

State and Regional Demonstration in Health Information Technology: Indiana



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HEALTH IT

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State and Regional Demonstration in Health Information Technology: Indiana

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Preface

This project was one of six State and Regional Demonstrations in Health Information Technology (IT) contracts funded by the AHRQ Health IT Portfolio. The goals of the projects were to identify and support data sharing and interoperability activities aimed at improving health care for patients and populations on a discrete State or regional level. These States and their respective health information organizations (HIOs) are as follows:

- Colorado: Colorado Regional Health Information Organization (CORHIO)
- Delaware: Delaware Health Information Network (DHIN)
- Indiana: Indiana Network for Patient Care (INPC)
- Rhode Island: *currentcare*
- Tennessee: Mid-South e-Health Alliance (MSeHA)
- Utah: Utah Health Information Network (UHIN)

For more information about these projects, including a cross-project summary of lessons learned, please visit <http://healthit.ahrq.gov/stateandregionahie>.

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Executive Summary

Background and Purpose

The Agency for Healthcare Research and Quality (AHRQ) through its contractor, the Regenstrief Institute at Indiana University, sought to identify and support statewide data sharing and interoperability activities aimed at improving the quality, safety, efficiency, and effectiveness of health care for patients and populations on a discrete State or regional level. The overall goal of the Indiana State and Regional Demonstrations (SRD) was to evolve a secure statewide health information technology (IT) network to securely and privately, communicate and share information individuals' health information among health care providers.

The Indiana Network for Patient Care (INPC) has operated since 1995, providing population- based, longitudinal, structurally coded, and text patient data on citizens of Indiana. The goal was to build on established health information infrastructure, the INPC, develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care and create a sustainable business model through implementation and use of these tools.

Specifically, through an extensive multiorganizational planning effort, we adopted the following goals:

- Make Central Indiana a national leader in the use of electronic health information to deliver superior health care and to lower the cost of that care.
- Develop and implement a health information exchange (HIE) that enables hospitals, physicians, laboratories, pharmacies and other health services providers to deliver faster, more accurate, safer, higher quality and less redundant medical care to patients in Central Indiana.
- Benefit from the work of medical and public health researchers by making available the unique databases that will be developed through the HIE, which will, in turn, benefit hospitals, payers, pharmacy benefits manager, employers, public health agencies, drug companies, and ultimately patients.
- Facilitate the development and adoption of new health-related technologies, which will likely result in new job opportunities in the Central Indiana economy.

Results

During the course of the SRD project, the Indiana Network for Patient Care was transformed from a research project into a sustainable, growing collaboration of care providers supported by the Indiana Health Information Exchange (a not-for-profit supporting organization) that provides multiple services that contribute to the quality, safety, and efficiency of care with a sustainable financial model. The exchange has continued to grow and evolve after the end of the SRD, which is perhaps its greatest success. During the course of the AHRQ-sponsored SRD project, the exchange grew from 17 to 71 (over 300 percent growth) hospitals; expanded the

scope of providers participating including long-term care, community health centers, and laboratories; added over 7 million patients; and added 2.75 billion structured results. In the course of the project, the governance structure and legal constructs evolved to support a larger scale, growing HIE and the evolving legal and regulatory environment in which health information was being exchanged. In particular, the exchange had to evolve from a membership to representative model. In terms of funding, we created a value-based model in which those who gained value from services paid, with each service supporting its own costs, and building on the functionality created, supported other services.

Recommendations for Future Research

Electronic HIE is a critical component to achieve health system reform, and the road to a more connected and coordinated health system is long. Despite strong engagement by a large number of early provider adopters, late adopters continue to express concerns regarding financial costs, human resource requirements, and return on investment. As health information exchanges mature, more strategic education campaigns and targeted investments will be required to help the nation reach the last mile.

There are a number of initiatives around the Nation in the process of establishing information infrastructures to support accountable care and care coordination efforts through the exchange of electronic information. Stimulus funds provided a boost to these initiatives, but the road to achieving the vision of a health care system more connected and coordinated is long.

Background and Purpose of This Report

This report documents the progress made during the course of the entire project, specifically the methods used to accomplish the project goals and objectives, key deliverables, findings, and lessons learned.

Background on the Project and Local Environment

Formation of the Project

The Indiana Network for Patient Care (INPC) was a research project led by the Regenstrief Institute, which is affiliated with the Indiana University School of Medicine. Initial development of the INPC, an operational health information exchange (HIE) in central Indiana, began in 1995. The INPC overcame some of the organizational, legal, and technical barriers that have hindered the development of HIE in other regions.

Project Goals and Objectives

Governance

The primary governance goal for the project was to transition the INPC from a research project driven by the principal investigators to an operational HIE governed by the participants.

Finance

The INPC was developed and operated with grant funding and support from the Regenstrief Institute. Our finance goal for the project was to establish a sustainable funding model for the exchange.

Technical Infrastructure

In order to support the anticipated scale and avoid potential disruptions due to reliance on hardware that was being discontinued, we planned to re-engineer the system to use contemporary virtualized, cloud-based hardware approaches and contemporary software architectures and implementations.

Business and Technical Operations

In order to establish a scalable and appropriately focused business and technical operations capability, we planned to transition operations to the Indiana Health Information Exchange, Inc. (IHIE), which was formed in February 2004 to build on Regenstrief's INPC network. Whereas Regenstrief's mission is research and improving clinical care, IHIE's mission is focused on customer services and the expansion of HIE throughout the State of Indiana.

Legal/Policy

In the course of developing the INPC as a research effort, we had developed legal agreements, policies, and procedures that have supported the HIE for several years. As part of the SRD project, we planned to modify these legal agreements and policies as needed based on evolution of State and Federal laws and regulations.

Results

Governance

Identifying Partners and Other Stakeholders

We recognized early on in the Indiana Network for Patient Care (INPC) research effort that, while hospitals were a necessary part of a health information exchange (HIE), they were not sufficient and that public health, physician practices, laboratories, radiology centers, pharmacies, and payers were all important constituents. Starting with the State of Indiana as our primary geographic scope and our “foothold” in central Indiana, we used a variety of resources to identify potential stakeholders including hospital association databases, State licensing databases, the Drug Enforcement Administration (DEA) databases, the Indiana State Medical Association, CMS lists of CLIA approved laboratories and payor database derived from claims submitted. We then prioritized these potential stakeholders first by the goal of obtaining completeness for central Indiana populations and then by centripetal expansion across the State. This work leveraged the established organizational, legal, and technical infrastructures that existed at the time and were developed over time by the Regenstrief Institute for the INPC. Collaborators and stakeholders included the five large hospital systems in central Indiana, local physician practices, laboratories, Indiana State Department of Health, Marion County Health Department, Mayor of Indianapolis, Regenstrief Institute, Indiana University School of Medicine, the two Indiana medical societies, one community foundation, and some ad hoc members.

What Is the Governance Structure?

The INPC is not a separate legal entity.¹ Instead, it is a contractual collaboration between Regenstrief (and now the IHIE) and the participating hospitals and physician groups to exchange health information. The INPC participation agreement establishes the INPC Management Committee that governs the operation of the INPC, creates and authorizes policies and procedures related to the INPC, and exercises such powers and duties assigned to it under these Terms and Conditions. The Indianapolis collaborative evolved over 10 years as new participants and functions were added. The collaborative operates under a mutual contract that adheres to all Health Insurance Portability and Accountability (HIPAA) requirements and allows the use of the repository data for prescribed treatment, public health and research, and purposes with oversight by the INPC Management Committee. The Regenstrief Institute and IHIE are responsible for gathering and standardizing the data and developing and operating the computer systems.

Did Governance Infrastructure Evolve? If So, How?

As a result of the SRD project, the INPC participation agreement underwent major revisions that included adding new types of participants like payers and data providers who don't provide direct patient care, such as laboratories, and modifying the structure of the management committee to transform it from a participatory to a representative model. The committee was becoming unwieldy because of continued network growth hindering its decisionmaking processes. We believe it was important to start with the participatory model but equally important to evolve to the participatory model after basic processes were established, a level of

trust in the organization achieved and broad participation established. In the third quarter of 2010, a significant milestone was achieved in the life cycle of the INPC to move it from a successful grant-funded experiment to a valuable, self-sustaining service. Specifically, two documents were created to represent a restructuring of the contractual relationship among the INPC members, Regenstrief Institute, and Indiana Health Information Exchange (IHIE) to make it more efficient, as the INPC continues to expand and as IHIE increased its role in supporting the INPC's operations. The restructuring, approved by the INPC Management Committee, supports the common goal to transition the INPC to a valuable, self-sustaining service. These two documents are as follows:

- **INPC Joinder Agreement**—In this document, Regenstrief, IHIE, and INPC participating organization agree to comply with the INPC Terms and Conditions. This document also contains any terms and conditions specific to the INPC participating organization.
- **INPC Terms and Conditions**—This document contains the terms and conditions that will govern the INPC members' participation in the INPC. The INPC Terms and Conditions are an update of the INPC New Member Agreement and Founders' Agreement to incorporate the Management Committee's decisions and recent changes to HIPAA under HITECH. The Terms and Conditions also provide a more workable contracting structure as Management Committee decisions are made over time and the INPC continues to grow. The Terms and Conditions include a change in the composition of the INPC Management Committee to broader representation of health care providers and parties interested in health information exchange (e.g., patients and consumers).

A third document, the INPC Pricing Agreement, was developed and is an agreement between each participating organization and IHIE that addresses the fee structure specific to each organization. Effective July 2011, IHIE has been receiving fees from INPC participants for HIE services provided.

Lessons learned about governance. Governance will most likely evolve to represent and be in synch with the vision and size of the collaboration.

Conclusions. We believe because it was built on a foundation of perceived mutual benefit and trust, the governance and operations of the Indiana Network for Patient Care (INPC) will continue to be successful as long as these key components continue to exist and the stakeholders and participants continue to utilize the HIE in important and innovative ways to reduce health care costs, enable and facilitate health care data sharing for patient care, and with appropriate privacy and security protections.

Finance

Initial Sources of Funding

The robust Regenstrief Medical Record System (RMRS)¹ was developed over 30 years by Regenstrief Institute investigators and their pioneering commitment to standards, interoperability and the interchange of clinical data for clinical, public health and research purposes. Building

¹ McDonald CJ, Overhage JM, Tierney WM, et al. The Regenstrief Medical Record System: a quarter century experience. *Int J Med Inform* 1999;54:225-53.

upon the RMRS, RI investigators created the Indianapolis Network for Patient Care (INPC) in 1995 with the goal of providing clinical information at the point of care for the treatment of patients with support from the National Library of Medicine, the Agency for Healthcare Research and Quality, and the Regenstrief Institute.

Developing and Implementing the Sustainability Plan

We also recognized that a long term financing strategy was required and so during the project, worked with other Indiana organizations to create the Indiana Health Information Exchange (IHIE), a not-for-profit supporting organization, to be the vehicle through which to create a sustainable funding model for HIEs. In 2004, IHIE, a non-profit company incorporated in the State of Indiana, was launched with the help of Regenstrief Institute, BioCrossroads, and other organizations. It is BioCrossroads' mission to serve as a catalyst for the continued growth of Indiana's robust life sciences industry. IHIE partnered with the Regenstrief Institute to leverage its cutting-edge, internationally recognized health information technology infrastructure, to provide solutions that address short- and long-term health care issues and improve the health care coordination. The model we created was predicated on the principle that sustained funding would require that the funding sources would have to achieve sustained value. The initial service provided was result delivery through the DOCS₄DOCS® service. Organizations that produced health information paid to have those results delivered to providers. In addition to supporting the costs of interfacing, developing and maintaining relationships with physician practices and some administrative overhead, the service raised the importance to the participating organizations of maintaining the integrity of the interfaces. The second service, Quality Health First®, created a value proposition (quality reporting to primary care providers) for additional participants to join the exchange including payers as data sources and additional physician practices and provided support for the provider matching services, data storage, and concept mapping. Most recently, a payment model has been created for access to the INPC clinical data repository. Hospitals pay for access which improves the quality, safety and efficiency of care that they provide.

Lessons learned about finance and sustainability. IHIE's sustainability strategy is based on principles key to health information exchange being a self-sustaining endeavor:

- HIE is a business—while IHIE is a not-for-profit organization, in order to successfully sustain the exchange operating in the professional and reliable fashion it has to in order to be credible with its partners, it has to operate in a an efficient, business-like manner and has to manage its revenues and expenses just as any sustainable business has to.
- Leverage high-cost, high-value assets—the infrastructure required to operate an exchange is expensive to create and to maintain. In order to support those costs, a variety of services that take advantage of those high-cost, high-value assets reduces the costs of providing any one of those services making adoption of the services easier or providers and furthering the HIE's mission.
- No loss leaders—In order to maintain transparency and fairness, it is important for the HIE to recognize the real costs of services and ensure that those receiving value are paying those costs.

- Independent, local sustainability.
- HIEs are natural monopolies—This principle is closely related to the “leverage high-cost, high-value assets” and “There is an optimal size for an HIE”. The infrastructure costs have to be defrayed across a sizeable number of users in order to be affordable. If the HIE is too small the costs are too high which leads to the principle that the HIE is a natural monopoly since in most markets there are barely enough participants (IHIE estimates the lower bound as 500,000 population) to achieve the necessary scale.

Unnecessary duplication of services and other assets is wasteful and makes achieving this scale difficult.

- There is an optimal size for an HIE—the need for scale
- Avoid grants for operational cost—HIE services must be able to generate revenue equal to or in excess of expenses. For HIEs that are not-for-profit, raising capital can be challenging and grants can fill part of that void but grants should not be used for operational costs as they should not be treated as long term funding streams.

Conclusions

Regenstrief Institute and IHIE are working together to create successful, sustainable HIE services in Indiana using a measured approach based on principles formed out of experience. While we experience steady progress, we remain aware that continued growth and sustainability are not assured and should not be taken for granted.

Technical Infrastructure

Selecting Technical Infrastructure Design

Formation and usefulness of the Technical Advisory Panel. Two Technical Advisory Panel meetings were held; one in January 2005, and the other in August 2005. Ten experts, including internal and external health information technology specialist, participated in each of these meetings to review and discuss the then current technical architecture (including network, message transfer, patient linkage and data repository; interface engine tools (homegrown versus commercial interface engine); examples of different security models; push versus pull approach; and how to best utilize the expertise of a Technical Advisory Panel in this work. Because of its long history and associated experience and the home-grown technical infrastructure, the advisory panel was of minimal value.

Role of stakeholder preferences/opinions. While IHIE did review technological infrastructure options, the scale and successful operational history of the INPC made it an obvious choice to build upon. The stakeholders did recognize the need to modernize the infrastructure.

Selecting a Vendor

As previously noted, the health information exchange (INPC) was built upon the robust Regenstrief Medical Record System (RMRS) developed over 30 years by Regenstrief Institute investigators.

Deployment of Technical Infrastructure Design

Our work was to achieve our region's goals by building on established local and regional health information infrastructure initiatives. We built on the INPC's established organizational, legal and technical infrastructure, expanded outward from its existing operations in central Indiana to include a significant portion of the State's population, physicians and hospital beds into what some have identified as the largest, most advanced HIE in the country. INPC participants deliver registration records (demographics), laboratory data, emergency department (ED), inpatient and outpatient encounter data including free-text chief complaint, and coded diagnoses and procedures (including length of stay) for hospital admissions and emergency room visits. The INPC takes what the source systems deliver: version 2.3 or 2.4 HL7 messages. In the centrally managed federated clinical data repository design, each institution's data reside in separate physical files on one computer, but files have the same data structure, share the same terminology dictionary, and operate under the same software system.² The system links the multiple medical record numbers from the patient registration records collected from all of the participating institutions. The system currently utilizes the real-time laboratory result data for active surveillance of reportable conditions. Some participants also deliver pathology, pharmacy, and vital signs data.

The system standardizes all clinical data as it arrives, laboratory test results are mapped to a set of common test codes (LOINC) with standard units of measure for patient care, public health and research purposes. Each institution has the same file structure in the Regenstrief system and shares the same term dictionary, which contains the codes, names (and other attributes) for tests, drugs, and coded answers. The system allows providers in any of the participating hospitals to view a patient's previous care information from all participating institutions as a single virtual record. The standardized clinical data repository supports a variety of services.

In the course of the project, we made a number of significant enhancements to the technical infrastructure that underlies the INPC. First, we completely redeveloped the software, moving from a locally developed hierarchical database to a commercial relational database (Oracle) and re-implemented the code in JAVA to create a contemporary service oriented architecture.

Second, we fully virtualized the system and migrated this new software from the Wishard Hospital data center where the exchange had been hosted since its inception, to a contemporary hardware and storage environment in a state of the art data center. This move increased reliability, performance, and security. One of the most important technical infrastructure efforts we undertook was to create and refine an improved process for interfacing participants. The process for "onboarding" new organizations had proven to be a rate limiting step in the networks growth. Our approach included establishing a project management office, monthly status tracking, dedicated interface engineers, and detailed process maps. While this approach certainly improved the process, we were still not satisfied with the rate of progress and continue to explore new ways to improve our interfacing capability. We also established a provider master index with matching during the project. This functionality allows us to link all data for a provider even though different provider identifiers might be used. For example, a prescription record from Surescripts might be identified by a DEA number while a laboratory result is identified by the

² McDonald CJ, Overhage JM, Barnes M, et al; INPC Management Committee. The Indiana network for patient care: a working local health information infrastructure. An example of a working infrastructure collaboration that links data from five health systems and hundreds of millions of entries. *Health Aff (Millwood)* 2005;24:1214-20.

local laboratory ID for that provider. This capability was used to facilitate access to the clinical data repository across provider organizations, to aggregate data for clinical data reporting and other, similar functions. A related technological improvement was creation of a provider attribution system. This system, utilizes a predictive model that uses data about the transactions passing through the exchange to identify providers who can be considered accountable for the patient's care. This attribution is used, for example, to select the patients used for by provider quality reporting. It is also used as the basis for an access control method, which allows a patient's primary care provider to access their record.

Security Policy and Practices

The terms and conditions agreement that govern INPC members' participation in the INPC incorporate recent changes to HIPAA under HITECH as well as a reporting process for serious breaches of confidentiality. The agreement allows the use of the repository data for prescribed treatment, public health and research, and purposes with oversight by the INPC Management Committee. Only authorized INPC member users associated with a given institution are given INPC access to the records of patients according to the agreed upon "trigger and access window rules" based the approved uses. It permits research on de-identified data extracts but prohibits research that compares institutions or providers, even if de-identified, unless specifically approved by the involved parties.

Lessons Learned About Technical Infrastructure

First, our experience during the SRD project confirmed our belief that aligning the technological infrastructure with the policies made operations and policy decisions easier and provided confidence to participants. In particular, by storing each participant's data in a separate file, we were able to protect privacy and institutional autonomy in ways that we could not if the data were merged in a single file. A second major lesson was that while technical specifications might suggest otherwise, achieving the levels of performance expected by participants was difficult. Population-based queries, in particular, required tens of hours despite investments in hardware and software, expert consultation, and extensive tuning: even a strong commercial relational database running on industry leading hardware was not up to the task we asked of them for a large-scale HIE. A third lesson was that terminology alignment is an unsolved problem. Despite our best efforts, mapping terminologies continues to be a major barrier. Building and maintaining interfaces to and from data sources as well as the initial and ongoing semantic normalization of data from different sources (i.e., "mapping") makes up roughly half of ongoing expenses. The training and support of new and existing customers makes up another quarter. The remaining quarter is divided, in decreasing portions, amongst software, database set-up and maintenance, project management, data center and hardware, and professional services.³ Lesson four is that existing standards are good enough. We were able to create and operate the exchange using primarily HL7 V2 messages over a VPN. This well evolved, well-understood approach stood us in good stead. While we certainly explored and demonstrated a variety of other technologies, these continue to be the workhorses of the exchange. Our final lesson was that

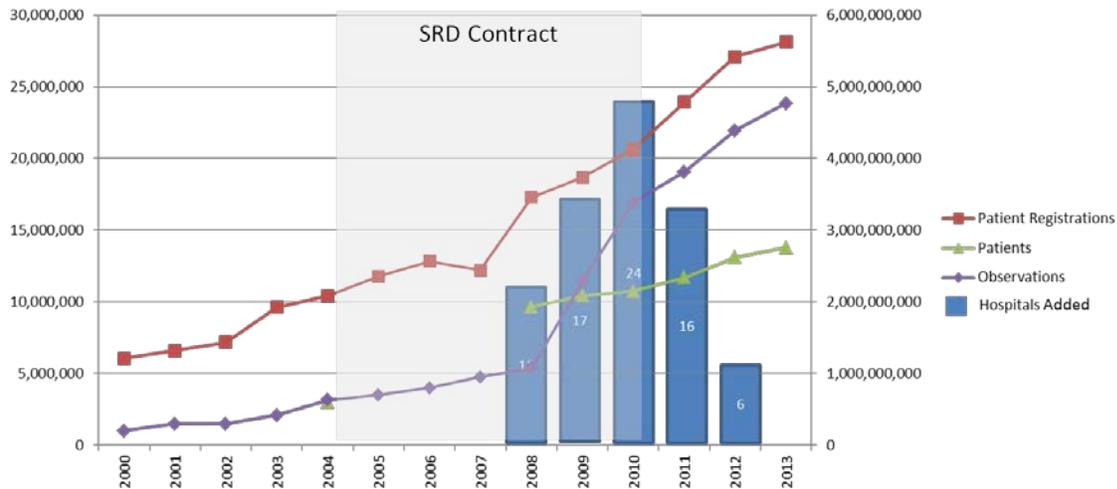
³ State and Regional Demonstrations in Health Information Technology. An Evolving Statewide Indiana Information Infrastructure. Sustainability Plan Deliverable. Contract No. 290-04-0015. September 30, 2008.

technology is the least of the challenges. We were usually able to overcome the technological challenges but the social, economic, and priority challenges were usually the greatest.

Conclusions

In 2012, INPC continues to expand with 90 hospitals (93 have signed, some are in queue to be implemented) and 19,000 physicians for at least one service. The clinical data repository contains data for 13,434,946 unique patients, 27,538,265 different patient registrations, 4,662,362,079 clinical results/rows/observations, and 118,167,868 text reports. The figure below illustrates the growth of data in the exchange over time in terms of number of patients (and patient registrations), observations and hospitals (as a proxy for all participants).

Figure 1. Number of patients, observations, and hospitals, 2000–2013



Business and Technical Operations

Developing Partnerships and Programmatic Linkages

In November 2009, Regenstrief Institute, Inc. entered into a Systems Support Agreement with IHIE to identify synergies and opportunities for additional services to be transitioned to IHIE, especially in the operations support area...” We created contractual relationships between IHIE and Regenstrief to facilitate the transition of operations. Initially, IHIE took on the contractual relationships, billings, and collection as well as end user support (help desk functions) but contracted Regenstrief to provide all technical support and operations. Gradually IHIE took on additional technical functions including data center operations.

Role of Stakeholder Preferences/Opinions on Business and Technical Operations

As the Joinder and Terms and Conditions documents serve as the legal documents for the INPC, the Management Committee is its legislative body. The restructure in 2011 changed the composition of the INPC Management Committee to broader representation of health care providers and parties interested in HIE (e.g., patients and consumers).

The Management Committee meets quarterly to resolve various issues surrounding the INPC network, such as the confidentiality of health information, compliance with new laws and regulations, the addition of new participants and the expansion of the INPC, modifications to the required information that is submitted to the INPC, technical issues relating to submission and access to the information, new services, and research uses of the health information.

Identifying Data Elements for Sharing

The INPC captures data from many sources, including hospitals, physician practices, public health departments, laboratories, radiology centers, pharmacies, pharmacy benefit managers (via SureScripts), and payers. Sources such as hospitals and physician practices provide many types of data, including laboratory, radiology, and pulmonary function test results; cardiology diagnostic results; gastroenterology study results; procedures performed; diagnoses assigned; transcribed reports (admission, operative, discharge); and inpatient, outpatient, and emergency department encounters. As reported above, the INPC Management Committee has the power to structure the future of the network in many ways, including identifying data elements required to be submitted and stored in the INPC.

Implementing Data Sharing

With the development of the INPC network in the mid-1990's the focus was sharing clinical information from hospitals to local emergency departments. The INPC continues to support data share for clinical care, public health surveillance, quality measurement, coordination of care and clinical research. The exchange continued to evolve new scenarios under which data could be shared. Each potential use, which was required to fall under the categories proscribed by HIPAA and subsequent legislation as well as the participation agreement, was reviewed and benefited from the input from the management committee before approval. This overarching approach of participants making their data available through the infrastructure with data sharing implemented at "usage time" where the appropriate restrictions and controls were applied as had been done since the INPC's inception.

Maintenance of Technical Infrastructure

The inbound and outbound data interfaces team continues to explore ways to improve efficiencies and productivity in these activities and find ways to enhance regular and timely communications with the external customers that have been a substantial cause of delays in the interface process. The hardware will require upgrades and maintenance, and the software will need to respond to customers' new requirements as they implement EHRs. There is an effort to explore the potential of a "cloud" services solution, as well as new commercial partnerships to increase the scope of services as well as geographic area served by IHIE.

Impact on Sustainability Plan

Hardware and software costs are clearly a significant capital expense that must be considered in operation of an HIE. By building on our pre-existing infrastructure, we were able to avoid large scale investments in hardware and software and minimize the contribution to cost.

Lessons Learned About Business and Technical Operations

We found the transition of business and technical operations from Regenstrief to IHIE difficult, in part because hiring individuals with the necessary skill sets is time consuming, there is a long learning curve and that it is common that the operations require a skill but not a full time person.

Conclusions

As is often the case, operations were the most difficult issues to resolve and to get to run smoothly.

Legal/Policy

Developing Policies: How Many, on What Topics, How They Were Implemented

The submission of data for storage, standardization, and use by care providers at other institutions requires clear agreements about the use of data and strong technical controls. The INPC agreement serves as the cornerstone for the interrelationship among the otherwise highly competitive participating institutions. It provides a mechanism to promote cooperation and trust by defining the data that will be submitted to the INPC, describing the authorized uses and disclosures of the data, providing for a participatory management structure, ensuring compliance with applicable laws, and, providing protection from liability for the participants should unforeseen events occur. The agreement allows for the submission of the data and the use and disclosure of the data for a variety of purposes.

As this was an existing HIE, many of these policies were already implemented prior to the start of this work. However, some changes were made as necessitated through the project period.

- Storage of Information and Administration of the Network
- Uses of Information
 - For Clinical Care
 - For Health care Operations
 - For Public Health
 - For Research
- Confidentiality
- HIPAA, HITECH, and other Federal and State laws

Role of Legal Counsel

We sought legal guidance in the development of our local HIEs to facilitate data sharing. Counsel provided guidance on the form of governance structure implemented and the later evolution of the governance structure. Health care data sharing requires close compliance with Federal and State laws, for example, special handling may be required for communicable disease or mental health records. These laws must be considered carefully in drafting any agreement between the various parties for sharing health care data. Legal counsel was also instrumental in helping to define indemnification and term and withdrawal provisions.

Specific Discussion of the Following (Including Role of Stakeholder Preferences / Opinions)

Report and discussion of developing data sharing agreements, developing privacy policies, lessons learned concerning legal/policy development, and conclusions are found in other sections of this report.

Evaluation

Developing the Evaluation Plan

Finally, the Regenstrief Institute has a long and successful history of evaluating clinical information interventions in a variety of settings. In addition to providing online access to the data through Web-based interfaces, we provided reminders to clinicians based on sentinel clinical events. We studied the value of these reminders. The intervention consisted of a series of computer generated reminders based on data received by the Indiana Network for Patient Care (INPC).

Implementing the Evaluation Plan

We created reminders using the CHICA (Child Health Improvement through Computer Automation) software we developed that uses data from the RHII to create patient and provider specific adaptive turn around documents. The software customizes these reports for each sentinel event, patient, and provider triad. Providers can then annotate the forms by checking boxes, filling in blanks with textual or numeric data and by handwriting on them. The providers fax these documents back to the RHII where the CHICA software performs optical mark and character recognition (subject to verification if necessary) to extract data from the forms and then stores the structured data and an image of the form in the RHII for future access. Subjects also completed a written survey regarding their satisfaction and perceived usefulness of the alerts.

Physicians who are subscribers to the DOCS4DOCS® results delivery service of IHIE were recruited. An alert was delivered when a patient visited an emergency room with a diagnosis of asthma. Alerts include check boxes and text boxes with which physicians can provide additional data to the INPC by faxing the forms back.

A more detailed Evaluation Report for this project is available [here](#).

Results

The Real Time Alert (RTA) is a computerized decision support system. RTA provides automated alerts to primary care providers (PCPs) for recommended services for their patients with asthma. Using Adaptive Turnaround Documents (ATAD), an existing HIE, and office fax machines, RTA is able to deliver and capture structured clinical data from providers. In this [pilot study](#), we evaluated RTA's performance for alerting PCPs when their patients with asthma have an emergency room visit anywhere in the State. Our results show that RTA was able to successfully deliver "just in time" patient-relevant alerts to PCPs across the state. Furthermore, of those PCPs who were alerted and returned information to RTA by fax, 33 percent reported finding the information helpful for management of their patients. Of those who reported finding information helpful also reported making a phone call, sending a letter, or seeing the patient for followup care.

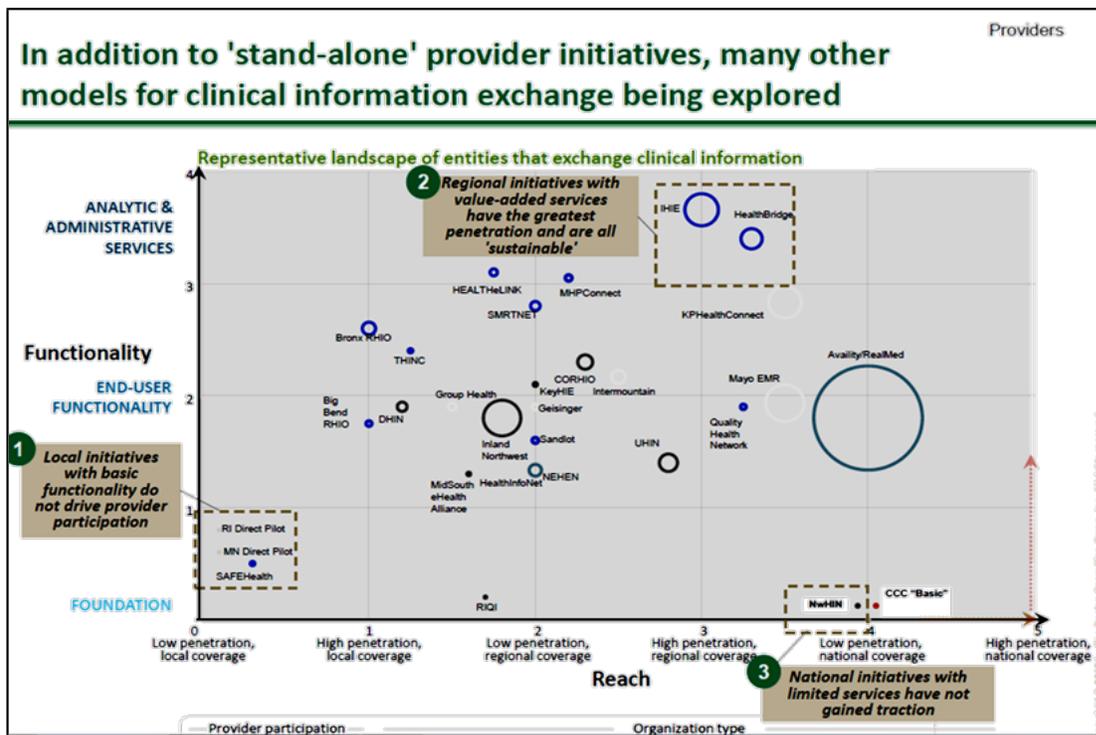
Recommendations for Future Research

We believe this method of information exchange is both feasible and innovative for followup care and can be used for management of many other chronic diseases such as diabetes or hypertension. We also believe it can bridge the last mile barrier for adoption and tight integration of EMRs across various practices. Furthermore, this method provides a pragmatic mechanism for exchange of information until universal identifiers for linking patients in different EMR systems can be determined.

Conclusions

We achieved all four of our initial stated goals. First, we clearly established Central Indiana as a national leader in the use of electronic health information to deliver superior health care and to lower the cost of that care as evidenced by the scale and number of services provided, the recognition in publications and presentations including those by objective third parties such as the Boston Consulting Group (Figure 2) and the results of our evaluation study which provides evidence of improved quality.

Figure 2. Boston Consulting Group Presentation, January 2013



We have less evidence that the project contributed to lower costs of care. Second, we developed and implemented an HIE that enables hospitals, physicians, laboratories, pharmacies and other health services providers to deliver faster, more accurate, safer, higher quality and less redundant medical care to patients in Central Indiana. The HIE now links essentially all hospitals, physicians, public health departments, and pharmacies in central Indiana, most of the payers for the market, and some reference laboratories, and long term care providers. Tens of thousands of health care providers access patient data through the HIE every day. The HIE has enabled improvements in care processes such as the reduction in MRSA cases demonstrated by Dr. Abel Kho and his colleagues. This achievement would not have been possible without the underlying HIE infrastructure. Third, the HIE has provided data that has benefited medical and public health researchers by making available the unique databases which has resulted in dozens of published research studies. It has also led to significant new collaborations such as the Merck-Regenstrief collaboration. Finally, we have made some progress toward the goal of facilitating the development and adoption of new health-related technologies that will result in

new job opportunities in Central Indiana. The Indiana Health Information Exchange, which employs approximately 70 people, is one example. The economic benefits are difficult to quantitatively capture but one measure of our progress on this goal is the clear recognition by Biocrossroads, an Indiana life sciences economic development organization, of the importance of the HIE as a driver for their efforts.