CASE STUDY REPORT

The State HIE Program Four Years Later:

Key Findings on Grantees' Experiences from a Six-State Review

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Executive Summary

In 2009, the Office of the National Coordinator for Health Information Technology (ONC) created the State Health Information Exchange (HIE) Cooperative Agreement Program (the State HIE Program), offering states and territories $564 million in funding and providing guidance for states to enable secure electronic information exchange.[1] The purpose of the State HIE Program is to "facilitate and expand the secure, electronic movement and use of health information among organizations according to nationally recognized standards."[2] To understand the effects of the State HIE Program on HIE progress, ONC contracted with NORC at the University of Chicago (NORC) to conduct a multi-year evaluation of the program.

Methods

Following an initial round of case studies in late 2012 and early 2013 to characterize early state implementation experiences,[3] NORC conducted a summative round of case studies in 2014 to identify key enablers, challenges, and lessons learned from the Program. We conducted a qualitative, in-depth assessment of six states (Iowa, Mississippi, New Hampshire, Utah, Vermont, and Wyoming), consisting of site visits and semi-structured discussions with 108 individuals over the course of 72 separate stakeholder meetings. This report describes key findings from discussions with stakeholders in these states regarding grantees' experiences enabling HIE services at the state level.

Key Findings

Most grantees pursued a dual-pronged strategy of enabling both directed and query-based models to electronically share a variety of information. Common services included care summary exchange, lab results reporting and exchange, public health reporting, and transmission of admission/discharge/transfer (ADT) messages, among others. Grantees varied in their technical infrastructure, for example, choosing federated models to emphasize data security, and/or centralized infrastructure for population health management and analytics. Grantees made decisions on infrastructure and service offerings based on a combination of factors such as local stakeholder needs in the short- and long-term (e.g., services), cost, privacy, and infrastructure security. Stages 1 and 2 of meaningful use requirements also played an important role in the decision-making process, as a driver of current and future exchange priorities.

Enablers

During implementation, grantees encountered a number of supportive factors that facilitated their activities. These factors include, but are not limited to, policy and regulatory levers associated with the Affordable Care Act (ACA) and payment reform, state/legislative actions, and stakeholder buy-in. Some states found that the ACA and other payment reform initiatives created opportunities to reinforce their programmatic efforts. For example, for organizations forming Accountable Care Organizations (ACOs), HIE is essential in coordinating care. States have found that marketing their services to ACOs, or requiring ACO participation in state-led services, can bolster demand and participation. Participation also increased in response to financial incentives at the state and federal level (e.g., meaningful use), as well as state-level legislative requirements for participation. In a few states, legislative action was necessary to address privacy concerns

and remove barriers to exchange. Finally, stakeholder buy-in—philosophical and financial—proved critical to HIE success. The more parties supported, promoted, and participated in HIE, the easier the implementation path. Ideally, stakeholder buy-in also included collaboration between entities like state Medicaid, the Regional Extension Centers (RECs) tasked with technical assistance, and the State HIE Program leadership team.

Lessons Learned

Grantees and stakeholders encountered challenges during implementation and developed strategies to continue moving their HIE efforts forward. One important lesson learned was to set tangible, intermediate goals that kept stakeholders energized by ongoing progress. Moreover, grantees found that defining incremental processes and goals allowed them to make course corrections when necessary. The presence of large health systems strongly influenced the development and uptake of grantee services. In some states, large players delivered participants and data to grantee-led HIE systems, while in others they acted as competitors and the absence of their data hurt the value proposition of state systems. Stakeholders in all six states reported IT-related challenges, from EHR and HIE developer limitations to lack of interoperability between systems and data capture and quality issues. To address EHR and HIE developer issues, some grantees shifted to a best-of-breed approach, working with multiple HIE developers for different needs. For interoperability, many look to the ongoing development and adoption of data standards as the long-term solution. In the short term, grantees are encouraging the use of certain standards among their participants and building capability in data translation and in-house teams responsible for data cleaning.

Sustainability

As part of the funding opportunity, grantees were required to develop sustainability plans to support activities beyond the funding period. Grantees are embracing the central tenant of providing value-added services to ensure sustainability. For many, this involves focusing on Stage 2 meaningful use exchange requirements and aligning their service offerings with payment reform priorities, such as care coordination. Five of the six states are planning to charge subscription fees and are in the process of determining appropriate rates for its various users. Many are also considering the best way to align with policy initiatives, payment reform efforts, and potential partners (e.g., RECs and payers) to ensure ongoing relevance of services, participation, and financial support.

Impact

Stakeholders credit the State HIE Program with a number of important achievements. First and foremost, stakeholders believe the program raised awareness of HIE and helped potential exchange partners gain an appreciation for benefits and its relevance to overarching health care reform and health care delivery goals. Stakeholders also reported HIE facilitated the breaking down of silos—of information and between entities for whom the program fostered conversation and collaboration. Critically, the program established the foundational elements necessary for exchange, including governance and technical structure, privacy and security policies, and stakeholder collaboration. Stakeholders believed it is too early to tell what kind of long-term impact the program has had on exchange, given the difficulty of measuring impact from the multitude of factors involved. However, they did feel that the value of program efforts would increase over

time with support from new care models, such as ACOs and Patient Centered Medical Homes, and new payment models.

Policy Implications

With the conclusion of the State HIE Program and sweeping changes to the health care system, there are a number of opportunities at the state and federal levels to continue supporting HIE services.

- The State HIE Program highlighted the important role states play in leadership and coordination, particularly in convening stakeholders, policy development, and needs assessment, which will be relevant to future stages of meaningful use and health care reform.
- There is a critical need for strong, ongoing support related to standards and interoperability.
- A provider- or federal-led effort to obtain buy-in from HIE developers for overarching HIE goals may be warranted and needed to change perceptions of interoperability.
- There is a need to assess how technical solutions evolve in different markets, to develop and disseminate best practices, and to develop governance and oversight requirements at a state and national level.
- Organizations should monitor findings and best practices for sustainability from existing federal and state level initiatives leveraging pay-for-performance models.

Conclusion

Since the program's inception, EHR adoption and HIE have grown enormously. Grantees profiled in these summative case studies have made progress with garnering stakeholder trust and participation, expanding HIE service options for providers, and addressing persistent challenges and barriers to HIE. The findings presented highlight important lessons learned during implementation; most notably, building exchange capability incrementally, selling the idea of HIE to big players, and resolving incompatibilities with HIE developers. The insights presented in these case studies may assist other states and policymakers in their ongoing HIE efforts, and identifies areas where important work remains to fully realize the benefits of HIE and to support health care and payment delivery reform efforts.

Introduction

In 2009, the Office of the National Coordinator for Health Information Technology (ONC) created the State Health Information Exchange (HIE) Cooperative Agreement Program (the State HIE Program), offering states and territories $564 million in funding and providing guidance for states to enable secure electronic information exchange.[4] The Health Information Technology for Economic and Clinical Health Act (HITECH), part of the American Recovery and Reinvestment Act (ARRA) of 2009, funded the program and in doing so created unprecedented opportunities to develop and expand HIE services throughout the nation.

The purpose of the State HIE Program, as authorized by Section 3013 of the Public Health Service Act and amended by HITECH, is to "facilitate and expand the secure, electronic movement and use of health information among organizations according to nationally recognized standards."[5] The program promotes the timely sharing of electronic health information to improve health care quality, efficiency, and safety and ensures health care providers have access to comprehensive clinical information that enhances delivery of patient care. It has the potential to expand the amount and quality of health-related data, thus improving public health programs and clinical research.[6]

Since the launch of the program, several initiatives further aligned federal priorities in support of HIE. The Centers for Medicare & Medicaid Services (CMS) implemented the Medicare and Medicaid Electronic Health Record (EHR) Incentive Programs, which offer incentive payments to eligible professionals, hospitals, and critical access hospitals (CAHs) as they adopt, implement, upgrade or demonstrate the meaningful use of certified EHR technology. In September 2012, CMS released its final rule specifying Stage 2 meaningful use criteria.[7] These Stage 2 criteria expand requirements related to HIE, such as electronic exchange of lab results, care summary exchange, electronic prescribing, and public health related measures – all of which have served to make HIE even more relevant for eligible hospitals and professionals.[8]

Other key efforts include the Direct Project and the HIE Challenge Grant Program. The Direct Project provides a set of standards, policies, and services to transport health information point-to-point through a secure, fast, and inexpensive "push" model, thereby creating an additional transport method for electronic health information.[9] The ONC-funded HIE Challenge Grant Program encourages development and innovation to address other persistent barriers to HIE, such as transitions to long-term and post-acute care and consumer-mediated exchange.[10]

To understand the effects of the State HIE Program on HIE progress, ONC contracted with NORC at the University of Chicago (NORC) to conduct a multi-year evaluation of the program. In late 2012 and early 2013, NORC conducted an initial round of case studies to characterize early state implementation experiences.[11] From March to May 2014, NORC conducted a summative round of in-depth case studies in Iowa, Mississippi, New Hampshire, Utah, Vermont, and Wyoming, six states not included in the earlier round of case studies, to identify key enablers, challenges, and lessons learned from the program. The case studies also offer insight on the impact of ONC funding on both the short- and long-term trajectories of state-level HIE. Here we report the results of the second round of case studies.

Methods

The primary objectives of the case studies were to understand:

- What factors contributed to greater depth and breadth (i.e., number of transactions and participants, types of exchange) of information exchange over time;
- How states specifically helped providers meet exchange requirements;
- The key challenges and lessons learned throughout the grant period; and
- The impact of the State HIE Program.

The six states we chose varied in population size, HIE technical models, and governance structures. NORC identified these six states based on:

1) **Program factors:** representative governance and leadership models and technical models. States employed three different leadership models: state-led (the state received ONC program funds and led HIE implementation efforts); a 'true' SDE (an SDE, or state designated entity, typically a non-profit organization designated by the state, received ONC funds and led implementation efforts); and an SDE-like (the state received program funds but an SDE led implementation efforts). Technical models consisted of query-based and directed exchange.

2) **State contextual factors:** average time of health information organization (HIO) operation pre-HITECH, pre-HITECH hospital competition, pre-HITECH EHR adoption (hospital and office-based); and population density.[i]

3) **State progress, based on key HIE outcome measures from several sources:** To assess state progress, NORC reviewed ePrescribing (eRx) data from Surescripts, as well as survey data from the American Hospital Association (AHA) Health IT Supplement, and National Center for Health Statistics' National Electronic Health Record Survey (NEHRS). In particular, we focused on nine HIE outcome measures in three domains: clinical lab exchange, care summary exchange, and eRx. The nine measures are displayed by domain in Appendix C. Based on this data, we identified four states that demonstrated strong progress in 2012 and two who made less progress.

Table 1 shows some basic characteristics of each case study state. Appendix A includes more detailed profiles of each state.

[i] More details on each selected case study state's contextual characteristics available in Appendix B.

Table 1: Basic Characteristics of States

Characteristic	Iowa	Mississippi	New Hampshire	Utah	Vermont	Wyoming
Funding Recipient	Iowa Department of Public Health	State of Mississippi Department of Health	New Hampshire Department of Health and Human Services	Utah Department of Health	Department of Vermont Health Access	Wyoming Governor's Office
Leadership Model	State-led	State-led	SDE-like	SDE-like	SDE-like	SDE-like
Lead Entity for Program Implementation	State-led	State-led	New Hampshire Health Information Organization (NHHIO)	Utah Health Information Network (UHIN)	Vermont Information Technology Leaders (VITL)	Wyoming e-Health Partnership, Inc. (eHealthWyo)
Statewide HIE System	Iowa Health Information Network (IHIN)	Mississippi Health Information Network (MS-HIN)	NHHIO	Clinical Health Information Exchange (cHIE)	Vermont Health Information Exchange (VHIE)	eHealthWyo
HIE Performance in 2012	High	Low	High	High	High	Low

Between March and May 2014, we conducted a qualitative, in-depth assessment consisting of site visits and semi-structured discussions with a variety of stakeholders, as shown below in Table 2. We spoke to 108 individuals over the course of 72 separate stakeholder meetings.

Table 2: Case Study Interview Respondent by Stakeholder Types

Stakeholder Type	Total
Health IT Coordinator and support staff	5
State Designated Entity Directors and support staff	5
Medicaid personnel	6
State Public Health Office personnel	5
Hospital/integrated delivery network and hospital association representatives	7
Providers, and health center and physician association representatives	10
Payer representatives	5
Vendors (HIE and EHR developers, health information service provider (HISP) for Direct)	9
Critical access hospital representatives	5
Long-term care and home health representatives	4
Regional Extension Center representatives	6
Beacon representatives	2
Accountable care organization representatives and representatives involved with quality	3
Total	**72**

This report discusses key findings from our discussions with stakeholders in these six states regarding grantees' experiences implementing HIE services. The report begins by describing the technical models grantees established to enable HIE services and their implementation process. Next, we discuss significant enablers for HIE, key challenges, and lessons learned to address these challenges. The report continues with descriptions of grantees' sustainability plans post HITECH funding and stakeholders' perceptions of program impact. We conclude with policy implications of key findings.

Grantees' Technical Models for Implementing HIE Services

To meet HIE priorities and leverage local market infrastructure, grantees weighed the utility of 'push' and 'pull' forms of exchange. Directed, or "push," exchange refers to providers' and individuals' ability to send and receive secure information electronically from an authorized user.[12] "Directed exchange" is the broad term that encompasses Direct Project protocols as well as other proprietary secure messaging solutions. Query-based, or "pull," exchange refers providers' ability to find or request patient information from other authorized users. Query-based exchange requires the support of infrastructure to host the information centrally, in distributed repositories, or both. Consumer-mediated exchange, the ability for patients to aggregate and control the use of their health information among providers, is the third key form of HIE; however, most states have not focused on this area.

Directed Exchange

Directed exchange is broadly available in all six case study states as of Q4 2013; that is, users can subscribe to regional- and state-level entities that facilitate exchange across unaffiliated organizations for directed exchange.[13] Grantees enabled directed exchange mainly through the Direct protocol.

Grantees often serve as or certified Health Information Service Providers (HISPs) to provide Direct services. A Health Information Service Provider, or HISP, is an organization that manages the security and transport for directed exchange.[14] Of the states with directed exchange broadly available nationally, 70 percent serve as or contract with HISPs, 36 percent provide financial incentives to encourage connections to HISPs, and 23 percent certify or qualify HISPs. Of the six case study states, four serve directly as or contract with a HISP, one provides financial incentives to encourage HISP connections, and one certifies or qualifies other HISPs to offer directed messaging services.

Query-Based Exchange

As of Q4 2013 query-based exchange is broadly available through a single entity in four of the six case study states, available regionally in Vermont and it is not currently available in New Hampshire. To enable query-based exchange, grantees selected one of three technical models: federated, centralized, or hybrid.

Federated models enable the flow of information from one provider or entity to another while allowing participating organizations to keep local control of their data. In this type of de-centralized model, only a limited set of patient data elements are centrally aggregated (e.g., patient demographics) in order to allow the

system to locate patient records. Often, grantees use record locator services (RLS) and/or master patient index (MPI) to enable locating patient records across organizations.[15] Iowa employs a federated model in which no patient data is stored centrally; instead, the Iowa Health Information Network (IHIN) functions as a hub that facilitates secure information sharing between authorized users. Similarly, in New Hampshire the locus of control rests in the hands of the individual systems sharing data, although future phases of the program will include the central aggregation and merging of records. Wyoming supports a federated model with a central master patient index and record location service, while allowing participating systems to store their data at their local facilities. Providers can request access to data through eHealthWyo.

Other grantees elected for 'heavy' or centralized infrastructure, consisting of a central data repository that aggregates patient data supplied by local sources (e.g., providers).[16,17] A central repository of data may provide the opportunity for a consolidated view of the patient and access to aggregated data for analytics and population health management. For example, Vermont Information Technology Leaders (VITL), the lead implementation entity, established a central data repository within its HIE system, the Vermont Health Information Exchange (VHIE), to aggregate lab results, lab orders, care summaries (with unaffiliated providers and ambulatory providers), e-prescribing, continuity of care documents (CCDs), and demographic files. Similarly, Utah is currently developing a centralized data repository through the clinical health information exchange (cHIE) to aggregate lab results, medication history, problem lists, and allergies data. In the future, the Utah Health Information Network (UHIN), the lead entity for the program, plans to expand the cHIE to support a federated model for data from large health systems.

Others opted for mixed, or hybrid, models of exchange. These grantees allow providers to query their system for data stored in federated repositories; however, the HIE system also stores a copy of a minimum clinical dataset (beyond basic data required to retrieve patient records) centrally in a data repository.[18,19] Access to other data remains federated. The Mississippi Health Information Network (MS-HIN) uses a record locator service and a community Master Patient Index to enable providers to search patient records for lab results, radiology and transcribed reports, medication history, and admission, discharge, transfer (ADT) data, and collects data in a central repository. MS-HIN has a provider directory and centrally aggregates patient demographic data.

Table 3 displays each grantee's technical models, services enabled, and implementation status of directed and query-based exchange.

Table 3: Grantees' Current Technical Approaches to Enabling HIE Services

	Iowa	Mississippi	New Hampshire	Utah	Vermont	Wyoming
HIE System	Iowa Health Information Network (IHIN)	Mississippi Health Information Network (MS-HIN)	New Hampshire Health Information Organization (NHHIO)	Clinical Health Information Exchange (cHIE)	Vermont Health Information Exchange (VHIE)	Wyoming e-Health Partnership, Inc. (eHealthWyo)
Technical Model for Query-based Exchange	Federated	Mixed Model (Hybrid)	Once enabled, will be federated	Centralized	Centralized	Federated
State Enabled Services	Continuity of Care Document (CCD) exchange, lab results reporting, medication history and public health (immunization) and quality reporting; record locator service (RLS); master patient index (MPI)	Access to lab results, medications, public health reporting; central MPI, RLS	CCD exchange, lab results exchange	Lab results, medication histories, allergies, transcription reports	MPI; RLS; demographics, CCD exchange, lab orders and lab results, transcribed reports; connections to Blueprint and state immunization registries	Routing of admission/discharge/transfer (ADT) messages, lab and radiology results reporting
Vendor(s)	HIE Developer; Xerox Subcontractors: HISP and HIE software: Informatics Corporation of America (ICA); State lab reporting and Medicaid Data Analytics (Alere)	Medicity	Orion Health	MPI: IBM Routing and data transformation: Mirth Natural Language Processing (NLP): Perfect Search HISP: Secure Exchange Solutions; Other HIE developers (for analytics, provider directory) still to be determined.	Medicity	OptumInsight
Directed Exchange Availability*	Broadly available	Broadly available	Broadly available	Broadly available	Broadly available	Broadly available
Query-based Exchange availability*	Broadly available	Broadly available	Not currently available	Broadly available	Available in regions	Broadly available

*As of Q4 2013; Source: State Health IT Program Measures Dashboard: http://healthit.gov/policy-researchers-implementers/state-hie-implementation-status

Grantees' Experiences Implementing their Selected Technical Models

This section discusses grantees' experiences with directed and query-based exchange.

Direct is gaining traction with some stakeholders. Stakeholders noted a shift in thinking about directed exchange, particularly around Direct. Initially, stakeholders viewed Direct as a competing model and distraction from query-based exchange. Over time, some stakeholders came to see it as the most attainable and useful option for data sharing in the absence of other more robust exchange mechanisms (i.e., query-based services). Providers in Utah found that because of delays in setting up query-based interfaces, Direct fulfilled their immediate exchange needs. Entities like long-term care facilities used Direct to exchange with other providers and with Medicaid for prior authorizations. Some EHR and HIE developers noted that the "mad dash" towards care coordination means providers and developers see a need to get Direct up and running. Given that HIE is an important part of Stage 2 meaningful use, interest in Direct is growing.

Workflow challenges with Direct persist. Despite an interest among some provider types for Direct, some noted a major barrier to its use is a lack of integration into existing EHR systems and clinical workflows. It requires providers to log into separate, standalone portals to send or receive data, which providers find onerous and therefore avoid. One provider in Utah noted that despite having access to a Direct address through UHIN, he prefers the secure messaging offered by his EHR developer because he can access and send files directly from his EHR system. Similarly, in both Iowa and Wyoming, Direct use is low because providers must access the secure messaging system through a web portal instead of through their EHRs. Stakeholders reported since Direct was not a requirement for vendor certification until Stage 2 meaningful use, EHR developers are only now integrating it into their platforms.

> *"[A federated model functions as] a post office, carrying a package of information from one place to another, and has the potential to be a very successful model. This is because the goal of these types of organizations is to be an enabler more than a controller, and it may be a better way to help people get connected with each other."*
>
> *– HIE developer*

Grantees with federated systems reported stakeholder enthusiasm for the federated model, in large part because of its perceived security. Stakeholders—particularly large delivery systems— favor the federated model over others because it alleviates concerns around data breaches and provides assurance and legitimacy of authorized access to third party systems. Notably, the failure of one system does not incapacitate the entire system and data is always current as providers query the most recent data available in a system's local repository. However, establishing connectivity to federated repositories is complex and costly, requiring time and effort. Furthermore, interoperability issues and gaps in or widely interpreted standards can delay the process for connecting systems from different vendors.[20] For example, New Hampshire experienced delays establishing their federated model related to the challenges and cost of establishing interfaces with each local system.

> *"[Direct is] a great idea if there is no other way to [exchange] securely. But there are so many different things that are going on and happening. [Direct] was just one more trial piece… If that's what we're going to use, that's great. But if there are six different things out there, Direct has no use."*
>
> *– Critical Access Hospital Representative*

Grantees opting for 'heavy' or centralized infrastructure reported numerous advantages, including opportunities for analytics. Stakeholders reported a centralized infrastructure ensures quicker access to requested data, given they are centrally maintained. The aggregation of data centrally also facilitates community-wide data analytics, population health management, and other value-add functions[21] and offers a consolidated view of the patient. For smaller states without a proliferation of HIOs, a statewide, centralized system provides connectivity to disparate provider networks. However, a centralized infrastructure requires large up-front investments to develop and implement. In Vermont, establishing the central repository portion of the HIE system was cost- and resource-intensive. Stakeholders noted that, if participating systems do not submit data to the repository in a timely fashion, the consolidated records might be inaccurate when providers query the system.[22] Other challenges include patient matching and data quality issues.[23]

> *"Shifting towards more efficient and aligned reimbursement models requires the trustable exchange of information among those that share in that accountability and broadly."*
>
> *– Large health system representative*

Exchange Enablers

In this section, we examine key factors influencing state efforts in enabling HIE services. These factors include, but are not limited to, policy and regulatory levers associated with the Affordable Care Act (ACA), payment reform, state actions, and collaboration and stakeholder buy-in.

Policy and Regulatory Levers

Some states are leveraging the rise of Accountable Care Organizations (ACOs) to bolster their HIE infrastructure, and vice versa. The ACA and other health care payment reform efforts are providing opportunities for states to leverage their investments in the State HIE Program. Reform efforts, many of which involve incentive payments (e.g., the Medicaid Balancing Incentive Program[24] and Incentive Payments for Primary Care Services[25]) motivated hospitals and providers to participate in HIE and care transformation efforts, such as ACOs and Patient Centered Medical Homes (PCMHs).

Stakeholders in multiple states reported that HIE is fundamental for the development of ACOs because participants need to communicate, coordinate care, and share information with each other. In Iowa, the state is requiring organizations forming ACOs to sign-up for IHIN because Medicaid wants access to ADT data to monitor their population. Iowa designated seven ACO regions through the Center for Medicare & Medicaid Innovation's State Innovation Models (SIM) Initiative, which provide support to states for the development and testing of state-based models for multi-payer payment and health care delivery system transformation.[26] SIM will increase the need for HIE capabilities; for example, a hospital caring for a Medicaid patient will need to share data with other providers in that region in order to meet standards for providing complete quality care. Vermont is experiencing similar synergies between ACOs and VHIE. By tightly integrating

VHIE with Blueprint for Health, which focuses on transforming care, payment, and system delivery,[27] HIE is an integral piece of care and payment reform efforts in Vermont.

Meaningful use requirements promote the use of many grantees' HIE systems. Multiple stakeholders reported that meaningful use provided significant impetus for HIE by raising awareness and establishing the necessary infrastructure to support HIE services. They noted meaningful use could serve as both a carrot and a stick for providers and HIE developers; it provides positive financial incentives to providers who adopt EHRs and engage in HIE while penalizing HIE developers who lose market share if they do not work towards meaningful use certification requirements and interoperability. In addition, meaningful use exchange requirements create an opportunity for regional extension centers (RECs) and state Medicaid to engage with providers and hospitals on adoption. In Iowa, meaningful use incentives propelled hospitals to work with the Iowa Department of Public Health (IDPH) to meet electronic lab reporting and immunization reporting requirements. This provided a platform for IDPH to develop relationships with hospitals, providing opportunities to educate them about available HIE services.

Financial incentives beyond the EHR Incentive Programs, such as subsidizing interfaces to the state HIE system, encouraged the use of statewide services.[28] The Wyoming Department of Health appropriated $1 million of its 2011 budget to provide grants and loans to critical access hospitals to implement EHRs,[29] which ultimately aimed to encourage broader exchange. eHealthWyo also used grant funds to highly subsidize the cost of onboarding and implementation of hospitals systems. In Mississippi, the MS-HIN Board approved an incentive program to promote provider enrollment by paying for the one-time HIE implementation and interface fees if providers committed to join by the end of the federal fiscal year.[30]

> *"Providers saw benefits from EHRs but there was not enough to tip the scale and cause them to jump on and buy them. But, the meaningful use incentives (which helped cover some of the expense) and the concept of HIE made EHRs more palatable."*
>
> *– Health IT Coordinator*

States used legislation to promote participation in statewide HIE systems. In both Mississippi and New Hampshire, the state passed legislation or policies around public health reporting requirements. The Mississippi Department of Health requires all eligible professionals, hospitals, and critical access hospitals to use MS-HIN to satisfy their meaningful use public health reporting.[31] In Vermont, Act No.79 established connectivity criteria for providers to connect to VITL and requires providers, by law, to use VITL for exchange.[32] The New Hampshire Health Information Organization (NHHIO) is now available for hospitals and providers to send their required public health reporting information to the state. Given that this is a recent development, many hospitals and providers do not yet have the technical capacity to use this function; however, New Hampshire expects public health reporting will encourage NHHIO's continued and expanded use.

In a few states, changes to privacy legislation facilitated HIE progress. Stakeholders across several states identified the opt-in consent model, where a patient must actively consent for providers to exchange their health data, as an impediment to the program. Grantees spent time and financial resources on education campaigns and other efforts to convince patients to opt-in, yet the build-up of a participant base was slow. In Utah, the state's opt-in consent model initially impeded UHIN's efforts to develop a central data repository. To address this issue, Utah passed HB 46, a law that automatically includes Medicaid, Medicare, CHIP, and

Public Employees Health Program beneficiaries in the cHIE unless they opt-out.[33] Utah has since moved to a HIPAA model, which is similar to an opt-out consent model; providers can exchange information for treatment, payment, and health care operations without explicit patient consent. Iowa faced similar obstacles with their opt-in consent models and subsequently adopted an opt-out model to facilitate greater patient participation and accelerate data availability through IHIN. In contrast, Mississippi and New Hampshire use opt-out models for their programs and stakeholders did not report experiencing any particular challenges to progress stemming from the consent model.

The original legislation governing HIE in New Hampshire (Section 332) limited electronic exchange to communication "between providers for the purposes of treatment only," with the term "provider" narrowly defined as only those individuals or entities who are directly providing health care. This definition excluded third parties such as the state public health department, payers, and those otherwise granted access under HIPAA rules. The state changed the law to allow the public health department access to data and there are current efforts to expand the definition of "provider" to align with HIPAA more closely.

Engagement of and Collaboration with Leadership and Key Stakeholders

Stakeholder buy-in and collaboration among relevant entities strongly influenced HIE progress. Grantees experienced varying levels of success marketing HIE as a concept and promoting the use of HIE systems to leadership and key stakeholders, including payers and Medicaid. Across states, the concept of ensuring major health care players collaborated on and bought-into program efforts manifested in several ways, and stakeholders viewed "big players" differently depending on their market. If grantees were unable to sell the HIE concept to big players, the path to success was more difficult. In Wyoming, stakeholders reported a partnership with Medicaid could have helped. However, Medicaid had already invested in the Total Health Record (THR), an EHR system, making the THR and eHealthWyo virtual competitors.

Vermont, Utah, and New Hampshire engaged stakeholders early on, including them in workgroups regarding governance and technical infrastructure. In Utah, UHIN's prior history as the community clearinghouse for claims data allowed UHIN to establish relationships with providers and community stakeholders. They continued to build upon these relationships in the context of the State HIE Program, which were instrumental in creating community goodwill toward HIE efforts.

Continuing to engage stakeholders beyond the initial implementation phase was also important. Stakeholder engagement largely manifested as participation on grantees' boards. Many stakeholders that initially participated in New Hampshire's early workgroups eventually served on NHHIO's board and continued to give input and engage their respective organizations. Additionally, eHealthWyo had five voting members on its board, representing two large hospitals, a small critical access hospital, the Medical Society, and one major payer. These stakeholders were very committed to HIE efforts and were extremely supportive of the former CEO of eHealthWyo. Stakeholders also reported development and maintenance of partnerships among other entities, such as ACOs and PCMHs exists, may help drive HIE demand and progress.

Establishing synergies across federal programs helped grantees align goals and promote HIE progress. Stakeholders in all six states mentioned the benefits of strong collaboration between the REC, the State HIE Program, and state Medicaid. Vermont's REC, Medicaid, and VITL disseminated a consistent message around HIE and worked together on communication and outreach. The co-location of the REC in VITL

enables a tight integration of outreach to providers with the more technical side of their operation. The aligned goals also extend to their relationship with Medicaid. These organizations also work closely with the Vermont Department of Health to support successful public health reporting. In Utah, the REC was instrumental in collaborating with Medicaid, public health, and others to support providers in meeting meaningful use requirements in the beginning of the program. The collaboration between the Department of Health and Medicaid eased providers move toward meaningful use, which built upon the high level of trust that historically existed in Utah.

> *"It's very complicated and you have to be in it for the long haul and not get frustrated because whatever you think is going to take X amount of time, you should probably quadruple it. Don't get discouraged, just keep plodding away."*
>
> *– Hospital representative*

Collaboration between grantees and RECs has been particularly beneficial to state HIE efforts. RECs have frequent contact with providers, allowing them to reinforce the value and uses of HIE. Therefore, collaboration between the State HIE and REC programs creates a coordinated and united front from which to engage providers. In New Hampshire, NHHIO and the REC are run by the same contractor, the Massachusetts eHealth Collaborative (MAeHC). Thus, both programs have a close relationship and experience working together. They often work in tandem to promote HIE efforts. Further, the New Hampshire State HIE Program and the REC worked to promote the state's immunization registry and help providers set up connections to the registry. The Iowa REC, Iowa Medicaid and IHIN worked closely in outreach and marketing efforts for IHIN. Representatives from the REC and IHIN jointly attended professional association meetings (e.g., for the Primary Care Association and the Medical Society) to promote health IT adoption and help providers meet MU requirements.

Lessons Learned in Mitigating Exchange Challenges

Stakeholders described many lessons learned as a result of challenges they encountered while enabling HIE services, including difficulty with stakeholder engagement for participation in the program and technology related challenges. This section discusses the various strategies grantees employed or would employ to mitigate the challenges they encountered to continue moving HIE efforts forward.

Challenges with Stakeholder Engagement

In order to address challenges related to stakeholder engagement, especially garnering provider buy-in and participation, grantees noted the need to build exchange capabilities incrementally and achieve a critical mass of data availability to offer participating organizations value in using the HIE system.

Building Exchange Capabilities Incrementally to Offer Stakeholders 'Small Wins'

Stakeholders believed a focus on building "massive" infrastructure and setting intangible goals that were difficult to envision could discourage provider and stakeholder engagement. Instead, stakeholders agreed the best way to maintain stakeholder interest is building a strong foundation and expanding over time; demonstrating small, incremental accomplishments and focusing on concrete goals to keep everyone on track.

Enabling HIE statewide should be a gradual process with room for course-corrections and flexibility to respond to market needs and manage inevitable challenges. Stakeholders in four states highlighted the importance of quick, early wins, necessary to build trust as opposed to the "build it and they will come" approach. In Utah, one stakeholder believed UHIN put too much emphasis on building something big that would eventually have a payoff. Whereas, in Iowa, one informant noted that initially the end goal was difficult for stakeholders to imagine, prompting them to shift focus to more concrete short-term benchmarks. Stakeholders in several states reported enabling HIE services and establishing state-offered services took longer than they anticipated, meaning small, incremental successes maintained morale.

Slow and deliberate progress is also important for sustainability in terms of assuring the plans are financially sound and the program is self-sustaining. Given the enormity of grantees' task in an ever-changing health care environment, a certain amount of organizational flexibility is important for responding to market needs. Stakeholders in Iowa noted state governments are not the most nimble players and this presented challenges to addressing market needs that needed to be met quickly.

Engaging Large Health Systems to Garner Provider Participation

Market consolidation within a state —meaning the presence of small versus large practices and independent versus health system-owned and affiliated providers—played a significant role in determining grantees' implementation strategies and their ability to reach and communicate with relevant parties. The purchase of smaller hospitals and physician practices by larger hospitals is a recent trend in the United States, stemming largely from a substantial reduction in the use of inpatient care and incentives under the ACA.[34] Consolidation reduces the cost of HIE for smaller practices, especially those with minimal or no investment in existing systems (migrating or integrating systems does have associated costs). Smaller providers can rely on the infrastructure of larger systems, while also improving their access to HIE. Whereas, a highly dispersed market poses challenges for connecting smaller, independent practices with limited resources and limited opportunities to leverage existing infrastructure and services through strategic partnerships.

Alternatives to state-led services compete for large health system participation. A trend toward private HIE networks interfered with provider participation in statewide efforts. Prior to the State HIE Program, many large health systems were already engaged in developing 'enterprise' HIE systems, connecting providers within their network. Additionally, EHR developers are currently expanding their EHR capabilities to include HIE solutions. For example, Epic has its own HIE platform that facilitates exchange between Epic and non-Epic systems. Large hospital systems tend to favor in-network HIE and are reluctant to participate in broader community-based HIE, as broader information sharing does not always align with their business interests. Given the various available HIE solutions, not all providers see value in state offered HIE services.

> *"Large systems did not need to be sold on the benefits of HIE. They were already doing it. A large system reminds me every day that they don't need us… they are so big and they are self-reliant and competitive. They are [participating in the State HIE Program] for now. But how long that lasts is a question mark."*
>
> *– Health IT Coordinator*

Market consolidation is a strong factor in participation. Markets with high levels of consolidation discovered the importance of large health system participation. Stakeholders in some states noted establishing connectivity with large delivery systems is very important because hospital data provides significant value to ambulatory providers and makes their participation more likely. VITL attributed part of their success to this strategy, as well as to a relatively uncompetitive health care market that facilitated VITL's engagement with large health systems. Similarly, Iowa's confidence in IHIN's future success derives from the participation of the state's four large health systems and largest commercial payer via a Memoranda of Understanding, which guarantee several years of participation.

Mississippi realized the importance of securing the participation of large hospitals when smaller practices joined MS-HIN and needed exchange partners. However, due to competition, some of the bigger hospitals did not connect to MS-HIN. Absent these major referral points, participating physicians did not see the full benefits of HIE. Stakeholders in Mississippi reported that given another chance, they would prioritize connecting large delivery systems. In New Hampshire, many physician practices are hospital-based, allowing NHHIO to capture a large portion of the market by engaging large hospital systems and their affiliates. Similarly, Iowa's highly consolidated market consisting mainly of two large networks, each with a large number of affiliated critical access hospitals, offered IHIN a smaller target for outreach and engagement efforts. In contrast, Wyoming's state demographics challenged HIE progress—the state consists primarily of smaller, independent practices dispersed throughout the state. eHealthWyo had to reach out to individual practices to educate them and gain buy-in from providers.

Achieving a Critical Mass of Data Availability to Offer Value to Participating Providers

Grantees with query-based services reported limited use of the functionalities. In the earlier round of case studies, availability of query-based exchange was a challenge. As the program and market have matured, query-based exchange is broadly available in 33 states;[35] however, grantees experienced difficulty achieving broad use of the system. In Iowa, although three of the largest health systems established interfaces to enable query-based exchange with the statewide HIE system, the development of these systems was slow and providers did not use the functionality. In Mississippi, though MS-HIN provides query-based access to retrieve clinical results and search for patient-centric clinical summaries, use of this functionality is still limited. MS-HIN noted one challenge with query-based exchange has been the need for providers to log out of their EHR system and into a separate portal in order to query MS-HIN for patient data. Instead, hospitals want to have data pushed into their native systems so they do not have to log into a separate system to access the information.

Providers derive value from query-based systems when there is a critical mass of data available and it is easily accessible. Stakeholders across states noted providers must be able to find patient information easily and readily when they initiate a query. Stakeholders reported it is very damaging to the reputation of state efforts when provider queries return insufficient results, leading users to conclude the system is not useful. Even when more data becomes available in the future, they fear the users who have been disappointed previously will not bother to return to use the system. In Utah, the absence of data and gaps in data within the cHIE led providers to question the value of the entire system. In Iowa, the first health system ready to go live with query trained approximately 1,000 providers on how to use the system. However, given other systems were years away from being ready to join, it was unlikely hospital providers would see immediate value in

HIE. Stakeholders in Vermont felt it was worth waiting until they reached a tipping point in participation and accumulated data before allowing providers to query the VHIE.

Health IT-Related Challenges

Often, grantees experienced challenges related to technology, including limitations in the capabilities of HIE developers, lack of interoperability among EHR and HIE systems, and poor data quality related to data collection issues at the point of care and technical issues around standards and patient matching.

Addressing Technological Limitations through Collaboration and Engaging Multiple EHR and HIE Developers

Stakeholders in all six states noted several developer-driven challenges, including limited capacity of EHR and HIE developers to support HIE implementation and lack of support for providers not incented under meaningful use (e.g., long-term care providers). Stakeholders noted EHR developers have worked within their own timeline and priorities, remaining mostly focused on EHR installation and upgrades, and have not prioritized HIE. As a result, they offered varying levels of services and capabilities to providers, impeding the progress of establishing interfaces to grantees' systems. Stakeholders also reported issues with developers who overpromised and under-delivered services. In one state, the HIE developer was unable to deliver a functioning federated architecture, thwarting HIE progress. Overall, delays and unfulfilled services meant some grantees were unable to meet expectations of HIE participants.

> *"No one aligned the MU and HIE programs and it has not worked out. Significant technological standards have been smoke [and] mirrors to actual connectivity. It shouldn't be this hard."*
>
> – *Regional Extension Center*

A grantee's ability to establish the needed infrastructure depended on their relationship with their developer. Synergies between grantees and the HIE developer's IT staff greatly improved grantees' ability to establish interfaces and connectivity with providers in the state. More established and larger grantee organizations often have staff, resources, and in-house technical expertise; therefore, they tend to push HIE developers for more self-service capabilities. Smaller grantee organizations and public organizations often face challenges with staffing and lack HIE resources, meaning they tend to rely on the technical expertise of the HIE developer. Vermont's close collaboration with the HIE developer resulted in a mutually beneficial partnership where each organization's technical staff was equally involved in implementation. As a result, VITL was able to troubleshoot and address issues encountered in establishing interfaces with providers, rather than all questions funneling toward the developer. VITL then provided feedback to the HIE developer to help them improve their product and service offerings. Stakeholders in Vermont noted this symbiotic relationship is partly responsible for VITL's ability to move HIE forward in the state. In contrast, MS-HIN and its vendors have discreet roles and tasks; the HIE developer handles connectivity with health systems, setting up interfaces, troubleshooting, and working with the hospitals.

Some grantees are migrating toward a "best-of-breed" approach for their HIE system. For some grantees, relying on a single HIE developer to build the technical architecture for the program slowed progress, as HIE

developers often had limitations in their software capabilities. In response, some grantees migrated to a 'best-of-breed' approach, contracting with multiple IT developers each with proven solutions in a specific area. One HIE developer noted the 'best-of-breed' approach is a natural consequence of a maturing health IT market. In Utah, limitations with the HIE developer's capabilities to develop a federated infrastructure caused UHIN to shift towards a 'best-of-breed' approach. UHIN noted the move cuts costs and provides the organization with the agility to address market and stakeholder needs. UHIN cautioned that because it has its own data center and IT staff, it is equipped to integrate systems from different vendors; however, other states may not have the in-house expertise and technical resources to manage the systems.

Working around Lack of Interoperability through Alternate Exchange Mechanisms

Stakeholders in all six states reflected on the need for truly interoperable systems, currently absent because of lack of adoption and inconsistent implementation of available standards for vocabulary and exchange, variability in document formats, and issues with interface designs. According to grantees, existing standards (i.e., Systematized Nomenclature of Medicine (SNOMED) and Logical Observation Identifiers Names and Codes (LOINC)) are not as complete as they should be, so developing interfaces is not a 'plug-and-play' activity. For example, a provider may need to support a point-to-point interface with their lab provider, a separate interface to the state immunization registry, and one to a local, regional or statewide HIE system. Especially for small providers, the development and maintenance of multiple point-to-point interfaces is resource intensive and cost prohibitive.

Stakeholders see potential in hub solutions. Some EHR developers are now establishing their own HIE hubs, which only require one interface from the provider EHR to the hub instead of multiple point-to-point interfaces. EHR developers are at various stages of implementing their hub solutions. Some providers and other stakeholders noted the potential value of a community-wide exchange system; one connection to all data versus many point-to-point connections. A HIE developer noted that because organizations use different HIE systems or create their own internal networks, having a local, regional or statewide hub bridges the gap between organizations efficiently, while allowing organizations to keep their native technologies. Additionally, a community-based HIO can provide economies of scale, such as a centralized master patient index for matching patients across systems and data consistency and quality checks. For small and independent practices that lack EHR systems or resources to establish their own HIE networks, a community-based HIO offers providers exchange options they would not otherwise have available.

> *"As organizations mature and gain greater IT talent and have more control of their destiny, they will want to invest in tools that can use data in different ways, pursue a different path, and have a quicker way to bifurcate and support that need. That is driving the need to find specialty products to solve specialty problems. Everyone capitalizes to deliver on niches; winning vendors are the ones that embrace it, not fight it."*
>
> *– HIE developer*

Some grantees and HISPs are looking to DirectTrust as a potential solution to interoperability related to Direct services. EHR and HIE developers encountered a new set of challenges in enabling Direct services related to HISP-to-HISP interoperability. One grantee has been trying to implement standards for Direct secure messaging but HIE developers vary in their interpretation of those standards. Such variation has been a

barrier to aligning true interoperability. Some EHR and HIE developers reported HISPs vary in their interpretation of Direct standards or do not share provider directories, limiting their ability to connect with each other and transfer information. Moreover, providers need to ensure their HISP includes HISP-to-HISP connections with all of their trading partners; otherwise, it is of limited utility.

DirectTrust is an organization that develops, promotes, and enforces as necessary best practices to maintain security and trust within the Direct community.[36] Some EHR and HIE developers believe DirectTrust will help scale connectivity with multiple networks by providing network-to-network functionality and making it easier for clients to find one another and communicate to scale Direct messaging. However, others believe DirectTrust is limiting the ability to connect to HISPs if they are not DirectTrust accredited. Additionally, although DirectTrust accredited HISPs have the potential to establish connections properly, many of them are not taking the next steps needed to actually connect.

Mitigating Data Quality Issues through Data Matching Algorithms and Cleaning Initiatives

Among its requirements, meaningful use has begun specifying data elements providers must collect for eventual exchange and use. However, a few states reported data quality issues have impacted downstream usability of data. Data quality issues include data completeness (ensuring systems capture all the necessary elements) and data accuracy (systems may transpose data into wrong fields during the data transfer process from the hospital to a regional HIO). For example, a patient's address may show up in the name field or the name field may have numerical values instead of text. In more extreme cases, when a patient is deceased systems may not consistently record and share this information with other systems. Data quality has consequences for entities planning to use data for quality improvement and care transformation processes. For example, providers managing chronic disease patients may inadvertently reach out to a patient who is now deceased. At all levels, understanding the mechanics of how systems capture, maintain, and translate data is important to ensure high quality data.

Stakeholders in Vermont and Utah also noted a need for reliable patient matching. Incorrectly matching a patient to a health record may have serious consequences, such as wrongful disclosure and medical error (e.g., treatment based on another patient's health record).[37] Stakeholders do not necessarily trust an HIO will correctly manage their data if they feel the matching capabilities are inadequate. Stakeholders also reported maintaining provider trust in data systems and their value becomes a losing game when they have to contend with data quality issues.

To address data quality issues, grantees are developing more robust data matching algorithms and creating data cleaning teams. In Utah, the Department of Health uses a specialized matching algorithm designed for the Utah population. Other grantees sought health IT developers who specialize in patient matching to conduct patient identify matching. Vermont deploys BluePrint Sprints, a team-based data quality initiative where representatives engage providers in the community to clean their data before it reaches the HIE system. Vermont considers a Sprint complete and successful when the lead clinician for the project and a Blueprint project team representative verifies and attests to data quality from the source EHR, through the VHIE, to the Blueprint clinical registry.

Sustainability Models

An important goal of the State HIE Program is to ensure sustainability of HIE beyond program funding. As a result, ONC charged states with developing sustainability plans as part of their program activities. Local market characteristics, and present or anticipated stakeholder needs strongly influenced grantee sustainability models. The better attuned grantee services are to local demand, the more likely it is they can justify charging for services. In this section, we discuss five grantees approaches to sustain their HIE efforts (see Table 4).

Given eHealthWyo in Wyoming dissolved its program shortly after the end of the State HIE Program, we discuss the state minimally in this section. Stakeholders cited a variety of difficulties that led to the decision to end services in Wyoming. Some cited the lack of resources—only one full time staff member at eHealthWyo was tasked with assessing needs and opportunities, guiding implementation, and ensuring sustainability. Others mentioned the cost of connecting was prohibitive for many potential trading partners. Others believed the eHealthWyo services did not adequately meet local needs, including strong alignment with meaningful use. Since the shuttering of eHealthWyo, the Wyoming legislature passed an appropriation to continue to support the five hospitals that onboarded to eHealthWyo prior to the shutdown.[38] The Department of Health oversees this funding and has maintained services through Nebraska's SDE, the Nebraska Health Information Initiative (NeHII). The Department of Health has engaged with a consultant and is convening local stakeholders to determine how best to continue enabling HIE services in the state.

Table 4. Grantee Approaches to Sustainability

	Data Contributors	Fee Structure	Policy Levers and Funding	Current/Planned Use Cases
Iowa	▪ Hospitals ▪ Provider practices ▪ State government agencies ▪ Payers ▪ Long-term care centers ▪ Home health providers ▪ Pharmacies ▪ Labs	▪ Subscription fees	▪ HITECH Medicaid 90/10 funding ▪ ACO development	▪ Exchange of hospital transcription notes ▪ E-prescribing ▪ CCD exchange ▪ Lab and radiology orders and results ▪ ADT records ▪ Potential use cases: enhance population health/clinical research/business research goals; pharmacy uses; eligibility/insurance verification
Mississippi	▪ Hospitals and providers ▪ State agencies ▪ Medicaid ▪ Other payers	▪ Subscription fee model	▪ ACO development	▪ Establishing bi-directional exchange between providers and state-offered services. ▪ Meaningful use functionalities for ambulatory providers ▪ Alerts notification system to provide payers inpatient and ER admits and discharges

	Data Contributors	Fee Structure	Policy Levers and Funding	Current/Planned Use Cases
New Hampshire	▪ Hospitals and providers ▪ Payers report being willing to contribute, but are not yet able to use the state's HIE system due to legal restrictions	▪ Subscription fee model ▪ Some larger hospitals covering infrastructure set-up costs for smaller entities	▪ ACO development ▪ Proposed SB 229 to expand use of HIE to support coordination of care efforts	▪ Query-based exchange ▪ NHHIO services to support care transitions, public health reporting, and lab exchange to meet meaningful use requirements ▪ Electronic Master Patient Index (EMPI) to provide information for a Relationship Listing Service
Utah	▪ Insurers, providers, and hospitals each contributing 1/3 of the cost of cHIE	▪ cHIE funding from subscription fees	▪ State will support a non-profit HIE (cHIE) as the SDE to enable small independent providers to be connected to these larger systems post HITECH funding	▪ ADT alerts and notification to payers ▪ Stage 2 meaningful use functionalities ▪ Products to support the needs of long-term care and behavioral health providers ▪ New MPI to ensure correct patient matching, linking, and identification ▪ Potential uses: case management, reducing utilization, HEDIS reporting for Medicare Advantage plans
Vermont	▪ Hospitals and providers (anticipated)	▪ To be determined	▪ Tax on medical claims ▪ HITECH ▪ ACO development and payment reform models being tested as part of current SIM grant ▪ Additional grants to allow VITL to expand VHIE capabilities	▪ Query-based exchange ▪ Data products and services such as data analytics for health care organizations and ACOs ▪ Medical image archival storage for hospitals ▪ Stage 2 meaningful use functionalities ▪ Connecting hospitals to neighboring HIOs
Wyoming	N/A	N/A	N/A	N/A

Market Needs

In the short-term, grantees are trying to identify use cases that align with the market. VITL in Vermont, like other SDE-like entities, is actively assessing market HIE needs and expanding its analytic capability in support of health care reform and payment efforts. UHIN is focusing on establishing ADT alerts, leveraging services they have already developed for Stage 2 meaningful use, and developing new services to support long-term care and behavioral health providers. Vermont has a three-pronged strategy for sustainability, which consists of: 1) deriving commercial value from existing services; 2) providing fee-based data services for health care organizations, such as data transport and analytics; and 3) expanding services to potentially include consulting, medical image archival storage for hospitals, and connections to neighboring HIOs. Mississippi and New Hampshire see value in continuing to build out query-based exchange as stakeholders see an increasing need for establishing robust query-based exchange.

Subscription Fees

All five states plan to use a subscription fee model – though with differing fees and payment timelines – as part of their sustainability plans. Iowa, New Hampshire, and Mississippi have annual subscription fee schedules that vary by stakeholder type and size. Utah has a three-pronged model where insurers, hospitals, and providers each pay one-third of the cHIE cost. UHIN anticipates maintaining the transaction fee model already established for claims data. VITL, like other SDEs in other states, is actively assessing market HIE needs and expanding on its analytic capability in support of health care reform and payment efforts.

All grantees will need to work with their hospitals and providers to devise an affordable payment scheme for services with demonstrated value. New Hampshire will base its payment scale on provider practice size and annual income. Large entities with high transaction volume typically pay a per-transaction fee; NHHIO is assisting smaller providers and hospitals for whom transaction fees would be too expensive and are instead charging them an annual rate. Similarly, in Utah clinicians pay a fee based on practice size while hospitals pay based on their prior year's discharges. Post-HITECH, the state will continue to offer financial support to the cHIE as the statewide HIE entity to make available HIE options for small independent providers not connected to or affiliated with larger systems. UHIN also intends to explore additional use cases of interest to key stakeholders in order to continue providing value and will therefore maintain paid subscriptions.

Interstate Exchange and Infrastructure Sharing

Given patients often seek care in neighboring states, many providers highlighted the importance of interstate exchange. Meanwhile, many grantees find the costs of building and maintaining HIE infrastructure to be financially untenable. To address this dual challenge, grantees suggested they may find greater value proposition in their HIE investments if organizations in neighboring states agree to exchange data and "rent" access to their infrastructure. This arrangement would ensure that—in addition to sustainable funds for the host state—partners would have ample information to populate their shared system, thus mitigating concerns over under-use and low return on investment. Furthermore, it would offer a solution to states motivated to exchange but wary of the start-up costs. Infrastructure sharing would also lower the threshold of participation for states with high need but limited funds and enthusiasm for managing the details of exchange. Finally, this sustainability strategy would further the goal of creating a system in which health records truly follow the patient; a philosophical ideal that many grantees and providers would like to see become a reality. Utah would like to exchange immunization data with nearby Idaho and may find other geographically proximal partners interested in both information and infrastructure sharing. Wyoming suspended its state-led program and is currently evaluating how best to leverage existing infrastructure, including connecting with neighboring states like Nebraska and Colorado who already engage in shared HIE services, as both a financial strategy and a means to serve their shared patient population.

Policy Levers

Grantees are using various state and federal policy levers to ensure continued funding for their HIE programs. Iowa will use HITECH Medicaid 90/10 funding to sustain the program, which it believes will provide for one or two years of additional services. Prior to HITECH, a tax on medical claims, V.S.A 4089: Health Care Claims Assessment and Health Information Technology Assessment funded VITL in Vermont.[39] Vermont

will continue to rely on the state tax on medical claims until 2016, which raises $5 million per year for the state health IT fund. The state uses the money to incentivize providers to join VHIE, build interfaces for providers, and support VITL in providing REC-like support to providers on issues related to EHRs and subsequent phases of meaningful use.[40]

A few states are considering options to leverage the knowledge base surrounding their RECs in order to assist providers with Stage 2 meaningful use and beyond. In Mississippi, the Division of Medicaid plans to engage with a group of consultants that previously worked for the REC. In Vermont, the state will continue to fund VITL in their role as the REC. In Utah, state Medicaid hired a resource to assist providers with Stage 2 meaningful use.

Stakeholders also point to payment reform policies, and specifically ACOs, as a cornerstone of their sustainability plans. As mentioned previously, HIE is important for the development of ACOs because the participating entities will need infrastructure to efficiently and effectively share data with each other. Rather than build it themselves, newly formed ACOs can turn to existing HIE infrastructure for a fee. As ACOs continue to form and grow, their demand for HIE services will presumably increase and as HIOs and services continue to advance, ACOs will be able to take greater advantage of these systems to bolster their own growth. The development of one will support the development of the other.

Payer Engagement

Some grantees actively engaged payers, for use cases such as case management, reducing utilization, and HEDIS reporting for Medicare Advantage plans, to provide continued funding to sustain HIE services. Utah has a three-way model for funding the cHIE: insurers pay one third of the total cost, hospitals pay another third, and providers pay the final third. Payers are coming to the table specifically for clinical data and access to pre-authorization for Medicaid. Payers in New Hampshire have compelling use cases for payers to participate with NHHIO, including receiving provider data for the quality reporting aspects of payment innovation models, streamlining the prior authorization process, receiving and sending patient records for risk identification, and increasing communication with providers for the overarching goals of quality improvement and cost reduction. However, legislative restrictions on NHHIO limit its use to providers for treatment purposes only. NHHIO hopes to see this policy revised as it continues to expand the scope of its services, so that payers can contribute data and financial support to help with sustainability.

Pursuing long-term sustainability requires grantees to expand their payment base by seeking out new financial contributors—payers, ACOs, and long-term care providers—and offering reasonably priced services to meet their needs. For some grantees, this also requires removing policy barriers and leveraging other funding streams, such as the medical claim taxes and Medicaid 90/10 matching.

Impact of the State HIE Program

Understanding the impact of the of the State HIE Program four years after HITECH is essential as states move forward with expanding their HIE efforts and leveraging existing infrastructure for health care and payment reform efforts. This section discusses stakeholder perspectives on the impact of the State HIE Program in their state.

Instrumental in Building Collaborative Efforts around HIE

Stakeholders in five states noted the State HIE Program contributed to building awareness of HIE and the benefits of exchanging information. Many stakeholders, across states in various stages of implementation and with various levels of HIE success, noted the work that went into securing the Cooperative Agreement grant funding and the collaboration required to set up the programs were instrumental in building awareness about the importance of HIE amongst all stakeholders. Stakeholders in most states described how hospitals and other providers are becoming more aware about HIE and the state efforts to help them exchange data and meet meaningful use requirements. Additionally, stakeholders across all states noted the work of the State HIE Program ensured physicians in small practices and safety-net providers (e.g., critical access hospitals and federally qualified health centers) who were not previously exposed to HIE gained an understanding and appreciation for how HIE could benefit their day-to-day activities and their patients. Stakeholders indicated close collaboration between the HIE program and the REC ensured a deeper comprehension of how HIE fit into the bigger picture of health, health reform, and desire for HIE capabilities. Furthermore, stakeholders in all of the states conveyed a general sentiment that a state-based HIE effort is important because of the neutrality of their role.

Aside from raising awareness amongst providers, stakeholders in half of the states also noted the State HIE Program built understanding and acceptance of HIE among state government officials, including the governor and legislative bodies. In these states, state government leadership was cautious and slow in how they proceeded due to privacy and security concerns. Today, however, there exists greater awareness of the clinical benefits of HIE and a keener understanding of what is needed from state governments to enable HIE services.

> *"[The State HIE Program] kick started a collaborative effort across the state that gave it the needed a punch in the arm to get it moving. Something like this would not have happened without the [ONC initiative]. Quickly, it's evolving into something that is beneficial to many organizations and to the population in the state."*
>
> *– HIE Developer*

Stakeholders reported a breakdown of silos and commented on the many collaborative efforts the program fostered. Several stakeholders from different states agreed that both the ONC stipulations for grant funding and the enormous scope of implementing a State HIE Program ensured participation from a wide variety of stakeholders who are not often all at the table. Several stakeholders conveyed how the program created a neutral space for organizations (in particular, hospitals and hospital systems) that are usually competitors to join and work toward the same vision of meaningful data exchange. Even though the EHR Incentives Program did not incent long-term care and behavioral health providers, the State HIE Program was instrumental in engaging these stakeholders, identifying their specific needs and the gaps that need to be filled particularly around care continuity. Similarly, providers highlighted the importance of the program as a

clearly defined and organized resource for them to seek support and to help them advance HIE capabilities of their own practices, especially in rural states and among small practices.

Established the Necessary Foundation and Infrastructure for HIE

Stakeholders across states agreed it is too early to determine the full impact of the State HIE Program; however, they noted it was instrumental in laying the infrastructure upon which future exchange efforts can take place. Several of the states are on the verge of- or just starting to implement- query-based exchange and stakeholders from those states all conveyed organizations need more time to fully implement these capabilities and assess impact. Stakeholders noted that the program funding combined with other HITECH initiatives accelerated advancement that would not have otherwise occurred or would have taken many more years to accomplish.

> *"Unfortunately, there has not been much of an impact yet. Structurally, the pieces are there, but the interfaces have not been created or made live yet. All participants are sitting around talking about it, as they have been for years."*
>
> *– Large health system*

A few stakeholders were less optimistic about program impact and the role of information exchange. These stakeholders mentioned uncertainty as to how to measure progress from the states' HIE pilot projects and how many providers were exchanging information in a meaningful way. These stakeholders mentioned that their particular state spent time and money on short-term, one-off solutions instead of working toward the long-term vision of interoperability that is so critically important.

Facilitates Care Transformation Efforts

In all states, stakeholders noted the importance of information exchange in care transformation efforts and how the ACA and other health reform efforts promoting ACOs, PCMHs, and other payment models will dramatically increase the value of state HIE efforts. Stakeholders in two states that are farther along with their payment reform efforts described how prior investments in HIE positioned them well to leverage existing and further expand infrastructure to support care transformation. In the remaining four states, stakeholders foresaw HIE as playing a critical role in health reform efforts. Specifically, stakeholders in each of these states noted that infrastructure enabled under the State HIE Program would facilitate information flow between entities forming ACOs. Many stakeholders noted that ACA and payment reform efforts give important context to the State HIE Program and helped to encourage buy-in from providers. They emphasized that ACOs and PCMHs must work closely with grantees and other HIE organizations to maintain and improve their exchange capabilities.

Policy Implications

The past four years of the State HIE Cooperative Agreement has witnessed unprecedented growth and development in the HIE infrastructure of the nation, as well as broader changes in the health care delivery system. As program funding ends and states and other organizations pursue e-health efforts, these summative case studies point to several important opportunities at the federal and state level.

The State HIE Program highlighted the important role states play in leadership and coordination, particularly in convening stakeholders, policy development, and needs assessment. With Stage 2 meaningful use unfolding, future phases of meaningful use to follow, and health care and payment delivery reform efforts taking hold, there is an increasing need for coordination – and further definition of the role and function of state government in the continued transformation of the health care delivery infrastructure.

There is a critical need for strong, ongoing support related to standards and interoperability. Despite significant progress in the electronic exchange of information, systems have yet to realize true interoperability. To fully achieve health care transformation, the scope of interoperability efforts needs to extend to settings critical to care transformation, despite being outside the central focus of meaningful use (e.g. long-term care, behavioral health, and home health). In addition, federal and state level efforts can support standards around shared services for statewide interoperability and state implementation of use cases related to the ACA.

A provider- or federal-led effort to obtain buy-in from developers for overarching HIE goals may be warranted and needed to change perceptions of interoperability. Developers have substantial control over the HIE arena as service providers and could significantly advance HIE, if motivated. Given the trajectory of meaningful use requirements, provider demand for certified technologies with HIE capabilities will continue to rise. Rather than labor solely on EHR upgrades and limited services that leave providers dissatisfied, EHR and HIE developers could look ahead to future requirements, current needs, and persistent complaints and choose to embrace the business opportunity HIE presents. Many hospitals systems have had HIE capable systems for years within their networks, so it is only a question of broader deployment and/or building HIE capabilities into every basic system. Interoperability is the more difficult challenge since, in some ways, it runs contrary to the business interests of EHR and HIE developers. Absent buy-in from developers, additional governmental policy actions related to HIE could ensure providers have the options they want and need to achieve their patient care and quality goals. On the other hand, many developers recognize interoperability is a federal and a provider priority that they will need to embrace.

There is a need to assess how technical solutions evolve in different markets, to develop and disseminate best practices, and to develop governance and oversight requirements at a state and national level. Case study findings show market-based HIE has an important and ongoing role in fulfilling provider HIE needs. Under the State HIE Program, many states pursued market-based approaches to HIE; however, questions remain as to what providers and organizations need to support broad-based exchange.

Organizations should monitor findings and best practices for sustainability from existing federal and state level initiatives leveraging pay-for-performance models. While many are and should expect grantees to find sustainability mechanisms for HIE, it is important to note that with increasingly difficult requirements in future stages of meaningful use, grantees will continue to need financial and technical support. Findings from the State Innovation Model Initiative test states and the Health Care Innovation Awards grantees funded through CMS may offer important lessons and guidance on how other organizations can tie their sustainability plans to pay-for-performance initiatives.

Conclusion

The HIE landscape has evolved dramatically in the four years since the State HIE Program's inception. Under the program, grantees made progress in enabling infrastructure to support HIE either directly or by leveraging existing market activities. There has been a marked increase in exchange options at the local, regional, and national level. EHR and HIE developers are also making significant investments to expand their HIE offerings.

States profiled in this round of case studies have made progress with engaging with key stakeholders, garnering stakeholder trust and participation in HIE, expanding HIE options for providers, and addressing persistent challenges and barriers. The findings presented in this report, while not representative of all state-enabled efforts, identify lessons learned around building exchange capability in a slow and incremental way, selling the idea of HIE to big players, and tackling issues with HIE developers.

The summative case studies offer insights that may assist other states and policymakers in their ongoing HIE efforts and also identify areas of important work as states and other organizations embark on leveraging health IT and HIE in support of health care and payment delivery reform efforts. Findings from these case studies suggest areas of necessary emphasis: defining the role of states in further e-health efforts and tackling the issues of interoperability, policy, and governance needs to support market-based HIE and sustainability. As the 'training wheels' come off and states embark on the next phase of HIE progress, they are well-positioned to build upon what is already in place and have identified the important issues that must be addressed to move forward.

Appendix A: State Profiles

Iowa

	Iowa
Population	3,090,416
Funding Amount	$8,375,000
Recipient Organization	Iowa Department of Public Health (State of Iowa E-Health)
State-Designated Entity (Lead Org.)	N/A
HIE System	Iowa Health Information Network (IHIN)
Technical Model	Federated
HIE Vendor	Xerox (formerly ACS, Inc.) Subcontractors: ■ Informatics Corporation of America (ICA): HISP and HIE software ■ Alere: State lab reporting and Medicaid Data Analytics
Approach to Direct	■ IHIN is serving as the state's HISP. They are deploying Direct through Informatics Corporation of America's Direct application.
Status of Direct and Query-Based Exchange	**Direct** ■ Direct became broadly available in July 2012. ■ As of January 1, 2014, there are 984 Direct accounts; 634 are medical professionals (i.e., nurses, physical therapists, dental assistants, occupational therapy, doctors) and 348 are health care support roles (i.e., billing office, technical users, office support staff, Medicaid staff). ■ Two of four early adopters (the organizations that signed MOUs) have recently given Iowa their internal list of Direct addresses, which will add 500-700 Direct accounts. ■ The use of Direct messaging remains very low. In the 4th quarter of 2013, Iowa reported 889 Directed transactions through IHIN. ■ Office managers and nursing staff, from both hospital and ambulatory settings, are the key users; they use Direct to push out records for referral. ■ IHIN is supporting the exchange of referral documents through Direct with bordering states, including Missouri, Illinois, Wisconsin, South Dakota, and Minnesota. **Query-Based Exchange** ■ Query became available in January 2013. One hospital is in production and is registering patients, and four other hospitals have executed participation agreements. ■ Participant subscribers are at various stages of completing the prerequisites to access the IHIN query services. Plans for roll-out at all the hospitals and clinics are just starting to be put into place.

Mississippi

	Mississippi
Population	2,951,996
Funding Amount	$10,387,000
Recipient Organization	State of Mississippi Department of Health (MSDH); originally Office of the Governor
State-Designated Entity (Lead Org.)	N/A
HIE System	Mississippi Health Information Network (MS-HIN)
Technical Model	Hybrid
HIE Vendor	Medicity
Approach to Direct	■ The Direct service became available in Mississippi in the beginning of 2011. ■ MS-HIN is serving as the state's HISP and they are deploying Direct through Medicity's iNexx application, which includes both Direct and a referral application. The Direct application can query the Provider Directory and users can attach files including but not limited to CCDs, and PDFs.[41] ■ The state's HIE strategy included using Direct for smaller practices (including solo providers and practices with five or less providers) to exchange with MS-HIN, given difficulty developing interfaces with the HIE system.
Status of Direct and Query-Based Exchange	**Direct** ■ Direct is broadly available in MS, though uptake is limited. ■ The main provider use case for Direct is meeting MU requirements (mostly for submission of immunization data). Providers use Direct to perform the test, not for ongoing submissions. ■ The REC has assisted 900-1000 providers to use Direct to meet their measures to attest to MU. **Query-Based Exchange** ■ Query-based exchange is broadly available statewide through a single service/entity, though use is limited. ■ MS-HIN provides query-based access for providers to retrieve clinical results and search for patient-centric clinical summaries.

New Hampshire

	New Hampshire
Population	1,323,459
Funding Amount	$5,457,856
Recipient Organization	New Hampshire Department of Health and Human Services (DHHS)
State-Designated Entity (Lead Org.)	New Hampshire Health Information Organization (NHHIO)
HIE System	New Hampshire Health Information Organization (NHHIO)
Technical Model	N/A - though NHHIO is in the process of developing a federated model for query-based exchange
HIE Vendor	Orion Health
Approach to Direct	▪ NHHIO is serving as the HISP
Status of Direct and Query-Based Exchange	**Direct** ▪ NHHIO is part of a Direct trust bundle through Orion. ▪ Various provider groups are still using other methods of exchange alternative to Direct. Home health agencies that do not yet have EHRs can use a web product that functions as secure email. The NH Medical Society provides a product called DocBooks for providers, which is a system for secure text messaging. Some organizations are using EHR-based exchange, especially in cases where several organizations have the same vendor, such as Epic. **Query-Based Exchange** ▪ NHHIO is currently testing its MPI system and is hoping to have it up and running by the end of May. ▪ NHHIO is hoping to have things in place for query-based exchange for Stage 3 meaningful use in 2017 since it looks like query retrieval will be a requirement at that point, so they want to have that functionality within the next couple of years.

Utah

	Utah
Population	2,900,872
Funding Amount	$6,296,705
Recipient Organization	Utah Department of Health (UDOH)
State-Designated Entity (Lead Org.)	Utah Health Information Network (UHIN)
HIE System	Clinical Health Information Exchange (cHIE)
Technical Model	Centralized
HIE Vendor	Optum, Insight (previously Axolotl)
Approach to Direct	■ UHIN began its work toward Direct by conducting a pilot with the Department of Defense using Direct to send patients for mammograms to local hospitals. The referrals and results back were via Direct. The VA is working to get their pilot going for same use case. ■ UHIN and Intermountain Healthcare are HISPs for Direct services. ■ Other potential use cases for Direct include interstate exchange (e.g., sending immunizations data to Idaho), exchange of information with providers that may not have EHRs, exchange with home health and long-term care providers, and exchange of behavioral health information.
Status of Direct and Query-Based Exchange	**Direct** ■ Direct is broadly available in the state. However, there has been limited uptake of Direct in the Utah market and providers are mostly using Direct for administrative purposes (primarily sending preauthorization requests to Medicaid). **Query-Based Exchange** ■ Currently, query-based exchange is broadly available in the state, but usage is low.

Vermont

	Vermont
Population	626,630
Funding Amount	$5,034,328
Recipient Organization	Department of Vermont Health Access
State-Designated Entity (Lead Org.)	Vermont Information Technology Leaders (VITL)
HIE System	Vermont Health Information Exchange (VHIE)
Technical Model	Hybrid
HIE Vendor	Medicity
Approach to Direct	■ Vermont implemented Direct on a very limited basis specifically to support behavioral health and long-term care providers. ■ Direct is ideal for behavioral health as it is sensitive information and the transport mechanism ensures that only the sender and the receiver get to see the content.
Status of Direct and Query-Based Exchange	**Direct** ■ While Direct is technically broadly available, use of Direct in Vermont has been very limited. **Query-Based Exchange** ■ Query exchange is available in regions. ■ VITL has prepared to launch query access by collecting data from providers so when VITL does launch VITLAccess, their query portal this summer, providers will have ample information readily available to make the HIE a useful tool. This will allow VITL to easier demonstrate the value of HIE.

Wyoming

	Wyoming
Population	582,658
Funding Amount	$4,873,000
Recipient Organization	Wyoming Governor's Office
State-Designated Entity (Lead Org.)	WY e-Health Partnership, Inc. (eHealthWyo)
HIE System	WY e-Health Partnership, Inc. (eHealthWyo)
Technical Model	Federated
HIE Vendor	NeHII/HIOSS (with Axolotl product, now known as OptumInsight)
Approach to Direct	▪ The Nebraska Health Information Initiative (NeHII) and HIO Shared Services, Inc. (HIOSS) served as the HISP and provided Direct through Axolotl/Optum Insight's application.
Status of Direct and Query-Based Exchange	eHealthWyo has dissolved the statewide HIE organization. However, prior to this, they had some activity related to Direct and query-based exchange. **Direct** ▪ Direct was broadly available. ▪ By the end of the grant, there were five hospitals using Direct to send ADT and lab data. One rural practice had also signed on to use Direct. ▪ There are about 270+ Direct addresses available, but usage was extremely low. As of Q4 2013, Wyoming had 413 Directed transactions. **Query-Based Exchange** ▪ Query was broadly available. ▪ By the end of the grant, eHealthWyo had on boarded five hospitals for query. Two hospitals finished their query interface two days before the grant period ended.

Appendix B: Health Care Market Characteristics of Case Study States

Prior evaluation work revealed a state's health care market characteristics, including level of market consolidation, play an important role in grantees' implementation of their HIE programs.[42] Table 4 shows each state's level of HIE activities, pre-HITECH.

Appendix B Table 1: States' Level of HIE Activities, Pre-HITECH

Characteristic	Iowa	Mississippi	New Hampshire	Utah	Vermont	Wyoming
Pop Density (Persons/Square mile)	54.5	63.2	147	33.6	67.9	5.8
Average Time of HIO Operation pre-HITECH (months)	9	29	78	0	32	0
Pre-HITECH Hospital Competition (HHI)*	0.52	0.51	0.79	0.54	0.78	0.4
Pre-HITECH Office-based Physicians EHR Adoption**	38%	33%	42%	52%	30%	22%
Pre-HITECH Hospital EHR Adoption***	45%	10%	15%	9%	15%	10%
Pre-HITECH HIE Investments	AHRQ-funded RHIO in northern Iowa Hospital-based networks	MS-CHIE pilot	Hospital-based networks	Utah Health Information Network; hospital-based networks; AHRQ State and Regional Demonstration Project	Blueprint for Health; Vermont Information Technology Leaders	Total Health Record; Wyoming Telemedicine/ Tele-Health Network Consortium

* We measure hospital competition within the hospital referral regions in the state by the Herfindahl-Hirschman Index (HHI), which ranges from 0 to 1. State HHI closer to 0 indicates higher hospital competition with more hospitals in the state, while HHI close to 1 indicates lesser hospital competition with fewer hospitals in the state.

** NAMCS Adoption of Basic EHRs: Overall Physician Practices. (2010). Retrieved from http://dashboard.healthit.gov/data/.

*** AHA Overall Hospital Adoption of EHRs (At least Basic without Notes). (2008). Retrieved from http://dashboard.healthit.gov/data/.

Appendix C: Development of an HIE Composite Measure

NORC reviewed several data sources to assess state-level HIE progress in 2012. We used this information as one criterion for selecting states for inclusion in the Round 2, or summative, case studies presented in this report.

The review included three priority HIE domains with 9 state-level measures:

- Exchange of lab results: 4 Measures from American Hospital Association (AHA) and National Ambulatory Medical Care Survey (NAMCS), 2011- 2012
  - % of hospitals sharing laboratory results electronically with hospitals outside their system (AHA)
  - % of hospitals sharing laboratory results electronically with ambulatory providers outside their system (AHA)
  - % of office-based physicians able to view lab results electronically (NAMCS)
  - % of office-based physicians able to send lab orders electronically (NAMCS)

- Exchange clinical care summaries: 2 Measures AHA Survey, 2011-2012
  - % of hospitals exchanging clinical care summaries with hospitals outside their system
  - % of hospitals exchanging clinical care summaries with ambulatory providers outside their system

- E-Prescribing: 3 Measures Surescripts Survey, 2011-2012
  - % of physicians actively using an electronic health record to e-prescribe via Surescripts (SS) network
  - % of physicians actively e-prescribing via SS network
  - % of new and renewal prescriptions e-prescribed

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