Project Title:	Health Information Technology in the Nursing Home
Principal Investigator:	Gurwitz, Jerry H., M.D.
Organization:	University of Massachusetts Medical School – Worcester
Mechanism:	RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
Grant Number:	R01 HS 015430
Project Period:	09/04 – 09/08, Including No-Cost Extension
AHRQ Funding Amount:	$1,458,965
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: The project provided a framework and foundation to assess the economic implications of health information technology (IT) in the nursing home environment. The dearth of evidence about the value of IT in the care of nursing home residents and uncertainties about return on investment continue to delay the adoption of this technology for use in the nursing home setting. The overarching aim of this project was to begin to fill this gap in knowledge with solid evidence using rigorous study designs to assess the value of computerized provider order entry (CPOE) with clinical decision support in the nursing home setting. The facility for this study was an academically-affiliated long-term care facility in Canada with an electronic medical record system with integrated CPOE. The facility's CPOE software was fully linked to information in the electronic medical record and was capable of being programmed to present alerts in real-time during medication orders. Ten community-based physicians provided care to long-stay residents. These physicians usually ordered medications personally through the CPOE system. The clinical decision support system (CDSS) for adjusting dose and frequency of medication orders for long-term residents with renal insufficiency was developed by a team of physicians, pharmacists, and informatics professionals. Sixty-two drugs were selected for inclusion based on published guidelines and lists from hospital-based dosing alert systems; those chosen included oral drugs commonly prescribed in the long-term care setting that are primarily eliminated by the kidney and have known nephrotoxic effects or for which drug efficacy may be modified due to renal insufficiency. As this CDSS was developed and implemented, a study estimating the time and costs involved was performed. Because the alerts were added to an existing CPOE system within an electronic medical record that included laboratory test results and nursing notes, no additional hardware or software were required. Costs for developing and implementing the system resulted entirely from personnel time. Analysis of the costs and benefits relating to implementation of CPOE with clinical decision support in the long-term care setting indicated that the costs of implementing and maintaining these systems will be incurred by multiple stakeholders, but that the costs incurred by each may not be aligned with the benefits.

Specific Aims

- Assess the effectiveness of computer-based clinical decision support in the nursing home setting for improving the quality of medication ordering. **(Achieved)**
- Determine costs directly related to the development and installation of computer-based clinical decision support and its impact in the nursing home setting on drug, laboratory, and personnel costs. **(Achieved)**
- Assess the impact of computer-based clinical decision support in the nursing home setting on provider productivity with reference to physicians, pharmacy staff, and nurses. **(Achieved)**

- Assess the nursing home culture and organizational structure with respect to readiness to incorporate CPOE with computer-based clinical decision support. **(Achieved)**

2008 Activities: Conclusions were synthesized from the data. Results were prepared for publication and disseminated.

Impact and Findings: A CDSS in the long-term care setting can lead to improved medication safety, but implementation costs are substantial and only modest cost savings can be expected. During the 12 months of the trial, more than 800 residents were present on the participating units. In total, there were 107,856 resident-days in the intervention units and 106,111 days in the control units. The rates of alerts were nearly equal in the intervention and control units. Physicians prescribing medications for residents in the intervention units received 274 alerts for a rate of 2.5 per 1,000 resident days. In the control units, 257 alerts were generated during physician medication orders and output to the audit trail for a rate of 2.4 per 1,000 resident days. The proportions of final drug orders for which doses were appropriate were similar between the intervention and control units (relative risk 0.95, 95 percent confidence interval [CI] 0.83, 1.1). For each of the remaining alert categories, a significantly higher proportion of drug orders was appropriate in the intervention units. The relative risks for appropriate drug orders were 2.4 for the alert category recommending maximum frequency (CI 1.4, 4.4), 2.6 for the category recommending that a drug be avoided (CI 1.4, 5.0), and 1.8 for alerts about missing serum creatinine (CI 1.1, 3.4). Across all categories of alerts, drug orders were appropriate significantly more often—relative risk 1.2 (CI 1.0, 1.4). By tracking personnel time and expenditures, the cost of developing the clinical decision support system was estimated at $48,668.57. Alternatively, if the CDSS product compatible with CPOE was previously developed and truly "plug and play," there could be reductions in programming and informatics management time; this scenario further reduces costs to $23,694.51. Drug costs saved over a 12-month period, however, were estimated at only $2,137. Successful adoption of health IT depends on physician, nurse practitioner, and nurse receptivity to using these systems. Thus, incentives, either non-monetary or monetary, may need to be in place to ensure this use.

Selected Outputs

Field TS, Rochon P, Lee M, et al. Computerized clinical decision support during medication ordering for long-term care residents with renal insufficiency. J Am Med Inform Assoc 2009;16(4):480-5.

Thomson MS, Gruneir A, Lee M, et al. Nursing time devoted to medication administration in long-term care: clinical, safety, and resource implications. J Am Geriatr Soc 2009;57(2):266-72.

Field TS, Rochon P, Lee M, et al. Costs associated with developing and implementing a computerized clinical decision support system for medication dosing for patients with renal insufficiency in the long-term care setting. J Am Med Inform Assoc 2008;15(4):466-72.

Wolfstadt JI, Gurwitz J, Field TS, et al. The effect of computerized physician order entry with clinical decision support on the rates of adverse drug events: a systematic review. J Gen Intern Med 2008;23(4):451-8.

Gurwitz JH, Field TS, Rochon P, et al. Effect of computerized provider order entry with clinical decision support on adverse drug events in the long-term care setting. J Am Geriatr Soc 2008;56(12):2225-33.

Subramanian S, Hoover S, Gilman B, et al. Computerized physician order entry with clinical decision support in long-term care facilities: costs and benefits to stakeholders. J Am Geriatr Soc 2007;55(9):1451-7.

Judge J, Field TS, DeFlorio M, et al. Prescribers' responses to alerts during medication ordering in the long-term care setting. J Am Med Inform Assoc 2006;13(4):385-90.

Rochon PA, Field TS, Bates DW, et al. Clinical application of a computerized system for physician order entry with clinical decision support to prevent adverse drug events in long-term care. CMAJ 2006;174(1):52-4.

Rochon PA, Field TS, Bates DW, et al. Computerized physician order entry with clinical decision support in the long-term care setting: insights from the Baycrest Centre for Geriatric Care. J Am Geriatr Soc 2005;53(10):1780-9.

Grantee's Most Recent Self-Reported Status: All aims were completed.

Milestones: Progress is mostly on track.

Budget: On target.