (19.3%)	46/124 (37.1%)	**0.0011**
SPINK1	23/134 (17.2%)	28/116 (24.1%)	0.1724
CFTR	44/138 (31.9%)	35/115 (30.4%)	0.8044
CTRC	5/117 (4.3%)	7/82 (8.5%)	0.2137
OBSTRUCTIVE FACTORS	38/180 (21.1%)	41/129 (31.8%)	**0.0340**
TOXIC/METABOLIC FACTORS			
Regular Alcohol Intake	0/196 (0%)	0/140 (0%)	
Tobacco Smoking (Active or Passive)	13/193 (6.7%)	9/139 (6.5%)	0.9249
Hypertriglyceridemia	25/182 (13.7%)	14/132 (10.6%)	0.4064
Medications	17/181 (9.4%)	6/132 (4.5%)	0.1046
AUTOIMMUNE PANCREATITIS	3/181 (1.7%)	0/130 (0%)	0.2678

651 ***SPINK1 DEFICIENCY IN A FERRET MODEL LEADS TO EXOCRINE PANCREATIC DISEASE AND GLYCEMIC DEFECTS EARLY IN LIFE.*** *Xingshen Sun[2], Yaling Yi[2], Bo Liang[2], Yang Yu[2], Qing Yang[2], Katherine Gibson-Corley[3], Andrew Norris[1,4,5], John Engelhardt[2,4], Aliye Uc[1,4,6]. [1]Stead Family Department of Pediatrics, University of Iowa, Iowa City, IA; [2]Anatomy and Cell Biology, University of Iowa, Iowa City, IA; [3]Pathology, University of Iowa, Iowa City, IA; [4]Fraternal Order of Eagles Diabetes Research Center, Iowa City, IA; [5]Biochemistry, University of Iowa, Iowa City, IA; [6]Radiation Oncology, University of Iowa, Iowa City, IA*

Background: *SPINK1* codes for serine protease inhibitor Kazal 1, a protein secreted by the acinar cells to protect against harmful effects of trypsin activity caused by ectopic activation of trypsinogen. Loss of function mutations in the *SPINK1* gene are strong risk factors for chronic pancreatitis in humans. Mutations leading to complete loss of SPINK1 function in 2 young children manifested with early-onset exocrine pancreatic insufficiency (Human Mutat 38:1660; 2017). Spink3 knock-out mouse demonstrated early-lethality with no signs of pancreatic injury (Gastroenterology 129:696; 2005). The purpose of this study is to demonstrate that *SPINK1* deficiency induces early-life pancreatic disease in a ferret genetic model.

Methods: Guide RNAs targeting exon1 and exon3 of ferret *SPINK1* gene were microinjected into single-cell ferret

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embryos (zygotes) with Cas9 mRNA or Cpf1 protein, which were then cultured to 2-cell stage and transferred to pseudopregnant jills. Eight founders with *SPINK1* mutations were generated. Fecal elastase-1, fasting and post-prandial blood glucose, oral glucose tolerance test (OGTT), mixed meal tolerance test (MMTT) and histopathology were performed.

Results: Birthweights were not different between *SPINK1*$^{-/-}$ (KO) and *SPINK1*$^{+/+}$ (WT) ferrets, but KO had slower weight gain, starting at 6 weeks of age. Exocrine pancreatic insufficiency was confirmed in KO ferrets at 6-8 weeks with fecal elastase-1 (33.6 ± 30.5 ug/g in KO vs. 1428.3 ± 326.4 ug /g WT, $p<0.05$, n=3). At 7-8 weeks, postprandial glucose was 286.3 ± 31.9 mg/dL in KO vs 148.2 ± 6.6 mg/dL in WT ($p < 0.05$, n=3). *SPINK1*$^{-/-}$ ferrets exhibited glucose intolerance (OGTT and MMTT). One KO animal died before initiating pancreatic enzyme replacement therapy (PERT) at 54 days. Another one survived and is maintaining weight on PERT (0.2 IU/kg) at 16 months of age. The pancreas of the deceased KO ferret showed acinar loss, fatty infiltration, fibrosis, scattered plasma cells and lymphocytes, but no islet cell loss.

Conclusion: *SPINK1*$^{-/-}$ ferret model does not exhibit early lethality as did the mouse model, but develops severe exocrine pancreatic damage, abnormal exocrine function and glycemic responses early in life. Future studies will involve a detailed description of the disease progression and better understanding of injury mechanisms in this unique model.

654 *CHENODEOXYCHOLIC ACID INDUCES ENTEROCYTE PROLIFERATION VIA AN FXR-FGF15/19-DIET1 MEDIATED MECHANISM.* *Linda Wang*[1], *Rosa-Maria Salazar-Gonzalez*[1], *Ajay Jain*[2], *Jasdeep Bhattarjee*[1], *Karen Reue*[3], *Rohit Kohli*[1]. [1]*Pediatric Gastroenterology*, *Children's Hospital Los Angeles*, *Los Angeles*, *CA*; [2]*Pediatric Gastroenterology Hepatology and Nutrition*, *SSM Cardinal Glennon Children's Medical Center, Saint Louis University*, *St. Louis*, *MO*; [3]*Human Genetics*, *UCLA*, *Los Angeles*, *CA*

Background: Bile acid molecules bind to nuclear and G-protein coupled receptors to affect downstream entero-hepatic signaling. One such nuclear receptor, the farnesoid x receptor (FXR), is activated by bile acids in the ileum leading to induction of fibroblast growth factor 15/19 (Fgf 15/19) that in turn represses bile acid production, improve lipid metabolism and glycemic control in the liver but also allows for preservation of gut mass, villus/crypt ratio potentially via ileal proliferation. *Diet1* is a relatively recently identified ileal protein understood to affect Fgf15/19 production.

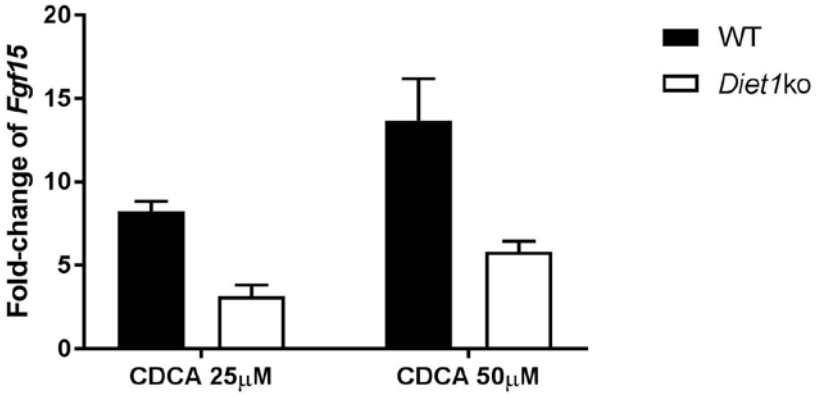
Aim: To study the effects of bile acids on intestinal proliferation mediated via the Fxr-Fgf15 pathway.

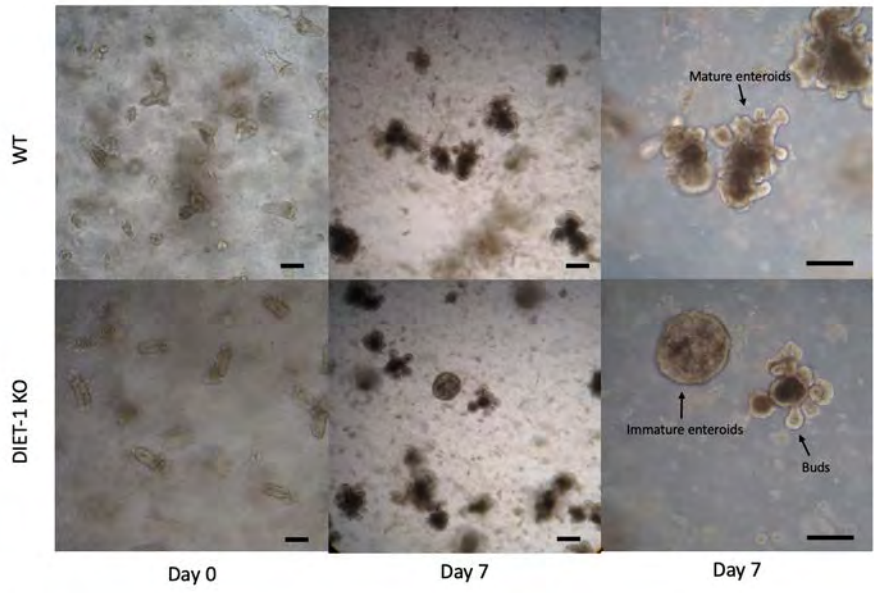
Methods: We generated enteroid cultures from the ileum of C57Bl/6J wild-type (WT)or C57Bl/6J *Diet1*$^{-/-}$ (Diet1ko*)* mice though established protocols for matrigel-based culture systems. After 7 days, cultures were passaged and expanded. After 3 weeks, cultures were exposed to chenodeoxy cholic acid (CDCA) 25μM, CDCA 50 μM, GW4064 1 μM (synthetic selective FXR agonist, positive control) or media (control). Enteroids were harvested after 20 hours and RNA was extracted. Quantitative PCR assays were run to measure the gene expression of specific target genes (*Fxr*, *Fgf15, Diet1, Tgr5*, *Glp1*, *iNOS*).

Results: Data from 3 separate experiments of intestinal crypts isolated from WT mice showed similar results in expression of *Fgf15*. Compared to control, WT enteroids exposed to CDCA at 25μM and 50μM had an average of 8-fold and 14-fold increase, respectively. *iNOS* expression was also noted at an average of 5-fold expression at both 25μM and 50μM concentrations. Images of WT and Diet1ko enteroids were captured at days 0 and 7. Diet1ko cultures showed a higher proportion of immature enteroids to mature enteroids at day 7. Diet1ko enteroids showed an average of 3-fold expression of *Fgf15* with CDCA 25μM and 6-fold expression at CDCA 50μM concentration. *iNOS* expression of Diet1ko enteroids showed an average of 2-fold and 3-fold expression at 25μM and 50μM, respectively.

Conclusion: Chenodeoxycholic acid produces a concentration-dependent up-regulation of ileal Fgf15 expression. Enteroids deficient in *Diet1,*have decreased Fgf15 expression and decreased maturation rate. Thus, we conclude that a lack of an intact Fxr-Fgf15 ileal signaling pathway may lead to a disruption in bile acid signalled ileal proliferation. *Diet1* may therefore be a novel therapeutic target for children with short gut syndrome.

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656 ***A QUANTITATIVE ANALYSIS OF GLUTEN CONTAMINATION IN EVERYDAY SCHOOL SUPPLIES AND CAFETERIAS AS A CONCERN FOR CHILDREN WITH CELIAC DISEASE .*** *Vanessa Weisbrod[1], Catherine Raber[1], Benny Kerzner[1], William Suslovic[2], Joyana McMahon[1], Blair Raber[1], Shayna Coburn[1]. [1]Gastroenterology - Celiac Disease Program, Children's National Medical Center, Washington,DC ; [2]Genetics, Children's National Medical Center, Washington, DC*

Background: Gluten is commonly found in food in school cafeterias and supplies used in classrooms, particularly in early childhood education centers and home economics classrooms. To date, there is no research investigating potential levels of gluten exposure in schools that may cause harm to a child with celiac disease.

Aims: To evaluate if and how much gluten is transferred from common school supplies and cafeteria foods to gluten-free food products that a child with celiac disease may eat. Additionally, to measure the efficacy of washing techniques to remove gluten from a child's hands and kitchen equipment.

Methods: Our study team set up three distinct experiments. First, ten healthy children ages 4 to 16 completed seven

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scenarios involving everyday school supplies including: playing with Playdoh; creating an art project using paper maché; playing with raw and cooked pasta in a sensory table; making sandwiches using gluten-containing bread for a community service project; applying gluten-containing lotion; and cutting gluten-free and gluten-containing cupcakes with the same knife. After each encounter, the level of gluten was measured on the children's hands, as well as on gluten-free bread touched after exposure to each gluten-containing supply. Second, study staff cooked gluten-free pasta in the same water previously used to cook gluten-containing pasta and toasted gluten-free bread in a toaster previously used to toast gluten-containing bread. Third, participants in each scenario were assigned a washing method to remove gluten. After cleaning, measurements were taken again to determine if gluten transfer was still possible. All measurements for gluten were made using the RIDASCREEN® Gliadin ELISA by R-Biopharma AG.

Results: Gluten was detected on the hands of children in all scenarios, however, the levels ranged greatly. Four of the seven scenarios produced transfer levels from the hands of children to the gluten-free bread product that exceeded the FDA's accepted standard of 20 parts per million. The most offending scenarios included handling: paper maché (**median:**1,339.38ppm **range:**154.87-13,744.95ppm); cooked pasta (**median:**241.12ppm **range:**13.33-341.33ppm); sandwich making (**median:**8.17ppm **range:** 1.25-219.44ppm) and the cupcake (**median:**8.97ppm **range:**1.25-116.57ppm). Far lower transfer rates occurred in three scenarios using the following supplies: Playdoh, dry pasta, and lotion with median values of 1.25, 1.25, and 2.06, respectively, most of which had ranges below the 20ppm threshold. After pooling the data from children for washing methods, the only techniques that significantly lowered levels of gluten on the hands were washing with soap and water and with water alone. For the two scenarios mimicking food preparation in a cafeteria, gluten was detected on all pasta samples cooked in contaminated water with detectable levels ranging from 33.9ppm to 115.7ppm. Rinsing the pots with water alone was as effective as scrubbing with soap and water to remove gluten, with both washing methods allowing for cooked gluten-free pasta with gluten transfer levels of <5ppm. Toasting in a shared toaster produced very little transfer of gluten, with most samples having <5ppm detectable gluten.

Conclusions: All of the selected scenarios offer a risk for gluten contamination. The most egregious scenarios were handling paper maché, cooked pasta and sandwich making, as well as cooking gluten-free pasta in water contaminated with gluten. Using a shared toaster produced little risk of gluten transfer, which may relieve anxiety for celiac patients toasting gluten-free products in a shared environment. Our pilot data shows the potential for gluten contamination in a school setting is high and that schools should provide gluten-free materials and foods for students with celiac disease as well as have a robust strategy in place to prevent contact with gluten.

This work is supported by grants from the Celiac Disease Foundation and SCHAR Nutrition Institute

660 ***THE VALUE OF BREATH TEST IN THE DIAGNOSIS OF FRUCTOSE MALABSORPTION AS A CAUSE OF RECURRENT ABDOMINAL PAIN IN CHILDREN.*** *Yanjia Zhang[1], Rosemary Pauley[2], Ariel Young[2], Sharad Kunath[2], Jon Vanderhoof[1]. [1]Gastroenterology, Boston Children's Hospital, Boston, MA; [2]Boys Town National Research Hospital, Omaha, NE*

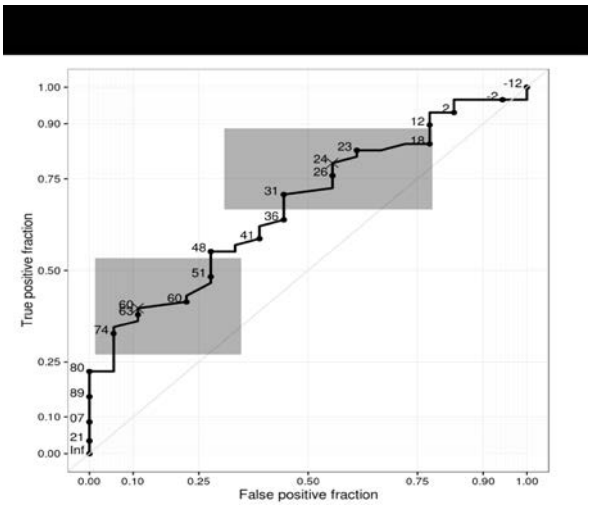
Objective and Study: Fructose is absorbed in the small intestine through carrier mediated passive transport at different rates among populations. Fructose malabsorption may occur in some individuals and is among the causes of recurrent abdominal pain and bloating in both children and adults. Fructose malabsorption, like most carbohydrates, can be identified by measuring breath hydrogen concentrations following a fructose load. Unfortunately, there are limited normative data and correlation between changes in breath hydrogen concentration following an oral load and abdominal pain has not been well established.

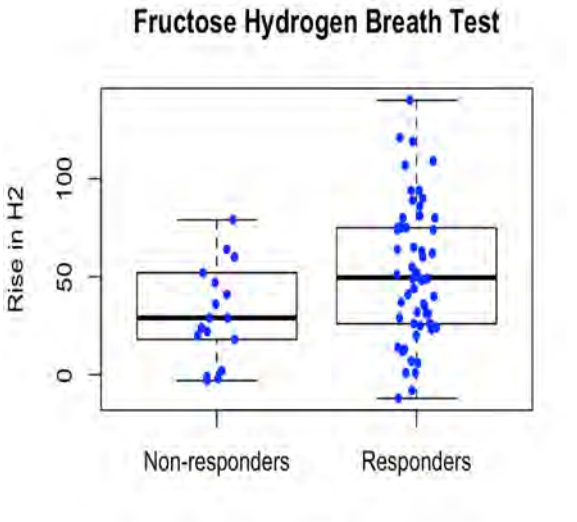
Methods: We therefore retrospectively evaluated the change in breath hydrogen concentration following oral administration of 2 g per kilogram of fructose at 1, 2, and 3 hours in 80 children with abdominal pain who had an increase in breath hydrogen of at least 20 ppm over baseline at 1 or 2 hours. Over 2 years 160 fructose breath hydrogen tests were performed at Boystown National Research Hospital in children with abdominal pain and suspected fructose intolerance. One hundred and one were considered negative with a rise of < 20 ppm of hydrogen from baseline and 59 were positive with a rise of greater than 20. Only patients with positive studies were placed on fructose restriction.

Results: Of the 76 positive patients, 18 did not respond to the fructose restricted diet, 3 were lost to follow up and 58reported a noticeable improvement in abdominal pain and bloating/gas after 3-4 weeks of fructose restriction. There was a large range of breath hydrogen concentration above each patient's individualized baseline (0 to 119 ppm of hydrogen). We hypothesized that the degree of hydrogen concentration would predict clinical response. At one hour post-challenge, there was a statistically significant difference between breath hydrogen concentrations in responders compared to nonresponders (p-value = 0.01 by one-tailed t-test). Responders had an mean rise in hydrogen of 52.2 ppm (95% CI [43.1, 63.0]) and non-responders had a mean rise in hydrogen of 32.1 ppm (95% CI[19.7, 44.37]).

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Conclusions: We conclude that children with abdominal pain and bloating who have an increase of at least 20 ppm in breath hydrogen concentration at one or two hours over baseline utilizing fructose breath hydrogen testing have a reasonable likelihood of responding favorably to dietary fructose restriction. While our data do not support a definitive correlation between the degree of rise in breath hydrogen and clinical response, a more robust controlled study might well demonstrate such a correlation.





Concurrent Session V
Saturday, October 19, 2019
2:00pm – 3:30pm

Upper GI Interventions

662 ***COMPARISON OF CURRENT DETECTION MODALITIES FOR RECURRENT TRACHEOESOPHAGEAL FISTULAE WITH A NOVEL METHOD: RISE IN END TIDAL CARBON DIOXIDE DURING ESOPHAGOSCOPY WITH CARBON DIOXIDE INSUFFLATION.*** *Jessica Yasuda[1], Steven Staffa[2], Russell Jennings[3], Peter Ngo[1], Michael Manfredi[1]. [1]GI, Boston Children's Hospital / Harvard, Boston, MA; [2]Anesthesia, Boston Children's Hospital / Harvard, Boston, MA; [3]Surgery, Boston Children's Hospital / Harvard, Boston, MA*
Background: Tracheoesophageal fistulae (TEF) carry significant morbidity related to recurrent pulmonary exposure to esophageal contents. Diagnosis of TEF can be difficult, and is made with contrast enhanced radiography or esophagram,

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rigid bronchoscopy, or esophgagoscopy. Esophagoscopy may miss small or subtle fistulae even when aided by intraoperative fluoroscopy. Endoscopic insufflation with carbon dioxide (CO_2) is increasingly commonplace, especially in colonoscopy. We hypothesize that endoscopic insufflation with CO_2 in the esophagus combined with monitoring of end tidal carbon dioxide ($etCO_2$) may aid in diagnosis of TEF due to passage of the gas from the esophagus to the trachea where it may be detected by capnography.

Methods: We retrospectively reviewed the intraoperative anesthesia records, radiography reports, rigid bronchoscopy reports, and esophagoscopy reports of 26 consecutive cases of recurrent TEF in pediatric esophageal atresia patients diagnosed at our institution between January 1, 2015 and May 1, 2019. Flexible esophagoscopy was performed with CO_2 insufflation under general anesthesia. Due to our routine use of intraoperative contrast enhanced fluoroscopy, all patients were endotracheally intubated whilst under anesthesia and $etCO_2$ monitoring (Dräger, Telford, PA) was used in all cases.

Results: A dramatic, abrupt rise in $etCO_2$ ($\geq$ 70 mmHg) was noted during esophagoscopy in 16 of 28 cases (57%) of TEF; though the actual number of cases with rise in $etCO_2$ is likely underestimated as our monitoring software defaults to record spot $etCO_2$ values in the chart once every 5 minutes.

There were 24 of 28 cases where intra-esophagoscopy fluoroscopy, bronchoscopy, and capnography were all performed. Sensitivities of various combinations of these three diagnostic modalities for recurrent TEF are listed in table 1. The highest diagnostic sensitivity was achieved by the combination of intra-esophagoscopy fluoroscopy plus bronchoscopy or by the combination of all three modalities (92%). There were 4 cases of TEF identified by capnography that were missed by intra-esophagoscopy fluoroscopy. Two cases of TEF were not identified by any of our non-surgical modalities and instead were identified incidentally intraoperatively during posterior tracheopexy surgery.

Conclusions: Attention to $etCO_2$ during esophagoscopy with CO_2 insufflation represents a novel way to detect TEF. Rise in $etCO_2$ had similar rates of TEF detection to esophgagoscopy with fluoroscopy in this retrospective study that likely underestimates rates of actual TEF detection by $etCO_2$ monitoring. Sensitivity of any individual TEF detection method was poor, and diagnosis of TEF requires a high index of suspicion. While bronchoscopy has traditionally been viewed as the diagnostic gold standard for TEF, we observed poor sensitivity for TEF diagnosis with bronchoscopy alone. Combinations of diagnostic modalities increased the ability to diagnose TEF to 92%. While further prospective studies are needed, a multi-diagnostic modality approach appears to increase sensitivity to detect recurrent TEF.
Sensitivity of Combinations of Diagnostic Modalities for Recurrent TEF

Test Positive by:	Sensitivity
Rise in etCO2	14/24 (58%)
Esophgagoscopy with fluoroscopy	14/24 (58%)
Rigid bronchoscopy	15/24 (63%)
Rise in etCO2 or endoscopy with fluoroscopy	18/24 (75%)
Rise in etCO2 or rigid bronchoscopy	21/24 (88%)
Esophgagoscopy with fluoroscopy or rigid bronchoscopy	22/24 (92%)
Rise in etCO2 or esophgagoscopy with fluoroscopy or rigid bronchoscopy	22/24 (92%)

Table 1. Analyses were performed on N=24 patients with recurrent TEF who had rigid bronchoscopy, intra-esophagoscopy with fluoroscopy, and capnography.

663 ***DEVELOPING AN INTERNATIONAL CONSENSUS ON QUALITY STANDARDS AND INDICATORS FOR PEDIATRIC ILEOCOLONOSCOPY: A REPORT FROM THE PEDIATRIC ENDOSCOPY QUALITY IMPROVEMENT NETWORK (PENQUIN).*** *Catharine Walsh[1], Jenifer Lightdale[2], David Mack[3], Jorge Amil-Dias[26], Patrick Bontems[4], Herbert Brill[8,25], Nick Croft[5,6], Douglas Fishman[7], Raoul Furlano[9], Peter Gillett[10], Iva Hojsak[11], Matjaz Homan[12], Hien Huynh[13], Kevan Jacobson[14], Diana Lerner[15], Quin Liu[16], Petar Mamula[17], Priya Narula[18], Salvatore Oliva[19], Joel Rosh[20], Marta Tavares[21], Elizabeth Utterson[22], Veronik Connan[23], Mike Thomson[24], . PEnQuIN Investigators[27]. [1]Division of Gastroenterology, Hepatology and Nutrition, Department of Paediatrics, Child Health Evaluative Sciences, Hospital for Sick Children, University of Toronto, Toronto, ON, Canada; [2]Department of Pediatrics, Division of Gastroenterology and Nutrition, UMass Memorial Children's Medical Center, Worcester, MA; [3]Department of Pediatrics, Children's Hospital of Eastern Ontario and University of Ottawa, Ottawa, ON, Canada; [4]Paediatric*

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Introduction: Measuring the quality of endoscopic care is an increasingly expected standard component of performing gastrointestinal endoscopy in children. Pediatric-specific quality standards for endoscopy are needed to define best practices, while the measurement of associated indicators is also critical for increasing transparency about patient care processes and outcomes. The development of quality standards and indicators around the performance of endoscopy in children should be based on evidence, as well as a high level of consensus that all proposed metrics are clinically meaningful and relevant.

Objective: To develop and define a set of quality standards and indicators tailored to pediatric endoscopic practice which encompass the performance of ileocolonoscopy, as it applies to children.

Methods: Rigorous methodology was utilized by PEnQuIN, an international group of pediatric endoscopists. Together they represent 31 centers from 11 countries, as well as various regions and practice types from the North American and European Societies of Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN and ESPGHAN). A systematic literature review was used to generate proposed standards and indicators, which were then revised iteratively using the Delphi approach, whereby all nominated participants were invited to provide comments and rate their level of agreement with each standard and indicator on a 5-point scale. Subsequently, standards and indicators were finalized at an in-person consensus conference in October 2018. Standards and indicators were considered to reach consensus if ≥ 80% of participants rated them as 4 (agree) or 5 (strongly agree). Participants who voted in all 3 Delphi rounds and attended the in-person meeting were eligible to participate in a final round of voting to determine the strength of recommendation ('strong' or 'conditional') for each standard and indicator that reached consensus. The quality of evidence and strength of recommendations for each standard and indicator was rated using the Grading of Recommendation Assessment, Development, and Evaluation (GRADE) approach.

Results: The literature search yielded 39 initial standards and 51 indicators adapted from similar consensus statements and published guidelines regarding quality of endoscopic procedures in adults. An additional 10 standards and 7 indicators were added by the PEnQuIN consensus panel during Round 1 of the Delphi process. Consensus was achieved across 24 participants eligible for the final round of voting on 49 quality standards and 48 indicators. These relate to the entire process of endoscopy in children, including the facility, the procedure, the endoscopist, as well as the patient and family experience. Due to a paucity of high-quality data, only 4 standards were assigned as 'strong', indicating they should be applied broadly. Minimal acceptable standards were defined for three key indicators: (a) terminal ileal intubation rate: ≥ 85%; (b) cecal intubation rate: ≥ 90%; and (c) rate of adequate bowel preparation: ≥ 80%. There was strong consensus that these indicators are integral to the performance of high-quality ileocolonoscopy in children.

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Conclusions: Pediatric-specific quality standards and indicators for the performance of endoscopic procedures in children can be developed through a rigorous international consensus process. All PEnQuIN standards and indicators achieved high consensus, suggesting universal agreement that there are clinically meaningful metrics for ensuring safe, high quality, patient and family-centered endoscopic care. These provide pediatric endoscopists and endoscopy services with a framework for auditing performance, providing feedback and ultimately benchmarking performance. Expansion of the evidence base and prospective validation of the PEnQuIN standards and indicators as predictors of clinically relevant outcomes and high-quality pediatric endoscopic care is now a research priority.
Note: *CMW and JRL are co-first authors

Concurrent Session V
Saturday, October 19, 2019
2:00pm – 3:30pm

Management of Chronic Pancreatitis

664 ***CLINICAL OUTCOMES FOLLOWING THERAPEUTIC ERCP IN CHILDREN WITH PANCREAS DIVISUM.*** *Tom Lin[1], Sagar Pathak[2], David Vitale[1], Jaimie Nathan[3], Maisam Abu-El-Haija[1]. [1]Gastroenterology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [2]Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, OH; [3]Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

Introduction: The most common pancreatic congenital anomaly is pancreas divisum (PD). PD has been found in up to 15% of children as a risk factor for those with established acute recurrent pancreatitis (ARP) and chronic pancreatitis (CP), compared to 7% in the general population. Endoscopic therapeutic intervention by endoscopic retrograde cholangiopancreatography (ERCP), specifically minor papilla sphincterotomy, may be of clinical benefit to facilitate improved drainage of pancreatic secretions through a diminutive minor papillary orifice, however, the short and long-term clinical outcomes from such intervention remain unclear. From our single-center pediatric multidisciplinary Pancreas Care Center, we sought to review the clinical outcomes and complications in children with PD following therapeutic ERCP.

Methods: From the study period of February 2012 through December 2018, a retrospective chart review was performed to identify all pediatric patients who underwent an ERCP at Cincinnati Children's Hospital Medical Center with confirmed PD. Pertinent patient, clinical and procedure information was collected. As described by the ASGE guidelines of ERCP-associated adverse events, all procedure-related complications were identified. Those patients who went on to undergo surgical intervention for their pancreatic disease were noted. A subsequent phone survey of the parents/legal guardian was conducted to help determine the clinical impact of the therapeutic ERCP intervention(s) performed. Questions included an inquiry of pancreatitis recurrences that may or may not have required hospital admission, symptoms suggestive of ongoing pancreatitis, and the family's overall impression of the benefit from the ERCP intervention(s) on their child's ARP – resolved/better/worse/unchanged.

Results: During the study period, a total of 58 ERCPs (median 2 procedures per patient, range 1-7) were performed in 28 patients (13 females; mean age: 10 years, range 2-19) with confirmed PD. A genetic mutation in one of the pancreatitis genes was identified in 19/28 (68%) patients (single mutation – 17, double mutation – 2, triple mutation – 1. All patients underwent a minor papilla sphincterotomy. Procedure-related adverse events were limited to post-ERCP pancreatitis, occurring in 21% of the procedures (12/58).

Twenty of 27 (74%) families agreed to participate in the follow-up phone survey; 7 families were unable to be reached and 1 family was not contacted due to the child having recently died due to unrelated causes. No families declined to participate in the phone survey. Median follow-up interval from the first ERCP intervention to completion of the phone survey was 31.5 months (range: 4-72 months). Thirteen of 20 (65%) patients reported clinical improvement from the endoscopic intervention(s) (4 with resolved pancreas symptoms and 9 with better symptoms). Of these 13, only one went on to surgery (total pancreatectomy with islet autotransplantation, TPIAT) due to ongoing significant symptoms despite a reported improvement from ERCP. An additional 5 patients who failed to respond to ERCP went on to undergo a TPIAT due to persistent debilitating symptoms and/or ongoing pancreatitis episodes impacting their quality of life.

Conclusion: Pancreas divisum is a known risk factor for ARP and CP in children. The majority of children in our cohort with confirmed PD were also found to have an additional pancreatitis risk factor of a genetic mutation(s). Based on our follow-up assessment of children with PD after therapeutic ERCP with or without genetic risk factors, the majority of children experienced an improvement or complete resolution of their pancreas-related symptoms without the need for additional intervention or surgery. Some children with PD who fail to adequately respond to ERCP may go on to require surgical intervention.

Therapeutic ERCP for PD appears to lead to a higher rate of PEP, which may reflect the greater level of procedural complexity associated with the aberrant ductal anatomy of PD.

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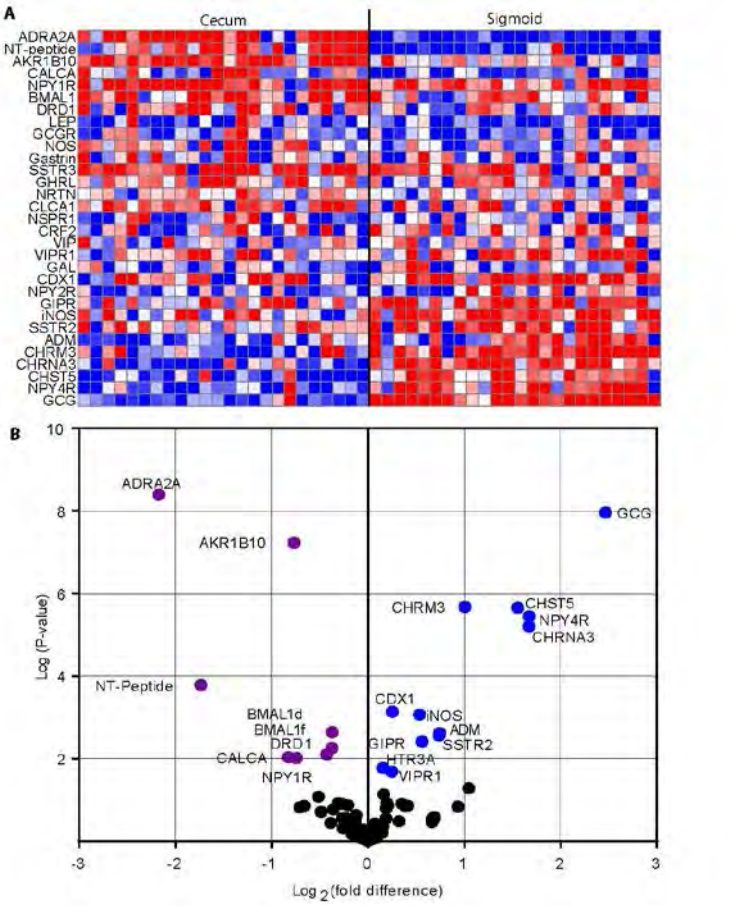
The ability to reliably identify those children with PD who are more likely to respond to therapeutic ERCP requires further investigation. Therapeutic ERCP should be included within the therapeutic algorithm for children with ARP/CP and suspected PD.

Concurrent Session V
Saturday, October 19, 2019
2:00pm – 3:30pm

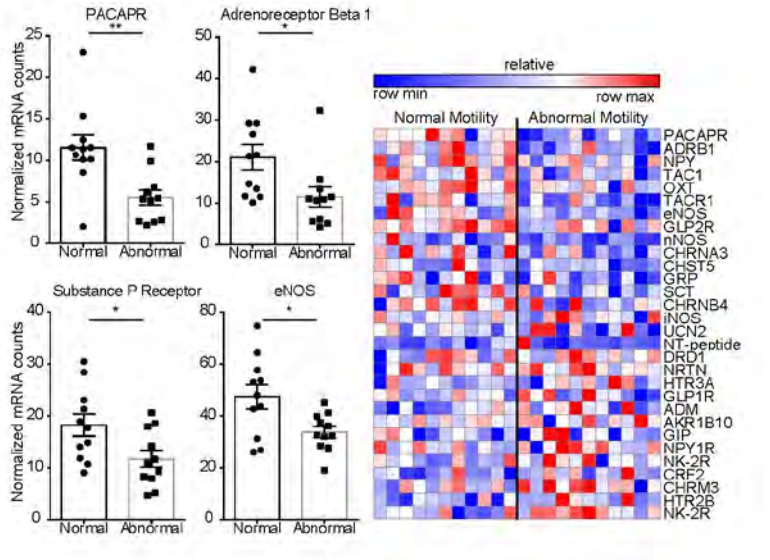
What, when and how of manometry in gastrointestinal motility

665 ***PROSPECTIVE STUDY EVALUATING THE CORRELATION BETWEEN COLON MOTILITY AND THE TISSUE NEUROTRANSMITTER GENE EXPRESSION.*** *Leonel Rodriguez*, *Kitzia Colliard*, *Benjamin Sallis*, *Edda Fiebiger*, *Samuel Nurko. Gastroenterology*, *Children's Hospital Boston*, *Boston*, *MA*
INTROCUCTION: Gastrointestinal motility is characterized by tone, phasic and tonic contractions regulated by complex mechanisms. Understanding those mechanisms is key to establish target therapies for gastrointestinal disorders. **AIMS:** Identify biomarkers associated with colonic motility in children by analyzing gene profiling expression in colonic biopsies from patients undergoing colonic manometry. **METHODS:** Prospective study of pediatric patients undergoing colonic manometry for evaluation of defecation disorders. During the colonoscopy 2 study biopsies were obtained (cecum/sigmoid). Digital mRNA pattern stamps were generated from biopsies using the nCounter® system (Nanostring®) using a panel of 100 target probes (5 internal positive controls, 5 housekeeping genes, and 90 probes for suspected mediators of colonic motility. We compared the gene expression in cecum and sigmoid colon and we also compared the gene expression between normal motility (fully propagated high amplitude propagating contractions -HAPCs-) and abnormal motility (absent or partially propagated HAPCs). Statistical analysis was done using nonparametric Mann-Whitney- u tests and heat maps with GENE-E software. **RESULTS:** A total of 24 pediatric patients (median age 8.9y, 14F) were included in the study. Of those, 12 had normal motility, 9 had partially propagated HAPCs and 3 had colonic inertia (no HAPCs). We found a significantly lower expression of glucagon, caudal type homeobox 1 (CDX1), Neuropeptide Y Receptor Y4, carbohydrate sulfontransferase 5 (CHST5), nitric oxide synthase 2, nicotinic receptor alpha 3 and muscarinic receptor 3 in the cecum compared to sigmoid colon ($p<0.001$) and a significantly higher expression of Neutotensin peptide and adrenoreceptor alpha 2A (ADRA2A) in cecum compared to sigmoid colon ($p<0.001$). See Figure 1. In regards to dysmotility we found a significantly lower expression of the adrenoreceptor pituitary adenylate-cyclase-activating polypeptide receptor (PACAPR), anti-B1-adrenoreceptor (ADRB1), substance P receptor and endothelial NOS in patients with colonic dysmotility, and a significantly lower expression of adrenomedullin, neuropeptide Y receptor Y1 (NPY1R) and tachykinin receptor 2 (NK-2R) in those with normal motility. See Figure 2. **CONCLUSION:** We found a significantly different gene expression of neurotransmitters in cecum compared to sigmoid colon, potentially explaining the different role of each segment. We also found a significant association between the gene expression and the presence and quality of HAPCs in colon. More studies are needed to further evaluate the role of neurotransmitter gene expression in constipation and colonic motility in children.

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Comparison of gene expression between cecum and sigmoid colon. A. Heatmap of gene expression and B. Graphs with log of count fold differences vs. log of p values.



Graphs with normalized mRNA counts and heatmap of neurotransmitters expression between normal and abnormal motility.

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666 ***EARLY-LIFE ADVERSITY RESULTS IN DIFFERENCES IN ENTERIC NERVOUS SYSTEM DEVELOPMENT AND GI MOTILITY.*** *Kimberly Law[1], Andrew Del Colle[1], Moneek Madra[1,2], Narek Israelyan[1,3], Kara Margolis[1]. [1]Pediatrics, Columbia University Medical Center, New York, NY; [2]Institute of Human Nutrition, Columbia University Medical Center, New York, NY; [3]Columbia University Vagelos College of Physician and Surgeons, New York, NY*

Introduction: Irritable bowel syndrome (IBS) is one of the most common gastrointestinal (GI) disorders, both nationally and internationally. The etiologies of IBS are thought to be multifactorial. Early-life stressors, however, are one factor that have repeatedly been demonstrated to be associated with an increased predisposition to IBS development. The preclinical model of maternal separation (MS) has been validated as a model of early-life stress and has been shown to result in similar IBS-like phenotypes as that seen in humans, including intestinal hyperpermeability, visceral hypersensitivity, microbiota dysbiosis, and bile acid malabsorption. Interestingly, early-life stressors (e.g., maternal separation) in preclinical and clinical studies are also associated with psychiatric comorbidities (e.g., anxiety and depression) and changes in central nervous system (CNS) development. These intestinal and behavioral changes are consistent with the hypothesis that there is a brain-gut connection in a subset of patients with IBS. IBS is often also, however, accompanied by dysfunctional motility. We thus sought to determine whether MS results in (1) developmental abnormalities in enteric nervous system (ENS) development and/or (2) functional defects in GI motility. We also sought to determine whether the defects in motility, if they existed, were the direct result of ENS abnormalities or transmitted abnormalities from outside of the ENS (e.g., CNS).

Methods: Wild-type (WT) C57BL/6 mice underwent a validated MS protocol whereby animals were separated from dams for 3 hours per day from DOL3 through DOL12 (MS mice). Control WT C57BL/6 mice were handled for 5 minutes on the same days and reunited immediately with their mothers. At 6-8 weeks of age all mice underwent testing for in vivo total-gastrointestinal-transit (TGIT) time (time for a gavaged non-absorbable red dye to pass into the stool), in vivo colonic motility (time for a 3 millimeter glass bead inserted 2 cm into the colon to be expelled), gastric-emptying (GE) and small intestinal transit (SIT). For GE and SIT, mice gavaged with fluorescent dye were euthanized after 15 minutes and the amount of dye in the stomach and segmented small intestine was measured in a flurometer and calculated as a measure of GE and SIT. Colonic motility was also studied ex-vivo to determine whether defects in colonic motility were due to an abnormal ENS. For these studies, colons were mounted in an organ bath in a physiologic solution and spatiotemporal maps were constructed to determine peristaltic contraction/ colonic motor migrating complex (CMMC) frequency and speed. To evaluate ENS number, whole mount tissue of the myenteric plexus of each mouse were dissected, stained with ANNA-1 (a marker for neurons), and quantified with the computer program, ImageJ.

Results: MS mice possessed a significantly greater number of enteric neurons in the myenteric plexus than the control mice ($p < 0.05$). MS mice did not demonstrate differences in GE and SIT. They did, however, demonstrate significantly faster in vivo TGIT and colonic motility compared to the control group ($p < 0.05$). In contrast, these same MS mice demonstrated significantly slower and less frequent CMMCs than the control mice ($p < 0.05$).

Conclusions: Early-life stress, modeled in a validated MS model, results in abnormalities in ENS development and GI motility. Interestingly, the results of the in vivo and ex vivo colonic motility studies are opposing. These findings suggest that early-life stress results in alterations in ENS development and, further, that innervation external to the gut (e.g., from the CNS) may modulate the in vivo motility changes that result from MS. Future directions for therapy of the GI dysmotility associated with early-life stress may thus involve modulation of CNS function.

Concurrent Session VI
Saturday, October 19, 2019
3:45pm – 5:15pm

Non-invasive markers of hepatic fibrosis

667 ***MRCP SEVERITY PREDICTS DISEASE OUTCOMES IN PEDIATRIC PRIMARY SCLEROSING CHOLANGITIS: A RELIABILITY AND VALIDITY STUDY.*** *Amanda Ricciuto[1], Kedar Patil[2], Alaa Alsharief[2], Jehan Al-Rayahi[2], Afsaneh Amirabadi[2], Peter Church[1], Binita Kamath[1], Mary-Louise Greer[2]*
[1]Gastroenterology, The Hospital for Sick Children, Toronto, ON, Canada; [2]Diagnostic Imaging, The Hospital for Sick Children, Toronto, ON, Canada

Background: Clinical trials in primary sclerosing cholangitis (PSC) are hindered by the lack of surrogate endpoints. Magnetic resonance cholangiopancreatography (MRCP) has not been assessed as a surrogate biomarker in pediatrics. We aimed to determine the inter-rater reliability, prognostic utility and construct validity of the modified Majoie ERCP

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classification applied to MRCP in a pediatric PSC cohort.

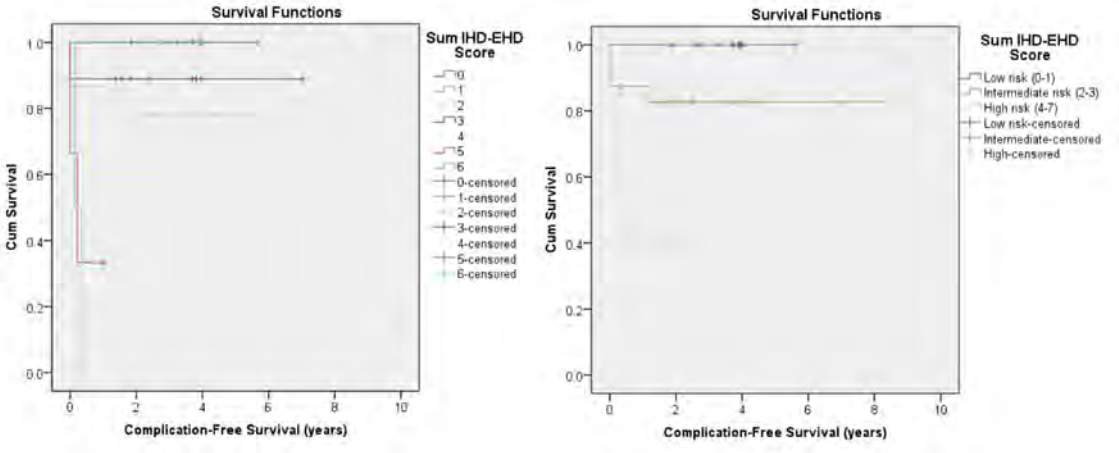
Methods: This single-center retrospective cohort study included children with PSC undergoing MRCP between 2008-2016. Six variations of the Majoie classification were examined, as defined in Table 1: 1) intrahepatic duct score (IHD), 2) extrahepatic duct score (EHD), 3) sum IHD-EHD, 4) average IHD, 5) average EHD, and 6) sum average IHD-EHD. MRCPs were scored by two blinded radiologists with disagreements resolved by a third blinded reader. Inter-rater reliability was assessed using weighted Kappas and intra-class correlation coefficients (ICCs). Ability to predict time to PSC-related complications (ascites, esophageal varices, variceal bleed, liver transplant (LT) or cholangiocarcinoma) (primary outcome) and LT (secondary outcome) was assessed with Harrell c-statistics, and univariate/multivariable survival analysis. Construct validity was further assessed with Spearman correlations.

Results: Forty-five (45) children were included (67% male, median 13.6 years, 89% inflammatory bowel disease). The median follow-up duration was 3.4 years. Ten children (22%) developed a PSC-related complication at a median of 1.1 years and 5 (11%) required at transplant at a median of 3.5 years after PSC diagnosis. The inter-rater reliability of all MRCP scores was substantial to excellent (Kappas/ICCs 0.78-0.82). The sum IHD-EHD had the best predictive ability for time to PSC complication and LT (c-statistics 0.80, standard error (SE) 0.06, and 0.97, SE 0.01). MRCP outperformed fibrosis stage on liver biopsy and most biochemical parameters (including GGT and ALP); total bilirubin performed similarly. Both the original sum IHD-EHD score and a simplified 3-level version (low, intermediate and high risk) were associated with time to PSC-related complications in univariate analysis (Figure 1A and 1B, log-rank p-values 0.004 and 0.001, respectively). Higher MRCP scores were independently associated with a higher rate of PSC-related complications (hazard ratio 2.00, 95% CI 1.32-3.04). MRCP sum scores correlated significantly with METAVIR fibrosis stage, total bilirubin and platelets ($r=0.40$, $r=0.33$, $r=-0.31$, respectively, $p<0.05$).

Conclusion: An MRCP score incorporating the worst affected intra- and extrahepatic regions is reliable and predicts meaningful outcomes in pediatric PSC. Next steps include prospective validation and responsiveness assessment.

Table 1. Variations of the Majoie Classification Examined

Cholangiographic Variation	Definition	Data type (range)
Intrahepatic duct score (IHD)	Modified Majoie classification applied individually to segment 1, 2, 3, 4a, 4b, 5, 6, 7 and 8 of the liver, right intrahepatic duct and left intrahepatic duct, and the **worst** score taken	Ordinal (0-3)
Extrahepatic duct score (EHD)	Modified Majoie classification applied individually to the common hepatic duct and the common bile duct, and the **worst** score taken	Ordinal (0-4)
Sum IHD-EHD	Sum of IHD and EHD	Ordinal (0-7)
Average IHD	Modified Majoie classification applied individually to segment 1, 2, 3, 4a, 4b, 5, 6, 7 and 8 of the liver, right intrahepatic duct and left intrahepatic duct, and the **average** taken	Non-integer (0-3)
Average EHD	Modified Majoie classification applied individually to the common hepatic duct and the common bile duct, and the **average** taken	Non-integer (0-4)
Sum average IHD-EHD	Sum of average IHD and average EHD	Non-integer (0-7)



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Figure 1. (A) Kaplan-Meier curve for time to PSC-related complication by sum IHD-EHD score (overall log-rank p=0.004). (B) Kaplan-Meier curve for time to PSC-related complication by simplified sum IHD-EHD score (overall log-rank p=0.001)

668 ***INTAKE OF DAIRY FAT IS INVERSELY ASSSOCIATED WITH HEPATIC STEATOSIS.*** *Mary Sawh[1,2], Martina Wallace[3], Craig Bross[2], Alexandra Schlein[4], Emma Shapiro[5], Janis Durelle[2], Kimberly P Newton[1,2], Hyeri You[6], Ronghui Xu[6], Jon Gangoiti[7], Bruce Barshop[7,8], Claude Sirlin[4], Christian Metallo[3], Jeffrey Schwimmer[1,2].*
[1]Gastroenterology, Hepatology and Nutrition, Rady Children's Hospital, San Diego, CA; [2]Pediatrics, University of California San Diego, School of Medicine, La Jolla, CA; [3]Bioengineering, University of California, San Diego, La Jolla, CA; [4]Radiology, Liver Imaging Group, University of California San Diego, La Jolla, CA; [5]Boston University, Boston, MA; [6]Altman Clinical and Translational Research Institute, University of California San Diego, La Jolla, CA; [7]Pediatrics, Biochemical Genetics Laboratory, University of California San Diego, School of Medicine, La Jolla, CA; [8]Metabolics and Mitochondrial Medicine, Rady Children's Hospital, San Diego, CA

Background: Nonalcoholic fatty liver disease (NAFLD) is the most common chronic liver disease in children. Although diet is thought to play a key role in the prevention and treatment of NAFLD, there is limited evidence regarding specifics of this relationship. Pediatric gastroenterologists recommend a variety of different dietary interventions to improve NAFLD, many of which overlap with dietary recommendations aimed at treating obesity and metabolic syndrome. One such recommendation from the American Academy of Pediatrics is to decrease total and saturated fat intake by switching from whole fat dairy products to nonfat or low-fat dairy products at the age of two. Recent studies in humans, however have challenged this recommendation by demonstrating improvements in markers of metabolic syndrome associated with increased consumption of dairy fat. Dairy fat is a complex mixture of bioactive fatty acids, including saturated odd chain and branched chain fatty acids. Animal studies have suggested that saturated odd-chain fatty acids and branched-chain fatty acids found in dairy fat such as margaric acid (C17:0) and iso-margaric acid (iso-C17:0) may play a protective role in the development of hepatic steatosis**.** The study hypothesis was that low intake of dairy fat is associated with higher amounts of hepatic steatosis. We sought to evaluate dairy fat intake as an exposure variable for the outcome of hepatic steatosis. Furthermore, we sought to evaluate the relationship between plasma levels of fatty acids and hepatic steatosis.

Methods: We enrolled children ages 8 to 17 years old. Evaluation included clinical history, physical examination, and a standard laboratory evaluation for NAFLD. Serum total fatty acid profiles were measured by gas chromatography/mass spectrometry (GC/MS). Hepatic steatosis was measured by magnetic resonance imaging (MRI) liver proton density fat fraction (PDFF). Dietary intake was measured by a registered dietitian using the Nutrition Data System for Research system to complete 3 individual, 24-hour recalls for each participant. The correlation between total dairy fat intake and MRI liver PDFF was assessed by Spearman's Rank Correlation Coefficient. Linear regression models were used to assess the relationship between plasma fatty acids and MRI liver PDFF.

Results: We studied 247 children with a mean (SD) age of 13.0 (2.7) years. The distribution of BMI percentile was 15% < 85th percentile, 13% 85th - 95th percentile, and 72% > 95th percentile. The median dairy fat intake was 10.5 grams per day (range 0 – 44.5 grams). The median MRI liver PDFF was 4.6% (range 0.9 – 45.1%). The daily intake of dairy fat was inversely correlated with MRI liver PDFF ($r = -0.2$, $p = .002$) and remained significant after controlling for both total fat and total caloric intake ($r = -0.135$, $p = .034$). Iso-margaric acid was inversely correlated with MRI liver PDFF ($r = -0.267$ $p < 0.001$).

Conclusion: In children, the daily intake of dairy fat was negatively correlated with hepatic steatosis and the plasma concentration of a branched chain fatty acid found in dairy fat, iso-margaric acid, was also negatively correlated with hepatic steatosis. These findings are consistent with the study hypothesis and raise the question as to whether dairy fat has a protective effect on hepatic steatosis. At this time, clinical trials are warranted to validate this effect and to better inform dietary recommendations.

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Concurrent Session VI
Saturday, October 19, 2019
3:45pm – 5:15pm

Challenges in IBD

669 ***TREATMENT OF INTESTINAL INFLAMMATION IN A MURINE MODEL WITH EPICUTANEOUS TOLERANCE INDUCTION REQUIRES TGF-β AND IL-10 BUT NOT FOXP3$^+$ TREGS.*** *David Dunkin[1,2], M. Berin[2,4], Virginia Gillespie[3], Hugh Sampson[2,4]. [1]Pediatric Gastroenterology, The Icahn School of Medicine at Mount Sinai, New York, NY; [2]The Mindich Child Health and Development Institute, New York, NY; [3]Center for Comparative Medicine and Surgery, The Icahn School of Medicine at Mount Sinai, New York, NY; [4]Division of Allergy and Immunology, The Icahn School of Medicine at Mount Sinai, New York, NY*

Background: Crohn's disease patients have a defect in the induction of T-regulatory cells (Treg) via the gut. Thus, we previously investigated the ability to induce tolerance and Tregs via the skin and their migration to the gut where they could suppress inflammation. Epicutaneous exposure to OVA induced tolerance and Tregs that migrated to the gut in a TGF-β dependent manner. Epicutaneous tolerance induction abrogated colitis and ileitis via bystander suppression in multiple murine models of IBD.
We sought to determine which Treg subtypes were necessary for this therapy to be effective in the transfer model of colitis.

Methods: Colitis was induced in RAG1$^{-/-}$ mice by the transfer of CD45RB^{HI} T cells from wild type mice. Once the mice lost weight they were given OVA-specific T cells from OTII mice and exposed to Viaskin-OVA or not exposed, followed by gavage feeding of OVA. Weight loss, intestinal inflammatory cytokine production and histology were assessed. To determine whether Foxp3$^+$ Tregs were necessary, Foxp3-DTR mice were immunized with OVA and memory CD4$^+$ T cells were used instead of OTII cells in the above model. Diphtheria toxin (DT) was then given or not prior to each exposure to Viaskin-OVA. To determine whether IL-10 or TGF-β were necessary, IL-10R$^{-/-}$ or TGF-β1$^{-/-}$ mice were immunized with OVA and memory CD4$^+$ T cells were used instead of OTII cells in the above model. Weight loss, colon length, intestinal inflammatory cytokine production and histology were assessed.

Results: Using OTII cells in the transfer model of colitis, epicutaneous OVA-Viaskin exposure prevented weight loss ($p<0.05$), decreased colonic TNF-α, IFN-γ and IL-17 production ($p<0.05$), and abrogated histological colitis ($p<0.05$). Exposure increased Foxp3$^+$ and LAP$^+$ Tregs in the colon lamina propria. When OVA specific T cells were derived from Foxp3-DTR mice and Foxp3$^+$ Tregs were ablated with DT, OVA-Viaskin abrogated colitis to a similar extent as if they were not ablated with DT. However, when OVA-specific T cells were derived from IL-10R$^{-/-}$ or TGF-β1$^{-/-}$ mice, OVA-Viaskin exposure failed to abrogate colitis as evidenced by weight loss, colonic shortening, colonic inflammatory cytokine production and histological colitis similar to that of control mice who were not treated.

Conclusions: Epicutaneous exposure to OVA abrogates colitis via bystander suppression in the transfer model of colitis in the presence of OVA-specific T cells as long as they are able to respond to and produce IL-10 and TGF-β. Epicutaneous tolerance induction has potential as a treatment for Crohn's disease and warrants further study.

670 ***CHARACTERIZATION OF THE FISTULA-ASSOCIATED MICROBIOME IN PEDIATRIC PERIANAL CROHN'S DISEASE.*** *Jessica Breton[1,2], Sarah Rowley[1,2], Ceylan Tanes[2,1], Kelly Kachelries[1], Lisa Mattei[2,1], Kyle Bittinger[2,1], Robert Baldassano[1,2], Peter Mattei[3,2]. [1]Pediatric Gastroenterology, Children's hospital of Philadelphia, Philadelphia, PA; [2]University of Pennsylvania, Philadelphia, PA; [3]Children's hospital of Philadelphia, Philadelphia, PA*

Introduction: The development of perianal abscesses and fistulas are recognized complications of Crohn's disease (CD) which can affect up to 25% of patients and lead to significant morbidity [1]. While the role of the gut microbiota in inflammatory bowel disease (IBD) has been increasingly recognized, its role in fistula development has scarcely been studied [2]. In order to address this knowledge gap, we performed a study characterizing the microbiome signature in children with this CD phenotype.
Methods: This is an ongoing single center prospective observational study including children age 6-18 years with a diagnosis of perianal fistulizing CD. Fecal samples, rectal and perianal fistula swabs were collected. Fecal and rectal swab samples from control children with CD without perianal disease and healthy children were used for comparison. Shotgun metagenomic sequencing was performed.
Results: This analysis included 18 children (5 (22.7%) females, mean age 15.4 ± 3 years) with perianal fistulizing CD and

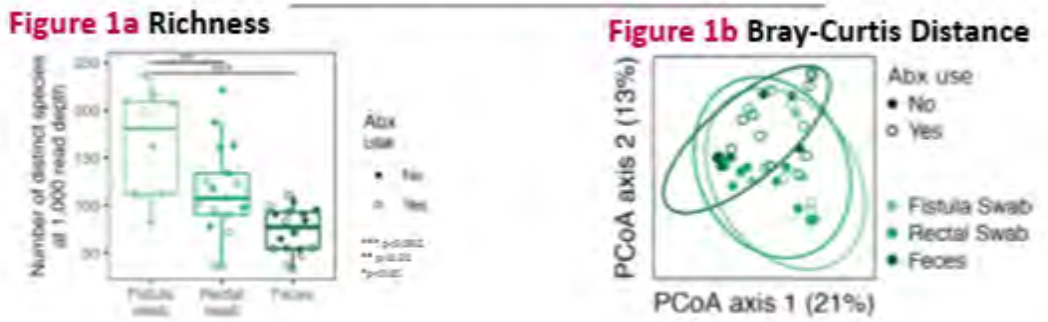
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mean disease duration of 4.1 ± 4.3 years. Controls included 23 children with active inflammatory CD (as defined by a fecal calprotectin >250µg/g) , 13 children with quiescent CD and 41 healthy children. A greater proportion of children in the perianal disease group were on antibiotics at time of sampling (59.1% vs 0%, $P < 0.001$). The fistula-associated microbiome showed an increase richness and alteration in the abundance of several taxa compared to the rectal and fecal-associated microbiome after adjusting for antibiotic use (fig 1). Noticeably, an increase abundance in *Clostridioides difficile* (P=0.04, FDR=0.1) was found in the fistula samples. Mucosal-associated microbiome comparisons between children with and without perianal CD showed a decrease in butyrate-producing bacteria in the fistula and rectal swab samples from children with perianal disease (fig 2). Targeting the terminal genes of the main butyrate producing pathway, we assessed the butyrate-producing potential of complex microbial communities from the fecal metagenomics data. Children with perianal disease exhibited a significant decrease in the genes of the main fermentative gene pathway in the fistula swabs, butyryl-CoA dehydrogenase (P=0.0058, FDR=0.017).

Conclusions: To our knowledge, this is the first study characterizing the fistula-associated microbiome in children with perianal CD. Here, using shotgun metagenomic sequencing, we identified a fistula-associated microbial signature in children with CD characterized by a decrease in butyrate producing bacteria. Further functional characterization of these organisms and their roles in disease pathogenesis will offer unique potential for development of new therapeutic strategies in this refractory disease phenotype.

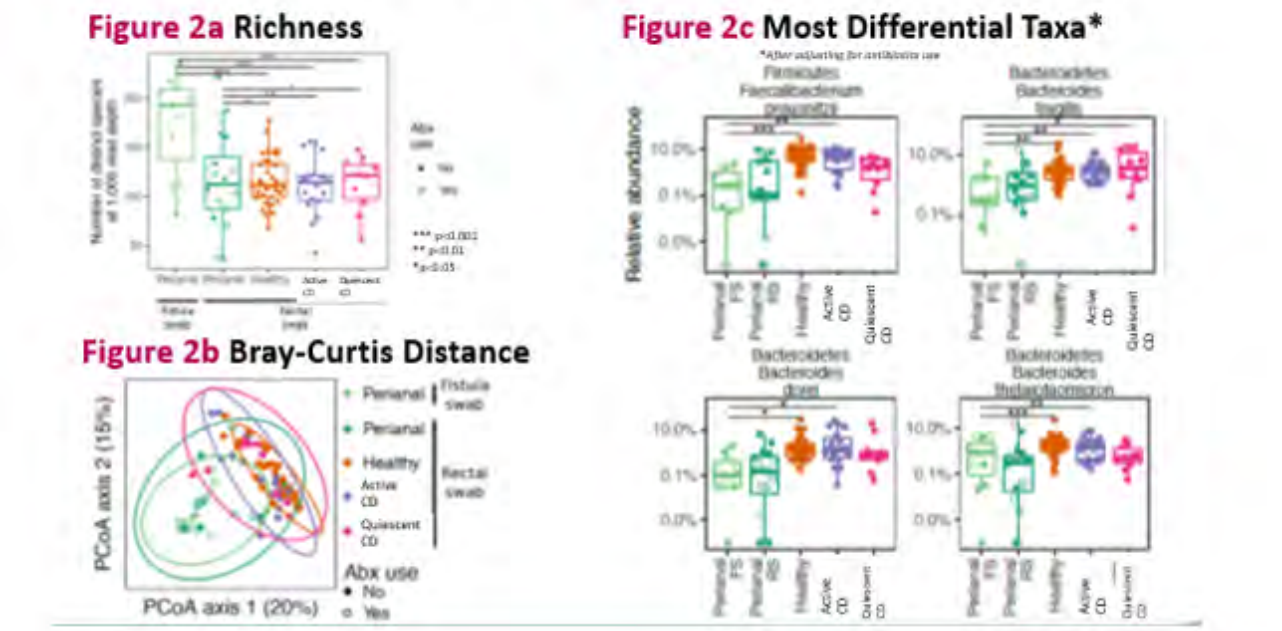
1. de Zoeten, E.F., et al., J Pediatr Gastroenterol Nutr, 2013
2. Siegmund, B., et al J Crohns Colitis, 2016

Figure 1. Microbiome comparison between fistula, rectal swabs and fecal samples



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Figure 2. Microbiome comparison between children with and without perianal CD



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Saturday, October 19, 2019
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Feeding disorders: Multidisciplinary approach

671 ***PHARYNGEAL AND UPPER ESOPHAGEAL SPHINCTER MOTOR DYNAMICS DURING SWALLOW IN CHILDREN.*** *Alisara Damrongmanee[1], Khalil El-Chammas[1], Lin Fei[2], Huaiyu Zang[2], Neha Santucci[1], Ajay Kaul[1].*
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Background: Pharyngeal muscle contraction and upper esophageal sphincter (UES) relaxation play a major role during the pharyngeal phase of swallowing. Motor abnormalities of either could lead to feeding or swallowing problems and aspiration. Pharyngeal and UES motor function have been evaluated by high-resolution esophageal manometry (HREM) in healthy adults and infants with varied results. There are currently no published data on this subject in the pediatric age group.
Objectives: 1) To determine normative values of pharyngeal contraction and UES relaxation pressures during swallow in children 2) To identify potential associated factors that affect these metrics in children, and 3) To compare these metrics between children with normal and abnormal swallowing
Method: We reviewed electronic medical records and HREM of children aged ≤ 18 years and classified them as 'normal' (no history of swallowing problems or UES dysfunction and/or normal videofluoroscopic swallowing study, VFSS) and 'abnormal' (known pharyngeal/UES dysfunction and abnormal VFSS) group. Demographics, indication, comorbidity, mode of feeding, UES metrics (integrated relaxation pressure [IRP], resting pressure [URP], and nadir pressure [UNP]), as well as peak pharyngeal pressure (velopharyngeal and meso-hypopharyngeal), were collected and analyzed.
Results: A total of 142 patients in the normal group and 19 patients in the abnormal group were included in the UES metrics analysis. In the normal group, mean age was 141.40±59.70 months, 41.5% were male, 59.2% had dysphagia (59.2%), and 20.4% were G-tube or GJ-tube fed. In the abnormal group, the patients were younger (mean age was 87.21±71.83 months, p<0.001), 57.9% were male, 94.7% had dysphagia, and more patients were on tube feedings (68.4%, P<0.001). The median and interquartile range [IQR] of UES-IRP 0.2, 0.4, 0.6, 0.8 s, URP and UNP were 1.00 [-2.50, 6.50],

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4.00 [0.00, 9.50], 11.00 [5.00, 16.00], 18.00 [11.00, 25.75], 53.50 [41.25, 72.75] and -1.00 [-5.38, 4.00] mm Hg, respectively in normal group and 10.00 [4.25, 16.75], 13.00 [8.75, 22.50], 21.00 [15.50, 28.50], 25.50 [18.50, 33.75], 47.00 [41.00, 69.50] and 8.00 [3.00, 11.75] mm Hg, respectively in the abnormal group. The UES-IRP 0.2, 0.4, 0.6 s, and UNP were significantly higher in the abnormal group and in patients with GJ-tube feedings.
Pharyngeal metrics were analyzed in those patients who had the entire pharyngeal region included in the manometry tracing and included 58 patients (of the total 142) in the normal group and 10 patients (of the total 19) in the abnormal group. Patients in the normal group were older than those in the abnormal group (mean age: 123.43±54.54 and 58.40±49.77 months, p=0.001) and there were fewer patients who were on tube feedings (25.9% and 70%, p=0.016). In the normal group, 46.6% were male and 62.2% had dysphagia while 70% were male and 90% had dysphagia in the abnormal group. The median [IQR] of peak velopharyngeal and meso-hypopharyngeal pressures were 210.50 [161.00, 298.25] and 144.75 [119.50, 209.50] mmHg in the normal group and 188.50 [100.12, 247.88] and 110.00 [74.38, 120.12] mmHg in the abnormal group. The peak meso-hypopharyngeal pressure tended to be lower in the abnormal group (p=0.065).
Conclusion: This is the largest study reporting UES metrics and pharyngeal pressure changes during swallow in children. Comparing our results with those reported in healthy neonates and adults, UES-IRP values in our normal children were lower than those reported in healthy adults (no data in neonates), URP values were higher than preterm infants but lower than adults, and UNP values were lower than neonates but similar to adults. The peak pharyngeal pressures were higher than those reported for neonates and adults. Our data indicate that there are differences in the motor dynamics of swallowing from the newborn period to adulthood and this may reflect a developmental or maturational process. Pediatric patients with abnormal VFSS or those on GJ-tube feedings had significantly higher UES-IRP and UNP than the normative values which may help explain the pathophysiology of their symptoms. We plan to use our normative data to enhance the interpretation of high-resolution pharyngeal manometry and help guide management, in children presenting with dysphagia or feeding disorders.

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