

*Prepared for the:*  
Administration for Children and Families (ACF)

**National Human Services Interoperable Architecture**

**Electronic Health Records: Background, Lessons  
Learned, and Potential for Application in  
Other Areas of Human Services**

**DRAFT Version D0.1**

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## Draft Issue

It is important to note that this is a draft document. The document is incomplete and may contain sections that have not been completely reviewed internally. The material presented herein will undergo several iterations of review and comment before a baseline version is published.

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## 1 Introduction

The National Human Services Interoperability Architecture (NHSIA) is being developed for the Administration for Children and Families (ACF) by the Johns Hopkins University (JHU) as a framework to support: common eligibility and information sharing across programs, agencies, and departments; improved efficiency and effectiveness in delivery of human services; improved detection and prevention of fraud; and better outcomes for children, youth, and families.

The goal of NHSIA is to provide an overarching framework for defining processes associated with planning, coordinating, monitoring, and evaluating services provided to clients. In particular, NHSIA is expected to enable information sharing and collaboration so that services can be provided efficiently and effectively. The intent of NHSIA is not to define the art and science of social work case management but rather to identify opportunities for information sharing in order to improve the outcomes of health and human services. To serve this purpose, the NHSIA business model has adopted a new business area, Service Management, as a counterpart to the Care Management business area specified for Medicaid Interoperability Technical Architecture (MITA) 3.0.<sup>1</sup> A holistic health and human service strategy includes both Care Management and Service Management.

This paper discusses how the experience, country-wide, of developing and providing electronic health records (EHRs) might inform the function of, and architecture for, the NHSIA.

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1 MITA 3.0 materials referenced in this study are dated May 2011.

## 2 Background

EHRs store privileged and protected information belonging to the same sort of clients that the NHSIA addresses. There has been high national attention on EHR adoption and architectures over the past 5 years.

This paper will present basic background information, will discuss health care reform in the context of health information technology (HIT), will discuss health information exchanges and its various architectures, and conclude with lessons learned and recommendations.

### 2.1 Key terminology

When Congress passed healthcare reform in 2010, phrases such as HIT, electronic medical records and “meaningful use” began appearing the public domain, though few people fully understood what they entailed. Below are the definitions of a number of key phrases.

**Electronic health records (EHR)** are defined as “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.”<sup>1</sup> EHR is often used interchangeably with the term Electronic Medical Records (EMR), though the latter term is sometimes distinguished as medical records that can only be used within one healthcare organization or limited to the physician’s view.

**Health Information Exchange (HIE)** (not to be confused with health insurance exchange of healthcare reform) is defined by the President’s Council of Advisors on Science and Technology (PCAST) report as “entities often built on a series of often bilateral legal agreements between different, often proprietary information systems to be able to share certain kinds of data.”<sup>(2, p 31)</sup>. Because many systems represent data in different ways, system interoperability presents a significant challenge to HIE. Due to these challenges of interoperability, the health IT community has created standards to make health information more exchangeable, though many data systems have not adopted these standards or have not adopted them consistently.

### 2.2 Who is using EHRs and how?

While many think of health information and data as the key functionality of an EHR, there are in fact myriad ways in which an EHR can improve patient safety and service delivery.<sup>3</sup> The most widely-referenced list of EHR functionalities is from a 2003 report by the Institute of Medicine (IOM). All functionalities in the IOM list address the following five criteria<sup>4</sup>:

1. Improve patient safety

2. Support the delivery of effective patient care
3. Facilitate management of chronic conditions
4. Improve efficiency
5. Feasibility of implementation

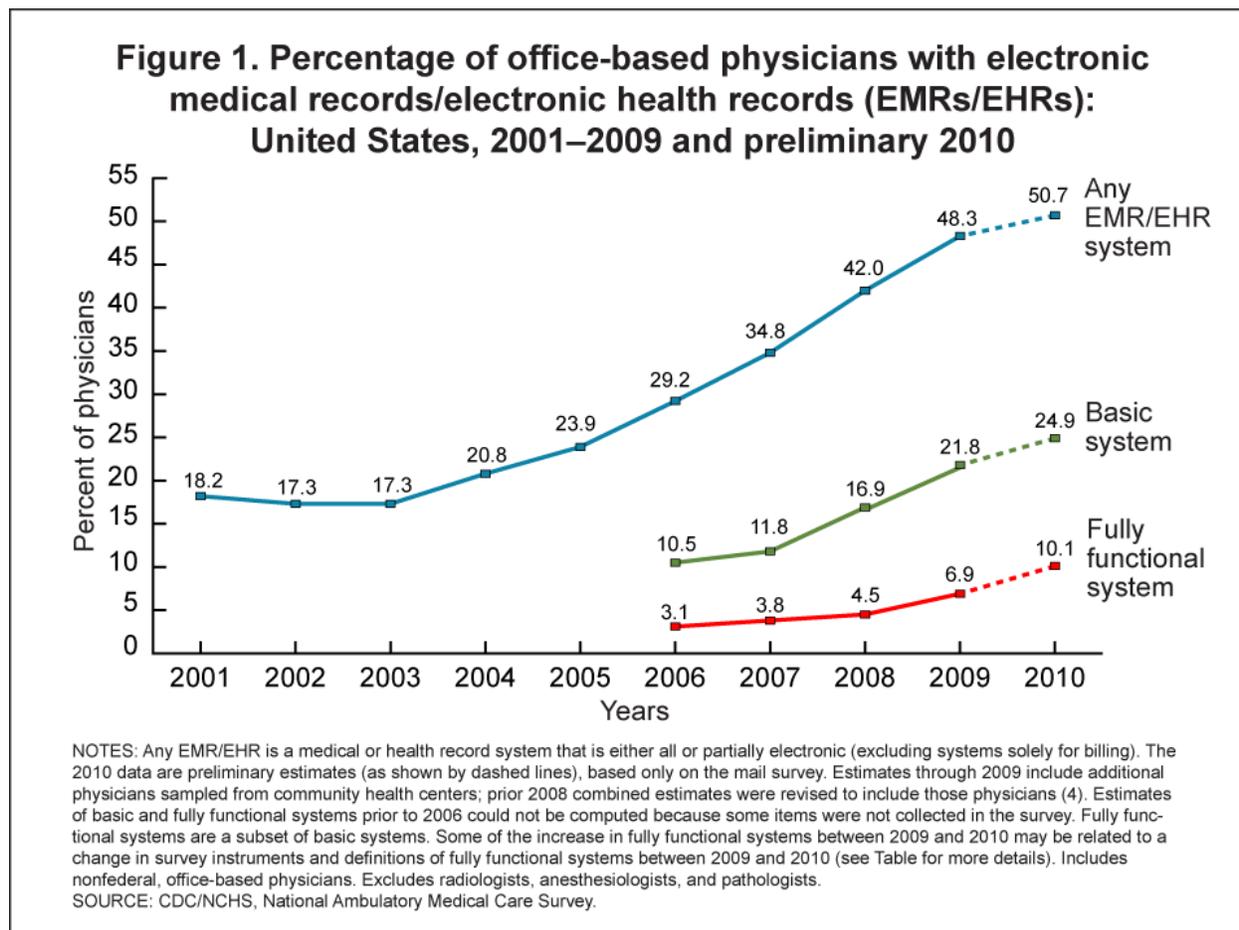
Having established these criteria, the IOM presented the following functionalities for an EHR:

- ⤴ **Health information and data:** This refers to the ability of clinicians to access information on a patient’s medical history. For example, an EHR would provide results from previous tests, which would preclude the need for redundant testing. The EHR could also display information on allergies, past referrals, current medications, etc.
- ⤴ **Results management:** EHRs can make test results (laboratory test results, radiology results, etc.) more easily and quickly available to clinicians, thus allowing them to provide better-informed and more timely diagnoses.
- ⤴ **Order entry/management:** This functionality improves care by “eliminating lost orders and ambiguities caused by illegible handwriting, generating related orders automatically, monitoring for duplicate orders, and reducing the time to fill orders.”<sup>2</sup>
- ⤴ **Decision support:** This refers to computer reminders and prompts that, using population-level data, aid clinicians in making decisions.
- ⤴ **Electronic communication and connectivity:** Particularly relevant for patients with chronic disease, this functionality allows providers to communicate with each other across silos.
- ⤴ **Patient support:** EHRs can allow patients to manage their own health, by accessing their records from home and providing patients with education on their specific diagnosis and treatment.
- ⤴ **Administrative processes:** Improved efficiency and accuracy with billing and claims data can improve care and minimize delays and confusion.
- ⤴ **Reporting and population health management:** This allows public and private sectors to report data for purposes of patient safety and public health.

## 2.3 Adoption

Given the potential to improve patient safety and care, it may come as a surprise that in the U.S., rates of adoption of EHRs by physicians’ offices and hospitals have been low. A 2008 survey showed that only 17% of physicians’ offices had adopted what they termed, “basic health IT” (data access only, with

no decision support), with only 4% utilizing full EHRs. The same survey showed that among hospitals, 8% had adopted basic EHRs, and only 2% had adopted full EHRs.<sup>5</sup> While the survey did show signs of an increase in EHR adoption, that increase was slow (see Figure 1 below). Of course, these numbers are changing as we speak, with the first set of HITECH incentive payments having gone out mid 2011.



**Figure 1. EHR Adoption.** Source: Hsiao, C., Hing, E., Socey, T. C., & Cai, B. (2009). *Electronic medical Record/Electronic health record use by office-based physicians: United states, 2008 and preliminary 2009*. Center for Disease Control National Center for Health Statistics.<sup>5</sup>

However, despite the potential of EHRs to improve patients outcomes, many physician practices, particularly smaller ones, do not stand to benefit financially from adopting EHRs. One study found that while EHRs save many care-providing health systems a large sum of money, physicians only see 11% of that return on investment.<sup>6</sup> This imbalance is particularly significant because physicians are often the ones who initially invest in converting their paper records to EHRs.

While most healthcare institutions have been slow to adopt EHRs, there are some noteworthy exceptions to the rule. In 2004, Kaiser Permanente implemented KP HealthConnect, a health information system that included an EHR with clinical decision support and real time connectivity across healthcare outlets, a patient-provider messaging system, and electronic interprovider messaging. This system is one of the most comprehensive EHRs in the United States. An independent study found that in one region, KP HealthConnect improved efficiency and created a new model for patient-centered care by decreasing office visit rates, and increasing scheduled telephone visits and emails between providers and patients.<sup>7</sup> Kaiser Permanente implemented this Health IT system in 2004, and the system now supports 8.6 million patients.<sup>8</sup>

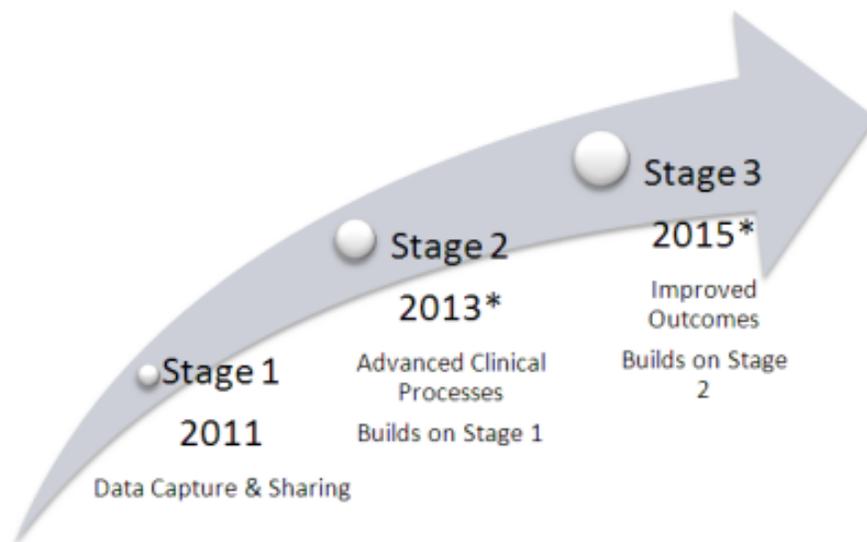
## 2.4 EHRs in Special Populations

Though Health IT and EHRs have been proven to improve care for multiple conditions<sup>9</sup>, they have been utilized most heavily for those populations that benefit from fully integrated care-- specifically individuals with chronic disease<sup>10</sup> and mental health and substance abuse disorders<sup>11</sup>. Health IT has been used in these populations to connect providers from both healthcare and human services, linking healthcare providers, social workers, substance abuse counselors, psychologists, occupation therapists and home care helpers. These interdisciplinary teams are essential to improving patients' health, however, the interoperability of data continues to be a challenge in linking systems.

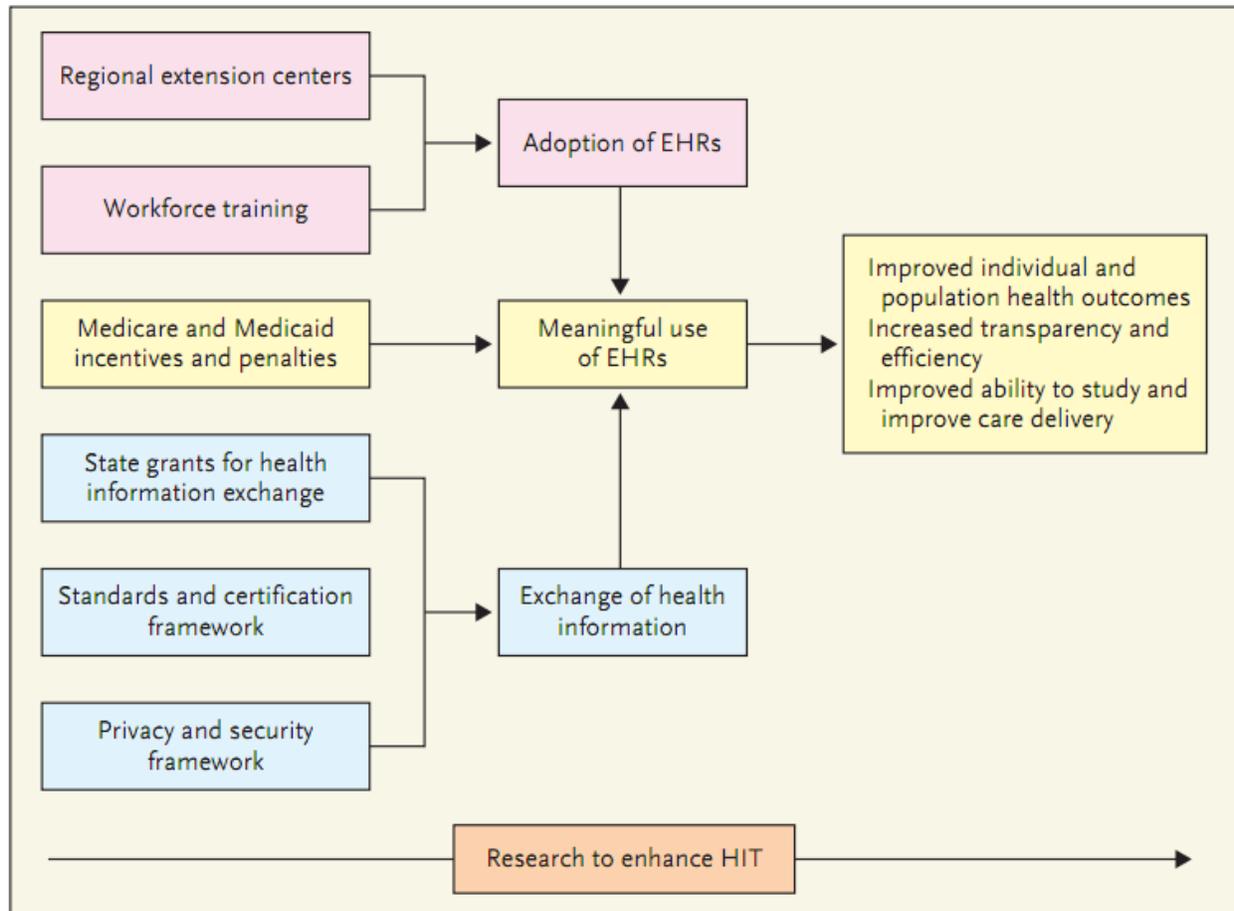
The perceived need for interoperability lies at the heart of federal policy. The ONC has made it part and parcel of its HITECH efforts. The Nationwide Health Information Networks remains one of its key initiatives.<sup>12</sup> To ensure that eligible providers and hospitals can exchange data under stage 1 of Meaningful Use, the Office has created an email-based system, the Direct Project.<sup>13</sup> However, the Office is still preparing for a future of interoperating information systems and has convened the Standards & Interoperability Framework,<sup>14</sup> to replace the HIT Standards Panel (HITSP) of the late 2000s. The President's Council of Advisors on Science and Technology made it central to its vision of the future: "we conclude that achievement of the President's goals requires significantly accelerated progress toward the robust exchange of health information."<sup>(2, p 3)</sup>

### 3 Healthcare Reform

The 2009 American Recovery and Reinvestment Act (ARRA, also known as the stimulus package) presented the largest incentives in history to encourage adoption of healthcare technology. The Health Information Technology for Economic and Clinical Health (HITECH) Act offered healthcare professionals billions of dollars in Medicaid and Medicare money if they adopted a “meaningful use” of EHRs. Between August and December of that year, DHHS Office of the National Coordinator for Health Information Technology (ONC) announced \$2 billion dollars in new programs aimed at helping people adopt meaningful use of EHRs.<sup>15</sup> The term “meaningful use” is broadly summarized as the requirement of providers “to show they’re using certified EHR technology in ways that can be measured significantly in quality and in quantity.”<sup>16</sup> With the goal of raising adoption and raising the bar of truly meaningful use of EHRs (and HIT more generally), ONC uses a strategy of staged rewards. Stage 1 criteria were announced in 2010 with the first payments made in 2011. Stage 2 criteria have been delayed to 2014, with Stage 3 to follow later.<sup>17</sup> CMS is responsible for administration of the incentives program (<http://www.cms.gov/ehrincentiveprograms/>).



**Figure 2.** The sequence of the stages of Meaningful Use incentives. Source: Missouri HIT Assistance Center. <http://assistancecenter.missouri.edu/node/17>



**Figure 3.** HITECH Act Programs and Regulations to address challenges of EHR. **Source:** Blumenthal, D. (2010). Launching HITECH. *New England Journal of Medicine*, 362(5), 382-385.

### 3.1 Interoperability and Developing Standards

As the HITECH Act incentivizes healthcare systems across the U.S. to adopt EHRs, more organizations are looking to create HIEs to improve patient care. The HIT Standards Panel, whose late 2000s functions have devolved onto the HIT Standards Committee<sup>18</sup> and onto the S&I Framework<sup>14</sup>, articulated 6 levels of standards required for interoperability: [Data Standards](#), [Information Content Standards](#), [Information Exchange Standards](#), [Identifiers Standards](#), [Privacy and Security Standards](#), [Functional Standards](#). (See the Public Health Data Standards Consortium site for a tutorial and review.<sup>19</sup>) The 2000s also saw the creation of a national paradigm for use-case specification, standards development, standards harmonization, and standards deployment.

Because the EHR incentives require attested meaningful use of certified EHRs, DHHS created ONC-Authorized Testing and Certification Bodies, which are specific bodies that can certify EHRs who meet the adopted standards. Some of these organizations are Certification Commission for Health Information Technology (CCHIT), Surescripts LLC, ICSA Labs and SLI Global Solutions.<sup>20</sup>

At the same time that these stakeholders were promoting standards for interoperability, the marketplace of large institutions have opted even more than before for single-vendor systems. Over 2009–2011, 75% of new-system purchases among hospitals with 200+ beds have been for Epic Corporation systems.<sup>21</sup> Given that this company’s prior strengths were in the ambulatory arena, this choice by inpatient-heavy organizations reflect a market that is not waiting for the federal interoperability to be worked out, even as every state fosters multiple HIE efforts.<sup>22</sup>

## 4 Health Information Exchange (HIE)

Without the ability to connect to outside records, EHRs can be only so effective. The ability to connect EHRs to other sources of data, including EHRs from other sites, radiology reports, prescription services, even human service organizations is known as a health information exchange (HIE). HIEs can improve patient care and lower costs by eliminating duplicate testing, allowing providers to get immediate up-to-date information on patient's health and healthcare history, and alerting public health officials to public health emergencies. While the importance of HIEs is undisputed, the business model is unclear and the manner in which information should be stored, shared and accessed has not been fully agreed upon.

Privacy and feasibility have emerged as the two major considerations for the design and implementation of HIE models. Privacy is a major concern for 39% of Americans for HIT.<sup>23</sup> A recent study of low-SES patients at an ambulatory clinic confirmed this concern as well, although non-white patients were less accepting of HIT than the white patients (and only 10% of the sample was African-American).<sup>24</sup> Minority patients have less broadband access, more mobile access, and the same, if not more concerns about benefits and privacy of EHRs.<sup>25</sup> HIEs, which introduce the electronic exchange of medical data across multiple institutions, bring up major concerns with privacy, IT security, and data ownership. HIPAA addresses some of these issues, but not without controversy<sup>26</sup>. However, some privacy concerns cannot be addressed by standards or regulations, and certain IT models simply make people uncomfortable. For example, many people feel vulnerable imagining all of their data in one central repository—particularly when that repository is controlled by the government (although the survey on which this statement is based is almost 9 years old).<sup>27</sup>

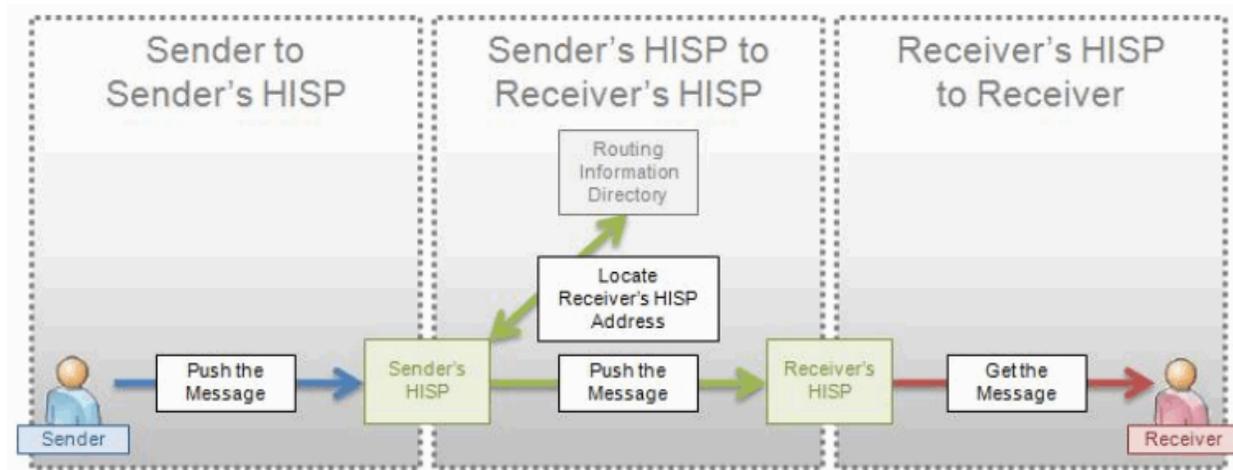
### 4.1 HIE Architectures

In his article, "Health-information exchange: why are we doing it and what are we doing?", Kuperman classifies HIE models as utilizing a "push" or "pull" of data, describing "the ability to push clinical data from one provider to another and ability to pull clinical data from an entire community."<sup>28</sup> Different HIE models address issues of privacy and feasibility differently. In this section, we outline some of the different HIE models, identify their strengths and weaknesses and provide examples of existing or pending projects that utilize that model. Two further architectures are the Service Bus and the Health-Record Bank models. HIMSS provides a short overview.<sup>29</sup>

#### 4.1.1 The "Push" Models

A push model is a system that enables a provider to send a patient's information to other providers. This model can be likened to email, in which people send and receive data, provided they have the correct address. In a push

model, a lab technician can send a primary care provider (PCP) a patient’s lab results, a PCP can send a referral to a specialized provider, and an emergency room can send details from an ED visit to a PCP. An example of this model is the Direct project, which was initiated by the Nationwide Health Information Network (NHIN) in 2007.<sup>13</sup> The Direct project aims to ease communication between providers, and “create specifications to enable the secure exchange of health information between authorized healthcare providers to support stage 1 meaningful use.”<sup>12</sup> This approach would allow for quicker and more efficient communication between providers than exists currently, thereby improving patient care. This model also avoids the costs of creating a central record locator, and does not have to address legal issues of protecting patient privacy across multiple record sources. There is no requirement that they Message’s payload be coded or structured data.



**Figure 4.** The Abstract Model for the Direct Project. HISP=Health Information Service Provide. Source: The Direct Project Overview.<sup>30</sup>

#### 4.1.2 The “Pull” Models

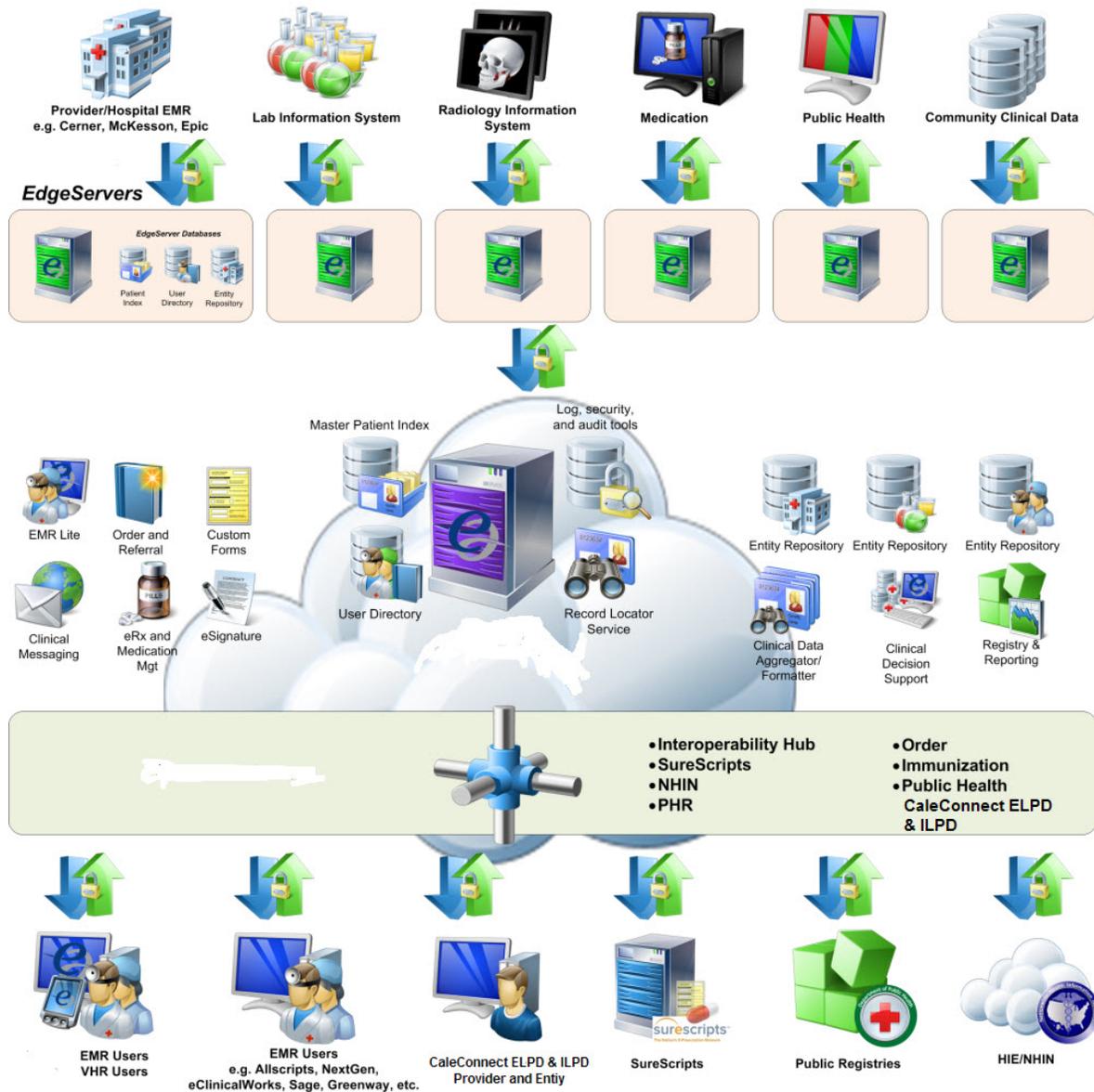
While improving communication between providers, the push model does not address many of the potential uses of EHRs. For example, emergency department providers would not be able to quickly access a patient’s medical records providers, consultants would not be able to draw upon data from multiple labs and imaging services, and primary care providers would not be able to synthesize the recommendations of multiple consultants. The “push” model also does not address potential public-health and quality-improvements “secondary uses” of EHR data.

Pull models allow providers to “pull” records on their patients from a number of sources. Within this category exist a variety of models that collect and store data in distinct manners.

#### *4.1.2.1 The “Scattered Model” AKA the “Federated Model” AKA the Decentralized Model*

The scattered model allows distinct organizations to share data, while maintaining separate databases. For example, Medicaid may be able to access a client’s data from a substance abuse database, but the client’s file will exist separately in each database. One advantage of this model lies in the comfort level of the public with private data storage. Many people feel more comfortable with their data being dispersed among different databases, rather than having one central file.

While the data are hosted and curated by the originating institutions, which is what makes the architecture decentralized, certain capabilities are required centrally: Master Patient Index (explicit or probabilistic), record locator, and access (authorization/authentication) services. These central services are often called “broker” services.



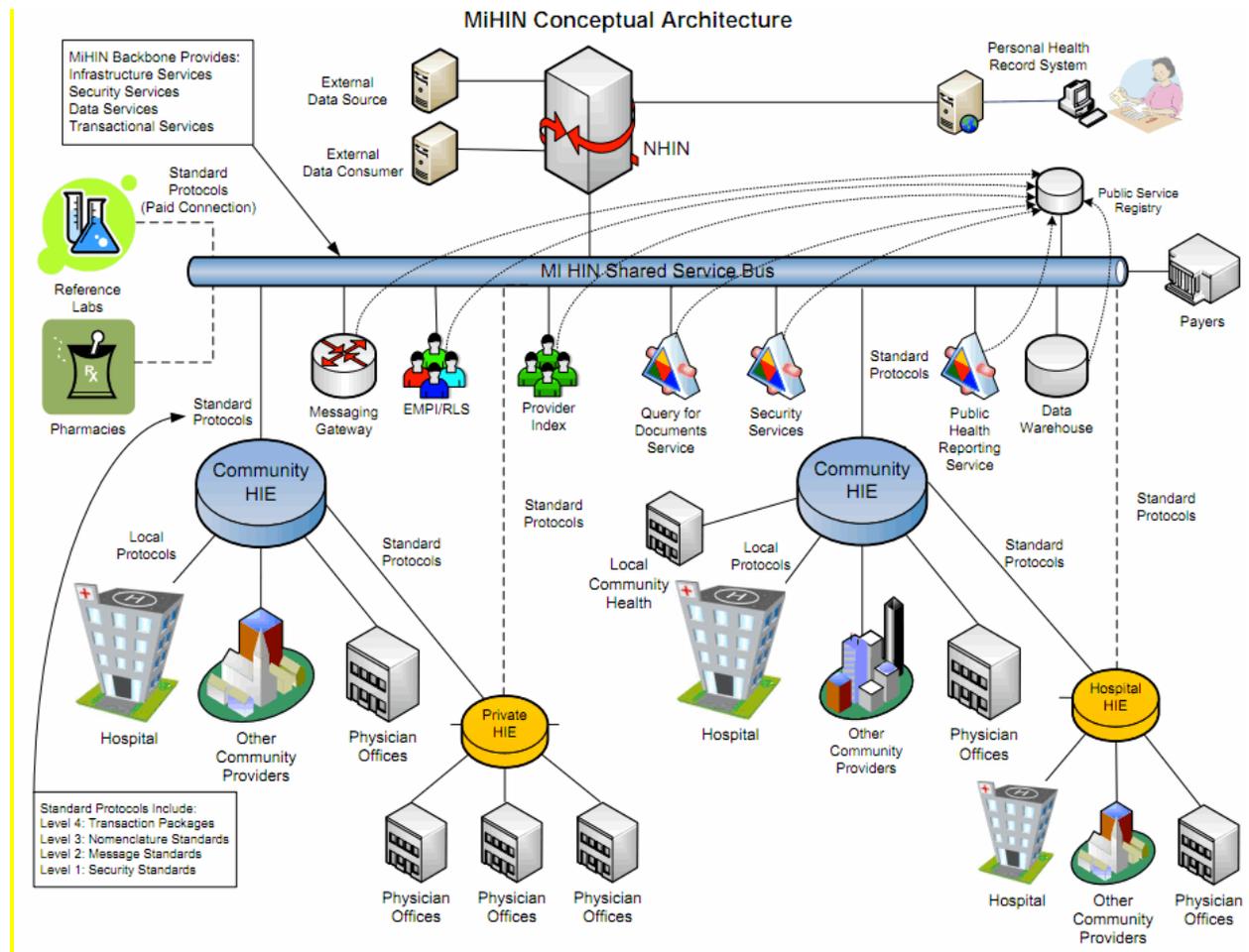
**Figure 5.** Decentralized architecture. The participating enterprises curate their own data, making some available through Edge servers. Record Locator Services use an established Master Patient Index, or a probabilistic pseudo MPI, to find data across the system. **Source:** Machado J. Santa Cruz HIE Architecture. 2011; [http://santacruzhie.org/wp/?page\\_id=2511](http://santacruzhie.org/wp/?page_id=2511), Accessed Sept 5, 2011.

The model has a number of limitations. Despite being “standard,” well-established message-exchange protocols, like HL7 2.x, are implemented with enough differences across vendors that “writing to the protocol” does not suffice, and developers are left with an  $O(n^2)$  problem, where the addition of 1 more system adds as much work as checking that the new system jibes with all previously-included systems. The process of retrieving data from multiple databases may be slow, thus limiting the ability of clinicians to quickly access a

patient's data. The record-locator service may be out of sync with the local hosts, leaving remote users to make decisions based on old and (more importantly) out-of-date data. The semantics of data generated for use in a local system may be lost when transmitted remotely. A system that depends on searching through and pulling out clients' data from multiple sites is vulnerable to technical glitches in each system and delay in locating records. An efficient decentralized model requires a patient identifier. However, the US government has proscribed work on unique patient IDs since 1999, which means that the linking algorithms must be probabilistic, which adds further overhead and uncertainty. The architectures tend to have high technical and financial overheads and complexity, which may limit their generalizability to all institutions participating in the care of a patient—which limitation defeats the purpose. Finally, these solutions, while technologically agnostic beyond its edges, tend to depend on a single vendor from the edge servers through the center to the requesting users. These vendors use a mix of standards (especially message-exchange (e.g., HL7) and vocabulary (e.g., ICD9)) and proprietary methods for moving data across the exchange or providing other services, like authentication or record matching. Whether these “Pull” models can achieve interoperability—where external data is “pulled” automatically and seamlessly into the provider's workflow—remains to be seen.<sup>31</sup>

#### **4.1.3 The Service Bus Model**

In contrast to the closed model of some current “Pull” models is the open, service-bus architecture advocated by the general HIE community at the highest policy levels. The entire standards-harmonizing structure of the mid 2000s was designed to develop an open set of protocols that would enable mixing and matching of specific implementations. Figure 6 shows a generic connectivity diagram of this motivating vision.



**Figure 6. The Service Bus Model.** Source: Doby, S. State of Michigan Health Information Exchange. Oct 10, 2010. <http://www.automationalley.com/servlet/servlet.FileDownload?file=0156000000qo9P>.

Federal initiatives are well thought out, starting from use cases and ending with implementation profiles and certification. The services are complex and in many cases have not been tempered by attempts at implementation. However, the thinking, despite the rapid time cycles, has been sophisticated and possibly complete. Figure 7 shows the component services for privacy and security.

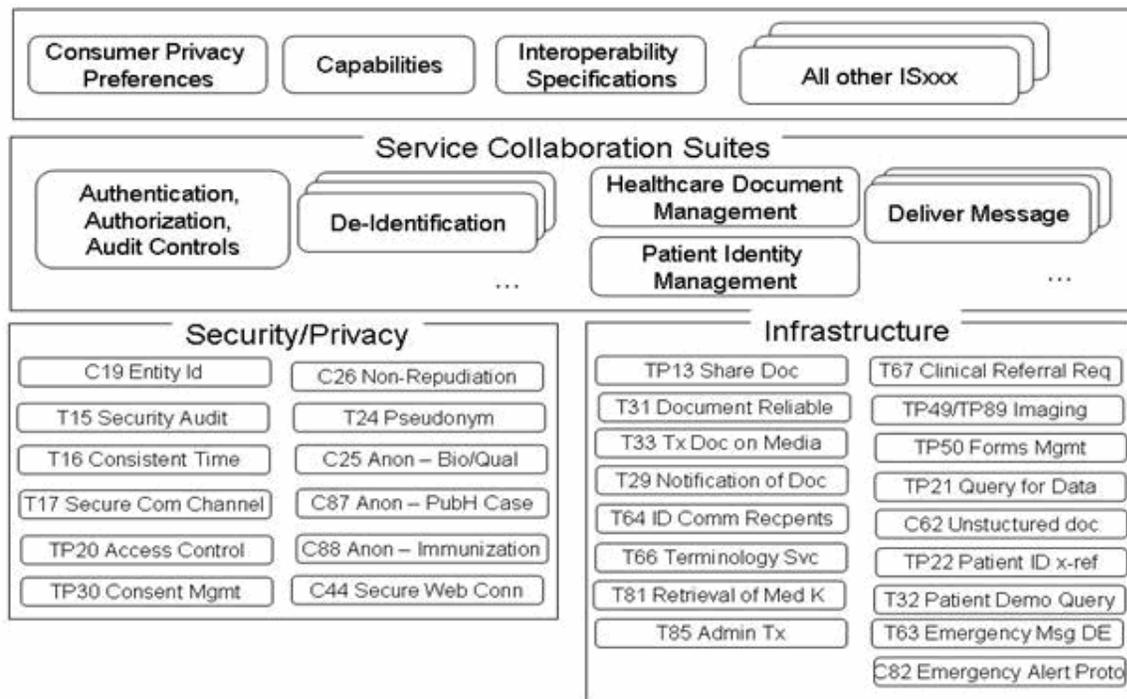


Figure 7. Security, privacy and infrastructure service collaborations developed by HITSP. Letter codes refer to Component (C), Transaction (T), or Transaction Package (TP) elements of the protocols. Source: HITSP<sup>32</sup> <http://wiki.hitsp.org/docs/TN904/TN904-4.html>

Probably the greatest success to date is the initiative by Integrating the Healthcare Enterprise (IHE) (<http://www.ihe.net>) that began as an effort to integrating radiology and imaging clinical services within hospitals. Their annual “connectathons”<sup>33</sup> demonstrate that disparate technologies and vendors can cooperate to effect a seamless workflow, in a specified area. The overhead in creating the “profiles” that describe the interactions is considerable. The clinical domains number over 10 profiles (e.g., Cardiology, Eye Care, Radiation Oncology, Radiology), and IT infrastructure, 17 profiles.<sup>34</sup> As of Aug 19, 2011, the Technical Frameworks comprise 3 volumes. Separately from the federal alphabet soup of standards specification and harmonization is an active group, SOA in Healthcare, an offshoot of the Objects Management Group (OMG), committed to innovating, developing, and implementing in this area.<sup>35</sup>

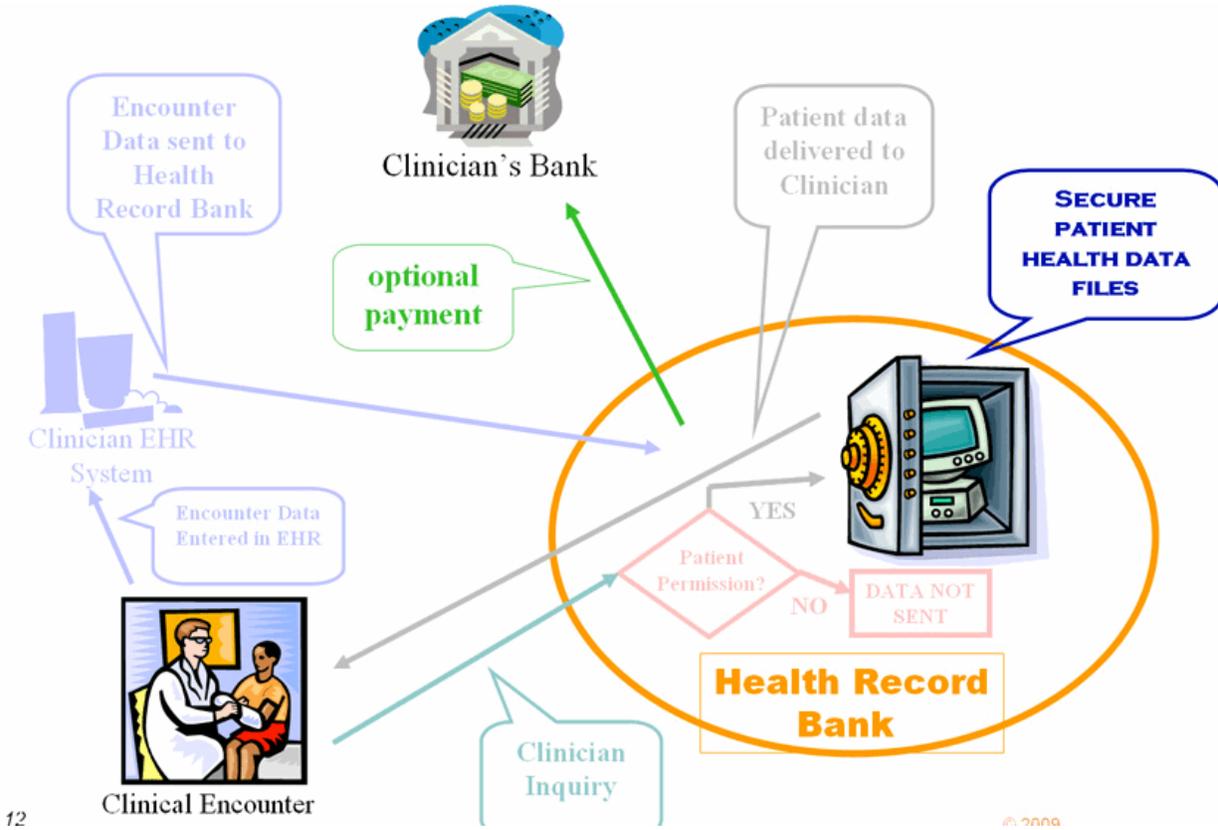
Livne<sup>36</sup> presents a state of the art model that they report is similar to IBM’s Garlic, which, in turn, was similar to APL’s Silberberg’s ADINA.<sup>37</sup>

#### 4.1.4 The Heath-Record Bank Model

In the preceding models, the effort at consensus and sharing is an  $O(n^2)$  process—as the number of participating institutions double, the work for consensus building and harmonization quadruples. This level of computational

complexity is already experienced within any clinical environment trying to get working together systems that even purport to use the same standard, like HL7 for communication.

An alternative model is where a single standard is established, and newly participating organizations must adapt to that standard. The computational complexity for growth is  $O(n)$ , that is, each addition requires the same amount of effort, albeit taking on risks in a different way from decentralized models. In the Health-Record Banking model, the consumer controls all deposits, accesses, and withdrawals (e.g., secondary use) from her account. Here, the consumer pays a small annual fee for maintenance of the data. Providers submit the patient’s data, from all sources, into the “account.” Having done so, they gain the privilege of taking data out of the account, as well, under the control and limits set by the consumer. A well structured motivation for the health-record-bank model was presented by Yasnoff at a recent Johns Hopkins Informatics Grand Rounds.<sup>38</sup>



**Figure 8.** Health Record Bank, focusing on the transaction between a data provider (individual clinician) and the Bank. **Source:** Varga J. Introduction to Health Record Banking. HIMSS 2009 Session e403. <http://www.healthbanking.org/docs/Run.html>

#### **4.1.5 Evidence for Success**

Most HIEs are mostly less than 4 years old. Most famously, the decentralized Santa Barbara HIE from 1998 disbanded because of “the lack of a value proposition.”<sup>39</sup> The HITECH initiatives have breathed new life into projects across the US. How many will be viable after the support of ONC wanes is unknown. Most exchanges are in relatively small areas, with some exchanges integrating only a small number of institutions. Our current state of evidence comes from a combination of publicity releases, presentations, anecdotes, and blogs.<sup>40</sup>

## 5 EHRs and Public Health

Public health plays three roles in federal and others' policies: First, as a secondary user of EHR data for such public-health Essential Services<sup>41</sup> as Monitoring and Assessment. Much of the efforts in biosurveillance over the past 10 years have focused on this function of EHR data as supplying a "signal" of public health evidence of disease outbreaks and the like.

Second, public health itself is a care provider (through its Essential Function of Assure Care). In this regard, it has its own needs to treat and follow patients, including non-standard populations like prisoners or patients with specific infectious disease (TB, STD).

Third, public health is starting to take advantage of electronic communication to deliver health messaging directly to consumer or directly to providers. For consumers, health messaging addresses disease prevention. For providers, efforts include outbreak notification and other just-in-time notices, delivered through the EHR.

For these last two roles, public health professionals are involved in the care of an individual patient, either directly (care provision) or through attributes of the patient, such as zip code or other risk factors.

The public health community increasingly is involved in national standards setting and harmonization to ensure that public health's needs are addressed, beyond the immediate clinical-care needs expressed by clinicians and health IT vendors.

## 6 Lessons Learned

A number of lessons from the EHR/HIE experience may be of interest in building human service systems, but those lessons depend on what is comparable to what between the human-service and clinical domains.

First, is the human-service **client** in the NHSIA comparable to a patient in an EHR? Arguing in favor is that human services should be provided to help the specific client. Arguing against is that the “client” is usually a family, if not larger network, and EHRs are poor at representing relationships and data among a family, let alone a network. Even more, while patients generally pay for some part of their care, consumers of human services generally do not, so data-ownership issues are more complex.

However, if a client could be thought of as a patient, then issues of data ownership and control, as well as paying attention to the “work” of being a client<sup>42</sup> (much as mobile and tele-technologies pay attention to the “work” of being a patient) lead to new ways of thinking about the human service information system (HSIS). We start to ask what is the equivalent of the human service portal (where enterprise information is made available to the client) and what is the equivalent of the personal human service record in the human services domain.

Second, is a **case worker** comparable to a clinical provider? Arguing in favor is that case workers have specific skills to supply and responsibilities to discharge. Their need for integrating information from multiple sources may be no less than that of the emergency-room physician or generalist trying to synthesize recommendations from a variety of consultants. Arguing against is that case workers take on much less autonomous roles than clinicians and have much of their activity specified by law and regulations.

However, if the comparison holds, then the major lesson to be learned is that the EHR (electronic human service record, EHSR) must be thought of as more than just a passive document to record the facts of a client’s needs and services. There must be decision support, that decision support must support the human-service workflow, and that decision support will change the nature of that workflow. Beyond decision support for the individual case, there is need for decision support for the case worker’s panel, because there is a good analogy with the physician’s panel of patients and a case worker’s panel of clients—e.g., managing the panel with respect to devoting the most time to the most in need clients/patients.

Third, is the mesh of **human service information systems** (HSISs) comparable to the mesh of clinical information systems (CISs)? Arguing in favor is that HSISs share a common goal (providing for the needs of the client) and share common data (such as demographic data). There is a range of business

processes in common among HSISs (e.g., eligibility determination), just as there is among CISs. Arguing against is that the funding for the program-related modules (e.g., Medicaid, Food Stamps, etc.) within HSISs come from a wider variety of sources than do the modules within CISs (e.g., lab reporting, provider order entry), making the interconnectivity among the modules in the former case more politically fraught than in the latter case and therefore more loosely coupled.

However, if the comparison holds, are there lessons from the HIE activities currently under way? The loose coupling among HSISs suggests that a decentralized model, using the language of Arzt and Salkowitz,<sup>43</sup> makes the most sense, in which case much attention must be paid to the nature of the human service client ID (either as with a master ID or with probabilistic matching) to ensure linking across the systems. “Push” approaches may make sense, especially before full architectures can be implemented, much as ONC is using the Direct Project before fully-functional HIEs are available. The “Pull” model (service-bus version) is clearly the architecture at the heart of the NHSIA. However, even the health-record bank has a comparable version in human services: An IT environment where clients control what data go into the record, what can be shared, and who can gain access to it. An example use case is a foster child or a child who has been abused/neglected for whom it might be very relevant to have a cumulative record with variable access. Given the degree of governmental control over the data, however, such a model would be a radical departure from current practice.

A further lesson from HIE interoperability is the concern for semantic interoperability: It is not enough to ensure data standards, but to ensure that the same word (or number) means that same thing in different systems or contexts. This concern speaks to the need for standardized vocabularies and ontologies in human service provision. NIEM is an important effort in the human-services realm that might provide those semantics.<sup>44</sup>

Finally, is the **human-services organization** comparable to a clinical organization? Arguing in favor is that human services provide services to individual. Arguing against is that clinical environments generally generate much more revenue than human services and they are allowed to bill (beyond clinical-services practices involving special populations, like DoD, VA, IHS, etc.).

With differences in organizational structure and rewards looming larger than similarities, it is doubtful that the financial incentives devised for clinical organizations will work the same for public health organizations. The value proposition for human services organizations must be made differently from the value proposition for clinical organizations.<sup>45,46</sup> For further discussion of this issue please see the draft working paper “National Human Services Interoperable Architecture: Performance Reference Model.”

The points of this section are summarized in Table 1.

**Table 1. Comparison of Health and Human Services Domains**

	<b>Health Domain</b>	<b>Human Service Domain</b>
<b>Patient / Client</b>	<ul style="list-style-type: none"> <li>• Health services provided to a patient</li> <li>• Patient is an individual</li> <li>• Patient wants access to information to understand and manage own care</li> <li>• Patients pay for part of care</li> </ul>	<ul style="list-style-type: none"> <li>• Human services provided to a client</li> <li>• Client may be an individual, family, or household; capturing relationships is critical</li> <li>• Client wants access to information to understand and manage own care</li> <li>• Government generally pays for care</li> </ul>
<b>Provider</b>	<ul style="list-style-type: none"> <li>• Many independent service providers</li> </ul>	<ul style="list-style-type: none"> <li>• Many independent service providers</li> </ul>
<b>Primary Care Physician / Case Worker</b>	<ul style="list-style-type: none"> <li>• Services may be coordinated by a primary care physician</li> <li>• Needs info from many sources</li> <li>• Physicians very autonomous</li> </ul>	<ul style="list-style-type: none"> <li>• Services may be coordinated by a case worker</li> <li>• Needs info from many sources</li> <li>• Case workers more constrained by organization and regulations</li> </ul>
<b>Data Ownership</b>	<ul style="list-style-type: none"> <li>• Mostly owned by private providers</li> <li>• Private providers control access, complying with patient rights and wishes</li> </ul>	<ul style="list-style-type: none"> <li>• Owned by a mix of government agencies and private providers</li> <li>• Government agencies control access, complying with patient rights and wishes when health or legal info is involved</li> </ul>
<b>Data Privacy</b>	<ul style="list-style-type: none"> <li>• Includes Personally Identifiable Info</li> <li>• Governed by many laws and regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Includes Personally Identifiable Info</li> <li>• Governed by many laws and regulations</li> </ul>
<b>Health IT / HS IT Investments</b>	<ul style="list-style-type: none"> <li>• Health IT has gained a great deal of momentum due to ARRA, HITECH, and PPACA</li> </ul>	<ul style="list-style-type: none"> <li>• Human services has not received a similar boost, except for Medicaid and the Health insurance Exchanges</li> </ul>
<b>Health / Human Service IT Environments</b>	<ul style="list-style-type: none"> <li>• Very complex mesh of systems</li> <li>• Loose coupling, but often in the same business enterprise</li> <li>• Duplicate some functions and data</li> <li>• Generally funded by the enterprise using the system; ONC funding augments this</li> </ul>	<ul style="list-style-type: none"> <li>• Very complex mesh of systems</li> <li>• Very loose coupling</li> <li>• Duplicate some functions and data</li> <li>• Generally funded by a Federal or state program (e.g., Medicaid)</li> </ul>

	Health Domain	Human Service Domain
<b>EHR / EHSR</b>	<ul style="list-style-type: none"> <li>• Could be physical or virtual</li> <li>• Immature technology; benefits not proven</li> </ul>	<ul style="list-style-type: none"> <li>• Could be physical or virtual</li> <li>• Does not exist</li> </ul>
<b>HIE / HSIE</b>	<ul style="list-style-type: none"> <li>• Immature technology; benefits not proven</li> <li>• Push, pull, ESB, EHR Bank architecture are all being experimented with and have application in different situations</li> <li>• Not enough evidence to pick a single approach as best</li> <li>• Semantic interoperability is essential</li> </ul>	<ul style="list-style-type: none"> <li>• Does not exist</li> <li>• Push, pull, ESB, EHR Bank architectures could all have application in different situations</li> <li>• Not enough evidence to pick a single approach as best</li> <li>• Semantic interoperability is essential</li> </ul>
<b>EHR Bank / EHSR Bank</b>	<ul style="list-style-type: none"> <li>• Gives patient ownership and control of their medical information</li> <li>• Private organizations own most of the source information</li> <li>• Contributes directly to improved care for the patient</li> </ul>	<ul style="list-style-type: none"> <li>• Gives patient ownership and control of their human service information</li> <li>• Government agencies owns most of the source information</li> <li>• Not clear that the benefits to the patient are significant</li> </ul>
<b>Health / HS Organizations</b>	<ul style="list-style-type: none"> <li>• Provide services to individuals</li> <li>• Generate significant billable revenues</li> </ul>	<ul style="list-style-type: none"> <li>• Provide services to individuals</li> <li>• Do not generate significant billable revenues</li> </ul>

## 7 Conclusions

The following conclusions were based on the findings summarized above:

- Many similarities exist between the domains of health care and human services in terms of goals, processes, challenges, and opportunities
- Emerging health IT approaches such as EHRs, Health Information Exchanges, and EHR Banks appear to have relevance to human services IT
- There is very little, if any, quantitative evidence that these emerging technologies have an acceptable ROI in the health domain, let alone the human services domain
- Even if the ROI could be proven, the investment funding for human services is much more limited than for health services
- With differences in organizational structure and rewards looming larger than similarities, it is doubtful that the financial incentives devised for clinical organizations will work the same for public health organizations

## 8 Next Steps

While it is beyond the scope of this white paper to make recommendations for action, recommendations for additional information gathering and analysis are appropriate. These follow-on activities are recommended:

- Create architectural patterns for NHSIA that embody the most promising emerging health IT approaches and apply them to human services
- Review these potential approaches with the human service community of interest as part of the overall NHSIA socialization process
- Maintain a library of information to support public health decision makers deciding on architectures and major IT purchases
- Recommend research on an ongoing basis that would inform those decision makers, including assessments of impacts through social return on investment

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