

Health Information Technology and Improving Medication Use

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Organization:	Brigham and Women's Hospital
Mechanism:	RFA: HS07-004: Centers for Education and Research on Therapeutics (CERTs) (U18)
Grant Number:	U18 HS 016970
Project Period:	September 2007 – August 2011
AHRQ Funding Amount:	\$1,999,073
Summary Status as of:	December 2010

Target Population: General

Summary: The Centers for Education and Research on Therapeutics (CERTs) program is a national initiative to increase awareness of the benefits and risks of new, existing, or combined uses of therapeutics through education and research. Each CERT supports multiple research projects under the direction of a lead principal investigator.

In 2007, recognizing that information technology (IT) has great potential to reduce medication errors and improve patient safety, the Agency for Healthcare Research and Quality funded the Brigham and Women's Hospital Health IT CERT program. The Brigham and Women's Hospital CERT-Health IT team is organized into two "cores": the Methodology and Data Resources Core, and the Translation and Dissemination Core. These cross-disciplinary cores currently support projects on soliciting information from patients on adverse medication events, using clinical decision support (CDS), evaluating new processes for medication reconciliation post-discharge, and assessing the impact of regional health exchange on medication safety.

Results from these projects will break new ground in determining how current health IT-related interventions can be broadly disseminated. In addition, the Brigham and Women's Hospital CERT-Health IT team will build and bolster educational tools and programs to assist with therapeutics and health IT.

Specific Aims:

- Evaluate the impact of using telephony to ask outpatients identified from electronic health record (EHR) data if they are experiencing adverse effects related to specific medications. **(Ongoing)**
- Evaluate the impact of clinical decision support and automated telephone outreach on antihypertensive and lipid-lowering therapy in ambulatory care. **(Ongoing)**
- Evaluate errors arising from implementation of electronic prescribing. **(Ongoing)**
- Evaluate the impact of implementing a post-discharge ambulatory medication reconciliation intervention. **(Ongoing)**
- Evaluate effects of multiple vendor-based prescribing systems on medication safety among six Regional Health Information Organizations in New York and Massachusetts. **(Ongoing)**

2010 Activities: The focus of activity for each project is described below.

Project 1: e-Pharmaco-vigilance: Integrating Patient Reports of Side Effects with Electronic Health Records for Surveillance of Recently Approved Drugs. The goal of this project is to increase surveillance

evidence for recently released Food and Drug Administration-approved drugs. Interactive voice response is linked to a patient EHR to actively monitor patients taking these medications by calling and asking them about their progress using a medication and if they are having any problems. The system is programmed with electronic triggers to e-mail corresponding messages to the physician. The project enrolled approximately 300 to 400 patients per month for a total of 7,755 patients over two years (August 2008 – February 2010). The response rate for followup calls was 70 percent for patients actively taking the targeted medications and with working telephone numbers.

Project 2: A Multi-Modal Intervention to Improve Antihypertensive and Lipid-Lowering Therapy. This project compares the impact of CDS with and without automated telephone outreach (ATO) to patients on the use of antihypertensive and lipid-lowering medications. The project conducted semi-structured informational interviews with primary care physicians to understand care gaps in the treatment of hypertension and hyperlipidemia. A manuscript detailing the qualitative results of the interviews is in final stages of preparation. The team received institutional review board approval and developed the automated telephone script for CDS-supported patient outreach for one arm of the evaluation. Vendor agreements were finalized to begin the ATO outreach. Parallel efforts were employed to identify community practices to engage in this effort.

Project 3: Unintended Consequences of ePrescribing. This project reviewed prescriptions from commercial pharmacies to identify e-prescription errors. The reviews were analyzed to determine the frequency and character of errors and develop recommendations for preventing these errors and other unintended consequences. Investigators also began work on the second aim of the project, studying the impact of ePrescribing on pharmacy workflow.

Project 4: Ambulatory Medication Reconciliation Following Hospital Discharge. In 2007, a post-discharge medication reconciliation module was created within the ambulatory EHR to reduce medication errors. When the trial began in 2008, use of the module was low, so the project team created an active reminder (“pop up”) in the EHR medication screen and a passive reminder in the EHR summary screen. The team compared use of the reconciliation module before and after the reminders were developed. By the end of 2010, over 1,000 clinical providers were enrolled. During the enrollment and followup period, the project team monitored the uptake of the medication reconciliation module and observed an increase in module use over time.

Project 5: Impact of Vendor Systems on Ambulatory Medication Safety. This project compares the impact of electronic prescribing by users in the short term (less than six months) to longer-term users (greater than one year). The project is enrolling providers in rural Hudson Valley, New York and New York City. Provider enrollment was completed in Hudson Valley and five providers in New York City were recruited. The team met with the commercial electronic prescribing vendor to ensure that the prescription data can be captured for the two time periods of interest. The team spent 2010 collecting data.

Project 6: Identification of Decision Support Rules for Dissemination in EHRs. This project is developing medication-related CDS rules for EHRs in inpatient and outpatient settings. The team reviewed a large dataset of adverse drug events involving multiple drugs in community hospitals to build on previous research and develop recommendations to prevent adverse drug events. As the second component of the project, seven sites were visited to assess the EHR and computerized physician order entry system alerts for compliance with human factors principles. Analysis of the data collected during the seven site visits began in 2010. The human factors principles were developed by the research team and are established for use in other systems with visual alerts. They have not yet been applied to clinical information systems.

Preliminary Impact and Findings: Preliminary findings for each project are described below.

Project 1: The project is tracking the percentage of calls that trigger an e-mail response to the provider and, for those e-mails, the percentage that result in direct followup through a phone call, office visit, or discontinuation of the medication. A manuscript describing the system's design, implementation, and challenges is in press at *Pharmacoepidemiology and Drug Safety*.

Project 2: An article detailing the qualitative assessment component of the study is in the final stages of manuscript preparation.

Project 3: Preliminary results have characterized the types of errors, error rates across different e-prescribing systems, differences in errors between systems, and range in error rates in areas such as inappropriate abbreviations and omitted duration. Initial findings were presented at the American Medical Informatics Association Annual Meeting in November of 2010 and a manuscript has been submitted for publication.

Project 4: The project team began analyzing the outcomes of using the post-discharge medication reconciliation module by adjudicating medication discrepancies and reviewing potential adverse outcomes. The analysis is pending and a manuscript is in preparation for publication in 2011.

Project 5: The project is completing data collection activities and will perform analysis in 2011. A manuscript detailing the study findings is expected late 2011.

Project 6: A manuscript was recently published in the *Journal of the American Medical Informatics Association* describing the key human factors principles for consideration in the design and implementation of medication-related decision support systems. Dr. Bates and Dr. Phansalkar discussed their findings on the CERT-Health IT CDS project at the 2010 Med Info meeting. This discussion described the development of content and evaluation criteria for implementing medication-related decision support at various institutions in the United States. The CERT-Health IT CDS project has focused on the development of a starter set of clinically significant rules on medication-related decision support that could be implemented in clinical information systems across health care settings.

Strategic Goal: Develop and disseminate health information technology (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