

Computer-Based Provider Order Entry Implementation in Intensive Care Units

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Organization:	University of Wisconsin–Madison
Mechanism:	RFA: HS-04-012: Demonstrating the Value of Health Information Technology (THQIT)
Grant Number:	R01 HS 015274
Project Period:	September 2004 – August 2009, Including No-Cost Extension
AHRQ Funding Amount:	\$1,455,066
Summary Status as of:	August 2009, Conclusion of Grant

Target Population: Adults, Pediatric*

Summary: While health care technologies can improve quality of care, the implementation of such technology can have negative repercussions. This project was a collaboration between researchers at the Center for Quality and Productivity Improvement at the University of Wisconsin–Madison and Geisinger Medical Center (GMC) in Danville, Pennsylvania. It built on an existing interdisciplinary research network to examine the impact of computerized provider order entry (CPOE) technology integrated in an electronic health record (EHR) in four ICUs (24-bed adult, 18-bed cardiac, 38-bed neonatal, and 12-bed pediatric) at GMC.

The research examined the effects of technology implementation on patient safety, quality of care, financial costs, and end-users. The project used prospective human-factors analysis methods to improve the design and implementation of CPOE in the ICUs at GMC. Applying a human factors engineering approach to CPOE and EHR implementation in ICUs is unique and, because of its theoretical basis, can provide important information on methods for improving the design and usage of CPOE in health care institutions. Specifically, Dr. Carayon and her team sought to: 1) determine the effect of CPOE and EHR implementation on safety and quality of care—including medication errors, adverse drug events, infection rates, protocol compliance, length of stay, mortality rates, and antibiotic turnaround time—in ICUs; 2) determine the impact of CPOE and EHRs on physicians, nurses, physician assistants (PAs), and nurse practitioners in ICUs, including end-users' job tasks, communication, coordination, quality of working life, and perceptions of patient safety and quality of care; 3) determine the financial value of CPOE and EHR implementation by examining the cost of patient care in the ICUs before and after the implementation; and 4) examine the role of human-factors analysis in CPOE and EHR implementation through a usability analysis and a proactive risk analysis.

Specific Aims:

- Conduct preliminary job task analysis of nurses and physicians. **(Achieved)**
- Conduct preliminary prospective risk analysis. **(Achieved)**
- Implement timeline revision with partner organization. **(Achieved)**
- Collect data to determine the impact of CPOE implementation on quality of care in and financial value to ICUs. **(Achieved)**

- Collect and analyze data to determine the impact of CPOE on end-users. **(Achieved)**
- Collect data to determine the impact of CPOE on ICU safety. **(Achieved)**

2009 Activities: The project team completed data collection and cleaned and analyzed data for the development of manuscripts.

Grantee's Most Recent Self-Reported Quarterly Status: The project ended August 2009 with all major aims completed.

Impact and Findings: The project team observed some short-term negative effects, such as decreased perception of communication timeliness. However, these negative effects disappeared one year post-implementation. In addition, the investigators observed changes in job tasks conducted by nurses, physicians, and PAs, such as increased time spent on documentation and review tasks. Finally, the results showed some benefit of CPOE and EHR on timeliness of IV medication delivery. The CPOE and EHR implementation was accompanied by major attention to organizational issues and change management. The investigators demonstrated the feasibility and benefits of using human-factors methods, such as usability and proactive risk assessment, before the technology was fully designed and implemented. Future research should focus on the longitudinal use of CPOE and EHR technology. This research can help identify ways that the technology can improve systems, care processes, quality of care, and patient safety. Issues related to end-user adaptation to the technology should also be examined in future longitudinal research.

More detail on the project findings is included in Dr. Carayon's final report: [Carayon 2009 Final Report](#).

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

* *AHRQ Priority Population*