HospSum: Integrating physician discharge notes with coded nursing care data to generate patient-centric summaries

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Abstract

To improve patient engagement, EHR data needs to be organized and presented in a coherent summary understandable to the patient. Focusing on inpatient hospital stays, we are developing a system combining physician discharge notes and nurse plans of care into a comprehensive narrative using patient accessible language.

Introduction

Every year, 7.9% of the US population is hospitalized, and up to two thirds of hospitalizations are due to an exacerbation of chronic health conditions. The acute inpatient stay is an opportunity to engage the patients in their care, which in turn requires them to understand what happened in the hospital. Access to the physician discharge notes in the Electronic Health Record (EHR) is not sufficient. Discharge notes only capture physician assessment and care. Nurses provide continuity of care during a hospitalization, which is described in nurses' plans of care. To provide the patient with a full understanding of their hospitalization, both sources of information are necessary.

Methods

Our goal is to generate a lay-language, patient-centric summary of a hospital stay that integrates events described in the discharge notes and the nursing notes. Discharge notes are available as free text, and we process them through MedLEE[1], a medical information extraction system, to produce a semi-structured collection of Concept Unique Identifiers (CUIs) from the Unified Medical Language System (UMLS[2]) metathesaurus. The nursing notes come from HANDS[3], an application for managing nurses' plans of care, organized by diagnoses with related interventions and outcomes. Each code is tagged with the appropriate nursing terminology source (NANDA, NIC, NOC). Since these sources are part of the UMLS metathesaurus, nursing codes are mapped to UMLS CUIs. The concept relation network in UMLS is used to identify connections between the concepts between physicians and nurses.

Results and Conclusions

In the exploratory phase of the project, we have processed information for a small number of hospital stays.

Pt	Doctor	Nurse	Overlap	Dist. 1	Dist. 2	Pt	Doctor	Nurse	Overlap	Dist. 1	Dist. 2
1	65	19	0	0	2	3	50	21	0	3	15
2	152	22	0	6	37	4	168	19	0	4	25

The table shows the number of concepts occurring in the doctor and nurse notes, the number of concepts in common, and the number of doctor concepts that find a corresponding nurse concept at distance 1 or 2 in the UMLS concept relation graph. We found that there is limited overlap between the physician and nursing documentation, which confirms our hypothesis that both are required to produce a comprehensive summary. Moving into the next phase, we face a number of challenges: selecting the right concepts to include in the summary, organizing them into a logical sequence, and generating a coherent English narration. Our goal will require us to advance the state of Natural Language Generation technologies[4] as applied in the field of medical informatics.

References

[1] C. Friedman, L. Shagina, Y. Lussier, and G. Hripcsak. Automated encoding of clinical documents based on natural language processing. Journal of the American Medical Informatics Association, 11(5):392, 2004.
[2] Lindberg DA, Humphreys BL, McCray AT. The Unified Medical Language System. Methods of Information in Medicine. 1993;32:281–91.
[3] G.M. Keenan, D. Tschannen, and M.L. Wesley. Standardized Nursing Terminologies Can Transform Practice. Journal of Nursing Administration, 38(3):103, 2008.
[4] S. Tata, B. Di Eugenio. SongRecommend: From summarization to recommendation. *Natural Language Engineering.* Available on Cambridge Journals Online, FirstView Article, pp 1-39, September 2012.