



Healthcare Leadership Council

Chief Executive Task Force on Quality and Patient Safety
Technical Advisory Board on Health Information
Technology

Recommendations to Congress to Advance Implementation of Health Information Technology

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EXECUTIVE SUMMARY

The Healthcare Leadership Council (HLC) has a long-standing commitment to improved quality of care and patient safety. HLC envisions a 21st century health care system that is integrated and linked by information technology, that is consumer-centered, and that utilizes new drugs, technologies, and medical procedures to perform the highest quality health care. Achieving this vision is dependent upon health care delivery that is effective and cost efficient. For this reason, HLC has maintained a strong interest in facilitating health information technology (HIT) and supports its accelerated adoption and deployment.

HLC members have a unique understanding and successful history in implementing HIT. In summer 2003, HLC established a Technical Advisory Board comprised of clinicians and others with information technology expertise within HLC's member companies to provide information about their HIT implementation experiences. In total, 17 teleconferences were conducted with individuals representing multiple perspectives, including providers, managed care organizations, payers, pharmaceutical companies, and health care delivery systems.

This report summarizes the views and observations of participants in those teleconferences. No comments are attributed to individuals or to organizations.

Key Findings and Themes

Health information technology solutions have long been and continue to be offered as a key factor in improving health care quality and efficiency. HIT has been around for decades, but the industry is still a long way from achieving full implementation. It is becoming increasingly apparent, however, that investments in HIT provide significant returns across a variety of metrics. ***HIT provides increased delivery system efficiencies and cost savings, contributes to greater patient safety and better patient care, and achieves clinical and business process improvements.*** Patients benefit from the comprehensive adoption of HIT and the ability to share data within and across sites of care and among clinicians. Ultimately, other stakeholders such as employers, payers, policy makers, public health officials, and regulators will benefit from the ability to share and exchange data. In short, the return on investment in HIT is significant for all parties involved.

HIT Benefits

Several HLC member organizations were among the earliest adopters and pioneers of HIT. For HLC members, specific benefits (and lessons learned) typically vary by several factors, such as delivery system, organization or entity, data network, and organizational culture and staff mix (i.e., on-staff or employed physicians versus community-based physicians).

HLC members have and continue to implement a wide range of clinical, financial and administrative applications and use diverse methods to develop systems. The following table summarizes the diverse benefits of HIT.

CLINICAL	ADMINISTRATIVE AND ORGANIZATIONAL	FINANCIAL
Reduced medication and other medical errors	Increased staff productivity	More accurate capture of codes and charges
Fewer and avoided adverse events	Increased access to data	Fewer rejected claims
Better communication between patients and clinicians	Increased job satisfaction	More efficient recruitment of qualified clinicians
Better communication with referring physicians	Enhanced recruitment of qualified nurses and other clinicians	Fewer duplicative tests
More timely and comprehensive infection control processes	Easier and more efficient data collection	Decreased operating costs
Increased time for hands-on patient care	Improved work flow	Reduced storage and transcription costs
Improved patient confidence in care	More efficient data flow to payers	Reduced per claim processing costs
Better information for clinical decisions and treatment options	More accurate, legible, and timely clinical documentation	Reduced supply costs
Fewer inpatient hospitalizations	Better compliance with regulatory requirements	Streamlined administrative processes
Reduced practice variation	Significant skill enhancement for nurses	Improved data capture for use in national quality of care, clinical outcomes, and benchmarking efforts
Improved patient satisfaction	Less redundant data entry	Enhanced physician recruiting via EHR
Decreased patient waiting times	More timely public health reporting	
Better patient compliance with treatment plans	Improved data quality for research and clinical trials	
Streamlined disease and case management	Streamlined administrative processes	

HIT Barriers

HLC participants highlighted a number of significant barriers, among them costs, standards, and interoperability. For example, in their quest to improve the quality of patient care, many health care providers, payers, and manufacturers continue to take advantage of information and communications technology. Unfortunately, their growing difficulty in investing scarce resources into increasingly expensive HIT, as well as the current lack of standards for HIT systems, have hampered the widespread adoption and implementation of these technologies.

Several participants cited an important yet often overlooked that must be taken into account reality regarding the costs and benefits of HIT systems. Providers that invest in or implement HIT absorb the full cost of system acquisition and implementation, but the benefits accrue to many others, including insurers, benefit managers, employers, regulators, patients, and the community as a whole.

Recommendations

In order to accomplish the widespread adoption of HIT, the Healthcare Leadership Council calls on the federal government to provide leadership, direction, and the capital necessary to spur the rate of diffusion through the entire health care system. Based on its members' successful track record, research, and "real world" experience, HLC offers the following recommendations, which can be organized into three broad categories:

- Standards to assure interoperability.
- Financial incentives and funding mechanisms.
- Liability protections to facilitate sharing of safety and quality data.
- Stakeholder collaboration on best practices.

Recommendation 1. The federal government should continue to oversee a comprehensive program of health data and information standards development that will facilitate exchange and sharing of data and information.

Such standards will foster smooth and efficient communications and cooperation, regardless of individual system structure or architecture. Among other things, this work should address the increasing need for data, connectivity, interface, and communications standards. The health care industry also needs standards for commonly accepted clinical definitions, vocabulary, and terminology. Finally, this effort must also address concerns about patient privacy and confidentiality.

Recommendation 2. The federal government should implement financing mechanisms to spur private-sector HIT investment and accelerate the widespread adoption of HIT.

This is designed to ease the financing crisis facing those attempting to adopt and implement often high-cost, highly complex HIT. Such financing mechanisms could

include: payment “rewards” or “add-ons”, creation of an HIT revolving loan fund to invest public dollars in HIT projects and programs (e.g., modeled after the “Hill Burton” program); a revolving loan fund with debt forgiveness in accordance with specified criteria such as savings to the Medicare trust fund, tax incentives, reimbursement incentives based on improved patient outcomes, and matching private funds with public funds through grants from the Departments of Health and Human Services and the Department of Homeland Security.

Recommendation 3. Congress and the Administration should pass legislation to encourage open sharing of patient safety data by providing liability protections for certain disclosures of such data.

A voluntary reporting system with strong legal protections for patient safety data is critical for improving the safety of the health care system. An environment where providers can share information for purposes of patient safety without fear of being sued will promote open disclosures of information about adverse events to designated patient safety organizations. Analysis of such disclosures can lead to system safety improvements. Legislation to accomplish this has been considered (but not passed) by Congress for the past three years. This legislation strikes a fair balance between protecting disclosures for patient safety purposes, while still protecting patient’s legal rights by permitting use and disclosure of information that exists separately from the patient safety data. Electronic exchange and interoperability of health care information systems plays a critical role in an error reporting system described above.

Recommendation 4. Stakeholders should collaborate in the dissemination of best practices and lessons learned to further the successful implementation of HIT systems with proven functionality.

HLC supports both industry-initiated and federally led dissemination of information about HIT implementation, including best practices and lessons learned. Such dissemination would allow and encourage additional collaboration among stakeholders, facilitate knowledge and experience sharing, and ultimately help providers and organizations utilize HIT to improve patient safety and quality of care.

A federal investment in private sector HIT will go a long way toward improving the quality, safety, cost, and effectiveness of health care.

Introduction and Background

The Healthcare Leadership Council (HLC) has a long-standing commitment to improved quality of care and patient safety. HLC envisions a 21st century health care system that is integrated and linked by information technology, that is consumer-centered, and that utilizes new drugs, technologies, and medical procedures to perform the highest quality health care. Achieving this vision is dependent upon health care delivery that is efficient and cost effective. For this reason, HLC has maintained a strong interest in facilitating health information technology (HIT) and supports its accelerated adoption and deployment.

HLC members have a unique understanding and successful history in implementing HIT. Several HLC member organizations were among the earliest adopters and pioneers of HIT. Some are involved in the National Library of Medicine's (NLM) program providing grant support to health-related institutions and organizations for projects to plan, design, test, and deploy systems and techniques for integrating data, information, and knowledge resources into a comprehensive networked information management system.¹ Additionally, some participated in various Institute of Medicine (IOM), General Accounting Office (GAO), and Agency for Healthcare Research and Quality (AHRQ) studies and committees. Others are actively involved in national standards-setting organizations and related projects (i.e., Health Level 7 (HL7)).

After examining members' in-depth and diverse hands-on experience in HIT research and implementation, this paper discusses the many applications of HIT, the challenges and benefits of implementing HIT, and some key factors for successful implementation of HIT. We also offer three recommendations for furthering the adoption of HIT.

Methodology

In summer 2003, HLC established a Technical Advisory Board comprised of clinicians and others with information technology expertise within HLC's member companies to provide information about their HIT implementation experiences. In total, 17 teleconferences were conducted with individuals representing multiple perspectives, including providers, managed care organizations, payers, pharmaceutical companies, and health care delivery systems.

This report summarizes the views and observations of participants in those teleconferences. No comments are attributed to individuals or to organizations.

¹ NLM has supported such efforts to build integrated advanced information management systems (IAIMS). IAIMS are computer networks that link and relate the published biomedical knowledge base with individual and institutional databases and information files, within and external to an institution.

Key Findings and Themes

Participants shared their success stories and expressed diverse viewpoints reflecting their far-reaching experiences with HIT implementation. HLC members have implemented and continue to implement a wide range of clinical, financial, and administrative applications and use diverse methods to develop systems. Participants uniformly noted that the ability to exchange accurate information quickly within and across systems is essential in order to achieve a positive impact on health care delivery and related services. This section summarizes the major themes and participant recommendations.

I. Members' HIT Applications

Clinical Applications of HIT. HLC members—providers, pharmaceutical companies, medical device manufacturers, payers, and group purchasing organizations—are very involved in HIT projects and described various successful applications and IT-enabled processes across the entire continuum of health care. While clinical applications of IT, such as electronic prescribing, electronic health records (EHR), and digital imaging are most pervasively used in hospital settings, it is notable that a broad spectrum of health care industry sectors plays a role in clinical HIT applications that, combined, have great potential to increase the quality and safety of the health care system.

For example, several HLC pharmaceutical manufacturer members have been instrumental in facilitating patient bedside bar code verification during drug administration by voluntarily producing unit dose packages printed with standardized bar codes. Some pharmaceutical companies have developed on-line disease management programs using sophisticated data systems. Insurers also have implemented on-line disease management programs using automatic alerts for both patients and clinicians. And one insurer participant discussed the company's sophisticated claims data mining system that helps classify providers according to the quality of care they provide. The insurer makes this information available on line to help its enrollee's select high-quality providers.

Hospital group purchasing organization participants discussed their innovative programs to collect data from their hospital members and use it to perform benchmarking to help develop and disperse best practices for diabetes and other diseases. This data is also being used in a demonstration project to reward providers for providing a higher level of care quality. Comments were made during this particular discussion that standardized clinical nomenclature would greatly improve the value of this quality improvement tool.

A medical device manufacturer participant described one of the latest clinical applications of HIT that allows human implanted medical devices automatically to report health data to an online electronic health record. The success of this technology is, of course, dependent upon widespread use of electronic health records.

The table below summarizes clinical uses of HIT and the types of organizations most likely to use these applications.

Clinical Uses of HIT

	<i>Hospital Inpatient</i>	<i>Hospital Out- patient</i>	<i>Office Practice</i>	<i>Insurer /MCO</i>	<i>Medical Device Manuf.</i>	<i>Group Purchas. Org.</i>	<i>Pharma Manuf.</i>
Computerized physician order entry (CPOE)	U	U	U				
Bedside bar coding	U	U					U
Electronic health record (EHR)	U	U	U				
Health record data mining	U	U		U		U	
Automated clinical guidelines and protocols	U	U	U	U		U	U
Digital imaging	U	U					
Provider and patient web-based communication	U	U	U				
HEDIS data collection	U	U		U		U	
On-line disease management programs	U	U		U		U	U
Prevention outreach	U	U		U			
Data collection for assessing quality of care	U	U		U	U	U	U
Physician alerts	U	U	U	U			U
Knowledge management applications	U	U		U			
Patient reminders	U	U	U	U			U
Decision support systems	U	U		U		U	U
Clinical data warehousing	U	U		U			
Assisting patients in provider selection	U	U		U		U	
Telemedicine	U	U					
Picture archiving and communications systems (PACs)	U	U					
Implanted medical device automatic data reporting and transmission to EHR	U	U	U		U		

Administrative Applications of HIT. In addition to the clinical application of information technology, participants discussed administrative applications such as patient registration, appointment scheduling, claims submission, eligibility verification, and billing. Comments were made that highly automated administrative systems linked with the organization's clinical systems not only free resources for more hands-on patient care, but also greatly increase patient and provider satisfaction as a result of less paperwork.

II. HIT Benefits

HLC member discussions revealed that HIT has had, and will continue to have, an enormously positive impact on health care practice and delivery within their organizations, enhancing patient safety and quality, and ultimately lowering costs. For HLC members, specific benefits (and lessons learned) typically vary by several factors, such as delivery system, type of organization or entity, data network, and organizational culture and staff mix (i.e., on-staff or employed physicians versus community-based physicians).

Increased patient safety is a highly desirable benefit of HIT systems, although a difficult benefit to quantify. However, one vendor participant noted that a university hospital system using bedside bar code technology has realized an 89 percent reduction in medication administration errors. The same university has realized an 85 percent improvement in documentation accuracy in the emergency room and 71 percent reduction in overall discrepancies utilizing an automated drug dispensing system.

In addition to increased quality of care and patient safety and reduced costs, ***increased satisfaction for patients and providers*** was overwhelmingly cited as a highly valued benefit of HIT systems. Satisfaction was often attributed to easier and quicker access to clinical information which decreases waiting times, repeat appointments and laboratory tests, paperwork, and redundant data collection for both clinicians and patients.

Well-functioning HIT systems contribute to ***increased satisfaction among physicians and nurses*** for other reasons as well, according to several participants. Increased enthusiasm for HIT systems was noticeable once clinicians were convinced that it was an important factor in better patient care. One organization that had implemented a computerized physician order entry (CPOE) system, for example, determined through internal surveys that physician satisfaction had noticeably increased in large part because the physicians believed patients were receiving better care as a result of the new system.

At a time of severe health care workforce shortages, HLC member organizations have found their HIT systems to be ***beneficial for recruiting and retaining health care workers***, especially nurses. Improving nurses' job satisfaction by transforming the way nurses practice nursing was raised frequently as a benefit of HIT. HIT has made tangible improvements in nurses' work processes such as infection control review and

case management. One hospital system participant with a very advanced HIT system said that, before implementing its electronic health record (EHR) system, nurses spent 30 percent of their time “hunting and gathering” scattered patient information; with the EHR system, time spent collecting data has been reduced to a fraction of the previous amount. Participants also cited HIT systems as valuable attractions for recruiting younger nursing graduates who see information technology as an integral part of their skill development as nursing professionals.

Collecting accurate data more efficiently to help consumers make better choices about their care was also frequently noted as an important HIT benefit for HLC’s member organizations. Electronic data used in EHRs, electronic prescribing systems, digital imaging, or other HIT applications facilitate the assembly of more complete and accurate data across multiple sources. This contributes to better case and disease management, more accurate treatment options, and the ability to direct patients to higher quality and lower cost care.

In addition, HIT applications that combine administrative, financial, and clinical information systems benefit health care organizations, participants said, by allowing more accurate, timely, and complete data for data mining, predictive modeling, and financial analyses.

The following table summarizes benefits of HIT cited during our interviews:

Summary of Cited HIT Benefits

CLINICAL	ADMINISTRATIVE AND ORGANIZATIONAL	FINANCIAL
Reduced medication and other medical errors	Increased staff productivity	More accurate capture of codes and charges
Fewer and avoided adverse events	Increased access to data	Fewer rejected claims
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Better communication with referring physicians	Enhanced recruitment of qualified nurses and other clinicians	Fewer duplicative tests
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Fewer inpatient hospitalizations	Better compliance with regulatory requirements	
Reduced practice variation	Significant skill enhancement for nurses	
Improved patient satisfaction	Less redundant data entry	
Decreased patient waiting times	More timely public health reporting	
Better patient compliance with treatment plans	Improved data quality for research and clinical trials	
Streamlined disease and case management	Streamlined administrative processes	
	Improved data capture for use in national quality of care, clinical outcomes, and benchmarking efforts	
	Enhanced physician recruiting via EHR	

III. Measuring Return on Investment

Discussions among the HLC participants and examples of quantifiable benefits from their institutions indicate that methods to measure HIT benefits vary widely, although measures generally include both formal and informal analyses of financial impacts.

Some institutions use a return on investment (ROI) methodology to assess the financial impact of service-related operating expenses compared to revenue gains from improved service delivery. In some instances, the measurable financial improvements attributed to or facilitated by an information system have included the ability to control or reduce operating expenses (such as those related to personnel, printing, transcribing or storage costs), or to expand the types and range of services offered by the health care organization. Several participants described measuring positive financial outcomes in terms of quantifiable improvements in operating expenses or as new revenue for their health systems.

To fully calculate quantifiable benefits or ROI measurements, participants reported that they **first determine the baseline measures of specific metrics** and then perform formal *projected* return on investment or cost benefit analyses before investing in HIT systems. Several organizations reported the difficulty of making such assessments, however, because of the long length of time HIT implementation often requires before the old system can be integrated or dismantled. For example, one hospital system began implementing HIT systems in 1991, and it was not until 1999 that they had enough infrastructure in place to be able to begin taking costs out of the combined old and new systems. In contrast, one system cited that, in just two months after getting its EHR system off the ground, it collected the same revenue with fewer patients, and after four months it was taking in more revenue with the same number of patients. Clearly, factors such as the size of an organization, the patient population, the intensity of the HIT application as well as many others make it difficult to compare costs versus benefits across sites.

Another participating organization pointed out that formal evaluations of returns on investment are seldom conducted because they are an expensive, added cost. This system felt confident that it was receiving a return, without the official analysis. It was noted that cost savings from personnel reductions and transcription costs were evidence that the organization was receiving financial returns, and that the increased ability to deliver better quality and safer health care overshadowed the need to prove a financial return.

Other HLC members also measured benefits in **more qualitative and perhaps intangible terms**. For instance, participants indicated that benefits resulting from implementing patient access to personal health records, patient-physician electronic messaging, and automated appointment scheduling include better communication, less hassle, and improved patient satisfaction. Maintaining critical staff and enhancing continuity of patient care were also raised as “returns on investment.” These and other benefits of HIT mentioned previously in this paper might be difficult to measure, but as

many participants pointed out, they intuitively translate into indirect cost savings for an organization.

There was general agreement that successful HIT implementation requires significant investments of time and therefore a system's financial return should also be measured over time because benefits are not always immediate.

IV. HIT Challenges and Barriers

Along with the benefits, HLC participants described several challenges in implementing HIT. One obvious challenge is that health care is fragmented and delivered by various providers across multiple settings. Clinical information is complex and there are logistical difficulties in information sharing across settings. Additionally, clinicians need access to larger amounts and increasingly more complicated kinds of information in order to provide adequate care. Health care organizations themselves are complex, presenting added challenges for information sharing. Legislative and regulatory requirements governing patient privacy and confidentiality add yet another layer of challenge. Finally, the health care industry continues to face increasingly technical and dynamic regulatory pressures and requirements.

HLC participants highlighted a number of other significant barriers, among them costs, standards, and interoperability.

HIT Costs. A lack of funding or adequate resources—combined with the high costs of HIT systems—was repeatedly cited as a barrier to effective implementation of HIT systems. There are ***significant front-end and ongoing maintenance and operational costs*** for HIT, including software, hardware, training, upgrades, and maintenance. Systems and products are virtually unaffordable for those providers who do not have ready access to the needed operating capital. In addition, health care organizations often view systems implementation as very time-consuming, which translates into another layer of costs.

Transitioning from existing paper-based or long-standing IT legacy systems is an expensive proposition. Systems that were implemented in earlier decades, many of which still exist, were often installed as stand-alone systems. Costs to replace or to integrate these systems are significant, as are costs for ongoing systems maintenance and upkeep.

In addition to capital costs, ***ongoing operational costs*** in any institution require careful consideration. One participant noted that health care providers typically commit to increased spending of about 3 percent for operational costs when planning IT projects. Other information-intensive industries—banking, insurance, investment houses—commit more than double or triple that number for operating IT systems. This participant believes that an EHR system requires at least a 4 or 5 percent increase in spending for ongoing operational costs.

Several participants cited an important yet often overlooked reality regarding the costs and benefits of HIT systems that must be taken into account. Providers that invest in or implement HIT **absorb the full cost of system acquisition and implementation**, but the benefits accrue to many others, including insurers, benefit managers, employers, regulators, patients, and the community as a whole.

Given these challenges, there are concerns that the pace and pattern of HIT adoption will not be uniform and will be too prolonged to have a significant impact on quality and safety in the foreseeable future.

HIT System Implementation Issues. Some participants discussed the difficulties of finding the “right” systems solutions among many HIT systems options. Major hospital system mergers have presented the challenge of integrating multi-vendor systems that have historically been incompatible. One participant described how his organization had to consolidate more than 70 products from 35 vendors across hundreds of provider sites to create a comprehensive HIT infrastructure leveraging the organization’s existing investments and legacy systems.

Regardless of mergers, as mentioned above, many HIT systems have been implemented over an extended period of time, beginning before the availability of many of today’s commercial vendor products. These homegrown legacy systems must frequently be factored into the design of an organization’s new HIT infrastructure; however, incorporating them into a new system design usually requires costly trade-offs in terms of speed of implementation and the ability to share data between organizations. Consolidation of multiple vendor products and legacy systems can be extremely challenging and costly. Developing tailored or customized systems in conjunction with vendors and implementing various commercial off-the-shelf (COTS) vendor products are among the daunting array of choices for HIT systems that organizations must investigate when trying to implement or integrate an HIT system.

Several participants were encouraged by a very recent evolution taking place among HIT vendors that seems to be resulting in more versatile HIT systems with greater user satisfaction and interoperability. This may be largely a result of vendors working more closely with their customers to develop commercial systems. One teaching institution participant, for example, worked over a period of several years with a major HIT vendor to develop a commercial CPOE system that was fine tuned through years of physician trial and feedback about content and usability.

One participant of a very large hospital system stated that she did not perceive a lack of quality HIT products and vendors, but is instead challenged by the short supply of knowledgeable, high-quality IT personnel to maintain HIT systems in the long term.

Inadequate Standards and Lack of Interoperability. To achieve system-wide health care benefits of HIT, there is an increasing need for data, connectivity, interface, and communications standards allowing the sharing of data nationwide. For example, the EHR, as envisioned by many, implies total consolidation of all patient data from before

birth through death, accessible by those who need to know, and available at all points of care. This will require full interoperability within and across all health care settings. Additionally, uniform interoperability would eliminate the issues many health care systems now face as a result of mergers of several smaller systems.

While participants acknowledged the importance of this “next step” of macro-interoperability, most are moving forward with implementation of HIT systems even in the absence of standards that would allow their systems to interface with other health organizations nationwide. There are still standards, however, that some stated as being necessary to help their individual HIT systems function better. One standard that was repeatedly cited as necessary to improve internal systems was **a commonly accepted clinical vocabulary**. Lack of such a standard has contributed to costly, cumbersome, and inefficient retrospective data mining. Hope was expressed by several participants that the Department of Health and Human Services’ recent action to publicly license SNOMED—a comprehensive set of clinical reference terminology that the health industry can use to improve the comparability of data—would prove an important step to resolving this particular problem.

Contributing to the interoperability challenge is the fact that health care is complex and no two providers, settings, or institutions are identical. **A successful solution in one setting is not necessarily transferable to another.** As discussed previously, in many instances, providers have merged into or have formed larger (integrated) delivery systems often resulting in numerous disparate and sometimes duplicative systems. In some cases we learned that even existing systems within organizations cannot communicate with each other.

All of these issues contribute to a fragmented use of technology with minimal interoperability. Federally driven standards (with appropriate testing and implementation considerations) could potentially go a long way toward resolving technical and technological constraints due to variations (and incompatibilities) among system configurations, architectures, and platforms.

V. HLC Members’ Successful HIT Implementations: Key Factors

Participants provided keen insight into successful HIT implementations based on their firsthand knowledge and long-standing experiences. They described several key factors influencing HIT implementations, including organizational culture, access to capital, and long-term commitments in terms of time and people.

Organizational Culture and “Buy-In”. An organization with a pervasive philosophy of continuous quality improvement and error reduction is bound to be more successful at HIT implementation. This foundation is laid through strong dedication and involvement of top executive leadership in process innovation and improvement well before commencing HIT systems implementation. Conversely, several participants stated the underlying danger of implementing expensive HIT systems on top of existing inefficient and poorly managed disparate processes.

Detailed preparation and involvement of clinical, technical, and other staff were also mentioned by many participants as being necessary factors in HIT systems success. Anticipating and overcoming staff resistance or unwillingness to use the HIT system were critical.

Making sure that clinicians are proponents of the system was raised by all participants. ***It is essential, they said, that clinicians, especially physicians and nurses, actively participate in and support the development and implementation of any HIT solution from the very early stages.*** Several examples for gaining clinician “buy-in” for HIT implementation were cited. These included using team processes and staff-driven decision-making criteria and ensuring that computer technicians and clinicians engage in ongoing dialogues throughout design and implementation. Not only does this involvement help increase acceptance among clinicians, it also allows for incorporation of specific features and functions specifically designed to support the clinicians’ unique work processes and needs.

One organization, for example, used a team of physicians to help design its EHR. The participant from that organization described the organization’s willingness to compromise between an “engineering marvel” and a system that was acceptable and would be usable by the organization’s physician staff.

The extent to which the use of HIT systems is “mandated” versus voluntary for clinicians (especially attending physicians) varied with the specific type of organization and HIT application. One hospital system definitively mandates that if physicians want to work in that hospital system, they must use the hospital’s EHR. Another participant reported that, while the use of its EHR system was voluntary, more than 70 percent of clinicians were doing direct data entry using the automated systems. Interestingly, in cases where using the hospital’s HIT systems is voluntary, there was little variance in physician user acceptance between staff models where the physicians are employees of the hospital versus models where the physicians are independent practitioners at the hospital.

Several participants said a key factor in influencing an “HIT culture” is to provide evidence to clinicians of improvement in safety and quality of care. One example offered involved improved outcomes data from fetal monitoring. In this case, there was enough evidence of improvement to compel an immediate practice change, which no physician resisted once shown the data. Similar results were demonstrated with nursing personnel. One respondent discussed the greatly increased level of commitment to IT by nurses who were presented with case studies of increased safety that resulted from automated systems.

Staffing and Training. The importance of up-front and ongoing staff training cannot be overstated, according to the participants. It is critical to make certain that staff is well trained and proficient in its use of HIT in order to assure acceptance and adoption of the system. One participant mentioned that each physician is required to complete 16 hours of electronic health record training in order to work at the hospital, in many cases required training hours exceeding that. Other participants remarked that taking the

system and the training to the clinicians on the floors and at the bedside—not in the classroom—was also critical.

Organizational Expectations. Repeatedly, participants stressed the need to establish clear expectations of HIT implementation projects. Organizations implementing HIT systems need to identify expected accomplishments and benefits and link what will be invested with what will be achieved. Expectations can include better communication between patients and clinicians, increased job satisfaction among clinicians, improved workflow, more efficient data sharing and communication, lower operating costs, and better information to make clinical decisions.

One participant stated the importance of recognizing differences across organizations in terms of cultures, patient bases, environments, attitudes, priorities, size, complexity, and scope of services provided. This means that a successful system in one location will not necessarily meet the requirements or expectations at another.

Another important point made was that institutions must recognize that HIT systems implementation is an ongoing evolutionary process. HLC members noted that their personal and organizational involvement in specific systems implementation often spanned decades. One participant described her health system's HIT plan in particularly far-sighted terms. The health system, which was once three smaller systems, is focused on trying to ensure that each hospital has a minimum foundation of IT integration that can eventually lead to CPOE, digital imaging, and an electronic health record. Just installing this minimal foundation, however, is expected to take several years.

Organizational Business Processes. Success depends, in part, upon factors related to how the institution conducts its business plan for HIT implementation, according to the participants. This includes methods of management and project design, selected aspects of service redesign and consolidation, integration of services across sites, and their effects on staff and productivity. Related to this is the need to coordinate HIT planning and investment management techniques across the enterprise. Consolidating common HIT functions, processes, and applications are also critical to successful implementation.

Recommendations

Based on its members' successful track record, research, and "real world" experience, HLC offers the following recommendations, which can be organized into four broad categories:

- Standards to assure interoperability.
- Financial incentives and funding mechanisms
- Liability protections to facilitate sharing of safety and quality data.
- Stakeholder collaboration on best practices.

Recommendation 1. The federal government should continue to oversee a comprehensive program of health data and information standards development that will facilitate exchange and sharing of data and information.

The federal government, working with private industry, should continue to establish agreement on basic rules for open, nonproprietary, and scalable system connectivity rules, operating protocols, data definitions, and data element specifications. The government should strongly encourage the use of these standards so that the same (versions of) standards are implemented and updated simultaneously across the industry. In order to overcome the continued lack of interoperability, HIT vendors need to implement systems in accordance with universally accepted standards so that different systems will work with each other. Obviously, such standards must address concerns about patient privacy and confidentiality.

The Department of Health and Human Services (HHS) is already playing a leadership role in fostering the development of data standards and encouraging investments to identify and speed the adoption of new technologies throughout the health care system. HHS efforts to date include the Consolidated Health Informatics Initiative (CHI) and support for the National Health Information Infrastructure (NHII). Both activities have contributed to the adoption of standards for federal health programs. There are many public-private activities underway to build the NHII, an idea noted in an Institute of Medicine (IOM) report on computer-based patient records in 1991 and then elaborated upon in a 2001 National Committee on Vital and Health Statistics Report.² The concept has since been endorsed by a variety of public and private sector organizations. The broad goal of the NHII is to deliver reliable data in a secure and private format to patients, clinicians, and providers when and where they need it, so they can use this information to make informed decisions about health and health care services.

In July 2003, HHS asked the IOM and Health Level 7 (HL7),³ to design a functional model and standard for the electronic health record; their efforts are ongoing.⁴ In July 2003, HHS also announced that the department had signed an agreement with the College of American Pathologists to license the college's standardized medical vocabulary system and make it available without charge throughout the United States.

² National Committee on Vital and Health Statistics. "Information for Health: A Strategy for Building the National Health Information Infrastructure." Washington, D.C. November 15, 2001.

³ HL7 is an accredited ANSI standard organization that produces the HL7 messaging standard. It is the accepted *messaging standard* for communicating clinical data. It is supported by every major medical informatics system vendor in the US. The HL7 mission is to provide a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery, and evaluation of health services.

⁴ CHI is a collaborative effort between the Department of Health and Human Services, the Veterans Affairs/Veterans Health Administration, the Department of Defense, and other federal agencies to adopt government-wide health information standards. The first set of CHI standards were announced on March 21, 2003 and include: Health Level 7 (HL7) messaging standards; Logical Observation Identifier Name Codes (LOINC) to standardize the electronic exchange of clinical laboratory results; National Council on Prescription Drug Programs (NCDPCP) standards for retail pharmacy transactions; Institute of Electrical and Electronics Engineers 1073 (IEEE1073) standards that allow for health care providers to plug medical devices into information and computer systems; Digital Imaging Communications in Medicine (DICOM) standards that enable retrieval and transfer of images and associated diagnostic information.

In April 2003, the Food and Drug Administration issued a proposed rule requiring the use of standardized bar codes on all levels of drug packaging, including unit-of-use packages.

While these are impressive efforts toward developing nationwide standards for HIT, a coordinated and accelerated initiative must take place to ensure that these and other standards and their related technologies are available for mainstream use in the near future.

Recommendation 2. Congress and the Departments of Health and Human Services and Homeland Security should implement financing mechanisms to spur private-sector HIT investment and accelerate the widespread adoption of HIT.

The federal government should drive the nation's implementation of HIT by offering federally supported financing for capital and operations costs to help providers defray the huge costs of acquiring and operating HIT. The Department of Health and Human Services (HHS) should accelerate the development and disbursement of these financial incentives in order to encourage widespread HIT adoption. How soon the government ultimately supports such financing will be critical to the ultimate levels and patterns of HIT adoption across all segments of the industry.

Discussions revealed that, in the absence of federal financing mechanisms, it would be years before most providers adopt HIT. Generally, few believe that natural market conditions or private sector market competition will be enough to propel the needed level and pace of HIT adoption. On the other hand, incentives related to HIT implementation and operation would have a far-reaching and positive impact on the entire health care community, ranging from large enterprises to individual practices. Benefits of greater efficiency, productivity, and quality would diffuse to individuals and institutions throughout the health care system.

Rapid implementation of interoperable HIT is also considered a critical component of the nation's emergency preparedness. In a May, 2003, report, the General Accounting Office (GAO) states "Many of the activities underway to prepare for and respond to public health emergencies—including bioterrorism—are supported by information technology, which can better enable public health agencies to identify naturally occurring or intentionally caused disease outbreaks and can support communications related to public health." The report also states that "automated medical information systems can play an important role for clinicians during their response to a medical emergency, in documenting the treatment of illness and its outcome, and in collecting and sharing diagnostic test results." Additionally the report states, "The use of electronic medical records could reduce the burdensome and costly use of paper-based processes, facilitating rapid access to data critical for near real-time public health surveillance."⁵

⁵ *Bioterrorism: Information Technology Strategy Could Strengthen Federal Agencies' Abilities to Respond to Public Health Emergencies*, General Accounting Office (GAO), May, 2003, GAO-03-139.

HLC advocates the consideration and implementation of multiple HIT funding mechanisms. Regardless of the option or options chosen, participants noted that the federal government should assume a leadership role and create a financial catalyst for widespread HIT adoption, particularly among providers. As mentioned previously, the beneficiaries of IT-driven quality and safety improvements extend far beyond the providers—a strong argument for public funding. Instituting new or expanded funding mechanisms to reward those who successfully implement HIT—to include initial system installation as well as system upgrades or maintenance and operations costs—is one of the more compelling strategies to accomplish widespread adoption of HIT.

Potential financing models or options include:

- **Payment “rewards” or “add-ons” based on HIT implementation and operating costs.** This could include direct payments for using specific HIT applications (such as CPOE), offering higher payments to providers who use HIT, or offering discounts on medical liability insurance for HIT implementers.
- **A loan program with debt forgiveness in accordance with specified criteria,** such as demonstrating a savings to the Medicare trust fund by achieving specific patient safety or quality of care improvements.
- **Creation of a HIT revolving loan fund to invest public dollars in HIT projects and programs.** For instance, as some have proposed, these could be administered through community-level nonprofit lending agencies.⁶ This could be a self-perpetuating fund as borrowers repay their loans and could be modeled after the “Hill Burton” program.⁷ It could also include funding formulas and federal conditions of participation.
- **Direct grants to designated organizations and providers** based on established criteria and needs.⁸ In addition to ongoing grant programs from the Department of Health and Human Services, the **Department of Homeland Security** could consider a grant program for facilitating the implementation and interoperability of HIT that can aid in health care delivery during an act of bioterrorism or other public health emergency.

⁶ Coye, Molly Joel, Bernstein, William S., “Perspective: Improving America’s Health Care System by Investing In Information Technology”, *Health Affairs*. Vol. 22/No.4.

⁷ The Hill Burton program was created by Congress in 1946 to give hospitals and other health facilities money for construction and improvement in exchange for providing a reasonable volume of services to those unable to pay and for making services available for all persons residing in the facilities area.

⁸ For example, the Agency for Healthcare Research and Quality recently announced the availability of research grants to assess the value derived from the adoption, diffusion, and utilization of health information technology (HIT) to improve patient safety and quality of care. The HHS Office for the Advancement of Telehealth recently granted a total of \$3.74 million to 15 existing telehealth programs. The awardees support clinical telemedicine, distance learning, and patient education/disease management programs.

- **Tax incentives** to stimulate private sector (especially provider) investment in HIT.
- **Reimbursement incentives** based on demonstrating designated levels of improved patient care outcomes or other established criteria. This could include an investment program based on federally developed standards of performance and tied to provider compliance with such standards or their ability to demonstrate performance in accordance with the criteria.
- **Adjustment of payment policies** to recognize designated HIT applications as a reimbursable service.
- **Initiatives to match private funds with public funds** via a grant and/or revolving loan program.

Recommendation 3. Congress and the Administration should pass legislation to encourage open sharing of patient safety data by providing liability protections for certain disclosures of such data.

A voluntary reporting system with strong legal protections for patient safety data is critical for improving the safety of the health care system. An environment where providers can share information for purposes of patient safety without fear of being sued will promote open disclosures of information about adverse events to designated patient safety organizations. Analysis of such disclosures can lead to system safety improvements. Legislation to accomplish this has been considered (but not passed) by Congress for the past three years. This legislation strikes a fair balance between protecting disclosures for patient safety purposes, while still protecting patient's legal rights by permitting use and disclosure of information that exists separately from the patient safety data. Electronic exchange and interoperability of health care information systems plays a critical role in an error reporting system described above.

Recommendation 4. Stakeholders should collaborate in the dissemination of best practices and lessons learned to further the successful implementation of HIT systems with proven functionality.

Commencing an HIT implementation project requires a daunting amount of research to evaluate constantly evolving commercial off-the-shelf products versus other options appropriate for an institution's unique environment and desired applications. Further complicating implementation plans is that some or all of an institution's legacy systems must be taken into consideration in the overall design. In some cases, institutions may form relationships with vendors to help them develop a "semi-custom" and effective system solution. In these cases, the provider organization often provides the clinical and organizational expertise for product development. In any case, researching and designing such systems contribute to the already high cost of implementation. Of even greater concern is the potential to waste limited funding by choosing applications or systems that may not maximize potential for increased safety and quality, or by failing to

consider adequately possible long-term complications. Given the expertise gained by many premier health care institutions pioneering HIT implementation, an industry-initiated effort to share best practices could potentially speed the adoption of HIT throughout the health care industry.

HLC also supports federally led (sponsored) dissemination of information about HIT implementation, including best practices and lessons learned. Such dissemination would allow and encourage additional collaboration among stakeholders, facilitate knowledge and experience sharing, and ultimately help providers and organizations utilize HIT to improve patient safety and quality of care.

Conclusions

From this work, HLC arrives at two overarching conclusions. First, that HIT holds enormous potential, but second, that it remains stymied by challenges and barriers—and that full implementation is still far off. With regard to the opportunities presented by HIT, it is becoming increasingly apparent that HIT will provide savings, contribute to greater patient safety, enhance patient care, allow for increased delivery systems efficiencies, and achieve clinical and business process improvements.^{9 10} HIT can drive across-the-board positive changes and enhance value in care delivery. In particular, applications such as electronic health records, electronic prescribing, and bedside bar coding have been identified and promoted as necessary to facilitate a safer and more efficient health care system. Patients will benefit from the comprehensive adoption of HIT and the ability to share data within and across sites of care and among clinicians. Ultimately, other stakeholders such as employers, payers, and regulators will benefit from the ability to share and exchange data.

However, as this report points out, the reality is that there has been limited adoption and implementation of HIT. Ultimately, more widespread adoption of HIT will eliminate or diminish duplicative information gathering and will help assure delivery of health care based on timely, relevant, and complete information. The federal government should develop and implement a comprehensive HIT-financing program to meet the wide variety of providers' needs and to be responsive to many stakeholders.

In the absence of federal leadership and specific initiatives, HIT implementation will continue in a piecemeal and fragmented fashion. HHS should facilitate ongoing collaboration between the public and private sectors to establish consensus enabling interoperability within and across health care organizations. A federal investment in private sector HIT will go a long way toward improving the quality, safety, cost, and efficiency of health care.

⁹ General Accounting Office (GAO) Information Technology. Benefits Realized for Selected Health Care Functions. October 2003. GAO-04-224.

¹⁰ Patient Safety: Achieving a New Standard for Care. Institute of Medicine of the National Academies, November, 2003.

Appendix A: Discussion Questions to Guide HLC Conference Call on Health Care IT

Please describe the clinical HIT (health information technology) systems or applications that you have implemented. For each, please note whether the system is "home grown" or a COTS product:

Admission/discharge/transfer	Patient registration
Computerized physician order entry (CPOE)	Electronic health record
Bar coding	Laboratory results
E-prescribing	Clinical decision support
Pharmacy/medication management	
Other?	

What were/are the compelling reasons to implement HIT systems? What were/are the benefits of implementing HIT systems?

What were/are the (strategic, tactical, operational, financial, cultural) challenges regarding HIT implementation?

What do you perceive as the most common barriers and obstacles to implementing HIT systems?

What were/are potential solutions to overcoming these barriers?

What strategies did you use/do you recommend to (successfully) implement HIT systems?

What role did/does HIT have regarding patient safety? Organizational productivity? Efficiency?

What role did/does organizational culture have in your implementation?

What do we need to do to help assure the continued future implementation/deployment of HIT systems?

How have you measured the success of your efforts?

Could you describe your techniques for conducting cost-benefit analyses of HIT implementations? For calculating your ROI (return on investment)?

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