Testimony of
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Chairman Conrad, Ranking Member Gregg and Members of the Committee, I want to thank you on behalf of the members of the Healthcare Leadership Council (HLC) for the opportunity to testify on health information technology and its role in health care reform.

My name is Mary Grealy and I am president of the Healthcare Leadership Council (HLC), a not-for-profit membership organization comprised of executives of the nation's leading health care companies and organizations. Fostering innovation and constantly improving the affordability and quality of American health care are the goals uniting HLC members.

HLC supports rapid adoption of healthcare information technology (HIT) to improve quality of care, reduce medical errors, and lower health care costs. Members of HLC – hospitals, health plans, pharmaceutical companies, medical device manufacturers, biotech firms, health product distributors, pharmacies and academic medical centers – have seen firsthand what widespread adoption of HIT can mean to patients and health care providers.

Several HLC member organizations have been among the pioneers of health information technology. The collective experiences and achievements of these early adopters leads us to believe that HIT has the capability to transform our health care system by providing increased efficiencies in delivering health care; contributing to greater patient safety and better patient care; and achieving clinical and business process improvements.

The important task before us is to make sure that the promise of electronic medical records and interoperable HIT is available to all patients in the United States. We believe that Congress can significantly reduce or eliminate barriers to HIT adoption and that, in the interest of patients' well-being and greater cost-efficiency throughout American health care, it is important that Congress *act this year* to address this issue.

In my testimony I will discuss the ways in which HIT brings greater quality and value to our health care system. I've included as part of my written statement an attachment (see Attachment 1) that describes how various HLC member companies and organizations have already achieved significant success utilizing information technology. I will then outline the need for Congressional action to remove barriers to nationwide adoption of HIT by creating funding mechanisms to assist health care providers with the sizable IT infrastructure investments that are necessary if they – and their patients – are to be part of this technological revolution. Lastly, I will address the need for Congress to oversee the development of national, uniform standards to facilitate an interoperable health information network.

The Benefits of HIT

HLC believes that the establishment of nationwide health information connectivity between health care providers will dramatically improve both the quality and effectiveness of care. That is not to say that we believe HIT is the single "silver bullet" that will address all of the health care challenges we face. We believe, though, that combined with comprehensive health system reform, HIT is a critical component in lowering health care costs over the long-term and providing safe, effective, efficient and equitable patient care.

One of the ways that HIT would lower costs and increase quality is by reducing or eliminating duplicative medical care and overutilization. William Yasnoff, former Senior Advisor on the National Health Information Infrastructure for the U.S. Department of Health and Human Services (DHHS), posits that 20 percent of all laboratory tests and radiology studies are redundant, performed because the results of previous tests are not available at the point of care. DHHS estimates that nationally, savings could reach more than $400 billion through the implementation of a national health information network.

Three studies at the Regenstrief Institute also illustrated this point by providing additional information to physicians in the process of ordering diagnostic tests. Physicians were provided with the costs of diagnostic tests, statistical models regarding the likelihood of abnormal test results, and patients' past diagnostic tests and results. In all three cases, the electronic health record (EHR)-based intervention decreased the number of diagnostic tests ordered by physicians. This suggests that HIT is an effective tool for decreasing the costly overuse of health care services.

Perhaps the greatest benefit of HIT is its potential to reduce medical errors. As is the case in other industries, technology in medicine will help to prevent the incidence of human error. A recent article in *USA Today* notes that pharmacy chains say they have spent billions of dollars on safety technology and other improvements that have cut their prescription-error rates to a fraction of one percent. The article also notes an Auburn University study showing that as Americans age, the projected odds of getting a prescription that results in a serious, health-threatening error is about 1 in 1,000. That could amount to 3.7 million such errors a year, based on 2006 national prescription volume. (*USA Today*. "Five-year-old Took Wrong Medication for Two Months." Brady, E. and McCoy, K., 2/12/08)

The Department of Health and Human Services projects that medication errors alone cost the healthcare system $76 billion per year (Yasnoff). For example, the most common error in the medication use history occurs when a patient or other caregiver omits reporting a medication that is taken at home; a computerized physician order entry system cannot detect such an error without linkage to a community pharmacy database. This points to the need for a unified

EHR to serve as a single source of clinical information so that a complete record of medications a patient is currently taking is available to providers and the patient's pharmacist.

By having patient data, including laboratory and radiographic results, instantly available to the patient and any provider of the patient's choice via an interconnected network, HIT improves the ability of health care professionals and patients to make more informed decisions and avoid providing duplicative and redundant services. Furthermore, reconciliation of medications will decrease the likelihood of omission errors when medications are not carried over in a unified EHR. Thus, errors of omission and commission can be prevented; both resulting in savings and, even more importantly, enhanced patient safety.

HLC member companies have already demonstrated that medical errors can be reduced by deploying proven technologies, including bedside bar-coded medication administration systems, widespread e-prescribing, and secure online, "anytime, anywhere" access for physicians to critical patient medication information.

Additionally, HIT tools such as Clinical Decision Support, which help providers gain use the most current practice guidelines during patient encounters, and better post-marketing surveillance, such as the initiative created by the FDA Amendment Act of 2007, will do even more to increase patient safety and create better health outcomes.

HIT also greatly improves coordination of care for patients by allowing providers to work as a virtual team, even when stationed in various venues. Numerous studies support this conclusion.

For example, innovative organizations are utilizing HIT to provide patients, who are diagnosed with serious conditions, with second opinions from health care providers who operate within specified system protocols. Following a thorough review of patients' medical records and diagnostic tests, physician specialists can render a second medical opinion that includes treatment options or alternatives, as well as recommendations regarding future therapeutic considerations. All of this can be coordinated through a registered nurse who stays in personal contact with the patient throughout the process.

HIT may also help to accelerate the promise of personalized healthcare through use of genomic information to improve healthcare by transforming clinical practice and reducing health disparities. There is also vast potential for HIT and genomic information to aid clinical research organizations in improving the way diseases are diagnosed and treated by advancing research and development of innovative therapeutics. Clinical data collected from electronic health records (EHRs) can help speed delivery of novel products to market and monitor their efficacy and continual safety.

HIT is also an important tool to assist in the implementation of other proposals to lower health costs and increase health quality. Pressure is mounting for reform of current payment policy to encourage quality improvement, transparency and efficiency. Consequently, there is a growing need to measure the efficacy and efficiency of health care delivery. HLC believes the health care delivery system needs rapid adoption of HIT interoperability standards that not only facilitate the clinical management of an individual patient but that also support the ready aggregation of data for quality and safety measurement and reporting. In short, HIT will help to ensure that patients are getting the right care at the right time in the most appropriate setting.

There is growing interest in comparative effectiveness research and evidence-based medicine to assist providers in evaluating the best care for patients. Chronic disease management to manage high-cost illnesses such as asthma, congestive heart failure, and diabetes is another potential cost saver. These important initiatives, with untold possibility to improve patient outcomes and produce greater efficiencies, are much more easily facilitated by an automated health care system.

Federal Funding to Spur Adoption of HIT

Given the benefits of HIT to the health care system, HLC believes that it is critical that Congress and the Administration invest funds to encourage the widespread implementation of health information technology. HLC also recognizes that any source of funding must be fiscally responsible and sustainable and we, therefore, would support a variety of possible mechanisms to do so.

Though some providers have begun the transition to electronic medical records (EMR), most medical records are still stored on paper. The U.S. lags behind many other countries in its use of standardized EMRs. Only 15 to 20 percent of U.S. physician offices and 20 to 25 percent of hospitals have adopted some version of an EMR system, and the majority of these systems can't effectively interconnect through networks to coordinate care with other health care providers. (RAND)

HLC's interest in this issue is long-standing. In the summer of 2003, HLC established a Technical Advisory Board, comprised of clinicians and others with information technology expertise within HLC's member companies and organizations, to provide insights regarding their HIT implementation experiences.

Attached to this statement is a copy of the consensus recommendations that resulted from this effort (see Attachment 2). The paper attempted to quantify key benefits of HIT along with existing barriers to HIT implementation. The paper

concluded that the following components are central to achieving effective HIT expansion:

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

The lack of funding or adequate resources – combined with the high costs of HIT systems – was repeatedly cited in our member study as barriers 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 are virtually unaffordable for those providers who do not have ready access to the operating capital needed for such an investment.

In an age in which health care providers must deal with rising costs associated with uncompensated care, medical liability rates, public health disaster preparedness and addressing staffing shortages, it is a simple fact that many providers do not have the financial wherewithal to invest in these new systems. This reality is especially prevalent among rural providers, who are most likely to need help overcoming the financial and workforce-based barriers to connecting their practices to a nationwide system. Our larger health system members have made it clear that although many of them have adopted HIT systems, they want to make sure that smaller community providers have ample capital, namely time and money, to do the same.

HLC believes that the federal government should provide impetus to the nation's implementation of HIT through financial incentives and funding mechanisms to help providers defray the huge costs of acquiring and operating HIT. Rapid implementation of interoperable HIT is also a critical component in achieving nationwide emergency preparedness.

While the Agency for Healthcare Research and Quality (AHRQ) and Office of the National Coordinator for Health Information Technology (ONCHIT) contracts and grants will support the development of a national information network and interoperability standards, we need to do more to get every provider using electronic health records now.

HLC advocates the implementation of multiple HIT funding mechanisms. We, of course, recognize that current fiscal deficits and budget constraints limit the ability of Congress to directly fund any expansive new program or initiative. There are creative options, however, that can help us achieve our health care goals without undermining the nation's fiscal future. Financing mechanisms could include: payment "rewards" or "add-ons;" a revolving low-interest 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; matching private funds with public funds through grants from the Department of Health and Human Services; and exceptions to the physician self-referral (Stark) and anti-kickback rules to allow hospitals to share their HIT investment with physicians. We look forward to working with the Committee to determine how Congress might best be able to assist providers in this regard.

National Standards to Insure Interoperability

In the area of standards, several public and private sector initiatives are making great strides in identifying or developing health information interoperability standards that will enable disparate systems to "speak the same language." And the work of the Certification Commission for Health Information Technology will complement these efforts by certifying that products are compliant with criteria for functionality, interoperability and security. This will help reduce provider investment risks and improve user satisfaction.

HLC believes, first and foremost, that in setting national standards to ensure interoperability, we must protect freedom for innovation. We firmly believe that the private sector should work collectively to develop a roadmap for effective health information exchange that specifies the priorities and the standards necessary to make such an exchange possible. 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. Currently, a great deal of data goes into systems, but little automatically comes out in a way that readily supports health care providers and researchers.

However, HLC also believes there is an important and necessary role for the federal government in facilitating the effective expansion of health information technology. One of these areas is the standard for patient confidentiality and security.

Developing a multi-state, interoperable system depends on national technical standards as well as national uniform standards for confidentiality and security. We have some significant challenges ahead of us in this regard.

While the current Health Insurance Portability and Accountability Act (HIPAA) privacy and security rules provide effective protections, a multi-state data network requires the creation of a national patient privacy standard to replace differing and sometimes conflicting state laws, rules, and guidelines. Such a standard must protect patient confidentiality without imposing unnecessary and

harmful restrictions that would impede the essential flow of patient information to health care professionals and medical researchers.

We believe congressional action to establish a uniform federal privacy standard is vital in order to ensure the viability of a national health information network.

Because the HIPAA Privacy Rule's preemption standard permits significant state variation, providers, clearinghouses and health plans are required to comply with the federal law as well as many state privacy restrictions that differ to some degree from the federal HIPAA Privacy Rule.

State health privacy protections vary widely and are found in thousands of statutes, regulations, common law principles and advisories. Health information privacy protections can be found in a state's health code as well as its laws and regulations governing criminal procedure, social welfare, domestic relations, evidence, public health, revenue and taxation, human resources, consumer affairs, probate and many others. Virtually no state requirement is identical to the federal rule.

In June of 2007, the Research Triangle Institute (RTI), under a contract with the AHRQ, issued its final findings on its project to identify state privacy laws and practices and determine whether they pose barriers to health information exchange. The report concludes that *variation in the interpretation and application of HIPAA poses a problem for health information exchange (HIE)*, along with varying levels of trust for security, and many other varied regulatory and business practice issues.

HLC is not alone in calling for action in this area. The eleven-member Commission on Systemic Interoperability, authorized by the Medicare Prescription Drug, Modernization, and Improvement Act to develop recommendations on HIT implementation and adoption, recommended that Congress authorize the Secretary of HHS to develop a uniform federal health information privacy standard for the nation, based on HIPAA and preempting state privacy laws, in order to enable data interoperability throughout the country.

Addressing this issue appropriately will be essential to achieving the interoperability necessary to improve the quality and cost effectiveness of the health care system – while still assuring patients' confidence that their information will be kept private.

To further underscore the importance of this issue to HIT development, attached is a map developed by the Indiana Network for Patient Care (see Attachment 3). Each dot represents a patient seen at an Indianapolis hospital during a six month period. While the dots are stacked very deep around Indianapolis as you would expect, patients served by the Indiana health providers during this period were also located in 48 of the 50 states. Today's health care providers, meeting the

needs of a mobile society, serve patients from multiple and far-flung jurisdictions. Looking at this map, it is easy to see why regional agreements will not be adequate to address the myriad regulations with which providers and others will need to comply to achieve "interoperability."

Conclusion

In looking at the original recommendations that HLC developed and issued in 2004, it is clear that there has been significant progress since that time.

HLC commends Congress on the enactment of the "Patient Safety and Quality Improvement Act," in June of 2005. We advocated for this legislation as an important step toward fostering a culture of safety – through liability protections to allow voluntary information-sharing and reporting.

Legislation to facilitate greater adoption of HIT enjoys bipartisan support and continues to gain momentum. Senate action in 2007, along with continued support for HIT initiatives, suggests that 2008 will be an important year for progress on this issue.

In conclusion, we believe that legislation to facilitate the adoption of HIT offers Congress a clear opportunity to improve health quality and lower health costs. Such legislation should especially focus on areas in which Congress and the President *must act* to remove barriers and facilitate successful implementation of HIT. Therefore, legislation should accelerate the adoption of HIT and interoperable EHRs by providing funding to assist providers who need it in adopting HIT and ensuring uniform standards including privacy and security standards.

HIT expansion alone will not enable us to close the gap between the health care system we have today and the one we are capable of achieving. As this committee knows very well, we need reforms that will enable us to deliver greater quality and value to patients and health care consumers. We need to make health coverage more accessible. We need to link health care spending with quality of outcomes, not simply volume of services. We need a greater focus on wellness and chronic disease management.

But, there is no denying that health information technology is a vital, critical component in the future of American health care. The United States is already known for its medical innovations, the development of new cures, practices, treatments and devices that improve and lengthen lives. Taking the right and essential steps on HIT will enable us to be known for the technological innovations that will make health care more efficient and more effective in improving the health care of every man, woman and child in this country.

The Healthcare Leadership Council appreciates the opportunity to testify on the development of health care information technology. Any questions about my testimony or these issues can be addressed to me or to Ms. Tina Grande, Senior Vice President for Policy, Healthcare Leadership Council (telephone 202-452-8700, e-mail tgrande@hlc.org).

Attachment 1 – Examples of HLC Member Organizations' Successes with Health Information Technology

Aetna is one of the nation's leaders in health care, dental, pharmacy, group life, and disability insurance, and employee benefits. They are one of the nation's leading diversified health care benefits companies, serving approximately 35.9 million people with information and resources to help them make better informed decisions about their health care.

Aetna's CareEngine®-powered personal health record (PHR) helps over 4.4 million members manage and organize their health data so that they can work with their providers to make informed decisions. Aetna will make this tool available to seven million additional members by the end of 2008. Aetna has also partnered with RxHub and the National e-Prescribing Patient Safety Initiative (NEPSI) to improve physician access to decision-support information and e-prescribing technology.

Aetna was also the first health insurer and one of the first employers to sign the statement of support for the Department of Health and Human Services' "Four Cornerstones of Value-Driven Health Care," which calls for the development and use of HIT, as well as tools that provide quality and pricing information to consumers. To that end, Aetna has developed an innovative price and clinical quality transparency program to provide members with doctor and facility specific information.

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Amerinet is a group purchasing organization that promotes quality health care delivery and helps all types of providers more effectively manage expenses. They specialize in solutions related to technology, clinical operations, data management, executive-level decisions, and supply chain management.

An Amerinet member, the Virginia Mason (VM) Medical Center, is a private, non-profit organization that offers a system of integrated health services made possible through its large, multispecialty group practice of more than 480 physicians. Virginia Mason has been testing telemedicine services in rural areas throughout Washington state and Alaska for over ten years, including a live, interactive video feed between VM and other remote clinics in the Pacific

Northwest. This capability allows them to provide real-time information and store-and-forward communications related to a variety of medical fields, including radiology, dermatology, cardiology, and others, to a region that has been identified as lacking a sufficient health professional work force. VM is able to use this service to transmit radiological studies, consult on diagnosis and referral, and conduct pre- and post-surgical examinations.

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Ascension Health is the nation's largest Catholic and largest nonprofit health system, serving patients through a network of hospitals and related health facilities providing acute care services, long-term care, community health services, psychiatric, rehabilitation and residential care.

Spearheaded by Ascension Health, the Austin, Texas-based, Indigent Care Collaboration (ICC) has demonstrated the effectiveness of HIT in improving health care for the uninsured and underinsured. Drawing from funding through federal and foundation grants, this community collaborative built I-Care, an integrating information structure providing for a shared patient record. This HIT system enables the area safety net providers, including hospitals and outpatient clinics and health centers, to obtain on a real-time basis a record for each patient's previous health care encounter. It also permits the ICC to map patients and diagnoses for health care planning and research; document, monitor, and manage diseases in the population, and measures the effects of policy changes on populations in the local region. In addition to improving the health and lives of vulnerable patients, ICC has become a self-sustaining business model upon which other communities can draw for expertise and inspiration.

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BlueCross BlueShield of Tennessee is an independent, not-for-profit, locally governed health plan company that provides health insurance benefits to Tennessee business customers and plan members.

SharedHealth, an independent subsidiary of BlueCross BlueShield of Tennessee, is the largest public-private electronic health information exchange in the United States and has made TennCare the only Medicaid program in the country to convert all its beneficiaries to an electronic health record application at the point of care.

By replacing paper-based systems with advanced technologies, TennCare effectively links authorized clinicians and patients with secure, up-to-date information at the point of care via an encrypted web-based system, including previous medical visits, service utilization, lab results, medications, allergies, and immunizations. The system also allows physicians to e-prescribe and will soon have additional functionality related to chronic care management.

Recent third-party studies have indicated that consistent utilization of SharedHealth increases clinician efficiency by 17%, resulting in savings of approximately $59 per episode of care and $9 per medication prescribed electronically.

* * *

Hospira is a global specialty pharmaceutical and medication delivery company dedicated to Advancing Wellness™ by developing, manufacturing and marketing products that help improve the productivity, safety and efficacy of patient care. To meet the needs of hospitals working to minimize errors, adhere to the best clinical practices, maintain continuity of care standards and fully utilize infusion devices, Hospira developed Hospira MedNet Software. Hospira MedNet Software is a server-based suite of applications designed to connect data from a hospital's drug information library to infusion devices throughout the hospital to monitor, control and provide reports at the device, group or system-wide levels.

The adoption by hospitals of "smart pumps," infusion pumps with safety software, helps to prevent medication errors at the patient's bedside. The system helps hospitals define medication dose limits and track intravenous drug delivery to help prevent errors. It involves hospital pharmacists with the rest of the hospital team to develop and program best-practice dose recommendations for the infusion of drugs into a database that can then be transferred to the pump. HLC members, **Cardinal Health** and **Baxter International**, also manufacture similar devices.

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The **Marshfield Clinic** is one of the largest private, multispecialty group practices in the United States today and includes over 750 physicians in 84 medical specialties and subspecialties located in over 40 centers throughout northern, central and western Wisconsin. Although Marshfield Clinic has become synonymous with the city of Marshfield, Wisconsin, the Clinic's "community" goes well beyond the immediate area, embracing nearly all of Wisconsin and much of Michigan's Upper Peninsula. Patients from every state in the nation and 25 foreign countries were seen in the Clinic system during fiscal year 2006.

As part of its participation in the three-year CMS Physician Group Practice (PGP) Demonstration, Marshfield Clinic has relied on substantial investments made in tools such as their long-established telemedicine initiative and an EHR. Using the data in the EHR at the point of care ultimately allowed clinicians to deliver higher quality care at a more efficient rate. CMS recently announced that Marshfield was successful over the first-year of the project in improving quality of care while controlling costs to Medicare.

Marshfield Clinic has been pioneering integrated computer technology for patient care for nearly 20 years. The Clinic is chartless as of 2007. Wireless tablet computers allow access to EMRs and prescription writing through an advanced electronic prescribing program called Medications Manager. Marshfield also employs an application called iList that allows providers to quickly identify and reach out to patients that have one of three chronic illnesses – diabetes, heart failure, or hypertension – yet do not meet all of their recommended health goals.

*   *   *

Mayo Clinic is a non-profit medical practice dedicated to the diagnosis and treatment of virtually every type of complex illness. Mayo provides clinic and hospital services at its locations in Rochester, MN; Jacksonville, FL; and Phoenix and Scottsdale, AZ.

The Automation of the Clinical Practice (ACP) at Mayo Clinic in Jacksonville, Florida is a project undertaken in 1993 to encompass the computer-based patient record with the addition of the mechanisms for automated charging and order creation by physicians. This vision was crystallized and communicated as the "paperless" practice of medicine that would increase patient safety and improve physician effectiveness while at the same time driving down expenses. The last paper-based record was circulated in January 1996 and the integrated outpatient practice continues to the present day.

The Automated Clinical Practice program involves all clinical users. The areas that are automated now include most aspects of the practice and examples include:
- An electronic medical record (EMR) including all clinical documents, orders, scheduling, and laboratory.
- A fully electronic filmless radiology department with speech recognition for radiologist documentation.
- An automated Intensive Care Unit with EMR integration and bedside medical device interfaces directly to the EMR.
- Inpatient and outpatient surgery areas consisting of surgical scheduling, material management, and nursing documentation.

From this level of automation patient safety initiatives have been possible. For example:
- Orders automatically generate task lists for nursing, respiratory, etc., in the hospital.
- Automated fall risk assessment and Braden skin scale assessment are generated in the hospital.
- A medical data warehouse allows free text searching against the entire repository of millions of documents in the EMR for patient care and research.
- An infectious disease application allows bioterrorism surveillance and automated infection control monitoring.

Dictating notes shifted work from the physician and improved both legibility and medical record turnaround time. The system allowed for real time availability of clinical information (notes, Lab, X-ray, and other results), automatic checking for duplicate redundant orders, simultaneous access to the same patient chart, improved ability to answer ad hoc questions for patient calls, more timely response from physicians when patients have questions, and improved flow of information to the physician enabling him or her to have a more "complete" picture of what is known about the patient's condition at the time of the appointment. Savings to the organization have been significant.

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McKesson and their subsidiary, McKesson Provider Technologies, deliver vital pharmaceuticals, medical supplies, and HIT solutions that touch the lives of more than 100 million patients each day. McKesson is the world's largest healthcare services company and a leader in wholesale delivery of medicines and healthcare products.

Customers of McKesson Provider Technologies, a leader in the distribution and deployment of HIT solutions, have demonstrated the benefits of implementing HIT firsthand. One hospital that introduced bedside bar-code scanning of medications reduced its already-low medication error rate by 80 percent and sustained that rate for over ten years. Additionally, a clinic in the process of deploying an ambulatory EHR and e-prescribing system reduced nurse time spent on charts by 24 percent and increased time spent with patients by 16 percent. Similarly, transitioning to electronic charts at a rural medical center cut the average nurse daily paperwork by 1.5 hours. Examples like these and many more demonstrate the potential for HIT to improve the quality and efficiency of care, allowing clinicians to spend more time and resources on providing better care to patients and less time on burdensome paperwork.

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Pfizer is the world's largest research-based biomedical and pharmaceutical company, with corporate headquarters located in New York and major research and development locations in the United States and England.

Since March 2006, Pfizer has been working with a small group of other pharmaceutical companies, including other HLC member organizations, to evaluate and explore how clinical research could be improved by leveraging the National Health Information Network (NHIN) and other Health Information Exchanges through an effort called the NHIN Slipstream Project. This group explored many important ways that the exchange of health information could improve patient health through the research, development, and commercialization of new therapies, and determined that the three most

important areas of initial focus in the ONC NHIN process are: post-marketing drug safety surveillance, connecting patients to clinical trials, and establishing appropriate care standards through outcomes, pharmacoeconomic, and personalized medicine research. The group has spent the past few months developing documentation for these use cases and will continue by determining the data elements necessary to support them and the value propositions and business cases for each set of stakeholders.

Pfizer also participates in the Cancer Biomedical Informatics Grid (caBIG), a voluntary network individuals and institutions to enable the sharing of data and tools related to cancer research. caBIG is a partnership between the National Cancer Institute (NCI) and the private sector to facilitate integration of clinical information and the growing volume of genomic and proteomic data for the purpose of advancing development of new therapies. In conjunction with 80 companies as well as NCI, NIH, and FDA, Pfizer is working on the CRIX (Clinical Research Information eXchange) initiative to expand the caBIG vision from cancer to other therapeutic areas. caBIG is being built on open source, open access, open development, and federation principles.

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

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 reality that must be taken into account 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 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.

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 Department 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.

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.

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[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.

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

	Hospital Inpatient	Hospital Out-patient	Office Practice	Insurer /MCO	Medical Device Manuf.	Group Purchas. Org.	Pharma Manuf.
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 assemby 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	
	Increased job satisfaction	
Better communication between patients and clinicians	Enhanced recruitment of qualified nurses and other clinicians	Fewer rejected claims
Better communication with referring physicians	Easier and more efficient data collection	More efficient recruitment of qualified clinicians
More timely and comprehensive infection control processes	Improved work flow	
	More efficient data flow to payers	
Increased time for hands-on patient care	More accurate, legible, and timely clinical documentation	Fewer duplicative tests
Improved patient confidence in care	Better compliance with regulatory requirements	Decreased operating costs
Better information for clinical decisions and treatment options	Significant skill enhancement for nurses	Reduced storage and transcription costs
Fewer inpatient hospitalizations	Less redundant data entry	
Reduced practice variation	More timely public health reporting	Reduced per claim processing costs
Improved patient satisfaction	Improved data quality for research and clinical trials	
Decreased patient waiting times	Streamlined administrative processes	Reduced supply costs
Better patient compliance with treatment plans	Improved data capture for use in national quality of care, clinical outcomes, and benchmarking efforts	
Streamlined disease and case management	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.

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

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[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 (NCDCP) 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.

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]

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.

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[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.

- *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.

- *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

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[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.

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 it 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

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

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 facilitiate 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.

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[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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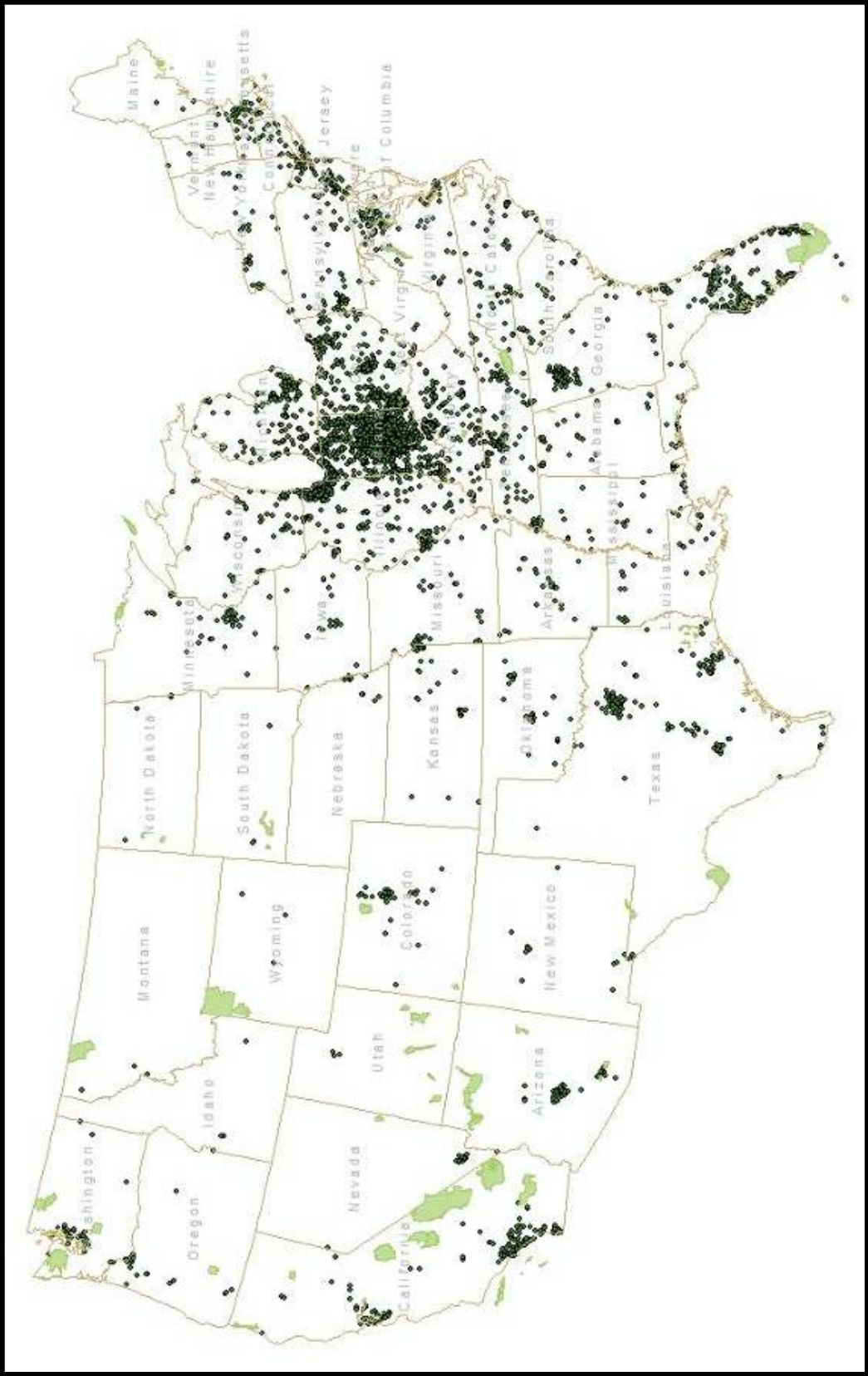
Attachment 3: Map prepared by the Indiana Network for Patient Care, 2004. Dots represent home addresses of patients treated at an Indianapolis, IN hospital over a six-month period.