Strategic Action In Health Information Technology: Why The Obvious Has Taken So Long

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Abstract (Document Summary)

Recent enthusiasm for the automation of medical records and the creation of a health information infrastructure must be viewed in the context of a four-decade history of anticipation and investment. To understand the current opportunities and challenges, we must understand both the evolution of attitudes and accomplishments in health care information technology (IT) and the cultural, economic, and structural phenomena that constrain our ability to embrace the technology. Because prudent IT investment could make a profound difference in U.S. health and disease management, our strategic response must begin with an understanding of the pertinent history plus the challenges that lie ahead. [PUBLICATION ABSTRACT]

Full Text (5914 words)

MORE THAN FORTY YEARS HAVE PASSED Since the first use of computer systems to support patient care through the management of clinical information. Among the early experiments, the Lockheed/Technicon system at El Camino Hospital in Mt. View, California, is perhaps the best known and most influential of the "hospital information systems."1 But the idea rapidly gathered momentum, and by the late 1960s there were experiments with fullfledged electronic medical record (EMR) systems that collected data directly from clinicians and were designed for use in both inpatient and outpatient settings.2 Archaic by modern standards, these systems predated personal computers, local area networking, and the World Wide Web. Yet many embraced a vision of health and health care supported by EMRs, even though some observers expressed concern about the influence the technology would have on clinical practice and the training of practitioners.3

During the subsequent three and half decades, society has been inalterably changed by the growth of computing and electronic communications, with modern cell phones having more computing power than machines that supported multiple time-shared users in 1970. Those who have worked in health care computing during this period of remarkable change often express frustration regarding the slow rate of adoption of information technology (IT) in health care when compared with other societal components (including finance, electronic commerce, travel planning, general news and information dissemination, and educational support, to name just a few examples).

It would be misleading to suggest that the world of medicine has been unaffected by the IT revolution that has been touching other aspects of society. We know, for example, that health information is among the most frequently sought search categories on the World Wide Web, and consumers have been increasingly empowered to participate actively in both treatment and prevention. Similarly, it is a rare physician who does not use computer systems to obtain laboratory or radiology results for his or her inpatients, and increasingly to submit prescriptions or to access drug information. The typical modern hospital is filled with computers-evident on every nursing unit (albeit too often in inadequate numbers for the growing demand), in outpatient clinics, and throughout the specialty units.

For the first time in those thirty-five years of evolution in health care IT, we see a U.S. president calling for EMRs for all Americans within a decade and a newly created Office of the National Coordinator for Health Information Technology (ONCHIT) in the Office of the Secretary of Health and Human Services (HHS).4 One might guess that the potential for a "revolutionary" change in how medicine is practiced is at hand, but similar observations have been made for years.5 Thus, we need to place such optimism in context by assessing what has succeeded and what still remains to be realized, while asking what barriers exist that have prevented optimal progress to date.

The existing clinical culture demonstrates a variety of attitudes regarding the role that IT can and should play in patient care. Many practitioners are encouraged by the progress in clinical computing and believe that the technology can and will increase both the efficiency with which they practice and the quality of the care they deliver. Others are concerned that the technology might interfere with an almost sacred relationship between physicians and their patients, potentially dehumanizing the care process and encouraging impersonal "cookie cutter" approaches to the deep human problems that emerge in the context of disease and its management.6 Others, while grudgingly accepting the inevitability of the technology and its clinical use, worry about whether they can personally develop the skills and attitudes necessary to use IT effectively. They may even worry about how they will be judged by their patients, or potential patients, based on either their use of or their failure to use IT in their practices.

There is no shortage of ideas on how to use technology in ways that seemingly will improve practice, provide more information to patients, and improve the quality of information and guidance that is available. But our challenge is how to leverage the evolving technology and communications infrastructure in a way that is cost-effective; that supports health promotion, clinical care, and biomedical research; and that recognizes and encourages the development of standards and of the cultural change that will be required.

This paper summarizes the evolution of the leadership for health care IT, both in government and in the professional and research environments. Recent momentum in the promotion and implementation of computer-based systems and infrastructure is viewed in the context of barriers to IT adoption and the forces that are at work to overcome those challenges.

Historical Perspective

It was natural that the initial use of computers in the health care arena would occur in hospitals, beginning in the 1960s.7 Not only did hospitals have the capital necessary for pursuing such implementations, but the successful uses of data processing methods in industry suggested clearly analogous opportunities for fiscal management in large hospital organizations. Systems that focused on clinical data management were novel, however, with several academic centers and the previously mentioned El Camino Hospital providing key initial examples.

The research implications of computers in support of clinical care were soon recognized, and the National Institutes of Health (NIH) established a "Computers in Medicine" study section for grant reviews in the late 1960s. Drawn naturally into information management innovation by the need to convert the venerable Index Medicus to a computer-based version (eventually known as Medline), the National Library of Medicine (NLM) emerged as the NIH institute with a particular interest in research at the intersection of computer science and clinical care.8 Other agencies followed, with the Division of Research Resources (reconstituted in the 1990s as the National Center for Research Resources) and the Agency for Health Care Policy and Research (subsequently reborn as today's Agency for Healthcare Research and Quality, or AHRQ) both promoting major research and demonstration programs in health IT.

The federal government also invested heavily in clinical IT in a series of systems that supported the military hospitals, Veterans Affairs hospitals, and the health care facilities of the Bureau of Indian Affairs. The major investment in the Veterans Health Information Systems and Technology Architecture (VISTA) is especially well known and has had a profound influence on the quality and efficiency of clinical care and data management in the nation's veterans' hospitals.9

Several countries with different (generally single-payer and centralized) models of health care organization and financing, were able to introduce major innovations in clinical IT, largely through the efforts of their central governments. The United Kingdom, New Zealand, Australia, Singapore, Hong Kong, and the Scandinavian countries have made particularly large investments in primary care medical record systems and in distributed communication networks for data sharing and reporting. In the Netherlands, essentially all primary care physicians use a single computer-based system that

supports their clinical care processes.10

In the United States, federal developments in the use of clinical computing were paralleled by the development of related activities in academe and in professional societies. A handful of academic units in clinical computing began to appear in the late 1960s and early 1970s, with the emergence of a defined scientific discipline that became known as medical informatics.11 The NLM supported such programs, not only through its external research grants program but also with pre- and post-doctoral training grants, which have had a major influence on the development of health care IT expertise since the early 1980s.12 The field's professional base evolved through a variety of stages until, in 1990, the American Medical Informatics Association (AMIA) was formed. It continues to provide leadership and expertise to advisory bodies and to those who are formulating policy in the area of health care IT.13 The vendor/applied side of the field came together in an organization known as the Healthcare Information and Management Systems Society (HIMSS), another important locus of leadership and expertise in the field and the sponsor of a major annual trade show for new and developing products.14

Federal Advisory Committees

Although a wide variety of advisory reports and recommendations have been offered to the federal government in the area of health care IT, three entities warrant special mention as we attempt to trace the origins of leadership and strategic direction at the national level. Perhaps most important is the National Committee on Vital and Health Statistics (NCVHS), established by Congress more than fifty years ago to serve as a public advisory body to HHS on health data, statistics, and national health information policy.15 Although its roots were in the gathering and analysis of health-related data for the nation, it was a natural evolution for the NCVHS to become increasingly involved with standards for health data and, in turn, with the promulgation of health data systems and subsequently patient record systems. The committee and its various subcommittees and working groups have been extremely influential over the years, especially with the renewal of its charter in 1996 at the time of the passage of the Health Insurance Portability and Accountability Act (HIPAA) of 1996. This legislation and committee charter allowed the NCVHS to play a central role during the past decade in developing and molding the privacy, security, and data transmission rules that were created by the HHS secretary. The committee reports to the secretary and generates frequent letters and recommendations that are publicly available on the committee's Web site and that frequently guide the development of HHS policies and organizational changes or programs. Indeed, a recent report of the NCVHS Workgroup on the National Health Information Infrastructure (NHII) contributed to the creation of an NHII office within HHS, a variety of programs to educate the health community about the NHII's role, and in time the appointment of the national coordinator for health IT.

Another federal advisory group with recent influence on national policy has been the President's Information Technology Advisory Committee (PITAC).16 Created in response to the High Performance Computing and Communications Act that was passed during the Clinton presidency, from the outset PITAC has had a special interest in health care IT and its unrealized potential in the United States. Its reports and recommendations have been widely quoted, and the first had an acknowledged influence on the NCVHS Workgroup on the NHII when it formulated its recommendations for a health IT leadership position in HHS.17

The National Academies, in particular a series of studies by the National Research Council (NRC) and the Institute of Medicine (IOM), have also had a profound influence in educating the public, the health professions, and policymakers regarding health IT topics. I discuss some of these reports later.

Barriers To Effective Use Of IT In Health Care

The barriers to successful implementation of integrated health IT are no longer primarily technical in nature.18 With the maturity of networking technology and methods for secure management of data systems in a networked world, introspection and observation reveal that the principal challenges lie in other areas. Most fall into one of three categories: culture, the business case, and structural realities of

the U.S. health care system.

* Cultural barriers. Despite thirty years of IT innovation in health care, the technology has never really been embraced, especially when it requires direct use by busy clinicians. The biomedical culture views IT as a support activity, outside the usual foci of biomedical science. In short, there has been poor appreciation of IT as a strategic asset. IT leadership has not often been at the table for day-to-day strategic planning, relegated instead to an operational role while institutional and practice leadership often fails to consider the role that IT could be playing in addressing their fiscal, quality, and organizational challenges.

There is also a (largely flawed) perception that IT systems provide more of a threat than a protection for data confidentiality when compared with traditional paper-based practices. Well-designed systems with suitable attention to authentication and authorization, as well as auditing of access, can provide protection and processes that are simply impossible in the paper-based world.

We have also seen that the technical challenges (and the need for ongoing research) are often poorly understood. Furthermore, some clinicians express fears that the increasing use of computing technology will lead to depersonalization of health care and barriers to the traditional rapport between clinicians and patients. We have also seen that IT is sometimes viewed as a distraction from an organization's (or practitioner's) primary goals. Finally, given the many other pressures on today's clinicians, and health care workers' relative lack of experience with computing during their training, there can be a reluctance to learn new skills in an area that seems foreign and tangential to medical care.

* Making the business case. The health care industry has experienced many highly visible system failures, many of which were implemented with much fanfare and expense but never fulfilled their promise or realized the anticipated cost savings. Problems are often blamed on the technology itself, rather than on the implementers (people and vendors), implementations (both the product's capabilities and the way in which it is installed), and available fiscal resources (too often overly constrained and dooming projects to failure at the outset). Purchasers of health care IT are often poorly prepared to make appropriate decisions, and the buyers generally are not the users. Furthermore, even when clinicians and other system users are involved in design and selection, they tend to be poor consultants. They are seldom trained in the field of biomedical informatics and follow their clinical instincts instead of depending on access to structured knowledge and criteria in determining what system capabilities and implementation processes are most likely to succeed, based on the external community's past (and often published) experiences with the same or similar products.

An institution's IT organization and activities are generally viewed as a cost center rather than a strategic enabler. Measuring benefits and return on investment is challenging and can be expensive, meaning that simple direct fiscal metrics are generally used rather than indirect benefits with regard to operating efficiencies and improved quality. Further, IT is poorly integrated into cost (and reimbursement) models for health care financing, so organizations have few incentives to make the necessary investments.

In the ambulatory setting, and especially in private practices, the lack of well-aligned incentives is a serious inhibiting factor.19 Physicians need help making informed choices and dealing with the logistical and financial hurdles that have until now often made it unattractive for them to invest in IT solutions. Many physicians have no innate objection to EMRs, decision-support technologies, or other aspects of office automation, but they do not know where to start and are not sure that they can justify the expense for the benefits gained. There has until recently been no certification process that allows them to be sure that a product that is offered is compliant with emerging national standards for connectivity, data storage and exchange, privacy, and security.20 Indeed, such standards are still evolving, and there is as yet no coherent and well-accepted process for bringing them to a broad consensus that allows all stakeholders to adopt them and comply. Consultants often seem as confused by the options as physicians are, and the expensive failures of "recommended systems" are legendary. It is small wonder that clinicians increasingly look elsewhere for assistance.

In addition, the arguments for implementation of health IT are too often viewed by clinicians as being primarily directed at health systems, payers, and patients, with much less direct benefit appreciated by the physicians themselves. They understandably ask why, in a financial environment characterized by major regulatory and reimbursement challenges for physicians in practice, the doctor should be asked to invest in medical record systems whose primary systemic beneficiaries are elsewhere.21 This misalignment of fiscal incentives is often cited as a major barrier to widespread dissemination of IT into the practice settings where, ironically, the primary data are gathered and where decision-support capabilities could most beneficially be used. Solutions need to recognize that physicians' offices are not only sources of key information (required by payers, health policy makers, researchers, and large institutions) but also vitally important users of information that a robust information infrastructure could be delivering directly to their practice settings-rural, suburban, inner-city, or academic. When physicians experience clear benefits from their IT investments, and see efficiencies and cost savings as well as improved information access, a major barrier to suitable investments will have been overcome.

* Structural barriers. Fragmentation of the U.S. health system has meant that decision making regarding IT investment is generally made locally, with local optimization in mind, leading to poor coordination and a lack of generally accepted standards. We see notable exceptions (for example, as previously mentioned, with the Veterans Affairs hospital systems, where central investment and technology dissemination has led to an interoperable and generally well-accepted system that is used with limited local variation from coast to coast), but competitive pressures among both providers and vendors have made coordination and integration evanescent goals. As previously mentioned, there are historically poor incentives for IT investment. Furthermore, health care organizations are complex social environments, and many IT users do not work for the organizations that provide the systems for them. This differs markedly from most segments of U.S. society, where an employer can of course simply require employees to use the computational tools that they make available. Physicians on a hospital's staff will resist such requirements unless they see the benefits of system use. One reason that systems often fail to meet this criterion is that too few people are trained to work effectively at the intersection of biomedicine and IT. A computer scientist with superb technical skills but little knowledge of the culture of health care and biomedicine may design elegant systems that are totally unrealistic for routine clinical use and are thus rejected by system users.

The crucial role of development of standards continues to attract attention in both the research and vendor communities, but the political and logistical challenges remain formidable. The problem has been widely recognized, and important efforts have been made by both the federal government and the industry.22 However, there has been no sizable federal funding of the standard-development process, and those who participate in standards organizations such as Health Level Seven (HL7) do so on an unsupported, voluntary basis.23 The poor coordination of the health care industry has also led to its inadequate participation in the evolution of those standards that have been developed by the general IT industry. The health care community generally has no choice but to adopt what is provided by others (for example, although we often try to use the Internet security standards developed for electronic commerce, they typically do not rigorously meet the needs of health data protection and patient privacy). The resulting challenges to integration within organizations and between institutions are significant.

The Climate For Change

For those of us who have observed the barriers to IT dissemination and use in health care for several decades, the recent changes in attitude and attention to this topic are truly remarkable. What has happened recently to lead to a new momentum for creating and maintaining the NHII? What led President George W. Bush to call for use of EMRs for all Americans within a decade? Why, after more than ten years of encouragement, has the government recently created a position of national coordinator for health IT in HHS (the first time there has been a high-level official in HHS with a specific charge related to health care IT and its optimal use and dissemination)?24

There are several explanations for the recent trends. One is the increasing use of the Internet and World Wide Web by consumers. The resulting empowerment of patients, armed with easily accessible

information on health promotion, disease prevention, and disease management, has led clinicians to recognize that IT has become an integral part of society that will play an inevitable role in the way health care is delivered.

Second, passage of HIPAA and the subsequent rulings regarding data transmission, patient privacy, and systems security have forced health care organizations of all sizes to recognize the importance of data security and to seek computer-based solutions to problems that defy solution in a paper-based world. Mandated standards for data transmission help support the underlying infrastructure for data sharing and pooling that is crucial for both patient care and public health goals.

Third, a variety of formal studies in the past decade have identified health care IT as a solution to many of the challenges to both the cost and the quality of modern medicine. Particularly important have been studies by the IOM and the NRC dealing with issues such as computer-based patient records, patient data protection, the role of the Internet in health and health care, and the importance of demonstration projects to show the value of systems integration within regions and nationally.25 As mentioned earlier, reports from PITAC and the NCVHS have also been influential.26 They called for the creation of the NHII and for the establishment of a leadership position for health IT in HHS. Led by the NCVHS and further promoted by the post-9/11 recognition of the need for improved technology to strengthen our public health system and our homeland defense from bioterrorism, there has been a growing acceptance of the need for the NHII.

No reports have been more important, however, than the series of three IOM reports addressing the problems of medical error, the promotion of quality, and the assurance of patient safety.27 Much cited in the lay press, these reports are filled with examples of problems that, they assert, can be addressed effectively largely through the appropriate adoption of IT. The studies acknowledge that IT can generate risks as well as benefits, with computer systems actually leading to errors, especially if they are poorly implemented or if humans become overly reliant on them.28 On balance, however, they make effective arguments for bringing modern health care more effectively into the computer age, citing some of the barriers presented here and arguing for leadership roles and investment by governments, health care organizations, and individual practitioners. Other organizations have echoed their call for action, including the highly influential Leapfrog Group, a coalition of employers that seeks improved quality and reduced costs of health care for the workers they employ. Their call for widespread adoption of computerized provider order entry (CPOE) systems has been especially influential on the nation's hospitals.29

Another subtle change has occurred as a result of changes in biomedical science. The human genome project clearly demonstrated that modern molecular biology research has become impossible, given the amount of data that must be gathered, managed, and analyzed, without major computational support. Furthermore, the computer science required to support modern biology is itself innovative, with computational biology and bioinformatics emerging as accepted sciences in their own rights. This new acceptance of IT in the biomedical academic and research world has changed attitudes and opened minds with regard to the general role that computers can and should play in the biomedical endeavor.

Momentum Gathers

During the past few years, a wide variety of activities have emerged that reflect and contribute to an increased recognition of the role that IT should be playing in the health care system. In the private sector, these include the creation of organizations such as the e-Health Initiative and its partnership with the Markle Foundation's Connecting for Health program.30 In addition, organizations that emphasize the delivery of high-quality health care are often including the adoption of health care IT in their highlighted activities, and professional medical societies are becoming similarly involved.31

On the federal side, Congress has been responding with frequent hearings and proposals regarding health care IT and its suitable promotion. Particularly influential in building momentum has been the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003.32 For example, its

call for electronic prescribing as part of the prescription drug benefit has stimulated discussion and investment in an important growing area of health care IT.33 Similarly, Medicare's "pay-for-performance" initiatives encourage improved quality of care through approaches requiring forms of monitoring and data management that will be difficult to implement without robust information systems.34 Also, AHRQ has instituted a variety of demonstration research projects and programs to further the growth and understanding of health care IT opportunities. To provide further stimulus to the process, ONCHIT has released a strategic framework for health IT, and David Brailer, the national coordinator, is highly visible nationally in key forums where the imperative for coordinated investment and implementation is becoming increasingly appreciated.35

EAGER ANTICIPATION OF WHAT LIES AHEAD in the area of health care IT is at last widely shared. However, the anticipated vision will require major cultural change, financial investment, and logistical planning. It is critical to take account of the competitive nature of the medical marketplace and the inhibitors it has placed on effective investment to date. That competition, coupled with fiscal pressures on providers and health systems, means that leadership for regional and national coordination will need to come from elsewhere-and likely from governments.

The effort is worthwhile. Today the United States is poised to achieve what has been sought and anticipated for at least three decades, and the gains for the U.S. health care system will be profound.

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[Footnote]

NOTES

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5. In the late 1980s, working with a graduate student and the HyperCard modeling environment, I created a scenario for office-based ambulatory medical records, integrated via the Internet using a national information infrastructure. Initially used as a motivating example for a plenary presentation at the 1989 Symposium on Computer Applications in Medical Care, the scenario also appeared in the introductory chapter of our textbook of medical informatics, well before the explosive changes in Internet use that occurred following the introduction of the World Wide Web. See E.H. Shortliffe and L.E. Perreault, eds., Medical Informatics: Computer Applications in Health Care (Reading, Mass.: Addison Wesley, 1990).
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18. Portions of this discussion are based on a presentation given by the author at the C-Change Summit on Cancer Surveillance and Information: The Next Decade, Phoenix, Arizona, 29 January 2004.
19. See Committee on Energy and Commerce, "Witness Testimony: Dr. Edward H. Shortliffe, M.D., Ph.D.," 22 July 2004, energycommerce.house.gov/108/Hearings/07222004hearing1342/Shortliffe2132.htm (26 May 2005).
20. Recognition of this problem, catalyzed by one of the stated goals of the Office of the National Coordinator for Health Information Technology in 2003, led to the creation of the Certification Commission for Healthcare Information Technology (CCHIT), a collaborative effort of the American Health Information Management Association (AHIMA), the Health Information and Management Systems Society (HIMSS), and the Alliance (National Alliance for Health Information Technology). See ONCHIT, "Goals of Strategic Framework," 10 December 2004, www.hhs.gov/healthit/goals.html (26 May 2005). Also see the home page of the CCHIT, www.cchit.org.
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