The match: associating e-prescribed medications with diagnosed indications in the EHR using a medication-indication matching resource

Taylor Woodroof, Pharm.D.; Wing Liu, Pharm.D.; Scott D. Nelson, Pharm.D. M.S.
Vanderbilt University Medical Center, Nashville, TN

Purpose:

Patient data in electronic health records (EHRs) is highly related, despite current disparate documentation, storage, and display. The use of separate lists for medications and diagnoses is one such example; therefore, the association between medications and indications often eludes common practice but is critical for the medication reconciliation and medication therapy management. The objective of this study was to describe the number of electronically prescribed medications with a probable match to a diagnosed indication on the patient’s problem list, as well as the number of diagnosed indications on the patient’s problem list with a probable electronic prescription medication match.

Methods:

We did a retrospective health record review at Vanderbilt University Medical Center of a de-identified dataset of medications e-prescribed from 1/1/2015 to 6/30/2015, along with their respective patient problem lists. To be included, patients had to have ≥2 visits in the past year, and ≥1 e-prescribed medication within the study period.

We used MEDI (MEDication Indication) to link medications and possible indications. MEDI is an open-source dataset which integrates medication indication information from four public medication resources—RxNorm, Side Effect Resource (SIDER), MedlinePlus, and Wikipedia. The MEDI High Precision Subset (HPS) is a smaller set of medication-indication pairs found either within RxNorm, or at least two of the other three resources.

We mapped medications from First Databank codes to RxNorm generic drug ingredient names (RxCUI IN term type). Prescriptions were excluded if they contained multiple ingredients or could not be mapped to RxCUIs. Diagnoses from problem lists were mapped from SNOMED CT terms to ICD-9 codes in order to match with MEDI. We then linked every patient’s electronic prescriptions and problem list diagnoses using MEDI (MEDI_01212013) and MEDI-HPS (MEDI_01212013_HPS) relationships. We randomly selected 30 patients for an independent manual review by two pharmacists to match clinically probable medication-indication pairs and establish a gold standard for comparison. We compared results from the MEDI matching against the gold standard and calculated precision, recall, and descriptive statistics.

Results:
There were 62,191 patients included in the study with 270,045 electronic prescriptions within the study period and 424,989 diagnoses documented in their EHR problem lists. Using MEDI, 61.3% of electronic prescriptions had a diagnosed indication match in the problem lists, while 37.3% of diagnoses had an electronic prescription medication match. Using MEDI-HPS, 37.5% of electronic prescriptions had an indication match, whereas 21.2% of diagnoses had an electronic prescription match. MEDI demonstrated a precision of 47.0% for prescription matching and 51.1% for diagnosis matching. Precision for prescription matching utilizing MEDI-HPS was 79.2%, and 68.9% for diagnosis matching. Recall for MEDI prescription matching was 57.4% and 58.8% for diagnoses matching, and 95.5% for prescriptions and 94.0% for diagnoses using MEDI-HPS. MEDI and MEDI-HPS matches occurred for 61% (n=47,892) and 36.8% (n=28,735) of the top 20 most e-prescribed medications, respectively. MEDI matches occurred for 47.9% (n=60,366) of the top 20 most documented diagnoses on a patient’s problem list. MEDI-HPS matches occurred for 32.9% (n= 41,434).

Conclusions:

MEDI-HPS, which demonstrated a high level of precision in this and previous studies, found low medication-to-indication matching. This suggests that medication indications are infrequently documented on the problem list, and that not all potential indications on the problem list are treated using medications. Further research is recommended to explore medications and indications that did not match, particularly high-risk medications, and determine if MEDI-HPS can be refined to reach an even higher precision. Electronic prescribing, medication reconciliation, and diagnoses documentation applications within EHR could incorporate matching resources to infer medication-indication relationships and facilitate thorough documentation before and during transitions of care.

References