

Using Natural Language Processing to Automatically Identify Wound Information in Narrative Clinical Notes: Application Development and Testing.



Maxim Topaz RN, PhD^{1,2}, Dawn Dowding RN, PhD^{3,4}, Victor J. Lei BA¹, Anna Zisberg RN, PhD⁵, Kathryn H. Bowles RN, PhD^{2,6}, Li Zhou MD, PhD^{1,1}



THIS study developed and validated one of the first automated natural language processing (NLP) applications to extract wound information (wound type, pressure ulcer stage, wound size, anatomic location, and wound treatment) from free text clinical notes.

Methods: First, two human annotators manually reviewed a purposeful training sample (n=360) and random test sample (n=1,100) of clinical notes (including 50% discharge summaries and 50% outpatient notes, including homecare notes), identified wound cases, and created a gold standard dataset. We then trained and tested our NLP system (known as MTERMS) to process the wound information. Finally, we assessed our automated approach by comparing system-generated findings against the gold standard. We also compared the prevalence of wound cases identified from free-text data with coded diagnoses in the structured data.

Results: The testing dataset included 101 notes (9.2%) with wound information. The overall system performance was good (F-measure =92.7%), with best results for wound treatment (F-measure =95.7%) and poorest results for wound size (F-measure =81.9%). Only 46.5% of wound notes had a structured code for a wound diagnosis.

Conclusion: The NLP system achieved good performance on a subset of randomly selected discharge summaries and outpatient notes. In more than half of the wound notes, there were no coded wound diagnoses, a fact that highlights the significance of using NLP to enrich clinical decision making. Our future steps will include expansion of the application's information coverage to other relevant wound factors and validation of the model with external data. We are also conducting a validation and further system development with homecare notes from the Visiting Nurse Services of New-York and will share the results at the H3IT conference.

¹Brigham and Women's Hospital, Boston, MA, USA

²Harvard Medical School, Boston, MA, USA

³Visiting Nurse Service of New York, NY, USA

⁴School of Nursing, Columbia University, NY, USA

⁵The Cheryl Spencer Department of Nursing, Haifa University, Israel

⁶School of Nursing, University of Pennsylvania, PA, USA