

Using Electronic Records to Detect and Learn From Ambulatory Diagnostic Errors

Principal Investigator:	Thomas, Eric, M.D.
Organization:	University of Texas Health Science Center Houston
Mechanism:	RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)
Grant Number:	R18 HS 017244
Project Period:	November 2007 – September 2010, Including No-Cost Extension
AHRQ Funding Amount:	\$873,108
Summary Status as of:	September 2010, Completion of Grant

Target Population: Adults, Pediatric*

Summary: The project utilized data from electronic health records (EHRs) from a Veterans Affairs (VA) and a non-VA primary care network to detect diagnostic errors and understand their causes. It lays the groundwork for future prevention strategies.

The project evaluated two methods to detect diagnostic errors. The first method applied a trigger algorithm to the EHR to detect patterns of visits that could have been precipitated by diagnostic errors. Manual chart reviews of the electronic records were conducted to verify the presence of diagnostic errors. The project tested the triggers by comparing their positive predictive values (PPV) with a random sample of visits that did not meet the trigger criteria. To improve the triggers, a logistics regression model was used to test the additive PPV of integrating the trigger with specific independent clinical variables such as vital signs, laboratory values, or radiology data. A second study used the alert management software of the Veterans Affairs Medical Center (VAMC) to track and identify cases where care providers did not electronically acknowledge pre-specified abnormal test results. Manual chart reviews of the electronic records were performed to determine the presence or absence of diagnostic errors related to test result followup.

The data for this project was collected from the VAMC's Veterans Health Information Systems and Technology Architecture (VistA) data repository and the repository of a home-grown integrated non-VA EHR for the non-VA site. The repositories contained all clinical data pertaining to patient care, including physician notes, laboratory and radiology reports, and other electronic data. Both repositories are periodically updated.

Specific Aims:

- Apply and improve computerized triggers based on visit patterns to detect, measure, and learn from diagnostic errors in diverse primary care settings. **(Achieved)**
- Test whether a method of computerized tracking for abnormal test results that are potentially lost to followup can be used as a trigger to identify diagnostic near-misses in primary care. **(Achieved)**

2010 Activities: In 2010, chart reviews were completed for both Trigger 1 and Trigger 2 at the two sites. Trigger 1 is a primary care visit (index visit) with hospitalization in the next 14 days. Trigger 2 is an index visit followed by one or more primary care visits, an urgent care visit, or an emergency department visit

within 14 days, but excludes index visits that were detected by Trigger 1. The project team decided to increase the sample size, which improved the analytic ability but lengthened the data collection period, especially given constraints of chart reviewers.

Grantee's Most Recent Self-Reported Quarterly Status (as of September 2010): The project accomplished all project aims during the no-cost extension phase within the proposed budget.

Impact and Findings: The project published articles in two journals. The first, published in the Archives of Internal Medicine, "[Timely follow-up of abnormal diagnostic imaging test results in an outpatient setting: are electronic medical records achieving their potential?](#)", describes the challenges, even within an integrated EHR system to the timely followup of abnormal diagnostic imaging results. The second was published in the American Journal of Medicine, "[Notification of abnormal lab test results in an electronic medical record: do any safety concerns remain?](#)", and describes the types of outpatient errors in abnormal lab result followup that remain even with an EHR system. Several other publications are in development, including one intended for the quality-improvement audience, focusing on the positive predictive values of triggers. It will describe how the team improved the triggers in a way that will allow others to build and improve their own triggers. The second paper will discuss clinical errors and the findings related to understanding these errors based on the development of the triggers. For example, it will describe the types of events that lead to clinical errors.

This project successfully developed a trigger that had a higher predictive value than those used in previous studies. A final important finding is that previously, diagnostic error in primary care has focused on cancer. Data from this study however, indicates that there is a range of common conditions in which diagnostic errors occur.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* *AHRQ Priority Population*