Emerging Issues for Policymakers

Health Information Exchange May Cut Costs and Reduce Medical Errors, but Raise Challenges

A major reason for skyrocketing health care costs in the United States is that health care delivery is highly fragmented.

Some patients stay with only one doctor for many years. But many seek care from an array of health care providers, including primary physicians, specialists, hospitals, nursing homes, public health facilities, pharmacies, labs, and imaging centers. But while patients tend to move from one provider to another, their medical records rarely move with them, either between providers or across time.

This leads to higher health care costs for several reasons. Health care providers who cannot access other providers' notes, test results, and medication lists often order redundant services and tests. Administrative costs also increase. For example, each insurance company has its own form, and hospitals must tailor their bills to insurance company requirements, a time-consuming task that forces hospitals to hire more billing clerks (Anderson et al., 2006).

Left unchecked, fragmentation will push health care spending well beyond the current 16 percent of the U.S. gross domestic product.

Shown above are (standing, left) Rajesh (Robby) Gulati, MD, Assistant Professor of Clinical Medicine, IU School of Medicine, (standing, right) Clement J. McDonald, MD, Director of the Lister Hill National Center for Biomedical Communications, and (sitting) Klaus A. Hilgarth, MD, Assistant Professor of Clinical Medicine, IU School of Medicine.

Fragmented services and records also weaken the *quality* of medical care—causing serious errors in medication, communication, and coordination of care. A joint study conducted by researchers in the United States and Canada found that nearly 20 percent of patients discharged from a tertiary care academic hospital experienced an adverse event within two weeks (Forster et al., 2003). In these situations, it is critical that the primary care doctor receives prompt information about the patient at the time of discharge. According to the Institute of Medicine (1999), adverse events are common, costly, and a leading cause of unnecessary deaths.

Leaders in government and the health care industry advocate leveraging the power of information technology to tackle the problem of fragmented health information between providers. To do so, they are turning to an innovation called *health information exchange (HIE),* a network designed to share patient information and deliver test results electronically between providers. HIE seeks to deliver information to providers at just the right time—right before, during, or just after an encounter with a patient.

The good news is that HIE networks already have a substantial base in Indiana. They give the providers who use them better access to patients' medical information, and they reduce costs, improve decision-making, and cut the risk of medical errors.

The bad news is that HIE networks are costly and complicated to develop. And notorious security breaches, often in other industries, incite fears that unauthorized individuals might "hack into them" to access private health information.

Cost Effectiveness

Preliminary reports show that HIE networks do reduce waste and improve clinical workflow, reducing health care spending. The networks can give physicians access to recent test results, reducing the likelihood that they will repeat a test. HIE also is faster and cheaper than a paper-based system for ordering tests and medications,

and the networks deliver test results more efficiently than traditional fax and courier services (Overhage, Suico, & McDonald, 2001). One analyst places the potential national value of these benefits at $77.8 billion (Walker et al., 2005).

HIE also may benefit population health. It can quickly deliver data and analyses to public health officials (Foldy & Ross, 2005), and make it easier for heath care providers to report data.

Despite these early evidence reports and estimates, experts are still evaluating the ability of HIE networks to provide sustainable, long-term savings. There may be hidden costs not yet reported, and costs incurred by one network may not be similar to those of a similar network in another state or region.

Reduction in Medical Errors

HIE networks have great potential to reduce medical errors by delivering information to physicians, nurses, and other providers just in time, when decisions about a patient's care are being made.

Many provider organizations are already using isolated *clinical decision support (CDS)* systems that generate reminders—notifying a clinician when an older American should be vaccinated against the flu—and warnings—alerting physicians when potentially harmful combinations of medications are prescribed. CDS systems have been used for several years at some Veterans Administration, private, and public hospitals, and the technology has been very effective at reducing medical errors (Kaushal, Shojania, and Bates, 2003).

HIE can be used to expand the availability of a CDS system to multiple hospitals and providers. By incorporating CDS technology, the HIE system can deliver reminders and warnings for safer health care delivery at hospitals and physician practices where CDS technologies have not been installed locally. The HIE network can build a higher standard of quality for all of the provider organizations who use it.

Indiana Is a Leader in Health Information Exchange

Currently 40 percent of residents of Indiana have medical records stored in some form of HIE, and the state is home to several public-private partnerships working to construct, expand, and maintain networks between otherwise fragmented health care providers.

One analyst places the potential national value of HIE benefits at $77.8 billion.

Central Indiana

For more than ten years, the **Indiana Network for Patient Care (INPC)** has sponsored a public-private HIE network to enhance health care delivery in central Indiana. With support and participation from the Indiana State Department of Health, the Marion County Health Department, the Indiana University School of Medicine, and private leaders at independent hospitals and laboratories, the INPC created a core infrastructure for efficient exchange of patient information between provider organizations. The Regenstrief Institute, an internationally recognized health informatics and health care research organization, developed and operates the INPC (see the box on page 3 about the INPC).

Originally the INPC delivered patient information to emergency departments. Today the network is also used in other acute care hospital departments, and has been expanded to deliver information to physician offices.

The INPC was developed and is maintained through federal and state research grants and from private donations from the philanthropic Regenstrief Foundation. Analysts have shown that hospitals who use the INPC save nearly $26 per emergency room visit.

In 2004, the **Indiana Health Information Exchange (IHIE)** was formed by the Regenstrief Institute, private hospitals, the Marion County Department of Health, the Indiana State Department of Health, and BioCrossroads. The network uses software developed by Regenstrief.

IHIE is a nonprofit corporation that provides a secure, Internet-based service that delivers clinical results and laboratory reports to physician offices, replacing traditional paper-based delivery systems such as courier, fax, and postal mail.

Original funding for the IHIE came from public-private capital investments. Seed money for a precursor network to IHIE was provided by the Marion County Health Department. Hospital and laboratory subscriptions pay for ongoing maintenance. Individual physicians who use the system do not pay for services.

The combined efforts of the INPC and IHIE could save central Indiana $562 million each year in reduced paperwork, test duplication, and community health status improvements.

In 2004, Regenstrief secured a $5.2 million contract from the Federal Agency for Healthcare Research and Quality (AHRQ) to expand IHIE services around the state. Several hospitals and

physician practices outside central Indiana have already joined the network, and other providers are expected to join in the next two years.

Northern Indiana

Northeastern Indiana hosts a slightly younger HIE network, the **Medical Web (Med-Web)**. Med-Web is also a public-private initiative, although its developer and operator is the for-profit Indiana company, Medical Informatics Engineering. Med-Web connects 92 percent of Fort Wayne area physicians. The network also includes several low income clinics – safety net providers – and the Fort Wayne-Allen County Department of Health.

Med-Web provides clinical messaging services, including laboratory orders and results, discharge summaries, diagnostic images, and information that is downloadable into the physician's electronic health record (EHR) system. The network also enables physicians to send information to the hospital and to exchange secure messages and e-mails. Members of the network, including physician offices, pay fees based on their level of use – similar to the "rate plans" offered by cellular phone companies.

Providers in St. Joseph and Marshal Counties are also exchanging clinical data with the **Michiana Health Information Network (MHIN)**. The MHIN, founded by St. Joseph Regional Medical Center, involves 12 provider organizations and 70 percent of the area's physicians. This HIE network provides clinical

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The Indiana Network for Patient Care

The Regenstrief Institute has pioneered one of the most successful HIE initiatives in the nation, the Indiana Network for Patient Care (INPC). Beginning in 1994 with limited patient information available in three emergency departments, members of the INPC now include 95 percent of all hospitals and emergency care facilities in Indianapolis. In 2004, healthcare providers outside Marion County began joining the network. The success of the INPC has generated national interest from state governments and federal agencies, and the network has been featured in several prominent medical, business, and law journals.

The core of the INPC is a set of large databases containing standardized data from its members. Member organizations – hospitals, laboratories, clinics, and other providers – deliver clinical information to the INPC, which connects the data to form a more complete medical record for patients. The network provides Internet-based, electronic medical records, a medical library, and other services to its members. These services enable its members to securely access patient records from all member organizations as needed and receive up-to-date clinical information for improved medical decision making.

URL: http://www.regenstrief.org/medinformatics/inpc

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messaging services similar to those of IHIE and Med-Web, and uses provider subscription fees for operating costs.

The MHIN also offers an optional, integrated electronic health record (EHR) service for physicians and allows physicians with independent EHR systems to interface with the MHIN. Although the network does not offer support for all EHR vendors, recent community planning efforts have enabled the MHIN to support vendors that local physicians want to use.

Southern Indiana

Discussions at Bloomington Hospital about joining the INPC grew into a larger community discussion that became incorporated as the Bloomington e-Health Collaborative (BEHC) in 2004. The nonprofit organization includes 12 provider organizations and 85 percent of the physicians in and near Bloomington.

In early 2007, the BEHC completed a strategic plan to establish a sustainable HIE network and will soon select a contractor through an open Request for Proposal process to construct its HIE network, nicknamed the **South Central Indiana Regional Health Care Network**. The network is supported in part by a $540,000 three-year Rural Health Network Development Grant from the federal Health Resources Services Administration. The grant will enable the BEHC to serve providers in Orange, Crawford, Dubois, Spencer, and Perry counties.

Similar planning efforts are underway in Evansville. In May 2006, the Tri-State Business Group on Health, a coalition of area employers, proposed forming an HIE network after reading about the success of the INPC and IHIE in Indianapolis. The group convened several community planning meetings that included its members and the Health Leadership Council, an advisory board of area provider organizations. Following the meetings, the group asked the University of Southern Indiana to lead the effort to develop the HIE network as a health care economic development project for the region. The university is preparing to conduct return on investment study for provider organizations to develop the area's business case for HIE.

Key Drivers

Formed in 2002, BioCrossroads has supported eight promising life sciences companies in Indiana. One such budding enterprise was the IHIE. With both the Indiana Future Fund and the Indiana Seed Fund, BioCrossroads is helping fund and support new life sciences companies that will help stimulate advances in HIE networks and other health information technologies.

The Indiana Life Sciences Initiative, formed by Indiana University in 2006, promises to further promote the development

of life sciences research, education, and jobs for the state of Indiana. HIE networks such as the INPC and IHIE were born from federal- and state-funded grants supporting research in the health information technology and informatics sectors. Future support for research, education, and development of technologies for HIE can keep Indiana on the map as a key innovator and developer of technologies that improve health care quality, safety, and efficiency. This will attract new companies, jobs, and intellectual capital to the state.

Nationally, there is a flurry of activity in the HIE arena. A number of federal agencies have funded HIE projects in Indiana and 34 other states, including the Office of the National Coordinator for Health Information Technology, the Agency for Healthcare Research and Quality, the National Library of Medicine, and the Health Resources Services Administration . In 2006, a report produced for the Agency for Healthcare Research and Quality estimated that there were more than 100 HIE networks in development across the nation.

The State Has an Important Role in HIE

Although some independent HIE networks have been successfully established in Indiana, the state lags others when it comes to state-led HIE initiatives. So far in Indiana, the private sector has

Tennessee Constructs a State-Wide HIE Network

In 2004, Tennessee Governor Phil Bredesen initiated a demonstration project to build a statewide HIE network. The new project, called the Volunteer e-Health Initiative, will be available first in the southwest corner of Tennessee to exchange health information for the state's Medicaid population. The goal is to develop a working model in one region of the state that eventually can be expanded statewide, benefiting all Tennessee residents.

The Volunteer e-Health Initiative is funded with federal, state, and private funds. Much of the demonstration project is funded through a contract with the Federal Agency for Healthcare Research and Quality (AHRQ). State funds paid for initial project planning efforts. Private in-kind technology and staff support largely comes from the Vanderbilt University Medical Center.

Since planning for the network began, project leaders in Tennessee have consulted with researchers at the Regenstrief Institute and executives at the Indiana Health Information Exchange. The developers modeled many aspects of the Tennessee project after these innovative Hoosier projects. The state will use a similar organizational structure, technology infrastructure, and policies to construct and operate the HIE network.

For more information, see http://www.volunteer-ehealth.org/

led efforts to form and develop HIE networks (Brailer, Augustinos, Evans, & Karp, 2003). In contrast, other states, such as Tennessee, Rhode Island, Utah, Florida, and Hawaii, have executive branch-driven development of HIE networks (Rosenfeld et al., 2006). See the information about the efforts in Tennessee in the box at the left below.

However, some Indiana state agencies have made impressive contributions to development of HIE networks. One important contributor has been the Indiana State Department of Health. Although often behind the scenes, the State Department of Health is involved in monitoring, convening, and contributing to HIE activities. As monitor, the agency opened communication channels with many public-private groups working on HIE across the state. As a convener, the agency has fostered open dialogue within and between groups. As contributor, the agency has been engaged in projects to increase the availability of public health officials to receive timely population health information, and has participated in projects with local health departments to improve the exchange of public health data. In addition, the State Department of Health has worked closely with the Medical Informatics Commission to examine the state's role in HIE.

The Role of Public Health in HIE Is Vital

Public health agencies monitor outbreaks and emergency medical data by gathering data from health care providers about communicable disease, monitoring for bioterrorism, and other public health events. Data gathering also allows public health agencies to assess population health trends and inform policymakers about immunizations, mortality rates and trends, morbidity trends, and other health-related behavior trends. Finally, public health agencies ensure essential services by assessing and addressing community needs and service gaps, stimulating new services through local coalitions, and by providing some services themselves such as community nursing, WIC (supplemental nutrition programs for women, infants, and children), and immunizations.

These public health roles can be performed on a local or state level, depending on the local health department's capacity. The role of convener however, is best done by the local public health as they are "part of the family," at least more so than the Indiana State Department of Health. However, the ISDH has the lead role in establishing standards for public health datasets and in assuring that rules and law allow good public health information exchange, both from the data sources and among public health agencies.

Challenges to Implementing HIE

In some ways, the health care industry is a latecomer to the technology revolution. Although many provider organizations use administrative IT systems for billing and record keeping, few use IT to transform core health care delivery processes. Although many public and private forces are pushing health care providers to redesign care using technology, the industry faces many challenges.

The transition from paper to electronic records has been difficult. Many critics believe that IT systems in health care can severely strain and disrupt the patient-physician relationship. Others blame high costs for limited access to HIE in rural areas and small physician practices.

In addition, HIE networks face technological and privacy challenges. A lack of standards for the exchange of information between provider organizations makes the task of sharing patient records difficult and high profile data security breaches raise fears that unauthorized individuals will be able to access private health information when HIE networks are operational and interconnected.

Physician-Patient Relationships May Suffer

HIE, of course, requires electronic patient information. But accessing patient information via a computer, or entering patient information into a computer, can impede good communication between a doctor and patient. Poor communication can be more detrimental to patients than lack of knowledge (Walsh, 2004), and some critics say that to maintain or enhance physician-patient relationships, HIE must improve communication between patients and doctors.

To foster better communication, HIE networks must be cautious where and how they deliver information to physicians. Clinical messaging delivers information to physicians asynchronously, much like email. Messages arrive as information becomes available, and physicians can check their inboxes as they are available. Clinical decision support delivers instantaneous alerts and reminders as physicians perform clinical tasks. Too many alerts or reminders and a physician can become fatigued, which lessens the effect of future alerts and reminders.

HIE Networks Are Costly to Develop

Significant planning is required to ensure that providers and patients are comfortable with the technology, and policies must be established to govern when, where, and how health information is exchanged. Initial expenses include planning, legal fees, and technology costs, licensed and proprietary.

Early initiatives like the Med-Web and MHIN received significant funding from large, private health providers. IHIE

received its funding from a private venture capital fund and philanthropic foundation. It is unlikely that Indiana's rural providers and small physician offices will be able to invest as much in HIE initiatives. Much of the savings realized by hospitals and physician practices comes years after an initial investment in HIE. Meanwhile, other providers, such as for-profit laboratories and insurance companies, also reap the benefits of a community HIE network. Additional public investment from federal, state and local government entities can help offset initial expenses. Once an HIE network is developed, it is possible to capture revenues from those who use the network to pay for operational expenses.

Standards Are Not Yet Consistent

Standards—generally agreed upon "languages" for the encoding of health information—enable disparate information systems to communicate seamlessly. This concept is often referred to as *interoperability*. Many federal agencies have made efforts to promote interoperability so that EHRs and HIE networks can more easily be linked. Private entities, such as the Markle Foundation, have also supported adoption and use of HIE standards.

However, standardization remains difficult and costly. Some vendors continue to develop and maintain systems that use proprietary methods for information management, and this information may be impossible for other networks to access. Customized interfaces that enable systems to communicate with one another are necessary for HIE to work. These interfaces require significant time and money, which limits both the speed with which HIE networks can form and the ability of the networks to accommodate the many vendor products on the market. Additional public-private collaborations are necessary for development of a truly common framework that enables seamless data exchange among local health care providers and regional HIE networks.

Privacy and HIPAA Laws May Pose Barriers

Several high-profile security breaches involving data from the Veterans Administration and the Indiana State Department of Health have made consumers wary about how their personal health information is stored, used, and shared among health care providers, contractors, and government agencies (Associated Press, 2006; Keeling, 2006). Add a general distrust of the government and corporate America, and talk of making private health information more broadly available through HIE networks invites elevated patient anxiety over who has access to their personal health information.

Although a right to health information privacy is protected under the Constitution and federal statutes such as the Privacy

Act of 1974 and the Freedom of Information Act, consumers' rights apply almost exclusively to health information that is generated, held, and transmitted by the government (Hodge et al., 1999). With the passage of the Health Insurance Portability and Accountability Act (HIPAA), Congress extended privacy rights to health information collected and shared between private health care organizations. However, HIPAA privacy and security regulations are complicated and ambiguous, in spite of "clarification" efforts by the U.S. Department of Health and Human Services (Greenburg et al., 2005).

Although efforts like those sponsored by the National Governors Association and the Health Information Security and Privacy Collaboration are examining challenges to the privacy of shared electronic health information, many believe that there is no need for additional federal or state oversight to keep health information confidential and secure.

Informed Consent Is Required for HIE-Based Research

HIE networks create large data warehouses of health information that could be easily accessed by researchers, but HIPAA privacy regulations do not allow researchers carte blanche access to electronic health information. On the contrary, HIPAA prohibits sharing any private health information, including contact information, without first obtaining informed consent. Institutional Review Boards (IRBs), organizational committees that govern human subject research, are usually responsible for

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Careers in Health Information Exchange

According to the Federal Bureau of Labor Statistics, 18 of the 20 fastest growing occupations between 2004 and 2014 will be in the health care and computer science fields (Rogers, 2006). However, the health care industry lacks a systematic plan to develop the intersection of these disciplines—a work force capable of innovating, implementing, and using health communications and information technology (American Health Information Management Association, 2006).

The health care workforce of the future will need knowledge about health and information science, and successful HIE requires educated personnel in many roles. Careers in HIE include:

- Executives—leaders who can manage HIE organization staff, business operations, and information systems'

- Clinical Liaisons—individuals who are knowledgeable about health care and who can establish partnerships with provider organizations and maintain existing relationships with administrators and clinicians;

- Information Technology Specialists—vendors and in-house IT staff responsible for daily information systems operations, protection of patient information, and data quality assurance.

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granting researchers access to health information and ensuring that informed consent is granted by patients. Many IRBs feel threatened or confused by conflicting interpretations of HIPAA, which has led to variability in IRB approvals (Pace, Staton & Holcomb, 2005). This creates a significant barrier to research, especially in the primary care setting where researchers often pull patients from multiple primary care organizations.

Thoughts for Policymakers

Information sharing among fragmented provider organizations to improve health care quality, safety, and cost is expanding in Indiana and across the nation. In Indiana, HIE efforts are primarily driven by activities in the private sector. But state efforts, like those of the Indiana State Department of Health, are notable because they support and encourage public-private initiatives. By improving laws involving the reporting and management of health information for public health purposes, information sharing between local, state, and national public health departments can be improved. Continued support for public-private partnerships will further enable Indiana to capitalize on its distinctive position as a leader in HIE.

The state government is uniquely positioned to foster economic development and growth in the life sciences through the following actions:

Promote the use of standards — State government support of public-private activities to create standards for interoperability is necessary for HIEs to succeed in Indiana. To create a viable state-wide HIE, each community HIE must be designed using standards. One constructive start for this process would be for policymakers to support the efforts of the Indiana State Department of Health to secure community commitment to use standards. Additional funding to organize state-based HIE networks would also help. The agency could bring HIE leaders together for cross-regional collaboration and data sharing. This would put Indiana on the map as the first state to have a truly statewide HIE network.

Invest in HIE for rural communities and small providers — There is a strong business case for HIE in Indiana. Over the long term, HIE can reduce costs while benefiting providers, patients, and the state. Once established, developers of the networks can use several strategies to pay for operations. However, initial costs are high, so it is not surprising that the areas supporting HIE development and growth to date have been primarily urban—Indianapolis, Fort Wayne, South Bend, and Bloomington. Networks in these areas have been financed primarily by large, private organizations. Expansion of HIE to rural hospitals and

small physician offices, which often serve the state's most underserved populations, requires capital investment that these types of providers lack.

Federal grants provide resources primarily for research, but not for HIE implementation in new areas of the state. Furthermore, federal grants often do not address state and local needs. Beyond the need for expansion in rural communities, the state needs more resources to ensure that public health is at the table and has enough resources to fully participant in HIE networks. Timely population health information will improve county and state public health department efficiencies and lead to better health monitoring for Hoosiers.

Increase awareness of security and privacy needs — The ability of an HIE network to quickly move health information electronically from provider to payer to researcher has implications for patients and the health care system. Recent federal legislation has attempted to address vulnerabilities. Technically HIE networks can operate safely and securely, but there may be potential unintended consequences of regulations such as HIPAA. Vagueness has created uncertainty, especially about informed consents for research. State policymakers may need to be involved in coalitions designed to address the issue of informed consent for research. Work with federal agencies and policymakers is also needed to prevent further pre-emption of states' rights and

barriers that could prevent HIE from making a significant impact on health care quality, safety, and efficiency.

Support workforce development — The presence of multiple high-profile HIE networks in Indiana is important to the state's economy. Expansion of HIE in the state will create opportunities for new companies and new jobs. But the American Health Information Management Association and the American Medical Informatics Association (2006) report that the talent pool is lacking. These professional organizations have suggested legislation to strengthen programs such as the IU Life Sciences Initiative. Increased funding for health information education programs will attract and increase the retention of bright students and talented faculty. In addition, funding for training programs and apprenticeships that transition health care workers to health information careers will open new doors for experienced professional (see the box on page 6).

Conclusion

HIE is a viable method for improving health care while lowering the costs of health care delivery. These networks can lead to innovations, new companies, and new jobs in health care in America. Indiana is already a leader in many aspects of HIE. Further support of public-private efforts and promotion of secure HIE activities from state government will really push Indiana ahead to serve as a model for the rest of the nation.
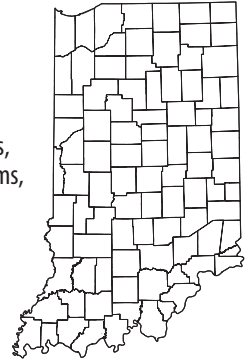
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