

Project Title:	Comprehensive Information Technology Solution for Quality and Patient Safety
Principal Investigator:	Jose, James, M.D.
Organization:	Children's Healthcare of Atlanta, Inc.
Mechanism:	RFA: HS04-011: Transforming Health Care Quality through Information Technology (THQIT)
Grant Number:	UC1 HS 015236
Project Period:	09/04 – 09/08, Including No-Cost Extension
AHRQ Funding Amount:	\$1,495,572
Summary Status as of:	September 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: Implementation and Use

Summary: Children's Healthcare of Atlanta partnered with Epic Systems Corporation, an electronic medical record (EMR) technology vendor, and with Georgia Tech and Emory University, which together provided the research and evaluation expertise needed to fully document and evaluate the health information technology (IT) implementation. The settings of this completed study were Children's Healthcare of Atlanta's (Children's) two inpatient facilities: one academic (Egleston), the other community-based (Scottish Rite). Children's has developed a vision for implementing health IT to improve all aspects of its operations. The hospital has embarked on a multiyear process to grow a culture of safety to support safe, consistent, quality care and services.

In particular, for this specific project, Children's started the implementation of a series of EMR components to improve patient safety and quality as well as increase efficiency of all operations. The wave of implementation focused on the pharmacy aspects of Children's as well as clinical documentation. Children are more susceptible to serious medication errors than adults due to weight-based dosing, off-label drug usage and preparation, limited ability to withstand a dosing error, and a limited ability to communicate with health care professionals when an error might occur or has occurred. Information technology such as computerized physician order entry (CPOE) and decision support are powerful tools to reduce medication errors. Designing and implementing a CPOE system in pediatrics is much more complicated than in adult medicine. The system must be able to frequently update the patient's weight because most of the medications are weight-dependent. Also, normal laboratory value ranges vary considerably as the child matures, requiring customized checks. However, due to the complicated nature of pediatric medication administration, CPOE would bring greater magnitude of benefits in pediatrics than in adult medicine to prevent potential errors.

The stages of functionality implementation in this project were: Inpatient Pharmacy System (January 2005), Electronic Medication Administration Record and Clerk Order Entry (November 2005), Nursing and Ancillary Documentation (May 2007), Physician Documentation (August 2007), and CPOE (June 2008). The phased implementation approach allows for the introduction and mastery of each EMR component separately, and for the separate analysis and reporting of each component and its contribution to improving patient safety and quality of care. It changes the culture of the organization gradually and whittles away at the medication error and other quality problems through improved tools, systems, practices, and culture.

Specific Aims

- Improve pediatric patient safety by reducing medication errors. **(Achieved)**
- Improve the hospital's culture of safety by changing staff attitudes and perceptions, particularly related to the role of health IT. **(Achieved)**
- Improve pediatric quality of care by evaluating and changing workflows. **(Achieved)**

2008 Activities: The CPOE module came online in 2008, completing the suite of capabilities targeted by this project. Final survey data were collected regarding attitudes toward health IT and the hospital's culture of safety. Analyses were performed, and production of dissemination vehicles continued, including several publications.

Impact and Findings: A total of 959 patients were randomized and evaluated for possible adverse drug events (ADEs) and medication errors using the trigger tool. ADEs include expected side effects associated with a prescribed drug, for example, nausea. Approximately 160 patient charts were examined for each time period: 40 patients from each general care unit and intensive care unit (ICU) at both campuses were reviewed. During the implementation of the EMR, Children's initiated other projects in addition to EMR to reduce ADEs and medication errors. During August 2005, smart pump technology for syringes was implemented to prevent medication errors at the bedside by catching any miskeys and/or pump programming errors. Also, in summer 2006, the pharmacy completed a Six Sigma project targeting a reduction in medication errors in preparation and dispensing medications. The phased EMR implementation and these other initiatives have contributed to the changes in medication error rates and ADEs observed in this study. Overall error rates, including low-severity errors, dropped to almost zero by late 2007. ADE rates, since they include known, expected medication side effects, were more variable across the study period. Redesigning workflows to incorporate the new systems was a critical component to ensuring that the EMR had the desired effects on quality, safety, efficiency, and on user acceptance.

The transition from paper records to an EMR is difficult, and it is important to address both the technology and workflow changes needed for a successful transition. For Children's, the transition from paper documentation to Epic, the EMR system, began with clinicians. The clinicians involved in the transition included the core clinical informatics (CI) team as well as representatives for each user group (e.g., clinical role, specialty, etc.) who worked with the CI team to design workflows for their area. The CI team is a diverse group with experience as nurses, respiratory therapists, pharmacists, and a clinical nutritionist. Design groups met approximately every 2 weeks during the design phase to review the latest Epic build and provide feedback. The design groups and EMR champions also received training on change management. This enabled them to help prepare other staff to move from paper to electronic documentation. Overall, 73 percent of clinical and pharmacy managers surveyed rated the success of their hospital's implementation as "very good" or "good," and the lessons learned can help future adopters of similar technology. Training and education were considered some of the most significant facilitators to the adoption of this technology. The training instructors were highly regarded and respected by their peers. Along with the formal training sessions, the availability of pharmacy "super users" was identified by a majority of study participants as a key implementation strategy. Children's put significant effort into ensuring that clinicians were engaged at all stages of the EMR implementation and that change management needs were addressed. Despite these efforts, clinician ratings of the system's impact on individual work (efficiency, effectiveness) and quality of care were moderate and changed very little over the course of the implementation. This indicates the current generation of EMRs has room for improvement, both in the design of the technology and the methods used to ensure successful implementation and adoption of these systems. If the promise of EMR systems is to be achieved, greater emphasis has to be placed on the human element.

Selected Outputs

Culler S, Jose J, Kohler S, et al. Implementing a pharmacy system: facilitators & barriers. *J Med Sys* 2009;33:81-90.

Edwards PJ, Moloney K, Jacko JA, et al. Evaluating usability of a commercial electronic health record: a case study. *Int J Human-Computer Studies* 2008 Oct;66(10):718-28.

Edwards PJ, Scott T, Richardson P, et al. Using staff perceptions on patient safety as a tool for improving safety culture in a pediatric hospital system. *J Pt Safety* 2008;4(2):113-8.

Edwards PJ, Huang D, Metcalfe LN, et al. Maximizing your investment in EHR: utilizing EHRs to inform continuous quality improvement. *J Healthc Inf Manag* 2008;22(1):32-7.

Grantee's Most Recent Self-Reported Quarterly Status: This project has been completed. All EMR functionalities have been rolled out successfully, and super-user clinicians are cultivating the hospital's culture of safety. Feedback processes have been established that have already begun to improve the quality and usability of the EMR system and its modules, and these processes will lead to further improvement.

Milestones: Grantee did not provide self-assessment in 2008.

Budget: Grantee did not provide self-assessment in 2008.