

Project Title: Automated Adverse Drug Event Detection and Intervention
Principal Investigator: Ferranti, Jeffrey, M.D., M.S.
Organization: Duke University
Mechanism: RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
Grant Number: UC1 HS 014882
Project Period: 09/04 – 08/08, Including No-Cost Extension
AHRQ Funding Amount: \$1,455,091
Summary Status as of: August 2008, Conclusion of Grant

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

Summary: The primary purpose of the Automated Adverse Drug Event Detection and Intervention project was to reliably measure and reduce the incidence of adverse drug events (ADEs) suffered by hospitalized patients using a computerized system for ADE detection, reporting, and intervention. The initiative embodied collaboration between information technology (IT) resources, patient safety and clinical leadership, and the departments of pharmacy at three partnering hospitals affiliated at a large, tertiary care-based health system: an academic medical center and two community-based hospitals. The surveillance system leveraged technology and information systems already in place at each of the three hospitals, and included three unique vendor-based systems, a centralized health system clinical data repository, and a mainframe-based rules engine. The rules engine process was scheduled to run in batch once daily, at which time it received transactional patient, laboratory, and pharmacy data from the hospital information systems. Within the rules engine, specific rule logic was programmed to screen for “trigger” data that alone, or in combination, suggested the occurrence of an ADE. When the logic of a specific rule was met, alerts were triggered and compiled into a daily electronic report for evaluation by pharmacists trained in ADE investigation. In addition to permitting immediate intervention and mitigation of ADEs, the automated surveillance system also permitted the establishment of baseline statistics on the incidence and nature of ADEs at each of the three partnering hospitals. This will permit evaluation of the effectiveness of alert-generated interventions, as well as the effectiveness of other interventions currently in implementation to improve medication safety.

Specific Aims

- Establish a baseline rate of the incidence of ADEs in hospitalized patients of the three-hospital system. **(Achieved)**
- Study the implementation and operational utility of an automated surveillance system for detection and mitigation of ADEs. **(Achieved)**
- Reduce the incidence of ADEs through process- or technology-based interventions. **(Ongoing*)**

** This aim was not completed prior to the scheduled conclusion of the grant (August 2008) yet, as other sources of funding have been secured, it is still targeted for completion.*

2008 Activities: Data collection activities from the automated ADE system concluded on September 20, 2008. The scope of drug interventions was narrowed to include only the top three high-risk drug categories: anticoagulants, hypoglycemics, and narcotics/benzodiazepines. This reduced the research

funded pharmacist full-time employee allocation. Medication safety and quality leaders across the organization applied these data to quality improvement efforts.

Impact and Findings: As part of this study, a comparison of two fully operational ADE detection methods was completed—computerized surveillance and voluntary reporting. This analysis underscored the synergistic nature of these two approaches. While surveillance provides quantitative data to estimate the true rate of ADEs, voluntary reporting contributes qualitative evidence to inspire future trigger development and to identify potential areas of emerging risk. In order to improve the safety profile of the health system, it is essential that safety leaders have prompt and accurate access to aggregate safety reports generated from the ADE surveillance system. This grant supported the integration of the ADE surveillance data into the enterprise data warehouse.

Pediatric patients are at exceptionally high risk for medication-related adverse events. Therefore, analyses of data were used from a 1-year period to compare the detection rates of two ADE discovery strategies, voluntary reporting and computerized surveillance, in pediatric inpatients at a large academic medical center. The primary drugs that generated ADEs in this specialized patient population were assessed, and recommendations were made as to which may identify the most opportunities for intervention and reduce patient harm. It was concluded that computerized ADE surveillance underperformed compared to detection rates seen in adult systems, suggesting that tailored rule sets are necessary to accommodate the unique needs of high-risk pediatric patients.

ADE detection methodologies appear to be synergistic and complementary. When used in combination with each other, multiple detection methods may provide additional clarity on the scope of medication safety issues. The surveillance system from this study focused on quantitative measurement of a succinct set of events which cause patient harm; whereas, the established voluntary reporting system captured a broader range of events and provided more qualitative data for reducing medication use process errors. Any hospital medication safety program should consider using multiple ADE detection methods, if resources permit.

Selected Outputs

Long AL, Bendz L, Horvath MM, et al. Characteristics of ambulatory anticoagulant adverse drug events: a descriptive study. *Thromb J* 2010;8:5.

Eckstrand JA, Habib AS, Williamson A, et al. Computerized surveillance of opioid-related adverse drug events in perioperative care: a cross-sectional study. *Patient Saf Surg*. 2009 Aug 11;3(1):18.

Horvath MM, Cozart H, Ahmad A, et al. Sharing adverse drug event data using business intelligence technology. *J Patient Saf* 2009;5(1):35-41.

Cozart H. Using Informatics and Basic Research to Improve Medication Safety. ASHP 2008 Midyear Clinical Meeting and Exhibition; December 2008; Orlando, FL.

Long A, Cozart H, Eckstrand J, et al. Implementation of Anticoagulant-Focused “Just-in-Time” Alerts in an Academic Medical Center. AHRQ 2008 Annual Conference; September 2008; Bethesda, MD.

Horvath M, Cozart H, Ferranti J. Sharing Adverse Drug Event Surveillance Results Using Business Intelligence Technology. 2008 AMIA Spring Congress; May 2008; Phoenix, AZ.

Cozart H, Horvath M, Ferranti J. Developing an Innovative Patient Safety System to Improve Healthcare Quality: Operational Integration of Computerized Adverse Event Surveillance. 2008 AMIA Spring Congress; May 2008; Phoenix, AZ.

Wu J. Using Information Technology to Detect Ambulatory Adverse Events Related to Anti-diabetic Drug Therapy. SERC presentation; April 2008.

Vila T. Impact of the Institute for Healthcare Improvement Global Trigger Tool Compared to Current Adverse Event Monitoring Systems at a Large Teaching Hospital. SERC presentation; April 2008.

Ferranti J, Horvath MM, Cozart H, et al. Reevaluating the safety profile of pediatrics: a comparison of computerized adverse drug event surveillance and voluntary reporting in the pediatric environment. *Pediatrics* 2008;121(5):e1201-7.

Ferranti J, Horvath MM, Cozart H, et al. A multifaceted approach to safety: the synergistic detection of adverse drug events in adult inpatients. *J Patient Saf* 2008;4:184-90.

Ferranti J. Bridging the Gap: Empowering Caregivers with Real Time Access to Aggregate Patient Safety Data. AHRQ 2007 Annual Conference; September 2007; Bethesda, MD.

Kilbridge PM, Alexander L, Ahmad A. Implementation of a system for computerized adverse drug event surveillance and intervention at an academic medical center. *JCOM* 2006;13:94-100.

Kilbridge PM, Campbell UC, Cozart HB, et al. Automated surveillance for adverse drug events at a community hospital and an academic medical center. *J Am Med Inform Assoc* 2006;13(4):372-7.

Grantee's Most Recent Self-Reported Status (as of August 2008): This grant has been completed. The next stage of this project will be to monitor the overall progress of the scorecard measure, as well as continue to educate safety leaders on the operational utility of the data collected by the surveillance system. Additional work will also continue to define and deploy “just-in-time” surveillance systems, which focus solely on monitoring for unsafe patient conditions across the medication use continuum.

Milestones: Progress is completely on track.

Budget: On target.