Reference Standard Development to Train Natural Language Processing Algorithms to Detect Problematic Buprenorphine-Naloxone Therapy

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BACKGROUND

- In July 2016, the Department of Veterans Affairs (VA) Pharmacy Benefits Management (PBM) began receiving complaints regarding a new formulary buprenorphine with naloxone (BUP/NAL) product.
- To investigate, PBM took multiple actions such as monitoring VA adverse drug event report (ADERS) requests via monthly reviews and database driven rapid cycle evaluations.
- Additionally, PBM dedicated resources to train natural language processing (NLP) tools to automate the detection of problematic BUP/NAL therapy in medical notes.

OBJECTIVE

- To develop a reference standard to train and validate NLP algorithms designed to identify problems with BUP/NAL formulations that include inadequate response to therapy, formulation and consumption difficulties, and clinician prompts to change the medication.

METHODS

- To build the reference standard (RS), 2,570 medical notes were selected from patients who switched from a formulary BUP/NAL product to a non-formulary alternative between 4/1/2016 and 1/31/2017.
- Medical note annotation was conducted in three phases: annotation guideline development, training & annotation guideline revision, and formal annotation with adjudication to produce the reference standard.
- During phase 1, six classes were defined to identify problems with BUP/NAL therapy, and one class was used to record evidence of effective therapy.
- During phase 2, four pharmacists annotated the same 150 notes and provided feedback during adjudication to refine the annotation guidelines.
- During phase 3, the pharmacist annotators were placed into pairs in order to annotate overlapping notes.
- One pharmacist then adjudicated batches in phase 3, to create a single record to be used for NLP.

FIGURE 1. ANNOTATION METHODOLOGY

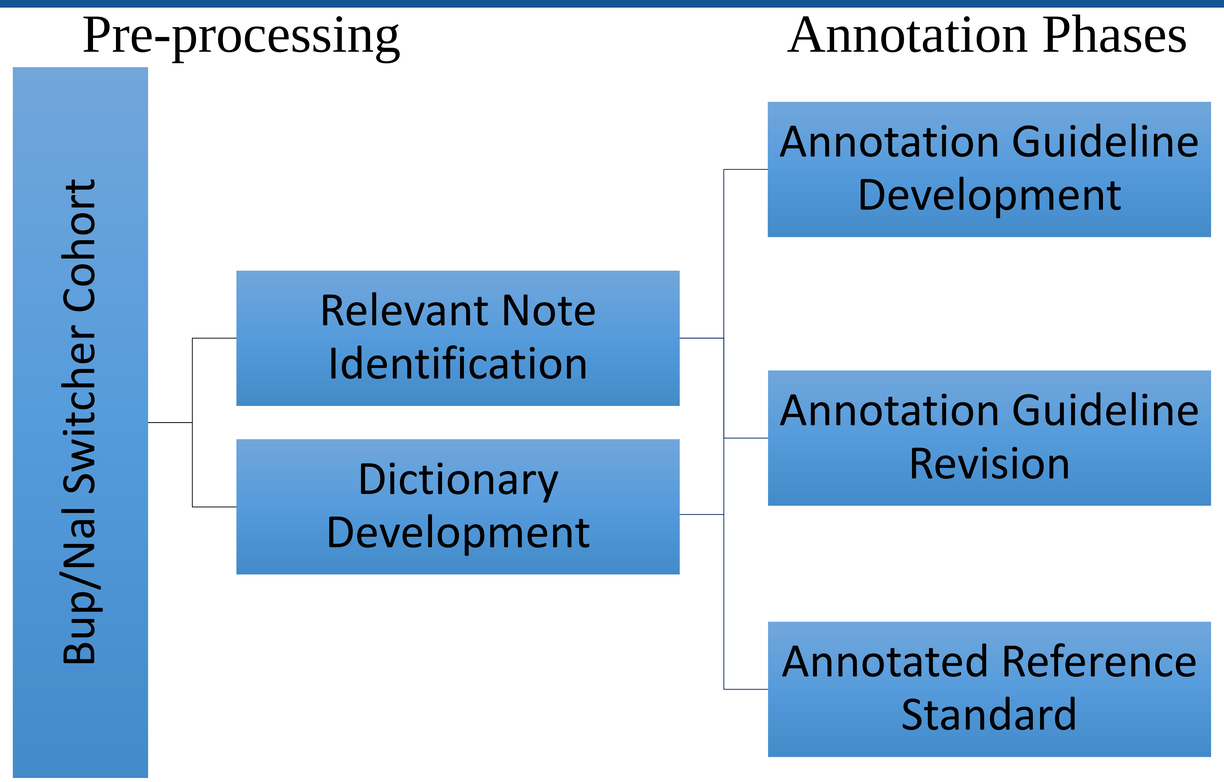
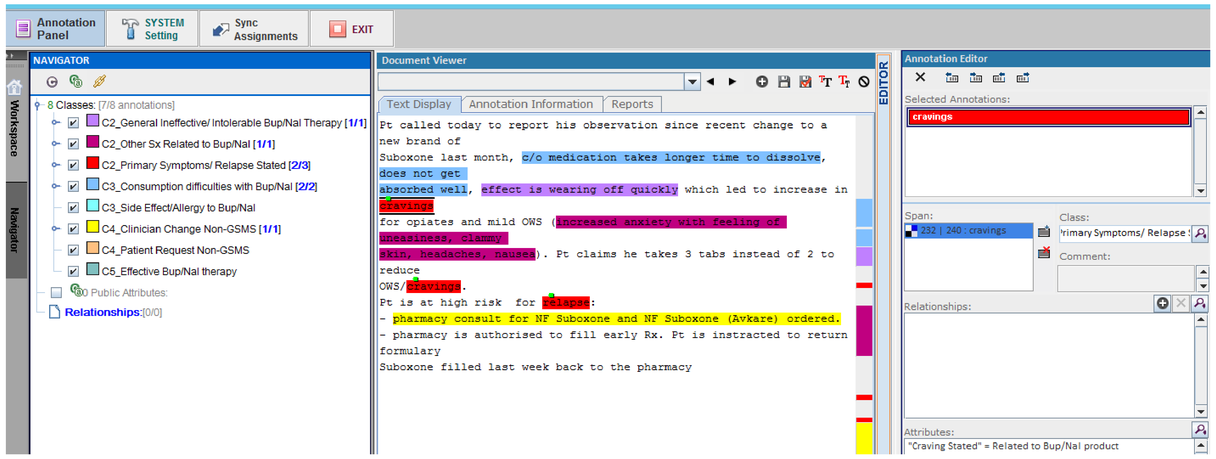


FIGURE 2. ANNOTATION EXAMPLES



RESULTS

Annotation Class	Mention Frequency	Percent of Total Mentions
General Ineffective/ Intolerable Bup/Nal Therapy	242	19%
Other Symptom Related to Bup/Nal	122	10%
Primary Symptoms/ Relapse Stated	344	28%
Consumption Difficulties with Bup/Nal	83	7%
Side Effect/Allergy to Bup/Nal	127	10%
Clinician Change Non-Formulary	332	27%
Total Mentions Identified	1250	-

DISCUSSION

- Development of a NLP reference standard is a labor-intensive task that requires identification of a relevant patient population using structured data, development of clinically relevant and project specific annotation guidelines, document selection for concept-relevant notes, annotation of a corpus of unstructured medical notes, and adjudication of notes for consistency and guideline adherence among batches.

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