

Project Title: Impact of Health Information Technology on Clinical Care
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Organization: Kaiser Permanente Division of Research
Mechanism: RFA: HS04-012: Demonstrating the Value of Health Information Technology (THQIT)
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AHRQ Funding Amount: \$1,487,606
Summary Status as of: September 2008, Conclusion of Grant

Strategic Goal: To develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

Summary: This study evaluated the impact of health information technology (health IT) on clinical care for patients with chronic diseases in a large, prepaid integrated delivery system (IDS), Kaiser Permanente-Northern California (KPNC). This natural experiment involved the staggered introduction of a commercially available ambulatory health IT system with an electronic medical record (EMR), computer-based provider order entry (CPOE), and embedded computer-based decision support systems (CDSS) across primary care teams serving over three million patients. Prior to this implementation, the health system introduced Web-based health IT tools in 2004 to assist with documentation (eChart), ordering (eRefill), and consultations (eConsult); these tools permitted clinicians to perform the basic clinical functions with minimal decision support and, importantly, did not replace the paper medical record. In contrast, the new systems are intended to replace traditional records entirely. Using a quasi-experimental design with concurrent controls, we evaluated health IT-associated changes in quality, safety, and resource use in chronic disease care patients between 2004 and 2008. We focused on the 780,000 patients with chronic diseases (asthma, congestive heart failure, coronary artery disease, diabetes mellitus, and hypertension) because these patients tend to require regular and complex ambulatory care, and they may be sensitive to health IT effects. We used measures of quality, safety, and resource use that are quantifiable both before and after the health IT intervention. To evaluate quality and safety, the association between health IT and guideline-consistent drug use and laboratory monitoring, drug adherence, and lab results were tested. These measures represent areas for which the Integrated Delivery System (IDS) has clinical guidelines and consistent data records, yet significant room for improvement exists. These measures also may be affected indirectly by health IT, such as through the use of performance feedback or greater care coordination between providers. To evaluate resource use, we assessed the association between health IT and office visits, emergency department (ED) visits, and hospitalizations.

Specific Aims

- Design and implement provider and staff surveys. **(Achieved)**
- Collect and analyze automated data. **(Ongoing*)**
- Disseminate findings. **(Ongoing*)**

** Several aims of the grant were not completed prior to 9/08, but, as other sources of funding have been secured, these aims are still targeted for completion.*

2008 Activities: Clinics continued to implement health IT systems throughout the year. Data collection and analysis continued. Preliminary findings suggest that a longer time frame for the study would be beneficial, as our data show a delay in the impacts of health IT systems after implementation.

Preliminary Impact and Findings: To date, a number of preliminary examinations of the data have been conducted. Automated data (2004–2006) were used from outpatient visits to assess the association between the implementation of the new health IT system and clinical data quality, including the timeliness of data and the thoroughness of documentation for patient diagnoses in an integrated health system. The implementation of a new health IT system was found to be associated with a dramatic increase in the timeliness of diagnostic information from that system, but not in the number of diagnoses charted during patient visits. Preliminary analysis found no statistically significant association between health IT implementation and changes in physiologic outcomes for diabetics; however, there were substantial secular changes in low-density lipoprotein (LDL) cholesterol levels. Further research is needed to assess the long-term effects; in analyses using longer follow-up periods, there appear to be statistically significant associations between health IT use and our quality outcomes. In addition, various measures of health IT use have been examined. Based on these analyses, health IT presence alone, i.e., adoption or introduction date, is believed to not be a sensitive or useful predictor. Using clinician survey data collected in 2005, the levels and patterns of clinician use of available health IT tools during primary care visits and the factors associated with systematic health IT use were examined. It was found that all clinicians reported at least some health IT use; however, the level of use varied significantly by function. In multivariate analyses, factors associated with systematic health IT use included perceived training adequacy, health IT incorporation into the clinical workflow, and hours worked per week. Clinician survey data collected in 2005 and 2006 were used to examine the impact of having an integrated health IT system on primary care clinician reports of the completeness and timeliness of all relevant clinical information, agreement on treatment goals and plans, and agreement on roles and responsibilities when multiple clinicians are involved with a patient's care. Health IT introduction was found to be associated with substantial improvements in the timeliness and completeness of relevant clinical information and agreements on treatment goals and plans.

Selected Outputs

Care Coordination Across Clinicians and Health Information Technology, Manuscript.

Clinical Data Quality and Health Information Technology, Manuscript.

Systematic Use of Health Information Technology. *International Journal of Medical Informatics*. Under review.

Variation in Chronic Disease Care in Primary Care Teams of a Large Integrated Delivery System, Manuscript.

Grantee's Most Recent Self-Reported Status: This grant has been completed. Development of methods to examine effects of health IT across multiple chronic conditions continues, incorporating data throughout the health IT implementation period (2008). While implementation of health IT was completed in 2008, data for all of the study covariates and outcomes will not be available until early 2009. In addition, it would be ideal to be able to incorporate as much additional follow-up time post-implementation as possible for many of the sites in order to capture any pattern in health IT-related outcomes after implementation. As of the conclusion of the grant, all milestones were either completed or on track, given the time frame across different primary care teams.

Milestones: Progress is mostly on track.

Budget: Spending is roughly on target.