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Health Information Technology (HIT) Toolkit for Family Physicians

Health Information Technology in Primary Care: A Bibliography

Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC, Institute of Medicine Committee on Quality of Health Care in America, 2001.

Making Health Care Safer: A Critical Analysis of Patient Safety Practices. M. AJ, Agency for Healthcare Research and Quality, 2001.

Bates DW and B. A (2010). "The Future of Health Information Technology in the Patient Centered Medical Home." Health Affairs **29**(4): 614-621.

- Most electronic health records today need further development of features that patient-centered medical homes require to improve their efficiency, quality, and safety.We propose a road map of the domains that need to be addressed to achieve these results. We believe that the development of electronic health records will be critical in seven major areas: telehealth, measurement of quality and efficiency, care transitions, personal health records, and, most important, registries, team care, and clinical decision support for chronic diseases. To encourage this development, policy makers should include medical homes in emerging electronic health record regulations. Additionally, more research is needed to learn how these records can enhance team care.

Bennett KJ and Steen CS (2010). "Electronic Medical Record Customization and the Impact Upon Chart Completion Rates." Family Medicine **42**(5): 338-342.

- Objective: The study's objctive was to determine if alterations to the utility of an existing electronic medical record (EMR) application resulted in an improvement in clinical operations. Methods: We altered several templates within an existing EMR application to improve ease of documentation of clinical encounters. These changes were disease specific, brought documentation into central locations, and altered the input method to facilitate point of care documentation. We examined the length of time (in days) from the creation of a chart entry to the final signing of that chart entry. These charts were delimited to faculty providers who had an active clinical practice during the entire study period. Results: We discovered that the template changes resulted in an increase in the number of charts completed within 30 days by nearly 5%, resulting in a substantial number of billable clinical encounters. Conclusions: This improvement is important, as compliance policies prohibit the billing of encounters if the chart is not

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completed within 30 days. We conclude that simple, inexpensive changes in existing technology may be adequate to have a significant impact upon an organization.

Chaudhry B, Wang J, et al. (2006). "Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care." Annals of Internal Medicine **144**: 742-752.

- Background: Experts consider health information technology key to improving efficiency and quality of health care.
- Purpose: To systematically review evidence on the effect of health information technology on quality, efficiency, and costs of health care.
- Data Sources: The authors systematically searched the Englishlanguage literature indexed in MEDLINE (1995 to January 2004), the Cochrane Central Register of Controlled Trials, the Cochrane Database of Abstracts of Reviews of Effects, and the Periodical Abstracts Database. We also added studies identified by experts up to April 2005.
- Study Selection: Descriptive and comparative studies and systematic reviews of health information technology.
- Data Extraction: Two reviewers independently extracted information on system capabilities, design, effects on quality, system acquisition, implementation context, and costs.
- Data Synthesis: 257 studies met the inclusion criteria. Most studies addressed decision support systems or electronic health records. Approximately 25% of the studies were from 4 academic institutions that implemented internally developed systems; only 9 studies evaluated multifunctional, commercially developed systems. Three major benefits on quality were demonstrated: increased adherence to uideline-based care, enhanced surveillance and monitoring, and decreased medication errors. The primary domain of improvement was preventive health. The major efficiency benefit shown was decreased utilization of care. Data on another efficiency measure, time utilization, were mixed. Empirical cost data were limited.
- Limitations: Available quantitative research was limited and was done by a small number of institutions. Systems were heterogeneous and sometimes incompletely described. Available financial and contextual data were limited.
- Conclusions: Four benchmark institutions have demonstrated the efficacy of health information technologies in improving quality and efficiency. Whether and how other institutions can achieve similar benefits, and at what costs, are unclear.

DesRoches, C. M., E. G. Campbell, et al. (2008). "Electronic health records in ambulatory care--a national survey of physicians." N Engl J Med **359**(1): 50-60.

- Background: Electronic health records have the potential to improve the delivery of health care services. However, in the United States, physicians have been slow to adopt such systems. This study assessed physicians' adoption of outpatient electronic health records, their satisfaction with such systems, the perceived effect of the systems on the quality of care, and the perceived barriers to adoption.
- Methods: In late 2007 and early 2008, we conducted a national survey of 2758 physicians, which represented a response rate of 62%. Using a definition for electronic health records that was based on expert consensus, we determined the proportion of physicians who were using such records in an office setting and the relationship between adoption and the characteristics of individual physicians and their practices.

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- Results: Four percent of physicians reported having an extensive, fully functional electronic-records system, and 13% reported having a basic system. In multivariate analyses, primary care physicians and those practicing in large groups, in hospitals or medical centers, and in the western region of the United States were more likely to use electronic health records. Physicians reported positive effects of these systems on several dimensions of quality of care and high levels of satisfaction. Financial barriers were viewed as having the greatest effect on decisions about the adoption of electronic health records.
- Conclusions: Physicians who use electronic health records believe such systems improve the quality of care and are generally satisfied with the systems. However, as of early 2008, electronic systems had been adopted by only a small minority of U.S. physicians, who may differ from later adopters of these systems.

Elder NC, McEwen TR, et al. (2010). "The Management of Test Results in Primary Care: Does an Electronic Medical Record Make a Difference?" Family Medicine **42**(5): 327-333.

- Background and Objectives: It is unknown whether an electronic medical record (EMR) improves the management of test results in primary care offices.
- Methods: As part of a larger assessment using observations, interviews, and chart audits at eight family medicine offices in SW Ohio, we documented five results management steps (right place in chart, signature, interpretation, patient notification, and abnormal result follow-up) for laboratory and imaging test results from 25 patient charts in each office. We noted the type of records used (EMR or paper) and how many management steps had standardized results management processes in place.
- Results: We analyzed 461 test results from 200 charts at the eight offices. Commonly grouped tests (complete blood counts, etc) were considered a single test. A total of 274 results were managed by EMR (at four offices). Results managed with an EMR were more often in the right place in the chart (100% versus 98%), had more clinician signatures (100% versus 86%), interpretations (73% versus 64%), and patient notifications (80% vs. 66%) documented. For the subset of abnormal results (n=170 results), 64% of results managed with an EMR had a follow-up plan documented compared to only 40% of paper managed results. Having two or more standardized results management steps did not significantly improve documentation of any step, but no offices had standardized processes for documenting interpretation of test results or follow-up for abnormal results. There was inter-office variability in the successful documentation of results management steps, but 75% of the top performing offices had EMRs.
- Conclusions: There was greater documentation of results managed by an EMR, but all offices fall short in notifying patients and in documenting interpretation and follow-up of abnormal test results.

Friedberg, M. W., P. S. Hussey, et al. (2010). "Primary Care: A Critical Review Of The Evidence On Quality And Costs Of Health Care." Health Affairs **29**(5): 766-772.

Garg, A. X. (2005). "Effects of Computerized Clinical Decision Support Systems on Practitioner Performance and Patient Outcomes: A Systematic Review." JAMA: The Journal of the American Medical Association **293**(10): 1223-1238.

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Hing, E. and C. W. Burt (2007). "Office-based medical practices: methods and estimates from the national ambulatory medical care survey." Adv Data(383): 1-15.

- Objectives: The report uses a multiplicity estimator from a sample of office-based physicians to estimate the number and characteristics of medical practices in the United States. Practice estimates are presented by characteristics of the practice (solo or group, single, or multi-specialty group, size of practice, ownership, location, number of managed care contracts, use of electronic medical records, and use of computerized physician order entry systems).
- Methods: Data presented in this report were collected during physician induction interviews for the 2003-04 National Ambulatory Medical Care Survey (NAMCS). The NAMCS is a national probability sample survey of nonfederal physicians who see patients in an office setting in the United States. Radiologists, anesthesiologists, and pathologists-as well as physicians who treat patients solely in hospital, institutional, or occupational settings-are excluded. Sample weights for physician data use information on the number of physicians in the sampled physician's practice to produce annual national estimates of medical practices.
- Results: During 2003-04, an average of 311,200 office-based physicians practiced in an estimated 161,200 medical practices in the United States. Medical practice characteristics differed from physician characteristics. Although 35.8 percent of office-based physicians were in solo practice, 69.2 percent of medical practices consisted of solo practitioners. The one-fifth of medical practices with three or more physicians (19.5 percent) contains about one-half of all office-based physicians (52.4 percent). About 8.4 percent of medical practices involved multiple specialties. Fifteen percent of medical practices, consisting of 19.0 percent of physicians, used electronic medical records. Similarly, 6.5 percent of medical practices, consisting of 9.2 percent of physicians, used computerized prescription order entry systems.

Hing, E. S., C. W. Burt, et al. (2007). "Electronic medical record use by office-based physicians and their practices: United States, 2006." Adv Data(393): 1-7.

- Objectives: This report presents the latest information on the use of electronic medical records in physician offices. Percentages of medical practices and physicians within the practices using electronic medical records (EMR) are presented for 2006 by selected physician and practice characteristics. Methods: Data from the physician induction interviews of the 2006 National Ambulatory Medical Care Survey (NAMCS) are presented. NAMCS includes a national probability sample of nonfederal office-based physicians who saw patients in an office setting. Sample data were weighted to produce national estimates of physicians. Estimates of medical practices were derived from NAMCS physician data by adjusting the weighting scheme using a multiplicity estimator.
- Results: In 2006, 29.2 percent of office-based physicians reported using full or partial EMR systems, which represented a 22% increase since 2005 and a 60% increase since 2001, when the NAMCS began monitoring this technology. Starting in 2005, the NAMCS included questions about EMR system features that health information technology experts consider minimal for a comprehensive EMR, namely computerized orders for prescriptions, computerized orders for tests, reporting of test results (lab or imaging), and clinical notes. Based on these requirements, 12.4 percent of physicians surveyed used comprehensive EMR systems in 2006, a figure not significantly different from the 9.3 percent reported for 2005. From 2005 to 2006, the percentage of medical practices using full or partial EMR systems increased by 42% (from 18.3

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to 25.9 percent), but the percentage of medical practices using a comprehensive EMR system did not change.

Kuperman GJ and Gibson RF (2003). "Computer Physician Order Entry: Benefits, Costs, and Issues." Annals of Internal Medicine **139**: 31-39.

- Several analyses have detected substantial quality problems throughout the health care system. Information technology has consistently been identified as an important component of any approach for improvement. Computerized physician order entry (CPOE) is a promising technology that allows physicians to enter orders into a computer instead of handwriting them. Because CPOE fundamentally changes the ordering process, it can substantially decrease the overuse, underuse, and misuse of health care services. Studies have documented that CPOE can decrease costs, shorten length of stay, decrease medical errors, and improve compliance with several types of guidelines. The costs of CPOE are substantial both in terms of technology and organizational process analysis and redesign, system implementation, and user training and support. Computerized physician order entry is a relatively new technology, and there is no consensus on the best approaches to many of the challenges it presents. This technology can yield many significant benefits and is an important platform for future changes to the health care system. Organizational leaders must advocate for CPOE as a critical tool in improving health care quality.

Menachemi, N. and R. G. Brooks (2006). "Reviewing the Benefits and Costs of Electronic Health Records and Associated Patient Safety Technologies." Journal of Medical Systems **30**(3): 159-168.

Miller, R. H. and I. Sim (2004). "Physicians' Use Of Electronic Medical Records: Barriers And Solutions." Health Affairs **23**(2): 116-126.

Miller, R. H., C. West, et al. (2005). "The Value Of Electronic Health Records In Solo Or Small Group Practices." Health Affairs **24**(5): 1127-1137.

Nelson, E. C., M. E. Splaine, et al. (2000). "Using data to improve medical practice by measuring processes and outcomes of care." Jt Comm J Qual Improv **26**(12): 667-685.

- Background: The purpose of this article is to help clinicians expand their use of data to improve medical practice performance and to do improvement research. Clinical practices can be viewed as small, complex organizations (microsystems) that produce services for specific patient populations. These services can be greatly improved by embedding measurement into the flow of daily work in the practice. Why Do It?: Four good reasons to build measures into daily medical practice are to (1) diagnose strengths and weaknesses in practice performance; (2) improve and innovate in providing care and services using improvement research; (3) manage patients and the practice; and (4) evaluate changes in results over time. It is helpful to have a "physiological" model of a medical practice to analyze the practice, to manage it, and to improve it. One model views clinical practices as microsystems that are designed to generate desired health outcomes for specific subsets of patients and to use resources efficiently. This article provides case study examples to show what an office-based practice might look like if it were using front-line

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measurement to improve care and services most of the time and to conduct clinical improvement research some of the time.

- What are the Principles for Using Data to Improve Processes and Outcomes of Care?: Principles reflected in the case study examples--such as "Keep Measurement Simple. Think Big and Start Small" and "More Data Is Not Necessarily Better Data. Seek Usefulness, Not Perfection, in Your Measures" -- may help guide the development of data to study and improve practice.
- How Can a Practice Start to Use Data to Improve Care and Conduct Improvement Research?: Practical challenges are involved in starting to use data for enhancing care and improvement research. To increase the odds for success, it would be wise to use a change management strategy to launch the startup plan. Other recommendations include "Establish a Sense of Urgency. (Survival Is Not Mandatory)" and "Create the Guiding Coalition. (A Small, Devoted Group of People Can Change the World)."
- Summary: Over the long term, we must transform thousands of local practice cultures so that useful data are used every day in countless ways to assist clinicians, support staff, patients, families, and communities.

Nutting, P. A., W. L. Miller, et al. (2009). "Initial Lessons From the First National Demonstration Project on Practice Transformation to a Patient-Centered Medical Home." The Annals of Family Medicine **7**(3): 254-260.

Ortiz E and Clancy CM (2003). "Use of Information Technology to Improve the Quality of Health Care in the United States." Health Services Research **38**(2): 11-22.

Parente, S. T. and J. S. McCullough (2009). "Health Information Technology And Patient Safety: Evidence From Panel Data." Health Affairs **28**(2): 357-360.

Reid, R. J., K. Coleman, et al. (2010). "The Group Health Medical Home At Year Two: Cost Savings, Higher Patient Satisfaction, And Less Burnout For Providers." Health Affairs **29**(5): 835-843.

Shekelle, P. G., S. C. Morton, et al. (2006). "Costs and benefits of health information technology." Evid Rep Technol Assess (Full Rep)(132): 1-71.

- Objectives: An evidence report was prepared to assess the evidence base regarding benefits and costs of health information technology (HIT) systems, that is, the value of discrete HIT functions and systems in various healthcare settings, particularly those providing pediatric care. DATA SOURCES: PubMed, the Cochrane Controlled Clinical Trials Register, and the Cochrane Database of Reviews of Effectiveness (DARE) were electronically searched for articles published since 1995. Several reports prepared by private industry were also reviewed.
- Review Methods: Of 855 studies screened, 256 were included in the final analyses. These included systematic reviews, meta-analyses, studies that tested a hypothesis, and predictive analyses. Each article was reviewed independently by two reviewers; disagreement was resolved by consensus.
- Results: Of the 256 studies, 156 concerned decision support, 84 assessed the electronic medical record, and 30 were about computerized physician order entry (categories are not mutually

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exclusive). One hundred twenty four of the studies assessed the effect of the HIT system in the outpatient or ambulatory setting; 82 assessed its use in the hospital or inpatient setting. Ninety-seven studies used a randomized design. There were 11 other controlled clinical trials, 33 studies using a pre-post design, and 20 studies using a time series. Another 17 were case studies with a concurrent control. Of the 211 hypothesis-testing studies, 82 contained at least some cost data. We identified no study or collection of studies, outside of those from a handful of HIT leaders, that would allow a reader to make a determination about the generalizable knowledge of the study's reported benefit. Beside these studies from HIT leaders, no other research assessed HIT systems that had comprehensive functionality and included data on costs, relevant information on organizational context and process change, and data on implementation. A small body of literature supports a role for HIT in improving the quality of pediatric care. Insufficient data were available on the costs or cost-effectiveness of implementing such systems. The ability of Electronic Health Records (EHRs) to improve the quality of care in ambulatory care settings was demonstrated in a small series of studies conducted at four sites (three U.S. medical centers and one in the Netherlands). The studies demonstrated improvements in provider performance when clinical information management and decision support tools were made available within an EHR system, particularly when the EHRs had the capacity to store data with high fidelity, to make those data readily accessible, and to help translate them into context-specific information that can empower providers in their work. Despite the heterogeneity in the analytic methods used, all cost-benefit analyses predicted substantial savings from EHR (and health care information exchange and interoperability) implementation: The quantifiable benefits are projected to outweigh the investment costs. However, the predicted time needed to break even varied from three to as many as 13 years.

- Conclusions: HIT has the potential to enable a dramatic transformation in the delivery of health care, making it safer, more effective, and more efficient. Some organizations have already realized major gains through the implementation of multifunctional, interoperable HIT systems built around an EHR. However, widespread implementation of HIT has been limited by a lack of generalizable knowledge about what types of HIT and implementation methods will improve care and manage costs for specific health organizations. The reporting of HIT development and implementation requires fuller descriptions of both the intervention and the organizational/economic environment in which it is implemented.

Walker J, Pan E, et al. (2005). "The Value of Health Care Information Exchange and Interoperability." Health Affairs(Web exclusive W5-14).

Wang, S. (2003). "A cost-benefit analysis of electronic medical records in primary care." The American Journal of Medicine **114**(5): 397-403.

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