

# Translating Medical Dialogues into Pictographs: An Approach Using UMLS

Johanna GERLACH<sup>a,1</sup>, Pierrette BOUILLON<sup>a</sup>, Magali NORRÉ<sup>a,b</sup> and  
Hervé SPECHBACH<sup>c</sup>

<sup>a</sup>*FTI/TIM, University of Geneva, Geneva, Switzerland*

<sup>b</sup>*CENTAL, ILC, Catholic University of Louvain, Louvain-la-Neuve, Belgium*

<sup>c</sup>*HUG, Geneva University Hospitals, Geneva, Switzerland*

**Abstract.** This paper describes a first attempt to map UMLS concepts to pictographs as a resource for translation systems for the medical domain. An evaluation of pictographs from two freely available sets shows that for many concepts no pictograph could be found and that word-based lookup is inadequate for this task.

**Keywords.** Pictographs, medical communication, umls

## 1. Introduction

Including pictographs in medical communication has been shown to improve patient comprehension [1]. Different systems exist to map text into pictographs, e.g., PictoBert, a general domain word-sense language representation model that predicts pictographs using WordNet and the ARASAAC pictograph database. In the context of the PROPICTO project, we are developing PictoDr, a translation system for French medical dialogues. Instead of a word-based approach, where homographs and medical multiword expressions would lead to errors, we chose a concept-based approach. PictoDr proceeds in two steps: 1. translating spoken utterances into a UMLS gloss (sequence of Unified Medical Language System (UMLS) concepts [2]) using a neural classification approach [3], and 2. mapping these concepts to pictographs. In this paper, we describe the creation of resources for this second step, using pictographs from ARASAAC and SantéBD<sup>2</sup>.

## 2. Methods

The UMLS concepts were extracted from the PictoDr training data which consist of 10k diagnostic questions and medical instructions, each linked to many French variations and a UMLS gloss. The resulting 1656 unique concepts were mapped to pictographs, based on associated words for ARASAAC and on filenames for SantéBD, resulting in 1182 concepts with between 1 and 54 pictograph candidates each, for a total of 3655 pictographs. Three doctors evaluated the usefulness of these pictographs in the context of the PictoDr sentences, rating them on a five-point scale from “useful” to “useless”.

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<sup>1</sup> Corresponding Author: Johanna Gerlach, E-mail: johanna.gerlach@unige.ch

<sup>2</sup> <https://arasaac.org/> and <https://santebd.org/>

3. Results

Of the 3655 included pictographs, 983 were found to be useful representations of the UMLS concept by at least 2 of the 3 evaluators. Table 1 shows the concepts grouped by UMLS semantic type with the number of concepts for which one or more of the pictographs was rated useful. Physical objects (e.g. medical devices, anatomical structures and substances) were the most successful with 79% obtaining an illustration, followed by activities (e.g. diagnostic procedures) with 74%. Conceptual entities (e.g. findings, signs and symptoms, qualitative concepts), which represent more than half of the studied concepts, as well as phenomena or processes (e.g. diseases) were less successful with only 60% finding a useful illustration. Overall 2/3 of the included concepts obtained one or more useful pictographs (ARASAAC and/or SantéBD).

Table 1. Concepts with pictographs found useful by at least 2 doctors, grouped by UMLS semantic type.

| Semantic type              | Concepts | # with at least 1 useful pictograph | %   |
|----------------------------|----------|-------------------------------------|-----|
| (A1) Physical Object       | 208      | 164                                 | 79% |
| (A2) Conceptual Entity     | 647      | 391                                 | 60% |
| (B1) Activity              | 158      | 117                                 | 74% |
| (B2) Phenomenon or Process | 144      | 88                                  | 61% |
| other (not UMLS)           | 25       | 15                                  | 60% |
| Total                      | 1182     | 775                                 | 66% |

4. Discussion and Conclusions

Close to three quarters of the PictoDr concepts obtained at least one pictograph candidate. However, in the case of SantéBD, identifying candidates based on filenames which were not designed for this task led to many potentially useful images being skipped.

Among the candidates, pictographs were rejected for different reasons. Some were marked as too specific, i.e., including more information than the concept, for example a wound on a specific body part rather than a wound alone for the concept “Injury wounds”, thus making them unsuitable for generic use in a sequential representation as proposed in PictoDr. Initial comprehensibility evaluations have shown that such pictographs can be confusing depending on the context. Others were rejected because they were mapped incorrectly due to ambiguous pictograph filenames, e.g. “strong” which in the general domain could be illustrated with a physically strong person, but is not appropriate in the context of “strong pain”.

References

[1] Houts PS, Doak CC, Doak LG, Loscalzo MJ. The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling*. 2006; 61(2):173–190.

[2] Bodenreider O. The Unified Medical Language System (UMLS): integrating biomedical terminology. *Nucleic Acids Res*. 2004 Jan 1;32(Database issue):D267-70. doi: 10.1093/nar/gkh061.

[3] Mutal J, Bouillon, P, Norré M, Gerlach J, Ormaechea Grijalba, L. A Neural Machine Translation Approach to Translate Text to Pictographs in a Medical Speech Translation System - The BabelDr Use Case, *Proceedings of AMTA*, 2022.