



National
*e*Health
Collaborative

HEALTH INFORMATION EXCHANGE ROADMAP

The Landscape and a Path Forward

APRIL 2012



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EXECUTIVE SUMMARY

We have all heard the ideal use case for health information exchange (HIE) in one form or another: You are a New Jersey resident on a ski trip in Aspen. Despite your best efforts, you take a tumble down the slopes that results in what you are sure is a broken leg. You are rushed to the nearest hospital but rather than filling out piles of forms to determine your medical history, allergies, and consent determinations, your attending physician goes to the computer in your room, types in your name and a personal identifier, and pulls up your full medical record, complete with medical history, hospital stays, insurance information and anything else the physician needs to know. This is all made possible by interoperable HIE that allows your record from New Jersey to be electronically exchanged with the hospital in Aspen, ensuring that you get the best, most efficient care. HIE is intended to eliminate boundaries in healthcare so that patients can be treated in a timely, informed manner, no matter where they are.

Though HIE is still in its infancy and that ideal use case is years away, there is great potential for it to be a significant factor in improving the quality, accessibility and cost effectiveness of healthcare. Properly implemented and adopted, HIE will revolutionize the practice of transitions of care and connected health, which have long been difficult to manage. The benefits of extending access to a more comprehensive view of the electronic health record (EHR) lays the foundation for the creation of a longitudinal patient record and more complete, effective and personalized care for the patient and their treatment process. It has long been said that healthcare is local; it no doubt remains personal, both to the patient and their loved ones. Of necessity, modern medicine involves many care providers, procedures and services from a variety of delivery settings. HIE enables the patient to regain the local and personal experience and the physicians' ability to oversee a comprehensive plan of care.

The infusion of Meaningful Use and HITECH incentives combined with new healthcare payment models that reward

value over volume represents the needed impetus that will propel the healthcare system to the next level of care. HIE is the next phase in EHRs. The benefits of HIE include better care coordination, the assurance that patients and providers have the right information available when needed, improved efficiency, improved quality, cost savings, fewer errors, avoidance of duplicate tests or procedures, improved population health, and more effective consumer and patient engagement. Truly, key facets of healthcare such as chronic disease management, case management for patients undergoing lengthy procedures, rehabilitation and homecare will reap significant benefits from HIE.

However, given the rapid market and policy changes and technology innovations occurring right now, there is confusion among healthcare stakeholders about how best to proceed with implementing HIE. Leading HIE organizations are indeed charting new ground. Emerging HIE efforts can and should learn from those who are further along in order to avoid reinventing the wheel and to leapfrog toward success.

Great progress is being made to make successful widespread HIE and all of its benefits to patients a reality. Challenges and barriers remain – most notably funding and sustainability, variations in how interoperability standards are implemented, provider adoption, disparate electronic medical records (EMRs), and privacy and security – but they are being tackled and overcome. HIE will be a vital foundation for new healthcare payment and delivery models such as accountable care and patient centered medical homes. This paper provides clear and relevant examples of leading HIE efforts, how they are leveraging national standards for exchange, and factors that contribute to their success.

This paper hopes to capture the broad vision for why HIE is important to improving patient care and to the performance of our healthcare system. The paper also provides a framework and a path forward for those working to achieve HIE in their communities. Interoperable HIE is a

journey, not a destination. There is no definitive endpoint. Success will require continuous learning, consensus building, improvement and innovation, and perhaps, some course corrections along the way.

The industry is reaching a tipping point and the time has come to begin working together to enhance the success and value of HIE for all. This roadmap is a result of [National eHealth Collaborative](#) (NeHC)'s work in recent years with leading and emerging HIE organizations. Before putting pen to paper, NeHC validated with many stakeholders that there was a need for this type of document to help synthesize and clarify the Federal government's many HIE related activities, highlight examples of varying approaches to HIE that are showing success and provide a path forward for those working to advance HIE. Based on that due diligence, as well as input on the development and refinement of the paper from an extraordinary range of stakeholders, this paper intends to help a wide range of stakeholders interested in advancing HIE. NeHC's target audience includes all individuals and organizations directly involved with and enabling HIE, including leaders of HIE organizations; health systems; payers; consumers; technology solution providers; public health departments; pharmacies; laboratories; imaging companies; local, regional, tribal, state and federal government; and more.

This paper describes:

- Federal government efforts to facilitate creation of a solid foundation for technical interoperability and trusted HIE through the development of building blocks representing common standards, services and policies
- Examples of various connectivity and exchange approaches that are successfully leveraging national standards and specifications to increase the value and utility of HIE in multiple contexts and across diverse markets
- How the federal efforts can be woven together with private sector strategies into a cohesive strategy for successful and market-driven interoperability and standards-based HIE

A common theme echoed by the contributors to this paper has been to “not let the perfect be the enemy of the good,” to release this paper sooner rather than later, and to remember that successful HIE is more about building consensus than it is about technology, sustainability or anything else. The key is keeping patients at the center. We took this to heart and will soon convene a collaborative process to identify, prioritize and tackle HIE related issues with our stakeholders in an effort to accelerate progress. As a neutral, inclusive, public-private partnership, NeHC is uniquely positioned to play this role.

NeHC will serve as the neutral convener and facilitator of a series of processes to help accelerate the growth and evolution of HIE as a means to improve health and healthcare. Potential areas for additional collaborative work include but are not limited to:

- Business models for financial sustainability
- Measures of success
- Best practices for prioritizing and phasing implementation of HIE services
- Stakeholder engagement and governance best practices
- Best practices for evaluating and selecting technology solutions
- Variations in implementation of interoperability standards
- Strategies and value proposition for consumer engagement
- Patient consent models and best practices
- Best practices for patient matching
- Secondary uses of data
- Payer and employer engagement in HIE
- Role and function of HIE in support of accountable care

NeHC encourages all stakeholders to join us as we work together to smooth the road to successful and widespread HIE that makes a difference in all of our lives as patients and consumers of healthcare.



INTRODUCTION

The most important reason to implement health information exchange (HIE) is to improve patient care. Though HIE is still in its infancy, there is great potential for it to be a significant factor in improving the quality, accessibility and cost effectiveness of healthcare. The clear benefits of HIE include better care coordination, assurance that patients and providers have the right information available when needed, improved efficiency, improved quality, cost savings, fewer errors, avoidance of duplicate tests or procedures, improved population health through electronic surveillance, more accurate and timely clinical research, and more effective consumer and patient engagement. In short, HIE is the arrow poised to strike the bullseye of the healthcare triple aim: enabling patient-centered care at lower cost and improving population health.

For many years momentum has been building for the widespread adoption and use of health information technology (IT) and HIE. Communities across the country have been coming together to develop organizations tasked with enabling HIE across many disparate and often competing care settings. Health systems, medical groups, private health plans, public health departments and other healthcare organizations have been implementing health IT to improve patient care and more effectively manage resources, and are increasingly setting up enterprise HIE capabilities that enable seamless exchange of information throughout large organizations and multiple delivery locations and settings. The HIE community is expanding rapidly and will very soon reach the tipping point at which HIE will no longer be the exception, but rather the rule, in providing high quality and cost effective patient care.

Passage of the [Health Information Technology for Economic and Clinical Health \(HITECH\) Act](#) in early 2009 increased the speed of adoption and use of electronic health records (EHRs) and HIE by providing tens of billions of dollars in financial incentives to physicians and hospitals for meaningfully using EHRs. In fact, [KLAS](#) reports that during

2010 the number of operating public HIEs increased 81% from 37 to 67, and the number of operating private HIEs increased 210%, from 52 to 160.

Great progress is being made to make successful widespread HIE and all of its benefits to patients a reality. Challenges and barriers do remain – most notably funding and sustainability, variations in how interoperability standards are implemented, provider adoption, disparate electronic medical records (EMRs), and privacy and security concerns – but they are being tackled and overcome. HIE will be a vital foundation for new healthcare payment and delivery models such as accountable care and patient centered medical homes. Interoperability among EHRs and the ability to easily share information electronically will become exponentially more important as a rapidly growing number of physician practices and hospitals deploy health IT and seek to communicate with one another, with patients, with payers, with public health departments, and with many other healthcare actors necessary to improve care.

Historically, it has been difficult to achieve technical interoperability among hospital and physician practice EHRs to allow for the exchange of information, yet the majority of stakeholders agree that it is an essential component of a transformed healthcare payment and delivery system. They also agree that consistent adoption and implementation of nationally-recognized standards and specifications is a major step in the right direction.

Adoption and use of health IT and HIE is growing fast and will improve quality, care coordination, cost effectiveness, and outcomes. Much work remains to be done before we reach the point at which fully interoperable HIE is ubiquitous. Indeed, interoperable HIE is a journey without a definitive endpoint. Many different approaches are being used, stakeholders are at different stages along this journey, and there is by no means a “one size fits all” model.

This paper is intended to provide context and a path forward to help different types of organizations – in diverse markets – that are at varying points along a continuum make progress toward interoperable and effective HIE. This paper describes:

- Federal government efforts to facilitate creation of a solid foundation for technical interoperability and trusted HIE through the development of building blocks representing common standards, services and policies
- Examples of various connectivity and exchange approaches that are successfully leveraging national standards and specifications to increase the value and utility of HIE in multiple contexts and across diverse markets
- How Federal efforts can be woven together with private sector approaches into a cohesive strategy for successful and market-driven interoperability and standards-based HIE
- A roadmap of the major steps communities can follow to accelerate progress toward the realization of a successful national network of interoperable EHRs, connected health IT tools and real time information sharing through HIE

ONC: BUILDING A FOUNDATION FOR INTEROPERABILITY AND TRUSTED EXCHANGE

The Federal government has a vital role to play in moving the industry forward in a manner that will benefit all of us as patients and consumers. The Office of the National Coordinator for Health Information Technology (ONC) in the U.S. Department of Health and Human Services has been a significant catalyst in propelling the nation toward the goal of interoperability among EHRs and information sharing through HIE. One of ONC's priorities has been a focus on facilitating development of the standards, services and policies needed for interoperable exchange, and on management of a portfolio of programs and initiatives designed to accelerate the expansion of HIE across the nation.

ONC has launched several significant HIE-specific efforts since the passage of HITECH, including the modularization and diversification of the [nationwide health information network](#), creation of the [Standards and Interoperability \(S&I\) Framework](#), and management of [State HIE](#) and [Beacon Communities](#) grant programs. ONC is also working to create a framework that will provide oversight of the nationwide health information network through a governance rule that will come out later in 2012. All of these efforts are strengthened by advice provided by ONC's two federal advisory committees, the [Health IT Policy Committee](#) and the [Health IT Standards Committee](#).

ONC's HIE initiatives are aimed at helping the industry address common interoperability needs and facilitate robust HIE that ultimately benefits patients. Their collective efforts create a supportive environment that enables stakeholders to collaboratively identify common problems; come together to reach agreement on common standards, services and policies; and enforce consistent implementation of those standards.

"Government's continued support is going to be critical. Now is not the time for any of the stakeholders to back off. We have to stay at this until we really have ubiquitous HIE as the standard, not the exception."

– **Michael Matthews**, MedVirginia CEO,
in *Government Health IT*, 3/15/12

FEDERAL ADVISORY COMMITTEES: HIT POLICY COMMITTEE AND HIT STANDARDS COMMITTEE

HITECH created the Health Information Technology (HIT) Policy Committee and HIT Standards Committee to provide official input to the National Coordinator for Health IT on the policies and technologies needed to improve healthcare through the effective adoption and use of health IT. All of the HIT Policy Committee and HIT Standards Committee meetings are open to the public and broadcast electronically in real time, promoting transparency and encouraging participation and input from all interested stakeholders.

The HIT Policy Committee is tasked with making recommendations to the National Coordinator on a policy framework for development and adoption of a nationwide health information infrastructure.

The HIT Policy Committee has many workgroups actively focused on different aspects of health IT policy. They include:

- The [Meaningful Use](#) workgroup makes recommendations on how to define meaningful use in the short- and long-term; the ways in which EHRs can support meaningful use; and how providers can demonstrate meaningful use.

- The [Certification/Adoption](#) workgroup makes recommendations on issues related to the adoption of certified electronic health records that support meaningful use, including issues related to certification, regional extension centers and workforce training.
- The [Information Exchange](#) workgroup makes recommendations on policies, guidance, governance, sustainability, architecture, and implementation approaches to enable the exchange of health information and increase capacity for health information exchange over time.
- The [Nationwide Health Information Network](#) workgroup created a set of recommendations on a policy and technical framework that allows the Internet to be used for the secure and standards-based exchange of health information in a way that is both open to all and fosters innovation.
- The [Strategic Plan](#) workgroup provides advice to the National Coordinator on ONC's strategic policy framework.
- The [Privacy & Security Policy](#) workgroup, which includes a special joint HIT Policy Committee and HIT Standards Committee [Privacy & Security Tiger Team](#), addresses privacy and security in the health IT policy context.
- The [Enrollment](#) workgroup was formed to respond to a section of the [Patient Protection and Affordable Care Act](#) that asks the HIT Policy Committee and the HIT Standards Committee to come up with a set of standards to facilitate enrollment in Federal and state health and human services programs. This might include standards for electronic matching across state and Federal data; retrieval and submission of electronic documentation for verification; reuse of eligibility information; capability for individuals to maintain eligibility information online; and notification of eligibility.
- The [Governance](#) workgroup drafted a set of recommendations on the scope and process of governance for nationwide health information exchange, including measures to ensure accountability and oversight.
- The [Quality Measures](#) workgroup makes recommendations on quality measure prioritization and the quality measure convergence process pertaining to measure gaps and opportunities for Meaningful Use Stage 2.
- The joint HIT Policy Committee and HIT Standards Committee [PCAST Report](#) workgroup was created to synthesize and analyze the public comments and input relative to implications of the President's Council of

Advisors on Science and Technology (PCAST) December 8, 2010 report entitled [Realizing the Full Potential of Health Information Technology To Improve Healthcare for Americans: The Path Forward](#) on current and future ONC work.

The Health IT Standards Committee endeavors to operationalize the policies recommended by the HIT Policy Committee by making recommendations to the National Coordinator for Health IT on standards, implementation specifications, and certification criteria that will enable secure electronic exchange and use of health information.

Multiple workgroups, power teams and initiatives have been working to develop recommendations for the HIT Standards Committee. These include:

- The [Clinical Operations](#) workgroup recommends requirements for EHR certification criteria, standards, and implementation specifications related to clinical operations. This workgroup has set up a Vocabulary Task Force to address vocabulary subsets and value sets as facilitators and enablers of Meaningful Use.
- The [Clinical Quality](#) workgroup recommends quality measures that should be included in the definition of Meaningful Use and future EHR certification requirements.
- The [Privacy & Security](#) workgroup recommends privacy and security requirements that should be included in standards, certification criteria, and implementation specifications.
- The [Implementation](#) workgroup brings forward "real-world" implementation experience, with an emphasis on strategies to accelerate widespread adoption of proposed standards.

In the summer of 2011, the HIT Standards Committee convened a number of accelerated workgroups focused on specific issues; their work is affectionately referred to as [Power Team Summer Camp](#).

Power teams worked on the following issues:

- The Metadata Analysis Power Team identified metadata elements and standards for patient identity, provenance and privacy. The team recommended HL7 CDA R2

header elements (with modifications).

- The Patient Matching Power Team determined the data that should be included in patient matching in order to achieve acceptable levels of specificity (99.9%) and sensitivity (95%).
- The Surveillance Implementation Guide Power Team came to consensus on the use of the HL7 2.5.1 standards across lab reporting to public health, immunization reporting, and syndromic surveillance. The team also recommended specific HL7 2.5.1 implementation guides.
- The E-prescribing for Discharge Medications Power Team recommended standards for electronic prescription of discharge medications, medication history, and eligibility.
- The Nationwide Health Information Network Power Team evaluated specifications developed for the Nationwide Health Information Network Exchange and The Direct Project and made recommendations for specifications that could be used to support the secure transport and exchange of electronic health information across the nation.
- The Biosurveillance Power Team was a Centers for Disease Control and Prevention (CDC) -sponsored workgroup used by International Society for Disease Surveillance members to help design content and recommend a set of 17 core elements and 16 optional elements for biosurveillance reporting. CDC staff then wrote the accompanying implementation guide.

THE NATIONWIDE HEALTH INFORMATION NETWORK: ENABLING STANDARDS-BASED NATIONAL EXCHANGE

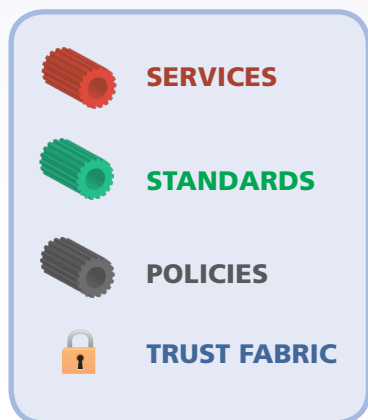
At the recommendation of the Federal advisory committees, specifically the HIT Policy Committee's Nationwide Health Information Network workgroup, ONC has officially defined the nationwide health information network as "a portfolio of services, standards and policies that enable secure health information exchange over the Internet." Consistent implementation and use of these standards, services and policies provide the essential foundation needed to attain the full technical interoperability that will allow for secure and accurate exchange of health information for patient care and real time analyses of individual and population health. Two key ONC-related projects, the Nationwide Health Information Network Exchange and The Direct Project, have instantiated the specifications of the nationwide health information network, and those specifications are currently being embedded into technology solutions and rolled out to HIE participants. Another ONC initiative, the Standards and Interoperability (S&I) Framework, is working to rapidly develop new standards and specifications to add to the nationwide health information network portfolio.

THE NATIONWIDE HEALTH INFORMATION NETWORK EXCHANGE: PURPOSE AND SCOPE

The Nationwide Health Information Network Exchange (often known as simply The Exchange) is one of the first pilots ONC embarked upon to spur progress toward interoperable HIE. Originally established in 2004 and officially launched in 2007, well before HITECH was passed, the Exchange began as ONC funded trial implementation projects meant to prove the viability of a nationally interconnected exchange model and offer lessons learned on how to improve, advance and grow HIE on a nationwide scale. Now in production for three years, the Exchange currently serves 500 hospitals (approximately 10% of the market); 4,000+ provider organizations; and 30,000 users. There are 1 million shared patients/beneficiaries covered by current connectivity in a population area of 65 million people.

NATIONWIDE HEALTH INFORMATION NETWORK

A portfolio of services, standards and policies that enable secure health information exchange over the Internet.



Credit: Doug Fridsma, MD, PhD keynote presentation, HIMSS12 HIE Symposium

The Exchange focused initially on query exchange, enabling one organization to ask other organizations on the network the questions, “Do you have any information about the patient that I am seeing?” and “If so, can you send it to me in a secure and standard fashion?” The responding organizations would then either reply, “We do not have that information,” or “Here is the information that we can release to you given the patient’s consent and the security trust established.”

This project provided an opportunity for federal agencies (which collaborate with ONC under the auspices of the [Federal Health Architecture](#) [FHA]), state agencies and HIE organizations to work together to develop specifications and approaches for HIE that would meet stringent requirements for the release of government-held personal health information to private sector healthcare facilities and other government agencies. The Exchange provides a single point of connection for the private sector to access records held by participating federal agencies. The [U.S. Department of Veterans Affairs](#) (VA), the [U.S. Department of Defense](#) (DoD), the [Social Security Administration](#) (SSA), the [Centers for Medicare and Medicaid Services](#) (CMS) and the [Centers for Disease Control and Prevention](#) (CDC) have agreed that participation in the Exchange is a best practice for the secure exchange of information between federal partners and private sector healthcare providers. SSA, VA and DoD in particular have been leaders in this effort, working to provide identity proofing, authentication and authorization strategies to secure personal health information and determining the details of how those transactions and protocols should work technically to enable seamless and effective HIE.

The Exchange enables a variety of transaction types, with a focus on transport and security standards:

- [Access Consent Policies Production Specification](#)
- [Administrative Distribution Production Specification](#)
- [Authorization Framework Production Specification v2.0](#)
- [Document Submission Production Specification v2.0](#)
- [Health Information Event Messaging Production Specification v2.0](#)
- [Messaging Platform Production Specification v2.0](#)
- [Patient Discovery Production Specification v1.0](#)
- [Query for Documents Production Specification v2.0](#)
- [Retrieve Documents Production Specification v2.0](#)
- [Web Services Registry Production Specification v2.0](#)

While the Exchange typically uses continuity of care documents (CCDs) such as HITSP/C32 and HITSP/C62 as its common care summary format, the transport standards used by the Exchange can accommodate any clinical data type.

To facilitate a common gateway connection into the Exchange, a suite of web services and tools known as [CONNECT](#) was developed by the FHA. Originally designed for use by Federal agencies, CONNECT was released publicly as open source software in April 2009. While use of CONNECT is not required to connect to the Exchange network of participants, it does provide a low cost option for organizations unable to afford the development of a commercial solution. Including the federal agencies, 1/3 of participants currently connect to the Exchange using CONNECT. CONNECT can also be used locally to assist in setting up HIE initiatives and implementing data sharing using nationally-recognized interoperability standards, or to ensure that HIE technology is compatible with other exchanges throughout the nation.

Legal Framework: Data Use and Reciprocal Support Agreement

Rather than having multiple two-way contracts between many parties that wish to exchange information in a similar manner, the Exchange created the multi-party [Data Use and Reciprocal Support Agreement](#) (DURSA). The DURSA, signed by each participant in the Exchange, provides a mechanism to ensure that all participants follow the same set of ground rules for participation, the same methods by which information can be exchanged, and the same requirements as to how the information must be protected. The primary intent of the Exchange has been to allow a certified participant to legally and technically exchange with all other certified participants. The multi-party DURSA circumvents the time consuming and expensive need for point-to-point legal and technical connections, thereby creating a conducive environment for driving broad implementation of HIE.

Examples of How the Exchange is Being Used

The DoD and VA use the Exchange to exchange summary patient records or CCDs in support of the [Virtual Lifetime Electronic Record](#) (VLER) initiative. VLER is designed to provide a single medical record for American soldiers, regardless of their status as active duty or as a veteran, and to enable seamless transition between DoD and VA medical facilities.

SSA uses the Exchange to accelerate disability determinations. In order to qualify for Social Security disability, SSA must gather and review the patient's relevant medical records. Enabling query-based exchange to seek and retrieve care documentation has dramatically decreased the time lag between application and determination.

SSA and VLER are both currently expanding the number of communities that they will connect to via the Exchange. By September 2012, a significant portion of the Veterans Health Administration will have the ability to exchange information using the Exchange, and SSA is actively recruiting new volunteer exchange partners.

CDC has used the Exchange for case reporting and biosurveillance in several pilot projects but shut down their gateway in Fall 2011, as they had accomplished their pilot. CDC plans to set up their production gateway and go through the validation process to be approved for full Exchange participation later in 2012.

CMS is currently in the exploration process with regard to whether quality assessment reporting is an appropriate use of the infrastructure of the Exchange. State HIEs, Beacon Communities, health systems and other HIE organizations are also looking to the Exchange to help achieve their goals.

Participation in the Exchange is Growing

As of March 2012, participants in the Exchange include:

- [Centers for Medicare and Medicaid Services](#)
- [Community Health Information Collaborative](#)
- [Conemaugh Health System](#)
- [U.S. Department of Defense](#)
- [U.S. Department of Veterans Affairs](#)
- [Douglas County Individual Practice Association](#)
- [EHR Doctors](#)
- [HealthBridge](#)
- [Inland Northwest Health Services](#)
- [Kaiser Permanente](#)
- [Marshfield Clinic](#)
- [MedVirginia](#)
- [MultiCare Health System](#)
- [National Renal Administrators Association](#)
- [New Mexico Health Information Collaborative](#)

- [North Carolina Healthcare Information and Communications Alliance, Inc.](#)
- [Oregon Community Health Information Network](#)
- [Quality Health Network](#)
- [Regenstrief Institute](#)
- [Social Security Administration](#)
- [South Carolina Health Information Exchange](#)
- [South East Michigan Health Information Exchange](#)
- [University of California, San Diego](#)
- [Utah Health Information Network](#)
- [Western New York Clinical Information Exchange](#)
- [Wright State University](#)

Identification of organizations that are in the process of joining the Exchange as of March 2012 as well as a number of large technology solution providers that are also supporting the Exchange can be found in Appendix A.

Streamlining Operations to Ensure a Strong Future

Given the rapid growth of participation and the need for scalability that is anticipated in the next several years, ONC and Exchange leadership have been working to streamline key aspects of the Exchange infrastructure, including improving the technical testing and legal frameworks that are required.

The Exchange's future objective is to continue to expand the use cases it supports, and the number of participating organizations, as well as continue to refine, mature and build capabilities to support broader connectivity and nationwide data exchange. On March 1, 2012, the Exchange Coordinating Committee (primary governance body of the Exchange) approved a strategic plan to evolve the Exchange into an independently supported business in order to maintain its trajectory of growth.

"[The Exchange] has to be resilient and robust at the same time and there's an infrastructure there that needs to be supported. And that's the value of taking it to the public-private partnership we're envisioning."

- **Tim Cromwell**, VA Director of Standards and Interoperability, in *Government Health IT*, 3/15/12

NEXT STEPS

QUERY/WEB SERVICES EXCHANGE

- Simplification of specifications around discovering patients and query/retrieve of patient health information
- Development of Exchange Business Plan for long term sustainability
- Bridge support for Certificate Authority to ensure continuity of operations for Exchange until transition is completed

Credit: Doug Fridsma, MD, PhD keynote presentation, HIMSS12 HIE Symposium

THE DIRECT PROJECT: REPLACING THE FAX MACHINE

Every healthcare provider and organization uses the Internet in a different way and at a different level of sophistication. Some are whiz kids walking around with EHRs on their iPads, others can barely use email. Similarly, not every provider or organization is ready for full query exchange, despite its potential utility. This is especially true if HIE is unfamiliar to them. Many providers, particularly those just now getting wired as a result of the Meaningful Use EHR incentive program, may find themselves better suited to starting out with information exchange in a form that is more familiar to them, such as secure email.

In 2010, ONC launched the Direct Project (Direct) to expand the specifications of the nationwide health information network because information exchanged across a vast number of EHRs has typically been mediated through printers, fax machines, unsecure email or regular mail. Direct complements the current specifications in the nationwide health information network by providing standards and specifications for a transport mechanism that allows participants to send encrypted information directly to known and trusted recipients over the Internet through the services of a health information services provider (HISP). Many stakeholders have been engaged in the development and testing of Direct protocols, including EHR, personal health record (PHR) and HIE vendors; health systems; federal

agencies; Exchange participants; HIE organizations; and local, regional, state and national HIE networks. Direct has been embraced by the marketplace and is quickly becoming a common service offered to HIE users.

Direct specifications are part of the standards, services and policies that make up the nationwide health information network. Direct is expected to coexist with current protocols, to help support certain use cases and provide a path to more advanced interoperability to help support patient care.

“Direct Project is really just one piece of Health Information Exchange. It’s just one of the tools that you want to have in your tool kit. It doesn’t replace other ways of exchange, but it could be layered over more robust services to provide an on-ramp. It can support speedy adoption for very simple use cases.”

- **Brian Ahier**, President of Gorge Health Connect, at NeHC University: Update on the Direct Project, 11/30/11

Directed exchange can play a key role in transforming healthcare by making patient care coordination and referrals relatively easy. Having a direct and secure option for one-directional electronic push of information between two healthcare providers, or between a provider and a patient, not only improves the patient experience, it also enables them to meet the exchange requirements of the Meaningful Use EHR incentive program.

As Direct continues to generate standards and service definitions, and implementation guides and codes that can be downloaded and examined as part of reference implementations, the uses of Direct that are underway now will help determine how to incorporate Direct protocols into some of the transport standards that will be a critical part of achieving Meaningful Use Stage 2.

In late February 2012, Notices of Proposed Rulemaking (NPRMs) on Stage 2 Meaningful Use and Standards, Implementation Specifications, and Certification Criteria were released for public comment by CMS and ONC respectively. The proposed rules establish Direct exchange

as an industry standard, require EHRs to certify Direct compliance by 2014, make “view online, download, and transmit” of clinical summaries a criterion for patient engagement, and make transmission via Direct a criterion for transitions of care. At its February 2012 meeting, the HIT Standards Committee discussed creating a streamlined version of Exchange with very simple specifications to enable point to point exchange in the short term (instead of having to first build master patient indices, record locator services, and other expensive infrastructure); requiring Direct for quality measure submission; and using Direct for “cc me,” ensuring patients get a copy of their records.

Examples of How Direct is Being Used

The VA has included Direct as one of the ways in which they can successfully exchange information for the VLER project, and CMS is working very closely with ONC to explore how Direct could be used for quality reporting.

More than 35 vendors have implemented Direct since Fall 2011, with 10+ more publicly announcing that Direct specifications are included in their product roadmap. Direct is also part of the core strategy of 40+ State HIE Grantees, 4 of which had already begun implementation in late 2011.

Many local, regional and state HIE initiatives have incorporated Direct into their service offerings. For example, the [Rhode Island Quality Institute](#) (RIQI), is using Direct to demonstrate direct provider-to-provider data exchange between primary care providers and specialists as a key component of Stage 1 Meaningful Use and as a means to seamlessly feed clinical information from practice-based EHRs to the statewide HIE [currentcare](#), integrating patient data across provider settings and during transitions of care.

[HealthBridge](#) is set up to act as its own HISP and is using Direct messaging to automate the transfer of patient discharge summaries between the care provider's EHR and a consumer-controlled PHR. HealthBridge is also using Direct to power its [ED-Admit Alert](#) initiative for asthma and diabetes patients whose health is being tracked as part of their Beacon Community project.

“Direct allows for people to make choices about who they trust without it having to be a major IT project.”

- **Sean Nolan**, Chief Architect of the Health Solutions Group at Microsoft, at NeHC University: Update on the Direct Project, 11/30/11

Additional examples of Direct currently in use can be found in the next section, most specifically in the case study examples of Indiana Health Information Exchange (IHIE) and Surescripts.

Next Steps: Establishing a Trust Framework

In April 2011, many of the participants in the Direct Project began a conversation about how to develop a trust framework for the stable and interoperable growth of Direct exchange. This conversation has evolved into the creation of [DirectTrust.org](#). DirectTrust.org is being formed as an independent, non-profit entity by and for participants in the Direct exchange community to establish and maintain the trust needed by all and to foster confidence in Direct exchange of health information. Members include representatives of HISPs, HIE organizations, Certificate Authorities (CAs), consultants, EHR vendors, and healthcare providers.

NEXT STEPS DIRECTED EXCHANGE

- Develop specifications and implementation support for Certificate Discovery and Provider Directories for Directed Exchange
- Support adoption of Directed Exchange in federal agencies
- Continue working with State HIE program to support Direct implementations

Credit: Doug Fridsma, MD, PhD keynote presentation, HIMSS12 HIE Symposium

THE STANDARDS AND INTEROPERABILITY FRAMEWORK: ENABLING STAKEHOLDERS TO DEVELOP SHARED SOLUTIONS

The Exchange and the Direct Project are examples of early pilots where stakeholders have come together to develop common solutions to HIE. Those solutions have evolved into integral parts of the HIE landscape. Beyond the successes of Exchange and Direct, however, there is still a need to expand these approaches to solve other challenges in interoperability and to continue developing the portfolio of standards, services and policies known as the nationwide health information network. The Standards and Interoperability (S&I) Framework was created to do just that.

The success of the Direct Project's open source convening methodology helped to set the stage for the S&I Framework. Created in 2010 and launched in January 2011, the S&I Framework has focused on first identifying high value goals and then working with the stakeholder community to develop common solutions, including specifications that reach across multiple organizations. All of the work of the S&I Framework is in the public domain; anyone who is interested can participate or provide comments. As of January 2012, 1,000+ people had registered on the S&I Framework wiki, and 450+ people representing 300+ organizations had committed to working

collaboratively on S&I Framework initiatives.

Underlying the work of the S&I Framework is a set of guiding principles articulated by ONC's Office of Standards and Interoperability, which oversees all of ONC's standards development and certification activities:

- Interoperability is a *journey*, not a destination
- Leverage *government as a platform* for innovation to create conditions of interoperability
- Health information exchange is *not one-size-fits-all*
- Build in *incremental steps* - "don't let the perfect be the enemy of the good"

The S&I Framework is intended to support the entire life cycle of standards development and harmonization, from the inception of a use case or a problem that needs to be solved all the way to the certification criteria. According to ONC, the S&I Framework is an example of "government as a platform," enabled by integrated functions, processes and tools for the open community of implementers and experts to work together to standardize. It provides the support tools that help make it easier to create initial use cases, to harmonize the specifications and the standards that come out of that, to develop reference implementations that test the specifications, then to coordinate with the National Institute of Standards and Technology (NIST) so that the appropriate testing criteria, tools and harnesses are in place to support the new specifications.

WHAT IS THE S&I FRAMEWORK?



Throughout this process, it is necessary to integrate across multiple standards development organizations (SDOs). To fully realize the vision of a technically interoperable healthcare system, SDOs must work together to develop common value sets, vocabularies and terminologies, and standards for the format and transportation of messages and documents exchanged electronically. Because there are multiple SDOs, each focused on a specific part of the process, the S&I Framework allows stakeholders who are trying to solve real world problems to come together and have one place where all those interested parties can take a look at the shared solutions.

Additionally, the S&I Framework process helps to underscore the importance of clear and consistent adherence to full standards and specifications. This foundation is necessary to ensure that stakeholders follow the specifications correctly; without consistent implementation of standards, true interoperability becomes a significant challenge. For example, it is one thing to be able to generate a “Summary of Care” document that conforms to a particular set of standards, but if those standards are not specific or detailed enough, if there are optional fields that some stakeholders include and others do not, conformance to the standard will still not enable fully interoperable information exchange. In order to address this issue and many others, a number of initiatives have been created under the auspices of the S&I Framework. Those include:

- The [Direct Project](#) is now considered an initiative of the S&I Framework.
- The [Provider Directories](#) initiative is establishing a standard for certificate discovery and the minimum data model needed for broader electronic service information queries.
- The [Certificate Interoperability](#) initiative is investigating architectural and operational options for cross-certifying HISPs with the [Federal Bridge Certificate Authority](#).
- The [Transitions of Care](#) initiative is creating clear implementation guidance for each of the key information exchanges needed in core care transition scenarios.
- The [Lab Results Interface](#) initiative is establishing a nationwide implementation guide for electronic submission of lab results to ambulatory EHRs.

- The [Electronic Submission of Medical Documentation](#) initiative is providing a new mechanism for submitting medical documentation to Medicare Review Contractors and investigating technical transport/authentication and proof of document authorship.
- The [Data Segmentation for Privacy](#) initiative is focused on standards-driven data segmentation to enable privacy of patient data based on consent decisions, applicable law and policies.
- The [Query Health](#) initiative is identifying the standards and services for distributed population health queries to certified EHRs and other patient data sources.
- There are also community-led initiatives working on issues in [Public Health](#) and [Longitudinal Coordination of Care](#).

The S&I Framework initiatives are making rapid progress. To date:

- There are a great many examples of Direct not only in pilot mode but in full production.
- There are at least five full-fledged cases of Transitions of Care initiatives in the pilot phase.
- There are five groups committed to piloting the Lab Results Interface very soon.
- The pilots for Data Segmentation for Privacy are in the early start up stages with pilot testing scheduled for April/May 2012.

The S&I Framework is designed to support both existing and new specifications for the nationwide health information network and new metadata tagged approaches recommended by the [PCAST Report](#), which envisions tying standardized metadata tags to individual, discrete elements of health data. The tags would contain information and attributes of the health data. The report also recommended technologies for a Universal Exchange Language (UEL), Data Element Access Services (DEAS) and granular access controls. As mentioned previously, the HIT Policy Committee and the HIT Standards Committee convened a PCAST workgroup early in 2011 to review the report and offer feedback. The workgroup’s recommendations effectively scaled back much of the ambitious vision embodied in the report by concluding that it may be more realistic to implement the new exchange architecture in an incremental fashion.

How the Pieces Fit Together into a Cohesive Strategy for Nationwide HIE

The nationwide health information network addresses both simple as well as more complex ways of exchanging information and delineates a series of specifications that define common building blocks that can be leveraged to fulfill particular exchange needs. Again, the nationwide health information network is the nationally-recognized portfolio of standards, services and policies to support and enable information exchange, including a framework that allows for an assessment of the maturity and adoptability of the standards. It is the umbrella under which continued expansion of HIE standards and policies will occur at the Federal level.

The components of the nationwide health information network are expected to be strengthened and clarified once ONC establishes governance, as is required by HITECH. The goal of governance will be to bring together many of the building blocks for interoperability, such as conformance testing, on-boarding, current and future exchange specifications, vocabularies and value sets in a comprehensive manner. A more generalized approach to governance with a transparent and inclusive process will help support the policy oversight, operations and technical infrastructure necessary to enable interoperability, with conditions of trust that provide for accountability and enforcement. ONC will establish this governance mechanism for the nationwide health information network through rulemaking, which is expected to be released for public comment by mid-2012.

ONC also works together with CMS to harmonize the pieces of the nationwide health information network puzzle. To begin building toward HIE, physicians and hospitals must first adopt EHRs. The effort to promote EHR adoption through Meaningful Use incentives is administered by CMS, with input from ONC. ONC works with CMS to ensure that policy frameworks for their respective programs and initiatives are in alignment under the nationwide health information network umbrella. The mission here is to ensure that the EHR adoption effort works in tandem with the advancement of HIE. Meaningful Use, especially in Stages 2 and 3, coupled with transformation of healthcare payment and delivery models in a manner that appropriately

OFFICE OF STANDARDS & INTEROPERABILITY

ENABLES STAKEHOLDERS

to come up with simple, shared solutions to common information exchange challenges

CURATES

A PORTFOLIO

of standards, services, and policies that accelerate information exchange

ENFORCES COMPLIANCE

with validated information exchange standards, services and policies to ensure interoperability between validated systems



Credit: Doug Fridsma, MD, PhD keynote presentation, HIMSS12 HIE Symposium

aligns incentives among stakeholders, will result in an acceleration of HIE in the coming years.

All of these pieces under the nationwide health information network umbrella will be critical to transforming healthcare and payment delivery. In March 2010, the [Patient Protection and Affordable Care Act](#), commonly referred to as the Affordable Care Act (ACA), became law. The ACA targeted reducing barriers to health insurance and reforming aspects of the health insurance industry, such as increasing coverage for those with pre-existing conditions, allowing adult children to remain on their parents' insurance coverage longer, and expanding coverage to an estimated 30 million people. The ACA encourages a partial shift from fee-for-service payments under Medicare to new models such as bundled payments and risk sharing in order to better align incentives between healthcare delivery and payment. Private payers are also piloting their own pay-for-performance projects. Regardless of the payment structure, for providers to optimize care in an environment of accountability, they must effectively use EHRs, health IT and HIE to share information electronically.

Federal efforts also spur innovation by providing the standards that lay the foundation for widespread interoperable HIE. With standardized HIE building blocks helping to ensure that core HIE services are commonly available, competition naturally arises on the fringes to fill gaps in services that meet the unique needs of individual communities. By adopting the basic building blocks for HIE made available by Federal efforts, initiatives can take advantage of an advanced starting point and more established programs can expand on their early success to provide even greater value to their communities and better care for patients.

The descriptions of various approaches to HIE in the next section demonstrate how a common set of standards, services and policies defined as the nationwide health information network provide the strong foundation upon which a wide variety of innovative exchange services can be created.

S&I METRICS

HOW LONG HAS IT BEEN?

Framework Launch Date	Jan 7, 2011
First Initiatives Launched	Jan 31, 2011
Elapsed Time (as-of today)	1 Year

HOW MUCH EFFORT HAVE WE PUT IN?

# Wiki Registrants	1,002
# Committed Members	457
# Committed Organizations	335
# Working Sessions Held	675
# Days Between Sessions*	0.4

HOW MUCH HAVE WE ACCOMPLISHED?

# Use Case Artifacts	17
# Harmonized Segments/Sections	150
# RI/Test Artifacts	64
# Pilots Committed or In Discovery	20+
# Pilot Vendors	25+
# Pilot Healthcare Organizations (e.g. hospitals, HIEs)	35+
HL7 Ballots	3
# Ballot Comments Received	1,854
# Ballot Comments Resolved	1,479

Credit: Doug Fridsma, MD, PhD keynote presentation, HIMSS12 HIE Symposium

EXAMPLES OF DIFFERENT APPROACHES TO EXCHANGING HEALTH INFORMATION

Leading HIE organizations, regional and national networks, and government agencies are using a variety of approaches that leverage national standards to exchange information electronically to improve patient care, achieve efficiencies and realize cost savings. Some examples of private, or enterprise, HIE networks include the Care Connectivity Consortium, Kaiser Permanente, and Surescripts. Other HIE examples include community-based, statewide, or multi-state HIE organizations such as HealthBridge, Inland Northwest Health Services, MedVirginia, Indiana HIE, North Carolina Healthcare Information Communications Alliance, and Rhode Island Quality Institute.

Given that most healthcare is still delivered in small physician practices and those small practices have the greatest challenges in implementing health IT, in addition to the specific examples outlined here, many of these initiatives have as a key strategic priority to provide standards-based services that assist small physician practices in implementing EHRs, getting connected for HIE, achieving Meaningful Use incentives, and preparing for emerging delivery models such as patient centered medical homes and accountable care.





GEISINGER



CARE CONNECTIVITY CONSORTIUM

In April 2011, five leading health systems – [Mayo Clinic](#), [Geisinger Health](#), [Kaiser Permanente](#), [Intermountain Healthcare](#), and [Group Health](#) – announced a plan to securely share patient-specific data through the creation of the [Care Connectivity Consortium](#). Individually, the five member organizations have been electronic health information pioneers, each already proving the value of health IT for their own patients. EMRs specific to each care setting are improving the quality of care for patients with chronic conditions such as heart disease, diabetes and asthma, as well as providing optimum care in emergency situations. Collectively, the intention of the consortium will be to take the practical steps needed to actually link needed data between the separate care systems and medical records. Members of the Care Connectivity Consortium have a clear vision that the same benefits of the full medical information that exists in each of the systems should be extended to all patients by connecting communities and the nation in order to improve healthcare for all Americans.

The purpose of the Consortium partnership is to demonstrate better and safer care through better data availability. For example, if a patient from one health system gets sick far from home and must receive healthcare in another system – or if any system sends patients to another – doctors and nurses using any of the Consortium's EHR systems will be able to access invaluable information about the patient's medications, allergies and health conditions in real time, allowing them to provide the right treatment and avoid unintended consequences such as adverse medication interactions.

The five health systems believe that achieving electronic health information interoperability and connectivity will be a critical next step in the United States becoming a 21st century information-enabled healthcare system. With patient privacy and security as overarching priorities, the Care Connectivity Consortium's goal is to clearly show that effective and timely HIE using the latest national health IT standards is possible in a secure environment and among geographically disparate healthcare providers.



HEALTHBRIDGE

[HealthBridge](#) is a large, successful HIE organization that has been in operation as a non-profit since 1997. Headquartered in Cincinnati, OH, HealthBridge serves 2.5 million patients at 50 hospitals, 800 physician practices, and 7,500 physicians in Ohio, Indiana and Kentucky. HealthBridge's HIE services include EHR integration/interfaces, electronic order entry and results

delivery, e-prescribing, HIE portal and user management, master patient index, provider directory, record locator service, summary record exchange, Direct and Exchange connectivity, public health reporting and syndromic surveillance. Roughly 3.2 million messages per month are sent through the HealthBridge HIE.

HealthBridge is focused on achieving cost savings for its participants, supporting hospitals and physicians in achieving Meaningful Use, and enabling its participants to take full advantage of innovations such as new payment and delivery models (e.g., accountable care, patient centered medical homes), quality improvement, business intelligence, and analytics. HealthBridge also serves as the local Regional Extension Center (REC) and is part of

the Greater Cincinnati Beacon Collaboration. As such, HealthBridge is assisting small physician practices in selecting and implementing EHRs and leveraging Direct protocols to enable real time clinical messaging to support transitions of care activities that qualify for Stage 1 Meaningful Use incentives. They have found that Direct provides an excellent option for communication between EHR-enabled and non-EHR-enabled facilities, such as is often required during transitions of care between hospitals and post-acute or long term care settings. HealthBridge will also assist providers in meeting Stage 2 and 3 Meaningful Use criteria.

HealthBridge's primary strategy in leveraging national and other standards and specifications is to look at the business problem and apply the connectivity solution that delivers the most cost effective approach to exchanging information. At HealthBridge, research and development into new lines of business is continuously occurring. As of March 2012, HealthBridge leadership believes they are merely at the tip of the iceberg with regard to new ways to apply Direct and Exchange-enabled connectivity to enhance the exchange needs of their community.

HealthBridge is leveraging both Direct and Exchange standards and protocols in creative ways that add value for their participants. For example, HealthBridge was an early participant in the Exchange. They were a partner in CMS' Exchange pilot CARE Health Information Exchange Project (C-HIEP) for use of electronic information to improve transitions in care and are part of the SSA Medical Evidence Gathering and Analysis through Health Information Technology (MEGAHIT) network. As part of an ONC Challenge Grant, they are using Exchange to enable interoperable exchange between five different HIEs that each serve patients based in Indiana.

The same Indiana HIE Challenge Grant also offers an opportunity to leverage Direct to facilitate consumer-mediated exchange. HealthBridge is set up to act as its own HISP and is using Direct messaging to automate the transfer of patient discharge summaries between the care provider's EHR and consumer-controlled PHRs sponsored by NoMoreClipboard through the HIE. Because Direct

provides a standalone message, NoMoreClipboard can make available to the patient a built-in option to accept/download or deny integration of the incoming care summary into their PHR. This project is scheduled to go into live production in April 2012.

HealthBridge is also leveraging Direct messaging to power its ED-Admit Alert initiative for asthma and diabetes patients whose health is being tracked as part of their Beacon Community project. HealthBridge currently receives ADT feeds from 20 different hospitals in their service area. When information from any of those feeds matches up with a patient in the Beacon program, an alert is automatically generated and sent in real time to the patient's primary care provider via Direct (in most cases, based on physician preference and capabilities).

Additionally, HealthBridge is using standards-based HIE, including Direct and HL7, to act as a data normalization intermediary for immunization reporting from HealthBridge participants to CDC's [Public Health Information eXchange](#) (PHIX).

According to HealthBridge, HIE critical success factors include only providing services that both solve business problems and have a clear sustainability model; remaining aligned with the size, dynamics and priorities of the community; and continuing to provide increasingly valuable service offerings.



Indiana Health Information Exchange

INDIANA HEALTH INFORMATION EXCHANGE

[Indiana Health Information Exchange](#) (IHIE) was founded in February 2004. It is a non-profit organization closely affiliated with the Regenstrief Institute, which is a widely recognized health informatics and research organization that pioneered a number of the health IT and HIE strategies in use today. IHIE relies on Regenstrief as its technology research and development partner, while Regenstrief enables IHIE to continuously innovate and develop new products and services. IHIE connects 90 of the 125 hospitals in Indiana and 19,000 participating physicians (more than reside in Indiana) in a geography that is populated by approximately 4 million people.

IHIE maintains an integrated approach to connectivity and exchange that is based on tools and technology developed by Regenstrief to power six primary service offerings. Through its relationship with Regenstrief, IHIE developed data repositories primarily using HL7 interfaces in physician practices and hospitals, and exchanges data with HealthBridge using both HL7 standards and connectivity to the Exchange. Regenstrief developed connectivity with the VA and SSA via the Exchange in its pilot demonstration phase and remains an Exchange participant today. IHIE will also make Direct available to its participants, anticipating that Direct may be a helpful pathway in particular for critical access hospitals and small physician practices to transmit patient information for referrals and other transitions in care.

IHIE provides the statewide infrastructure for early detection of bioterrorism and other public health emergencies from hospital emergency departments throughout the state; enables delivery of text reports via hospital or IHIE web-based portal, fax, or directly into the physician practice's EHR; offers a patient-centric community

health record for Indiana citizens that includes provider, payer and public health data; and has a chronic disease management and preventive care program for payers that is being expanded as a result of a Beacon Community grant from ONC.

Additionally, IHIE is participating in an innovative project funded by an ONC Challenge Grant to enable consumer-mediated exchange at five HIE organizations serving patients in Indiana, including HealthBridge. This project will seek to develop the privacy and security policies and mechanisms needed to provide consumers access to their health information in a trusted and secure way. One of this project's expected outcomes is a scalable model that can be adopted nationally.

IHIE's primary critical success factor is to approach HIE as a business first and foremost, and never provide something of value without first knowing how to sustain it in the long term. IHIE does, however, recognize that there will be some lines of business that are profitable beyond cost recovery and can often support the introduction of new services until they reach critical mass and a business model capable of supporting those services.



INLAND NORTHWEST HEALTH SERVICES

[Inland Northwest Health Services](#) (INHS) was founded in 1994 by two competing healthcare entities in Spokane, WA, as a collaborative non-profit organization that is entirely focused on healthcare and health IT. INHS has a large air ambulance collaborative, runs and manages a freestanding rehabilitation hospital, provides community health education and outreach for its hospital, and operates a shared services IT organization. INHS manages IT for 38 hospitals and EMR systems for 750 physicians in the Northwest, and has 3.5 million people in a single master patient index. In 2011, 19 of INHS' hospital customers were awarded "[Most-Wired](#)" status and 12 qualified for Stage 1 Meaningful Use incentives.

INHS serves as an information hub, providing interoperability among disparate technologies for clinical data. INHS is moving towards new care coordination and information exchange activities to provide a foundation for new delivery models such as accountable care and patient centered medical homes, as well as evidence-based clinical decision support, workflow integration, quality measurement, patient engagement, care communications and alerts, case management, and mobile technologies.

Some of INHS' major projects include:

- Partnering with the State of Washington to create an electronic case management tool designed to get injured workers back to work more rapidly
- Partnering with CDC on a [BioSense initiative](#) to take lab and ED results on flu and other outbreaks out of hospitals' and physicians' EMRs and report them to the Department of Health on a daily basis
- Working as an ONC Beacon Community grantee

focused on strengthening care coordination for patients with type II diabetes

- Partnering with SSA to provide electronic disability claim eligibility information for hospitals, physicians and their patients through the Exchange

INHS also exchanges health information with VA and DoD through the Exchange. With a VA hospital and an Air Force base in Spokane, there is a need for information on veterans and active duty military personnel to flow between the Veterans Health Administration, the Military Health System and the private sector to support patient care. By connecting to the Exchange and supporting the VLER project, INHS enables this information exchange to occur, realizing benefits for caregivers as well as veterans and active duty military. The system is live, clinicians are accessing data on the VA and the DoD patients, and INHS is receiving feedback and monitoring the physician and clinician experience related to workflow and usability of the technology.

While INHS does not currently have any Direct pilots underway, they are actively engaged in the process of identifying appropriate opportunities to integrate Direct messaging protocols into their service offerings.

From INHS' point of view, HIE critical success factors include reaching critical mass of clinical data exchange and interoperability, building trust with stakeholders and exchange partners, collaborating as a community, bringing value, and always putting the patient first.



KAISER PERMANENTE®

KAISER PERMANENTE

[Kaiser Permanente](#) is the largest private integrated healthcare delivery system in the U.S., delivering healthcare to approximately 8.9 million members in nine states and the District of Columbia. Kaiser Permanente includes Kaiser Foundation Health Plan, the nation's largest non-profit health plan, and its health plan subsidiaries outside California and Hawaii; the nonprofit Kaiser Foundation Hospitals, which operates 37 hospitals and over 450 other clinical facilities; and the Permanente Medical Groups, independent physician group practices that contract with Kaiser Foundation Health Plans to meet the health needs of Kaiser Permanente's members. Most pharmacy, diagnostic, and laboratory services delivered to Kaiser Permanente members are performed within Kaiser Permanente facilities.

Kaiser Permanente has made a significant investment in developing its secure EHR system to support the delivery of care to its members and patients and to enhance communications among the medical professionals who serve them. Kaiser Permanente considers its secure EHR system to be a critical tool in enabling coordination across various points of care.

Kaiser Permanente has also been a pioneer in supporting the exchange of structured health data by and among clinicians and patients outside of its integrated system, by using federal health data standards and participating in the Exchange. In January 2010, Kaiser Permanente and the VA launched the very first VLER pilot program, linking the electronic health records of patients who receive care at both VA and Kaiser Permanente facilities in San Diego County, California. In addition to being a founding member of the Exchange, Kaiser Permanente is also a founding member of the Care Connectivity Consortium and expects to participate in other state and regional HIE initiatives as well.

Kaiser Permanente has been a pioneer in providing consumers access to their personal health information online. More than 3.8 million Kaiser Permanente members are registered on KP.org and currently have the ability to view clinical data such as laboratory results, email their doctors, refill prescriptions, and manage appointments online. Kaiser Permanente members can obtain electronic copies of their records through their clinics and soon will have self-service ability to download their information.

Kaiser Permanente has long promoted the view that secure HIE can extend clinical care across boundaries. From its perspective and experience, the key success factors for HIE are physician and IT collaboration, engaged stakeholders, a commitment to consensus-based decision making and problem solving, collaborative data governance, appropriate standardization and aligned goals focused on ensuring that critical health information is available in a secure manner to support improved health and healthcare.



MEDVIRGINIA

[MedVirginia](#) was established in 2000 by several local provider organizations and launched its community-based for-profit HIE organization in 2006. MedVirginia currently supports 1,100+ users, 900,000 patients, and over 1 million messages per month. Since its inception, MedVirginia has processed over 50 million electronic messages.

MedVirginia is focused on implementing the most effective and efficient ways to exchange information in support of improving patient care. MedVirginia uses a multifaceted approach to HIE, leveraging both the Exchange and Direct protocols. MedVirginia is committed to ensuring delivery of the full complement of medical and critical information regardless of the modality used because it results in better patient care. In fact, MedVirginia's primary decision making factor in considering new use cases to support is "leave no patient behind," and has demonstrated its commitment to this principle through significant work to build HIE connectivity for four Virginia free clinics in 2007.

MedVirginia is a strong proponent of the Exchange and its capabilities. They were the first private sector organization to go into production with the Exchange in order to share information with SSA, VA, DoD and CMS. MedVirginia's partnership with SSA has been wildly successful, resulting in a 45% decrease in benefits determination time and a significant revenue enhancement of \$2.1 million for Bon Secours Hospital System in Richmond, VA. In addition to federal agency access, MedVirginia considers the Exchange to be their preferred model for exchanging information with other community-based HIE organizations.

MedVirginia plays a major role in statewide HIE as well. In 2011, ConnectVirginia, a MedVirginia non-profit subsidiary, was awarded a contract from the state government to build and operate the statewide HIE. MedVirginia provides support and strategic services to ConnectVirginia, including

assistance in developing strategic and sustainability plans, pricing strategy, fee structures, and service level agreements. In February 2012, MedVirginia, through ConnectVirginia, launched a project to use Directed exchange to connect their care management group with primary care practices by enabling bi-directional secure clinical messaging.

MedVirginia's critical success factors include building a "framework of trust" to enhance credibility in the community, being flexible enough to understand the diversity of participant needs and capabilities and respond by providing extensive functionality, participating in work to develop nationally-recognized standards and demonstrate how HIE can comply with and leverage those standards, and continuing to provide extensive training and education to participants and other providers in the region on how to optimize use of HIE.



NORTH CAROLINA HEALTHCARE INFORMATION AND COMMUNICATIONS ALLIANCE

The [North Carolina Healthcare Information and Communications Alliance, Inc.](#) (NCHICA) was formed in 1994 as a non-profit organization with a mission to improve health and healthcare by accelerating the adoption of information technology and enabling policies. NCHICA has been successful in creating a trusted environment where all North Carolina healthcare stakeholders can come together to develop consensus-based approaches to meeting the clinical, technology and policy needs of its members. Some of NCHICA's accomplishments include working on model privacy legislation for electronic records and signatures; standing up a secure, web-based immunization registry; holding educational workshops and conferences; and joining the Exchange.

The [Western North Carolina Health Network](#) (WNC), a member of NCHICA, has a portal that provides a view into

patient records held by 16 different hospitals. However, the [Charles George VA Medical Center](#) in Asheville, NC, which cares for upwards of 30,000 veterans, was the only hospital that was not connected to the WNC network. NCHICA found that more than 9,200 veterans visited at least one non-VA network hospital over the course of a year, so they built a business case as to why a connection with the VA through the Exchange would be helpful in providing quality care to Western North Carolina's veteran population. NCHICA went live with its standards-based gateway to connect to the Exchange in March 2011, enabling data to flow between the WNC and the VA Medical Center in Asheville in an authorized and secure manner. NCHICA views this gateway as a utility and would like to see more information flowing to and from North Carolina healthcare providers and the SSA, [Indian Health Service](#) (IHS), DoD, CDC, and others so that the cost per transaction goes down.

From NCHICA's perspective, the future of healthcare is to bring information to the point of clinical decision making, which takes place across enterprises, across state boundaries, and with federal agencies. NCHICA considers a connection to the Exchange an important opportunity to gain insight into the standards and policies that are required for cross-enterprise, cross-region, and cross-nation exchange on behalf of patients.



RHODE ISLAND QUALITY INSTITUTE

[Rhode Island Quality Institute](#) (RIQI) was founded in 2001 as a non-profit organization with a mission to significantly improve the quality, safety, and value of healthcare in Rhode Island. RIQI is a collaboration of leaders in the Rhode Island community, including hospital CEOs, health insurers and businesses, along with leaders of consumer groups, academia, and government who are determined to improve the healthcare system in the state by building on the availability and advantages of health IT.

RIQI provides Rhode Island's statewide HIE, [currentcare](#), a secure electronic system with an opt-in consent model that allows physicians and other providers access to a patient's health information in order to provide the best possible care. [currentcare](#) is connected to all Rhode Island labs, all hospital ADT feeds, and 90% of in state pharmacies, and will be fully connected to all Rhode Island hospitals by the end of 2012. [currentcare](#) has processed 5.8 million records since its inception and continues to process 42,000 records per day for 1 million patients in a total population of 6.4 million.

RIQI is the REC for Rhode Island as well, which allows them to work closely with small practices, assisting them in implementing EHRs, connecting for HIE, and achieving Meaningful Use incentives. RIQI is also a Beacon Community grantee. Their Beacon project is focused on supporting the transition to patient centered medical homes and quality reporting, in particular by enhancing the quality of care provided to patients with diabetes, reducing preventable hospital and emergency department use, reducing the impact of tobacco use, and reducing the impact of undiagnosed and untreated depression.

RIQI is a national leader in using Direct protocols to satisfy a wide variety of use cases. For example, RIQI has a project

underway to use Direct to enable a physician to send an update on a patient's record, often a structured clinical care summary, to [currentcare](#). When [currentcare](#) receives an update on a patient from a hospital, such as a discharge summary, it uses Direct to send an update to the patient's primary care physician. This Direct message serves as a notification about what happened during the patient's hospital stay, thus supporting the transition of care from the hospital back to the physician office setting. Direct is being leveraged as a relatively simple way to enable exchange among small physician practices and to support electronic referrals and care coordination. The HIE is building a data repository with updates and information it obtains through Direct to perform analytics and quality reporting. The HIE can then transmit analytics and quality information back to the physician practice using Direct.

RIQI sees Rhode Island as a living laboratory for testing new approaches to alternative and holistic methods of providing care. They believe that critical building blocks for success include strong implementation skills (project management, analytics and project forecasting capabilities); the ability to leverage core assets (for RIQI, these are the [currentcare](#) statewide HIE, an analytics platform, strong policies and procedures, and functions to serve vertical product lines); and the ability to quickly create and deliver new services and tools to participants.



SURESRIPTS

[Surescripts](#), the only national network dedicated to electronic prescribing (e-prescribing), enables secure, standards-based connectivity and HIE among payers, pharmacy benefit managers (PBMs), physician practice EHRs, and pharmacies, primarily for prescription information. By leveraging [National Council for Prescription Drug Programs \(NCPDP\)](#) standards, Surescripts enables PBMs to deliver formulary and prescription benefit information to prescribers at the point of care, and enables PBMs and pharmacies to deliver medication history information that will allow prescribers to make safer, more cost effective prescribing decisions than they would otherwise be able to without the information. Surescripts also enables bi-directional electronic exchange of prescription information between physician practices and the chain, independent, or mail order pharmacy of the patient's choice, including automation of prescription renewals. Electronic prescribing reduces healthcare costs, improves patient safety, and increases efficiency and convenience.

In November 2011, Surescripts announced that over 52% of all office-based physicians are e-prescribing. At that time, there were nearly 360,000 active e-prescribers on the Surescripts network, including physicians, physician assistants, and nurse practitioners. Almost 95% of pharmacies nationwide are receiving e-prescriptions.

In late 2010, Surescripts announced that it would leverage its e-prescription network to offer clinical interoperability through a strategic relationship with [Kryptiq](#). Surescripts' clinical interoperability service allows healthcare providers to securely exchange clinical information with peers locally, regionally and nationally between EHRs and across health systems and healthcare networks. The service supports all federal and state health information standards, including Exchange and Direct, and those dealing with privacy, security and Meaningful Use.

In April 2011, CDC announced that it was funding the creation of the [Lab Interoperability Cooperative](#) with participation from the [American Hospital Association](#), the [College of American Pathologists](#), and Surescripts. The purpose of the Cooperative is to recruit hospitals to participate in a program that will electronically connect hospital laboratories with public health agencies. This will enable hundreds of hospitals to engage in the electronic reporting that helps public health officials act more rapidly and efficiently to control disease. The project is intended to help hospital labs meet criteria established by ONC for Meaningful Use of EHRs, specifically the criteria regarding submission of electronic data on reportable laboratory results to public health agencies. During the two year grant period, the Cooperative will recruit, educate and connect a minimum of 500 hospital labs to the appropriate public health agencies. At least 100 of these labs will be part of critical access or rural hospitals.

Though technical standards are currently available to enable the electronic exchange of lab results, commercial labs, hospitals and providers have implemented and make use of these standards on a limited basis. Electronic laboratory reporting has been promoted as a public health priority for the past several years and its inclusion as a Meaningful Use objective for public health serves as a catalyst to accelerate its adoption. Based on the [Surescripts Network for Clinical Interoperability](#), the Cooperative network will support all federal and state policies and standards, including privacy, security and technical interoperability specifications.

MAJOR STEPS ON A ROADMAP TOWARD INTEROPERABILITY AND HIE

Healthcare organizations are at different stages along the continuum leading to full interoperability and widespread HIE. This roadmap is intended to provide a path forward for those committed to making progress toward HIE because they believe it will improve patient care and healthcare outcomes. This section outlines a series of steps necessary to progress in the right direction, regardless of where an organization may be along their journey, whether they are considering implementation of, or participation in, a private or public HIE initiative, or are already exchanging community health information. Given this roadmap's emphasis on key success factors, even mature HIE initiatives may find value in revisiting some of the foundational elements that are most likely to lead to success. Indeed, interoperability is a journey, not a destination. Innovations and the rapidly changing market ensure that there is no definitive endpoint for this journey.

Before outlining the steps to implementing successful and sustainable HIE, it may be helpful to review the key lessons learned from the examples of HIE progress in the previous sections:

- Leaders emphasize that a guiding principle for those working to achieve widespread HIE should be to *focus on what is best for the patient above all else*.
- Building stakeholder trust and achieving ongoing alignment around the vision and objectives is critical, especially given potential conflicts inherent among stakeholder groups.
- HIE is benefiting its participants and the patients they care for because patient information is available when needed, which results in better quality, coordination, safety and efficiency.
- HIE is happening successfully among many diverse types of organizations using many different approaches; there is by no means a “one size fits all” model or approach.
- Deciding the most appropriate deployment approach for HIE – whether sponsored by a hospital or a health system, a payer, or a multi-stakeholder organization – should be determined based on local market characteristics and the needs of the community.
- Government funds and grants are helpful to catalyze, but not sufficient to sustain, the function of HIE. HIE initiatives must deliver services that stakeholders value and for which they will pay. Leaders advise that no HIE initiative should ever start a new service without knowing how it will be sustained over the long term.
- HIE will likely accelerate as a result of Directed exchange becoming a standard and the requirement for EHRs to certify Direct compliance by 2014 in Meaningful Use Stage 2.
- New delivery models such as accountable care, patient centered medical homes and payment models that align incentives with value rather than volume will not be possible without widespread robust HIE.
- While a great deal of progress is being made, additional collaborative work is needed in certain areas, including business models for sustainability; quantifiable measures of success; best practices for phasing HIE services; governance and stakeholder engagement; evaluating and selecting technology; and ensuring privacy and security, as well as consumer engagement; quality reporting; public health reporting and more.

Critical success factors for leading HIE organizations identified by National eHealth Collaborative in [Secrets of HIE Success Revealed: Lessons from the Leaders](#) (published in August 2011) may also be helpful in this context:

- Aligning stakeholders with HIE priorities is an intensive and ongoing effort
- Successful HIEs work hard to establish and maintain a role as a trusted, neutral entity committed to protecting the interests of participants
- Keep a strong business orientation and always focus on how stakeholders' common needs present an associated value proposition for sustainability
- Market structure and dynamics matter, especially in the early stages
- Successful HIEs value their core competencies of understanding clinical workflows and managing change



PHASE 1: HIE OBJECTIVES AND VISION

A local multi-stakeholder leadership group should come together to decide why they want or need to exchange health information in their community. This leadership group should have representation from all major healthcare stakeholders in the community, including consumers, providers, employers, and other key opinion leaders. Those pursuing private, or enterprise, HIE should consider bringing its external stakeholders to the table at this early stage as well. It is well worth the time it may take to bring everyone together up front, as consensus and community buy-in are the cornerstone to building the solid foundation of communication, transparency and trust needed to sustain a successful HIE infrastructure.

The multi-stakeholder leadership group should begin this phase by reaching agreement on the vision for what they hope to achieve through HIE, including identifying benefits by stakeholder, the value proposition that will attract participation, and consensus on desired exchange partners. Underlying the development of the HIE objectives and vision should be consideration for how patients naturally move within the community and how health information should best be shared electronically in support of referral patterns and patient flow.

MAJOR STEPS



“We found the primary factor to success to have nothing to do with technology and everything to do with relationships. Fostering and preserving trust relationships with influencers like politicians, medical societies, privacy advocates, consumer groups and others is critical to successful implementation and ongoing operations.”

- Devore Culver, HealthInfoNet

Building trust among stakeholders and reaching agreement on the community's guiding principles, goals and priorities for HIE is the most important outcome of this phase. Effective and ongoing stakeholder engagement is of utmost importance and can be challenging when various stakeholders have different and sometimes conflicting perspectives. It is

important to incorporate into the objectives and vision how the HIE intends to reach the full range of healthcare delivery settings, including small physician practices, hospitals, post-acute and continuum of care facilities and consider where this fits in the vision and objectives for the community. Each delivery setting will likely have different challenges associated with implementing health IT and connecting for electronic sharing of health information.

In formulating the vision and objectives for HIE, it is also important to determine how stakeholders will measure success or quantify the benefits. While measures of success or value may evolve as the HIE matures, an ongoing examination of benefits will be a critical underpinning for financial sustainability.

Potential measures of success to consider could include:

- ☒ Growth in adoption (e.g., number of providers) and use (e.g., number of transaction types, volume of transactions)
- ☒ Number of connected providers likely to achieve Meaningful Use incentives through HIE
- ☒ Number of connected providers more effectively and efficiently coordinating care
- ☒ Cost savings (e.g., avoiding duplicate tests due to information access, reduced cost of transactions such as lab result reporting)
- ☒ Improved quality (e.g., avoiding errors)
- ☒ Usability of information and perceived value to the community
- ☒ Reliability, speed and cost of the HIE
- ☒ Success of business models in sustaining the exchange of health information among participants, including return on invested capital
- ☒ Patient satisfaction, including confidence that providers have needed information so patients no longer have to fill out the same forms repeatedly
- ☒ Provider satisfaction, including the expectation that valuable patient information will be readily available when needed and the knowledge that the availability of information leads to higher quality and more efficient medical practice



PHASE 2: MARKET ASSESSMENT

It has long been said that healthcare is local; that is certainly true when considering deployment of HIE. Market conditions and community readiness should be thoroughly assessed and understood. Under the direction of the multi-stakeholder leadership group, there should be an inventory and assessment of the capabilities and HIE infrastructures that are currently available not only at the national level (described herein) but also at the community level. This includes reviewing any existing technology infrastructure related to EHR adoption; state, local and health system HIE efforts; the structure of the market (number, size and types of providers, payers and patients); and a realistic assessment of the referral relationships, competitive dynamics and culture for collaboration in the community.

Consideration should be given at this time to potential secondary uses of data for research, analytics and public health purposes. Additionally, consumer engagement is increasingly important in an environment of accountability and shared risk. Stakeholders in the community may look to HIE as a resource to provide tools to facilitate effective consumer engagement. Playing a valuable role in supporting strategies such as consumer engagement may help the HIE initiative establish credibility in the community as a trustworthy steward of valuable information, which will encourage participation in the HIE. Playing a meaningful role in consumer engagement can also help participants in the HIE and consumers in the community become comfortable that information sharing can be done in a manner that is secure and protects patient privacy. These types of strategies can help the HIE initiative achieve the critical mass of provider and patient participation without which additional investment and funding will not be possible.

Working toward HIE can be an opportunity for mutual benefit and should leverage the community's existing health IT investments, business and clinical relationships. The multi-stakeholder leadership group must understand what is already working well or not working effectively and identify critical gaps in HIE capabilities. They should also consider the challenges and needs of small physician practices and the full range of delivery settings, such as post-acute and long term care. Possessing a clear understanding of provider workflow and how HIE can help to make that easier, more efficient, and more cost effective is core to successful deployment of sustainable HIE.



PHASE 3: STRATEGY DEVELOPMENT

Based on the vision and objectives of the community and the results of the market assessment, the multi-stakeholder leadership group will next need to identify strategic options for implementing HIE, evaluate the pros and cons of those options, and develop the strategy for deployment. This strategy should include an understanding of the value proposition for each potential participant and a consensus decision on potential business models for financial sustainability. Ideally, the strategy will leverage existing capacity and infrastructure that is working and focus on filling in the most important gaps in HIE capabilities. The strategy should strive for the most effective and efficient HIE approaches that support patient-centeredness, the transformation of healthcare delivery and payment, and ongoing quality measurement and improvement.

A key component of strategy development in this phase is the identification of options for implementing technical interoperability and HIE connectivity. Ascertaining now which specific options and what implementation phasing will most effectively drive adoption and use of HIE will provide the most likely sustainable return on investment and will result in better patient experiences and outcomes.

Suggested criteria for considering which services may accelerate adoption of HIE could include:

- ✓ Is there an initial connectivity infrastructure or service that can be achieved that allows participants to derive early value?
- ✓ What services are needed that will provide a direct or indirect financial benefit to participating stakeholders?
- ✓ Are there benefits to be gained by linking to existing regional or national networks?
- ✓ Does the service support local, state and Federal agency program needs?
- ✓ What clinical workflow processes (frequently paper-based and people intensive), especially those that require the external exchange of clinical information, can be automated?

- ✓ What tools or services can HIE enable to capitalize on consumer engagement, information sharing and empowerment?
- ✓ How do the services help hospitals and physicians – in particular small physician practices – attain Meaningful Use incentives?



PHASE 4: STRATEGY IMPLEMENTATION

This phase is focused on establishing the details of the implementation plan. Technical requirements, roles and responsibilities, capital and financial implications, data sources and service rollout timing will need to be identified. This includes addressing governance; technology and interoperability platforms; privacy, security and patient consent policies; strategies to add value beyond core services; and the role of HIE in new delivery models such as patient centered medical homes and accountable care. As implementation planning gets closer to completion, the value propositions and business models identified in Phase 3 will likely need further refinement. It is also important to build specific evaluation criteria and processes into the implementation plan so that the perceived value of services can be documented and analyzed and return on investment can be measured. The data collected to support the evaluation criteria will be especially helpful in the future if the HIE organization seeks new funding or considers offering new service options.

HIE technology choices can also drive significant business opportunities and challenges. It may be helpful to keep in mind that technology solutions are rapidly and constantly evolving. Software flexibility and the ability to adapt as the HIE initiative and its participants' needs evolve should be critical decision making factors when evaluating and selecting technology solutions.

Some best practices have been identified for evaluating and selecting technology solution providers to support HIE functionality. This process should encompass at

least two key elements – a standard technology vendor questionnaire and product demonstrations with clear ground rules. The vendor questionnaire should include a company profile, support services (implementation, deployment, software upgrades, ongoing technical support), technology (functionality, pricing, timelines to install and service), training (for both HIE-related staff and HIE users), recommendations specific to your HIE environment and initiative, service level agreement options (refers to an acceptable level of technical down time – in healthcare this needs to be as close as possible to zero given the potential impact on lifesaving actions) and business references for the company. The structured product demonstrations should allow only live demonstrations (not static PowerPoint presentations), cover current and relevant functionality only, and have a set length of demonstration time. A small team of evaluators should be selected from both the user community and the multi-stakeholder leadership group – chief information officers and physician users are good options here – to participate in the technology demonstrations and test and rate the options under consideration. Each of the evaluators should complete an evaluation form rating the functions of the technology with exceeds requirements, meets requirements, unclear, and does not meet requirements. The criteria measured will vary by user and by the HIE initiative as a whole based on the value each evaluator is looking for the technology to provide.

Another very important part of the implementation plan to build out during technology evaluation is to determine the best way to phase implementation of HIE technical functionality. HIEs services should be rolled out in an incremental and balanced way in order to build momentum and deliver value without overwhelming the participants with major workflow changes. For example, many organizations deploying HIE have found that it makes sense to start with electronic referrals between providers and electronic results delivery from hospitals to connected providers. This can often be accomplished by leveraging Direct protocols and a nearby HISP. The next phase could include patient summary inquiry, which allows a provider with appropriate access rights to query and view patient demographic information and reports on clinical encounters from multiple sources. Depending on the needs of the

community, connection to the Exchange may be valuable in providing this service. Working up to the capability to deploy a complete longitudinal community health record that provides connected participants with patient-centric data reporting and real time alert capabilities is a valuable future goal. Later stages of HIE may require additional services such as population health analytics and other value add tools to help connected participants proactively manage care for and improve outcomes of the population they serve.

CONCLUSION

The environment has never been more promising for HIE and its potential to benefit patients. HITECH and its financial incentives for Meaningful Use, the ONC programs created to encourage adoption of EHRs and implementation of HIE, and new payment models that truly align financial incentives for value rather than volume have accelerated the market. The efforts of the HIT Policy Committee, HIT Standards Committee, and the Standards & Interoperability Framework, as well as the success of both the Exchange and Direct as part of the nationwide health information network, all together create an inclusive, collaborative process to drive progress and provide the sound foundation for interoperable information sharing that is needed to achieve widespread successful interoperability and HIE.

Leveraging the standards and services offered by the nationwide health information network will help ensure technical interoperability and provides a stamp of approval that participants are:

- Following best practices to securely and efficiently exchange health information
- Compliant with existing national standards and implementation recommendations
- Willing to take a test to demonstrate conformance
- Following through responsibly to protect the health information that our patients entrust to HIE

Many HIE initiatives are successfully enabling the sharing of information at the local, regional, state, multi-state, and national levels. They are leveraging existing standards and using multiple approaches to exchange information electronically, which is improving patient care, achieving efficiencies and better managing costs. Some of them are finding sustainable business models through a fee structure that asks all participants to pay a fee based on the value they receive – both connected providers as well as data sources. Others are seeking out partnerships and grants from the state and federal government, investments from payers

or health systems, or payments for providing the technical backbone of an accountable care organization or patient centered medical home as ways to contribute to business models for sustainability.

Despite the supportive environment facilitated by government leadership and the substantial progress that is underway and providing value, there is still a long way to go before HIE becomes an integral and expected part of providing high quality healthcare. Emerging HIE initiatives and those organizations striving to continue their progress to implement comprehensive HIE can and should build on the lessons and successes of others. Starting with developing a vision and objectives for why to share health information and building stakeholder trust, followed by a market assessment to understand the existing infrastructure and readiness, and moving through strategy and business model development and implementation is a sound roadmap to follow. Like all networks, all HIE initiatives, regardless of structure or business model, will increase in value as the number of participants and the scope of the information they share grows. Decisions made at the outset can have both positive and negative consequences on future success. Be sure to build in a core process to measure success and evaluate implementation in order to adjust the strategy and business plan as needed.



Final note: Creating and maintaining a successful and sustainable HIE initiative is difficult but rewarding. The ultimate goal of HIE is to ensure that the right information is available at the right time and place every time to support the delivery of high quality, well coordinated, and cost effective patient-centered healthcare. Keeping a consistent and clear focus on what is best for the patient is above all else the smartest way to stay on course in the ever-changing environment of HIE.

APPENDIX A: EXCHANGE PARTNERS

Organizations that are in the process of joining the Exchange as of March 2012 include:

- [Alabama's One Health Record](#)
- [Alaska HIE](#)
- [Allina](#)
- [Big Bend RHIO](#)
- [Bronx RHIO](#)
- [Brooklyn Health Information Exchange](#)
- [Cal eConnect](#)
- [Coast Guard](#)
- [Dignity Health](#) (formerly Catholic Healthcare West)
- [Central Alabama Health Image Exchange](#)
- [Florida HIE](#)
- [Geisinger Health](#)
- [HealtheConnections RHIO of Central NY](#)
- [Health Information Partnership for Tennessee](#)
- [Hilo Medical Center](#)
- [Idaho Health Data Exchange](#)
- [Indian Health Service](#)
- [Indiana State Department of Health](#)
- [Louisiana HIE](#)
- [Maine HIE](#)
- [Medical University of South Carolina](#)
- [Michigan Health Information Network](#)
- [North Carolina HIE](#)
- [Strategic Health Intelligence \(Pensacola\) HIE](#)
- [Redwood MedNet](#)
- [Risarc](#)
- [Rural Healthcare Pilot Program](#)
- [State Health Information Network - New York](#)
- [MyHealth Access Network](#)

A number of large technology solution providers are also supporting the Exchange, including:

- [OptumInsight](#) (formerly Axolotl)
- [CareEvolution](#)
- [CGI Federal](#)
- [Cogon Systems](#)
- [CSC](#)
- [Epic](#)
- [K Force](#)
- [MedPlus](#)
- [Mirth](#)
- [OneHealthPort](#)
- [Orion](#)
- [SAIC](#)
- [Talis](#)
- [Vangent](#)

APPENDIX B: HELPFUL RESOURCES

Agency for Healthcare Research and Quality (AHRQ)	AHRQ HIE Evaluation Toolkit
Agency for Healthcare Research and Quality (AHRQ)	Developing a Universal Consent Form: Lessons Learned from Florida Medicaid
Agency for Healthcare Research and Quality (AHRQ)	Leveraging Existing Leadership to Support Health IT and HIE: Lessons Learned from Minnesota's Medical Assistance Program
American Journal of Managed Care	Health Information Exchange Among US Hospitals
Annals of Internal Medicine	A Survey of Health Information Exchange Organizations in the United States: Implications for Meaningful Use
Beacon Partners	Health Information Exchange Study: Assessing the Interest and Value in HIE Participation
BlueCross BlueShield Association	BCBSA Toolkit for Plan Engagement with Health Information Exchanges
CapSite	2011 U.S. Health Information Exchange (HIE) Study
Center for Community Health Leadership	Establishing Governance: Focus on Sustainability and Community Inclusion
DirectTrust.org	http://directtrust.wikispaces.com/Website
eHealth Initiative	2011 Report on Health Information Exchange: Sustainable HIE in a Changing Landscape
eHealth Initiative and CHIME	The HIE Guide for CIOs
EHR Association	Supporting a Robust Health Information Exchange Strategy with a Pragmatic Transport Framework
Government Health IT	The Top 5 Roadblocks HIEs Face
Government Health IT	3 Reasons to Let HIE Customers Define Services
Health Affairs	From the Office of the National Coordinator: The Strategy for Advancing the Exchange of Health Information
Health Data Management	Which Way for Data Exchanges?

Health Data Management Editorial Insights Web Seminar	Governance: The HIE Differentiator
Healthcare IT News	6 Tips for HIE Sustainability
Ingenix	Formula for Long-term HIE Sustainability, Better Health Care - The HIE Gateway Model, Part II: Return Model for HIE Value-Add Advanced Analytics Services
JAMIA	A Framework for evaluating the costs, effort, and value of nationwide health information exchange
JAMIA	Health Information Exchange: Persistent Challenges and New Strategies
JAMIA	Health Information Exchange: Why Are We Doing It, And What Are We Doing?
JHIM	The Next Step in Health Data Exchanges: Trust and Privacy in Exchange Networks
Journal of Participatory Medicine	Health Information Exchange: A Stepping Stone Toward Continuity of Care and Participatory Medicine
Laura Kolkman, RN, MS and Bob Brown	The Health Information Exchange Formation Guide
Legal Health Information Exchange	HIE Liability Issues
Markle Foundation	Markle Common Framework
National Association of State CIOs	Sustainable Success: State CIOs and Health Information Exchange
National eHealth Collaborative	Secrets of HIE Success: Lessons from the Leaders
National Governors Association	Sustaining State Health Information Exchange: A State Toolkit
National Institute of Standards and Technology	Security Architecture Design Process for Health Information Exchanges
Nationwide Health Information Network Exchange Website	http://www.nationalehealth.org/exchange
NeHC University: Spotlight Learning Series on HIE Leadership and Sustainability (webinars)	Spotlight Learning Series: HIE Leadership and Sustainability (Fall 2011) Spotlight Learning Series: HIE Leadership and Sustainability (Spring 2012)
NHINWatch	Defining a Maturity Model for HIEs
Northwest Regional Telehealth Resource Center	The Crossroads of Telehealth, Electronic Health Records & Health Information Exchange: Planning for Rural Communities
ONC	A Message from Dr. David Blumenthal, National Coordinator for Health IT: There is No 'One-Size-Fits-All' in Building a Nationwide Health Information Network

ONC Technical Website	http://healthit.hhs.gov
ONC-NAHIT	Defining Key Health Information Technology Terms
Patient-Centered Primary Care Collaborative	Meaningful Connections: A resource guide for using health IT to support the patient centered medical home
President's Council of Advisors on Science and Technology	Report to the President: Realizing the Full Potential of Health Information Technology to Improve Healthcare for Americans: The Path Forward
PricewaterhouseCoopers	Designing a health IT backbone for ACOs
Robert Wood Johnson Foundation	A Practical Guide for Engaging Stakeholders in Developing Evaluation Questions
Standards & Interoperability Framework Wiki	http://wiki.siframework.org
State Alliance for e-Health	Public Governance Models for a Sustainable Health Information Exchange Industry: Report to the State Alliance for e-Health
The Direct Project Website	http://www.directproject.org
The Direct Project Wiki	http://wiki.directproject.org
The George Washington University and The University of Texas	Summary of the August 2011 Symposium on The Role and Future of Health Information Technology in an Era of Health Care Transformation
The Internet Journal of Medical Informatics	Clinical Value-Add for Health Information Exchange (HIE)
Thomson Reuters	Statewide Health Information Exchange: Best Practice Insights from the Field

APPENDIX C: HIE ROADMAP GLOSSARY

Accountable Care Organization: An accountable care organization (ACO) is a type of payment and delivery reform model that seeks to tie provider reimbursements to quality metrics and reductions in the total cost of care for an assigned population of patients. A group of coordinated health care providers form an ACO, which then provides care to a group of patients. The ACO may use a range of payment models (capitation, fee-for-service with asymmetric or symmetric shared savings, etc.). The ACO is accountable to the patients and the third-party payer for the quality, appropriateness, and efficiency of the health care provided. According to the Centers for Medicare and Medicaid Services (CMS), an ACO is “an organization of health care providers that agrees to be accountable for the quality, cost, and overall care of Medicare beneficiaries who are enrolled in the traditional fee-for-service program who are assigned to it.”ⁱ

Beacon Community: A grant program sponsored by the Office of the National Coordinator for Health IT (ONC) for communities to build and strengthen their existing health information technology infrastructure and exchange capabilities. These communities demonstrate the vision of a future where hospitals, clinicians, and patients are meaningful users of health IT and together the community achieves measurable improvements in health care quality, safety, efficiency, and population health.ⁱⁱ

BioSense Initiative: BioSense is a Centers for Disease Control and Prevention (CDC) initiative to support enhanced biosurveillance, early detection, quantification, and localization of possible biologic terrorism attacks and other events of public health concern on a national level. The goals of the BioSense initiative are to advance early detection by providing the standards, infrastructure, and data acquisition for near real-time reporting, analytic evaluation and implementation, and early event detection support for state and local public health officials.ⁱⁱⁱ

Biosurveillance: While there is no commonly accepted definition of biosurveillance, it typically refers to automated monitoring of existing health data sources to identify trends that may indicate naturally occurring or intentional disease outbreaks. Such data may supplement traditional surveillance and disease reporting methods.^{iv}

Bundled payments: Payments are referred to as bundled when the unit of payment includes multiple individual services. For instance, hospitals receive a single bundled payment from Medicare for each discharge; that payment covers all of the services provided by the hospital during the stay, including nursing, room and board, operating room fees, and so on. In general, bundled payments offer providers an incentive to reduce the costs of the services within each component of the bundle and to increase the efficiency with which they provide medical care.^v

Certificate authority: A certificate authority (CA) is an authority in a network that issues and manages security credentials and public keys for message encryption. As part of a public key infrastructure (PKI), a CA checks with a registration authority (RA) to verify information provided by the requestor of a digital certificate. If the RA verifies the requestor's information, the CA can then issue a certificate. Depending on the public key infrastructure implementation, the certificate includes the owner's public key, the expiration date of the certificate, the owner's name, and other information about the public key owner.^{vi} See also: registration authority, digital certificate, public key infrastructure.

Certification criteria: Certification of Health IT products will provide assurance to purchasers and other users that an EHR system, or other relevant technology, offers the necessary technological capability, functionality, and security to help them meet the meaningful use criteria established for a given phase. Providers and patients must be confident that the electronic health IT products and systems they use are

secure, can maintain data confidentiality and can work with other systems to share information. Confidence in health IT systems is an important part of advancing health IT system adoption and allowing for the realization of the benefits of improved patient care.^{vii} Certification criteria are determined by regulations led by ONC.

Continuity of care document (CCD): The Continuity of Care Document (CCD) specification is an XML-based markup standard intended to specify the encoding, structure and semantics of a patient summary clinical document for exchange. The CCD specification is a constraint on the HL7 Clinical Document Architecture (CDA) standard. The patient summary contains a core data set of the most relevant administrative, demographic, and clinical information facts about a patient's healthcare, covering one or more healthcare encounters. It provides a means for one healthcare practitioner, system, or setting to aggregate all of the pertinent data about a patient and forward it to another practitioner, system, or setting to support the continuity of care. Its primary use case is to provide a snapshot in time containing the pertinent clinical, demographic, and administrative data for a specific patient.^{viii}

Conformance testing: Conformance is usually defined as testing to see if an implementation faithfully meets the requirements of a standard or specification. There are many types of technical testing available, including testing for performance, robustness, behavior, functions and interoperability. Although conformance testing may include some of these kinds of tests, it has one fundamental difference — the requirements or criteria for conformance must be specified in the standard or specification.^{ix}

CONNECT: CONNECT is an open source software stack and community that implements health exchange specifications. CONNECT enables secure electronic health data exchange among healthcare providers, insurers, government agencies and consumer services. CONNECT was originally developed by the Federal Health Architecture to provide a common and compliant gateway to connect federal agencies to the Nationwide Health Information Network Exchange and was released for open source use in 2009. The CONNECT roadmap also includes support for the Direct specifications, which will allow any organization using CONNECT to implement the Direct specifications.^x

Data Use and Reciprocal Support Agreement (DURSA):

The DURSA is the legal multi-party trust agreement that is entered into voluntarily by all entities, organizations and Federal agencies that desire to engage in electronic health information exchange with other members of the Nationwide Health Information Network Exchange.^{xi}

Digital certificate: A digital certificate is an electronic “credit card” that establishes an individual's credentials when doing business or other transactions on the Web. It is issued by a certificate authority (CA). It contains the certificate holder's name, a serial number, expiration dates, a copy of the certificate holder's public key (used for encrypting messages and digital signatures), and the digital signature of the certificate-issuing authority so that a recipient can verify that the certificate is real. Some digital certificates conform to a standard, X.509. Digital certificates can be kept in registries so that authenticating users can look up other users' public keys.^{xii} See also: certificate authority, registration authority, public key infrastructure.

Electronic health record (EHR): An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization.^{xiii}

Electronic medical record (EMR): An electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one health care organization.^{xiv}

Electronic order entry: Computerized physician order entry (CPOE) (also sometimes referred to as computerized provider order entry or electronic order entry) is a process of electronic entry of medical practitioner instructions for the treatment of patients under his or her care. These orders are communicated over a computer network to the medical staff or to the departments (pharmacy, laboratory, or radiology) responsible for fulfilling the order. CPOE decreases delay in order completion, reduces errors related to handwriting or transcription, allows order entry at the point of care or off site, provides error checking for duplicate or incorrect doses or tests, and simplifies inventory and posting of charges.^{xv}

Federal Health Architecture: The Federal Health Architecture (FHA) is an E-Government Line of Business initiative managed by the Office of the National Coordinator for Health IT (ONC). FHA was formed to coordinate health IT activities among the more than 20 federal agencies that provide health and healthcare services to citizens. FHA and its federal partners are helping build a federal health information technology environment that is interoperable with private sector systems and supports the President's plan to enable better point-of-service care, increased efficiency and improved overall health in the U.S. population. FHA is responsible for supporting federal efforts to deploy health IT standards and ensuring that federal agencies can seamlessly exchange health data among themselves, with state, local and tribal governments, and with the private sector.^{xix}

Fee-for-service payments: Fee-for-service is a payment model where services are unbundled and paid for separately. In the health insurance and the healthcare industries, fee-for-service occurs when doctors and other healthcare providers receive a fee for each service, such as an office visit, test, procedure, or other healthcare service. Payments are issued retrospectively, after the services are provided. Fee-for-service is the dominant physician payment method in the United States.^{xvii} This is the opposite structure to accountable care payment models.

Formulary: A formulary is a list of prescription drugs covered by a particular drug benefit plan.^{xviii}

Health information exchange (HIE): VERB - The electronic movement of health-related information among organizations according to nationally recognized standards.^{xix}

Health information exchange (HIE): NOUN - An organization that oversees and governs the exchange of health-related information among organizations according to nationally recognized standards.^{xx} See also: health information organization (HIO) and regional health information organization (RHIO).

Health information organization (HIO): An organization that oversees and governs the exchange of health-related information among organizations according to nationally

recognized standards.^{xxi} See also: health information exchange (HIE) and regional health information organization (RHIO).

Health Information Service Provider (HISP): A Health Information Service Provider, or HISP, is a logical concept that encompasses certain services that are required for Direct Project exchange, such as the management of trust between senders and receivers. It may be a separate business or technical entity from the sender or receiver, depending on the deployment option chosen by the implementation.^{xxii}

Health Information Technology for Economic and Clinical Health (HITECH) Act: The Health Information Technology for Economic and Clinical Health (HITECH) Act seeks to improve American health care delivery and patient care through an unprecedented investment in health information technology. The provisions of the HITECH Act are specifically designed to work together to provide the necessary assistance and technical support to providers, enable coordination and alignment within and among states, establish connectivity to the public health community in case of emergencies, and assure the workforce is properly trained and equipped to be meaningful users of EHRs. Combined, these programs build the foundation for every American to benefit from an electronic health record, as part of a modernized, interconnected, and vastly improved system of care delivery.^{xxiii}

Health IT Policy Committee: The Health IT Policy Committee is an advisory committee, as defined in the Federal Advisory Committee Act, created for the purpose of making recommendations to the National Coordinator for Health IT on a policy framework for the development and adoption of a nationwide health information infrastructure, including standards for the exchange of patient medical information.^{xxiv}

Health IT Standards Committee: The Health IT Standards Committee, a federal advisory committee like the Health IT Policy Committee, is charged with making recommendations to the National Coordinator for Health IT on standards, implementation specifications, and certification criteria for the electronic exchange and use of health information.^{xxv}

Healthcare quality: The Institute of Medicine defines healthcare quality as the extent to which health services provided to individuals and patient populations improve desired health outcomes. The care should be based on the strongest clinical evidence and provided in a technically and culturally competent manner with good communication and shared decision making.^{xxvi}

Implementation guides: Publications listing electronic data interchange messages that are in use in a particular industry or application. It indicates how the information in those messages should be presented on a segment-by-segment, and data-element-by-data-element basis, including which segments and data elements are needed, which are not and what code values will be expected in the application of that particular message.^{xxvii}

Master patient index: Healthcare organizations or groups of them will implement a master patient index (MPI) to identify, match, merge, de-duplicate, and cleanse patient records to create a master index that may be used to obtain a complete and single view of a patient. The MPI will create a unique identifier for each patient and maintain a mapping to the identifiers used in each records' respective system.^{xxviii}

Meaningful Use criteria: The American Recovery and Reinvestment Act of 2009 specifies three main components of Meaningful Use: 1) The use of a certified EHR in a meaningful manner, such as e-prescribing; 2) The use of certified EHR technology for electronic exchange of health information to improve quality of healthcare; 3) The use of certified EHR technology to submit clinical quality and other measures. Simply put, "meaningful use" means providers need to show that they are using certified EHR technology in ways that can be measured significantly in quality and in quantity. The criteria for meaningful use will be staged in three steps over the course of the next five years: Stage 1 (2011 and 2012) sets the baseline for electronic data capture and information sharing; Stage 2 (expected to be implemented in 2014) and Stage 3 will continue to expand on this baseline and be developed through future rulemaking.^{xxix}

National eHealth Collaborative: National eHealth Collaborative (NeHC) is a public-private partnership focused on accelerating progress toward widespread, secure and

interoperable nationwide health information exchange to improve health and healthcare. NeHC's neutrality and diverse multi-stakeholder participation provides a unique platform for collaboration. NeHC educates, connects, and encourages healthcare stakeholders to advance health information technology and health information exchange nationwide through its NeHC University web-based education program, its Consumer Consortium on eHealth, its support of the Nationwide Health Information Network Exchange, its collaborative online community and its ongoing study of leading health information exchanges. National eHealth Collaborative is a cooperative agreement partner of the Office of the National Coordinator for Health IT within the U.S. Department of Health and Human Services.

Nationwide Health Information Network: The nationwide health information network is the portfolio of nationally recognized services, standards and policies that enable secure health information exchange over the Internet. Often also used as an umbrella term to describe the result of standards harmonization and pilot testing activities led by the ONC Office of Standards and Interoperability.

Nationwide Health Information Network Exchange: The Nationwide Health Information Network Exchange ("Exchange") is a group of federal agencies and non-federal organizations that came together under a common mission and purpose to improve patient care, streamline disability benefit claims, and improve public health reporting through secure, trusted, and interoperable health information exchange.^{xxx}

Office of the National Coordinator for Health Information Technology: The Office of the National Coordinator for Health Information Technology (ONC) is the principal Federal entity charged with coordination of nationwide efforts to implement and use the most advanced health information technology and the electronic exchange of health information. The position of National Coordinator was created in 2004, through an Executive Order, and legislatively mandated in the Health Information Technology for Economic and Clinical Health Act (HITECH Act) of 2009.^{xxxi}

Patient centered medical home: A patient centered medical home integrates patients as active participants in their own health and wellbeing. Patients are cared for by a physician

who leads the medical team that coordinates all aspects of preventive, acute and chronic needs of patients using the best available evidence and appropriate technology. These relationships offer patients comfort, convenience, and optimal health throughout their lifetimes.^{xxxii}

Patient consent: There are five generally accepted models for defining patient consent to participate in an HIE. The no-consent model does not require any agreement on the part of the patient to participate in an HIE. The opt-out model allows for a predetermined set of data to be automatically included in an HIE but a patient may still deny access to information in the exchange. The opt-out with exceptions exchange enables the patient to selectively exclude data from an HIE, limit information to specific providers, or limit exchange of information to exchange only for specific purposes. The opt-in model requires patients to specifically affirm their desire to have their data made available for exchange within an HIE. The opt-in with restrictions model allows patients to make all or some defined amount of their data available for electronic exchange.^{xxxiii}

Patient Protection and Affordable Care Act: The federal Patient Protection and Affordable Care Act (P.L. 111-148), signed March 23, 2010, as amended by the Health Care and Education Reconciliation Act, signed March 31, 2010, is also referred to as the Affordable Care Act (ACA), or simply as “federal health reform.” The 900+ page act contains many provisions, with various effective dates. Provisions included in the ACA are intended to expand access to insurance, increase consumer protections, emphasize prevention and wellness, improve quality and system performance, expand the health workforce, and curb rising health care costs.^{xxxiv}

Personal health record (PHR): An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared, and controlled by the individual.^{xxxv}

Power team summer camp: Health IT Standards Committee workgroups tasked to “ensure that ONC has all the standards, implementation specifications, and certification criteria recommendations/advice needed going

forward.” This workgroup met during the summer of 2011 in advance of the February 2012 Notice of Proposed Rulemaking on Standards & Certification.^{xxxvi}

Private HIE: The term “private” HIE generally refers to HIEs which operate under the governance of an integrated delivery network (IDN) or a single healthcare system.^{xxxvii} The term “enterprise HIE” is often substituted in this context.

Public HIE: The term “public” HIE is generally used to describe HIEs which are community-based and are open to, and governed by, participants from multiple organizations. Public HIEs often rely on grants to help them get established and then require a solid revenue stream to become sustainable. Note, however, that public HIEs are not in fact always totally funded with public or government funds.^{xxxviii}

Provider directory: Provider directories are like an electronic “yellow pages” of healthcare providers. A provider directory is a core requirement for accomplishing secure directed exchange to a previously unknown entity.

Public key infrastructure: A PKI (public key infrastructure) enables users of a basically unsecure public network such as the Internet to securely and privately exchange data and money through the use of a public and a private cryptographic key pair that is obtained and shared through a trusted authority. The public key infrastructure provides for a digital certificate that can identify an individual or an organization and directory services that can store and, when necessary, revoke the certificates.^{xxxix} See also: certificate authority, digital certificate, registration authority.

Publish/subscribe: Often abbreviated to pub/sub, publish/subscribe is a messaging pattern where senders of messages, called publishers, do not program the messages to be sent directly to specific receivers, called subscribers. Published messages are characterized into classes, without knowledge of what, if any, subscribers there may be. Subscribers express interest in one or more classes, and only receive messages that are of interest, without knowledge of what, if any, publishers there are.^x Pub/sub is often used to submit public health information.

Push and send: Push and send refers to one-directional electronic messaging such as those for which The Direct Project has developed standards and specifications for secure transport. In push messaging, as in email, the receiver of the message must be a known entity.

Query/retrieve: Often used in the context of the Nationwide Health Information Network Exchange, query/retrieve refers to a messaging pattern in which a query is initiated from one participating health information organization to another, requesting a list of available documents meeting the given query parameters for a particular patient for later retrieval.^{xli}

Record locator service: In an HIE, a record locator service is the part of the system that determines what records exist for a member and where the source data is located. The record locator service includes these distinct functions: manage participating provider identities; maintain and publish a patient index; match patients using an algorithm; look up patient record locations (but not the records themselves); communicate securely and maintain an audit log; and manage patient consent to record sharing (under state laws and ARRA).^{xlii}

Reference implementation: A reference implementation is the standard from which all other implementations, with their attendant customizations, are measured, and to which all improvements are added. Characteristics of a reference implementation include: 1) developed concurrently with specification and test suite; 2) verifies that specification is implementable; 3) enables the test suite to be tested; 4) serves as Gold Standard against which other implementations can be measured; 5) helps to clarify intent of specification where conformance tests are inadequate.^{xliii}

Regional Health Information Organization (RHIO): A health information organization that brings together health care stakeholders within a defined geographic area and governs health information exchange among them for the purpose of improving health and care in that community.^{xliv} See also: health information organization (HIO) and health information exchange (HIE).

Registration authority: A registration authority (RA) is an authority in a network that verifies user requests for a digital certificate and tells the certificate authority (CA) to issue it. RAs are part of a public key infrastructure (PKI), a networked system that enables companies and users to exchange information and money safely and securely. The digital certificate contains a public key that is used to encrypt and decrypt messages and digital signatures.^{xlv} See also: certificate authority, digital certificate, public key infrastructure.

Rulemaking: Rulemaking refers to the process that executive and independent agencies use to create, or promulgate, regulations. In general, legislatures first set broad policy mandates by passing statutes, then agencies create more detailed regulations through rulemaking. Legislatures typically rely on rulemaking to add more detailed scientific, economic, or industry expertise to a policy—fleshing out the broader mandates of authorizing legislation.^{xlvi} For example, the HITECH Act called for healthcare providers to meaningfully use a certified EHR in order to be eligible for financial incentives. It was then the job of the U.S. Department of Health and Human Services to define “meaningful use” and “certified EHR” through the rulemaking process. Rulemaking generally has multiple phases built into the process in order to accommodate several rounds of public comment.

Specifications: A specification (often abbreviated as spec) is an explicit set of requirements to be satisfied by a material, product, or service. Specs are a type of technical standard. A technical specification may be developed by any of various kinds of organizations, both public and private. Example organization types include a corporation, a consortium, a trade association, a national government (including its regulatory agencies and national laboratories and institutes), a professional association, or a purpose-made standards organization such as ISO.^{xlvii}

Standards: The term “standard,” or “technical standard” as cited in the National Technology Transfer and Advancement Act (NTTAA), includes all of the following: common and repeated use of rules, conditions, guidelines or characteristics for products or related processes and production methods, and related management systems practices; and the definition of terms; classification of components; delineation

of procedures; specification of dimensions, materials, performance, designs, or operations; measurement of quality and quantity in describing materials, processes, products, systems, services, or practices; test methods and sampling procedures; or descriptions of fit and measurements of size or strength.^{xlviii}

Standards & Interoperability Framework: The Standards and Interoperability (S&I) Framework is a set of integrated functions, processes, and tools being guided by the healthcare and technology industry to achieve harmonized interoperability for healthcare information exchange.^{xlix}

State Designated Entities (SDEs): Organizations appointed by each state that received ARRA/HITECH funding through the HIE Cooperative Agreement Program to establish or expand statewide exchange.ⁱ

State HIE: The state HIE provides alignment of architecture, technology and policy throughout an individual state. Currently there are fifty-six states and territories planning

and coordinating state level exchanges through a State Designated Entity. The state HIE typically manages funding provided by the Office of the National Coordinator (ONC) and assists specific HIEs within the state.ⁱⁱ

The Direct Project: The Direct Project specifies a simple, secure, scalable, standards-based way for participants to send authenticated, encrypted health information directly to known, trusted recipients over the Internet.ⁱⁱⁱ

Virtual Lifetime Electronic Record (VLER): The VLER initiative launched following President Obama's April 9, 2009 direction to the Department of Defense (DoD) and the Department of Veterans Affairs (VA) to create a unified lifetime electronic health record for members of the U.S. Armed Services. VLER will contain both administrative (i.e. personnel and benefits) and medical information for Service members and Veterans. VLER will provide access to information from day one of a Service member's military career through transition to Veteran status and beyond.ⁱⁱⁱⁱ

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