

Electronic Prescribing and Electronic Transmission of Discharge Medication Lists

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Summary: This project consists of three studies that assessed the impact of health information technology (IT) on patient safety in the ambulatory setting. The first was a multi-center pre-post study measuring the impact on medication errors when switching from a locally-developed electronic health record (EHR) with an electronic prescribing (e-prescribing) system to a vendor-based system. The second was a qualitative study of physicians using one-on-one-interviews and direct observation to understand variations in human-computer interactions with this new e-prescribing system, and how user patterns or system features may influence medication errors. The third study used a cohort controlled design to evaluate the effect of electronically transmitting discharge medication lists from the hospital to the ambulatory setting on: 1) medication discrepancies at the first ambulatory visit following discharge; and 2) adverse drug events (ADEs) 30 days post-discharge.

These studies added to the knowledge of medication safety and the impact of health information exchanges on patient safety. In addition, by including a qualitative component on human-computer interactions, this project yielded critical insights as to why certain health IT interventions work while others do not, and how future interventions should be designed to better align themselves with physicians' workflow. The studies also have implications for institutions and practices as they transition from one EHR to another. If error rates vary greatly between systems, there are potential policy implications for more stringent certification criteria of e-prescribing to ensure medication safety.

Specific Aims:

- Measure the effects on medication errors of transitioning from one e-prescribing system to another in the ambulatory setting. **(Achieved)**
- Measure the effects on human-computer interactions of transitioning from one e-prescribing system to another in the ambulatory setting. **(Achieved)**
- Evaluate the impact on medication discrepancies of electronic transmission of medication lists at discharge from the hospital to the ambulatory setting at the first ambulatory visit following discharge. **(Achieved)**
- Evaluate the impact on ADEs 30 days post-discharge of electronic transmission of medication lists at discharge from the hospital to the ambulatory setting. **(Achieved)**

2011 Activities: The first study, measuring the effects on medication errors and data collection when transitioning from one electronic prescribing system to another, was previously completed. For the second study, a qualitative study measuring the effects on human-computer interaction of this same transition, data from two sets of interviews were analyzed and a manuscript was submitted for publication. The third study evaluated the impact on medication discrepancies and ADEs of electronic transmission of medication lists at discharge. An experienced research nurse identified medication errors in the data and ADEs experienced by the patient. All medication errors were reviewed by two experienced physicians who used the tool to rate the severity of the errors and ADEs. Due to delays with data collection, Dr. Kaushal used a 1 year no-cost extension to complete data cleaning and analysis. As last self-reported in the AHRQ Research Reporting System, project progress was on track and project budget spending was on target. This project was completed in August 2011.

Impact and Findings: For the first study, the rates and types of prescribing errors made by physicians were assessed at four time periods: 1) baseline, when physicians were using the locally-developed EHR with minimal clinical decision support for e-prescribing; 2) three-months post-implementation of the commercial EHR with more advanced clinical decision support for e-prescribing; 3) one-year post-implementation; and 4) two-years post-implementation. The research team found that error rates were highest at baseline and lowest at 2 years. Improvements were primarily attributed to reducing inappropriate abbreviation errors. Other error types increased and remained elevated at 1-year post implementation, suggesting that transitioning from a locally-developed to a commercial EHR for e-prescribing can reduce certain errors; however, important safety threats remain. Over time, as users become accustomed to a system and iterative refinements are made, safety may continue to improve. Recognizing the challenges associated with transitions and refining clinical decision support within systems may help maximize safety benefits and allow potential safety threats to be better anticipated and managed.

For the second study, Dr. Kaushal used qualitative techniques to assess providers' perceptions of the two systems. The results again indicated that the transition was difficult for the providers, even though the providers all had experience using computers systems in clinical practice. Providers want systems that improve speed and ease of prescribing. Systems that were complicated were disliked, even when they had more robust clinical decision support. Providers overwhelmingly preferred certain features of the new vendor-based system, including remote access. Over time, providers became more positive in their perceptions about the new system, including its perceived impact on safety. Dr. Kaushal found that perceived system usability and efficiency for order writing were key determinants of provider satisfaction.

For the third study, 162 subjects completed all parts of the study, of which 82 patients were in the intervention arm. Overall, Dr. Kaushal found that medication discrepancies were extremely common. The intervention did not significantly reduce these discrepancies or ADEs for patients in the intervention group. Cardiovascular drugs, gastrointestinal drugs, non-narcotic analgesics, and anti-coagulants were the classes of medications with the highest error rates. The most common type of discrepancy detected was omitted medications. Risk factors for medication errors and ADEs included taking 11 or more medications, having two or more outpatient visits during the previous year, having less than a high school education, and receiving care from an intern as opposed to a senior resident.

Overall, this study underscores the importance and challenges of developing interventions that facilitate medication reconciliation while supporting provider workflow. The results also provide important information on the most common types of medication errors. This information can help providers identify patients who may be at higher risk for medication errors in an effort to reduce their risk of harm from medication discrepancies.

Target Population: Adults

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: Implementation and Use
