

## Health Information Technology and Improving Medication Use

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<b>Principal Investigator:</b>	Bates, David W., M.D., M.Sc.
<b>Organization:</b>	Brigham and Women's Hospital
<b>Mechanism:</b>	RFA: HS07-004: Centers for Education and Research on Therapeutics (CERTs) (U18)
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**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 health 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 comprised of a methodology and data resources core and a 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 information exchange on medication safety.

Results from the six CERT projects described below 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. **(Achieved)**
- 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. **(Achieved)**
- Evaluate the impact of implementing a post-discharge ambulatory medication reconciliation intervention. **(Achieved)**
- Evaluate effects of multiple vendor-based prescribing systems on medication safety among six Regional Health Information Organizations in New York and Massachusetts. **(Achieved)**

**2011 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 monitor patients taking these medications by calling and asking them about their progress using a medication and if they are having any problems. The project team completed the intervention in 2010 and in 2011 focused on data analysis, manuscript preparation, and dissemination.

*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 to patients on the use of antihypertensive and lipid-lowering medications. The team recruited one intervention site in Brockton, MA, that received EHR-based alerts, and two control sites in New York where patients will receive generic automated telephone interactive voice response (ATIVR) messages. The project conducted semi-structured informational interviews using an interview script with primary care physicians to understand care gaps in the treatment of hypertension and hyperlipidemia. The project director worked with the EHR vendor to map the CDS rules at the intervention practices, and developed a method for patient identification in a paper-based chart system at the control sites.

*Project 3: Unintended Consequences of ePrescribing.* This project reviewed prescriptions from commercial pharmacies to identify electronic prescription (e-prescribing) errors. The prescriptions were analyzed to determine the frequency and character of errors, and develop recommendations for preventing these errors and other unintended consequences. The team prepared for an expert panel to review unintended consequences of e-prescribing and evaluate its impact on pharmacy workflow. This panel developed a list of recommendations for preventing unintended consequences of e-prescribing. The team conducted a qualitative study of the unintended consequences of e-prescribing in the outpatient pharmacy setting, including workflow implications. A manuscript is currently being prepared.

*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, more than 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. The project team conducted a secondary analysis of the accuracy of medication lists one month after discharge compared with patient report. A manuscript describing their findings on the impact of the post-discharge ambulatory medication reconciliation intervention is being written.

*Project 5: Impact of Vendor Systems on Ambulatory Medication Safety.* This project compared the impact of e-prescribing by users in the short term (less than 6 months) and the longer term (greater than 1 year). The project completed enrollment of 20 providers in rural Hudson Valley, New York, and 17 providers in New York City. The team met with the commercial e-prescribing vendor to ensure that the prescription data could be captured for the time periods of interest. The team obtained electronic prescription downloads of the data from the e-prescribing vendor, and completed prescription review and data analysis. One manuscript draft has already been completed and is undergoing internal review. A second manuscript draft is being prepared.

*Project 6: Identification of Decision Support Rules for Dissemination in EHRs.* This project developed 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. The team analyzed the data collected during the seven site visits using ATLAS.ti software to identify the constructs that determine successful implementation of medication-related CDS and assessment of human factors principles. 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.

A 1-year no-cost extension is being used to analyze data and develop manuscripts. The project will end in August 2012.

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

*Project 1:* Pharmacovigilance provides important information related to the patient perspective. Significant differences in medication cessation were reported by patients when compared with documentation in the EHR. The project tracked the percentage of calls that triggered an email response to the provider and, for those emails, the percentage that resulted in direct follow-up through a phone call, office visit, or discontinuation of the medication. Analysis identified that pharmacovigilance is associated with increased use of specialty services but is not associated with EHR-documented medication cessation, use of acute services, death, or use of primary care services.

*Project 2:* An article detailing the qualitative assessment component of the study is in the final stages of manuscript preparation. Available tools from this project include an ATIVR guide and script, *Achieving Benchmarks in Treating Hypertension and Hyperlipidemia: Barriers and Best Practices*, and a detailed description and specification of quality measures and the corresponding alert triggers for the EHR alerts implemented in the intervention practice.

*Project 3:* Informatics strategies can be used to minimize errors, including the following: 1) CDS with maximum dose checkers; 2) automating amount to be dispensed to prevent inconsistent quantity errors by eliminating the redundant entry of the final medication quantity; and 3) use of dispense forcing functions, which create constraints in data entry to prevent errors such as structured data entry with mandatory data fields to prevent omitted information.

*Project 4:* If the post-discharge medication regimen is not correct in the outpatient medical record, it perpetuates the cycle of medication discrepancies. Primary care providers (PCPs) are in the best position to identify and correct errors of inpatient medication reconciliation. The electronic medication reconciliation system creates a seamless transition by explicitly involving the PCP in the post-discharge medication process.

*Project 5:* Support for providers before, during, and after implementation may help mitigate potential safety threats from implementation of an EHR system and result in sustained safety benefits over the long term. Relatively low error rates were found, both during implementation and during sustained use among practices with support for use of a new e-prescribing system.

*Project 6:* 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. These findings have been disseminated through published articles in *Health Affairs*, *BMJ Quality & Safety*, the *Journal of the American Informatics Association*, and the *Journal of Patient Safety*.

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**Target Population:** General

**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

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