that we have had access to in order to constitute our reference corpus

« UNE ZONE INFLAMMATOIRE *SÉQUELLAIRE* D'OESOPHAGITE PEPTIQUE »: FUNCTIONAL ANALYSIS OF THE EXPRESSION OF CAUSE/EFFECT PATTERNS IN MEDICAL RECORDS

Agathe PIERSON[1] Louise-Amélie COUGNON[2]

(1) PhD Student (FSR), CENTAL, IL&C, UCLouvain (2) FNRS Post-doc, CENTAL, IL&C, UCLouvain

INTRODUCTION

- The medical language is admitted as a *sublanguage* :
  "Certain proper subsets of the sentences of a language may be closed under some or all of the operations defined in the language, and thus constitute a sublanguage of it" (Harris 1971).

Sublanguage:
- Circumscribed subject area
- Common vocabulary
- Common habits of word usage

(Hirschman & Sager 1982)

→ Restrictions at the **syntactic**, **lexical** and **semantic** levels

- *Causality* is a phenomenon that reachs all these linguistic levels (Nazarenko 2002).
- *Causality* is everywhere in language because it helps to (Gross 2009):
  - dispel uncertainties
  - understand links between various events or states
  - structure the universe around us.

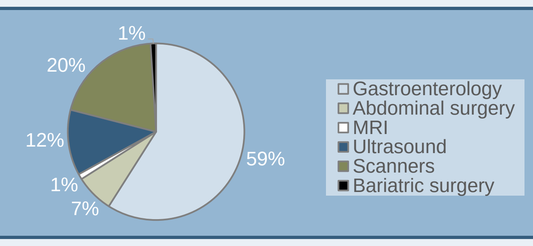
→ To consider causal expressions in medical language enables to enhance patient's safety, to take medical decisions and to improve the quality of provided care.

RESEARCH QUESTIONS

1. Are there **special features** relating to the use of causal expressions in medical language?
2. Are there **contextual factors** that have an influence on the use of a particular type of causal expression in written medical language?
3. Which **function** does each type of causal expression correspond to, according to these factors, in medical language?

CORPUS: iMediate corpus

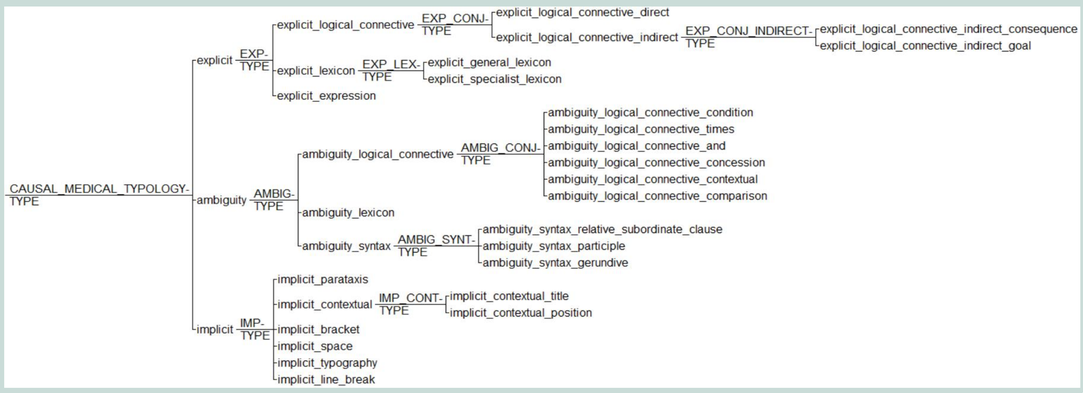
- 226,106 anonymised medical texts divided into 1,000 patient's medical files between 1996 and 2014
  → 88 million words
- Collected in six services of a Brussels hospital (gastroenterology, abdominal surgery, bariatric surgery, MRI, ultrasound and scanners)
- Gathering different sub-genres of medical texts (Patient Discharge Summary, Radiology Reports, etc.)



METHODOLOGY – SIX-STEP APPROACH

STEP 1

Exploratory analysis to set up our causal typology



STEP 2

Creation of a French reference corpus

on the basis of the composition of the CRFC (Siepmann, Bürgel & Diwersy 2016)

Informal spoken	Spoken
Stage plays and film scripts	Pseudo-spoken
Film and daily soap subtitles	
Text messages	
Discussion forums (Doctissimo)	
Formal oral (speeches, news)	Pseudo-written
Academic texts	Written
Non-academic texts	
Prose fiction	
Diaries and blogs	
Newspapers	

1 million words for each componant

↓

Sum: 11 million words

STEP 3

Comparison between medical professional language and general language

Manual annotation of one sample of both corpora (WebAnno 2014)

	Number of words	WebAnno	Edited by R
iMediate corpus	2,773	0.96	0.69
Complete reference corpus (CRC)	62,522	0.97	0.7
Reference corpus for (pseudo-)written language (RCWL)	25,413	0.98	0.74

Intra-annotator agreement

	General categories of causal expressions	Precise categories of causal expressions
iMediate corpus / CRC	χ^2 = 67.880 (p = 0.001) Cramer's V = **0.141** (p = 0.001)	χ^2 = 934.190 (p = 0.001) Cramer's V = **0.523** (p = 0.001)

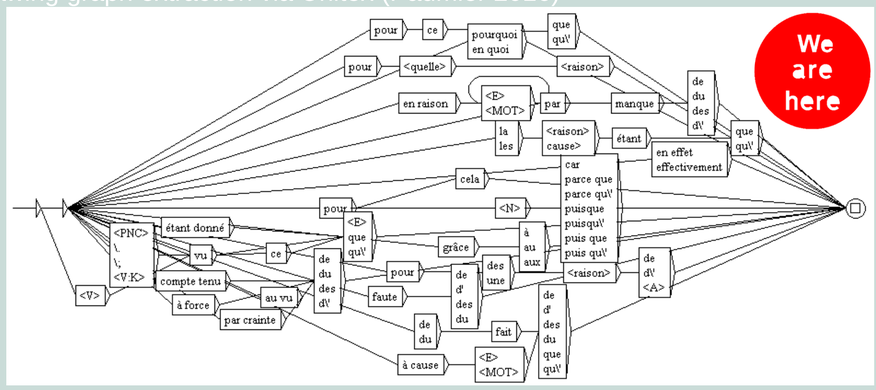
Chi-squared and Cramer's V between iMediate corpus and complete French reference corpus

	General categories of causal expressions	Precise categories of causal expressions
iMediate corpus / RCWL	χ^2 = 84.869 (p = 0.001) Cramer's V = **0.257** (p = 0.001)	χ^2 = 259.958 (p = 0.001) Cramer's V = **0.450** (p = 0.001)

Chi-squared and Cramer's V between iMediate corpus and French written reference corpus

STEP 4

Drawing graph extraction via Unitex (Paumier 2016)



Example of graph extraction of direct causal marker

STEP 5

Determine whether the 12 cpntextual factors that we consider have an impact on the types of causal expressions produced

Factor related to the medical staff
- *Prescriber's gender*

Factors related to the patient
- *Number of documents*
- *Age's patient*

Factors related to the disease
- *Type of disease*
- *Seriousness of the disease*
- *Temporality of the disease*

Factors related to the document
- *Sub-genre of the text*
- *Date of writing*
- *Place of writing*
- *Service*
- *Length of the text*

→ Test statistic between these contextual variables and the variable 'causal expression extracted'

STEP 6

Identification of the relevant factors and attemp to identify hypotetical functions for each type of causal expression depending on the context

	Categories of Explicit causal expressions
Services	χ^2 = 2473.022 (p = 0.001) Cramer's V = 0.169 (p = 0.001)

Test statistic for the variables Services and Explicit causal expressions

→ Conclusion: The variable « Services » is relevant but only 3% of the variance in type of explicit causal expressions may be explained as a result of the services from which come the files.

How to determine hypothetical functions?
- Look deeper at the results of the extractions of all causal expressions
- Try to notice anomalous uses from which we could venture hypothesis
- xxxxxxxxxxxx

CONCLUSION & PROSPECTS

Question research 1: Over: There are special features relating to the use of causal expressions in medical language → the variable "Type of corpus" explains 20% of the variability of the use of causal expressions (at the micro level)
→ This supports the requirement of a linguistic study of causal expressions in French medical language.

Question research 2: In progress: Require the awareness of methods of disambiguation and incorporation of implicit causal (October 2017)

Question research 3: In progress: Require graphs that extract all types of causal expressions (November 2017)
→ This will allow us to identify global functions (and no partial ones) in order to have a global insight of the functioning of the causal expression in French medical language

→ So as to confirm our hypothesis: field survey with a questionnaire (LimeSurvey) submitted to 150 physicians (Janvier 2018)

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CONTACT

agathe.pierson@uclouvain.be
Faculté de philosophie, arts et lettres FIAL
Centre de Traitement Automatique du Langage (CENTAL)
Place Blaise Pascal 1/L3.03.12 B-1348 Louvain-la-Neuve (Belgium)
Tel. 32(0)10 47 37 77

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