Health Information Exchange

Rhona Banayat
Ralph Garcia
Charlie Kesinger
Amanda McCook
David Schlossman

Northwestern University
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Introduction

Electronic health records (EHR), in conjunction with a Health Information Exchange (HIE) can improve both the quality and the efficiency of the health care system. Specifically, secure access to complete patient information at any location where it is needed can reduce medical errors, avoid adverse drug interactions, and prevent costly duplication of medical tests and x-rays. Medical information can be aggregated, tracked, and analyzed to identify trends over time or over patient populations. Records can be backed up and secured, avoiding loss in accidents and disasters. The costly cumbersome process of managing paper records can be reduced or eliminated.

The federal government enacted the Health Information Technology for Economic and Clinical Health (HITECH) provisions of the American Recovery and Reinvestment Act of 2009 (ARRA) to create incentives for the adoption and integration of EHR. A key objective of this act is to create a framework that harmonizes standards and facilitates interoperability in order to support the uniform sharing of secure data across a variety of disparate organizations and improve health outcomes. Two methods of standards adoption include (1) creating complex, precise, proprietary technical standards and mandating their use, and (2) letting user proposals and adoption drive standards and platforms. The standards create data liquidity, permitting information to transfer easily from system to system. The Department of Health and Human Services (DHHS), through its committees and staff, has chosen the latter path and is carefully trying to provide enough structure to overcome the barriers to data exchange without being too restrictive or stifling.

Although U.S. government organizations such as the Office of the National Coordinator of Health Information Technology (ONCHIT) have been providing standards guidelines and coordinating working Health Information Exchange (HIE) forums for nearly two years, progress has been slow. The lack of consensus unified standards for data content, transport, security, and terminology still significantly limits the exchange of health information between different providers and organizations. The large number of evolving standards increases the difficulty and complexity of developing HIE platforms, and direct digital exchange of data between one electronic medical record and another remains an elusive goal.

This paper will analyze the current state of standards for data structure and content such as HL7, and CCD/CCR, for data terminology and nomenclature such as SNOMED, LOINC, and ICD 9/10, for data exchange such as SHIO, RHIO, and private vendor and for data security, such as biometrics, smartcards, and RSA SecureID® tokens and smart phone applications. Although we will consider national level initiatives, our focus will be on identifying standards that could be utilized now at a regional and community level. We will consider the limited model scenario of how a community hospital would implement full digital data sharing with several of its most closely allied physician group practices. The groups will design and establish a shared clinical data repository and an enterprise master patient index. They will select the data structure and terminology standards and identify a community or regional health information organization to assist in constructing the necessary interfaces and host the sharing process. They will design the data security procedures to ensure compliance with all applicable privacy and security regulations such as HIPAA. The goal is to establish a system that will permit free exchange of patient demographic data, payer information, problem lists, medication lists, laboratory data,

transcribed radiology reports, and transcribed clinician notes among all participating organizations. In addition, we will identify the gaps and provide recommendations for improvement. The most recent ONCHIT Federal Health Information Technology Strategic Plan specifies this level of data exchange will be nearly universal by 2014 or 2015 and we will assess this goal.

Standards Review

"Technical standards are essential to improving healthcare. For health IT to reduce medical errors and risk to patient safety, improve access to medical records, and support innovations in "individual-based" care, its tools must adhere to certain data interchange standards. Standards also enable aggregation of information from disparate sources and sophisticated reviews of such information to glean knowledge that can inform clinical decisions." (Hammond et al, 2009)

Background

Within the past decade, a tremendous focus has been placed in health information technology (HIT), specifically on system interoperability. HIT has been identified as a critical tool for improving patient safety and reducing the rise in healthcare costs. In order to fulfill these objectives, health care systems developed by different organizations and vendors must be able to seamlessly exchange data not only within an organization but also externally across organizational boundaries. This system capability, termed interoperability, largely depends on the successful development and implementation of standards.

So what are standards? As defined by Shortliffe and Cimino (p. 265), a standard is a "set of rules and definitions that specify how to carry out a process or produce a product." Several types of standards are important in HIT. These include standards for data coding, data classification and terminology, data interchange, data content, and data security.

Data coding and classification standards include International Classification of Diseases 9th revision (ICD-9), Current Procedural Terminology, 4th revision (CPT-4), and diagnosis related groups (DRG's). Terminology standards include Systemized Nomenclature of Medicine – Clinical Terms (SNOMED CT), Logical Observation Identifiers Names and Codes (LOINC), and RxNorm, a federal drug terminology.

The current primary data interchange standards in healthcare are Health Level Seven® (HL7), American National Standards Institute (ANSI) X12N, Digital Imaging and Communications in Medicine (DICOM), and National Council for Prescription Drug Programs (NCPDP). HL7 is probably the most recognizable and widely used in many health care systems integration efforts.

Recently the American Society for Testing and Materials (ASTM) and HL7 International integrated the ASTM Continuity of Care Record with the HL7 Clinical Document Architecture to form the Continuity of Care Document (CCD) standard (Product CCD, n.d.). The CCD standard was selected by the Health Information Technology Standards Panel (HITSP) as the harmonized format for the exchange of clinical information and has become the most widely supported data content standard. The CCD as represented in the HITSP C32 standard is an

extensible markup language (XML) document consisting of 17 modules, each containing multiple data elements (Kuperman, GJ et al., 2010):

Box 1 Modules of HITSP/C32

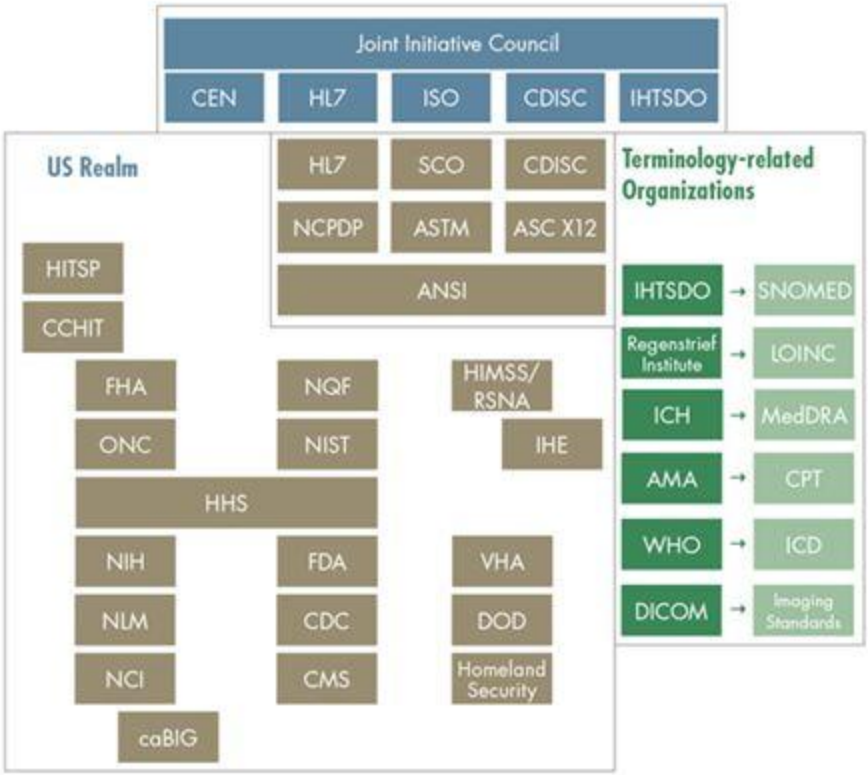
Person information
Language spoken
Support
Healthcare provider
Insurance provider
Allergy/drug sensitivity
Condition
Medication—prescription and non-prescription
Pregnancy
Information source
Comment
Advance directive
Immunization
Vital sign
Result
Encounter
Procedure

Data security standards are largely driven by the Health Information Portability and Accountability Act (HIPAA) Security Rule established in 2003. The Security Rule is divided into categories that include Administrative Safeguards, Physical Safeguards, Technical Safeguards, and Policies, Procedures, and Documentation. In the context of interoperability, data encryption, remote access security, user and system authentication protocols, and system firewalls are the key technical safeguards that fulfill these requirements. HIPAA requirements for the security and privacy of protected health information (PHI) are just as stringent in the setting of electronic data as they are in the world of paper documents.

Current and Future Direction of Standards

The current state of standards development today is best described as progressing but still fragmented. Standards development for HIT continues to grow and advance as the demand for system integration increases. However, many of the development activities remain somewhat uncoordinated. This is due in part to the fact that there is no single governing body that mandates the use of specific standards. Numerous organizations are involved in the development of HIT standards. Figure 2.1 below shows a summary of these standards development organizations (SDO's).

Figure 2.1 Healthcare Standards Development Organizations Landscape



Source: Hammond, Jaffe, and Kush, July 2009

Despite this fragmentation, the increased push towards greater integration and interoperability among the various systems in the market has driven the formation of groups such as Integrating the Healthcare Enterprise (IHE). The IHE is an organization made up of 423 healthcare professional organizations, trade associations, private healthcare IT and consulting companies, government agencies, standards organizations, health information exchanges (HIE's), and healthcare provider organizations whose goal is to "bring together healthcare information technology stakeholders to implement standards for communicating patient information efficiently throughout and among healthcare enterprises by developing a framework for interoperability. (HIMSS, 2011) IHE does not develop standards but rather promotes the adoption of standards through "IHE Profiles" in order to achieve the needs of healthcare IT integration. According to the Healthcare Information and Management Systems Society (HIMSS), "IHE Integration Profiles provide a common language for healthcare IT purchasers and vendors offering a more precise definition of how standards are implemented to meet identified clinical needs." IHE supports the consensus-driven model of standards development. An annual event called the Connect-athon brings in thousands of industry stakeholders to see demonstrations of how various systems, applications, as well as hardware components can be built to utilize standards and achieve high interoperability.

Probably the most important development to impact standards thus far is the recent passage of the HITECH Act. This health reform legislation aims to improve the overall health of Americans by improving care coordination, motivating greater patient engagement, and increasing the use of EHR's. Care providers, including hospitals and physicians, can receive large financial incentives for demonstrating "Meaningful Use" of EHR's by completing and reporting the requisite number of Core Objectives and Menu Set Objectives specified by DHHS and the Certification Commission for Health Information Technology (CCHIT) (Blumenthal and Tavenner, 2010). Care providers who do not meet Meaningful Use criteria will be penalized by reductions in their Medicare and Medicaid reimbursement starting in 2013 (for hospitals) or 2015 (for doctors).

In the rush to implement EHR's provoked by HITECH incentives, several key standards have gained ground and are being promoted as the primary standards to be implemented with the EHR systems. Standards acceptable in systems to be certified for Meaningful Use include

- HL7 – Standard for electronic submission of data to public local and state health agencies for surveillance or reporting
- HL7 CCD – Standard for electronically transmitting patient records to other care providers
- CCR (now being phased out) – Standard for electronic sharing of patient care summary records
- SNOMED- CT – Standard to capture problem list of current and active diagnoses
- NCPDP – Exchange standard for electronic prescriptions
- RxNorm – Standard nomenclature for clinical drugs
- LOINC – Standard for lab results reporting
- OMB – Standard for capturing patient demographics information specifically race and ethnicity
- NIST – Any NIST standards for encryption and decryption of electronic health information

Source: US Department of Health and Human Services

Other key standards that are already in use include the ICD-9 (soon to be ICD-10) coding standard for diagnoses, claims and billing and the ANSI X12 for electronic transmission of insurance eligibility information, claims, remittance advice, and provider directories. These standards were included as part of the HIPAA ruling established in 2000 and updated in 2002. (Wager, Wickham and Glaser, pg. 244)

The future of standards in healthcare IT will continue to evolve as the industry implements and uses newer and more sophisticated technologies. Internet technology is already having a big impact on both standards development and healthcare in general. For example, the extensible markup language (XML) standard is used to create structured computer documents suitable for health information exchange (Schweiger et al, 2002). CCD's are written in XML. Another relevant technology likely to play a big part in the future of healthcare IT and standards is the Services Oriented Architecture (SOA). SOA is a technology design concept that leverages reusable "services" and standardization of data. SOA can also be utilized in connecting health information exchanges (HIE) and networks (Juneja, Dournaee, Natoli et al., 2008). Internet-

based technologies like XML and SOA are rapidly gaining acceptance and recognition for their potential contributions to greater system integration and interoperability in healthcare.

Federal Interoperability Initiatives

The HITECH Act also established an Office of the National Coordinator for Health Information Technology (ONCHIT) to lead the administration's efforts to support EHR adoption and interoperability (ONC, 2010). HITECH charges the National Coordinator with improving the American health care system through the use of information technology. ONC's mission includes (ONC, 2010):

- Promoting development of a nationwide Health IT infrastructure that allows for electronic use and exchange of information that:
    - Ensures secure and protected patient health information
    - Improves health care quality
    - Reduces health care costs
    - Informs medical decisions at the time/place of care
    - Includes meaningful public input in infrastructure development
    - Improves coordination of care and information among hospitals, labs, physicians, etc.
    - Improves public health activities and facilitates early identification/rapid response to public health emergencies
    - Facilitates health and clinical research
    - Promotes early detection, prevention, and management of chronic diseases
    - Promotes a more effective marketplace
    - Improves efforts to reduce health disparities

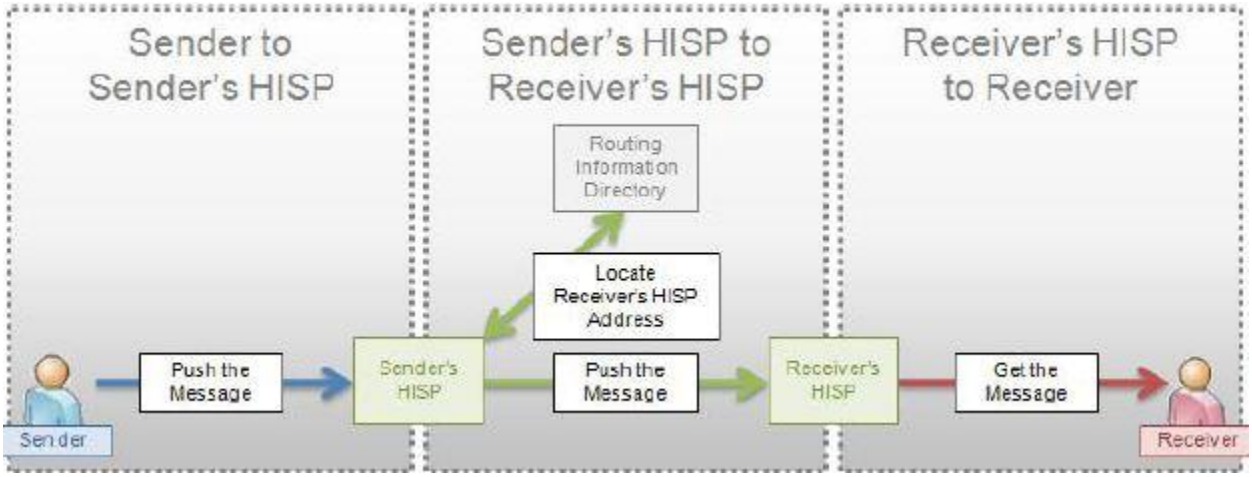
- Providing leadership in the development, recognition, and implementation of standards and the certification of Health IT products;
- Health IT policy coordination;
- Strategic planning for Health IT adoption and health information exchange
- Establishing governance for the Nationwide Health Information Network.

In carrying out this mission, ONC is coordinating closely with CCHIT in certifying which EHR systems are eligible to be used by providers trying to satisfy Meaningful Use measures. The ONC also works closely with IHE (see description above), SDO's and other stakeholders to certify appropriate standards and incorporate them into systems that can support true interoperability. In 2009 and 2010 ONC managed the distribution of $564 million in HITECH grants to 56 states, territories, and designated entities to fund the establishment of state health information exchanges (HIE's), also called health information organizations (HIO's), which are a mechanism to support the secure transmission of electronic health-related data across organizations within a geographic region. HIO's will be discussed in more detail below. Independent of the ONC, the Departments of Defense and Veteran Affairs are also using federal resources to fund their own integrated electronic health record (iEHR), which is scheduled to go live in 2012 (Perera, 2011).

Interoperability Use Case Scenario

Have standards and technologies advanced enough for a community hospital and several closely associated physician groups (the providers) to actually implement extensive electronic data sharing in the near future? Initial analysis suggests that the project might be accomplished by building on the extensive body of work already done by the DHHS in developing the Nationwide Health Information Network (NHIN). The purpose of the NHIN is "to provide a secure, nationwide, interoperable health information infrastructure that will connect providers, consumers, and others involved in supporting health and healthcare." (DHHS, 2010) The initiative is divided into two main parts, NHIN Direct, also known as The Direct Project, and NHIN Connect. As discussed above, there are many standards and SDO's in the field of health information exchange. Interoperability specifications and profiles based on combinations of these existing standards can rapidly become extremely complex and too cumbersome for use by smaller organizations with limited resources. The mission of NHIN Direct is to develop "a simple, secure, scalable, standards-based way for participants to send authenticated, encrypted health information directly to known, trusted recipients over the Internet" (The Direct Project, 2010) thus making health information exchange available to any user who can send and receive secure e-mails. The model envisioned will

1. Accept data in many formats from simple text to highly structured documents such as CCD's.
2. Package the data using Secure Multipurpose Internet Mail Extensions (S/MIME) which provide encryption for security and confidentiality and digital signatures for authentication and data integrity.
3. Authenticate sender to receiver with X.509 Digital Certificates and transmit messages using Simple Mail Transfer Protocol.
4. Use well-established open standards throughout all stages of data transfer.



HISP=Health Information Service Provider
Source: The Direct Project Overview, October 11, 2010

Although far superior to mail and fax, the NHIN Direct model is designed to utilize a very small set of the most widely deployed and well supported standards in order to allow the widest possible spectrum of providers to access the tools they need for secure data transfer over the

Internet (Halamka, 2010). However, the data transfer is unidirectional. A sender can push data to a receiver, but the receiver cannot search for and obtain additional data that might be needed. This can leave significant needs unmet, especially in an urgent care situation, and it ultimately limits the complexity and usefulness of the data exchange.

To meet their needs going forward, the hospital and physician groups decide they need a more scalable comprehensive system capable of full patient lookup, document discovery, and data retrieval. This is the mission of the NHIN Connect project which is developing the architecture for organizations to securely link their existing health information technology systems into health information exchanges (HIE's) which will ultimately connect to a network backbone and permit interoperable electronic health information exchange with other NHIN compliant organizations anywhere in the country (NHIN Connect, 2010). Connect will actually supply a free complete open source software package capable of setting up and running a health information exchange. Although the providers have the technical expertise and hardware resources to run the software, using this solution requires implementing a large number of critical enterprise components and services with which they have little previous experience. Potential problems with improper implementation, especially problems involving breaches of data confidentiality or security, could be very severe. Rather than take the risk of implementing their own HIE, the providers explore other options.

They soon find that in late 2009 their state Department of Public Health received a multimillion dollar grant from the ONCHIT State Health Information Exchange Cooperative Agreement Program to set up a State HIE. An HIE corporation has been formed, and a major national health information technology company has been contracted to establish and run the exchange. Some of the necessary central infrastructure components have also been purchased using funds from the federal grant. On further investigation, the providers find that there will be a substantial initial membership fee for each organization to join the collaborative and continuing monthly service fees thereafter. The HIE managers explain that the grant funds will soon be exhausted, and without a sustainable source of income to offset operating costs, the exchange will fail. Given recent economic conditions, the state cannot support the HIE with taxpayer funding, and even operating as a nonprofit organization, the HIE must generate the revenue necessary for sustainability (Kansky, 2010). Ultimately the providers decide that the HIE services will improve their efficiency enough to justify the cost by providing strategic benefit and competitive advantage within their region (HIMSS, 2009a). They contract to form a Regional Health Information Organization (RHIO) under the auspices of the State HIE.

The next decision the providers face is selecting between Centralized and Federated architectural models for the RHIO. In the Centralized Model all patient medical data is collected from the local sources and stored in one large combined clinical data repository. Centralized systems can respond very quickly to data requests, leverage economies of scale, and facilitate community-wide public health studies, since all data is available in one place (HIMSS, 2009b). However, they also raise serious concerns about data security, accessibility, and ownership, and they require a huge initial investment of technical and organizational time to transfer and integrate the large legacy databases of various stakeholders into a functional whole (HIMSS, 2009b).

The providers therefore decide to use a Decentralized or Federated Model where each organization maintains possession and control of its own data. In the Federated Model, data is stored locally at the point of creation and is always current. There is no single point of failure that can cripple the whole system, and there is no conflict over who owns the data, except perhaps over what ownership rights the patient has delegated to the healthcare organizations. Federated systems do need to manage the standards and methods for locating and retrieving records across organizational boundaries, for authenticating which users are authorized to access data from third-party systems, and for recording and enforcing patient consent to opt in or opt out of the extended network. Although these requirements can introduce complexity, cost, and potential points of failure into the system, the Federated Model is easier to implement in stages and overall provides a better solution for the providers' immediate needs (HIMSS, 2009b).

The first step in linking patient data from multiple sources is combining the individual master patient indices (MPI's) of the organizations into a single Enterprise Master Patient Index (EMPI), a database that establishes a unique identifier for each patient in the RHIO and contains standard identifier data elements such as name, date of birth, gender, race, address, telephone number, Social Security number, ethnicity, previous or maiden names, facility identifier for contributor of the data, and internal patient number in that facility (Elyse, 2004). One of the most fundamental challenges in establishing this and several other components of the RHIO is proper data matching (HIMSS, 2009b). The central repository must accurately match the data in the local systems, avoid duplicating patients, and avoid incorrectly associating one patient's data with another patient's identifier. Although the local MPI's may share identifying fields, simple deterministic matching of data fields yields too many false positives and false negatives. Data may be structured differently within the fields, such as John Smith versus Smith, John in a name field, and some local data may be incorrect because of mistakes in data entry such as transposed digits in a birthday or Social Security number. Highly sophisticated probabilistic data matching algorithms have been developed to address these problems (Lenson, 1998; Jaro, 2007), and the state HIE vendor has extensive experience in producing an EMPI with acceptably low error rates.

The RHIO vendor provides a Record Locator Service (RLS), the system that determines what medical data exists for each patient and where that source data is located. Although this service does not actually transfer data, the ability to look up patient record locations brings the responsibility to communicate securely, maintain an audit log, and implement a patient consent manager so the process of data sharing does not begin unless appropriate patient consent to information sharing is on file in the system (HIMSS, 2009c). The providers agree that they want to use an opt-in system where they explain the value of data sharing within the RHIO to their patients and execute a standardized signed consent document that allows the patient to specify the exact details of how and when his health information may be shared. These details are then programmed into the system. Finally, the RLS along with other components of the RHIO must manage an index of provider identities and an authorization policy engine that only permit access to protected health information by staff members with legitimate purposes and under conditions covered by patient consent (HIMSS, 2009c).

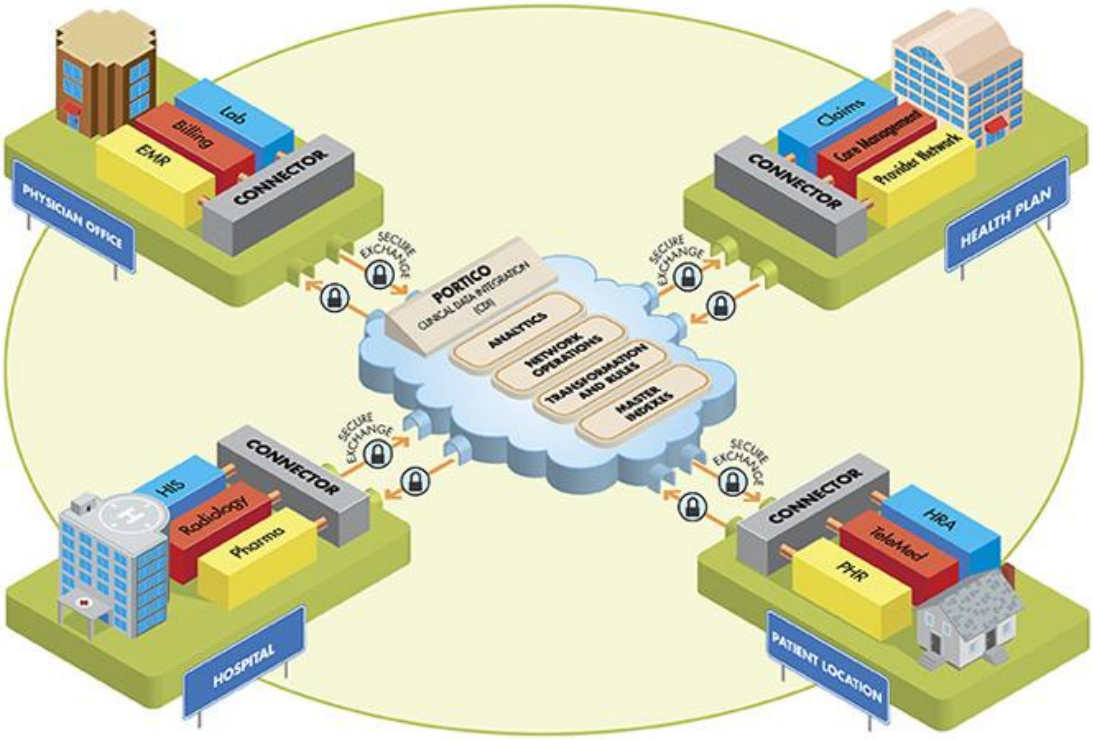
The vendor also provides an integration engine, software which uses standard protocols and transaction sets to allow the different provider computer systems to communicate with each other

and actually move patient records from one location to another. The integration engine supports the exchange of messages in extensible markup language (XML) and health level (HL7) formats and can be upgraded with transformation rules to support other standards. Data transmission between RHIO and provider servers is managed by secure technology such as secure hypertext transfer protocol (https), secure socket layer (SSL), and virtual private network (VPN). The integration engine also provides message validation, acknowledgment generation, encryption and decryption, S/MIME encoding, and server to server authentication by digital certificates.

The hospital is by far the largest organization in the RHIO, and its Board of Directors generously agrees to assign hospital information technology (IT) staff members to work with the vendor's professional services team to set up the local components of the RHIO infrastructure. The hospital will also assign someone on its IT staff as system administrator to designate access privileges and manage the system. All the provider groups also agree to several additional measures and standards. To help the RHIO operate more efficiently they will

1. Require special training in data privacy and security procedures for all staff members with access to the RHIO.
2. Require that authorized users log on to the RHIO system using strong two factor authentication, such as a smart card and personal identification number (Smart Card Alliance, 2004), an RSA SecureID® token and pass code generation (RSA, 2011) or a biometric device such as a fingerprint reader.
3. Use the continuity of care document (CCD) as the primary structure for data interchange. In the process of preparing for Stage I Meaningful Use certification, each provider group has implemented the ability to transmit CCD's and send HL7 compliant messages within its own EHR. All groups code their diagnoses and problem lists by ICD-9 with plans to update to ICD-10 and are able to identify their laboratory observations by LOINC terminology. Interestingly, in preparing to meet meaningful use core measures, the groups have independently identified and deployed a consensus set of widely supported standards that are well-suited to support their data sharing project. The standard CCD modules cover all the major data types they want to share.
4. Work with the RHIO staff to set up edge servers and software interfaces that link easily with the RLS and ensure that all medical records documents in those servers contain sufficient identifying metadata to be located when needed.

Surprisingly, the project looks feasible on a 12 to 18 month time scale. Looking forward, the providers hope to add additional secure interfaces that will allow third-party payers and patient personal health records to have access to appropriate sections of the RHIO data. They also plan to add analytic functions such as the collection of data to confirm the providers are meeting core quality measures and the analysis of community-wide data to support public health functions and research. Eventually they would like to evolve to a hybrid model of data architecture with a "minimum clinical data set" on each patient stored centrally along with the RLS pointers to the rest of the data. Such information would include current problem list, allergies, and current medication list (HIMSS, 2010b). The desired model would be



Source: http://www.medicexchange.com/news/category/health-it/

The Road to Full Interoperability

HITECH has indeed been successful in driving EHR adoption, as evidenced by comparison of the pre-HITECH (2009) adoption environment with current conditions. Prior to 2009, most EHR's were provided with predefined functionality that was difficult and expensive to modify and did not allow for addition of new, innovative modular applications. IT vendor business models were based on proprietary, non-interoperable technical standards, and their EHR products had high prices, high switching costs and created customer lock-in. Adoption levels of EHR's for both hospitals and doctors were very low. Today 80 percent of the nation's hospitals and 41 percent of office-based physicians currently intend to take advantage of at least some federal incentive payments for adoption and Meaningful Use of certified EHR technology. In a recent DHHS survey, about 65% of hospitals and 32% of doctors responded that they will enroll during Stage 1 of the Incentive Programs, in 2011-2014. Only 14 percent of respondents said they were not planning to apply for any meaningful use incentives. The proportion of primary care physicians using at least a basic HER rose by 50 percent from 19.8 percent in 2008 to 29.6 percent in 2010 (U.S. Department of Health & Human Services, 2011).

Over the last seven years, ONCHIT has sponsored incentives for the implementation of EHR's and set Meaningful Use criteria for electronic records. In addition to developing standards and supplying financial support for EHR's, ONCHIT has facilitated adoption by developing Regional Extension Centers (REC's) to assist heath care facilities of all sizes in the transition from paper records. The first step to a world with seamless data exchange is the adoption of an EHR system

with correct standards and guidelines in place. In addition to the EHR efforts, ONCHIT has initiated steps to develop the NHIN technology infrastructure.

An effective NHIN is expected to improve the quality of patient care, reduce medical errors, support remote chronic disease management, reduce the cost of health care delivery and facilitate medical research by transitioning from a world where inert data is trapped in narrow silos to a world where structured dynamic data is seamlessly exchanged. We need an integrated, comprehensive, nationwide, 21st century system for routine and emergency care, personal health, clinical research and public health (Roberts, 2003). Developing an infrastructure that can facilitate seamless data exchange depends on not only an EHR foundation but also on widely supported guidelines and standards.

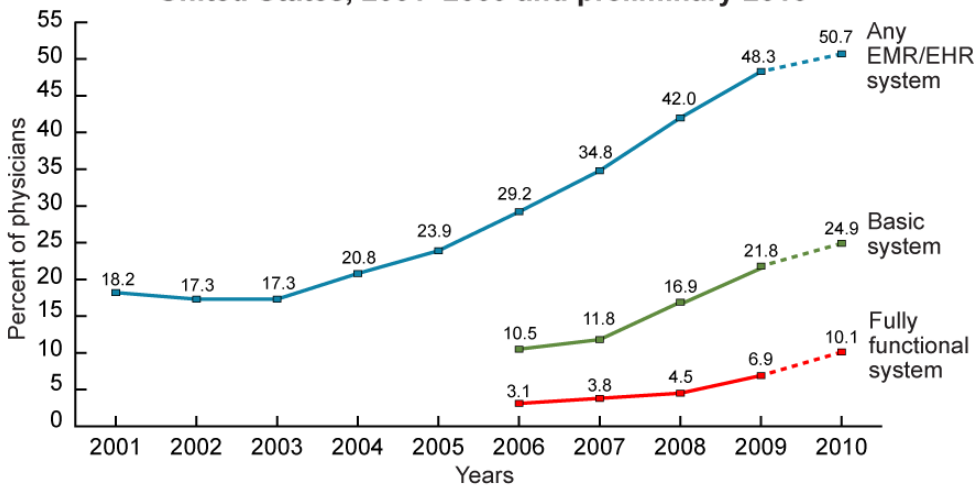
A vast amount of data, even in a setting of effective communication will not drive a productive system that overcomes healthcare roadblocks. Filtering data to personalize the patient experience and providing the exact data needed when and where it is needed are the keys to operational efficiency, reduced costs and increasing quality of care. ONCHIT is in charge of developing the roadmap leading to this type of data exchange.

> Electronic health records for patients have to be consistent, have to speak the same language to get the message across to different types of health care providers. (Furlong, 2007)

Several groups are finally working together to address interoperability. To support standards for interoperability, HL7 and IHE formed a collaborative agreement, renewed in 2005 in the Associate Charter Agreement. The Healthcare Information and Management Systems Society (HIMSS) formed the Integration and Interoperability Steering Committee (I&I) in 2004 and works in alliance with the International Organization for Standardization (ISO). In addition to these, a group of key health informatics leaders have formed the Electronic Health Record Vendors Association (EHRVA) to develop an Interoperability Roadmap and respond to NHIN initiatives. Although organizations such as EHRVA and HIMSS have been vital in facilitating the collaboration of key groups developing standards, ONCHIT will still have to lead the way for these efforts to move forward. SDO's and their collaborations can drive technology, but only ONCHIT can provide the level of incentives necessary for hospitals and healthcare facilities to adopt the new technologies and for vendors to support them.

Although efforts to create the NHIN are underway, observation of the EHR adoption process shows that anticipated time lines for a developing a robust system are unrealistic. Articles from 2003 and 2005 predicted a ten year schedule for full implementation of the NHIN. Now in 2011, we are still working on EHR adoption and focusing on obtaining a larger percentage of physicians with EHR's (Figure 1 below) (Intergovernmental Advisory Board, American Council for Technology, 2006).

Figure 1. Percentage of office-based physicians with electronic medical records/electronic health records (EMRs/EHRs): United States, 2001–2009 and preliminary 2010



NOTES: Any EMR/EHR is a medical or health record system that is either all or partially electronic (excluding systems solely for billing). The 2010 data are preliminary estimates (as shown by dashed lines), based only on the mail survey. Estimates through 2009 include additional physicians sampled from community health centers; prior 2008 combined estimates were revised to include those physicians (4). Estimates of basic and fully functional systems prior to 2006 could not be computed because some items were not collected in the survey. Fully functional systems are a subset of basic systems. Some of the increase in fully functional systems between 2009 and 2010 may be related to a change in survey instruments and definitions of fully functional systems between 2009 and 2010 (see Table for more details). Includes nonfederal, office-based physicians. Excludes radiologists, anesthesiologists, and pathologists.
SOURCE: CDC/NCHS, National Ambulatory Medical Care Survey.

ONCHIT's end state goals for health information communication will progress from ensuring security to exchange of historical passive documents to active management of structured data to workflow management (Figure 6 below). ONCHIT plans to address security and historical passive information first because these foundation elements will have less impact on processes and physician workflows than other areas of the scope (HIMSS Electronic Health Record Vendor Association, 2004). Health information technology has lagged somewhat behind IT in other industries, and most facilities still need to upgrade their technology foundations. ONCHIT's priority on laying the EHR foundation was a good first step and produced today's rush to install EHR along with other technology elements. Will 2011-2012 be the time when infrastructure upgrades and standards development finally reach the critical mass necessary to support full interoperability and data liquidity? The signs are promising, but not yet certain.

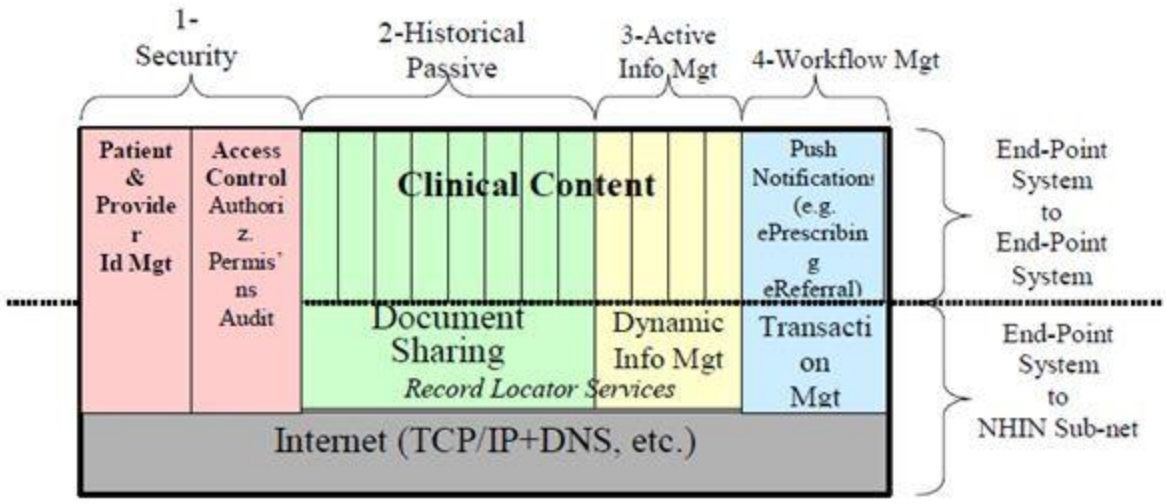


Fig 6 - Health Info Communication Services – End Goal Scope

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