

**Project Title:** Health Information Technology Value in Rural Hospitals  
**Principal Investigator:** Ward, Marcia M., Ph.D.  
**Organization:** University of Iowa  
**Mechanism:** RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)  
**Grant Number:** R01 HS 015009  
**Project Period:** 09/04 – 08/08, Including No-cost Extension  
**AHRQ Funding Amount:** \$1,304,478  
**Summary Status as of:** August 2008, Conclusion of Grant

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**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:** Today, hospital-based health information technology (IT) encompasses a wide range of quality and patient safety applications including: electronic medical records, personal health records, e-mail communication, clinical alerts and reminders, computerized physician order entry, computerized decision support systems, hand-held computers, electronic information resources technology, electronic monitoring systems, and telehealth consultative and diagnostic services. However, very few rural hospitals have developed or implemented these health IT capacities because of factors including expense, limited in-house IT expertise and staffing, and the fact that many health IT applications benefit from economies of scale that are unavailable to them. Currently, there are significant gaps in knowledge about the value of health IT in general, but they are especially pronounced in rural applications. There has been little systematic study of whether existing health IT technologies, or investment in the commonly implemented health IT projects, readily lend themselves to quality enhancement in rural hospitals. For a rural hospital with limited resources, there needs to be a better understanding of the fit between actual quality and safety problems and the health IT solutions under consideration. Rural hospitals could benefit substantially from assistance and tools to aid in their health IT decisionmaking.

This grant was designed to address these knowledge gaps, using an in-depth study of Iowa's 89 rural hospitals with a particular focus on its 80 critical access hospitals (CAHs). A major component of this research was focused on identifying and prioritizing the quality-of-care and patient safety issues facing rural hospitals; this was assessed by surveys, interviews with key personnel, and quantitative analysis. Related to this was the aim of identifying challenges and barriers facing rural hospitals embarking on health IT projects, using research methods including expert panels, case studies, and a literature review. Assessment work also included investigations of the correspondence between various types of health IT technologies and improvements in patient safety, as well as the cost-effectiveness of health IT for rural providers. The information gathered through the project's research efforts was then synthesized into toolkits for rural providers in Iowa.

### Specific Aims

- Characterize patient safety and health care quality issues in rural hospitals. **(Achieved)**
- Characterize the health IT capacity and barriers of rural hospitals. **(Achieved)**
- Identify which health IT capacities are most strongly related to patient safety and health care quality issues in rural hospitals. **(Achieved)**
- Identify the cost of health IT in rural hospitals. **(Achieved)**
- Develop toolkits to help rural hospitals make informed health IT investments. **(Achieved)**

**2008 Activities:** With data collection complete, the primary 2008 activities were analysis and dissemination of knowledge products.

**Impact and Findings:** The Iowa Hospital Association and the Iowa Department of Public Health–Iowa Medicare Rural Hospital Flexibility Program (FLEX) created a workgroup, the Iowa CAH Data Workgroup, of representatives from CAHs to focus on identifying “rurally relevant” patient safety and quality issues. The “rurally relevant” patient safety and quality issues that the Iowa CAH Data Workgroup identified as having the highest priority for Iowa CAHs were: medication errors, falls, appropriate assessment and treatment of chest pain presenting in the emergency department, and births for those hospitals that have obstetric services. They established a Web-based reporting tool for all CAHs to report on these five topics on a quarterly basis for benchmarking within Iowa’s CAHs. The Iowa CAHs have been participating in this voluntary reporting and benchmarking effort since 2005. Quantitative analysis showed that the only Agency for Healthcare Research and Quality Patient Safety Indicators (PSI) for which Iowa was substantially worse than the national benchmark involved maternal trauma during vaginal deliveries. An in-depth analysis of these procedures determined that a number of factors were involved, including maternal risk factors (e.g., higher prevalence of teenage mothers), baby risk factors (e.g., higher prevalence of large babies), and procedure risk factors. This compounding of risk factors occurred more often in rural hospitals and appeared to be related to emergency deliveries in rural hospitals that were not staffed to handle unplanned cesarean deliveries. Analysis of PSIs in rural hospitals before and after conversion to CAH status indicated improvement in indicator rates for prevalent complications coincident with enhanced financial performance. The team also found that the raw in-hospital mortality rate for acute myocardial infarction (AMI) in Iowa rural hospitals (14 percent) was twice the rate of Iowa urban hospitals (6.4 percent). However, AMI patients admitted to rural hospitals were a decade older and were sicker than those admitted to urban hospitals, in part because many AMI patients in rural hospitals are transferred to urban hospitals, and this sub-population of transfers is younger and healthier than those who remain at rural facilities. An instrumental variable approach to control for this trend caused the difference in in-hospital mortality rates to disappear. In a published review of existing literature, the project concluded that to expedite the spread of health IT in rural America, Federal and State governments, along with private payers—who are important beneficiaries of health IT—must make difficult decisions as to who pays for the investment in this technology. They must also drive standards, simplify approaches for reductions in risk, and create a workable operational plan. Toolkits developed included an algorithm to optimize AMI patient referrals, a health IT cost calculator, and online toolkit offering information on health IT implementation and best practices.

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### **Selected Outputs**

Allareddy V, Ward MM, Allareddy V, et al. Effect of meeting Leapfrog volume thresholds on complication rates following complex surgical procedures. *Ann Surg* 2010;251(2):377-83.

Li P, Schneider J, Ward MM. Converting to critical access status: how does it affect rural hospitals' financial performance?. *Inquiry* 2009 Spring;46(1):46-57.

Li P, Ward MM, Schneider JE. Factors associated with Iowa rural hospitals' decision to convert to critical access hospitals status. *J Rural Health* 2009 Winter;25(1):70-6.

Bahensky JA, Jaana, M, Ward MM. Health care information technology in rural America: electronic medical record adoption status in meeting the national agenda. *J Rural Health* 2008;24(2):101-5.

Bahensky J, Moreau B, Frieden R, et al. Critical access hospital informatics: how two rural Iowa hospitals overcame challenges to achieve IT excellence. *J Healthc Inf Manag* 2008;22(2):16-22.

Chi CL, Street WN, Ward MM. Building a hospital referral expert system with a Prediction and Optimization-Based Decision Support System algorithm. *J Biomed Inform* 2008;41(2):371-86.

Clabaugh G, Ward MM. Cost-of-illness studies in the United States: a systematic review of methodologies used for direct cost. *Value Health* 2008;11(1):13-21.

Li P, Bahensky J, Jaana M, et al. Role of multihospital system membership in electronic medical record adoption. *Health Care Manage Rev* 2008;33(2):169-77.

James PA, Li P, Ward MM. Myocardial infarction mortality in rural and urban hospitals: rethinking measures of quality of care. *Ann Fam Med* 2007;5(2):105-11.

Li P, Ward MM, Schneider JE. Effect of critical access hospital conversion on patient safety. *Health Serv Res* 2007;42(6 Pt 1):2089-108.

Roberts LL, Ely J, Ward MM. Factors contributing to maternal birth-related trauma. *Am J Med Qual* 2007;22(5):334-43.

Wakefield DS, Ward MM, Wakefield BJ. A 10-Rights framework for patient care quality and safety. *Am J Med Qual* 2007;22(2):103-11.

Jaana M, Ward MM, Pare G, et al. Antecedents of clinical information technology sophistication in hospitals. *Health Care Manage Rev* 2006;31(4):289-99.

Ward MM, Evans TC, Spies AJ, et al. National Quality Forum 30 safe practices: priority and progress in Iowa hospitals. *Am J Med Qual* 2006;21(2):101-8.

Ward MM, Jaana M, Bahensky JA, et al. Clinical information system availability and use in urban and rural hospitals. *J Med Syst* 2006;30(6):429-38.

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**Grantee's Most Recent Self-Reported Quarterly Status:** This project is complete. All aims have been met and outputs have been developed to help rural providers assess their health IT needs and possibilities.

**Milestones:** Progress is mostly on track.

**Budget:** Somewhat underspent, approximately 5 to 20 percent.