A Roadmap for the Adoption of e-Health
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ABSTRACT

Electronic health (e-health) refers to the delivery of health care with support from various information and communication technologies, such as electronic health records, telemedicine, clinical decision support, and computerized provider order entry. E-health is considered by government, providers, and payers as a primary method of improving quality, safety, and costs associated with the delivery of health care. Although currently on a pedestal, e-health has not been readily adopted by a majority of health care providers in the United States. To achieve greater adoption and use of technology in health care, the health care community needs a roadmap, or model for adoption, that can be used to develop a business case to lower risk for providers who adopt and use technology in clinical practice. This article suggests such a roadmap. The roadmap advocates for (1) greater dissemination of implementation best practices, (2) continued development of a strong e-health workforce, and (3) sustainable resources to help those seeking to adopt and use e-health technologies in clinical practice. The e-health community is invited to advance the roadmap to assist providers in embracing and utilizing information and communication technologies for health care system improvements.

Keywords: *electronic health, e-health, business case, adoption, public policy*

INTRODUCTION

Electronic health (e-health) refers to the delivery of health care with support from various information and communication technologies, such as the electronic health record (EHR), telemedicine, clinical decision support, and computerized provider order entry systems (Eysenbach, 2001). It is widely believed that e-health can address many of the problems currently faced by the American health care system, including but not limited

to rising costs, suboptimal quality, and risk of injury or death from mistakes (Shekelle et al., 2006).

E-health captured a center position on the political stage in 2004 when President Bush announced a strategic initiative to radically increase the adoption of EHR systems in the United States by 2014 (National Economic Council, 2006). Following the announcement of his strategic initiative, the President appointed a national health information technology (IT) "czar" to lead the initiative and coordinate federal activities related to the adoption and use of e-health. The U.S. Congress also voiced support for e-health, authorizing funds for projects administered by the U.S. Department of Health and Human Services (HHS). Independent professional and nonprofit organizations in the health care and e-health fields, such as the American Academy of Family Physicians (AAFP), the eHealth Initiative, the Health Information Management Systems Society (HIMSS), and the American Medical Informatics Association (AMIA), have joined the President and Congress in supporting legislation, funding opportunities, and advocacy for expanding the role that e-health plays in the delivery of health care in America.

In this article, I propose a roadmap to highlight key factors needed to embrace e-health. The roadmap outlines a framework to guide stakeholders in the U.S. towards greater adoption and use of technology for quality, safety, and efficiency improvements in health care.

THE NEED FOR AN ADOPTION ROADMAP

The adoption of IT has been much slower in health care than it has been in other industries such as banking and manufacturing. Cost is often cited as the primary reason why the health care field has not embraced IT quite as fast as the rest of the world (Simon et al., 2007; Bates, 2005). Although many health care providers face financial crises, the slow adoption of e-health cannot be blamed on cost alone.

When making purchasing decisions, especially large ones, health care organizations must weigh costs against benefits. All health care providers seek a positive return-on-investment (ROI) in order to justify expenses, survive financially, and provide a benefit to their stakeholders, whether they are patients, partners, board members, or shareholders. Although most often conceived of as cost savings, benefits can also include improved patient satisfaction, operating efficiencies, quality of care, and patient safety. In health care, an emphasis on non-monetary outcomes is often the rule and not the exception (Shekelle et al., 2006). To spur adoption of e-health, organizations must have methods for calculating financial and other types of benefits at their disposal.

In addition to ROI, health care providers are also concerned about the impact of e-health on privacy and security. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) has placed new demands on health care providers to better protect health information. The scope of HIPAA is extensive, regulating electronic, paper, and

oral communications and creating a dizzying array of administrative and legal activities for hospitals, practices, and solo practitioners (Feld, 2005; Turner and Foong, 2003). Despite initial work by legal and medical consultants, the long term impact of HIPAA on the practice of health care remains uncertain (Feld, 2005). Given the complexity and uncertainty surrounding HIPAA implementation, many providers are wary of introducing new technologies into the delivery of health care (Ackerman, 2007), especially technologies such as electronic health records that make sharing protected health information easier (Sadan, 2001). Providers are concerned that e-health may create privacy and security vulnerabilities, which would likely increase the chance of legal action from individual patients or consumer advocacy groups. Without a roadmap that educates providers on how e-health can be used safely and securely, it is unlikely that providers will move beyond fear of increased liability.

Uncertain costs, ROI, and impact on privacy and security combine to create a very risky proposition for the adoption of e-health. Adoption is risky, because the costs are often high without a body of evidence to justify the expense. Implementation is risky, because it may not improve workflow efficiencies or reduce medical error rates. Use is risky, because it may open the door to legal action for improper handling of protected information.

Once the e-health community can move beyond uncertainty, providers will need guidance on how to implement and utilize the technologies in which they invest. The nation needs a roadmap for adoption of e-health to support its transition from paper to electronic methods of information management.

A PROPOSED ROADMAP FOR ADOPTION

The Agency for Healthcare Research and Quality (AHRQ) has a portfolio of projects that are independently examining the use of e-health in clinical settings. I have interacted with these projects, monitoring their progress and providing them with access to knowledge resources. Common challenges and successes experienced by projects in the portfolio inspired me to draft the following roadmap, a framework document designed to initiate dialogue and motivate action, to help the U.S. embrace e-health. The roadmap was further influenced by recent white papers published by e-health professional societies (Osheroff et al., 2006; Safran et al., 2006). These activities in the e-health community generated the idea to create a general framework that would assist in developing all forms of e-health to change health care delivery, making patient care processes safer, more efficient, and of higher quality.

The foundation for the roadmap is a business case developed by e-health researchers that will lower the risk of adoption for health care providers. A strong foundation will enable three targeted efforts by the e-health community to partner with providers, payers, and policymakers. First, the roadmap will help the e-health community disseminate

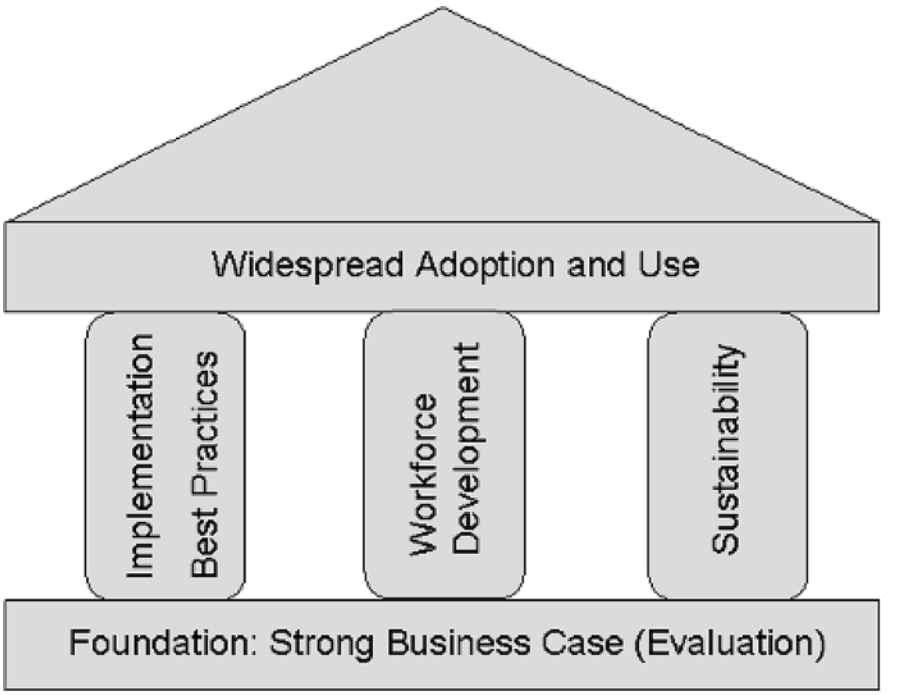

Figure 1. Roadmap for the adoption of e-health

the business case and make available implementation best practices to providers seeking information. Second, it will guide the nation to develop a workforce capable of implementing and utilizing e-health technologies in clinical settings. Finally, the roadmap will outline methods to ensure sustainability of e-health's role in health care delivery.

The roadmap was designed not as a prescriptive model for any one particular technology, but rather a framework to help the e-health community to demonstrate real value to providers, integrate IT into clinical practice, and disseminate best practices to providers in the many settings that currently define the American health care landscape. The roadmap, summarized in Figure 1, is discussed with greater detail in the following sections.

Developing a Business Case for E-Health

Early adopters of a technology assume risk because they are innovators who seek new approaches to solving problems. Widespread adoption of a technology takes time, and it requires a business case that provides evidence for justification of investment in the technology. This is necessary because the vast majority of hospitals, clinics, practices, and physician offices do not have large discretionary spending dollars to allocate to every potentially beneficial technology that enters the marketplace. Instead, hospital administrators, practice

managers, and physicians must choose among competing projects. Rational decision-making dictates that projects be selected based on their ability to produce a return, such as higher reimbursement rates, improved patient outcomes, or more efficient care delivery processes.

Developing a business case involves collection and analysis of data for use in predictive models that inform decision-makers as to what extent a new technology might produce a certain return. Another term for the formation of a business case is evaluation. High quality evaluation studies produce generalizable results, which allow a hospital administrator or practice manager to predict similar results if a technology is implemented and utilized in the hospital or practice.

Evaluation is not unique to e-health, but the growth of evaluation studies in e-health over the past decade signals recognition of the importance of having mechanisms to distinguish bad forms of e-health from good ones, benefits from consequences, and advances from failures (Despont-Gros, Mueller, and Lovis, 2005). As Shekelle et al. (2006) point out, there have been several evaluation studies in e-health that have examined the impact of an implemented technology on cost, quality, safety, and efficiency. This is especially true for computerized provider order entry (CPOE) systems (McDonald, Overhage, Mamlin, Dexter, and Tierney, 2004). Noted in Chaudhry et al. (2006), however, is that most evaluation studies have occurred with homegrown IT systems implemented by four dominant research organizations: the Brigham and Women's Hospital/Partners Health Care, the Regenstrief Institute, the Department of Veterans Affairs, and LDS Hospital/Intermountain Health Care. Commercial off-the-shelf (COTS) systems have been largely ignored in the e-health evaluation literature, although this is beginning to change (Han et al., 2005; Koppel et al., 2005).

Despite recent attempts at developing common tools for CPOE and other e-health evaluation, there remains a lack of consensus on standardized evaluation methods and frameworks (Häkkinen, Turunen, and Spil, 2003). Data sets that are diverse and inconsistent cannot produce generalizable, comparable results from which the e-health field might develop its business case. Implementation of the same system in a different environment may not produce similar results.

The proposed roadmap for the adoption of e-health recommends development of common, standardized tools for evaluation. These tools could be used to gather initial data to demonstrate generalizable e-health implementation results. As adoption of e-health grows, the tools could be reused to benchmark newly released systems, re-test upgraded components, and validate other improvements to e-health infrastructure and software. Although some tools are available now and others coming soon, like the First Consulting Group (FCG) Inpatient and Ambulatory CPOE Assessment Tool (Kilbridge, Welebob, and Classen, 2006), there are not enough to fill a toolbox that spans the breadth of e-health. More work must be done to develop robust evaluation tools that will build a stronger business case for e-health technologies.

Sharing Best Practices and Case Studies

The trend in health care toward evidence-based practice has spawned an interest in research-driven best practices on the front lines of medicine. This is true even in primary care where practice-based research networks (PBRNs) have been formed to link practicing clinicians with researchers for intervention-oriented randomized control trials (Pace, Staton, and Holcomb, 2005). A best practice is not simply an extension of the business case where an intervention or technology is shown to be effective, but is a practice that improves organizational performance to such an extent that it creates desire to emulate it (Ginexi and Hilton, 2006). Just as clinicians look to evidence-based medicine to provide them with medical best practices, so too do hospital administrators and practice managers look towards e-health best practices to inform them of not just the value of e-health technologies but also demonstrated ways to successfully implement and utilize the technologies to improve organizational performance.

Rogers (2003) describes sharing best practices as diffusion, a process in which an innovation (e.g., electronic health records) is communicated via multiple channels over time among members of a social system. Diffusion research by Rogers and others supports the theory that most individuals evaluate an innovation not on the basis of scientific evidence as reported in the literature but through subjective evaluations as reported by peers who have already adopted the innovation. This explains in part why, although a solid body of literature from the last thirty years on outcomes related to the implementation of e-health exists, there still remains a significant research-to-practice gap (Ginexi and Hilton, 2006). Despite efforts of the four dominant research organizations, the federal government, and e-health advocacy groups, less than twenty five percent of physician offices have EHRs and approximately five percent of hospitals utilize CPOE (Robert Wood Johnson Foundation, 2006).

Therefore the proposed roadmap calls for the development of strategies for successful dissemination of implementation best practices. Although the roadmap must be rooted in a strong business case that provides a clear, evidence-based rationale for adoption, the roadmap must also communicate peer experiences since this subjective evidence is just as important to the success of the goal of widespread adoption.

Best practice dissemination will help physicians, hospitals, rural clinics, and practices alike be successful in their adoption of e-health technologies. Sharing best practices will further lower risk, because each health care organization would not need to reinvent the wheel or hire consultants to facilitate adoption. Instead, known best practices could be applied through freely available articles, guides, and reports. Initial work done by entities such as the eHealth Initiative, the AHRQ National Resource Center for Health IT, and the AAFP Center for Health IT could be expanded and coordinated to reach out to every level of the health care system.

Development of the Health IT Workforce

In addition to the development of best practices to support providers in implementing various e-health technologies, the roadmap also asks the e-health community to develop a workforce capable of utilizing e-health systems to deliver quality, safe, and effective care to patients. A 2001 report from the US Department of Labor's Bureau of Labor Statistics projects a 49 percent growth in the number of health information management (HIM) workers by 2010 (Hecker, 2001). The Bureau of Labor Statistics' *Occupational Outlook Handbook 2006-07* reports that 18 of the 20 fastest growing occupations between 2004 and 2014 will be in the health care and computer science fields (Rogers, 2006). Analysis from the American Health Information Management Association (AHIMA) (2006) reveals that no current systematic plan exists to train current and future members of the health care workforce, including HIM workers, physicians, and nurses. Resources from inside and outside of academia are necessary to help prepare the health care workforce to adequately use and implement e-health in clinical settings.

There are several early initiatives aimed at addressing the need for a trained e-health workforce. AMIA has announced its 10x10 program, an initiative aimed at training 10,000 clinicians by 2010. AHIMA offers several certifications for various HIM-related careers. HIMSS also offers a certification program in e-health systems. Despite early initiatives from these e-health professional organizations, more partnerships between academic and private organizations are required to truly transform the current workforce (Hersh, 2006).

Sustaining the Health IT Transformation

To sustain the growth and use of e-health technologies, assistance will be necessary to support individuals and organizations as they seek to change. There is great potential for e-health technologies to transform the health care system. Success will depend on the achievement of long term adoption and use. There are and will be future barriers along the road to widespread adoption and use, so support is necessary to facilitate the other dimensions of the roadmap. Financial support will drive continued innovation and evaluation of e-health technologies, and technical assistance will help the health care industry maximize its use of e-health to achieve the goals of improved quality, safety, and efficiency.

To date the federal government has provided some funding for the exploration of e-health deployment in health care. The National Library of Medicine (NLM), the Agency for Healthcare Research and Quality (AHRQ), and the Office of the National Coordinator for Health IT (ONC) have provided an initial funding stream for e-health technologies (Shekelle et al., 2006). Each agency has supported numerous innovations in how e-health can contribute to delivery of higher quality, safety, and more efficient health care. NLM and ONC grants and contracts have supported rapid implementation of cut-

ting edge e-health technologies for the development of interoperable health IT systems and networks. AHRQ has contributed to implementation projects as well as evaluation projects in which the impact of e-health on health care delivery has been measured. HHS recently created the American Health Information Community (the Community) which has brought leaders from health care organizations, insurance companies, and consumer advocacy groups together to collaborate and express a vision for the future of e-health (American Health Information Community, 2006).

The government has also provided technical assistance to help some providers adopt, implement, and use e-health technologies to improve quality, safety, and efficiency. In addition to its financial support of e-health projects via grants and contracts, AHRQ has created a National Resource Center for Health IT to support providers seeking to implement e-health technologies (AHRQ, 2006). The Resource Center interfaces with providers primarily through a publicly accessible Web site, http://healthit.ahrq.gov, although the Center has provided more direct assistance when directed by Agency officials or Congress. The Center supports implementation through knowledge transfer from both the growing body of evidence from government-sponsored e-health projects and existing best practice resources. The Health Resource Services Administration (HRSA) recently created an Office of Health IT (OHIT) to support adoption, implementation, and use of e-health in federally qualified health centers (FQHCs) and rural providers (Duke, 2006). While young, OHIT has already sponsored a national conference and a report on known barriers and facilitators of adoption of e-health in rural communities. These examples highlight the need for guidance as various providers look towards adopting and using e-health to transform local health care delivery.

Government support of e-health innovation and adoption is commendable, but federal spending on e-health can be viewed as modest when compared to spending by other nations (Anderson, Frogner, Johns, and Reinhardt, 2006). Significantly more resources, as much as $156 billion over five years, are necessary to help providers, especially rural and small providers, integrate e-health into health care delivery (Kaushal et al., 2005). While pending legislation in Congress would provide some additional resources, support must also come from the private sector, especially from payers. Payers should initially support physician adoption and use of e-health to better manage patients with chronic diseases, perhaps through subsidies for equipment, software, and training. Longer-term support could involve changing reimbursement schemes to reward quality. While many pay-for-performance initiatives are under way, there is a lack of consensus on what measures define quality, and the capacity to collect nascent measures is often absent in ambulatory settings (Jha, 2006; HHS, 2006). Given the challenge of defining and measuring quality, surrogate measures for quality can serve, in the interim, to benchmark health care processes and test whether e-health interventions are moving us closer to better quality, safety, and efficiency.

Support for e-health adoption can and should come in more forms than direct fi-

Table 1. Key points the roadmap advocates

The Path to Successful Adoption and Use of e-Health

- Development of a strong business case will lower the risk of adoption, implementation, and use of e-health
- Successful knowledge transfer must include information about best practices for implementation, not just peer-reviewed literature
- Workforce development is necessary to equip the nation for proper use of implemented e-health technologies
- Financial support from the government and payers is critical for additional providers to make an initial investment in e-health
- Technical assistance is required to assist provider organizations in successfully implementing e-health and changing the culture of clinical practice

nancial reimbursement for the purchase of e-health systems. States should support public health modernization efforts to enable e-health solutions for wellness, prevention, and epidemiology. Universities should support efforts to develop the workforce necessary to operate e-health systems and guide their future development. Non-profit organizations must help educate providers and consumers about the role of e-health in patient care. E-health vendors must work towards production of interoperable technologies that will reduce the cost and risk associated with e-health adoption. Working together, government, payers, providers, industry, and non-profits can help bring about the culture change necessary to achieve the aims of the roadmap.

CONCLUSION

The roadmap outlined here (Figure 1) is not designed to be a complete prescription for achieving widespread adoption of e-health technologies. On the contrary, the roadmap is intended to start a dialogue within the e-health community on defining a clear path towards achieving the commonly held vision shared by government, academic, and private industry leaders. All of us want a higher quality, safer, and more efficient health care system, and e-health could be a key component of achieving the vision. However, many of us are working in silos, focused on a single technology. Coordination and collaboration will allow us to share a roadmap, advancing towards development and utilization of those e-health technologies that will prove to be most advantageous for the health care system.

E-health is currently on center stage at the national level as dialogue over health care system reform heats up. The U.S. Congress and the President support more action to see e-health technologies adopted and used. I encourage comments and refinements to the roadmap, but my primary goal is to rapidly put it in the hands of policymakers, e-health researchers, and providers who can use it to take action on e-health adoption and use, as outlined in Table 1.

To achieve the vision of greater safety, improved quality, and increased efficiency in health care delivery, we must use the opportunity before us to advance the development of a business case, the dissemination of best practices, the creation of a strong workforce, and the formation of sustainable resources for greater adoption and use of e-health technologies. Please join in advancing and sharing this roadmap, creating synergy around its adoption in the e-health community.

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