



Services

Health Information Exchanges: Strategies and Point of View

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Executive Summary

The purpose of a Health Information Exchange (HIE) is to enable the creation of an interoperable Electronic Health Record (EHR) for each individual by connecting the information contained in various organizations across the entire continuum of care as shown in Figure 1. Through the interoperability provided by the HIE, the same organizations that contributed health information can now access a longitudinal or community view of a patient's health record resulting in improved quality and patient safety, reduced costs, and evidence-based care.

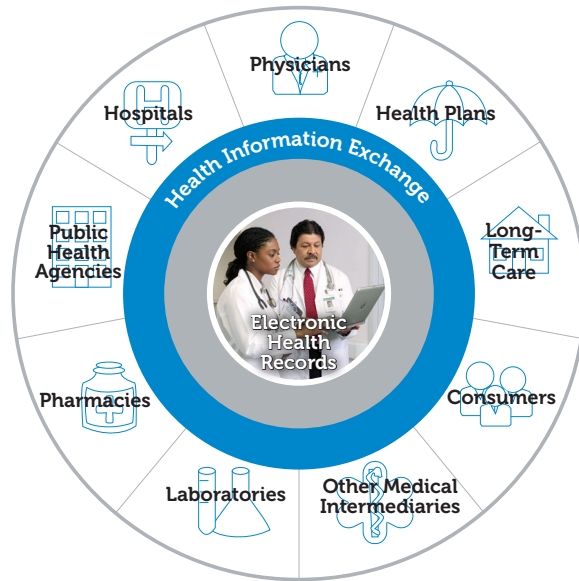


Figure 1: HIE Relationship with the Continuum of Care

Conceptually, HIEs have been around for many years under the names Community Health Information Networks (CHINs) or Regional Health Information Organizations (RHIOs). While these efforts have led to success in pockets of the country, they did not produce the results that would lead to their wide-spread adoption, primarily due to the lack of a sustainable business model.

So what is different today?

The American Recovery and Reinvestment Act of 2009 (ARRA), more specifically the HITECH Act within ARRA, allocated funds to improve the quality of healthcare in the form of grants and reimbursements related to HIEs. Not only did the government provide the funds to help drive down costs, they also set the criteria around "meaningful use" of these interoperable EHRs, and established aggressive timetables that would both incent action and penalize inaction.

To date, there are 193 active health information exchange initiatives underway in the U.S., with only 57 operational HIEs. This is a 40 percent increase since 2008, and with \$564 million in HIE funding set aside in the ARRA, the number is expected to continue growing.

The funding for those organizations creating HIEs will flow through the states to State Designated Entities (SDEs). These SDEs have the daunting task of connecting provider organizations (hospitals and health systems) that have separate businesses, and often political agendas. Aligning these interests from the top down will take time, especially if the technology solution proposed by the HIE conflicts with any prior technology decisions made by the hospitals. Most organizations resist change, and particularly so when it has a price tag attached.

Cost savings and efficiency without interruptions to care are the two prevalent benefits being reported by more than 70 percent of the operational HIEs. Cost savings were realized with reduced clinical and administrative staff time on tasks, as well as a decrease in redundant tests and medication errors.



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It is already evident that the stimulus funds are accomplishing one desired goal — to move an entire industry to act. There is a constant flow of new “solutions” appearing in the market. Unfortunately, without a blueprint that illuminates the path a given healthcare decision-maker must follow, the influx of new solutions may provide more confusion than clarity.

Why is there not a single blueprint or a limited set of blueprints?

Quite simply, this is a difficult problem. There are many elements that must be considered when creating an HIE. This paper was developed to present the reader with a better understanding of HIE concepts, design elements, and deployment models, and concludes with some practical recommendations for healthcare organizations that are contemplating the creation of, or interaction with, HIEs.

Driving Healthcare Quality and Efficiency

The purpose of health-related information moving electronically among organizations has surfaced as paramount because of major concerns voiced by consumers, healthcare providers, and lawmakers. By creating comprehensive views of a patient’s entire health record across a community, HIEs can enable improvements in quality and efficiency. Examples include:

Tracking Disease Outbreaks and Immunizations: Take the recent example of the swine flu outbreak. Dr. David Hunt, Chief Medical Officer for the Office of the National Coordinator for Health Information Technology (ONCHIT), noted at the Public Information Network Conference in September 2009 that, “The H1N1 pandemic is an opportunity to identify needs in the exchange of electronic health information.” Jeff Hussinger, a telecommunications analyst with the City of Milwaukee, noted that the Wisconsin Health Information Exchange, “originally established to relieve overstretched emergency departments and other public health workers of the tedious — but extremely necessary — task of filling out paperwork to report outbreaks of illnesses like H1N1,” will also be used to track the dispensing of flu vaccines as well.

Chronic Conditions: A chronic condition is a condition that is treated for more than three months. Today there are more than 100 million Americans with a chronic condition, and it is expected that within the next year, 70 million Americans will have multiple chronic conditions. Chronic conditions represent roughly 75 percent of the healthcare spending in the United States.

An HIE can actually help reduce these numbers and improve chronic conditions through the creation of a community or longitudinal health record. The information contained in a community or longitudinal record would be an aggregation of the patient’s complete medical record from all of his/her healthcare providers. It would be combined into a single view so that the clinician(s) could view all underlying factors related to the chronic condition and then determine the best course of treatment.

Disease Registries: The community or longitudinal view will also be able to provide a view of multiple patients at a state, local, or federal level from which a specific disease registry can be created to include valuable information about the condition. The data can then be mined for better patterns of care and disease trending. This information can be utilized by epidemiologists and public health officials to identify risk factors associated with the disease and vulnerable populations that may be at risk.

Medical Home: The medical home concept is often related to discussions of chronic conditions. In the medical home, a single provider coordinates the care of a patient’s medical needs, regardless of how many providers or clinicians are utilized by the patient. Having a single view of a patient’s health record enables seamless coordination and better care delivery among the various care providers treating the patient.

Reducing Duplication: All too often, as a patient moves to see different providers in the healthcare system, unnecessary duplication takes place. Reducing duplication will have a

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profound impact on the overall cost to our healthcare system. However, cost reductions are not the only benefits. For instance, if care providers can reduce the number of times they “light up” a cancer patient by performing even one less X-ray or CT-SCAN, the positive impact it could have on the health of that patient might be enormous.

Reducing Medical Mistakes: HIE networks have great potential to reduce medical errors by delivering information to physicians, nurses, and other providers at the best time, while they are in the process of making decisions about a patient’s care. For example, an HIE system can alert physicians by providing automatic flags for potentially dangerous drug-drug, drug-allergy, and drug-food reactions.

Promoting Evidence-based Medicine at the Point of Care: HIEs can securely connect clinicians to relevant patient information at the point of care. This will provide clinicians with data previously unavailable in a paper-based record system, which will ultimately result in better quality of care. HIEs will allow the provider to access more information on the patient’s medical history, reducing the uncertainty in the diagnostic process and treatment plan. The provider can also have access to public health data and other research sources to support clinical decision making. The ultimate advantage offered by HIEs is that the availability and accessibility to health information allows clinicians to spend more time on patient care and less time on administrative paperwork.

Federal Funds — Forcing a Tipping Point

In his 2000 book, *The Tipping Point: How Little Things Can Make a Big Difference*, Malcolm Gladwell describes a tipping point as “the moment of critical mass, the threshold, the boiling point.” Bryan Walsh describes a tipping point as “the level at which the momentum for change becomes unstoppable.”

The government is trying to create a tipping point for HIEs and interoperable EHRs by providing incentives for their creation and use through a combination of a top-down and bottom-up approach as shown in Figure 2. At the top, they allocated one-time grants for the creation of HIEs to be awarded through a State Designated Entity. At the bottom, they allocated funds for incentive payments to providers (both hospital-based and independent) for them to use interoperable health records in a meaningful way. In the middle, for those organizations that do not have the means to “connect the dots,” they allocated funds in the form of one-time grants for the creation of Regional Extension Centers.



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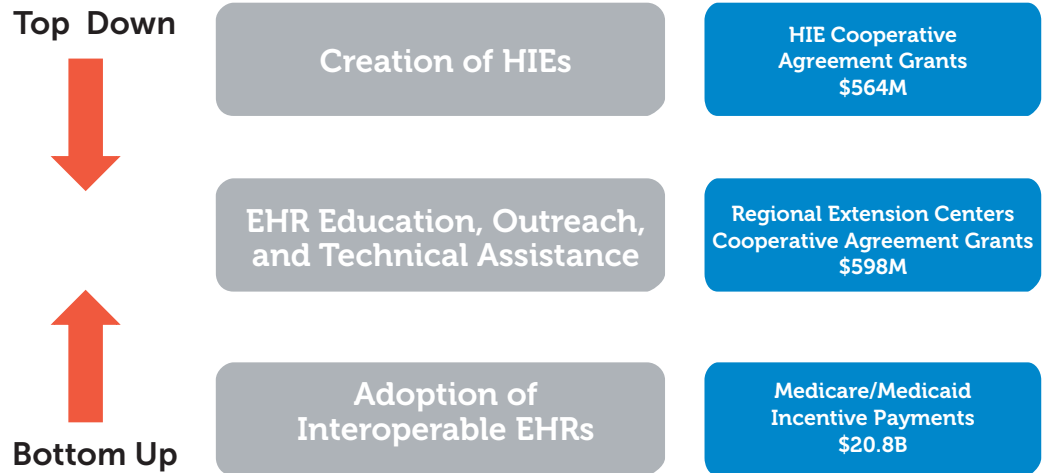


Figure 2: Federal Funds Related to HIE Development

As of this writing, The Office of the National Coordinator for Health Information Technology (ONCHIT) has set aside \$598M in grants to support the creation of 70 Health Information Technology/Regional Extension Centers. Preliminary applications for the first round of funding (\$189M) were due September 8, 2009. The preliminary applications for the second round of funding (\$225M) were due December 22, 2009, and the third round (\$184M) must be filed by June 1, 2010.

All in all, ARRA is providing more than \$20B in incentive payments to providers who show "meaningful use" of certified EHR technology. These incentives will be paid out to those achieving "meaningful use" as early as 2011 with graduated incentive payments being made through 2015. If "meaningful use" has not been attained by 2015, providers will be penalized.

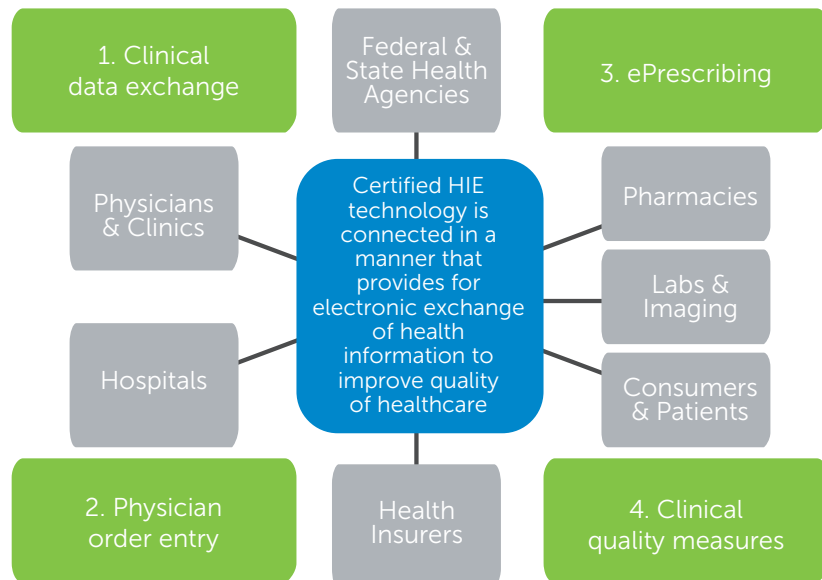


Figure 3: EHR Meaningful Use Criteria

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To stimulate the movement toward the wide-spread use of EHRs, the government designed an incentive/disincentive structure for providers. Figure 4 shows the reimbursement structure for hospital-based physicians. To get the full reimbursement available, hospital physicians must be using interoperable EHRs by the year 2013.

	2011	2012	2013	2014	2015	2016	2017
Payment for adopting before/in FY '11	100%	75%	50%	25%			
Payment for adopting in FY '12		100%	75%	50%	25%		
Payment for adopting in FY '13			100%	75%	50%	25%	
Payment for adopting in FY '14				75%	50%	25%	
Payment for adopting in FY '15					50%	25%	
Penalties for not adopting by FY '15: Three quarters of applicable market basket updates are reduced by:					(33%)	(66%)	(100%)

Figure 4: Hospital Provider Reimbursement Schedule

Many organizations will look at 2013 and believe they have plenty of time to see how the market will unfold and react accordingly. However, what they are ignoring is the lessons history has taught us when an entire industry makes changes to meet a defined time table. The best example of this was the Y2K issue at the end of the last century. Because dates in computerized records were stored in most systems at that time using only 2 digits, the transition from the year 1999 to 2000 would have caused serious issues with computer programs that used the difference between current year and previous years (e.g., birth date) in their programming logic. The difference in dates would have resulted in negative numbers, application shut-downs, or unpredictable processing errors that seriously impacted results and future data integrity.

While the Y2K dilemma was resolved without many major incidents, the cost of resolution was not uniform across all organizations. Those organizations that started to address the problems early ended up with a much lower "total cost of solution." This lower cost was due to factors such as quality, availability of resources, and perhaps just as important, starting early allowed for a more orderly transition with greater predictability and control.

In a like manner for today's HIE implementations, waiting until the last minute may not provide the clarity healthcare organizations are looking for and could significantly increase the total spend needed to qualify for stimulus reimbursement funds. Getting started in a timely manner in the near future will only benefit transition, adoption, and funding options.

Stimulus funding is not the only driver for HIEs. The weakened economy has had a negative impact on many provider organizations. Hospitals and health systems are witnessing declines in net patient days, net patient revenue, and cash flow due to patients postponing procedures and the growing number of uninsured. These healthcare organizations need new ways to increase patient admittance without a significant capital investment.

Many hospitals are actively seeking relationships with the independent physicians in their geographic market in order to increase referrals into the hospital. In many markets, the competition between hospitals is becoming more intense with time becoming the critical factor. An integrated and networked HIE is one way to improve collaboration potential.

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HIE Functionality, Architecture, and Services

Because they are often unique to one organization, there is a saying that “When you have seen one HIE, you have seen one HIE.” To understand what an HIE is, it helps to look at it from three perspectives – functionality, architecture, and services.

The functionality of an HIE should not be considered a static target but a continuum of functionality that will continue to evolve over time. Figure 5 depicts a continued evolution of HIE functionality. At the apex of the graph is the functionality currently defined as “meaningful use” for HIEs.

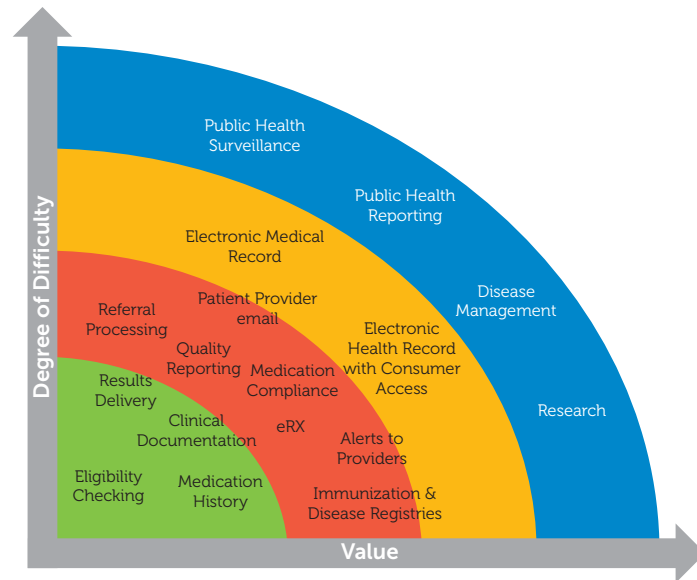


Figure 5: HIE Functional Evolution Chart

Underlying this evolution of functionality is the robust technical capability an HIE must implement or enable.

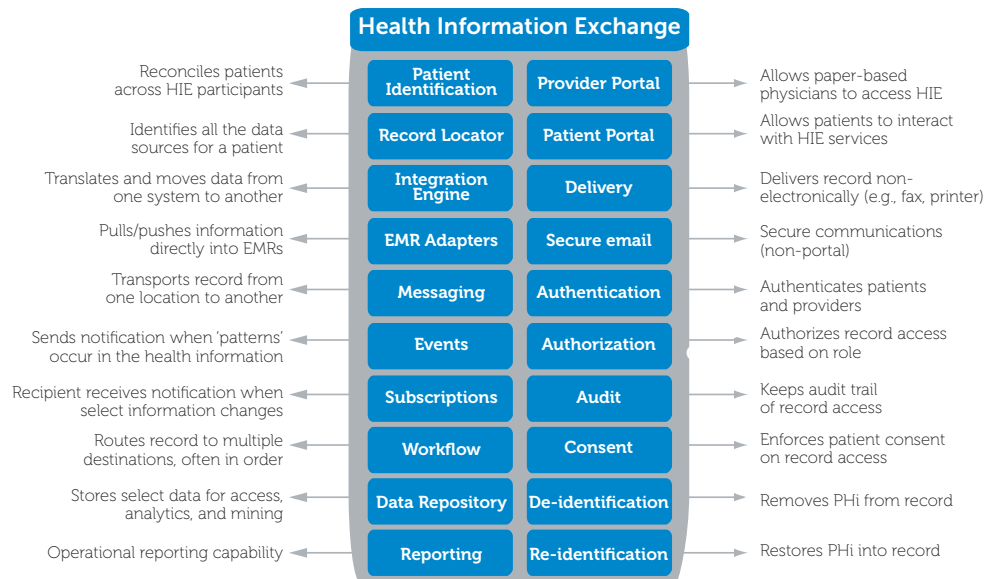


Figure 6: HIE Technical Functionality

The architectural model often seems to be the primary focus of conversation around the implementation of HIEs. Even though functionality and services are just as important to consider, much debate is usually devoted to which platform model to use. Figure 7 provides a high-level summary of the models including the advantages and disadvantages of each.

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Model Type	Description
Federated	<ul style="list-style-type: none"> Connects the participants of an HIE to one another. Participants maintain their own health information and respond to requests from other HIE members HIE provides community-based tools to facilitate patient identification (MPI), patient record location (record locator) and security (authentication, authorization, auditing, and patient consent), but relies on members to enforce. <p>Pros: Data providers have more control over data. Cons: Performance and resiliency of exchange is based upon weakest link model.</p>
Centralized	<ul style="list-style-type: none"> HIE participants submit data to one shared repository which participating providers then query to obtain patient information. Patient identity matching is performed when record is added to central repository. Security functions (authentication, authorization, auditing, and patient consent) are enforced centrally at time of repository access. <p>Pros: Very high performance and resiliency, enables community-based services. Cons: Higher HIE infrastructure/support costs, data ownership concerns.</p>
Hybrid	<ul style="list-style-type: none"> Centralized repository is constructed over time as requests are processed by the exchange. The size and intent of the CDR can differ, ranging from a focused database (e.g., all immunization data) to the ultimate creation of a Centralized model.

Figure 7: HIE Architectural Models

The purpose and role of any system architecture is to implement or enable the desired system functionality. A sound architecture will also be adaptable to enable future expansion of business functionality. This implies that architecture is a unifying entity to allow different products and technologies to be combined and/or substituted to meet the changing needs of the system.

Figure 8 shows how the functionality ultimately provided by an HIE can be implemented with a combination of architectural models.

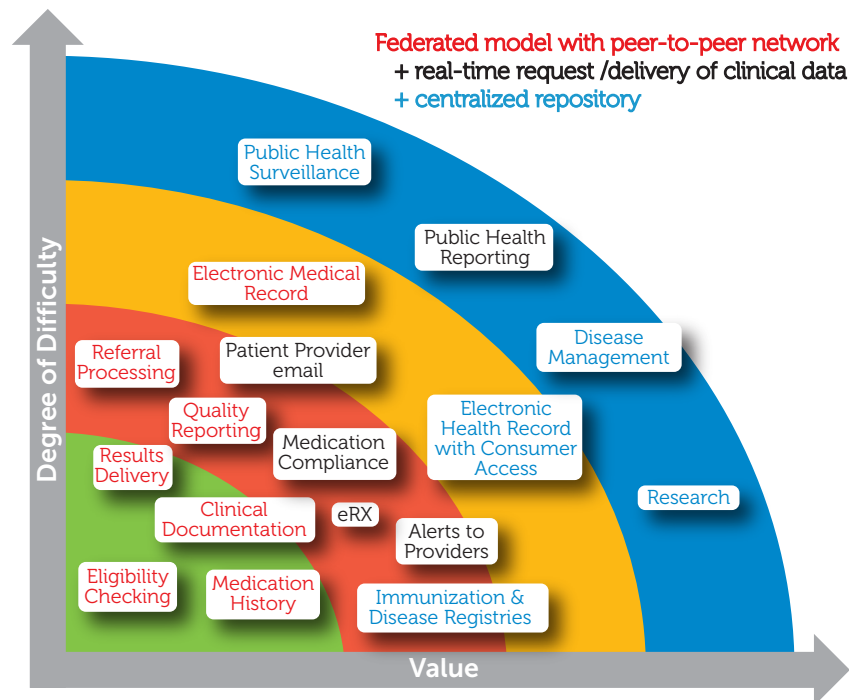


Figure 8: HIE Functionality Mapped to Architecture Models

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There are times when system architecture must take into account factors other than technical and functional requirements. HIEs are one of those cases. What HIEs also need to consider is that in many organizations there are cultural aspects with a reluctance to “let go” of their data to a third party. While the proper safeguards can be put into place to partition one organization’s data from another, as well as privacy and security provisions, many organizations are still reluctant to release their data to any third-party custodian. For these organizations, a federated architecture makes sense initially.

Services is the last aspect required to create, implement, and sustain an effective HIE. Figure 9 shows a high-level view of the different services required for different stages of HIE evolution.

Health Information Exchange Service Provider		
HIE Governance, Planning and Sustainment	HIE Systems Integration, Hosting and Operations	HIE Member Services
HIE Creation <ul style="list-style-type: none"> • Business Planning • Funding/Grants • Policy Development • Business Development • Project Management 	Platform Creation <ul style="list-style-type: none"> • Requirements Specification • HW/SW Selection • Capacity Planning • Exchange Hosting • System Configuration • Interface Design • Interface Implementation 	Technical <ul style="list-style-type: none"> • Interface Implementation • Training • Help Desk • Security Audits • Troubleshooting
HIE Operations <ul style="list-style-type: none"> • Progress Reporting • State, Federal Reporting • CCB • Financial Sustainment Model • Member Advisory Board • Data Provider Agreements • Physician Vetting • Program Management 	Platform Operations <ul style="list-style-type: none"> • Remote Hosting • System Monitoring • Technical Security • Physical Security • Identity Management • Capacity Management • Performance Management • Reporting (Operational Stats) • Interface Management 	User <ul style="list-style-type: none"> • Identity Management • Help Desk • Clinical Adoption • Training – Physicians • Training – Site Administration • Administration • Issue Management • Program Management • Interface Management

Figure 9: HIE Requisite Services

The first column of services in Figure 9 describe the services required to create and operate an HIE. Frequently, these services are performed by a Health Information Organization (HIO). The middle column of services deals with the technology (hardware, software, infrastructure) required to create and sustain HIE operations. The last column depicts services that are delivered to the organizations connecting into the HIE as providers and/or consumers of health information.

HIE Deployment Models

There are different models for how HIEs are deployed. While there are likely several different variations, there are three primary models – a regional exchange, a private exchange, and an exchange network.

Figure 10 shows the logical construction of a regional exchange. The goal of a regional exchange is to promote the sharing of health information across all participants in a given region. The regional exchange is governed by an HIO and is designed to implement the needs of the community, not just the needs of select members of the community. Because of this, Regional Exchanges are considered “public” or “open.” It should be noted that a region can be as big as a state.

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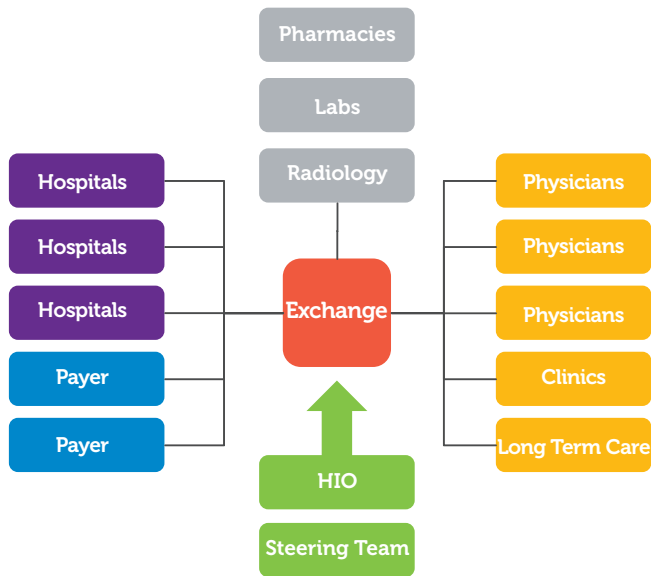


Figure 10: Regional Exchange Model

A private exchange, as shown in Figure 11, is very similar to the regional exchange with the exception that it is controlled by a private organization and is often established to promote the needs of a given hospital or health system. There are two primary reasons why a hospital or health system would create a private exchange: because there is no alternative in their region or they are implementing a physician attraction strategy and want to pull referring physicians into their closed community.

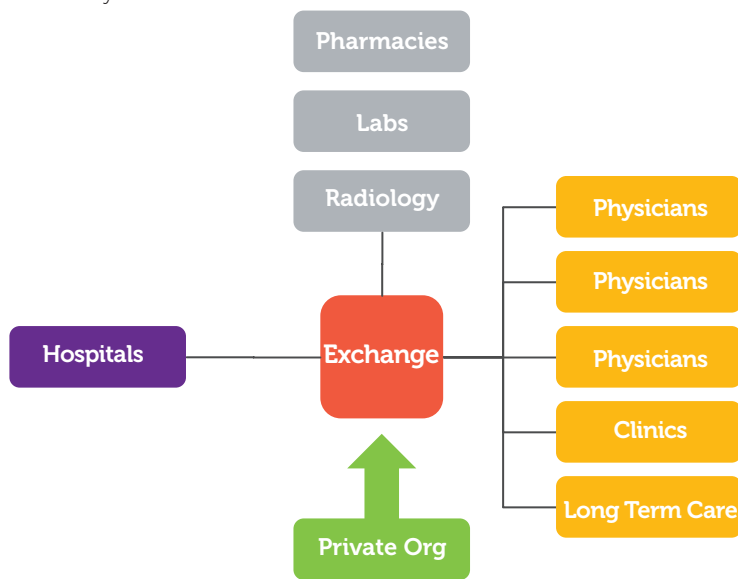


Figure 11: Private Exchange Model

The last model, an exchange network, is shown in Figure 12. In this type of exchange, the goal is to connect multiple separate HIEs together either at the state or federal level.

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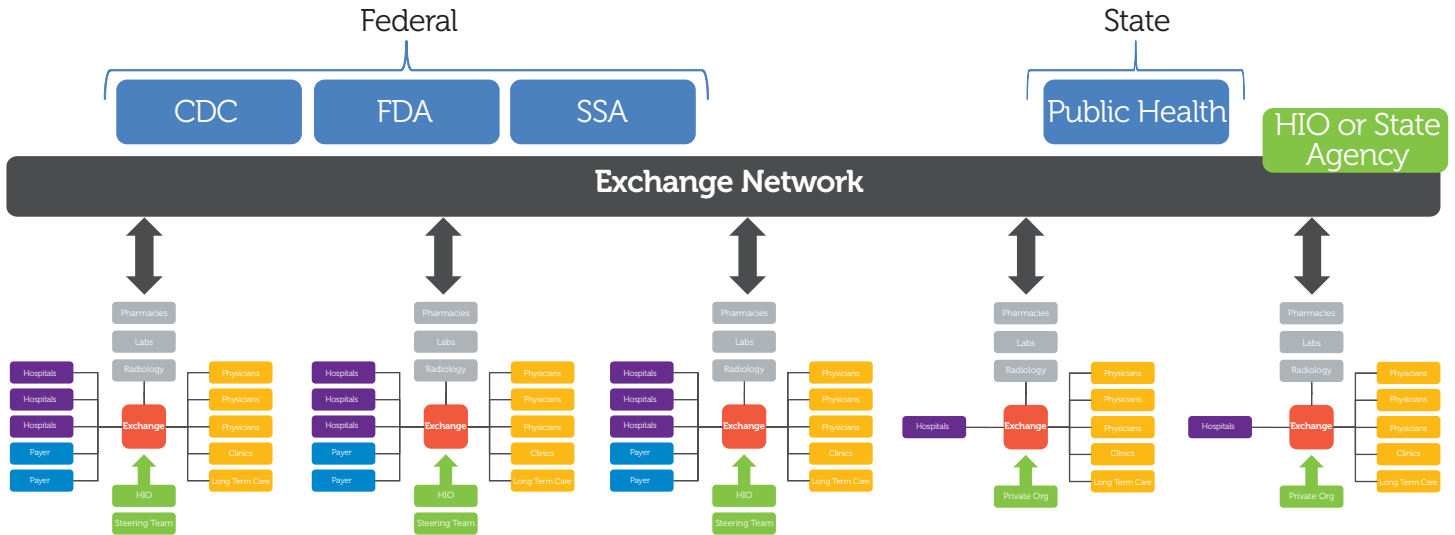


Figure 12: Exchange Network Model

Exchange networks are also considered to be public or open and are often controlled by a state agency or an HIO that works closely with or is an instrument of the state. The Nationwide Health Information Network (NHIN) is a federal effort designed to promote interoperability between independent HIEs. The focus of the NHIN is to establish policies and standards that allow inter-HIE exchanges to take place, even across state boundaries.

The importance of exchange networks goes well beyond the ability to share a patient's EHR between two HIEs. Exchange networks establish HIEs as data sources to state and federal agencies, allowing these agencies to deliver their services more efficiently.

Other Challenges

In addition to dealing with the complexities around the evolution of functionality, technical infrastructure, security, and the architecture and deployment models, organizations implementing HIEs are also faced with challenges related to different geographic "patterns" as described in Figure 13.

Pattern	Description	Issues
Large Metropolitan Area	<ul style="list-style-type: none"> High population density Multiple competing healthcare organizations 	<ul style="list-style-type: none"> Competition vs. cooperation Differing technical solutions Strong personalities <p>Results: Delayed Consensus</p>
Overlapping Metropolitan Areas	<ul style="list-style-type: none"> No clear boundaries between metropolitan areas 	<ul style="list-style-type: none"> Partitioning the communities Competing solutions Local politics <p>Results: Delayed Implementation</p>
Cross-State Communities	<ul style="list-style-type: none"> Community providers and patients span state boundaries 	<ul style="list-style-type: none"> Competing solutions Data exchange agreements Differences in approach, privacy laws, etc. <p>Results: Delayed Implementation</p>
Small Metropolitan Area	<ul style="list-style-type: none"> Single or small number of hospitals serve entire area 	<ul style="list-style-type: none"> Physician or hospital led? Covered by regional efforts? <p>Results: Delayed Implementation</p>
Rural Area	<ul style="list-style-type: none"> Very small population centers 	<ul style="list-style-type: none"> Lack of funds Limited telecommunications Migrant workforce <p>Results: Delayed Implementation</p>

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Figure 13: Challenging Geographic Patterns

Recommendations

There are many people currently in positions of authority who are faced with making near-term decisions regarding HIEs that will have significant financial impact on the organizations they represent. However, the choices available and the decisions to be made are different based upon the role of the individual making the decision.

State Organizations

State organizations are faced with the challenge of leveraging federal HIE funds to provide the biggest impact benefits for their state. The approach a state should take to maximize the value of the federal funds is dependent upon several factors, including the size and geographic complexity of the population, the current HIE efforts already underway (private and public), and the political climate.

While there is no one solution that fits all, there are several "projects" the state can sponsor that will provide maximum value. These projects are shown in Figure 14.

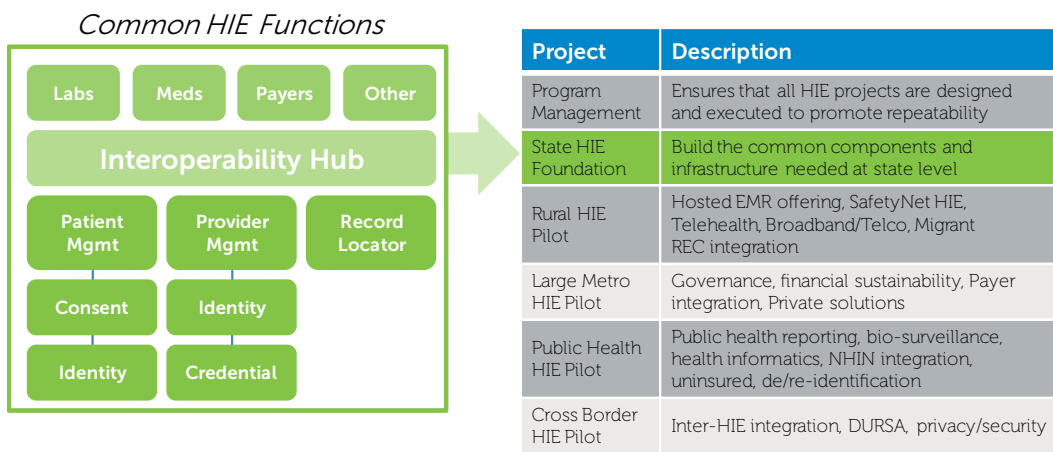


Figure 14: State HIE Project Candidates

It is important to understand the concept behind the project approach, each of which are designed to solve a different pattern that HIEs need to address. For example, larger states might deem it more efficient to build a statewide HIE "backbone" or foundation that consists of common functionality needed by all regional HIEs. Other states may be more concerned with how to deal with a rural health population, how to exchange information across state boundaries, or even how to build a business model that will include payer participation and funding. Some states will have to solve many if not all of the project parameters defined in Figure 14.

To ensure that each project is designed and executed in a manner that will allow the solution to be replicated across the state, the state must provide adequate program management to span each of the projects and ensure that the limited funds available are being spent wisely while

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allowing multiple projects to take place simultaneously.

Hospitals and Health Systems

Many hospitals and health systems have the ability to initiate efforts to connect their hospitals to surrounding physicians (i.e., a private exchange), or connect into the HIE efforts already underway at the regional or state level.

While there is no definitive set of rules that dictate which path a hospital or health system should take, there are some general “rules of thumb.” In general, a hospital or health system should join the regional- or state-based HIE efforts if the following holds true:

- The HIE is operational or close to operational
- Governance structures ensure fairness to all participants
- The financial model is sound, and the cost of the solution is not prohibitive
- The security and solution architecture will support changing requirements
- The solution complies with all standards and certifications required for federal funding
- Competition is not forcing a need to attract referring physicians and offer additional services (e.g., increase “stickiness”)

If an organization finds that the above criteria does not hold true, then it may be prudent to consider implementing a private exchange. As time evolves and the regional or state efforts mature and the above criteria changes in a positive direction, organizations can either connect or evolve their private exchange into the regional or state HIE.

Summary

The ARRA has been a catalyst or “tipping point” for the accelerated creation of new HIEs. HIE development has not been seen as solely dependent on ARRA funding; however, the available funds and requirements surrounding implementation of EHR systems for care delivery organizations are providing greater motivation for building truly functional networks to securely exchange patient data. Activity surrounding the development of HIEs in the United States has increased 40 percent since 2008, and with \$564M in ARRA funding set aside, this number is expected to grow.

While it may not have been the case historically with past data exchange models similar to HIEs, measurable benefits are already being seen for today’s active exchanges. Benefits include: reduced clinical and administrative time on tasks, decreases in redundant test and medication errors, and other cost savings. In terms of enabling improvements in quality and efficiency of care, there are numerous examples, including: improved tracking of disease outbreaks and immunizations, better management of chronic conditions, complete and accurate disease registries, reductions in unnecessary treatments, reductions in medical errors, and more.

One of the primary challenges for HIE development that has arisen is ensuring the alignment of interests among disparate groups of stakeholders. Interests can differ for those at federal, state, or local levels. Additionally, varying barriers can be encountered based on geography. Consequently, HIEs will need to be complex, evolving structures. That is, the functionality of an HIE should not be considered a static target, but rather a continuum of functionality that will evolve over time.

Currently, three primary deployment models exist: regional, private, and exchange networks. The goal of a regional exchange is to promote the sharing of health information across all participants in a given region. A private exchange is very similar to the regional exchange with the exception that it is controlled by a private organization and serves an individual hospital or health system. An



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exchange network connects multiple, separate HIEs together at the state or federal level.

Solid architecture must provide a foundation for the current and future needs of an HIE; however, there are numerous other factors that must be considered, including cultural aspects around the organization's use of the system and the services required to sustain the HIE.

Many organizations are currently in a position to make near-term decisions regarding development or implementation of an HIE. There are no hard and fast rules as to which model or solutions apply; however, there are some general rules of thumb that should be considered in order to ensure proper decisions leading to effective operation, replication, and sustainability of the HIE.

As you better understand the concepts surrounding and driving the creation of HIEs, you can determine the best course you and your organization can take during this landmark point, as America plots its roadmap toward healthcare change.

Creating a successful HIE is challenging, but by no means impossible. By continuing to foster collaborative forums and sharing experiences and expertise, it is possible to fulfill the important long-term goals of improving healthcare safety, efficiency, and quality. In addition, ARRA standards and incentives are also playing a key role in funding and accelerating adoption.



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6. Through a combination of incentive payments and penalties.
7. Figure 6 illustrates many of the technical capabilities currently envisioned for HIEs. It is anticipated that the functionality needed will continue to evolve.

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