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Initiatives and Barriers to Adopting Health Information Technology

A US Perspective

Henry A. DePhillips III

MEDecision, Inc., Wayne, Pennsylvania, USA

Abstract

In recent years, US healthcare experts have increasingly agreed that the effective application of information technology (IT) can enable the industry to address its three most pressing concerns: an increase in medical errors, rising costs, and the fragmentation of care delivery. While other industries have fully adopted and capitalized on IT to optimize operational efficiencies and customer service delivery, healthcare systems in the US have generally been slow to make a full transition.

Presently, one of the quickest and most efficient ways health systems can begin to benefit from IT is through the implementation of the electronic health record (EHR). This dynamic resource provides key healthcare stakeholders (patients, payers, and providers) with a comprehensive view of current and historical patient data compiled from various sources. It holds tremendous potential for better management of chronic diseases, improving outcomes, and streamlining expenses.

While the EHR has been shown to generate positive results in its limited use so far, its widespread implementation faces several hurdles, most notably cost. Additionally, primary EHR users (payers and providers) often experience initial infrastructure and personnel burdens, along with potential workflow disruptions. Despite this, considerable support for the EHR as an entry point for full-scale IT adoption is mounting in the US with a number of high-level government initiatives.

This article examines the current state of health IT efforts in the US, the barriers to further adoption, and how technology can be, and is being, used to meet major challenges in the US healthcare industry. Although this article exclusively examines the US healthcare system, the author believes that many of the issues and scenarios described herein are universal among healthcare systems worldwide. At the same time, the author acknowledges that, to a great degree, each nation's healthcare system faces its own unique considerations that may or may not be reflected in or relevant to the information in this article.

Healthcare experts believe that the use of information technology (IT) offers the industry tremendous potential for resolving some of its most important issues,[1] namely the rising number of medical errors, escalating costs, and care fragmentation. Traditionally, health IT (HIT) adoption has been slow[2] because the industry itself is vastly different from most others and because it spends about 50% less on IT than most other sectors.[3] However, employing IT in any application involves a basic, universal principle: maximizing IT implementation in order to establish the richest product offering at the lowest cost. Generally, the only difference across industry segments is defining what constitutes the richest product offering. In healthcare, the aim is to employ IT so that providers can ensure patients receive the highest quality of care and best outcomes. IT can also enable the healthcare system to improve operational efficiencies and reduce costs.

One of the most promising manifestations of HIT is the electronic health record (EHR). Among other things, it is believed that the EHR can help reduce medical errors, improve healthcare quality, and streamline operational efficiencies.[4] In the US, several government initiatives, including a directive from President

George W. Bush (discussed in section 6), have established a goal for HIT to furnish each insured individual with a single EHR.

This article will examine the current state of HIT efforts in the US, the barriers to further adoption, and how technology can be, and is being, used to meet major challenges in the US healthcare industry. Although this article exclusively examines the US healthcare system, the author believes that many of the issues and scenarios described herein are universal among healthcare systems worldwide. At the same time, the author acknowledges that, to a great degree, each nation's healthcare system faces its own unique considerations that may or may not be reflected in or relevant to the information in this article.

1. The Goal of Adopting Health Information Technology (HIT)

Broadly speaking, there are three sources of patient healthcare information: the patients themselves; physicians, hospitals, and other providers; and the patient's health plan or other healthcare payers. Consequently, there are three different versions of health records: the personal health record (PHR), consisting of data known to the patient; the electronic medical record (EMR),[1] which includes data known to healthcare providers; and the payer-based health record (PBHR), consisting of data known to the patient's health plan.

The EHR is created through the combination of the three sources of data, developing a common view of a patient's health. It is a secure, real-time, point-of-care, patient-centric information resource for clinicians that aids decision making by providing access to clinical information about the patient and evidence-based decision support where and when it is needed. The EHR automates and streamlines the clinician's workflow, closing loops in communication and response that result in delays or gaps in care. It also supports the collection of data for uses other than direct clinical care, such as billing, quality management, outcomes reporting, resource planning, and public health disease surveillance and reporting.[5]

The goal of having an interoperable EHR in the majority of healthcare provider organizations is challenging, given the current market penetration and estimates of future implementation rates. For example, in a study published in the Joint Commission's *Journal on Quality and Patient Safety* of 738 medical groups, researchers found that less than one-third of the medical groups reported having either patients' medical records or patients' progress notes in an EHR.[6]

2. Preventing Medical Errors through Technology

The Institute of Medicine's landmark 1999 report 'To Err is Human: Building a Safer Health System' launched a major directional shift in healthcare. The report's surprising primary conclusion was that as many as 98 000 people die in the US every year from avoidable medical errors.[7] This prompted the healthcare industry to conduct a thorough self-analysis and to more seriously consider the role that technology might play in reducing medical errors.

Most medical errors made at the point-of-care can be attributed to providers having insufficient or imperfect patient data.[7] Strong evidence suggests that furnishing physicians with more thorough patient clinical data, including a patient's medical history, medication list, tests received, and physicians seen, will enable them to make better decisions, which, ultimately, will result in better outcomes. The presence of a medication list alone could help avoid many medication errors, which are the most common medical mistakes, injuring an estimated 1.5 million people in the US every year.[8] Conservative estimates state that the cost of treating the 400 000 preventable drug-related injuries per year in US hospitals is $US3.5 billion, not including lost wages and productivity or other healthcare costs.[8]

HIT can help to rectify the problem of having insufficient information by creating the EHR from various data sources in the healthcare system and then delivering it to physicians and other caregivers for use in making more informed clinical decisions, thereby reducing mistakes.

Including clinical decision support functionality (involving clinical best practices) in the EHR allows providers to achieve even better clinical decisions and patient outcomes. It also helps close healthcare's current knowledge gap; that is, the difference between current, state-of-the-art, evidence-based best practices in medicine and the rate at which these clinical practices are actually being employed. Embedding evidence-based medicine, including clinical best practices and processes, into HIT can help to bridge this gap by providing physicians with clinical information at the point-of-care that includes treatment opportunities and preventative health and wellness data.

1 The EMR contains data gathered by physicians and other healthcare providers in an electronic format. The EHR is the combination of all electronic patient data from sources including the healthcare payer, provider, and patient.

3. Addressing Fragmentation of Medical Care with Technology

Medical care fragmentation is largely the result of patients receiving different types of care at multiple facilities from various providers. For example, a primary care physician may treat a certain condition while a specialist treats another. This same patient may have also received treatment at an outpatient center or an emergency room. Every care encounter generates patient data that remain with the respective provider within each individual facility because physicians do not routinely communicate with one another and share pertinent clinical information about common patients.

Healthcare payers currently maintain the most comprehensive patient-care data available in an electronic format, including pharmacy claims, medical and surgical claims, behavioral health claims, health risk assessments, and case-, disease-, and utilization-management data. However, payers also do not routinely share this information with their provider base, so fragmentation of medical care persists.

The goal of HIT in reducing the fragmentation in healthcare is to provide a complete view of a patient's clinical history so that when various facilities, providers, and payers are working on a component of the patient's healthcare, they have all of that individual's information available to them. For example, one doctor being made aware of the treatment another doctor has provided and, perhaps more importantly, the medications the other doctor has prescribed, increases the opportunity for better healthcare outcomes for the patient and reduces the risk of a medical error.

4. Technology and its Role in Healthcare Costs

According to the Centers for Medicare and Medicaid Services, US healthcare spending is expected to rise from $US2.1 trillion in 2006 to >$US3.8 trillion in 2015.[9] This rate of medical inflation means that the proportion of the US gross domestic product directly related to healthcare will rise from its current level of 16.2% to 20% in 2015.[9] This trend continues to increase the pressure on the healthcare industry to contain costs.

IT holds tremendous promise for lowering healthcare expenses in a number of ways. For example, it can help reduce or eliminate duplicate and unnecessary testing. With the EHR's amalgam of patient data from varying sources forming a more complete and common patient view, physicians can be aware of a patient's previous tests and contact the ordering physician for further discussion. This is especially important in the emergency department where duplicate testing is common as a result of the usually high level of medical severity and the low availability of patients' historical medical information.

To illustrate the value of the common patient view that resources such as the EHR provide, MEDecision, Inc. (Wayne, PA, USA) recently completed a study with a payer and a regional level 1 trauma center in Delaware, USA.[10] The initiative analyzed the cost implications of providing emergency department physicians with a payer-based EHR, also known as a patient clinical summary. Specifically, it examined emergency department patients covered by the payer who were subsequently admitted to the hospital as a result of the emergency department visit. The study found that medical costs were, on average, $US545 less for the subset of patients for whom a comprehensive patient clinical summary was provided compared with patients for whom one was not provided.[10].

Applying these savings to the estimated 110 million emergency department visits in the US per year produces a considerable net cost reduction.[11] Clearly, a more effective and efficient use of existing medical data can significantly benefit the healthcare industry in its pursuit to control costs.

5. Barriers to HIT Implementation

According to the Office of the National Coordinator for Healthcare Information Technology, widespread adoption of HIT faces several market barriers and challenges. Among others, the most common hurdles physicians cite are cost and complexity of implementation, uncertain financial returns, workflow changes and disruptions, along with the fact that learning a new computer system takes time away from patient interaction.[12]

While HIT undoubtedly has the potential to significantly reduce costs, it is widely viewed as a major expense in and of itself. In one example, a study of 14 solo and small group practices conducted by the Commonwealth Fund found that initial EHR costs averaged $US44 000 per full-time provider, and ongoing costs averaged $US8500 per year.[13] In another case, an independent, four-internist, community-based practice saw its annual technology budget rise from $US10 000 to $US40 000 after implementing an EHR system, along with $US24 000 in annual carrying costs for financing the purchase over a 5-year period.[14] In both scenarios, however, the medical practices in question did eventually see a favorable return on investment.[13,14]

Additional, and often unforeseen, costs come in the form of personnel, hardware, software, ongoing upgrades, and maintenance. Many organizations fail to adequately plan for this fact and are blindsided by these significant training and change-manage-

ment expenditures, which occur well into their implementations. Amatayakul and Hodges examined some of these issues in an article published in *Healthcare Financial Management* entitled 'Don't Underestimate the People Costs of EHR.'[15] They noted that "plans for change management, process and workflow improvement, comprehensive training, user support and system ownership are all critically important to EHR success and require funding, but without the right people and the right team, the initiative can wander – and may very well fail. In an effort to be cost conscious – or perhaps because of their naiveté – many early adopters of EHRs and integrated clinical systems completely underestimated the 'people part.'"[15] The article goes on to describe how HIT projects are often forced into limbo, even after multi-million dollar budgets have been approved, because of unplanned staffing and cost issues.[15]

In other instances, HIT implementations have created major disruptions in workflows and tremendous upheaval among staff during initial usage stages. A study in the *Canadian Medical Association Journal* documented three case studies in which the introduction of various IT systems at one community hospital and two university hospitals was met with varying degrees of resistance, divisiveness, and contention among staff.[16] In at least one instance physicians resigned, a CEO was dismissed, and the IT system was reduced to a mere 25% of its intended functionality.[16]

The case of one small, independent, community-based practice in general internal medicine located in Philadelphia, PA, USA, further illustrates the turmoil that can be caused when converting from a paper-based system to an EHR.[14] In an article in the *Annals of Internal Medicine*, four internists involved in the transition summed up the experience early on: "Its financial impact is not clearly positive; workflows were substantially disrupted; and the quality of the office environment initially deteriorated greatly for staff, physicians and patients."[14] Despite this dire assessment, the authors went on to say that they would never revert to a paper environment because of the great strides that have been made in meeting patient expectations, creating operational efficiencies and improving care for patients.

On a similar note, a literature review published recently in the *Journal of Healthcare Information Management* outlined some of the success factors for HIT implementation, also in the physician practice setting.[17] The authors stated "Critical success factors included readiness to change, solidarity in EHR use, a commitment to striving, and process improvement strategies that used the EHR system to repair suboptimal clinic workflows."[17] The authors concluded such implementation is worth the effort, stating that "observed benefits include improvements in patient access, workflow efficiency, communication, decision support use, and financial performance."[17]

The preceding cases illustrate that the gains achieved in creating a comprehensive patient view do not come without some financial and organizational pain; however, the benefits that are provided by HIT far outweigh the negatives.

Some market barriers and challenges to widespread adoption of EHR are as follows:

- Payers often do not reward efficiency or quality, but rather they pay based on volume.
- Adoption issues: (i) a negative business case exists for typical healthcare IT adoption; (ii) a significant EHR adoption gap exists based on organization size; and (iii) there is a first-mover disadvantage for healthcare IT buyers.
- High failure rate for EHR implementation: (i) variable availability of IT expertise in physician offices; (ii) a high failure risk for business re-engineering; and (iii) limited implementation support for 75 000 small practices.
- Limited capacity for interoperability: (i) few healthcare IT products include standards; (ii) standards are not rigorous and lag behind commercialization; and (iii) there is no viable health information exchange infrastructure.[18]

6. Momentum Begins to Grow

Despite the significant barriers to HIT, many organizations are making progress. The key, as evidenced by the payer/emergency department study commissioned by MEDecision, Inc.,[10] is that small-scale implementations of certain measures have the potential to generate immediate results. Observing and documenting these smaller successes will generate enthusiasm for larger-scale implementations until eventually, a legitimate trend forms.

Already, the US government is taking a leadership role in creating momentum for HIT. The topic has become one of the few widely supported, bipartisan initiatives in the fragmented, often contentious healthcare sector.[19] In his 2004 State of the Union address, George W. Bush acknowledged the great value to the entire healthcare system of establishing a comprehensive patient record. "By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care." he said.[20] In April 2004, Mr Bush announced the goal of providing interoperable EHRs within 10 years, and in May of the same year he appointed David Brailer as the first US National Coordinator for Health Information Technology.

In early October 2005, the Department of Health and Human Services awarded three contracts totaling $US17.5 million to

public and private groups with the goal of accelerating the growth of healthcare IT and promoting the secure portability of health information across the country. The grants were intended to create strategic partnerships that would create 'building blocks' toward the widespread adoption of EHRs by 2014. The contracts were awarded in three major areas: (i) harmonizing HIT standards; (ii) creating a compliance certification process for EHRs; and (iii) addressing regional and organizational differences in how security and privacy issues are handled.[21]

In March 2006, US Representative John C. Porter (Nevada, USA) introduced the Federal Family Health Information Technology Act. Among other things, the legislation calls for the creation of EHRs for individuals covered under the Federal Employees Health Benefits Program. If enacted, the bill would provide these 8.5 million beneficiaries with an EHR by the end of the decade. The process would begin with PBHRs, add PHRs, and then provide resources via grants for providers to implement EHR systems.[22]

In August 2006, George W. Bush issued the executive order 'Promoting Quality and Efficient Health Care in Federal Government Administered or Sponsored Health Care Programs.' Among its primary components was a directive for federal agencies to employ better HIT systems to facilitate a more streamlined and efficient exchange of health information.[23]

7. Summary: The Bottom Line

IT offers the healthcare industry tremendous potential for addressing and rectifying some of its greatest concerns. As with most other major reforms, HIT maintains its own set of challenges and barriers until its full implementation can be significant. However, the benefits clearly justify persevering through initial complications. Studies and reports have shown that implementing IT, even on a small scale, to furnish payers, providers, and patients with more thorough data enables better decision making at the point-of-care, resulting in better outcomes and streamlined administrative and financial efficiencies.

The manner in which IT may greatly impact healthcare is through the EHR. By aggregating existing patient clinical information from sources that would not otherwise share data, IT formulates a common and concise patient view for each healthcare stakeholder. It is widely acknowledged that further proliferation of the EHR will be the foundation for the healthcare industry to better address its major challenges, such as the prevalence of medical errors, care fragmentation, and skyrocketing expenses. HIT in the form of the EHR will also allow the industry to bridge the existing medical-knowledge gap.

The widespread adoption of HIT is gaining momentum; the US government has helped in large part to build this momentum. A presidential executive order and a congressional bill have both called for large-scale IT implementation in healthcare and greater proliferation of the EHR. Additionally, George W. Bush has created the position of the National Coordinator for Healthcare Information Technology. Collectively, these actions confirm the power that IT holds to bring about significant change and reform to the healthcare industry overall.

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References

1. Kuperman GJ, Gibson RF. Computer physician order entry: benefits, costs, and issues. Ann Intern Med 2003; 139: 31-40
2. Kaushal R, Blumenthal D, Poon E, et al. The costs of a national health information network. Ann Intern Med 2005; 143; (3): 165-73
3. Bates DW. The quality case for information technology in healthcare. BMC Med Inform Decis Mak 2002; 2: 7
4. Frist WH. Shattuck Lecture: health care in the 21st century. N Engl J Med 2005; 352 (3): 267-72
5. Handler T, Holtmeier R, Metzger, J, et al. HIMSS electronic health record definitional model, Version 1.0: EHR definition, attributes and essential requirements Version 1.0. [online]. Available from URL: http://www.himss.org/content/files/EHRAttributes.pdf [Accessed 2006 Dec 1]
6. Simon JS, Rundall TG, Shortell SM. Drivers of electronic medical record adoption among medical groups. Jt Comm J Qual Patient Saf 2005; 31 (11): 631-9
7. Kohn LT, Corrigan J, Donaldson MS, editors. To err is human: building a safer health system. Washington, DC: National Academy Press, 2000
8. Aspden P, Wolcott J, Bootman JL, et al., editors. Preventing medication errors. Washington, DC: National Academy Press, 2006
9. Washington DC: Centers for Medicare and Medicaid Services, 2005. National health care expenditures projections: 2005-2015 [online]. Available from URL: http://www.cms.hhs.gov/NationalHealthExpendData/downloads/proj2005.pdf [Accessed 2006 Aug 2]
10. Wiley VJ, Daniel GW. An economic evaluation of use of a payer-based electronic health record within an emergency department. Wayne (PA): MEDecision, Inc., 2006 Jul. (Data on file)
11. National Hospital Ambulatory Medical Care Survey: 2004 emergency department summary [no. 372]. Hyattsville (MD): National Center for Health Statistics, 2006 Jun 23
12. Hackbarth G, Milgate K. Using quality incentives to drive physician adoption of health information technology: Medicare should help physicians overcome the barriers to adoption but should not simply pay the bill. Health Aff (Millwood) 2005 Sep-Oct; 24 (5): 1147-9
13. EHRs may benefit small practices financially, but only modest gains in quality seen. Healthc Financ Manage 2005 Oct; 59 (10): 126
14. Baron RJ, Fabens EL, Schiffman M, et al. Electronic health records: just around the corner? Or over the cliff? Ann Intern Med 2005; 143: 222-6
15. Amatayakul M, Hodges L. Don't underestimate the people costs of EHR. Healthc Financ Manage 2006 Aug; 60 (8): 130-1

16. Lapointe L, Rviard S. Getting physicians to accept new information technology: insights from case studies. CMAJ 2006 May 23; 174 (11): 1573-8
17. Zaroukian MH, Sierra A. Benefiting from ambulatory EHR implementation: solidarity, six sigma, and willingness to strive. J Health Inf Manag 2006 Winter; 20 (1): 53-60
18. Office of the National Coordinator for Health Information Technology. Department of Health and Human Services. Current market barriers and challenges to widespread adoption of health information technology [online]. Available from URL: http://www.hhs.gov/healthit/barrierAdpt.html [Accessed 2006 July 29]
19. Chaudhry B, Wang J, Wu S, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. Ann Intern Med 2006; 144 (10): E12-W18
20. Bush G. 2004 state of the union address [online]. Available from URL: http://www.whitehouse.gov/stateofthe union/2004 [Accessed 2006 Aug 2]
21. HHS Press Office. HHS awards contracts to advance nationwide interoperable health information technology [online]. Available from URL: http://www.hhs.gov/news/press/2005pres/20051006a.html [Accessed 2006 Aug 2]
22. H.R. 4859 - 109th Congress: Federal Family Health Information Technology Act of 2006 [online]. Available from URL: http://www.govtrack.us/congress/bill.xpd?bill=h109-4859 [Accessed 2006 Aug 2]
23. Promoting quality and efficient health care in federal government administered or sponsored health care programs [online]. Available from URL: http://www.whitehouse.gov/new/releases/2006/08/20060822-2.html [Accessed 2006 Aug 22]

About the Author: Dr DePhillips joined MEDecision, Inc., in March 2004 as chief medical officer, responsible for establishing clinical leadership within the company and expanding product delivery for integrated medical management. Prior to joining MEDecision, he spent 10 years as a community family practice physician, followed by 8 years in senior medical management at a large managed-care insurance company. In addition to his duties at MEDecision, Dr DePhillips holds a staff appointment as an instructor at Thomas Jefferson University in Philadelphia and is a consulting staff physician at three hospitals in Delaware.

Correspondence: Dr *Henry A. DePhillips*, III, MEDecision, Inc., 601 Lee Road, Wayne, PA 19087-5607, USA.