Electronic Medication Management

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Summary: When patients transfer to new health care settings, there is an increased risk of medication errors due to incomplete or inaccurate medication information. These discrepancies can be harmful. To decrease such errors, policymakers such as the Joint Commission have focused on improving the quality of medication list documentation and communication through the process of medication reconciliation. Medication reconciliation employs a systematic approach to comprehensively review all of a patient's medications at each care transition and compare them to what is ordered for the patient in order to identify and resolve medication discrepancies.

In 2008, the New York-Presbyterian (NYP) Healthcare System instituted a structured, electronic process designed to improve medication reconciliation as patients transitioned between ambulatory-to-hospital and hospital-to-ambulatory care settings. Before the adoption of this intervention, pre-admission medications and discharge medications were kept as free-form text in the patient's electronic health record (EHR). After adoption, medications were documented using the Outpatient Medication Profile (OMP), a structured, longitudinal electronic medication list shared across NYP's ambulatory and inpatient EHRs. When a patient was admitted to the hospital, the OMP was updated by verifying existing entries and adding new medications that the patient was taking. A medication reconciliation view was created within the EHR that displayed two columns: 1) the list of the current inpatient medication orders; and 2) the list of outpatient medications from the OMP. From this screen, a provider could identify discrepancies between the lists and update the inpatient orders accordingly. Once finished, the provider attested that medication reconciliation was complete by clicking a checkbox. A medication reconciliation reminder in the inpatient EHR was implemented so that a reminder dialog was displayed when placing orders in the computerized provider order-entry system if attestation of medication reconciliation had not been completed within 6 hours of hospital admission. If the attestation had not been completed by 18 hours after admission to the hospital, a "hard-stop" dialog was displayed and no orders could be placed until attestation was documented.

This study evaluated the effectiveness of the electronic medication reconciliation intervention by comparing outcomes pre- and post-implementation in six community-based primary care clinics and two inpatient facilities.

Specific Aims:

- Assess differences in medication management workflow in two provider cohorts before and after the adoption of electronic medication reconciliation. **(Achieved)**

- Assess differences in the completeness of documented medication lists in two provider cohorts before and after the adoption of electronic medication reconciliation. **(Achieved)**
- Assess differences in the rate of clinically important medication discrepancies in two provider cohorts before and after the adoption of electronic medication reconciliation. **(Achieved)**

2011 Activities: Data were obtained retrospectively from six community-based primary care clinics and two inpatient facilities that adopted the electronic process for medication reconciliation at hospital admission using the OMP. Dr. Vawdrey and the project team examined medication lists in free-text clinical documents to determine the harm potential for missing information about the name, dosage, route, or frequency of a medication. For medication lists that were incomplete, they evaluated the harm potential associated with the missing information. Electronic notes authored over a 2-year period were collected for a random sample of 100 patients who had the following sequence of consecutive clinical encounters: an outpatient visit, an inpatient admission, an inpatient discharge, and a second outpatient visit. Each encounter was expected to generate a note, for a total of four notes per patient.

Each clinical note was reviewed to identify a medication list within the note, and each medication list was categorized as "complete" or "incomplete." Medication lists deemed incomplete were independently reviewed and categorized as "potentially harmful" or "low harm potential" by three experienced physicians. The physician reviewers were instructed to classify each incomplete medication list as "potentially harmful" if, in the opinion of the reviewer, the information missing from the list could lead to a prescribing error. If the missing information could likely be inferred by a practitioner with a similar background, then the medication list was classified as "low harm potential." Inter-rater agreement was calculated; if the three reviewers were not unanimous in their classifications, the classification chosen by a majority of the reviewers was used.

During the compilation of the medication lists for the study, it was observed that many lists contained comments or annotations separate from the dose, route, and frequency information. This observation prompted a secondary qualitative analysis of the medication lists based on a grounded theory approach.

During the year, Dr. Vawdrey and his team continued to disseminate the results of the project, including a presentation, Evaluation of Medication List Completeness, Safety, and Annotations at the 2011 Annual Symposium of the American Medical Informatics Association in October, and a published manuscript, Use of Electronic Clinical Documentation: Time Spent and Team Interactions in the *Journal of the American Medical Informatics Association*.

Dr. Vawdrey used a 1-year no-cost extension to complete the project, which ended in September 2011. Dr. Vawdrey did not submit a report in the AHRQ Research Reporting System during 2011 with a status of activities or project spending.

Impact and Findings: Before the electronic medication reconciliation process was adopted, the average number of medications contained in the OMP for a patient at hospital admission was less than two. One year after adoption, the average number had increased to 4.7. Of 253 medications lists reviewed, 181 lists (72 percent) had at least one medication missing a dose, route, or frequency. Missing information was judged to be potentially harmful in 47 of 253 lists (19 percent).

Before the reminder intervention, the mean duration between hospital admission and attestation of medication reconciliation was 84.5 hours (median= 9.1 hours). After the reminder intervention, the mean duration between hospital admission and attestation of medication reconciliation was 9.2 hours (median=

5.3 hours).

Target Population: Inner City*, Low SES/Low Income*, Medicaid, Medically Underserved, Racial/Ethnic Minorities*: Hispanic

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Knowledge Creation

** This target population is one of AHRQ's priority populations.*