Using Natural Language Processing to identify Goals of Care Discussions in the Medical Intensive Care Unit

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Background

- Goals-of-care (GOC) discussions are an important aspect of care for patients and an valuable quality metric in palliative care.
- Traditional approaches to extracting goals-of-care discussion data from the electronic medical record (EHR) are labor and time-intensive.
- Natural language processing (NLP) combined with machine learning (ML) represents a novel expedient approach to identifying the presence of documented GOC discussions in the EHR.

Methods

- NLP combined with ML algorithms were trained on a retrospective sample of clinical notes from inpatient with serious illness at University of Washington affiliate hospitals and clinics.
- Three NLP algorithms (Bag of Words, Rules, and Hybrid) were trained, tested, and then validated to evaluate per-patient test performance on a sample of 150 patients.

Results

	Per-patient performance % (binomial 95CI)			
Algorithm	Sensitivity	Specificity	PPV	NPV
Bag of Words	75.0 (56.6-88.5)	93.2 (87.1-97.0)	75.0 (56.6-88.5)	93.2 (87.1-97.0)
Hybrid	84.4 (67.2-94.7)	86.4 (78.9-92.0)	62.8 (46.7-77.0)	95.3 (89.4-98.5)
Rules	93.8 (79.2-99.2)	57.6 (48.2-66.7)	37.5 (26.9-49.0)	97.1 (90.1-99.7)

- The bag of words algorithm uses NLP to encode text from notes into numerical representation. This numerical data is then used as an input into an ML algorithm to determine the probability of a given patient's chart containing a GOC discussion.
- The Rules algorithm uses rules input by humans who have reviewed and coded sample notes with and without GOC discussions.
- The Hybrid algorithm is a combination of the two above algorithms.

Future Plans

- Apply the Hybrid NLP algorithm to EHR notes from a study population of critically ill hospitalized adult patients (>/= age 18) with at least one chronic, life-limiting illness, during their first hospitalization in the medical ICU between 2016 and 2019.
- Use ML to identify the probability of whether or not a documented GOC discussion appeared in the EHR notes of the study population patients.
- Identify predictors of the presence of a GOC discussion in study population patients.

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