

Enabling Medication Management Through Utilization of Health Information Technology

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Organization:	McMaster University
Contract Number:	290-07-100601-5
Project Period:	June 2009 – February 2011
AHRQ Funding Amount:	\$415,975

Summary: McMaster University has produced one of three evidence report in a series on the strategic goals of the Agency for Healthcare Research and Quality's (AHRQ's) Health Information Technology (IT) Portfolio. This report focuses on improving medication management through health IT applications. Because of the diversity of health IT applications being developed and the different ways that impact can be measured, the review includes peer-reviewed scientific literature, conference proceedings, and grey literature. The report considers many health IT applications, including e-prescribing applications, computerized provider order entry, clinical decision support, bar-coded medication administration, pharmacy-based health IT applications, electronic medication administration records, and other IT-based medication management tools.

The report synthesizes the evidence on medication management health IT (MMIT) to understand health IT's impact and set future direction for the field. Medication management involves many actors and interactions, beginning with the prescribing or ordering of medications by clinicians, interactions between clinicians and pharmacists to perfect the pharmacists' medication dispensing and administering of medications, and clinical monitoring of the effects of the medications. The report also assesses the use of health IT for medication reconciliation and educational activities. Studying the integration and utilization of medication management and IT systems will lead to a better understanding of how health IT improves or could improve the quality, safety, and sustainability of medication management.

Project Objective:

- Summarize evidence on the extent to which health IT enables improved quality and safety in the medication management phases, which include but are not limited to: 1) accurate and timely prescribing of medication in response to a specific patient; 2) correct first-fill and refill dispensing of medications; 3) appropriate administering of medication, and; 4) patients' taking of the pharmaceutical treatment regimen as prescribed. **(Achieved)**

2011 Activities: The [final report](#) for this project was submitted to AHRQ in December 2010, ahead of the project's scheduled end date of February 2011. The report was posted to the AHRQ National Resource Center for Health IT Web site in early 2011.

Impact and Findings: The literature search retrieved 40,582 articles that were screened using titles and abstracts. From a full-text screen of 4,356 articles, 428 articles were summarized in the report. Another 361 articles on topic but with limited data were included in a bibliography.

Most of the studies in this evidence report are quantitative observational assessments, often using historical controls. Randomized controlled trials and other methodologies with controlled populations and multi-centered demonstration studies are lacking. Those that exist often have inadequate details or weak methods, which result in only incremental additions to the evidence base for the use of MMIT. Sustainability studies,

strengthened study methods, fuller descriptions of MMIT applications and settings, and reporting standards are still needed.

Evidence for evaluating MMIT is strong for prescribing and monitoring, especially for hospitals and primary care settings. The evidence from these studies indicates process improvements, often measured as improvements in medication orders during the prescribing and monitoring phases. The bulk of this evidence of improvement is shown in studies set in hospitals. Improvements in use, knowledge, skills, and attitudes were also found to be associated with MMIT systems. These cumulated changes can, but may not always, lead to efficiency and cost gains. In contrast, little work has been done on other phases of medication management that use integrated health IT. Some IT applications used in dispensing and administering are stand-alone technologies and, by definition, not included in this report.

Little evidence was found of significant improvement in clinical outcomes with MMIT. Possible reasons include the small number of events, the outcomes being far removed from the application of the technology, and that the clinical aspects were often not the studies' main endpoints. It is also not known whether MMIT applications are cost-effective because of a lack of sound economic data. User groups, including nurses and pharmacists, evaluate systems and features differently and have needs and preferences that sometimes are in conflict with other groups of health professionals. The qualitative literature highlighted positive and negative perceptions and differing levels of satisfaction with the integrated health IT applications, supporting the importance of carefully assessing the effects of the health IT on workflow and the working relationships of the users.

A number of areas of study, most notably order communication, dispensing, administration, reconciliation, and education, are poorly addressed in the literature. Inpatient care is the most studied setting, followed by ambulatory care; whereas few studies assessed long-term care and pharmacies, especially those outside hospitals. Regarding technology, most of the studies evaluated computerized decision support systems or computerized provider order-entry systems. The report identified gaps in the evidence of the effects of MMIT applications in the domain of patient and informal caregiver access to MMIT applications. Another important gap is in the assessment of MMIT tools that nonphysicians use. These gaps are especially true for applications that are integrated with existing clinical applications, such as electronic medical and personal health record systems. A patient-centered focus for MMITs promises a new and exciting domain of study.

The value of MMIT systems needs to be assessed across financial, clinical, and organizational components. The value proposition for each stakeholder will be different based on his or her value set. Individual and group values have not been studied well. For example, what is important to nurses and pharmacists may not be viewed similarly by physicians or patients. Although some evidence suggests positive financial and organizational gains, they are not universal and depend on the technology, the setting, and the impact on the stakeholders using them. Clinical benefit is not assessed well in the literature. Existing evidence seems to indicate no or very small clinical benefit from MMIT applications. Rigorous studies are needed to accurately assess economic and other values.

Target Population: General

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: Synthesis and Dissemination
