

EVALUATION OF THE STATE HIE COOPERATIVE AGREEMENT PROGRAM

Final Report

MARCH 2016

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U.S. Department of Health and Human
Services
Washington, DC

Contract Number:
HHSP2337010T/OS33547

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Acknowledgements

The NORC project team would first like to acknowledge the large number of stakeholders who contributed to this evaluation, including State Health IT Coordinators, State Designated Entity Directors, HIE leadership, subject matter experts and many others who participated in interviews, discussions, and case studies. We would like to thank Dr. Julia Adler-Milstein of the University of Michigan for her ongoing involvement with the evaluation and her review and thoughtful feedback on this final report, Dr. Ashish Jha of Harvard School of Public Health for his involvement in the early stages of the evaluation, and Felicity Skidmore for her editorial support. We also gratefully acknowledge the contributions of our ONC project team, Matthew Swain, Vaishali Patel, Talisha Searcy, Michael Furukawa, and Jawanna Henry, as well as other ONC staff who provided thoughtful input and guidance throughout the project.

Throughout the duration of this five year evaluation, numerous NORC staff contributed to evaluation activities. We acknowledge current and former NORC staff, including Adil Moiduddin, Christine Nye, Sai Loganathan, Lindsay Virost, Catharine Q. Fromknecht, Ilana Dickman, Michael Latterner, Rebecca Shore Catterson, Sarah Downie, Jean-Ezra Yeung, Terra Gore, Stephanie Hedquist, Samantha Zenlea, Sarah Downie, Elizabeth Babalola, and Melissa Atlas. We also acknowledge the efforts of the National Survey for Health Information Exchange survey team including Susan Schechter, Ken Copeland, Felicia LeClere, Erin Tanenbaum, Rene Bautista, Michael Colichia, Brad Parsell, Lauren McNamara, and Susan Hinkins.

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Abbreviations

| Acronym | Description |
|---------|---|
| ACA | Patient Protection and Affordable Care Act |
| ACO | Accountable Care Organization |
| ADT | Admission, Discharge, Transfer |
| AHA | American Hospital Association |
| AHRQ | Agency for Healthcare Research and Quality |
| API | Application Program Interfaces |
| ARRA | American Recovery and Reinvestment Act |
| CAH | Critical Access Hospital |
| CCD | Continuity of Care Document |
| C-CDA | Consolidated Clinical Document Architecture |
| CFR | Code of Federal Regulations |
| CHIP | Children's Health Insurance Program |
| CHPL | Certified Health IT Product List |
| CLIA | Clinical Laboratory Improvement Amendments |
| CMS | Centers for Medicare & Medicaid Services |
| CRM | Customer Relationship Management |
| DoD | U.S. Department of Defense |
| DURSA | Data Use and Reciprocal Support Agreement |
| ED | Emergency Department |
| EHI | eHealth Initiative |
| EHR | Electronic Health Record |
| ELR | Electronic Laboratory Reporting |
| FOA | Funding Opportunity Announcement |
| FQHC | Federally Qualified Health Center |
| GAO | Government Accountability Office |
| HCIA | Health Care Innovation Award |
| HHS | U.S. Department of Health and Human Services |
| HIE | Health Information Exchange |
| HIMSS | Health Information Management Systems Society |
| HIO | Health Information Organization |
| HIPAA | Health Insurance Portability and Accountability Act |
| HISP | Health Information Service Provider |
| HITECH | Health Information Technology for Economic and Clinical Health Act |
| HITRC | Health Information Technology Research Center |
| ICD-10 | International Statistical Classification of Diseases and Related Health Problems, 10 th revision |
| IDN | Integrated Delivery Network |
| IIS | Immunization Information Services |
| IT | Information Technology |

| Acronym | Description |
|------------------|--|
| LOINC | Logical Observation Identifiers Names and Codes |
| MACRA | Medicare Access and CHIP Reauthorization Act of 2015 |
| MIPS | Merit-Based Incentive Payment System |
| MMIS | Medicaid Management Information System |
| MSA | Metropolitan Statistical Area |
| MU | Meaningful Use |
| NATE | National Association for Trusted Exchange |
| NEHRS | National Electronic Health Record Survey |
| NORC | NORC at the University of Chicago |
| NPP | Notice of Privacy Practices |
| NwHIN | Nationwide Health Information Network |
| ONC | Office of the National Coordinator for Health Information Technology |
| OSCAR | Online Survey, and Certification and Reporting |
| PCMH | Patient-Centered Medical Home |
| PIN | Program Information Notice |
| PPS | Prospective Payment System |
| REC | Regional Extension Center |
| RFP | Request for Proposal |
| RWJF | Robert Wood Johnson Foundation |
| S&I | Standards and Interoperability Framework |
| SIM | State Innovation Model |
| SNOMED | Systematized Nomenclature of Medicine |
| SNOMED CT | SNOMED Clinical Terms |
| SDE | State Designated Entity |
| VA | U.S. Department of Veterans Affairs |

Executive Summary

I. Introduction and Context

As part of the 2009 American Recovery and Reinvestment Act (ARRA), Congress passed the Health Information Technology for Economic and Clinical Health (HITECH) Act, to promote “the electronic movement and use of health information among organizations using nationally recognized interoperability standards.”¹ The HITECH Act provided \$564 million to the Office of the National Coordinator for Health Information Technology (ONC) in the U.S. Department of Health and Human Services (HHS), to enable rapid development of health information exchange (HIE) across the nation.¹ The State Health Information Exchange Cooperative Agreement (State HIE) Program was created to achieve this objective via tailored, state-level solutions. Organizations in all 56 states and territories submitted strategic and operational plans; and during the four-year program, they received funding and ongoing ONC guidance for development and implementation of their plans. The HITECH Act also mandated an annual evaluation of program activities; grantees completed self-evaluations; and in 2010, ONC awarded a contract for an independent program evaluation to NORC at the University of Chicago (NORC).

Multiple approaches are available to accomplish information exchange; and the funding opportunity announcement (FOA) offered grantees flexibility in selecting their approaches, recognizing the need for distinct models depending on the state/territory and its relevant ecosystem.² Exchange can occur through secure email or messaging (directed exchange), drawing information from a dataset (query-based exchange), or communication between electronic health records (EHRs). Ideally, this means patients, families, caregivers, and health care providers can send and receive health-related information securely; authorized parties can access and use the information; and providers can interact with the greater health care ecosystem to support population health outcomes and contribute to the learning health care system.³

Increasing availability and use of systems for exchange was a central goal of the State HIE Program, and a central question in the evaluation. Developing systems for exchange is also a stepping stone to achieving health system-wide interoperability—the ability of two or more systems or components to exchange information, so recipients can use the information in a meaningful way.⁴ Although not a central program goal, interoperability was a frequent theme throughout the evaluation and remains a long-term federal objective of ONC, the Centers for Medicare & Medicaid Services (CMS), and other agencies engaged in health information technology (health IT)-related initiatives and delivery system reform.

Program and Evaluation Overview

The overarching goal of the State HIE Program was to rapidly build HIE capacity by: (1) ensuring every provider has at least one option for meeting the HIE requirements of meaningful use (MU)ⁱⁱ; (2) fostering creation and use of networks of exchange through which information can flow; (3) filling existing gaps in exchange capacity (e.g., overcoming technical barriers, lack of services); and (4) ensuring exchange can occur across networks. Given the program’s design as a one-time investment over a four-year period, ONC recognized it would be challenging “for states to implement and operate comprehensive statewide HIE services” using HITECH funds alone.⁵ As such, states were encouraged to fill service gaps, leverage

ⁱ Initial awards were made in February and March 2010; the program ended in February 2014

ⁱⁱ Under CMS’ EHR Incentive Programs, eligible providers must demonstrate “meaningful use” of certified EHR technology in order to receive incentive payments.

existing information exchange, and coordinate with key stakeholders in pursuit of sustainable HIE solutions.

NORC conducted an independent program evaluation, funded by ONC, which focused on three aims:

AIM 1: Characterize the Approaches Taken to Enable HIE and How They Evolved over Time.

This included identifying the technical and operational models grantees selected, factors that influenced their approach selection, and how these approaches evolved in the context of state-level priorities and pressures.

AIM 2: Characterize HIE Levels at Baseline and How They Changed over Time. Following the initial characterization of state approaches to HIE, Aim 2 focused on how state-level measures of EHR adoption and HIE participation and activity progressed over the course of the program.

AIM 3: Assess Overall Program Effectiveness. Finally, over the course of the four-year program, what were the factors (contextual and programmatic) that influenced HIE progress? What were the program impacts?

II. Methods

NORC developed a mixed-methods approach to obtain a comprehensive understanding of the planning, implementation, operation, and impact of the program. The evaluation consisted of a variety of qualitative and quantitative evaluation activities occurring between 2011 and 2014. We designed these activities to explore different dimensions of the states’ implementation approaches; different stakeholder perspectives; and state-level challenges, barriers, and lessons learned.

III. AIM 1: Characterize Approaches Taken to Enable HIE and How They Evolved

In AIM 1 of the evaluation, we focused on three key research questions: 1) What approaches did grantees take to enable HIE services? 2) What was the rationale for the approach chosen? 3) How did grantee approaches evolve over the program?

What Approaches Did Grantees Take to Enable HIE Services?

Grantees were able to select state-specific implementation approaches, given varied market dynamics.

Leadership and Organizational Structure. HITECH authorized ONC to provide program funding and leadership authority to states and state designated entities (SDEs), which led to development of three models for disseminating program funds and leading implementation: state-led approach, SDE-like approach, and “true” SDE approach. Each approach presented its own advantages and drawbacks, as discussed in Chapter I (Introduction and Context) and Chapter III (AIM 1).

Technical Approaches. ONC allowed grantees leeway in developing their technical approaches in response to local needs and, in some cases, existing infrastructure. In spite of wide variation in overall technical approach, many grantees either: (1) established or leveraged a single statewide organization for exchange, or (2) connected local or regional nodes in a “network-of-networks” approach. A majority of grantees used a single organizational entity to provide technical services across the state, rather than engaging with multiple organizations to do so. In general, grantees’ services aligned strongly with the Medicare and Medicaid EHR Incentive Programs’ MU priorities.

Legal and Policy Approaches. Most grantees selected “opt-out” consent models, allowing providers to exchange patient health information unless the patient explicitly requests otherwise. Many encouraged HIE participation via legal and policy levers. These levers included mandating provider participation in the statewide HIE system; enacting legislation to promote HIE participation, EHR adoption, or both; and

accrediting or certifying health Information organizations (HIOs) or health information service providers (HISPs) to increase stakeholder trust in HIE efforts and organizations.

What Was the Rationale for the Approach Chosen?

The level of HIE activity prior to HITECH affected grantee selection of leadership and organizational approach. State characteristics—including population size and urbanicity, local use cases, and presence of HIOs and other hospital systems engaging in exchange—influenced grantees' selected technical approach. Privacy and security concerns, combined with existing legislation related to health information disclosure and use, influenced state selection of a consent model.

How Did Grantee Approaches Evolve over Time?

Given the ongoing evolution of both the health care market and the health IT landscape, as well as the availability of exchange via organizations outside the State HIE Program, many grantees shifted their approach during the program to strengthen the capacity of existing networks of exchange instead of positioning themselves as the state's central HIE service provider. Throughout the program, grantees' priorities shifted from Stage 1 MU requirements and services emphasized by the initial State HIE Program Information Notice (PIN)⁶ (e.g., electronic prescribing [e-prescribing], receipt of structured laboratory results, sharing of patient care summaries, and public health reporting) towards Stage 2 MU requirements related to HIE.

Grantee perspectives shifted on the uses and utility of types of exchange as well. After enabling or increasing availability of query-based exchange, grantees recognized the importance of ensuring high data quality to build trust and amass users. Grantees began to view directed messaging as a short-term solution—or a solution with specific use cases (e.g., exchange of behavioral health information)—with query-based exchange as the preferred solution but (for many) a long-term goal.

IV. AIM 2: Characterize HIE Levels at Baseline and How They Changed over Time

AIM 2 focused on two research questions: (1) What was the baseline level of HIE across states? (2) How did HIE progress over the program period? Since the primary data collection did not include direct measures of HIE at the grantee level, AIM 2 relies on national and state-level data from secondary sources. Given the numerous public and private efforts operating concurrently that also influenced HIE, we cannot attribute changes in HIE levels directly to the program. Isolating program efforts from broader health IT and other delivery system reform efforts is also a challenge.

What Were HIE Levels at Baseline and How Did They Progress over the Program?

To assess baseline HIE levels and progress we look at measures of HIE capability and activity. Our measures of HIE capability show increased access to, and opportunity for, exchange throughout the program. While most measures reflect gains in HIE activity, they must be taken in the context of the baseline—grantees started with a modest amount of exchange at program inception (with the exception of a limited number of states), which grew to more robust levels. However, there is considerable room for service expansion and improvements in overall participation and use.

Measures of HIE Capability. To assess capacity for exchange we analyzed: (1) the capacity to exchange based on available HIOs, and (2) the extent to which hospital and ambulatory providers actively shared patient-level clinical data through an HIO. From 2010 to 2015, the number of HIOs fluctuated but saw a 41 percent net growth nationally.⁷ Hospital and ambulatory practice exchange of clinical data through an HIO increased twofold and threefold, respectively; however, overall participation numbers remained low, with 30 percent of hospitals and 10 percent of ambulatory care practices⁸ sharing data in 2012.

We also measured grantee participation in directed and query-based exchange, as well as the capacity of clinical laboratories to exchange laboratory results. Acute care hospital participation in directed exchange increased from just over 100 in 2011 to just under 1,000 in 2013, while participation of ambulatory entities increased from 4,500 in 2012 to 21,000 in 2013. The number of acute care hospitals participating in query-based exchange increased from less than 400 in 2011 to 2,000 in 2013 (nearly a threefold increase), while participation of ambulatory entities increased from 2,200 to 8,800 (a fourfold increase). In addition, 67 percent of clinical laboratories reported the capability to send structured laboratory results electronically in 2012, again with significant variation across states.

Measures of HIE Activity. These measures included the overall volume of directed and query-based transactions, hospital and office-based physician electronic exchange of PIN priority MU measures (i.e., measures of e-prescribing, receipt of structured laboratory results, sharing of patient care summaries, and public health reporting), and a composite measure of HIE activity.

- **National Levels of HIE Activity.** As reported by grantees, the total number of directed transactions increased more than threefold, while total number of patient record queries increased more than fourfold from 2011 to 2013.⁹ Although these numbers represent considerable growth, national averages of participation were driven by a small number of top performing states, rather than by high participation across all states.
- **PIN Priority MU Measures.** HIE levels related to PIN priority MU measures increased over the program period (i.e., measures of e-prescribing, receipt of structured laboratory results, sharing of patient care summaries, and public health reporting). The average share of physicians actively using an EHR to e-prescribe via Surescripts increased by 28 percentage points from 2011 to 2014.¹⁰ However, only 22 grantees reported providing or enabling e-prescribing as an operational service in 2013.¹¹ The average increase in care summary exchange from a hospital to another hospital outside the system was 38 percentage points over the same period.¹² In 2014, 85 percent of eligible hospitals were reporting, without exclusion, to the Medicare EHR Incentive Program on at least one public health measure.¹³ In the same year, 72 percent of participating Medicare professionals who vaccinate reported electronically to an immunization information system, up from 51 percent in 2011.¹⁴
- **Summary of HIE Activity.** As part of the evaluation, NORC developed a composite HIE score made up of seven measures within three of the PIN priority MU domains (e-prescribing, laboratory results exchange, and care summary exchange).ⁱⁱⁱ Our results showed positive change on multiple dimensions. The national composite HIE score increased from 36 to 79 percent from 2010 to 2014—an increase that was reflected in each of the seven measures making up the composite. In 2014, the level of HIE activity ranged from 51 percent (Nevada) to 97 percent (Minnesota). The gap between hospital-to-hospital and hospital-to-ambulatory care provider exchange also narrowed over the period—by 9 and 13 percentage points, respectively, for clinical care summary and laboratory results exchange.

Together, these results indicate a positive trend in HIE adoption and use, across the program years, states, and multiple services. Nonetheless, adoption and use varies heavily by state and many opportunities for expansion remain.

ⁱⁱⁱ The composite HIE score was derived from seven measures: percent of hospitals sharing laboratory results electronically with hospitals outside their system, percent of hospitals sharing laboratory results electronically with ambulatory providers outside their system, percent of office-based physicians able to view laboratory results electronically, percent of office-based physicians able to send laboratory orders electronically, percent of hospitals exchanging clinical care summaries with hospitals outside their system, percent of hospitals exchanging clinical care summaries with ambulatory providers outside their system, percent of physicians actively using an electronic health record to e-prescribe via Surescripts (SS) network

V. AIM 3: Assess Overall Program Effectiveness

AIM 3 focused on two research questions: (1) What were the factors (contextual and programmatic) that influenced HIE progress? (2) What were the overall program impacts? Contextual factors are state-specific demographic and market characteristics (e.g., health system characteristics, and EHR adoption level), which often affected decisions regarding program factors (e.g., governance structure, technical and consent model, and supportive legislation) during implementation. We defined impact as the extent to which the program achieved its objectives to: (1) establish HIE infrastructure, (2) expand HIE adoption and reduce the cost and complexity of participation in exchange, and (3) help providers meet MU requirements.

What Were the Factors (Contextual and Programmatic) that Influenced HIE Progress?

Qualitative and quantitative evaluation findings suggest that program factors such as technical, leadership, and consent models significantly influenced the grantees' trajectories, and that the influence of the State HIE Program increased over time. During the early program stages, contextual factors were of primary importance. For example, states with high levels of EHR adoption prior to HITECH had higher levels of exchange. In other words, states with experience in EHR adoption had a head start in HIE implementation and participation.

Over the four-year program, quantitative findings show that program approaches selected by states drove most of the changes in state HIE. Qualitative and quantitative findings also show that program and contextual factors worked together synergistically to support higher levels of exchange across the program years. Overall, states with a solid HIE foundation experienced greater success; these states were able to accelerate their progress with State HIE Program support. States with little foundation in HIE struggled to establish themselves in the early program years and only made measurable advances in the later years. In later program years, states with state-led HIE showed more success with HIE than true SDE or SDE-like models.

What Were the Overall Program Impacts?

Based upon qualitative evidence, the State HIE Program impacted areas related to engaging stakeholders, aligning with Medicaid and public health programs, expanding HIE services and adoption, reducing the cost and complexity of exchange, helping providers meet MU requirements, raising awareness and acceptability of HIE, and creating infrastructure that can be leveraged by delivery system reform efforts.

Importantly, the program did not operate in a vacuum. Because it funded all 56 states and territories—and because grantees were encouraged to pursue solutions based on their own local needs, stakeholders, contexts, etc.—implementation variation among states is high, making the confounding factors numerous.

Finally, many program investments are likely to pay dividends in the coming years, as HIE becomes more established, more widely available, and more interoperable. As a result, additional program impacts may emerge downstream that cannot be captured at present.

VI. Lessons Learned: Key Drivers, Challenges, and Solutions

A central goal of the evaluation was to extract important lessons from grantee implementation, to guide and inform similar efforts and provide an opportunity for grantees to learn from one another's experiences.

Lessons Learned

Across grantee reports, several common key drivers eased the implementation of HIE, encouraged participation by hospitals and providers, and accelerated progress:

- Involvement of diverse stakeholders was of great value to build relationships, establish trust, improve acceptance, align goals, leverage existing HIE assets, and create a sense of ownership for all those involved.
- Initial service offerings played an important role in driving momentum for HIE by building services based on provider needs and demand, rather than building a service or standard and then trying to recruit adopters.
- Governing bodies varied in their official responsibilities, legal authority, membership, and affiliation with government—all of which had implications for the design, pace of development, and sustainability of HIE.
- Starting simply, rolling out services incrementally, and layering on complexity over time in response to growing provider demand, allowed states to demonstrate immediate value and gain buy-in for HIE.
- Delivery system reform has played, and will continue to play, a role in HIE expansion. The State HIE Program has facilitated provider efforts to meet the requirements of MU, and existing HIE infrastructure will play an important role supporting delivery system reform efforts.

Challenges

- Developing and implementing HIE infrastructure and services was more resource intensive (in time, money, and effort) than grantees anticipated.
- Common standards and incentives were needed to achieve interoperability.
- Grantees encountered barriers in their relationships with EHR developers and HIE vendors, as well as lack of developer readiness to accommodate the needs of HIE stakeholders.
- Sustainability was a persistent concern among grantees.

Sustainability

The State HIE Program catalyzed HIE through a substantial, one-time infusion of funds. Many factors will contribute to the sustainability of HIE services, whether state-led or otherwise—including diverse stakeholder engagement, a flexible infrastructure, continued marketing of benefits, and clear and consistent policies and regulation. Grantees expressed concerns about the financial sustainability of their HIE efforts, wondering whether they would be able to secure the necessary financial investment to continue operating in the short term—needed to demonstrate long-term value to stakeholders. Post-program, seven grantees are no longer operational. Grantees who continue to operate reflected that they may require more examples of the value-add of HIE to motivate continued stakeholder commitment and investment. Long-term sustainability requires that grantees seek out new financial contributors (including payers, ACOs, and long-term care providers) and offer them reasonably priced services that address their needs and priorities for exchange.

VII. Policy Implications

With the conclusion of the State HIE Program and sweeping changes to the health care delivery system, HIE requires continued support at the federal, state, and community levels. Informants^{iv} reported a desire for facilitation on multiple fronts, to maintain the program’s momentum and to leverage its efforts for current and future HIE initiatives.

^{iv} Informants included interviewees from Round 1 and 2 case studies, stakeholder discussions, and summative key informant interviews, as described in the Methods and Policy Implications chapters.

State Role

- **Leadership and coordination**, particularly in convening stakeholders; policy development and delivery system reform; and conducting ongoing state-level needs assessments.
- **Engaging in future HIE efforts vis a vis Medicaid and social services**, given Medicaid’s growing population creates a growing role for HIE and Medicaid’s strength and influence as a payer and licensing body means its participation would lend strong support to HIE sustainability.
- **Creating and maintaining the Health IT Coordinator role**, given the value of having a dedicated official focused on health IT/HIE opportunities in the state with access to different levers and collaborators to prompt state action (e.g., Medicaid, state insurance, state employer program, state public health department). The Health IT Coordinator can act as a liaison/initiator for ongoing federal-state partnership opportunities to advance HIE.
- **Driving/sustaining demand for HIE and leveraging existing HIE investments under delivery system reform**, for example, engaging in pre-Stage 3 MU “marketing” to communicating the value of HIE and reinforcing the state’s commitment; leveraging investments formerly supported by the State HIE Program for delivery system reform; and pursuing HIE-supportive policies (e.g., promote ACOs and other models that leverage technology and potential incentives).

Federal Role

- **Crucial guidance around HIE governance and technical standards**. Informants called for continued ONC leadership on privacy and security; assistance creating user agreements, trust agreements, and policy frameworks; policies on secondary data use; as well as data standards to mobilize electronic information from diverse providers, and for research. Informants also requested leadership on difficult technical issues (e.g., patient matching algorithms, certification criteria for the Certified Health IT Product List [CHPL] for MU); and dissemination of lessons learned from the program and best practices to guide those newly interested in HIE.
- **Provide strong leadership and support for interoperability**, especially to extend the scope to settings that are critical to care transformation (e.g., long-term care, behavioral health, and home health); and to emphasize open standards, interfaces, and protocols, and coordination with MU.
- **Align HIE efforts across agencies**, pursuing aligned “policy push” with federal incentives for standards of information; coordinating with MU and other initiatives; and leading consensus-building around development, dissemination, and use of standards.
- **Emphasize HIE as part of delivery system reform activities**, such as including HIE use in changes to payment structure; continuing HIE-supportive initiatives, such as SIM and Medicaid 90/10 funding; and expanding efforts like CMS quality initiatives to encompass health IT/HIE.

Shared Needs and Responsibilities

- **Continue to assess how technical solutions evolve in different markets, and develop and disseminate best practices (state and federal role)**. States can support best practices put forward by ONC and tailor solutions to their local needs—enacting supportive legislation that removes barriers to information flow (e.g., policies for data ownership and use, protections against data breaches and unauthorized access), and aligns more closely with federal laws such as HIPPA.
- **Monitor best practices and funding opportunities (provider organization role)**. Increasingly difficult requirements for MU mean grantees and others will need financial and technical support. Providers should keep informed of useful findings and funding opportunities related to delivery system reform initiatives (e.g., SIM awards, Health Care Innovation Awards [HCIA], Medicaid 90/10 funding, ACO incentives and development grants).

Conclusions

HITECH funding, including awards made under the State HIE Program, created and expanded HIE-related infrastructure—both in the technical sense of services and infrastructure and in the legal, governance, consent, and policy structures to support it. This HIE infrastructure is now available and delivery system reform efforts are likely to leverage it. Our evaluation findings demonstrate that there is no one-size-fits-all solution with HIE; instead, development and use of HIE is predicated on the state and local environments within which it exists. That said, certain factors influence HIE and are helping some states gain traction. These factors and exemplar states may serve as lessons learned for HIOs, grantees, and state and federal policy makers interested in continuing HIE development.

Throughout the program, grantees overcame many challenges to HIE, and new challenges emerged in the process. Some states were more successful than others in navigating these challenges and in enabling exchange. Though not all such challenges have been resolved, there is now more HIE capacity than before the program, as well as a path forward toward greater data liquidity for both exchange and interoperability.

I. Introduction and Context

Chapter Summary

This chapter provides an overview of health information exchange (HIE), the State HIE Program, and HIE progress since passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 and the Patient Protection and Affordable Care Act (ACA) of 2010. We briefly review central issues in HIE implementation and use. We also introduce the principal aims of the State HIE Program evaluation.

Overview of the State HIE Program and Related Federal Initiatives

The State HIE Program was created under Section 3013 of the HITECH Act as part of the American Recovery and Reinvestment Act (ARRA) of 2009.¹⁵ Led by the Office of the National Coordinator for Health Information Technology (ONC), its main objective was to enable rapid HIE development to: (1) ensure every provider has at least one option for meeting the HIE requirements of meaningful use (MU); (2) foster creation and use of exchange networks; (3) fill existing gaps in exchange capacity; and (4) ensure exchange across networks.

The motivation for a state-level program was to empower grantees to develop tailored strategies to address state-specific needs. Given the one-time funding, states were encouraged to leverage existing infrastructure. Participating states determined their own leadership and organizational structures but collaborated with ONC throughout.¹⁶ ONC provided guidance to grantees on their strategic and operational plans, ongoing monitoring and feedback, and technical assistance; ONC also helped in coordinating across other federal health information technology (health IT) programs.

With State HIE Program activities already under way, the evaluation focused on three aims:

AIM 1: Characterize the Approaches Taken to Enable HIE and How they Evolved over Time.

AIM 2: Characterize HIE Levels at Baseline and How they Changed over Time.

AIM 3: Assess Overall Program Effectiveness.

Changes in Landscape: Progress since HITECH

In addition to the State HIE Program, the HITECH Act created and/or leveraged a number of HIE-supportive and related initiatives. HITECH was followed by passage of the ACA in 2010, which created additional opportunities and support for health IT and HIE initiatives.

Since passage of HITECH, electronic health record (EHR) adoption among ambulatory providers and hospitals has grown significantly^{17,18} and HIE utilization has expanded.¹⁹ Interoperability remains difficult and will continue to be a focus of HIE-related efforts—including development and adoption of standards, future stages of MU, and future federal health IT initiatives.

Early demonstration projects provide evidence that adoption and use of these technologies has contributed to improved patient health, safety, and care; cost reductions; and identification of potentially high impact uses of data for secondary research.

Introduction

HIE refers to the process of electronically exchanging or sharing health information across health care stakeholders. There is now widespread acceptance of the idea that timely sharing of health information

can improve health care quality, efficiency, and safety; it can enable more effective public health programs and clinical research; and it can offer providers more comprehensive clinical information to help treat patients. While efforts to promote HIE have existed for nearly two decades, the country made slow progress towards nationwide exchange due to an array of barriers—including limited availability and adoption of infrastructure or technology to enable exchange, limited uptake of standards, privacy and security concerns, lack of stakeholder engagement, and an uncertain business case.

Overview of the State HIE Program

To address the low levels of HIE and health IT adoption, Congress passed the HITECH Act as part of the 2009 ARRA. Under the HITECH Act, ONC received a total of \$564 million in funding to “facilitate and expand the secure, electronic movement and use of health information among organizations according to nationally recognized standards” through the State HIE Program. The four-year program provided the 56 states and territories with \$548 million to invest in HIE solutions; an additional \$16 million was awarded to eight states as Challenge Grants to expand their efforts.

ONC charged states, territories, and entities qualified by the state (state designated entities, SDEs) with creating or enabling the necessary governance, policies, technical services, business operations, and financing mechanisms to advance HIE. The motivation for a state-level program was to empower grantees to develop tailored strategies to address state-specific needs. The legislation also required an evaluation of the program. ONC decided that the grantees should conduct self-evaluations and that ONC would engage an independent evaluator to assess the program as a whole. ONC awarded the evaluation contract to NORC at the University of Chicago in 2010, the evaluation began shortly thereafter.

To rapidly build information exchange capacity, the State HIE Program focused on four core objectives: (1) ensure every provider has at least one option for meeting HIE requirements of MU, (2) foster creation and use of exchange networks, (3) fill existing gaps in exchange capacity, and (4) ensure exchange across networks.²⁰ Moreover, given the heterogeneity of exchange needs and local environments, HITECH determined that a state-level program would be most appropriate for achieving program goals and overcoming state-level barriers.

Funding Opportunity Announcement and PIN Priorities

ONC intended for the original Cooperative Agreement Funding Opportunity Announcement (FOA) to assist states in developing a framework to facilitate HIE. After CMS finalized Stage 1 MU requirements, ONC issued the first Program Information Notice July 28, 2010, to clarify certain specific requirements and advise states that “the immediate priority of the State HIE Program is to ensure that all eligible providers within every state have at least one option available to them to meet the HIE requirements of MU in 2011.”²¹

Given that the ONC funding was intended as a one-time investment, ONC recognized it would be challenging “for states to implement and operate comprehensive statewide HIE services” with the available funds. As such, the Program Information Notice encouraged states to use available HITECH funds to fill gaps, leverage existing HIE activities, and coordinate with key stakeholders (e.g., Medicaid, public health, providers, consumers) to promote secure and sustainable HIE. The emphasis on filling gaps sprang from recognition that small independent providers, especially those serving rural and/or underserved populations, would derive much benefit from HIE but lag in their adoption of technology because of cost-related barriers. Connecting existing networks and broadening networks to fill gaps have the additional advantage of breaking down health care silos that segregate patient information and lead to duplicative testing and poor coordination of care, among other inefficiencies.

ONC's Programmatic Role

Under the State HIE Program, ONC and awardees agreed to accept responsibility for particular aspects of the program. This emphasis on collaboration distinguishes the Cooperative Agreement from a grant program, under which the funding agency has more limited involvement in awardee activities.²² ONC committed to providing guidance to awardees through collaboration with states and SDEs on their strategic and operational plans, ongoing monitoring and feedback, technical assistance, and help coordinating across other federal health IT programs. ONC also provided leadership by: (1) establishing technical standards and certification criteria for exchange and interoperability capabilities in certified EHR technology; and (2) promoting common standards, services, and policies through the eHealth Exchange (formerly the Nationwide Health Information Network [NwHIN] Exchange).²³

State-Level Planning and Coordination

Each state—in addition to writing strategic and operational plans that specified planned services, infrastructure, governance, consent models, and sustainability plans, among other things—was required to appoint a State Health IT Coordinator dedicated to achieving state health IT goals and coordinating across federally funded state programs. Health IT Coordinators were also responsible for developing and advocating for health IT policy, addressing legal and policy issues related to privacy protections, collaborating with neighboring states to establish inter-state exchange when appropriate, and prioritizing activities to prepare state providers to meet MU criteria. In addition, Health IT Coordinators ensured the coordination of health IT activities across Medicaid, behavioral health, public health, departments of aging, and other federally funded state programs.²⁴

Participating states determined their own leadership and organizational structures. States could either receive program funds themselves or appoint an SDE^v to do so, and implement the operational plan themselves or empower the SDE to do so. Alternatively, grantees could choose an SDE-like approach, in which the state receives program funds but designates another entity, typically a non-profit organization, to lead HIE implementation efforts.²⁵ States that selected an SDE or SDE-like approach could operate the State HIE Program and Regional Extension Center (REC) activities within a single organization or independently. We discuss the pros, cons, and implications of state approaches in detail in Chapter III (AIM 1). Appendix I Exhibit 1 contains a list of all states, grantees, SDEs (where applicable), and funding amounts.

Program Evaluation

Section 3013(h) of the HITECH Act requires that ONC evaluate the activities conducted under the State HIE Program and implement lessons learned from the evaluations. NORC has served as the State HIE Program evaluator for the life of the program—undertaking a wide range of activities to characterize the states' approaches, assess their progress enabling HIE, and track the evolution of HIE nationwide. This report describes the evaluation activities, methodologies, and findings. It also places the State HIE Program in the broader context of changes in the health care delivery system, both to describe its successes and challenges and to discuss the future of HIE now that the program has ended.

HIE Overview

The definition of HIE, which has evolved over time, has come to refer to the process of electronically exchanging or sharing health information across health care stakeholders. Exchange can occur through

^v According to the HITECH Act, an SDE must meet the following requirements: “(1) be designated by the State as eligible to receive awards; (2) be a not-for-profit entity with broad stakeholder representation on its governing board; (3) demonstrate that one of its principal goals is to use information technology to improve health care quality and efficiency through the authorized and secure electronic exchange and use of health information; (4) adopt nondiscrimination and conflict of interest policies that demonstrate a commitment to open, fair, and nondiscriminatory participation by stakeholders; and (5) conform to such other requirements as the Secretary may establish.”

secure email or messaging, querying, or EHR-to-EHR communication. Notably, this definition does not specify the entity that enables HIE to occur.

Types of Exchange

ONC offered grantees flexibility in selecting the types of services and infrastructure they enabled to meet program goals. Below we outline three common mechanisms grantees used to enable HIE. A single entity may enable one or more of these types of exchange.

1. *Directed exchange* (the “push” model) enables secure, point-to-point exchange of structured and unstructured information in human-readable and machine-readable formats. This includes the [Direct Project](#)²⁶ specifications and other industry approaches to secure messaging.
2. *Query-based exchange* (the “pull” model) allows users to draw information by querying a set of data, either hosted in a repository or through a distributed model where physical control of the data remains at the source.^{27,28}
3. *Consumer-mediated forms of exchange* give individuals access to their health information, allowing them to aggregate their health information and control its sharing and use by providers.²⁹

Interoperability and Data Ownership

Interoperability refers to the ability of two or more systems or components to exchange information that is usable for recipients.³⁰ This means that individuals, caregivers, and health care providers can send and receive information securely, as well as find and use that information to optimize the delivery, management, and quality of care. It also means that providers are able to interact with other members of the greater health care ecosystem (e.g., public health departments, researchers) to support population health and contribute to the learning health system.³¹ In 2011, ONC formed the Standards and Interoperability (S&I) Framework, a multi-stakeholder collaborative dedicated to addressing the need for common standards.³² Interoperability remains difficult and will continue to be a focus of HIE-related efforts—including development and adoption of standards, future stages of MU, and future federal health IT initiatives.³³

Networks and Methods of Data Exchange

Currently, HIE occurs over a wide range of channels. EHR-to-EHR connection is one mechanism of exchange in which users send, receive, find, and integrate information at the EHR level.³⁴ Some integrated delivery networks (IDNs) and large health systems enable exchange through “enterprise” models of HIE, connecting separate health care providers and business entities to one network. Connections facilitated via Health Information Service Providers (HISPs) are also common. An HISP is an organization that provides directed exchange between trading partners, and ensures the security of that exchange.³⁵

Regional and local health information organizations (HIOs), accountable care organizations (ACOs),³⁶ and patient centered medical homes (PCMHs)³⁷ are enabling exchange among health care stakeholders in defined geographic areas. These organizations have formed broad networks to facilitate information sharing for improved care coordination, improved efficiency, and reduced costs, coupled with financial incentives for achieving these delivery system reform goals.³⁸

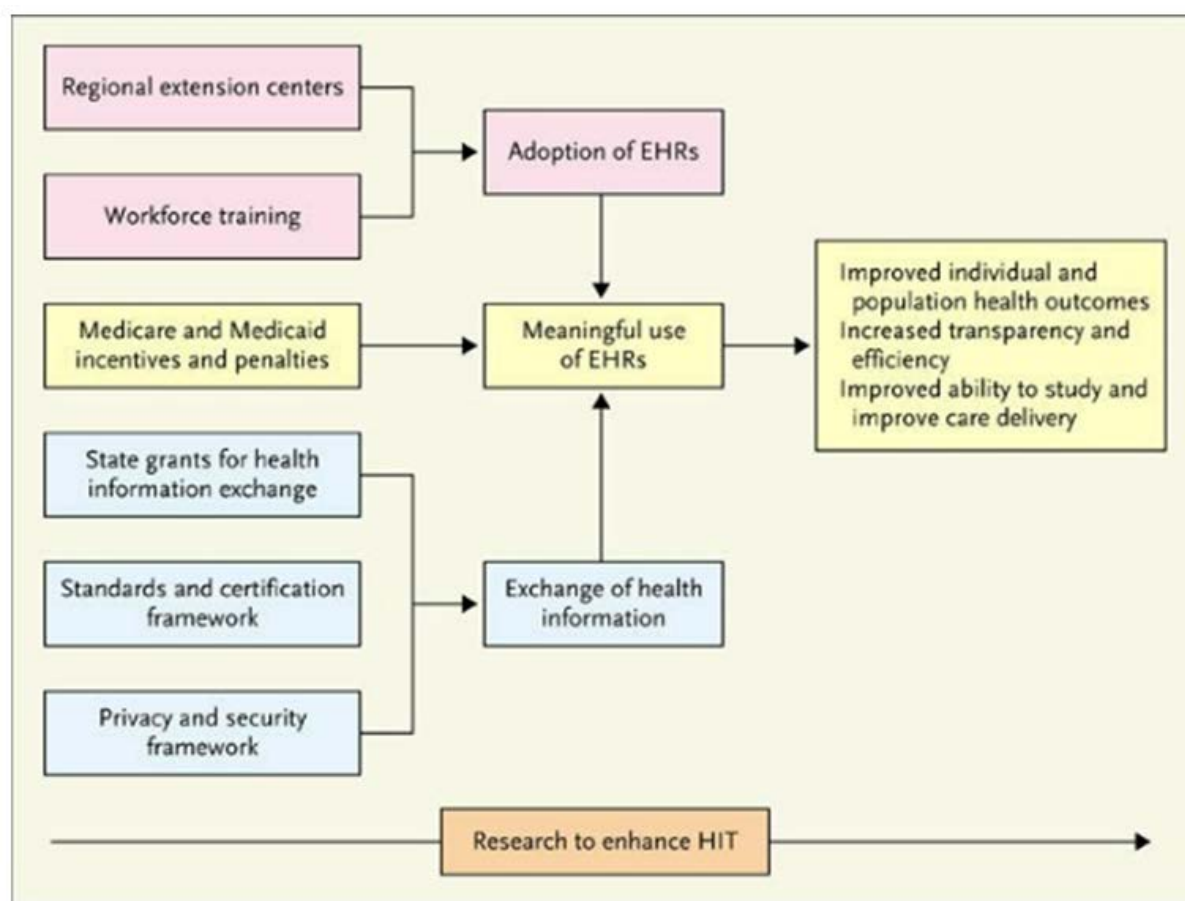
HITECH and EHR/HIE-Supportive Initiatives

The State HIE Program was just one of the major initiatives put in place under the HITECH Act to support HIE. Here we briefly describe other HITECH programs and supporting initiatives that contributed to the recent expansion of EHR adoption and the evolution of HIE, in some cases in concert with the State HIE Program.

Federal Initiatives

EHR Incentive Programs and MU. In July 2010, CMS released its final rule on Stage 1 MU requirements, which announced the availability of incentive payments for providers and hospitals for the meaningful use of certified EHR technology. MU provided a gradual roll out of requirements intended to promote the “adoption, implementation, upgrade or demonstration of meaningful use of certified EHR technology” among eligible providers. CMS designed the requirements to grow increasingly robust: whereas Stage 1 emphasized adoption and implementation of technologies (e.g., electronic data capture and reporting), Stage 2 (2014) and Stage 3 (2016) put greater emphasis on using these technologies to exchange information and support improvements in quality, efficiency, and patient outcomes.^{39,40} An early ONC article laid out MU’s proposed path toward health care system improvements, including the roles of supportive initiatives, the use of EHR/HIE, and the need for ongoing research (see Exhibit 1).⁴¹ MU co-occurred with and heavily influenced the State HIE Program.

Exhibit 1: The HITECH Act’s Framework for Meaningful Use of Electronic Health Records



SOURCE: Blumenthal D. Launching HITECH. N Engl J Med 2010.

Health IT Certification Program. ONC initiated the Health IT Certification Program, which established standards and certification criteria for EHRs to assure providers and hospitals that the technology has the necessary technical, functional, and security features to meet MU requirements and therefore qualify for incentive payments.⁴²

ONC State HIE Challenge Grant Program. ONC funded the Challenge Grant Program (“State Grants to Promote Health Information Technology”) in December 2010, to encourage development and

innovation to address persistent barriers in HIE (e.g., transitions to long-term and post-acute care and consumer-mediated exchange).^{43,44} The program provided more than \$16 million of supplemental funding to eight State HIE Program grantees to encourage development and innovation in five areas: (1) achieving health goals through HIE, (2) improving long-term and post-acute care transitions, (3) supporting consumer-mediated information exchange, (4) enabling enhanced query for patient care, and (5) fostering distributed population-level analytics, all of which must be adaptable and usable by others interested in exchange.⁴⁵

The Regional Extension Center (REC) Program. ONC created the REC Program to fund organizations with the expertise and resources to assist providers in meeting MU requirements. RECs provide education, outreach, EHR-related support, and technical assistance related to health IT—focusing on individual and small practices, critical access hospitals, and safety net providers who serve vulnerable populations and often have few resources to invest in EHRs and HIE. ONC also funded the Health Information Technology Research Center (HITRC), through which RECs can share best practices and lessons learned.⁴⁶

Medicaid 90/10 Funds. To promote HIE among Medicaid and the Children’s Health Insurance Program (CHIP), the HITECH Act authorized CMS to offer 90/10 matching opportunities for administrative costs related to developing or upgrading health IT through December 31, 2015. The initiative emphasized the importance of flexible system design that allows for information sharing; timely and accurate communication among providers; and interoperability with state-level HIOs, public health agencies, and other community-level assistance programs.⁴⁷

Beacon Community Program. ONC funded the Beacon program to bolster the activities of 17 communities that had already made significant advances in these areas.⁴⁸ ONC charged communities with investing in advanced exchange capabilities; translating investments into cost, quality, and outcomes improvements; pursuing innovation in performance measurement, health care delivery, and technology; and generating evidence on the value and effectiveness of these new approaches.⁴⁹

Public-Private Partnerships, Networks, and Private Initiatives

Non-federal Nationwide Networks and Initiatives. To enhance the reach of HIE, public and private organizations are establishing nationwide networks and “trust communities”—including eHealth Exchange,⁵⁰ the Care Connectivity Consortium,⁵¹ Surescripts,⁵² CommonWell Health Alliance,⁵³ The National Association for Trusted Exchange (NATE)⁵⁴ and DirectTrust.⁵⁵ For example, the *eHealth Exchange*, run by Healtheway, is a network of federal and non-federal organizations committed to interoperable HIE as a means of achieving the three-part aim. The now 30+ organizations that participate agree to certain policies and standards of exchange to share information across their common network.⁵⁶ The *Care Connectivity Consortium* is one Healtheway partner and a collaboration of leading health organizations: Geisinger Health System (PA), Group Health Cooperative (WA), Intermountain Healthcare (UT), Kaiser Permanente (CA), Mayo Clinic (MN), and OCHIN (OR). These organizations use a common set of standards to connect their data exchange networks, and they collaborate to develop and pilot new data sharing solutions that may be of use to broader networks like the eHealth Exchange consortium.^{57,58}

DirectTrust is a network of health IT and provider organizations that all abide by a security and trust framework for directed exchange. ONC emphasized Direct early in the State HIE Program; as part of Stage 1 MU, the Direct Project developed a simple and affordable option for providers to participate in HIE, and implemented it on a pilot basis in several states.

The ACA and HIE-Supportive Initiatives

The ACA began a system-wide shift in the provision of health care services and created a variety of new initiatives that further: (1) expanded the role of health IT and HIE and (2) oriented health care providers towards the need for EHR adoption and HIE.⁵⁹ Various initiatives are attempting to build a strong

business case for HIE—including the *Medicare Shared Savings Program*, with adjustments to Medicare payments; *Hospital Readmission Reduction Program*, which reduces payments for failure to achieve quality benchmarks;^{60,61} and *Medicaid Health Homes*, which target beneficiaries with chronic conditions and are being funded to make investments in data systems.⁶²

The *State Innovation Model Initiative* is supporting states in the design of payment and service delivery models to improve health, improve care, and lower state costs with HIE as a cornerstone of many state strategies.⁶³ The *Health Care Innovation Awards* (HCIAs) fund 107 initiatives to test new models of value-based payment—one component of which is exploring innovations related to health IT and focused on Medicare, Medicaid, and CHIP populations.⁶⁴

State HIE Program Evaluation

ONC charged NORC, as program evaluator, with assessing the approaches, progress, and impact of the State HIE Program, using mixed methods approaches guided by three aims:

AIM 1: Characterize the approaches taken to enable HIE and how they evolved over time. Our examination included the approaches grantees selected to enable HIE, factors that influenced their selection, and how these approaches evolved over time in the context of state-level priorities and pressures.

AIM 2: Characterize HIE levels at baseline and how they changed over time. We looked at how these efforts progressed and the relevant factors that contributed to progress.

AIM 3: Assess overall program effectiveness. To achieve this aim, we evaluated the extent to which providers are now able to exchange health information in ways that meet MU requirements, and whether provider efforts to build infrastructure and enable services have produced sustainable solutions that will continue serving patient, provider, and evolving market needs. Critically, we also attempted to distinguish program successes from market maturation and the effects of concurrent health IT initiatives.

II. Methods

In 2010, ONC funded NORC to conduct a four-year evaluation of the State HIE Program. The evaluation’s purpose is to acquire a comprehensive understanding of the effectiveness of the planning, implementation, operation, and impact of the program. In particular, the evaluation explored: (1) the different innovative approaches states used to enable and facilitate information exchange and (2) states’ challenges, barriers, and lessons learned in the process.

NORC’s mixed-method evaluation included both qualitative and quantitative activities. Qualitative activities entailed reviewing grantee-reported data and conducting discussions with state leadership and other key stakeholders, in-person site-visits, and summative HIE stakeholder discussions. Quantitative activities included analysis of secondary data sources, fielding a national survey of clinical laboratories, and developing a typology of state approaches to enabling HIE services.

This section describes the aims, research questions, and methods behind the total of 12 evaluation activities. We provide detailed descriptions of the methodology for evaluation activities in Appendix II.

Evaluation Aims, Research Questions, and Data Sources

The State HIE Program evaluation, as noted, had three AIMS, each with associated research questions and corresponding activities and data sources used to evaluate them. Exhibit 2 contains a description of how each activity related to each key research question.

Exhibit 2: Evaluation Aims, Research Questions, and Activities/Data Sources

| Evaluation Aim | Research Question | Activities and/or Data Sources |
|---|---|--|
| AIM 1: Characterize the approaches taken to enable HIE and how they evolved over time | What approaches did states take to enable HIE? | <ul style="list-style-type: none"> ■ Content analysis of state plans ■ 2013 Typology ■ 2013 Customer Relationship Management (CRM) ■ Data HIE Program Measures Dashboard |
| | What was the rationale for the approach? | <ul style="list-style-type: none"> ■ Discussions with State Health IT Coordinators/SDE Directors in 27 states ■ Follow-up discussions with HIE stakeholders in 10 states ■ 2011 eHealth Initiative (eHI) Annual HIE Survey ■ 2010 Robert Wood Johnson Foundation (RWJF) Survey ■ Round 1 case studies |
| | How did the approaches evolve over the duration of the program? | <ul style="list-style-type: none"> ■ Follow-on discussions with HIE stakeholders in 10 states ■ Round 1 case studies ■ Provider focus groups ■ Round 2 summative case studies ■ Content analysis of grantee final program performance reports ■ 2013 CRM Data |
| AIM 2: Characterize HIE levels at baseline and how they changed over time | What were the baseline HIE levels across states? | <ul style="list-style-type: none"> ■ Composite HIE score ■ 2010, 2012, and 2014-2015 RWJF Survey ■ 2011-2014 American Hospital Association (AHA) Annual Survey IT Supplement |
| | How did HIE progress across the duration of the program? | <ul style="list-style-type: none"> ■ 2011-2014 National Electronic Health Record Survey (NEHRS) data ■ 2011-2014 Surescripts data ■ ONC Health IT Dashboard ■ State HIE Program Measures Dashboard ■ 2013 CRM Data ■ 2012 ONC Survey of Clinical Laboratories |

| Evaluation Aim | Research Question | Activities and/or Data Sources |
|--|---|---|
| AIM 3: Assess overall program effectiveness | What were factors (contextual and programmatic) that influenced HIE progress? | <ul style="list-style-type: none"> ■ Hypotheses testing ■ 2013 Typology ■ Round 1 and Round 2 case studies ■ Summative key informant discussions ■ 2013 CRM data |
| | What are the overall program impacts? | <ul style="list-style-type: none"> ■ Summative key informant discussions ■ 2014 eHI Annual HIE Survey data ■ 2014-2015 RWJF Survey |

As noted in Exhibit 2 above, qualitative data sources included approved grantee Strategic and Operational plans (state plans), state plan updates, and grantee final program performance reports. Primary collection of qualitative data included discussions with stakeholders and site visits. For the quantitative analyses, NORC analyzed available secondary data from national sources and surveys—including the American Hospital Association (AHA) Annual Survey Health IT Supplement, the National Electronic Health Record Survey (NEHRS),^{vi} Surescripts e-prescribing data, the Robert Wood Johnson Foundation (RWJF) survey of HIOs, the Health IT Dashboard, and the State HIE Program Measures Dashboard. We also conducted primary data collection, fielding a national survey of clinical laboratories and a typology questionnaire. A full description of key data sources is available in Appendix II Exhibit 1.

Qualitative Evaluation Activities

The evaluation’s qualitative activities fall under three main domains: (1) content analysis, (2) stakeholder discussions, (3) and case studies. This section provides a brief overview of each activity. Appendix II describes each activity’s methodology and analytic approach in more detail.

Content Analysis of Grantee-Reported Data

From 2010 to 2011, each state submitted a state plan defining their strategic and operational strategies for enabling HIE. Following the end of program funding in 2014, grantees submitted final program performance reports outlining accomplishments, remaining gaps, and lessons learned.

State Plans. From January to June 2011, NORC conducted a systematic review of all 56 ONC-approved state plans. Data collected from the review provided background material and baseline data for the evaluation and informed AIM 1 (to classify state approaches to enable HIE). State plans differed in level of detail; how they addressed each topic area required by ONC’s first Program Information Notice (e.g., environmental scan, strategy to meet MU, coordination with Medicaid, HIE sustainability plans); and the format used to present information—differences that presented challenges in locating the required information.

Grantee Final Program Performance Reports. In April 2014, ONC required all grantees to submit a State HIE Close-out Checklist and Attestation, which included a final report. From July to August 2014, NORC conducted a systematic review of these final reports, which helped identify the major challenges states experienced implementing their selected approach, lessons learned, and sustainability plans (AIMS 1 and 3).

Stakeholder Discussions

Throughout the evaluation, NORC held 132 telephone discussions with an array of stakeholder types across states.

^{vi} Formerly known as the National Ambulatory Medical Center Survey (NAMCS) Electronic Medical Records Supplement

Initial discussions with State Health IT Coordinators and HIE leadership in 27 states. From January to July 2011, NORC conducted discussions with 23 State Health IT Coordinators, 11 SDE directors, and 27 other key HIE leaders to address AIM 1 research questions. We selected the 27 states based on their geographic diversity, variability in strategic approaches to enabling statewide HIE, state plan approval date (an indicator of states' varying levels of readiness to implement their plan), presence of a Direct pilot, and extent to which state approaches and activities reflected national trends. Discussions with state leaders focused on the role of HIE leadership, type of models selected and rationale, implementation progress, issues and challenges, role of national policies in the state strategy, and initial approach to sustainability.

Follow-up discussions with key HIE stakeholders in ten states. Of the 27 states with which NORC had initial discussions, we selected ten for follow-up discussions based on population size, geographic diversity, and different technical models. A full list of selection criteria is available in Appendix II Exhibit 6. From September to December 2011, NORC conducted discussions with 84 key HIE stakeholders in those ten states (See Appendix II Exhibit 7 for a count by stakeholder type).

Discussion goals were to gather stakeholder perspectives on state HIE efforts; assess stakeholder perceptions of program effectiveness relative to the progress described by state leadership; identify common enablers, barriers, and lessons learned for engaging key stakeholders in program activities; and determine the contribution of stakeholders to states' HIE efforts.

Summative key informant interviews. NORC, in collaboration with ONC, developed a select list of key state, federal, and HIE experts. From July to September 2014, NORC conducted 21 summative key interviews to gauge program impacts and inform AIM 3 of the evaluation: assessing overall program effectiveness. The conversations covered topics such as program successes and challenges, sustainability, and alignment with other initiatives.

Case Studies

NORC conducted qualitative, in-depth examinations of 11 states, including in-person site visits to seven states (including nine provider focus groups in five states).

Round 1 Case Studies. From November 2011 to March 2012, NORC conducted site visits to and semi-structured discussions in five states (Nebraska, Maine, Texas, Washington, and Wisconsin). Our primary objectives were to: (1) assess experiences of states establishing governance structures and technical services and implementing privacy and security frameworks; (2) assess stakeholder priorities, current use, and anticipated need for HIE; (3) identify common enablers, barriers, and challenges states encountered during implementation; and (4) collect and characterize lessons learned. Case study research questions informed AIMS 1 and 3.

Provider Focus Groups. During the Round 1 case studies, NORC conducted focus groups in the five case study states. We held nine focus groups, five with physicians from small practices (5 physicians or fewer) and four with physicians from larger practices (20 or more physicians).

Findings from the provider focus groups informed AIM 1, primarily regarding the major challenges associated with implementing specific HIE approaches.

Round 2 Summative Case Studies. Between March and May 2014, NORC conducted a summative round of case studies in six additional states: Iowa, Mississippi, New Hampshire, Utah, Vermont, and Wyoming. We conducted in-person site visits to Vermont and Utah and virtual discussions with the remaining four states. The goals were to identify key enablers, challenges, and lessons learned (Chapter VI), identify how approaches evolved over the duration of the program (AIM 1, Chapter III), and assess impacts of both short- and long-term trajectories of HIE at the state level (AIM 3, Chapter V). We interviewed 108 individuals over the course of 71 separate stakeholder meetings.

Analytic Approach for All Qualitative Activities

NORC used grounded theory to identify common themes and barriers across different states, enablers to HIE, and lessons learned. The team analyzed the in-depth, transcript-style notes to identify emerging themes. For the case studies, the team debriefed after each visit or focus group to discuss emerging themes within key topic areas. Identification of additional themes allowed refinement of research questions and hypotheses. Grounded theory analysis helped examine relationships among state roles, perceptions, and program characteristics.

Quantitative Evaluation Activities

This section provides an overview of all quantitative evaluation activities. Appendix II describes the methodology and analytic approach for each quantitative activity in detail.

Typology

In fall 2012, NORC collected data on state-level programmatic efforts and policies to facilitate HIE, focusing on three domains: (1) program leadership and organizational structure (the approach the state is taking to operating and overseeing state-level information exchange efforts); (2) technical approach (infrastructure if any, services, and use of Direct and query-based exchange); and (3) legal and policy approach (relevant state law and regulation, approach to privacy and patient consent, and sustainability). In the summer of 2013, ONC Project Officers completed a follow-up questionnaire, validating or modifying their original responses. This activity informs AIMS 1 and 3 of the evaluation.

Composite HIE Score

NORC constructed a composite measure of HIE at the state level. Our goal for this composite was to create a summary measure of state HIE that was easy to compute and understand, was methodically robust, factored in program priorities, and was actionable—that is, allowed states to identify areas of information exchange they need to address and improve upon. We identified three priority domains based on ONC’s Program Information Notices—laboratory results exchange, clinical care exchange, and e-prescribing—and identified seven measures from which we created the composite. The composite HIE score informs AIM 2 of the evaluation.

Hypotheses Testing

To study the effect of specific program and contextual factors on the relative levels of HIE across states, as measured by the composite HIE score, we generated and statistically tested hypotheses. This activity informs AIM 3 of the evaluation. We summarize the program and contextual factors, dependent variables, hypothesis tested, distribution of the program factor variables across the 51 states, as well as the source data and source variables, in Appendix II.

National Survey on HIE in Clinical Laboratories

Given the importance of laboratory results to support clinical care delivery, one of the program priorities was for grantees to promote the electronic exchange of structured test results from clinical laboratories to health care providers. Given the absence of a reliable national data source regarding the baseline capacity for clinical laboratory information exchange, we conducted a survey of clinical laboratories in the spring and summer of 2013.

Data collection focused on two key indicators: (1) percentage of laboratory facilities *within each state* and *nationally* able to send structured laboratory results electronically to ordering providers, both overall and separately for hospitals and independent laboratories; and (2) percentage of laboratory results *within each state* and *nationally* currently being sent electronically in structured format to ordering providers, both overall and separately for hospitals and independent laboratories.

III. AIM 1: Characterize Approaches Taken to Enable HIE and How They Evolved over Time

Chapter Summary

In this chapter, we address AIM 1 of the evaluation: to determine grantees' approaches to enabling HIE services, rationale for their selected approaches, and how those approaches evolved over time.

What Approaches Did Grantees Take to Enable HIE Services?

Grantees were able to select state-specific implementation approaches, given varied market dynamics.

Leadership and Organizational Structure. Grantees selected one of three models: state-led, SDE-like, and true SDE. Three-quarters of the states directly received program funds from ONC, but fewer than half chose a state-led model entity for their implementation efforts.

Technical Approaches. Most grantees used a single entity to provide technical services across the state, rather than connecting local or regional entities in a “network-of-networks” approach. Grantees' services generally aligned strongly with the Medicare and Medicaid EHR Incentive Programs' MU priorities.

Legal and Policy Approaches. Most grantees selected “opt-out” consent models, which authorized providers to exchange patient health information unless the patient explicitly requested otherwise. Many grantees also used legal and policy levers to support building HIE infrastructure, to help create services, and/or to encourage HIE participation.

What Was the Rationale for the Approach Chosen?

Grantee approaches were influenced by local context and market factors. For example, the level of HIE activity prior to HITECH affected grantee selection of leadership and organizational approach. State characteristics—including population, local use cases, state geographic size, and presence of HIOs and other hospital systems engaging in exchange—influenced grantees' selected technical approaches.

How Did These Approaches Evolve over the Duration of the Program?

Given the ongoing evolution of both the health care market and the health IT landscape, as well as availability of exchange outside the State HIE Program, many grantees shifted their approaches towards strengthening existing networks of exchange, instead of positioning themselves as the state's central HIE service provider. Grantees' top planned services also shifted from Stage 1 MU requirements and services emphasized by ONC's first Program Information Notice⁶⁵ towards Stage 2 MU requirements related to HIE. Grantee perspectives shifted from enabling or increasing availability of query-based exchange, to ensuring high data quality to build trust and service use. Grantees also began to view directed messaging as both a short-term solution and a solution with specific use cases for which query-based exchange was not an option.

Conclusions

Leadership and governance structures, technical models, and legal and policy approaches were important factors in the grantees' abilities to enable or expand HIE. While these factors were not fully responsible for programmatic progress or lack thereof, there is a clear trend in favor of certain implementation models and approaches. Grantees were strongly influenced by local context and market factors and chose approaches that “played to their strengths.”

Introduction

According to the FOA, program activities should focus on “developing the statewide policy, governance, technical infrastructure and business practices needed to support the delivery of HIE services” by:

- Convening health care stakeholders to ensure trust of, and support for, a statewide approach to HIE
- Ensuring that an effective model for HIE governance and accountability is in place
- Coordinating an integrated approach with Medicaid and public health
- Developing state-level directories and enabling technical services for HIE within and across states;
- Removing barriers and creating enablers for HIE
- Developing or updating privacy and security requirements for HIE within and across state borders.⁶⁶

The FOA offered grantees flexibility in selecting implementation approaches, recognizing the need for distinct models given varied state market dynamics.⁶⁷ The ONC’s first Program Information Notice highlighted the importance of expanding existing infrastructure and emphasized the benefits of market-based strategies that leveraged existing networks of exchange.⁶⁸ As the health care and health IT landscape evolved, grantees found it necessary to adjust their approaches.

In this chapter, we address AIM 1 via the following key research questions:

- What approaches did grantees take to enable HIE services?
- What was the grantee’s rationale for its selected approach?
- How did these approaches evolve over time?

NORC drew from a wide range of data sources and evaluation activities to inform these research questions. We developed a typology to characterize grantee approaches, held discussions with key stakeholders across states, and conducted in-depth case studies to understand the reasoning behind grantees’ selected approaches, and how those approaches evolved. State plans, eHI’s Annual HIE Survey, and grantee final reports provided additional evidence for our analysis. A more detailed description of the methodology is available in the Chapter II: Methods. The three key research questions are the organizing framework for this chapter.

What Approaches Did Grantees Take to Enable HIE Services?

We describe grantee approaches to enabling HIE services based on their leadership and organizational structure, technical models, and legal and policy approaches—all important domains highlighted by the FOA as necessary for enabling statewide HIE services.

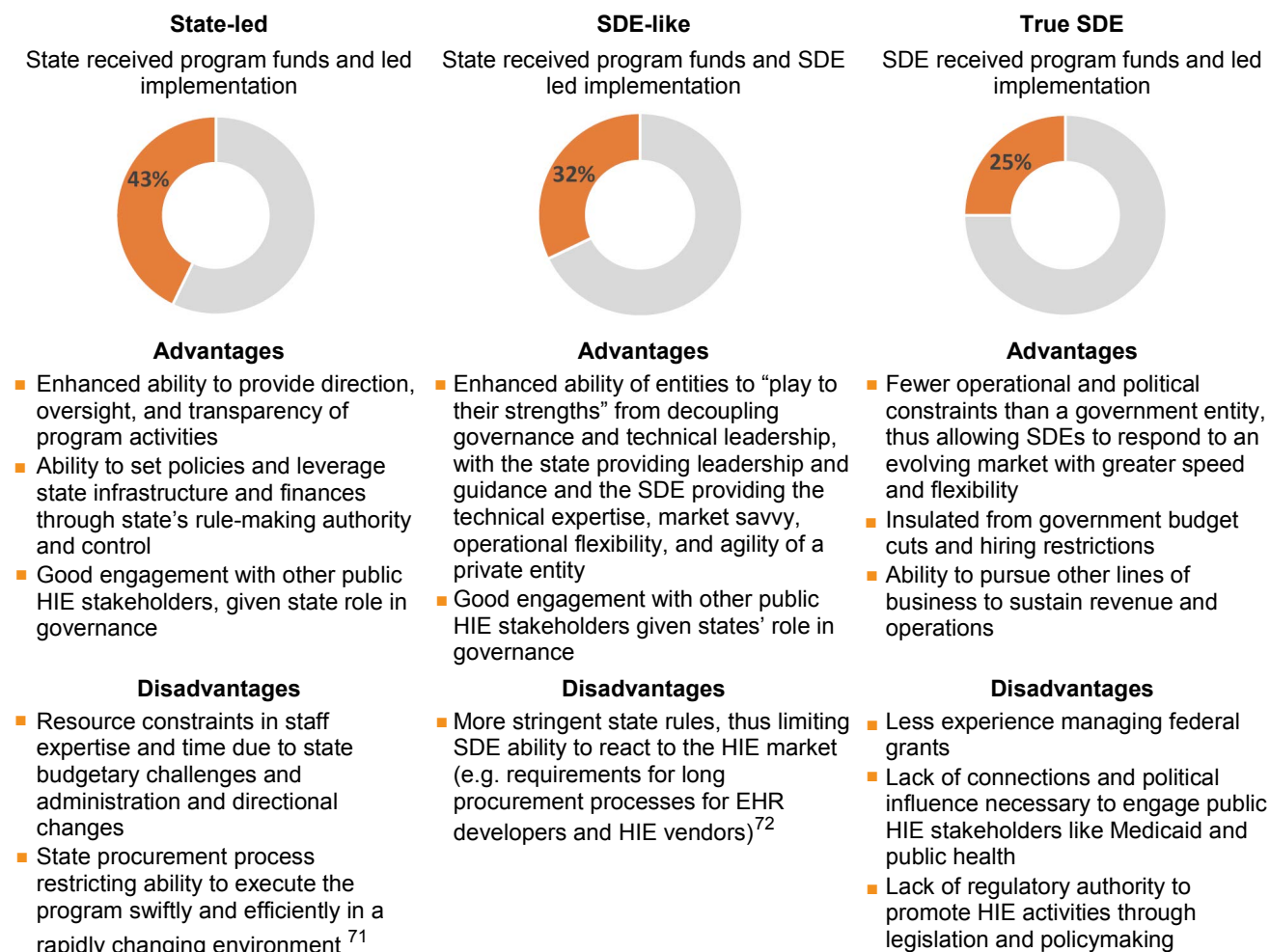
Leadership and Organizational Structure

The FOA identifies governance, which “provide[s] oversight and accountability of HIE to protect the public interest,” as a necessary element for enabling statewide HIE services.⁶⁹ This section describes stakeholders’ perceived advantages and disadvantages of grantees’ varying leadership and organizational structures as a governance approach.

Grantees implemented varying leadership and organizational structures, each with its own advantages and drawbacks. ONC provided program funding and leadership authority to both states and SDEs. Under Section 3013 of the Public Health Service Act, an SDE must “[be a] not-for-profit [organization] with broad stakeholder representation on the board; demonstrate that one of its principal goals is to use health IT ... through authorized and secure electronic exchange of health information; and adopt ... fair and nondiscriminatory participation by stakeholders.”⁷⁰ This structure for disseminating program funds and leading HIE implementation led to three models of leadership and organizational

structure: state-led, SDE-like, and true SDE. Exhibit 3 shows the percent adoption of each model and stakeholder-perceived advantages and disadvantages of each.

Exhibit 3: Grantees' Leadership and Organizational Model (N=56)



SOURCE: 2013 Program Data Collected by NORC

The leadership role of State Health IT Coordinators influenced states' ability to enact policy and lead implementation efforts. Many Health IT Coordinators held responsibilities beyond the State HIE Program—including to other health IT and non-health IT initiatives like administration of the state Medicaid program. Discussions with Health IT Coordinators and HIE leadership in 27 states revealed that state government responsibilities were an advantage, enhancing their overall authority and the ability to engage state agencies or programs in the State HIE Program. However, this also meant reduced involvement in and knowledge of the technical aspects, implementation, and day-to-day operations of the grantee's efforts.⁷³

Technical Approach

This section describes grantees' high-level technical approach to enabling HIE services as well as details of how grantees enabled directed and query-based exchange.

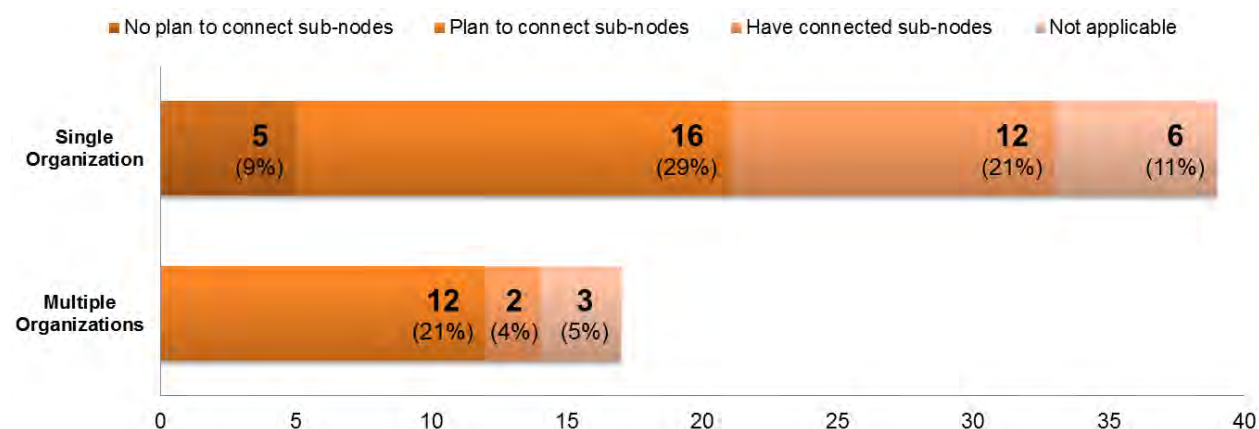
High-Level Technical Approach

The State HIE Program FOA noted that technical infrastructure—“the architecture, hardware, software, applications, network configurations and other technological aspects that physically enable the technical services for HIE in a secure and appropriate manner”—is one of the necessary domains for developing HIE capacity.⁷⁴ Although grantees’ high-level technical approaches to HIE services varied greatly, the majority involved: (1) establishing or leveraging a single statewide organization to provide HIE services; or (2) using a “network-of-networks” approach, which connects local or regional exchange nodes (e.g., HIOs). Other approaches used by grantees include funding regional HIOs without establishing a network, or funding providers to join existing HIOs without offering centralized services.

Seventy percent of grantees used a single organizational entity to provide technical services across the state, via a state-led or SDE model (see Exhibit 4). Some states, like Vermont, had established, statewide HIE organizations and therefore used more extensive, centralized services to enable exchange. Fifty percent of grantees using a single organizational entity to provide technical services were connecting or had plans to connect sub-nodes. This mixed model approach allowed grantees to leverage existing infrastructure, establish central services to fill gaps in the market, and ensure all providers had options to participate in HIE.

Other grantees, often in states with multiple existing exchange networks, assumed the role of connecting local or regional nodes (i.e., a capacity-builder model).⁷⁵ For example, instead of building new infrastructure for exchange, some grantees created more inclusive sharing networks by connecting local and regional HIOs, large health systems, and health center–controlled networks across their states or regions.⁷⁶ Some grantees played distinct governance roles, in which the state or SDE established policies and acted as a neutral convener for involved entities while local HIOs or other HIE networks performed technical operations.

Exhibit 4: Approach to Sub-Nodes by General Approach to Enabling Exchange, as of 2013 (N=56)



SOURCE: 2013 Program Data Collected by NORC

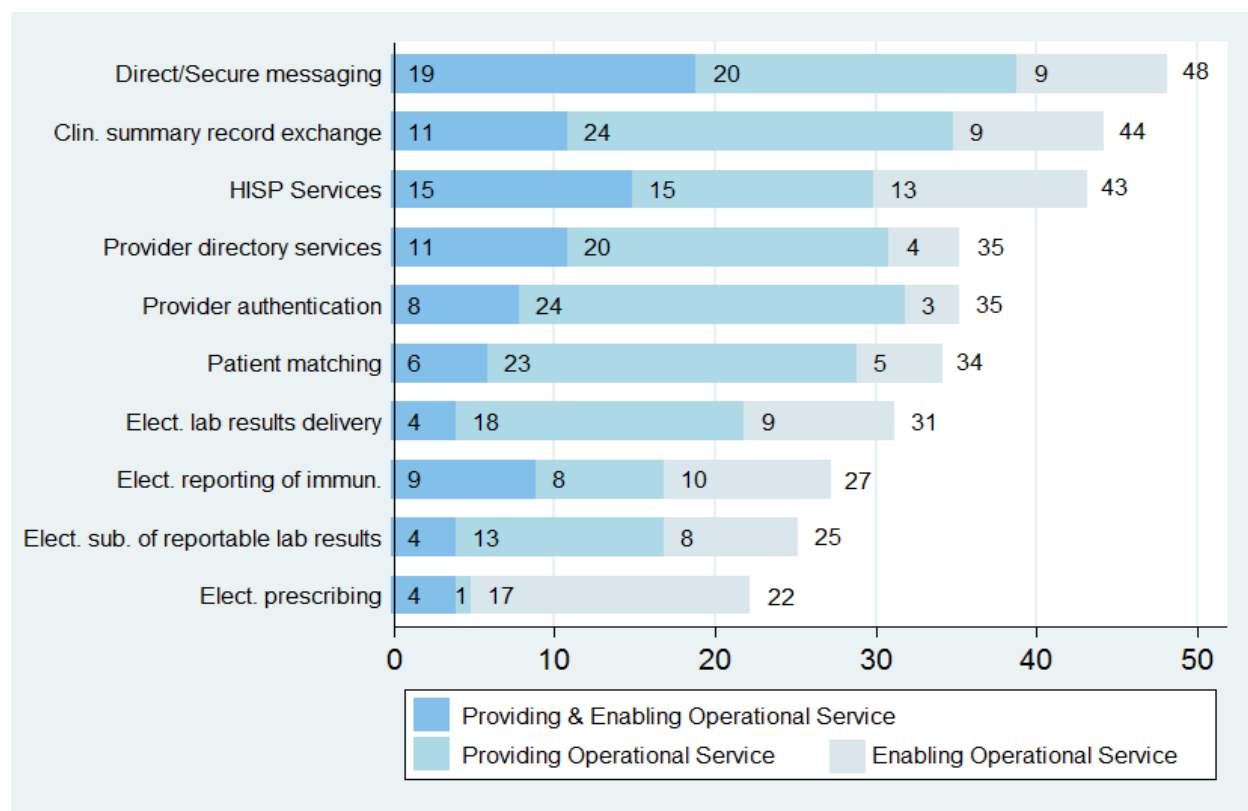
Grantee-Enabled Services

Stage 1 MU established HIE objectives in specific areas: e-prescribing; exchange of clinical care summaries; integrating laboratory results into EHRs; and reporting of immunizations, laboratory results, and syndromic surveillance data to public health departments.⁷⁷ In ONC’s first Program Information Notice, ONC emphasized three of these exchange priorities: e-prescribing, receipt of structured laboratory results, and sharing of patient care summaries.⁷⁸

The number and range of services offered by grantees varied but aligned strongly with the EHR Incentive Programs’ Stage 1 MU priorities. According to Customer Relationship Management (CRM) data provided by ONC, in 2013 Direct/secure messaging (48 grantees) and HISP services (43 grantees)

were two of the top services grantees either directly provided or enabled, by funding or offering technical assistance to other entities providing the service (see Exhibit 5). ONC’s focus on Direct played a significant role in grantee provision of secure messaging and HISP services. Other top services included provider directory services, clinical summary exchange, and reporting of immunization data.

Exhibit 5: Top Ten Operational Services Grantees Directly Provided or Enabled*, as of July to December 2013 (N=56)



* A “directly offered” service means the state provides the service to users. An “enabled” service means the state funds another entity to provide the service or the state provides technical assistance to support implementation/use of the service.

SOURCE: 2013 CRM Data Provided by ONC

Types of Exchange

Grantees enabled HIE services through two main mechanisms: directed and query-based exchange. This section describes the two, including stakeholder use cases and perceptions of each.

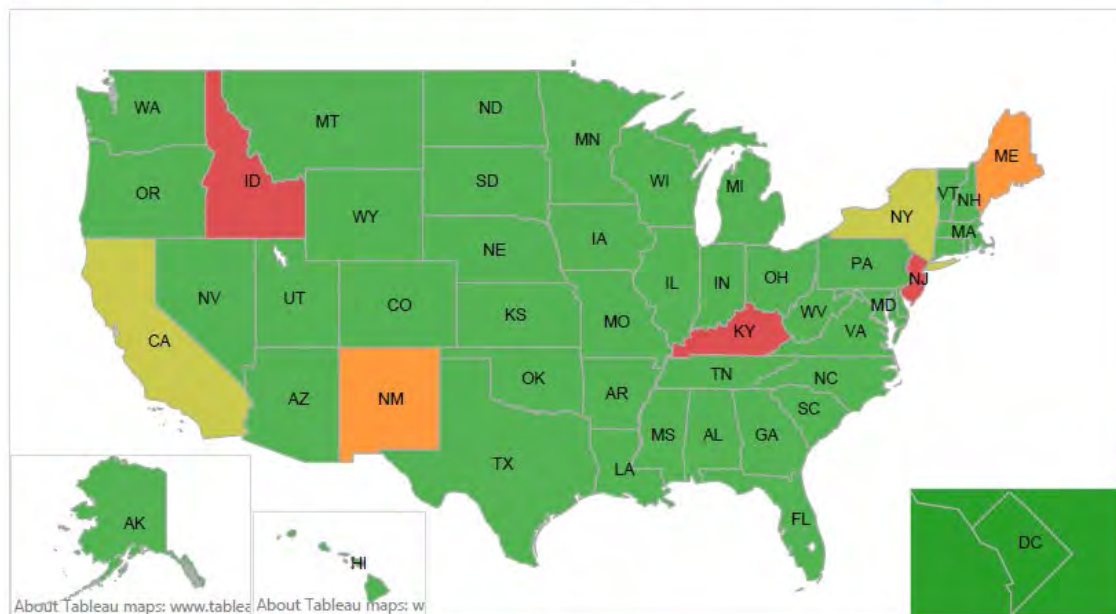
Directed Exchange

In 2010, ONC convened public and private stakeholders for the Direct Project, which specifies a set of standards and services to transport health information point-to-point through a secure, fast, and inexpensive “push” model—thereby creating an additional HIE method under the program.⁷⁹ The purpose of Direct was to offer all providers, including those without EHR capacity, a method of engaging in exchange. In the fourth quarter (Q4) 2013, 47 states and territories had directed exchange broadly available—providers could subscribe to regional- and state-level entities that facilitate exchange across unaffiliated organizations (see Exhibit 6).⁸⁰

Exhibit 6: Directed Exchange Implementation Status, as of Q4 2013 (N=56*)

Directed Exchange Implementation Status

Available in regions Broadly available Not currently available Pilot

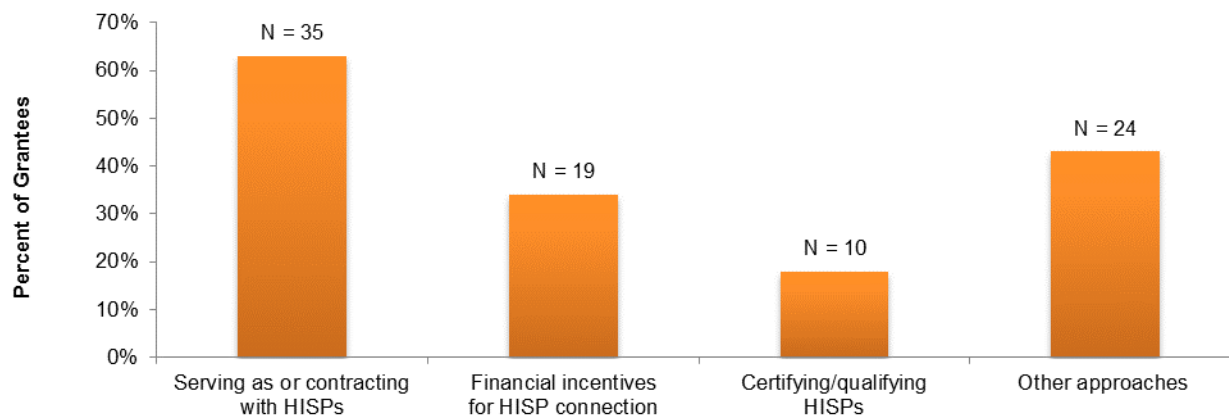


SOURCE: ONC State HIE Program Measures Dashboard (Q4 2013) available here: <http://www.healthit.gov/policy-researchers-implementers/state-hie-program-measures-dashboard>

*Territories not shown on map.

Grantees took multiple approaches to facilitating directed exchange services. As noted, HISPs provide secure, directed exchange between trading partners.⁸¹ Grantee-reported strategies for enabling directed exchange include certifying or qualifying HISPs (by establishing minimum service and interoperability requirements), contracting with HISPs, developing technical services and serving as the HISP themselves, or providing financial incentives to HISPs (see Exhibit 7). For example, in Wisconsin, Maine, and Nebraska, grantees served as HISPs; in contrast, Texas opted for a more market-based approach, certifying developers to function as HISPs rather than providing services itself.

Exhibit 7: Grantee Approach to Facilitating Directed Exchange Services, as of 2013 (N=56)*



* Grantees took more than one approach to facilitating directed exchange services.

SOURCE: 2013 Program Data Collected by NORC.

Exhibit 9: Advantages and Disadvantages of Models for Query-Based Exchange

| Model | Advantages | Disadvantages |
|-------------------------------|---|---|
| Centralized Repository | <ul style="list-style-type: none"> ■ A consolidated view of the patient access to aggregated data for analytics and population health management ■ Faster access given the data are already centrally maintained ■ Translation and mapping services that may enhance data quality⁸⁶ ■ Facilitates other value-add functions, such as community-wide data analytics⁸⁷ ■ Connects otherwise disparate networks and provides access to centralized data for entities, limiting the number of point-to-point connections | <ul style="list-style-type: none"> ■ Costly to develop and large up-front investment ■ Lack of flexibility to respond to market shifts ■ Participating systems must submit data to the repository in a timely fashion, to ensure record completeness when providers query the system⁸⁸ ■ Data owners unable to maintain direct control of their data ■ Concerns about security breaches |
| Federated Repository | <ul style="list-style-type: none"> ■ Flexibility to respond to market needs ■ Leverages existing exchange infrastructure, i.e., private and community-based HIOs ■ Data suppliers maintain control over their data ■ Alleviates concerns around data breaches and provision of assurance and legitimacy of authorized access to third party systems ■ Failure of one system does not incapacitate the entire system ■ Data always current as providers query the most recent data available in a systems local repository | <ul style="list-style-type: none"> ■ Complexity of establishing connectivity to federated repositories requires considerable time and effort ■ Interoperability issues, given lack of, or differentially interpreted, standards that delay the process for connecting systems from different EHR developers⁸⁹ |

A **mixed, or hybrid, model** allows providers to query a network of federated repositories while the HIE system also stores a copy of a minimal clinical dataset (beyond the data required to identify the patient) in a data repository.^{90,91} In Massachusetts, for example, the state enabled queries of patient data but health care systems housed their own data. The system also stores a clinical dataset centrally when necessary for certain use cases—such as public health and quality reporting for MU—as the statewide infrastructure supports connections to the state’s immunization registry and quality data centers.

Legal and Policy Approaches

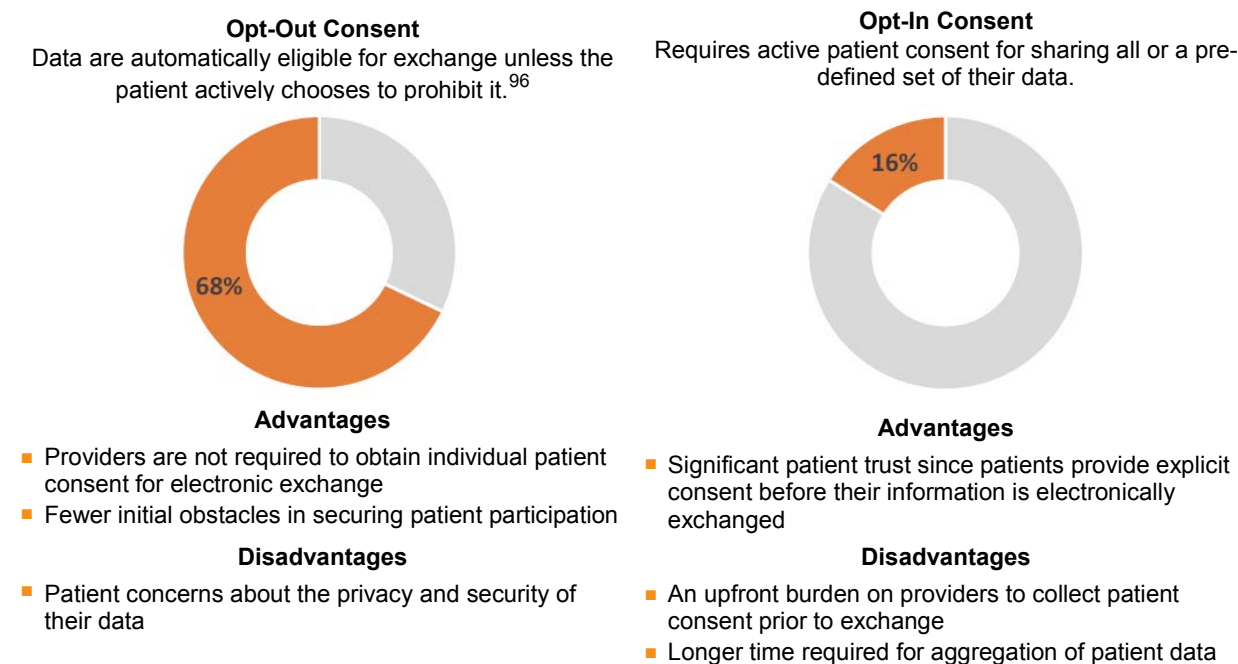
The FOA and third Program Information Notice required grantees to establish privacy and security protocols and “incorporate the privacy and security provisions of the ARRA, HIPAA Privacy Rule, HIPAA Security Rule, Confidentiality of Alcohol and Drug Abuse Patient Records Regulations, and the HHS Privacy and Security Framework into the State Strategic and Operational Plans.”⁹²

Throughout the program, ONC also encouraged states to use all available levers available to them to encourage HIE. For example, states could leverage their purchasing powers and establish requirements for reimbursements.⁹³ This section discusses the varied legal and policy approaches grantees used to ensure information could be securely exchanged.

Privacy and Security

ONC required grantees to ensure the secure exchange of individually identifiable health information and to develop requirements for their privacy and security frameworks.⁹⁴ ONC’s third Program Information Notice instructs states to provide individuals with “a reasonable opportunity and capability to make informed decisions about the collection, use, and disclosure of their individually identifiable health information” when “HIE entities store, assemble or aggregate [individually identifiable health information] beyond what is required for an initial directed transaction.”⁹⁵ That is, ONC requires consent policies when grantees use query-based exchange versus secure, directed messaging between two pre-authenticated providers. Patient consent models included opt-out, opt-in, and other. Exhibit 10 describes the main consent models and their advantages and disadvantages.

Exhibit 10: Grantees' Consent Models (N=56)*



* The remaining 16 percent of grantees (not shown) pursued “other” approaches to consent.
SOURCE: 2013 Program Data Collected by NORC

In 2013, most grantees (68 percent) had instituted an opt-out consent model. In some cases, grantees had opt-out policies with opt-in provisions to allow patients to restrict the exchange of certain sensitive data elements, such as mental health and substance abuse data. For example, both Maine and Nebraska have opt-out policies, with opt-in required for the exchange of sensitive health information. Only 16 percent of grantees established opt-in consent models.⁹⁷ The remaining 16 percent pursued ‘other’ approaches to consent—including not instituting a uniform consent model but allowing each organization to choose their own consent approach. Lack of a uniform consent model allowed each organization to institute its own preferred policy for garnering patient consent; however, stakeholders were concerned about the ability to exchange data among organizations that implemented different models.

Some states adopted legislation to restrict the flow of sensitive health information, while others adopted approaches for enabling its exchange. Stakeholders noted laws around the exchange of sensitive health information were often major barriers to exchange, given limitations in providers’ ability to separate sensitive health information from other clinical data. Confidentiality of Alcohol and Drug Abuse Patient Records (Part 2) of the electronic Code of Federal Regulations limits disclosure and use of information about individuals seeking or obtaining diagnosis, referral, or treatment in federally assisted alcohol or drug abuse treatment programs.⁹⁸ In some cases, states took a proactive approach to facilitate data flow via state law. For example, Maine adopted an opt-out consent model through Legislation LD 1331 (An Act to Increase Health Care Quality through the Promotion of Health Information Exchange and the Protection of Patient Privacy, 2011) for non-sensitive data, which allowed patients to opt-in for the electronic exchange of sensitive data.⁹⁹ Other grantees carved out sensitive data and limited their electronic exchange.

Beyond use of consent models, grantees addressed privacy and security–related concerns via other related policies. In 2010, for example, Maryland enacted legislation to ensure HIOs or other entities could not use patient data inappropriately or for secondary uses; it also prohibited the sale or transfer of data until the state finalized its privacy policies. Additionally, 2011 legislation stipulated that the Maryland Health Care Commission, an independent regulatory agency, would adopt regulations to ensure

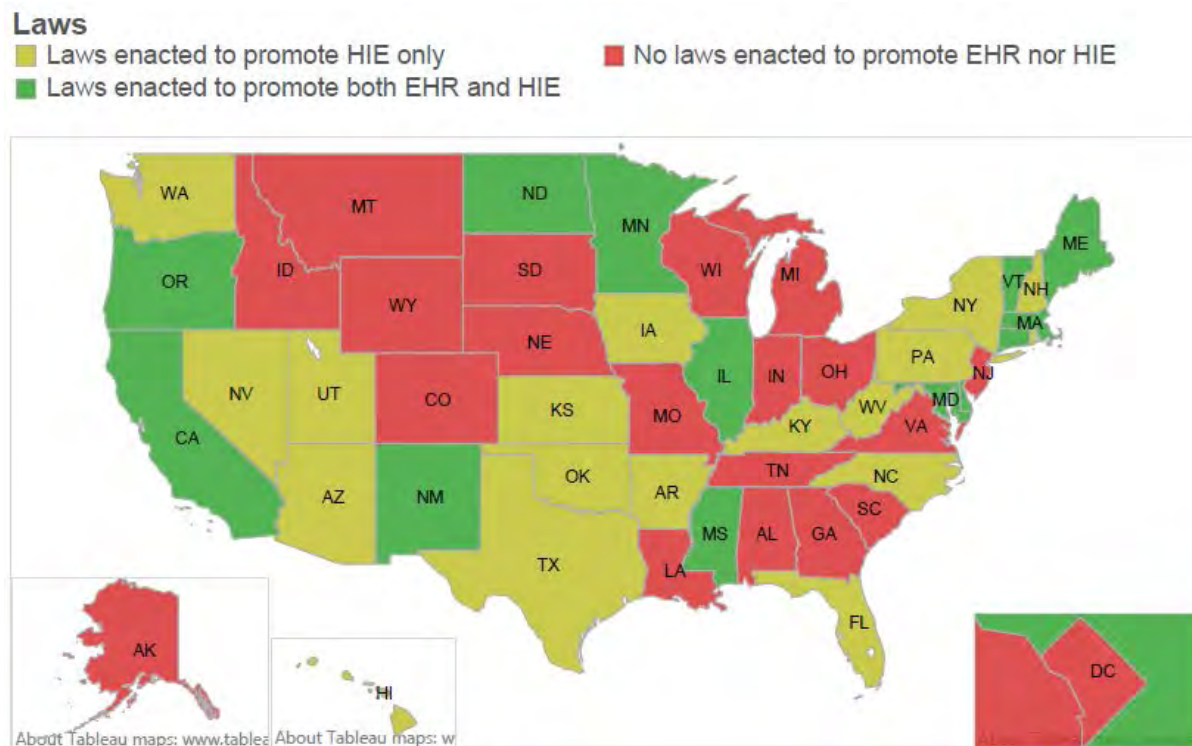
the privacy and security of protected information exchange through an HIO. Stakeholders noted these laws engendered trust, as stakeholders were confident HIOs would exchange their information securely as long as the state enforced the regulations. More generally, stakeholders reported that Maryland used the legislature effectively to enable HIE services and garner trust in the program.

Legal and Policy Levers

States used legal and policy levers to promote the exchange of health information—including mandating provider participation in HIE; enacting legislation to promote HIE participation, EHR adoption, or both; and accrediting HIOs or HISPs.

Many grantees enacted legislation to promote HIE participation, EHR adoption, or both. In 2013, 59 percent of grantees had enacted legislation supporting HIE participation and EHR adoption, 36 percent had laws promoting HIE, and 23 percent supported both HIE and the use of EHRs (see Exhibit 11). In Minnesota, for example, the 2007 Interoperable Electronic Health Record Mandate required all providers to use an EHR system by 2015, while the 2010 Electronic Prescribing Mandate, effective January 1, 2011, required all providers, group purchasers, prescribers, and dispensers to establish, maintain, and use an e-prescribing drug program. In North Carolina, House Bill 834 of the state’s Health Care Cost Reduction and Transparency Act of 2013 required all hospitals with EHR systems to connect to the North Carolina Health Information Exchange (NCHIE) in order to submit patient demographic and clinical data on services paid for by Medicaid.¹⁰⁰ Other states leveraged the rise of ACOs to bolster their HIE infrastructure, by requiring organizations forming ACOs to become part of the statewide HIE system.

Exhibit 11: Legislation Passed to Promote HIE Participation, EHR Adoption, or Both, as of 2013 (N=56*)



SOURCE: 2013 Program Data Collected by NORC

*Territories not shown on map.

Another policy lever states used was offering financial incentives beyond the EHR Incentive Programs to promote adoption of EHRs and engagement in HIE. Some states subsidized costs of establishing interfaces to the grantees’ HIE systems or offered monetary incentives to encourage

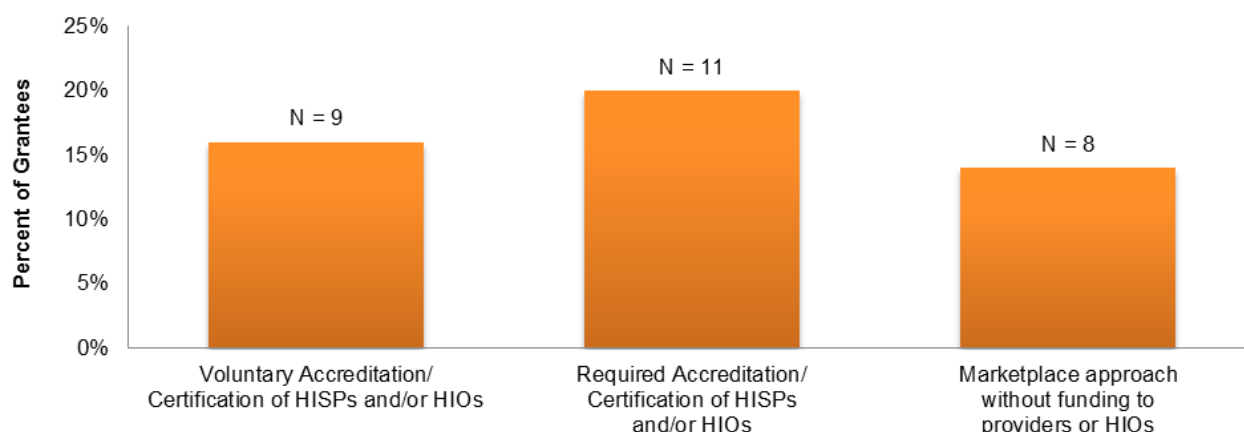
providers to use statewide services. Indiana Health Information Technology, the SDE, provided connectivity grants to rural and underserved providers, as well as local and regional HIOs. Stakeholders agreed the grants were instrumental in helping rural providers gain the capability to exchange information. Other states offered financial incentives to providers, such as through connectivity grants and subsidized costs, including Montana, Maryland, Wyoming, and Mississippi.

Some grantees mandated provider participation in their statewide HIE system to achieve greater provider participation.¹⁰¹ In North Carolina, for example, House Bill 834 of the state’s Health Care Cost Reduction and Transparency Act of 2013 required all hospitals with EHR systems to connect to the North Carolina Health Information Exchange (NCHIE) in order to submit patient demographic and clinical data on services paid for by Medicaid.¹⁰² Similarly, the Maryland Health Care Commission mandated all acute care hospitals to submit demographic data to the Chesapeake Regional Information System for our Patients (CRISP), the statewide HIE, by December 1, 2011.¹⁰³ Hospitals are required to connect to CRISP in order to send admission, discharge, or transfer (ADT) data, so the Maryland Health Services Cost Review Commission can track readmissions across hospitals.

Some grantees required public health reporting to occur through designated statewide HIE systems as a policy lever to promote HIE services. Requirements include immunizations, syndromic surveillance, and electronic laboratory reporting. In Mississippi, for example, the Department of Health requires all eligible providers, eligible hospitals, and critical access hospitals to use the Mississippi Health Information Network (MS-HIN)—that is, the statewide HIE system—to satisfy their MU public health reporting requirements.¹⁰⁴ In New Hampshire, the Department of Health and Human Services proposed legislation to expand the law governing HIE services, to allow for any required public health reporting to the state to occur through the New Hampshire Health information Organization (NHHIO).

Grantees accredited or certified HIOs or HISPs to increase stakeholder trust in HIE efforts and organizations. Over one-third of states used voluntary or required accreditation and/or certification of HIOs or HISPs within their state. Some made sub-awards to existing HIOs, requiring accreditation or certification as a pre-requisite for state funding (see Exhibit 12). In Minnesota, for example, the 2010 Health Information Exchange Oversight Law required entities aspiring to serve as HIE service providers to apply for a Certificate of Authority,¹⁰⁵ demonstrating established policies and practices to comply with all federal privacy and security laws as well as those specific to Minnesota (many of which are more stringent than HIPAA). Texas certified HISP developers to enable trust among providers using those developers.¹⁰⁶ Policy levers like accreditation have the potential to adapt to market needs, and to promote use of best practices and continuous process improvement.

Exhibit 12: Use of Accreditation/Certification of HISPs and/or HIOs as Policy Levers, as of 2013 (N=56)



SOURCE: 2013 Program Data Collected by NORC

What Was the Rationale for the Approach Chosen?

Decisions regarding program leadership and organizational structure, technical approach, and policy approach required states to weigh the advantages and disadvantages associated with each model (described above) and state market variables. This section describes grantee-reported rationales for selecting their state approaches to enabling HIE services.

Leadership and Organizational Structure

Grantees' selection of leadership and organizational structures for governance was often based on availability of existing organizations to enable HIE services and HIE activity level prior to HITECH, among other factors.

The capacity of existing organizations to enable statewide HIE services influenced states' decision to lead implementation of the State HIE Program or work with an SDE. Stakeholders indicated that states first assessed the presence of organizations that could meet the FOA requirements, as well as any existing HIE infrastructure in the state, to determine their optimal approach. States with single statewide HIE providers often collaborated with them as SDEs, or relied on them to lead technical implementation efforts. In contrast, states lacking a predominant HIE service provider typically opted for a state-led approach to build infrastructure. Some states with prevalent hospital-based HIE and local/regional HIOs opted for connecting existing networks.

HIE activity prior to HITECH was one of the main factors in states' selection of leadership and organizational approach. State HIE leadership discussions and data abstracted from approved state plans revealed that states engaging in significant information exchange activity prior to HITECH tended to implement true SDE approaches. States with some activity at baseline favored SDE-like approaches, while those with limited baseline exchange favored state-led approaches. These data, though qualitative and based on approximately half of the grantees (N=27), support the notion that a state's history with HIE and HIE activity level at baseline influenced its program approach.

Case study and state HIE leadership discussions identified a number of other factors as significantly influencing state leadership and operational approaches. These include number of established local HIOs that predated HITECH; EHR adoption rates pre-HITECH; number of affiliated providers, hospitals, and integrated delivery networks in the area; and urban or rural location of population.¹⁰⁷ The 2011 eHI Annual HIE Survey echoed these findings, with grantees identifying the top three factors influencing their selection of a leadership and operational approach as: (1) level of stakeholder involvement (2) level and maturity of HIE infrastructure and (3) state geography.¹⁰⁸

Technical Approach

State characteristics—including population size, local use cases, and presence of HIOs and other systems engaging in exchange—all influenced grantees' selection of a technical approach.

Population density and location factored into grantees' selection of their technical approach.

Grantee respondents to the 2011 eHI Annual HIE Survey cited state population size (71 percent) and location (rural versus urban, 67 percent) as the most common factors influencing their choice of technical model. States with small populations and/or few local HIOs reported pursuing a more basic model in the short-term—with the intent of rapidly offering HIE capabilities to give providers at least one option to meet MU requirements.¹⁰⁹ State population size and urbanicity also influenced whether a state provided centralized services (small populations) or leveraged existing HIOs (larger populations), to account for local differences in needs. Texas' large and dispersed population, for example, led it to opt for a capacity-builder approach to HIE, leveraging existing HIOs instead of building redundant or competing systems. Local stakeholders then determined and provided services based on the precise needs of their target users.

Local use cases for HIE informed grantees' selection of services, and whether these services should be centralized or enabled through existing networks. Grantees often identified use cases for HIE based on their type of environment. In urban areas, providers worked at multiple locations and saw patients who visit multiple providers—highlighting the need for connecting with in- and out-of-system providers. These areas often benefited from federated repositories that connected disparate networks. Primarily rural states with population centers often serve patients who rely on small regional care centers for primary care but must travel long distances to see multiple providers for major health concerns—making proper care coordination a challenge. In such areas, the use case of improved coordination via a central repository can allow providers to collect otherwise diffused health records to provide better care. In addition to use cases specific to local needs, states targeted the broad goals of improving care, coordination, quality, and efficiency; and compliance with MU requirements.

The existence of large hospital systems, integrated delivery networks (IDNs), and other market factors influenced technical model selections. Similar to the presence of local HIOs, these systems are large players in the market, supporting a network-of-networks approach that creates other opportunities for exchange outside grantee services. These alternatives increased collaboration in some states while increasing competition in others; however, in both cases the greater the presence of providers engaging in HIE, the more awareness and potential interest in it. A 2015 RWJF survey found that 84 percent of operational HIOs (including grantees) cited competition as barrier to HIE development.¹¹⁰ State HIE leadership also sought less tangible factors that influence state selection, such as flexibility in both stakeholder involvement and the ability to adapt over time as new technologies emerge. Further, to make their efforts less threatening, grantees sought to pursue models that were least disruptive to existing relationships and regulations.

Legal and Policy Approach

Privacy and security concerns, combined with existing legislation, were the main factors identified as leading grantee selection of a consent model or other policy approach.

Privacy and security, particularly data breaches and unauthorized access (of special concern to patients and providers),¹¹¹ directly influenced choice of consent models and pursuance of related legislation. A 2009 HIO survey funded by the RWJF found that 61 percent of respondents cited privacy and security concerns, and 56 percent cited legal/regulatory challenges, as moderate or substantial barriers to HIE.¹¹² The 2011 eHI Annual HIE Survey identified privacy and confidentiality issues as one of the top two governance challenges states faced.¹¹³ Grantees devoted significant energy to ensuring privacy and security from a technical standpoint—for example, through federated databases to prevent accidental disclosure of sensitive data, as well as through policies governing the sharing of health data. In some states, such as Rhode Island and Utah, stakeholders recognized the need to ensure explicit patient control over their data in order to achieve HIE acceptance, which led to the selection of opt-in consent models. States that found less resistance to sharing at the local level selected either opt-out models or hybrid models that only require explicit consent for sharing certain types of information.

States often enacted policies in response to existing legislation that either hindered or enabled HIE progress. Grantees found legislation could be an enabler or a hindrance—depending on how their states interpreted the HIPAA Privacy Rule, which dictates: (1) a provider's ability to exchange health information with other providers, (2) what information providers' exchange, and (3) how they use the data. Some state legislation sets more stringent requirements than HIPAA—interpreting the Privacy Rule in a way that restricts information flow. As a result, some grantees enacted privacy and security-related policies to update and/or overcome historical barriers to electronic information exchange. In other states—including Maryland, Minnesota, and North Carolina—prior use of legislative levers to support EHRs and e-prescribing tended to predict the type of HIE legislation passed.

How Did Approaches Evolve over the Duration of the Program?

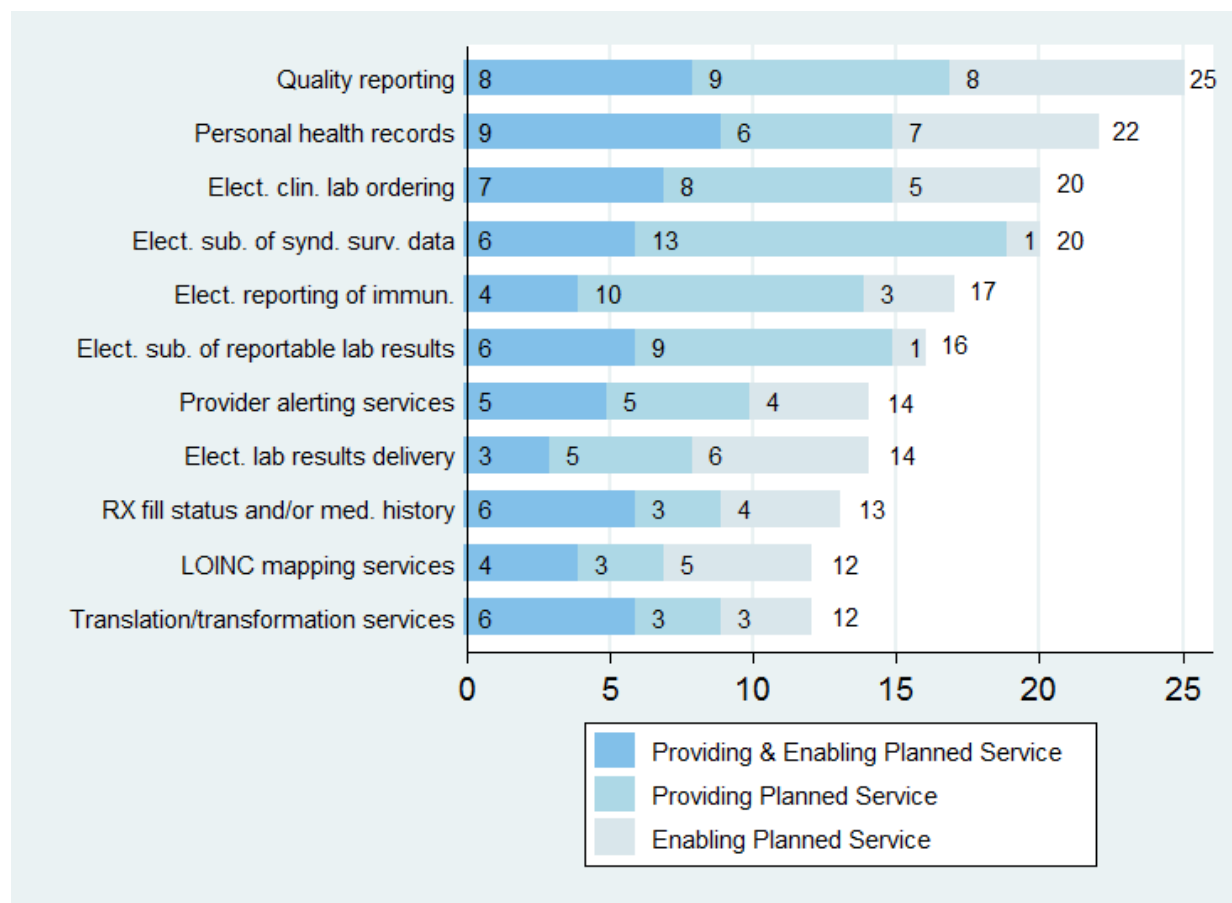
Given the continually evolving health care and health IT landscape, grantees had to adjust their approaches over time to address changing market needs.

As the program progressed, increased availability of other HIE solutions and changes in market needs led many grantees to shift their approach from building infrastructure to bolstering existing networks of exchange. “Capacity building,” one method for establishing and cultivating HIE,¹¹⁴ bolsters sub-state exchange through financial and technical support tied to performance goals. Initially, only four grantees used a capacity-building approach.¹¹⁵ As time went on, however, more grantees used this approach (21 by September 2012)—making sub-awards to existing HIOs, subsidizing provider costs for establishing interfaces, offering incentives to providers to use directed and query-based exchange services, and offering exchange-related technical assistance to providers and health care delivery organizations.¹¹⁶ As more private HIE solutions became available and large hospitals systems engaged in their own networks of exchange, grantees re-evaluated their service offerings. This market shift, along with technical challenges in implementing HIE solutions and delays in developing infrastructure, moved grantees to leverage available market infrastructure rather than continue developing their own.¹¹⁷

Grantee-provided services shifted to include more options for secure, directed messaging and HISP services. While previous evaluation findings¹¹⁸ revealed that providers’ HIE needs revolved around connecting disparate systems and meeting MU requirements around exchange, summative case study findings suggest providers’ needs around HIE evolved beyond those initial priorities. The 2011 eHI Annual HIE Survey found patient matching (28 percent), electronic reporting of immunizations (26 percent), and e-prescribing (21 percent) to be the top types of shared services provided by states or SDEs. By 2013, these priorities had shifted; according to CRM data, Direct/secure messaging and HISP services were the top two services grantees either directly offered or enabled. ONC’s focus on Direct—to offer providers at least one option for HIE—played a significant role in the shift to secure messaging and HISP services.

Grantee service plans indicate a future focus on supporting more sophisticated forms of HIE to help providers meet Stage 2 MU and support delivery system reform. Stage 2 markedly expands the requirements for HIE.^{119,120} For some of these requirements, providers must move beyond sending test messages and demonstrate more robust exchange capabilities. Grantees’ reported planning to offer services focused on quality reporting (25 grantees), electronic clinical laboratory ordering (20 grantees), and supporting MU public health reporting requirements such as the electronic submission of syndromic surveillance (20 grantees) or electronic submission of reportable laboratories (16 grantees) (see Exhibit 13). For some states, the ACA and delivery system reform initiatives created opportunities to reinforce their programmatic efforts. For example, grantees found that marketing their services to ACOs, or requiring ACO participation in state-led services, bolstered HIE demand and participation.

Exhibit 13: Top Ten Services Grantees Planned to Directly Offer or Enable, as of July to December 2013 (N=56)



Note: LOINC mapping services and translation/transformation services tied for the tenth most common service grantees plan to Directly Offer or Enable.

* A “directly offered” service means the state provides the service to users. An “enabled” service means the state funds another entity to provide the service or the state provides technical assistance to support implementation/use of the service.

SOURCE: 2013 CRM Data Provided by ONC

Some providers welcomed this shift in priorities and service availability, highlighting the potential for HIE to improve access to ‘actionable’ data (that is, integrated patient information from across the care continuum accessible to clinicians at point of care) to improve care delivery. As of 2015, the desire for actionable data, focus on MU 2 priorities, and exchange related to delivery system reform is in evidence. Care summary exchange rates facilitated through HIOs are high—for example, care record summaries (89%); discharge summaries (78%); and ambulatory clinical summaries (67%). Exchange rates are also high for test results (89%), ADT alerts (69%), and inpatient medication lists (68%).¹²¹ For grantees with investments in heavy infrastructure, however, the expansion of private HIE networks and market-based solutions caused fear that their investments might become duplicative or unnecessary.

Grantees’ ability to develop appropriate, necessary infrastructure depended on the relationship between each grantee and its EHR developer(s) and/or HIE vendor as well as developer capacity and expertise. Case study findings revealed that, for some grantees, relying on a single developer or vendor slowed HIE progress. When available HIE products did not allow grantees to develop the intended federated or centralized infrastructure, some grantees altered their original technical approach to make needed services available in a timely way. Others migrated to a “best of breed” approach; this allowed them to contract with multiple developers, each with proven solutions in a specific area. For some

grantees, the ability to host their own system allowed flexibility in responding to provider needs—an approach requiring in-house expertise and the technical resources to manage the system.

Challenges associated with query-based exchange have shifted from lack of availability to concerns about data quality. In the earlier round of case studies, stakeholders noted the availability of query-based exchange as a challenge. However, the maturing of both the program and the market led 34 grantee states to implement query-based exchange and make it broadly available.¹²² Providers reported enthusiasm for the increased availability but highlighted the importance of having a critical mass of patient data, without which the utility of query-based exchange is limited. For a few grantees, data quality issues have affected downstream usability of data. Quality issues include data completeness (ensuring systems capture all necessary elements) and data accuracy (ensuring systems do not transpose data into wrong fields during data transfer). Data quality has major consequences for entities planning to use data for quality improvement and care transformation processes.

Many stakeholders that initially expressed concern about the utility of Direct now see it as the most feasible short-term solution. In initial discussions, some stakeholders viewed Direct as a competing approach to query-based exchange. In recent evaluation activities, however, stakeholders perceived Direct as meeting short- rather than long-term exchange needs—and to be best suited for addressing particular types of needs, such as exchange of behavioral health data, that query-based exchange does not currently support. Entities like long-term care facilities, in particular, noted the use of Direct to exchange with other providers and with Medicaid for prior authorizations. According to a recent health Information Management Systems Society (HIMSS) survey, HIOs see Direct as useful for sending information related to managing care coordination (e.g., ADT notifications, communications related to transitions of care). Like query-based exchange, however, Direct users encounter challenges related to standards, integrating information received from other providers into their EHRs, and accessing a reliable provider directory.¹²³

IV. AIM 2: Characterize HIE Levels at Baseline and How They Changed over Time

Chapter Summary

The objective of AIM 2 is to characterize HIE levels at baseline and assess how they changed over the program period. Since the primary data collected for the evaluation did not include direct measures of HIE at the grantee level, we addressed AIM 2 using both national and state-level data from a range of secondary sources.

What Were HIE Levels at Baseline and How Did They Progress over the Program?

Nationally there was significant progress on a variety of measures used to assess HIE capability and activity over the program period, including in program priority areas. However, grantees varied in the levels of HIE achieved.

Progress in Program Priority Areas. During the program period, HIE capacity improved significantly. The number of HIOs increased, as did HIE participation levels across providers—including hospitals, ambulatory care providers, and office-based physicians. Providers exchanged clinical data through HIOs using directed and query-based exchange at unprecedented levels, resulting in three- and fourfold increases in transactions. Yet, in spite of the large positive change in participation, the total number of providers engaging in exchange remains low overall and varies significantly by state.¹²⁴

HIE levels across MU priority measures reflect similar patterns, wherein the net change is strongly positive but the number of active HIE users for most measures of exchange remains a fraction of the potential users. From 2011-2014, HIE capacity and use increased for e-prescribing, the sending of electronic laboratory orders, and care summary exchange, as well as public health measures and immunization reporting; but the need to expand both services and participation is ongoing.

Variations in Grantee Achievement and Improvement. To assess grantee levels of HIE activity across multiple dimensions, we developed a composite HIE score. Nationally, there was consistent improvement across the program years, with about half of the states performing at or above the national average, and the average state composite HIE score increasing over the program period. In addition, gaps in exchange between hospital-to-hospital versus hospital-to-ambulatory care provider narrowed over time. While these overarching trends are positive, it is important to look at the underlying patterns at the grantee level. While some grantee states achieved high levels of exchange and/or showed considerable improvement, the majority showed growth on varied measures but still have considerable opportunity for service expansion and improvements in overall participation and use.

Conclusions

Both national and state-level data from secondary sources consistently showed HIE levels increasing on a wide range of measures over the duration of the program. Progress and achievement also varied across grantee states, leaving opportunity for further service expansion and improvements. Given broader health IT reform, delivery system reform, and other public and private efforts operating concurrently that also influenced HIE, we cannot attribute changes in HIE levels directly to the program.

Introduction and Methods

A central motivation for the State HIE Program was to create options for providers to engage in HIE. ONC's first Program Information Notice, as noted, advised states that "the immediate priority of the State

HIE Program is to ensure that all eligible providers within every state have at least one option available to them to meet the HIE requirements of meaningful use in 2011.¹²⁵ Thus, for AIM 2 of the evaluation, we established baseline levels of HIE across states and nationally, and measured how these levels changed over the program period.

Since the primary data collected for the evaluation did not include direct measures of HIE at the grantee level, we used both national and state-level data from a range of secondary sources, including: the RWJF survey (2010, 2012, 2014), the AHA Annual Survey IT Supplement, the National Center for Health Statistics' National Electronic Health Record Survey (NEHRS)^{vii}, Surescripts, and the ONC Health IT Dashboard. We cannot attribute changes in HIE levels directly to the State HIE Program, given the numerous HITECH-funded efforts operating concurrently during the program years that also influenced HIE. These include the EHR Incentive Programs, the Regional Extension Center (REC) program, and the Beacon Community Program. Moreover, it is impossible to isolate program-specific efforts from broader health IT and delivery system reform efforts. Therefore, this chapter describes changes in state HIE levels over the program period. Exhibits 14 and 16 provide a full list of measures and sources used and the rationale underlying each choice. We also developed our composite HIE score by aggregating seven individual exchange measures from AHA Health IT Supplement, Surescripts, and NEHRS data to assess changes in HIE levels for each state (see Exhibit 17).

We present a detailed description of the methodology used to develop the composite HIE score for each program year in Chapter II (Methods).

Methodological Limitations

The results presented in this chapter must be interpreted in light of the following methodological limitations:

- We calculated changes in HIE levels based on measures obtained from the AHA IT Supplement Survey, NEHRS, and Surescripts, aggregated at the state level. Since differences in respondents for these three surveys could contribute to variation in the HIE measures across survey and program years, we also conducted imputations to minimize the effect of sampling variation on the measures—thus making the HIE measures more stable for assessing contextual and program factors within and across states. Sensitivity analyses showed that our overall results were robust to (i.e., did not depend materially on) the particular imputation method used.
- States used multiple program approaches to facilitate HIE and these program approaches were correlated. Such correlation reduces the confidence we can place in the multivariate results. This limitation is somewhat mitigated by the fact that the results align well with results when we tested the effect of each program factor on the state composite HIE score separately.
- While presenting a composite HIE score allows us to measure the relative performance of different states on all three priority areas of HIE, it cannot be used to evaluate the relative importance of each measure's contribution to the composite.
- Our composite HIE score captures hospital-based measures for laboratory results and care summary exchange, and physician-based measures for laboratory results exchange and e-prescribing. NEHRS data limitations prevented capture of physician-based measures for care summary exchange.

We present the AIM 2 results in this chapter by measure type: (1) measures of HIE capability, and (2) measures of HIE activity (which include key MU requirements highlighted by ONC as priorities). These measures do not address the effect of HIE on the three-part aim; we describe program impacts in AIM 3 (Chapter V).

^{vii} NEHRS was formerly a part of the National Ambulatory Medical Care Survey (NAMCS)

Measures of HIE Capability

In this section, we discuss measures of HIE capability at baseline and their changes over time. These include number of operational HIOs, percentage of hospitals and ambulatory care practices actively exchanging clinical data through operational HIOs, number of acute care hospitals and ambulatory practices participating in directed and query-based exchange, and the capacity of clinical laboratories to exchange. See Exhibit 14 for a list of the five HIE capability measures and sources used, and the rationale underlying each choice

Exhibit 14: Measures used to Calculate State HIE Capability at Baseline and Changes over Time

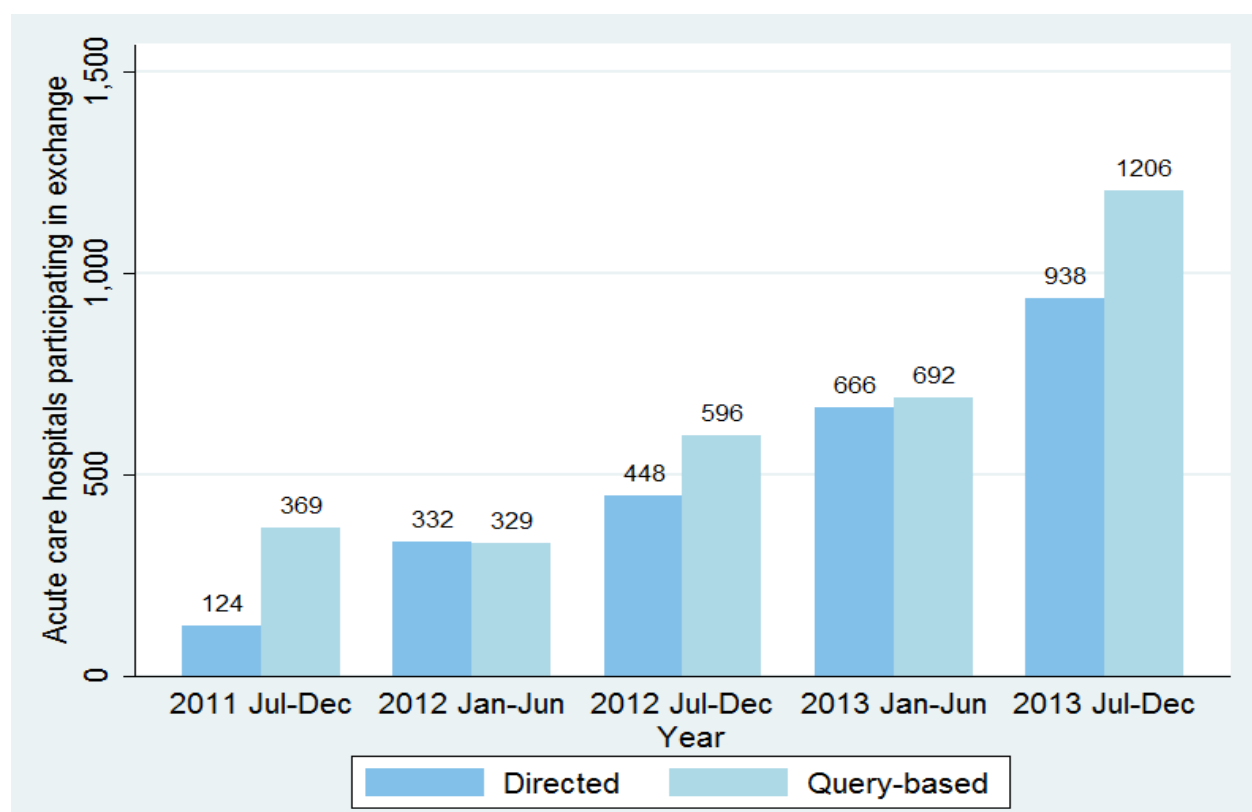
| HIE Measure | Description | Data Source | Rationale for Inclusion |
|---|--|--|---|
| Measures of HIE Capability | | | |
| Number of HIOs | Number of operational HIOs | Data from RWJF survey (2010, 2012, 2014) | HIOs were the main mechanism for HIE pre-HITECH |
| Hospitals participating in operational HIOs | Percent of hospitals participating in an operational HIOs | Data from RWJF survey | HIOs were the main mechanism for HIE pre-HITECH |
| Ambulatory care practices participation in HIOs | Percent of ambulatory care practices participating in an operational HIOs | Data from RWJF survey | HIOs were the main mechanism for HIE pre-HITECH |
| Acute-care hospitals and ambulatory entities participating in directed and query-based exchange | Self-reported numbers of acute-care hospitals and ambulatory entities actively participating in directed and query-based exchange | 2013 CRM Data | Directed exchange was one method of HIE promoted by ONC |
| Clinical laboratories' capability to send structured laboratory results | Percent of clinical laboratories with the capability to send results in a structured format electronically to an ordering provider's EHR and percent of clinical laboratories with that capability that reported sending structured test results to an ordering provider's EHR | 2012 ONC National Survey on HIE in Clinical Laboratories | MU requirement and ONC PIN priority |

Nationally, the number of operational HIE efforts, though fluctuating throughout the period, grew by 41 percent between 2010 and 2015. Immediately following HITECH, HIOs were the primary mechanism through which providers exchanged clinical data.¹²⁶ In 2010, there were 75 operational HIOs and 73 in planning stages.¹²⁷ By 2015, 106 HIE efforts were operational and 21 were in the planning stages.¹²⁸ These changes can only be partially attributed to the program. In addition to HIE organizations established through the State HIE Program, other mechanisms for exchange also emerged—including interoperable EHRs, private HIE systems, and integrated delivery networks establishing their own exchange systems. Data from the 2014-2015 RWJF survey revealed that 51 percent of HIE efforts in 2015 were HIOs, 26 percent were program grantees, 13 percent were health care delivery organizations, and 5 percent were technology developers, among other types of organizations offering HIE services.¹²⁹

Despite the two- and threefold increase in number of hospitals and ambulatory care practices, respectively, exchanging clinical data through an HIO, the numbers remain low. In 2010, only 14 percent of hospitals and 3 percent of ambulatory care practices were exchanging clinical data through operational HIOs.¹³⁰ By 2012, this number had increased to 30 percent of hospitals and 10 percent of ambulatory care practices—doubling the proportion of hospitals and tripling the proportion of ambulatory practices over the period, but from a low base.¹³¹

Acute care hospital and ambulatory practice participation in directed and query-based exchange increased over the program years. Under the State HIE Program, ONC encouraged grantees to adopt Direct project specifications or other secure messaging mechanisms, to offer providers at least one option for engaging in exchange. In addition, some grantees and other organizations engaging in HIE enabled query-based exchange. As reported by grantees, the number of acute care hospitals actively participating in directed exchange increased from 124 to 938 between 2011 and 2013; their participation in query-based exchange increased from 369 to 1,206 (see Exhibit 15).

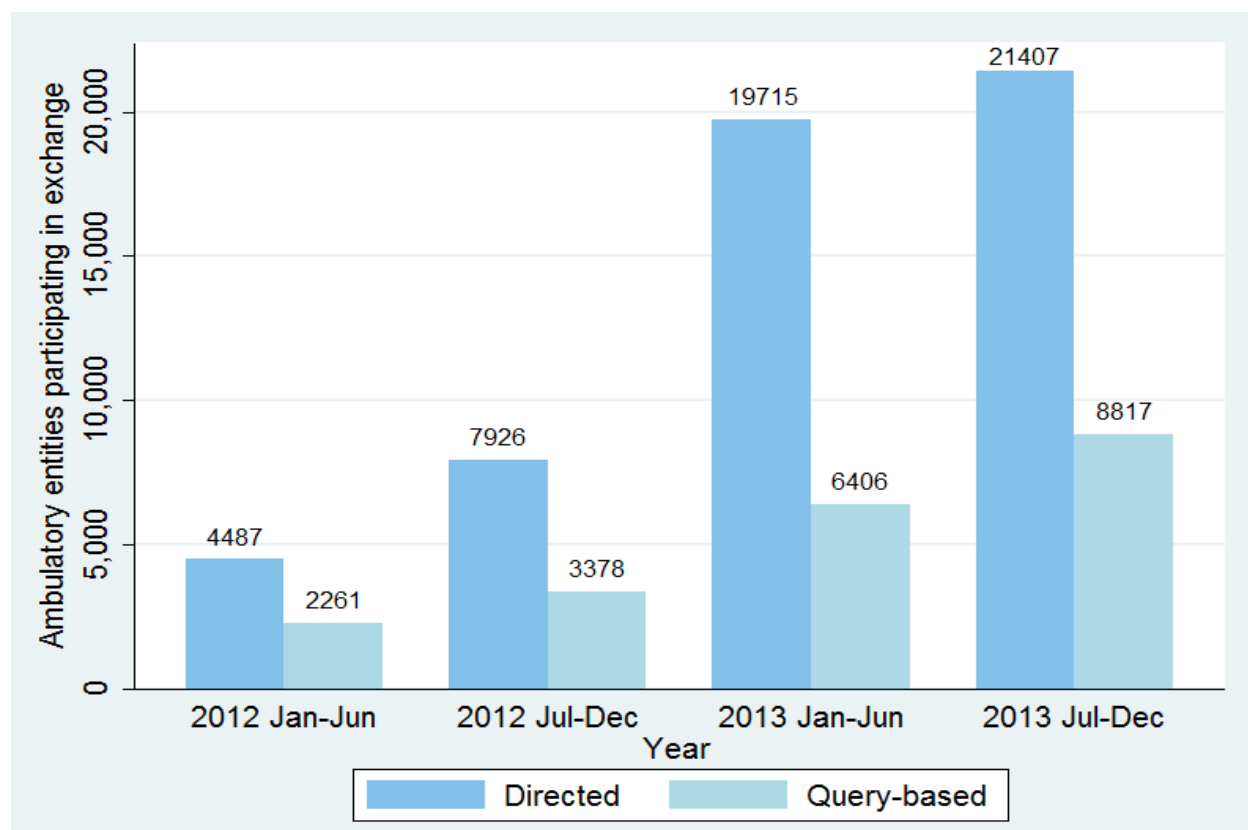
Exhibit 15: Acute Care Hospitals Participating in Exchange, as Reported by Grantees (N=56)



SOURCE: 2013 CRM Data Provided by ONC

The number of ambulatory entities participating in directed exchange increased from 4,500 to 21,000 from 2012 to 2013 (see Exhibit 16). The number of ambulatory entities engaging in query-based exchange increased from 2,300 in 2012 to 8,800 by 2013.

Exhibit 16: Ambulatory Entities Participating in Exchange, as Reported by Grantees (N=56)



SOURCE: 2013 CRM Data Provided by ONC

Two-thirds of clinical laboratories reported the capability to send structured laboratory results electronically in 2012, though this capability varied significantly across states. In 2012, 67 percent of laboratories had the capability to send results in structured format electronically to an EHR, of which 80 percent sent structured results electronically to an ordering provider’s EHR.¹³² The capability of clinical laboratories to send structured results to an EHR varied state to state, ranging from 44 percent in Alaska to 100 percent in Vermont. The proportion of test results sent electronically to an EHR ranged from 29 percent in Puerto Rico to 84 percent in Rhode Island, with a national average of 58 percent.

Measures of HIE Activity

We assessed HIE activity using general measures of HIE related to exchange of electronic documents (e.g., laboratory results, radiology reports, clinical care summaries, medication lists) and the number of directed transactions and patient queries. In addition, we assessed changes in certain PIN priority measures—highlighted by ONC as priority MU requirements related to exchange in its first Program Information Notice—which include e-prescribing, clinical care summary exchange, laboratory exchange, and public health reporting. Finally, we evaluated overall levels of HIE nationally and at the state level, by developing a composite HIE score using seven measures within the PIN priority categories. See Exhibit 17 for a list of HIE activity measures and sources used, and the rationale underlying each choice.

Exhibit 17: Measures used to Calculate State HIE Activity at Baseline and Changes over Time

| HIE Measure | Description | Data Source | Rationale for Inclusion |
|--|--|--|--|
| Measures of HIE Activity | | | |
| General HIE Measures | | | |
| Exchange of electronic health information among non-federal acute care hospitals | Percent of non-federal acute care hospitals exchanging an array of electronic documents with external providers | Data from the ONC data brief using data from the AHA Annual Survey IT Supplement | Assesses level of exchange |
| Total Directed Exchange Transactions | Total number of directed transactions, through State HIE grantee-funded or supported/enabled mechanisms such as HIOs, HISPs, etc., in each state during the quarterly reporting period | Data from the ONC HIE Program Measures Dashboard | ONC promoted the Direct project to support point-to-point exchange under the State HIE Program |
| Total Patient Record Queries | Total number of patient record queries, through State HIE grantee-funded or supported/enabled mechanisms such as HIOs, HIEs, etc., in each state during the quarterly reporting period | Data from the ONC HIE Program Measures Dashboard | Query-based exchange one of the two main types of exchange used by grantees |
| State-Specific Measures of HIE Activity | | | |
| e-Prescribing | | | |
| Physicians e-prescribing using an EHR | Percent of physicians actively using an electronic health record to e-prescribe via Surescripts (SS) network | Data from Surescripts | MU requirement and ONC PIN Priority |
| Laboratory Exchange | | | |
| Hospitals sharing laboratory results electronically with hospitals | Percent of hospitals sharing laboratory results electronically with hospitals outside their system | Data Imputed from AHA | MU requirement and ONC PIN Priority |
| Hospitals sharing laboratory results electronically with ambulatory providers | Percent of hospitals sharing laboratory results electronically with ambulatory providers outside their system | Data Imputed from AHA | MU requirement and ONC PIN Priority |
| Office-based physicians viewing results electronically | Percent of office-based physicians able to view laboratory results electronically | Data from NEHRS | MU requirement and ONC PIN Priority |
| Office-based physicians sending laboratory orders electronically | Percent of office-based physicians able to send laboratory orders electronically | Data from NEHRS | MU requirement and ONC PIN Priority |
| Care Summary Exchange | | | |
| Hospitals exchanging clinical care summaries with hospitals | Percent of hospitals exchanging clinical care summaries with hospitals outside their system | Data Imputed from AHA | MU requirement and ONC PIN Priority |
| Hospitals exchanging clinical care summaries with ambulatory providers | Percent of hospitals exchanging clinical care summaries with ambulatory providers outside their system | Data Imputed from AHA | MU requirement and ONC PIN Priority |
| Public Health Measures | | | |
| Hospitals reporting on electronic laboratory reporting | Percent of hospitals reporting without exclusion on the electronic laboratory reporting measure under the CMS EHR Incentive Program for public health measures | Data from ONC Health IT Dashboard using Medicare EHR Incentive Attestation Data | Meaningful use requirement |

| HIE Measure | Description | Data Source | Rationale for Inclusion |
|---|---|---|----------------------------|
| Hospitals reporting on syndromic surveillance | Percent of hospitals reporting without exclusion on the syndromic surveillance measure under the CMS EHR Incentive Program for public health measures | Data from ONC Health IT Dashboard using Medicare EHR Incentive Attestation Data | Meaningful use requirement |
| Hospitals reporting without exclusion on the immunization measure | Percent of hospitals reporting without exclusion on the immunization measure under the CMS EHR Incentive Program for public health measures | Data from ONC Health IT Dashboard using Medicare EHR Incentive Attestation Data | Meaningful use requirement |
| Physicians reporting to the Immunization Information Services | Percent of participating Medicare professionals electronically reporting to Immunization Information Services (IIS), 2011-2014 | Data from ONC Health IT Dashboard using Medicare EHR Incentive Attestation Data | Meaningful use requirement |

General Measures of HIE

General measures of HIE activity included: (1) hospital and office-based physician exchange of electronic documents; and (2) total numbers of directed and query-based transactions.

Between 2010 and 2014, the share of non-federal acute care hospitals’ reporting electronic documents exchange with hospitals outside their system had increased from 19 percent to 62 percent. In contrast, the share of office-based physician reporting electronic exchange with external providers outside their organization had reached only 14 percent in 2013. At program outset in 2010, 44 percent of non-federal acute care hospitals reported exchanging electronic documents with external providers. By 2014, this share had increased to 76 percent.¹³³ Hospitals electronically exchanging health information with other hospitals *outside their system* increased from 19 percent in 2010 to 62 percent by 2014, an increase of 43 percentage points. Across states, hospital rates of electronic exchange of key clinical data with outside providers ranged from 42 to 100 percent in 2014, up from 24 to 67 percent in 2010.¹³⁴ In sharp contrast, by 2013 only 39 percent of office-based physicians reported having any electronic exchange with other ambulatory providers or hospitals and only 14 percent exchanged clinical data with any provider *outside their organization*.^{135,136}

Directed and query-based transactions increased more than three- and fourfold, respectively, between Q2 2012 and Q4 2013; however, only a small number of states drove these overall increases. Directed transactions are secure message exchanges between two distinct entities—for example, through State HIE grantee-funded or other supported/enabled mechanisms (HIOs, HISPs, etc.) to a provider. From Q2 2012 to Q4 2013, the total number of directed transactions nationally rose from almost 73 million to 237 million.¹³⁷ Total patient record queries (through State HIE grantee-funded or supported/enabled mechanisms such as HIOs, HIEs, etc.) rose from 1.6 million to 7 million.¹³⁸ Although these numbers represent considerable growth, a small number of top performing states drove these national averages. In Q2 2012, for example, three states (Indiana, Colorado, and New York) accounted for over 85 percent of total directed transactions; in Q4 2013, five states (Michigan, Colorado, Indiana, New York, Michigan, and Vermont) accounted for over 85 percent of the total. Similarly, in Q2 a single state (Indiana) accounted for over 65 percent of total directed transactions; in Q4 2013, four states (California, Indiana, Texas, and New York) accounted for over 65 percent of the total.

PIN Priority MU Measures

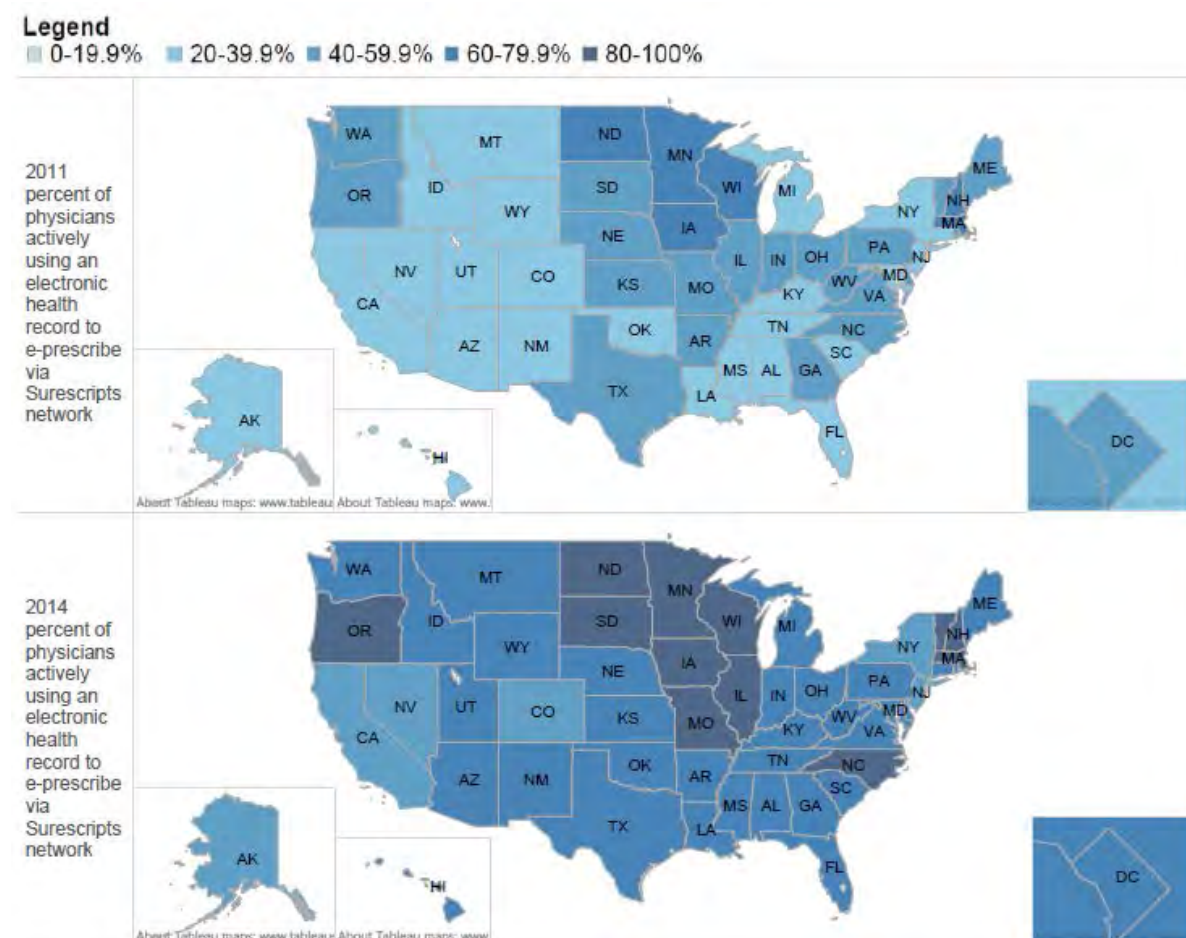
ONC’s first Program Information Notice listed the following “Stage 1 meaningful use requirements in 2011: e-prescribing; [exchange of] laboratory results; sharing patient care summaries across unaffiliated organizations.”¹³⁹ Exchange of laboratory results and care summaries can facilitate clinical decision support and care coordination efforts across providers, while e-prescribing can improve medication

management and safety.¹⁴⁰ The same notice tasked states with establishing strategies for “building capacity of public health systems to accept electronic reporting of immunizations, notifiable diseases and syndromic surveillance reporting from providers” to help public health agencies track immunizations and cases of infectious diseases. Here, we describe changes in levels of HIE activity across priority HIE MU measures.

e-Prescribing

States averaged a 28 percentage point increase (from 44 to 72 percent) in the number of physicians actively using an EHR to e-prescribe between 2011 and 2014 (see Exhibit 18), though only 22 grantees directly provided or enabled e-prescribing in 2013. In 2011, most states fell in the 20–39.9 percent or 40–59.9 percent range; by 2014, most states had reached the 60–79.9 percent range. As of 2014, the highest performing states were Minnesota (100 percent), Iowa (95 percent), and Massachusetts (94 percent). States with the greatest improvements from 2011 to 2014 were Michigan (40 percentage points), Connecticut (38 percentage points), and Wyoming (37 percentage points). As of 2014, the lowest performing states were Alaska (48 percent), Nevada (50 percent), and California (53 percent). The states with the smallest improvements from 2011 to 2014 were New Hampshire (16 percentage points), Nevada (19 percentage points), and Arkansas (20 percentage points). Although 72 percent of physicians nationwide reported e-prescribing via Surescripts using an EHR in 2014, only 22 grantees reported e-prescribing as a service they were directly providing or enabling as of 2013 (see Exhibit 5 above).

Exhibit 18: State-level Map of the Percent of Physicians Actively Using an Electronic Health Record to e-Prescribe via Surescripts Network, 2011-2014

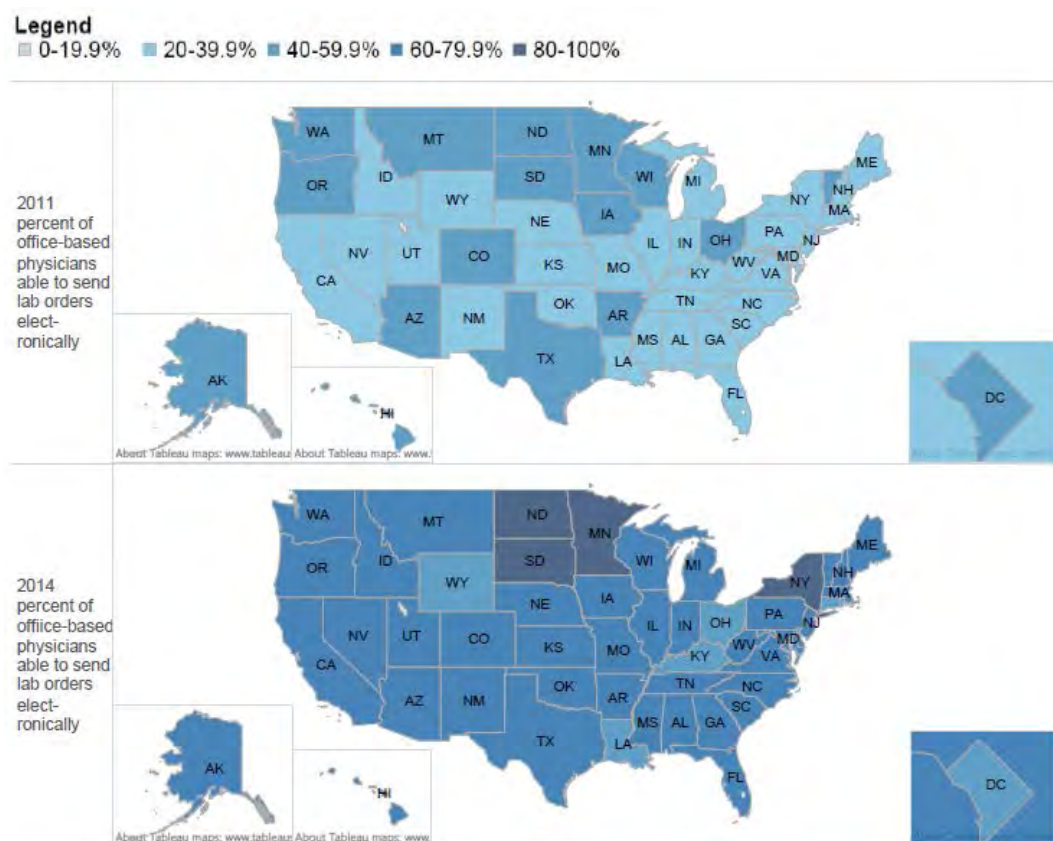


SOURCE: Surescripts, SK&A

Laboratory Exchange

States averaged a 30 percentage point increase (from 36 to 66 percent) in office-based physicians' ability to send laboratory orders electronically between 2011 and 2014 (Exhibit 19). In 2011, most states fell in the 20–39.9 percent or 40–59.9 percent range; by 2014, most states had reached the 60–79.9 percent range. In 2014, the highest performing states were Minnesota (86 percent), North Dakota (86 percent), and New York (83 percent). States with the greatest improvement from 2011 to 2014 were Delaware (59 percentage points), New York (55 percentage points), and West Virginia (48 percentage points). The lowest performing states were the District of Columbia (48 percent), Louisiana (50 percent), and Rhode Island (53 percent). The states with the smallest improvements from 2011 to 2014 were the District of Columbia (5 percentage points), Ohio (18 percentage points), and Washington (19 percentage points).

Exhibit 19: State-level Map of the Percent of Office-Based Physicians Able to Send Laboratory Orders Electronically, 2011-2014



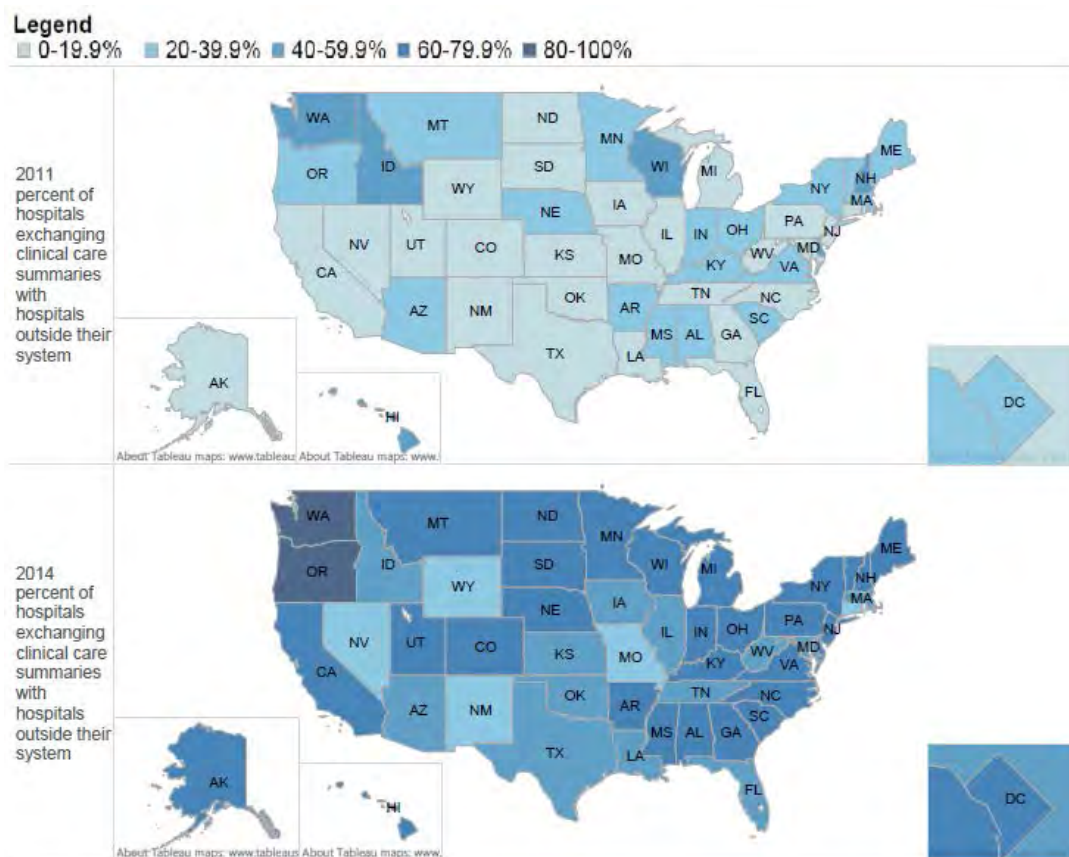
SOURCE: NEHRS

Care Summary Exchange

States averaged an increase of 38 percentage points (from 22 percent to 60 percent) in care summary exchange from a hospital to another hospital outside their system between 2011 and 2014 (see Exhibit 20). In 2011, most states fell in the 0 to 19.9 percent or 20 to 39.9 percent range; by 2014, most had reached the 20 to 39.9 percent or 40 to 59.9 percent range. In 2014, the highest performing states were Washington (82 percent), Oregon (82 percent), and Minnesota (78 percent). States with the greatest improvement from 2011 to 2014 were South Dakota (59 percentage points), North Dakota (58 percentage points), and Colorado (54 percentage points). The lowest performing states were Rhode Island (17 percent), Missouri (21 percent), and New Mexico (29 percent). The states with the smallest

improvement from 2011 to 2014 were Missouri (7 percentage points), Arizona, and Idaho (both at 10 percentage points).

Exhibit 20: State-level Map of the Percent of Hospitals Exchanging Clinical Care Summaries with Hospitals Outside Their Systems, 2011-2014



SOURCE: AHA Survey

Public Health Reporting

Public health reporting requirements under the EHR Incentive Programs include electronic reporting of data regarding immunizations, ED visits (“syndromic surveillance”), and infectious disease laboratory results. Eligible professionals and eligible hospitals had to attest to at least one of these measures for Stage 1 MU; under Stage 2, CMS mandates electronic reporting of all three.

In 2014, 85 percent of eligible hospitals reported on at least one public health measure to the Medicare EHR Incentive Program, without exclusion,¹⁴¹ while participation of Medicare professionals in immunization reporting increased by 21 percentage points (from 51 percent to 72 percent) between 2011 and 2014.¹⁴² Most eligible hospitals (73 percent) reported immunizations to public health departments in 2014.¹⁴³ Overall, 47 percent of eligible hospitals reported their ability to electronically submit reportable laboratory results to their public health agency; 48 percent of participating hospitals that provided urgent care or emergency services electronically reported syndromic surveillance data to their public health agency; and 72 percent of hospitals in Stage 2 reported on all public health measures.¹⁴⁴ Seventy-two percent of participating Medicare professionals who vaccinate reported electronically to an immunization information system in 2014, up from 51 percent in 2011.¹⁴⁵

Composite HIE Score

Our composite HIE score, as noted, assesses state levels of HIE activity across seven measures within the three PIN priority areas over the program period (see Exhibit 21). The composite incorporates four measures of laboratory results exchange by hospitals and office-based physicians, two measures of hospital care summary exchange, and one measure of physician e-prescribing. We calculated composite scores for the 50 states and District of Columbia; the 5 U.S. territories are excluded.

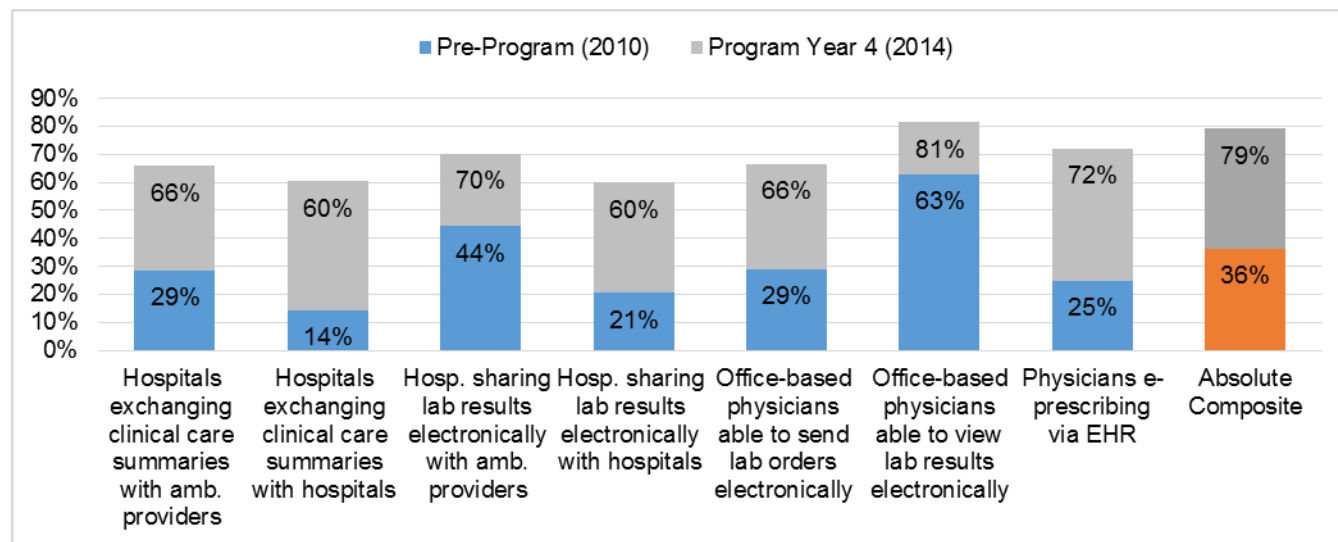
Exhibit 21: Measures Used to Calculate Composite HIE Score

| Type of exchange | Measure | Data Source |
|-----------------------------|---|-------------------|
| Laboratory Results Exchange | Percent of hospitals sharing laboratory results electronically with hospitals outside their system | Imputed AHA |
| Laboratory Results Exchange | Percent of hospitals sharing laboratory results electronically with ambulatory providers outside their system | Imputed AHA |
| Laboratory Results Exchange | Percent of office-based physicians able to view laboratory results electronically | NEHRS |
| Laboratory Results Exchange | Percent of office-based physicians able to send laboratory orders electronically | NEHRS |
| Care Summary Exchange | Percent of hospitals exchanging clinical care summaries with hospitals outside their system | Imputed AHA |
| Care Summary Exchange | Percent of hospitals exchanging clinical care summaries with ambulatory providers outside their system | Imputed AHA |
| E-prescribing | Percent of physicians actively using an electronic health record to e-prescribe via Surescripts (SS) network | Surescripts. SK&A |
| Composite HIE Score | Composite of the above measures | All the above |

The national composite HIE score increased from 36 percent in 2010 to 79 percent in 2014 (see Exhibit 22). This increase was associated with increases in each of the seven measures within the composite. Of the seven measures, states demonstrated the highest performance as of 2010 and 2014 on the office-based physicians able to view laboratory results electronically measure (at 63 and 81 percent, respectively). States had the lowest performance on the hospital exchange of clinical care summaries with hospitals outside their system measure (at 14 and 60 percent in 2010 and 2014, respectively). States also averaged 60 percent in 2014 for the hospitals sharing laboratory results electronically with hospitals outside their system measure. The two measures that showed the greatest improvement across program years were physicians actively using an EHR to e-prescribe via the Surescripts network, which increased by 47 percentage points from 2010 to 2014, and hospital exchange of clinical care summaries with hospitals outside their system, which increased by 46 percentage points.

The gap between hospital-to-hospital and hospital-to-ambulatory care provider exchange narrowed over the program years. While a disparity still persists between the two types of provider exchange, the gap between hospital-to-hospital and hospital-to-ambulatory care exchange decreased by 9 and 13 percentage points for clinical care summaries and laboratory results exchange, respectively, from 2010 to 2014. In 2010, the share of hospitals exchanging clinical care summaries with ambulatory providers was 15 percentage points higher than with hospitals, while in 2014 exchange with ambulatory providers was only 6 percentage points higher than with hospitals. In 2010, the share of hospitals exchanging laboratory results with ambulatory providers was 23 percentage points higher than with hospitals, while in 2014 exchange with ambulatory providers was only 10 percentage points higher than with hospitals.

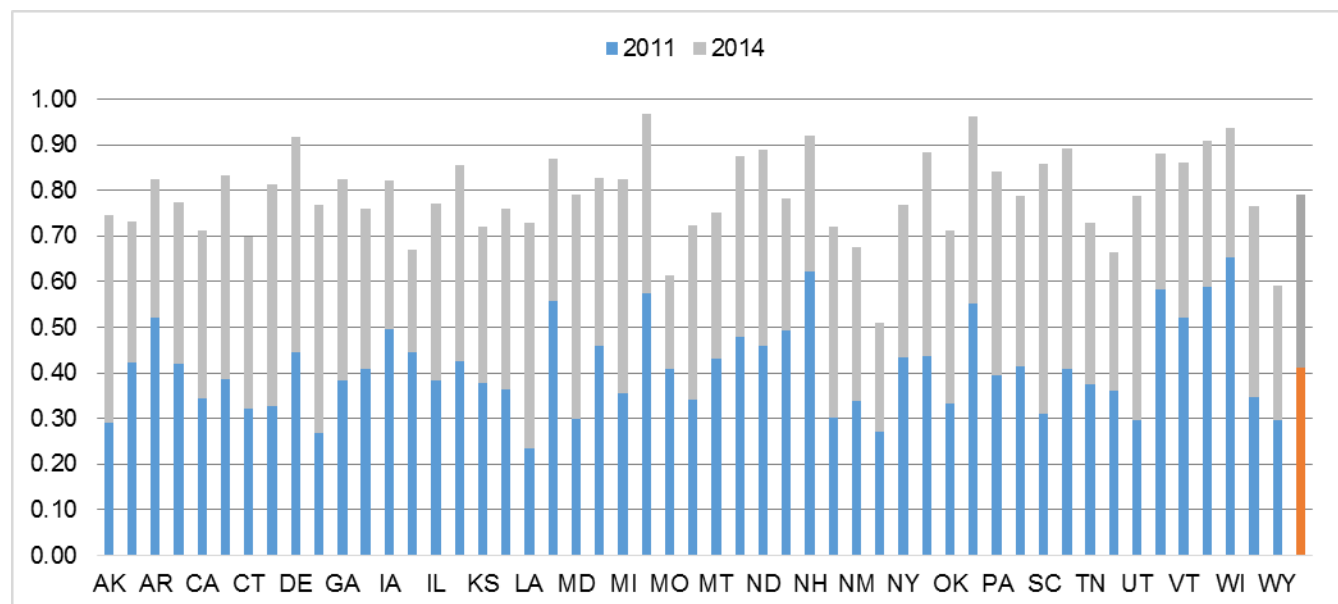
Exhibit 22: Baseline Level of HIE Measures Related to Meaningful Use and Changes over Program Years, 2010-2014



SOURCE: AHA Survey, NEHRS, Surescripts

The average composite HIE score increased 38 percentage points (from 41 to 79 percent) between 2011 and 2014 (see Exhibit 23). In 2014, the highest performing states were Minnesota (97 percent), Oregon (96 percent), Wisconsin (94 percent), New Hampshire (92 percent), and Delaware (92 percent). About half of the states performed at or above the national average composite HIE score in 2014. States with the greatest improvement from 2011 to 2014 were South Carolina (55 percentage points); Florida (50 percentage points); and Louisiana, Utah, Maryland, and DC (all at 49 percentage points). In 2014, the lowest performing states were Nevada (51 percent), Wyoming (59 percent), Missouri (62 percent), Texas (66 percent), and Idaho (67 percent). Exhibit 23 shows state-level composite HIE scores on a scale of 0–100 percent for 2011 and 2014.

Exhibit 23: Changes in Composite HIE Scores, 2011-2014



SOURCE: AHA Survey, NEHRS, Surescripts

V. AIM 3: Assess Overall Program Effectiveness

Chapter Summary

Our assessment of the State HIE Program’s impact focused on two questions: (1) What were the factors (contextual and programmatic) that influenced HIE progress? (2) What were the overall program impacts? We defined program impact as the extent to which the program achieved its overarching objectives to: (1) establish HIE infrastructure, (2) expand HIE adoption and reduce the cost and complexity of participation in exchange, and (3) help providers meet MU requirements.

What Were the Factors that Influenced HIE Progress?

During the State HIE Program years, program factors such as the leadership models grantees selected significantly influenced the trajectory of HIE adoption and use in each state. This is consistent with qualitative conversations with grantees and stakeholders, who described the importance of choosing leadership, technical, and consent models that best facilitated HIE in their local environments. It was equally important, according to grantees and stakeholders, to select high value services that met the needs of local stakeholders—thereby gaining their trust, investment, and use of services.

Contextual factors such as pre-HITECH EHR adoption were also foundational to exchange. States with a solid foundation of pre-HITECH activity were able to accelerate progress with program support, whereas states with little HIE foundation struggled to establish themselves and only made measurable HIE advances in later program years. Early EHR adoption facilitated HIE from a technological and financial standpoint (i.e., existing investments that could be leveraged), as well as created a corresponding awareness of the value of EHRs and HIE among key stakeholders. Grantees in states without this experience were compelled to spend significant time and resources educating stakeholders and promoting HIE adoption and use. In later program years, contextual factors (such as lower levels of hospital competition and higher concentration of managed care) became increasingly linked to higher HIE levels—such that states in “facilitating market environments” made greater strides.

What Were the Overall Program Impacts?

Grantees, providers, and other stakeholders reported positive program impacts related to core objectives—including technical, operational, and financial support for HIE; expansion of services; assistance related to MU; as well as other impacts such as increased awareness, interest, and participation in HIE. In addition, many felt they could leverage the infrastructure and services created under the program to assist them in addressing the benchmarks and participating in delivery system reform initiatives.

Conclusions

The program years saw a rapid increase in HIE across states driven by program factors, both in themselves and working synergistically with contextual factors. Overall, states with a solid HIE foundation were able to leverage this experience under the State HIE Program, while states with little foundation struggled to establish and attract users for their services. Qualitatively, grantees, providers, and other stakeholders reported a variety of positive program impacts, including expanding services and creating the necessary infrastructure and awareness for future delivery system reform efforts.

Introduction

To address AIM 3, Assessing Overall Program Effectiveness, we focused on two research questions: (1) What were the factors (contextual and programmatic) that influenced HIE progress? (2) What were the program impacts? We defined “impacts” as the extent to which the State HIE Program achieved its overarching objectives of:

- Establishing HIE infrastructure
- Expanding HIE participation, reducing the cost and complexity of participation in exchange
- Helping providers meet MU requirements in Stages 1 and 2, specifically HIE Program Information Notice priorities: e-prescribing, care summary exchange, and laboratory exchange

Data Sources

To answer these questions, we drew on a mix of qualitative and quantitative data collected throughout the evaluation (Exhibit 24). The qualitative data sources included two rounds of case studies consisting of 11 states;^{146,147} and a series of key informant discussions with 22 thought leaders in the field across state, federal, and private sectors. We conducted these discussions in the final months of the evaluation, for the express purpose of gathering insights into program impact. Quantitative data sources consisted of:

- Hypothesis testing of contextual and program-level variables against a composite HIE score
 - ▶ To create the composite HIE score, as described under AIM 2, NORC drew seven measures related to ONC’s Program Information Notice HIE priorities (laboratory results exchange, clinical care exchange, e-prescribing). Sources were the American Hospital Association (AHA) Health IT Supplement, National Electronic Health Record Survey (NEHRS) annual surveys from 2011 to 2014, and Surescripts e-prescribing data.
- Data from ONC’s CRM Tool
- 2014 eHI Annual HIE Survey data
- RWJF survey data
- MU Attestation Data

We describe the methods associated with each primary data source in detail in Chapter II (Methods).

Exhibit 24: Data Sources and Characteristics

| Data Source | Data Collection/ Analysis | Population | Timeframe |
|-----------------------|-----------------------------|---|--|
| Summative Discussions | Primary, phone-based | 21 HIE experts from state, federal, academic, and industry roles | Jul.-Sep. 2014 |
| Case Studies | Primary, onsite and virtual | Large health systems, provider associations, SDE Directors and support staff, State Health IT Coordinators and support staff, Medicaid and public health personnel, REC leads, EHR developers/HIE vendors, consumer advocates, and laboratory representatives, among others <ul style="list-style-type: none"> ■ Round 1: 105 stakeholders in Maine, Nebraska, Texas, Washington, and Wisconsin ■ Round 2: 108 stakeholders in Iowa, Mississippi, New Hampshire, Utah, Vermont, and Wyoming | Round 1: Nov. 2011-Mar. 2012 Round 2: Mar.-May 2014 |

| Data Source | Data Collection/ Analysis | Population | Timeframe |
|---|-------------------------------------|--|----------------------------------|
| Hypothesis Testing | Primary and Secondary data analysis | Comparison of the association between <ul style="list-style-type: none"> ■ Dependent Variable: Composite measure of state HIE progress in each program year (developed from PIN priorities and relevant measures from the American Hospital Association (AHA) and National Electronic Health Record Survey (NEHRs) surveys, and Surescripts e-prescribing annual data ■ Independent Variable: State contextual and program factors drawn from evaluation data^{viii} | 2011-2014 survey data |
| ONC Customer Relationship Management (CRM) Tool Data | Secondary data analysis | Program data related to implementation metrics, technical infrastructure, performance on PIN priorities, etc. | 2014 data |
| eHealth Initiative (eHI) Annual HIE Survey Data | Secondary data analysis | 126 stakeholders from community-based and regional HIOs (68), health care delivery organizations (24), grantees/SDEs (23), payers (1), public health departments (1), and others (9) | 2014 survey data |
| Robert Wood Johnson Foundation (RWJF)-sponsored Survey Data | Secondary data analysis | 127 respondents from HIOs (65), State HIE grantees/SDEs (32), healthcare delivery organizations (17), community-based organizations (11), non-governmental organizations or advocacy groups (7), public health departments (6), state Medicaid (3), academic institutions (3), and state government (non-Medicaid or public health) (2) | Dec. 2014 – May 2015 survey data |
| MU Attestation Data | Secondary data analysis | Medicare and Medicaid eligible providers, hospitals, and critical access hospitals who registered and received payments | Mar. 2015 attestation data |

Limitations

It is important to interpret our findings in the context of the following limitations:

- First are the inherent issues associated with using qualitative data to assess the impact of such a large and complex program. Although we spoke to hundreds of stakeholders from a diverse set of states at multiple time points in the evaluation, and our findings represent a careful synthesis of these perspectives, we do not claim to have collected a comprehensive data set with which to statistically evaluate program impact.
- For quantitative data, we relied on several secondary data sources. Each of these sources has its own limitations (e.g., limited grantee response rates, high margins of error). However, we believe that in combination, they provide an accurate reflection of the status of HIE participation and activity during the program.
- Importantly, the program did not operate in a vacuum. Because the program funded all 56 states and territories—and because grantees were encouraged to pursue solutions based on their own local needs—implementation variation among states is high, making the confounding factors numerous. In addition, there were other health IT and HIE-related programs operating simultaneously, such as the REC Program, Meaningful Use, and a variety of ACA initiatives, whose effects are difficult to disentangle.

^{viii} For program and contextual factors, dependent variables, distribution of the program factor variables across the 51 states, and source data and source variables, see Appendix I, Exhibits 22 and 23.

- Finally, many program investments are likely to pay dividends in the coming years, as HIE becomes more established, more widely available, and more interoperable. As a result, additional program impacts may emerge downstream that cannot be captured at present and/or are only just beginning to emerge.

Factors that Influenced HIE Progress

Findings from qualitative evaluation activities, specifically the case studies and discussions with key stakeholders, suggested both contextual and program factors influenced states’ implementation strategies and primary use cases for HIE.^{148,149,150} Contextual factors refer to state-specific demographic and market characteristics (e.g., state population size and urbanicity, health system characteristics, and EHR adoption level); program factors refer to decisions grantees made to guide the State HIE Program implementation (e.g., governance structure, technical and consent model, and supportive legislation).

We conducted a series of quantitative analyses to further assess the effect of contextual and program factors on composite HIE scores (using the composite measure developed from AHA, NEHRS, and Surescripts data sources) across states.

We studied the effect of contextual factors and program factors on the composite across states, using the four sets of models. We ran these models with both sets of factors, and then with contextual factors alone, to assess the relative influence of the contextual and program variables taken separately. The four model sets are:

- Generalized linear model across all program years:** We created a longitudinal dataset with repeated measures of the composite for states across the four program years. We ran a generalized linear panel model to study the impact of contextual and program variables across the four years.
- Ordered logit model across all program years:** We grouped states into quartiles (1 to 4) based on their composite score in each year. We ran an ordered logit panel model to obtain the odds ratios for contextual and program variables across the four years.
- Generalized linear models for each program year:** We ran separate generalized linear models for each year to study the impact of contextual and program variables in each year.
- Ordered logit models for each program year:** We ran separate ordered logit models for each year to obtain the odds ratios for contextual and program variables in each year.

We studied whether effects of program and contextual factors differed across program years by testing whether coefficients for these factors obtained from the model for each program year were significantly different.

Exhibit 25 displays the contextual and program factors whose association with states’ HIE progress we tested. A more detailed explanation of the hypotheses testing methodology is available in Chapter II (Methods); we present results from the univariate analyses in Appendix II.

Exhibit 25: Program and Contextual Factors That Influence HIE Progress

| Contextual factors | Program Factors |
|---|--|
| State’s geographic size | State-led HIE |
| Population density | Laws to promote HIE under program |
| Managed care penetration | States with opt-out consent model |
| Level of hospital competition | Market-based model |
| Pre-HITECH adoption of EHRs by hospitals | Availability of directed exchange services |
| Pre-HITECH adoption of EHRs by ambulatory providers | States funding providers, HIOs etc. |

| Contextual factors | Program Factors |
|---|-----------------------------------|
| Number of existing and planned HIO Infrastructure | Percentage of program funds spent |
| Average time of operational HIO | |
| Urbanicity | |

To what degree does the State HIE Program affect HIE progress and activity compared to contextual factors? How do contextual and program factors interact to influence HIE progress and activity? To answer these questions we compared the variation in composite HIE scores explained by program and contextual factors, across all four program years and in each program year. We hypothesized that as the State HIE Program progressed, program factors would explain more of the variation in HIE seen across states, by themselves and by interacting with contextual factors.

We used the aforementioned models to estimate the proportion of total variation in HIE across states and program years that the contextual and program factors explain.^{ix} Exhibit 26 summarizes how much variation in composite HIE scores across states is explained by contextual and program factors, across all program years, and in each specific program year.

Across all program years, contextual and program factors explained 62 percent of the composite HIE score variation between states. Contextual factors alone account for 52 percent of variation, while program factors alone account for 17 percent of the variation in composite HIE between states. Overall, contextual factors account for a greater proportion of the variation in HIE between states.

As the State HIE Program progressed from 2011 to 2014, variation in the composite HIE score explained by program factors increased by 10 percentage points (from 13 percent to 23 percent). At the same time, the variation in state HIE explained by contextual factors increased by 3 percentage points (from 54 percent to 57 percent). The program factors also interacted with the contextual factors from 2011 to 2014, to increase the overall variation in state HIE explained by the two by 17 percentage points (from 59 percent to 75 percent).

From 2011 through 2014, grantees progressively put the required infrastructure in place, program factors increasingly explained more of the variation in composite HIE between states. In the last two program years (2013 and 2014), not only were states able to utilize program approaches to make progress in HIE activities, but these program approaches worked synergistically with state contextual factors to facilitate greater HIE progress.

Exhibit 26: Variance in Composite HIE Score, by Contextual and Program Factors

| Factors | Generalized linear panel model for all program years | Generalized linear model for each program year | | | |
|----------------------|--|--|-----------------------------------|-----------------------------------|-----------------------------------|
| | Between States 2011-2014 [§] | Between States 2011 ^{§§} | Between States 2012 ^{§§} | Between States 2013 ^{§§} | Between States 2014 ^{§§} |
| Contextual & Program | 0.725 | 0.590 | 0.630 | 0.649 | 0.754 |
| Contextual Only | 0.624 | 0.540 | 0.527 | 0.525 | 0.568 |
| Program Only | 0.169 | 0.126 | 0.166 | 0.152 | 0.227 |

[§]R square obtained from generalized linear panel model studying association between state composite HIE scores across all program years with (i) contextual & program factors, and (ii) contextual factors alone

^{§§}R square obtained from generalized linear models studying association between state composite HIE scores in each program year with (i) contextual & program factors, (ii) contextual factors alone.

^{ix} Model R-squares summarize the variation in the dependent variable (states' composite HIE score) explained by the independent variable (contextual and program factors)

What specific contextual characteristics of states, and what program approaches used by states, are associated with the greatest performance in HIE across the program years? To answer this question, as noted, we grouped states into quartiles based on their composite HIE score in the four program, and used ordered logit models to study the association between higher state composite HIE scores and states’ contextual characteristics and program approaches. Exhibit 27 summarizes the results from these models. For each contextual characteristic or program approach, we present the odds ratio for a state with that characteristic or approach being in the highest state HIE quartile. Across all four program years, we found the following: states with smaller population size, states with greater pre-HITECH office-based provider adoption of EHR, states that used an opt-out consent model, and states that spent down a greater proportion of their HITECH program funds were all associated with greater state composite HIE scores.

Exhibit 27: Results from Ordered Logit Panel Model Studying Association between Quartiles of State Composite HIE Scores and State Contextual & Program Factors across All Program Years, 2011-2014

| Variables | Odds Ratio (95% CI OR) |
|---|----------------------------|
| Contextual Factors | |
| State Population Size | 0.540* (0.270-1.080) |
| Number of HMOs | 2.136 (0.806-5.664) |
| Number of MSAs | 0.936 (0.455-1.925) |
| Population Density in the State | 1.345 (0.651- 2.779) |
| Number of Existing and Planned HIO Infrastructure pre-HITECH | 0.977 (0.824- 1.159) |
| Average time of operational HIO pre-HITECH | 1.006 (0.996-1.015) |
| Hospital Competition within hospital referral regions, pre-HITECH | 1.436 (0.833-- 2.474) |
| Office Based Provider Adoption of Basic EHRs, pre-HITECH | 1.198*** (1.132-1.269) |
| Hospital Based Adoption of Comprehensive EHRs, pre-HITECH | 1.067 (0.924-1.232) |
| Program Factors | |
| State funding providers, HIOs, HIE, White Space, or technical assistance | 1.192 (0.240- 5.925) |
| States with multiple organizations (capacity-builder or market-based model) compared to states covered by a single organization | 0.676 (0.125- 3.650) |
| States with using an opt-out consent model for query-based exchange compared to states using an opt-in or other consent model | 6.024*** (1.866-19.451) |
| States that enacted laws to promote HIE and/or EHR adoption compared to states that have not enacted laws | 0.851 (0.317- 2.281) |
| States with state-led HIE compared to states led by SDE or ‘SDE-like’ entity | 0.889 (0.291- 2.716) |
| States with broadly available Directed Exchange Services compared to states with some or no Directed Exchange | 1.066 (0.461- 2.464) |
| Percentage of HITECH Fund Spend-down | 1.047*** (1.016-1.079) |

*Significant at 0.10<p<0.05; **Significant at p<0.05; ***Significant at p<0.01

As the program progressed across years, what state characteristics were associated with the greater performance in HIE? To answer this question, we studied the association between contextual factors

and program factors of states with their composite HIE score, separately in each program year. We then compared the effect of contextual and program factors in each program year on composite HIE.

Exhibit 28 summarizes the results from the ordered logit models that analyzed the association between quartiles of state composite HIE scores and states’ contextual and program factors, across each of the four program years. For each factor and program year, we present the odds ratio for a state with that factor being in the highest state HIE quartile.

Contextual factors foundational to higher HIE activity—like higher pre-HITECH office-based provider adoption of EHRs—were significantly associated with greater composite state HIE in all four years. In later program years, certain market-driven contextual factors—like lower hospital competition within hospital referral regions in the state, and greater presence of managed care plans in the state—became significantly associated with greater composite state HIE. States with such favorable market factors were able to better implement their programs as time went on. Other contextual factors like smaller state population size and higher population density were significantly associated with greater state HIE in later program years, suggesting that such states leveraged ongoing programmatic activity in those program years to make HIE progress.

Program factors were not significantly associated with higher HIE in the early program years (2011-2012), with the exception that states using an opt-out consent model for query-based exchange showed higher performance in HIE. By the fourth program year (2014), as explained further below, the following program factors were associated with greater state HIE:

- States that used an opt-out consent model for query-based exchange had much greater composite HIE compared to those that used an opt-in model.
- States with state-led HIE were significantly more likely (at p<0.1 level) to have higher composite HIE score compared to states where SDEs or SDE-like entities led the HIE effort.
- States with broadly available directed exchange services were more likely to have higher composite HIE compared to states that had some or no directed exchange.
- States with higher spend-down of HIE funds were more like to have higher composite HIE scores.

Exhibit 28: Results from Ordered Logit Models Studying Association between Quartiles of State Composite HIE Scores and Contextual & Program Factors across Each Program Year, 2011-2014

| Variables | 2011 Odds Ratio (CI) | 2012 Odds Ratio (CI) | 2013 Odds Ratio (CI) | 2014 Odds Ratio (CI) |
|--|------------------------|---------------------------|---------------------------|----------------------------|
| Contextual Factors | | | | |
| State Size | 0.664 (0.238-1.850) | 0.208** (0.062-0.696) | 0.332* (0.107-1.033) | 1.222 (0.394-3.791) |
| Number of HMOs | 0.610 (0.182-2.045) | 3.776** (1.057-13.491) | 5.420** (1.432-20.512) | 3.784* (0.854-16.764) |
| Number of MSAs | 1.851 (0.726-4.720) | 1.654 (0.594-4.606) | 0.535 (0.197-1.452) | 0.410 (0.137-1.232) |
| Population Density in the State | 1.000 (0.363-2.759) | 0.734 (0.225-2.387) | 1.021 (0.351-2.973) | 7.632*** (2.083-27.965) |
| Number of Existing and Planned HIO Infrastructure pre-HITECH | 1.242 (0.928-1.664) | 0.863 (0.642-1.161) | 0.828 (0.608-1.129) | 0.939 (0.672-1.313) |
| Average time of operational HIO pre-HITECH | 1.007 (0.992-1.023) | 1.002 (0.985-1.018) | 1.006 (0.990-1.023) | 1.013 (0.996-1.031) |

| Variables | 2011 Odds Ratio (CI) | 2012 Odds Ratio (CI) | 2013 Odds Ratio (CI) | 2014 Odds Ratio (CI) |
|---|---------------------------|---------------------------|---------------------------|--------------------------------|
| Hospital Competition within hospital referral regions, pre-HITECH | 1.046 (0.537-2.037) | 0.802 (0.347-1.852) | 2.384** (1.073-5.299) | 3.300** (1.252-8.698) |
| Office Based Provider Adoption of Basic EHRs, pre-HITECH | 1.193*** (1.087-1.310) | 1.267*** (1.131-1.420) | 1.228*** (1.105-1.365) | 1.340*** (1.179-1.523) |
| Hospital Based Adoption of Comprehensive EHRs, pre-HITECH | 1.154 (0.931-1.430) | 1.030 (0.852-1.245) | 1.164 (0.941-1.440) | 0.948 (0.754-1.193) |
| Program Factors | | | | |
| States funding providers, HIOs, HIE, White Space, or technical assistance | 2.626 (0.437-15.775) | 1.896 (0.286-12.593) | 0.603 (0.086-4.210) | 1.319 (0.166-10.493) |
| States with multiple organizations (capacity-builder or market-based model) compared to states covered by a single organization | 0.308 (0.042-2.233) | 0.353 (0.050-2.514) | 3.040 (0.409-22.590) | 0.394 (0.044-3.535) |
| States with an opt-out consent model compared to states using an opt-in or other consent model | 5.978* (0.926-38.599) | 3.914 (0.556-27.554) | 4.826 (0.642-36.288) | 137.561*** (9.055-2089.864) |
| States that enacted laws to promote HIE and/or EHR adoption compared to states that have not enacted laws | 0.955 (0.273-3.336) | 1.202 (0.335-4.310) | 0.994 (0.246-4.021) | 0.302 (0.064-1.423) |
| States with state-led HIE compared to states led by SDE or 'SDE-like' entity | 2.060 (0.449-9.453) | 0.151** (0.026-0.890) | 0.384 (0.070-2.106) | 4.482* (0.760-26.444) |
| States with broadly available Directed Exchange Services compared to states with some or no Directed Exchange | 1.444 (0.336-6.198) | 0.284 (0.063-1.289) | 0.799 (0.187-3.407) | 6.028** (1.194-30.444) |
| Percentage of HITECH Fund Spend-down | 1.047 (0.991-1.107) | 1.016 (0.959-1.076) | 1.064** (1.001-1.131) | 1.089** (1.018-1.165) |

*Significant at 0.10 < p < 0.05; **Significant at p < 0.05; ***Significant at p < 0.01; ^{Year}Significant difference between coefficients in the program year

Quantitative Effects of Program Factors

Program factors progressively accounted for more of the variation in HIE between states across program years, by synergistically working with contextual factors. This is consistent with our qualitative findings, which suggest that states already on a positive trajectory because of favorable contextual factors were able to leverage the program to make additional strides in HIE across the years. In contrast, states that lacked the contextual foundation to facilitate exchange were unable to show tangible improvements in HIE until much later in the program.

Controlling for contextual factors and program time (Exhibit 28), we found the following trends:

- **States using an opt-out consent model were associated with significantly higher composite HIE.** This is consistent with our qualitative findings, in which stakeholders across states identified the opt-in consent model as an impediment to the HIE progress. 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 still slow. For example, in Rhode Island and Massachusetts, stakeholders noted that opt-in helped engender significant patient trust; however, opt-in imposes an upfront burden on providers because patients need to explicitly consent to the electronic exchange of their data. In contrast, states with opt-out consent models, like Illinois, tended to have higher HIE participation because there are fewer barriers to sharing data through this mechanism, making it easier to demonstrate the value of the investment to stakeholders.

- **By 2014, states with state-led HIE had significantly higher composite HIE compared to states where SDEs or SDE-like entities led HIE efforts.** Notably, this does not necessarily mean that these states invested in centralized infrastructure, but rather that they led both the organizational and technical aspects of HIE implementation. For example, both Minnesota and Oregon are state-led efforts with high composite HIE scores. They used a “thin layer” strategy for central services and focused on connecting HIOs and filling “white space” areas with little to no connectivity. Consistent with our qualitative findings, state-led efforts were able to leverage existing infrastructure and state finances, and benefited from their capacity to create HIE-supportive policies and bring together public and private stakeholders in a neutral way. Given that many grantees reported a slow start to establishing services and attracting users, it is possible that positive effects from the program are only now emerging. It is also possible that more states will begin to demonstrate positive effects from program activities now these are more established. HIE activity must continue to be monitored to determine whether this trend will continue and to clarify the underlying mechanism(s).
- **By 2014, states with broadly available directed exchange services had higher composite HIE compared to states with some or no directed exchange.** This finding indicates that states with high capacity for directed exchange also experienced high usage of this service. Use of directed exchange is high in states such as Wisconsin, for whom Direct was a priority, as well as in states that made Direct available but had limited initial uptake, such as Washington and Minnesota. Qualitative findings suggest that many grantees used directed exchange as a short-term solution to meet their exchange needs until query-based exchange was available. Others found directed exchange supported important use cases for which no other solutions existed, such as exchange of behavioral health information. That directed exchange significantly influenced composite HIE scores only in 2014 could reflect either: (1) the slow start reported by many grantees, and/or (2) limited demand for Direct until exchange needs expanded to include behavioral health providers and providers not incented under MU but important for care coordination (e.g., long-term care).
- **States that spent down a greater proportion of their program funds had significantly higher composite HIE.** State spend-down of HITECH program funds, which is strongly related to their capacity building, was associated with greater composite HIE. For example, New Mexico, Maryland, Ohio, Oregon, and Florida had significant levels of HIE activity that pre-dated the State HIE Program, and had significantly higher spend-down of program funds. The same is true of Utah, Delaware, Colorado, and Indiana, which were all AHRQ State and Regional Demonstration projects funded to support regional data sharing and interoperability.¹⁵¹ States able to spend down greater proportions of their program funds may have existing capacity to facilitate greater ongoing exchange, rather than having to invest in new capacity for future exchange.

Quantitative Effects of Contextual Factors

State contextual factors accounted for all within-state variation in HIE, and for progressively less of the between-state variation (which program factors increasingly explained) as the program progressed. Smaller states, and states with higher pre-HITECH office-based provider adoption of basic EHR, were associated with greater HIE across all years (Exhibits 27 and 28). As HIE became more common across states in later program years, higher managed care penetration and lower hospital competition within a state, among other market factors, differentiated states with greater HIE (Exhibit 28). States with facilitating market environments were also associated with increased levels of exchange activity in 2013.

States with smaller population size were associated with significantly higher composite HIE across program years. Stakeholders in smaller states like Vermont and Maine reported being likely to know one another, work together, and meet face-to-face to discuss issues—all of which contribute to greater ease of collaboration in state efforts. For example, the Maine grantee reported its approach to HIE centers on leveraging its longstanding relationships with stakeholders and a collaborative environment, which helped develop a shared vision and strategy for HIE. Smaller states also have fewer hospitals, providers, and

laboratories—thereby reducing the effort necessary to engage stakeholders in conversations and agreements related to HIE.

Average length of pre-HITECH operational HIO was significantly associated with higher composite HIE across all four years. This factor, along with the number of existing and planned HIO infrastructure pre-HITECH (though not statistically significant), likely influences HIE levels. Qualitative findings confirm that stakeholders in many states believed prior HIE investments shaped leadership approaches under the State HIE Program and strongly influenced progress. For example, Indiana had robust HIE prior to the program in the form of five functioning HIOs, each covering a different state region with an urban center. The five HIOs (operational between 5 and 15 years) contain more than 12 million patient records and have approximately 12,000 participating physicians.¹⁵² Stakeholders also report that previous HIE efforts in their states facilitated collaboration and established trust between state officials and other stakeholders; such trust has been integral to state success. In many cases, previous HIE efforts served as “proof of concept” pilots or demonstration projects and spawned supportive policy that paved the way for state-led services.

Hospital competition within hospital-referral regions pre-HITECH influenced the level of HIE in the four program year. In some states, the existence of large hospital systems and integrated delivery networks increased collaboration, but in others they created competition. Our qualitative data collection activities, as well as 2015 RWJF survey results,¹⁵³ support these findings. Large hospitals’ use of the New Hampshire system was a boon to state-led services, because one health system’s participation also included owned and affiliated practices. In contrast, the Wisconsin grantee reported struggling to provide services of value to stakeholders in an already developed and competitive market. Although the literature is limited on this subject, one study found that less competitive marketplaces tend to have greater hospital participation in regional HIOs (and by extension HIE activities).¹⁵⁴ The same study found that hospitals with a large market share, as well as non-profit versus for-profit hospitals, are more likely to participate in regional HIOs.

Office-based provider pre-HITECH adoption of basic EHRs was associated with higher state composite HIE scores across all four program years, whereas hospital-based pre-HITECH adoption of comprehensive EHRs was associated with a higher state composite HIE scores in 2011.^{155,156} Having EHRs, and therefore the capacity to store electronic data, is a necessary condition for information exchange. Several states had pre-HITECH EHR adoption rates by hospitals and ambulatory care providers higher than the national average (e.g., New Hampshire, Vermont, and Utah). Stakeholders in these states reported that HIE was already occurring among certain hospitals on common systems like Epic. In contrast, stakeholders in states with mixed or low EHR adoption rates prior to the program reported barriers to HIE. For example, although Iowa had above average EHR adoption among ambulatory providers (38 percent), it had below average EHR adoption among hospitals (4 percent). Similarly, Mississippi had above average ambulatory provider adoption (33 percent) but below average rates for hospitals (10 percent). As a result of lagging EHR adoption, states like these reported lower provider readiness to engage HIE, lack of connectivity to a community-based HIE system, and lower HIO capacity to work with customized systems and interface development.

Our quantitative as well as qualitative findings suggest that population density and urbanicity^x may be notable determinants of state needs and strategies for enabling HIE services. Urban centers tend to have greater patient volume and greater need for electronic exchange and record keeping for administration and care coordination. In urban environments, providers often described working at multiple locations—in different hospitals or at multiple offices of the same practice—and seeing patients with providers and specialists not only at different locations, but also not necessarily in the same health system (e.g., Washington State). As such, providers across states identified a shared need to connect with community records and with in- and out-of-system providers to obtain accurate and complete patient

^x Urbanicity is measured by number of Metropolitan Statistical Areas (MSAs) as well as number of managed care plans in the state.

health histories. Contrastingly, patients in rural states often rely on small regional care centers for primary care but must travel to see multiple providers for major health concerns, making proper care coordination a serious challenge, especially if patients cross state lines to seek care (e.g., Nebraska, Colorado, Utah, and Wyoming). In this environment, HIE and data storage in a central repository and/or enabling queries of the broader network can allow providers to collect otherwise diffuse health records to provide better care and coordination.

Summary of Hypothesis Testing Results

The four program years saw a rapid increase in HIE across states. Program factors drove most of the changes in HIE seen across states in these four years, both by themselves and by synergistically interacting with contextual factors, which is consistent with qualitative findings.

Certain contextual factors were correlated with strong exchange participation from the beginning (e.g., high pre-HITECH EHR adoption, small states). Over time, other market-driven contextual factors (such as lower hospital competition and greater presence of managed care) appeared to influence exchange participation. Program factors also became more important over the duration of the program, facilitated by strong foundational contextual factors (e.g., program-mediated exchange).

States with a solid HIE foundation (indicated by contextual factors) were more able to accelerate progress with program support. States that started with little foundation struggled in the early program years and only made measurable advances in the later years

Key Program Impacts

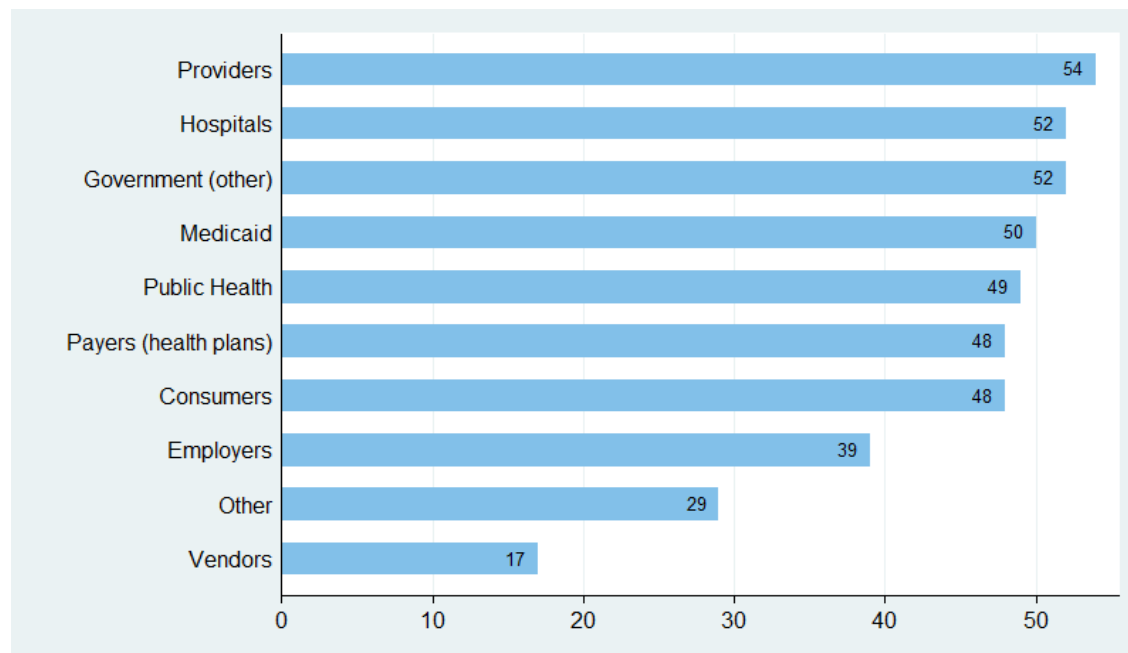
To address the question of how much the State HIE Program helped grantees achieve its major program objectives, we reviewed evidence related to the following major objectives:

- 1) Engaging stakeholders per the ONC’s first Program Information Notice Priorities to “initiate a transparent, multi-stakeholder process” and “align with Medicaid and public health programs”¹⁵⁷
- 2) Expanding exchange services and HIE adoption (including e-prescribing, care summary, and laboratory exchange) and reducing the cost and complexity of provider participation in exchange
- 3) Helping providers meet the HIE requirements of MU

Below we synthesize the quantitative and qualitative results of our evaluation activities with respect to these objectives.

Engaging stakeholders to “initiate a transparent, multi-stakeholder process” and “align with Medicaid and public health programs.”¹⁵⁸ The Program Information Notice priorities recognized the importance of active stakeholder involvement in planning and implementing State HIE Program activities and stipulated their involvement. The same Notice advised that this group be representative of consumers and other relevant stakeholders in each state, with the understanding that because states differed in their local environments, major players would vary. The primary way states instituted the requirement for stakeholder involvement was to include them in their governance structures. According to the CRM data, over 80 percent of grantees reported having consumer, payer, public health, Medicaid, government, hospital, and provider representatives in their governance structure. Across all grantees in all four years, the mean number of participating members from private organizations (15.3) outnumbered that from public organizations (8.1)—highlighting the strength of private sector involvement in program governance. Exhibit 29 shows the diversity of stakeholders represented in grantee governance structures.

Exhibit 29: Stakeholder Representation in Governance Structure, July to January 2013 (N=56)



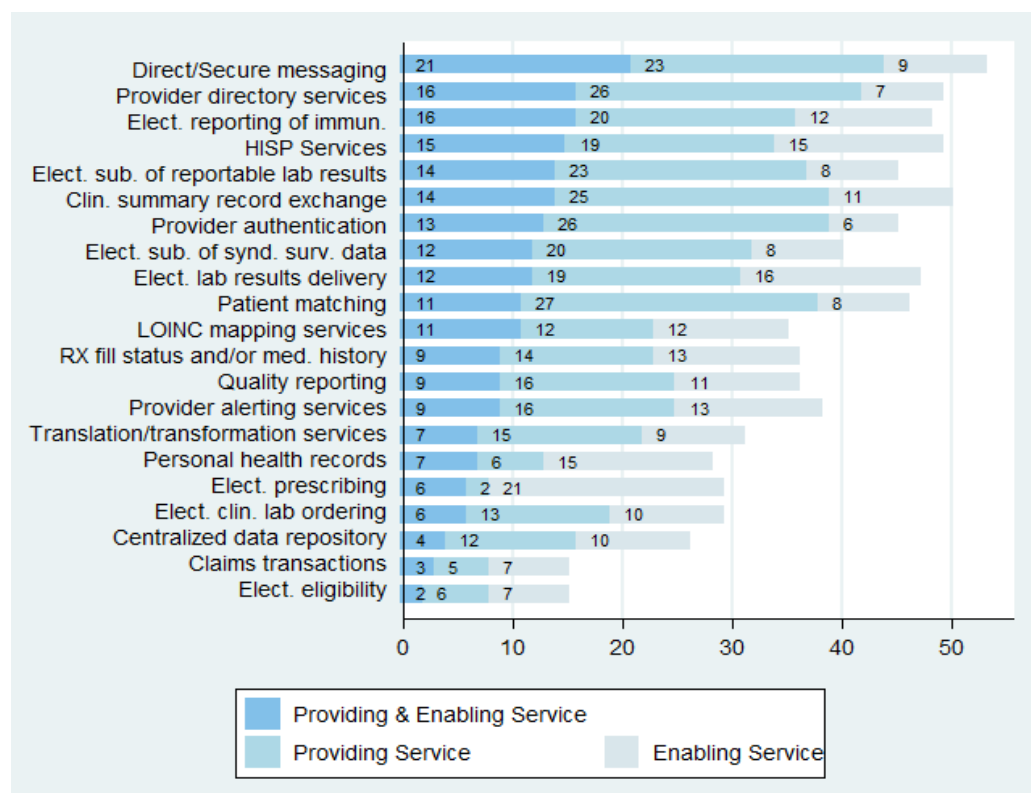
SOURCE: 2013 CRM Data Provided by ONC

Informants generally agreed that the State HIE Program created a neutral forum where state and federal stakeholders could come together and engage in conversations around HIE policies. In addition, the program facilitated greater awareness and more frequent discussion of HIE. These discussions on HIE helped bring together state-level public players with private data holders to discuss issues like how states and communities can come together to move data. Some informants pointed to Medicaid as one of the most significant players in HIE, now that State HIE Program funding has ended. These informants predicted that Medicaid’s participation and/or leadership in HIE will drive future demand and use, and that many states will seek HIE-related funding from their Medicaid agencies.

Informants also noted that the program’s emphasis on stakeholder engagement encouraged inclusion of previously excluded sectors of health care (such as ambulatory providers, behavioral health, and long-term care) in conversations regarding HIE. Many believed that directly engaging with these providers reduced their reluctance to participate in exchange. Others thought the program should have done more to include these providers in conversations, program implementation, and ultimately data exchange.

Expanding exchange services and expanding HIE adoption (including e-prescribing, care summary, and laboratory exchange) and reducing the cost and complexity of provider participation in exchange. With respect to infrastructure, many informants credited the State HIE Program with funding the technical infrastructure and policy work that helped accelerate HIE. CRM data on the variety of services enabled under the State HIE Program (see Exhibit 30), including Direct services and secure messaging, provider directory services, and electronic reporting of immunizations, among many others. Some informants characterized the main expansion of HIE as from hospitals to ambulatory care, with a wider acceptance of public-private sharing. Many felt expansion into other settings and other services will be necessary to achieve delivery system reform objectives, especially those related to care coordination.

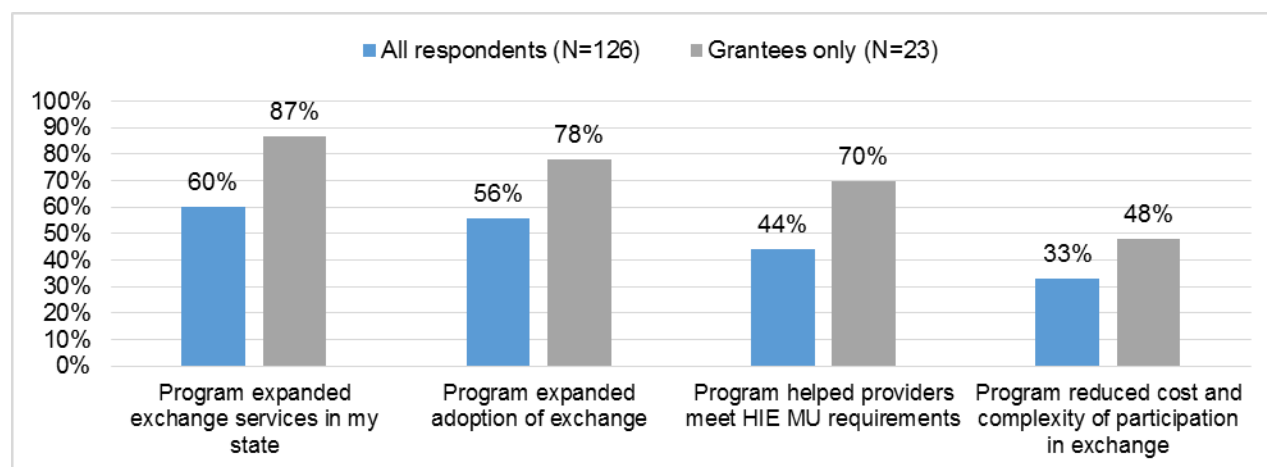
Exhibit 30: Services Provided and/or Enabled, July to December 2013 (N=56)



SOURCE: 2013 CRM Data Provided by ONC

The 2014 eHI Annual HIE Survey found the majority of grantees agreed that the program met its goals: expanding exchange services (87 percent) and adoption (78 percent), and helping providers meet MU (70 percent); 48 percent of grantees felt the program reduced the cost of exchange. Among the broader group of respondents, which included grantees and non-grantees (e.g., community HIOs, health care delivery organization), a majority believed the program expanded services (60 percent) and adoption (56 percent); 44 percent thought that the program helped providers with MU and 33 percent that the program reduced the cost and complexity of exchange participation (see Exhibit 31).

Exhibit 31: Priority Measures of Program Success

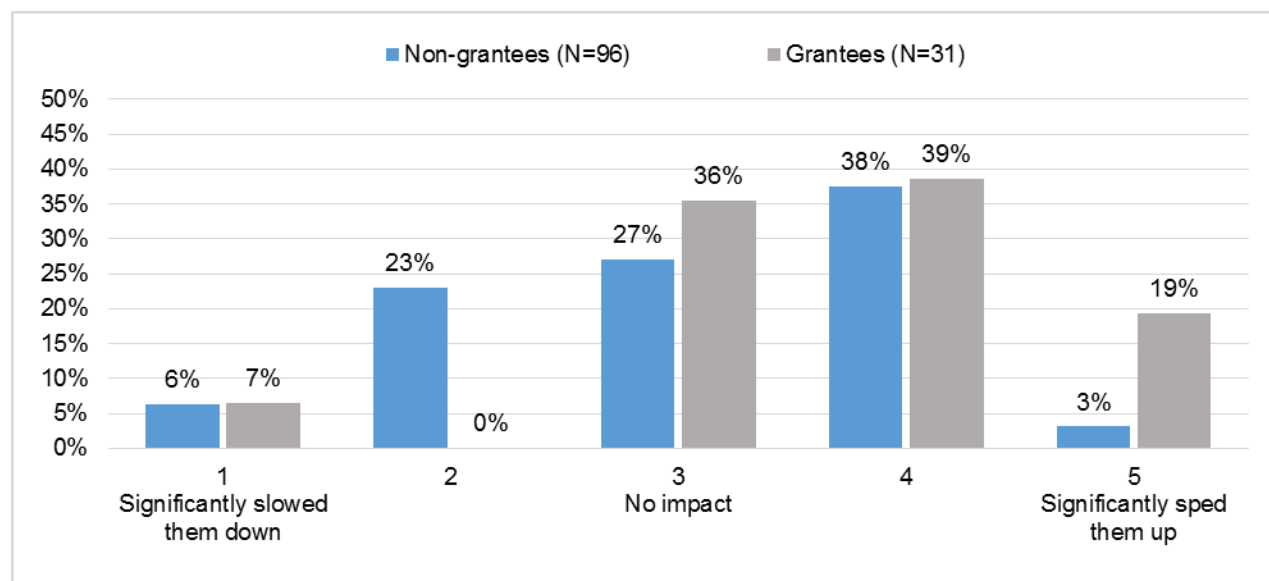


SOURCE: 2014 eHI Annual HIE Survey

When respondents to an RWJF-sponsored survey were asked to what extent **statewide** HIE effort impacted the progress of **regional/local** HIE efforts in their states, their opinions differed (Exhibit 32).¹⁵⁹ Fifty-eight percent of grantees that responded to the survey reported their State HIE Program efforts had positive effects on local/regional efforts in their states (sped them up, 39 percent; or significantly sped them up, 19 percent); 36 percent believed they had no impact on external activities, and 7 percent believed their program efforts slowed others down. Among non-grantee HIOs, opinions ranged across the spectrum: 41 percent reported the program significantly sped up their own progress (39 percent agreed, 3 percent thought significantly); 27 percent reported no impact; 29 percent believed grantee efforts slowed others down (23 percent said slowed, 6 percent said significantly slowed). In addition, these organizations varied in their grantee involvement, from not involved to very involved.

Overall, grantees found their efforts to be more supportive of HIOs than did the HIOs themselves. Situations where HIOs perceived State HIE Program efforts as having no impact on external activities could indicate either: (1) that the two operated independently and/or (2) that the HIOs were pursuing private/enterprise solutions. Situations where HIOs perceived grantee activities as slowing down regional/local HIOs could be the result of either competition between the two or the time necessary to forge collaboration.

Exhibit 32: Effect of State HIE Program Activities on Regional/Local Efforts



SOURCE: 2015 RWJF Survey

Many stakeholders reported that the State HIE Program provided a critical infusion of funds, thereby reducing the cost of exchange—without which many believed states would have found it difficult to launch any HIE efforts. According to interviews, the program enabled states without prior funding to launch some type of HIE infrastructure. For states already on the cusp of success, informants noted that program funding provided additional support, which helped them make significant HIE progress. For example, the Michigan Health Information Network (MiHIN) reported having millions of transactions happening per week, compared to zero at the beginning of the program. Under the program, Michigan also improved standardization and scalability of its public health reporting. In California, where regional and closed network HIE is the norm, HIE efforts evolved from small and mostly community-based networks into 30 HIE efforts either exchanging data or launching services. In California and New York, informants noted their appreciation for the forum created by and guidance they received under the

program, which allowed them to meet their stakeholders' needs outside statewide exchange and to expand the volume of exchange and the stakeholders at the table.

However, the program did not universally expand services. Wyoming's grantee, for example, contracted out their services to Nebraska until the program ceased, at which point lack of funds necessitated a strategy change. The state Medicaid office is now leading HIE in the state. In other states, stakeholders like state government, payers, and hospital systems have committed the funds to maintain program services; some described HIE as a public utility, others saw it as a public service or "the right thing to do," while still others predicted future returns that would merit their investment.

Informants noted that it will take many years and significantly more funding and resources to fully establish HIE. However, they agreed that program funding has indeed helped states to build new infrastructure, launch new services, enhance existing and sometimes previously substandard HIE infrastructure, and expand networks to support data mobilization and information exchange.

Helping providers meet the HIE requirements of MU. The State HIE Program predated MU; however, subsequent PINs prioritized grantee focus on preparing providers to meet MU exchange requirements. Stage 1 MU requirements for HIE, as previously noted, included e-prescribing, care summary exchange, laboratory results exchange, and public health reporting (i.e., immunizations, electronic laboratory reporting, and syndromic surveillance data). See Appendix II for more information on HIE measures under Stages 1 and 2 of MU.¹⁶⁰ Stage 2 MU expanded information exchange requirements, including incorporation of structured laboratory results, electronic transmission of patient care summaries to support transitions in care across unaffiliated providers, and public health reporting requirements.^{161,162} For some of these requirements, providers must move beyond sending test messages and demonstrate more robust exchange capabilities.

Grantees prepared providers for MU exchange requirements in various ways, not limited to building infrastructure and offering services. Our typology indicates that 18 percent of grantees chose to certify developers as HISPs that could provide Direct services, such as public health reporting. Twenty-one grantees (41 percent) assumed a capacity-building role¹⁶³—making sub-awards to existing HIOs, subsidizing provider costs for interfaces, offering incentives to providers to use directed and query-based exchange services, and providing technical assistance to providers and health care delivery organizations.¹⁶⁴ Many grantees served as or worked closely with RECs, which providers reportedly: (1) relied heavily on for technical assistance and support and (2) considered instrumental in helping them understand and meet those requirements. Co-location of the REC and the grantee was particularly beneficial because of the added ease of delivering these supportive services. RECs also performed such functions as promoting MU among providers throughout the state and disseminating the idea that MU was a mechanism to improve patient care through care coordination.

Infrastructure and Services Established Related to MU

Some providers leveraged services offered through the State HIE Program to perform tests to meet Stage 1 requirements. For example, Mississippi providers used Direct services offered by MS-HIN to conduct tests of their ability to exchange immunization data; in Utah, the Clinical Health Information Exchange (cHIE) supported providers' performing test messages for exchanging care summaries. According to 2015 national MU attestation data, over 305,000 eligible providers and 4,300 hospitals successfully attested to Stage 1 MU requirements. At the time of our evaluation, grantees were preparing to support providers in meeting Stage 2 requirements, particularly around public health reporting (immunizations, electronic laboratory reporting, syndromic surveillance). According to 2015 MU attestation data, over 54,000 eligible providers and 1,800 hospitals attested to Stage 2 requirements. Drug formularies, immunization registries, and patient lists were the most common requirements attested to among providers; hospitals favored advance directives, clinical laboratory test results, and drug formularies.

Interaction of MU and the State HIE Program

Qualitative findings showed some providers struggling at times to balance MU and State HIE Program priorities. Some stakeholders believed there was a fundamental conflict between the timing and requirements for the two programs, leading to confusion and divided attention. Some informants felt that if ONC had initiated the State HIE Program after MU had produced measurable gains in EHR adoption, providers would have been better prepared to implement HIE. However, others found the combination of funding, guidance, and attention from the two programs helped their implementation efforts. Multiple stakeholders in both the case studies and key informant interviews reported MU was a significant impetus to establishing the necessary infrastructure to support HIE, given that having EHR use is a precursor to HIE. Despite these differences of opinion, hospitals and providers showed measurable gains in MU attestation and HIE Program Information Notice priorities.

Additional Program Impacts

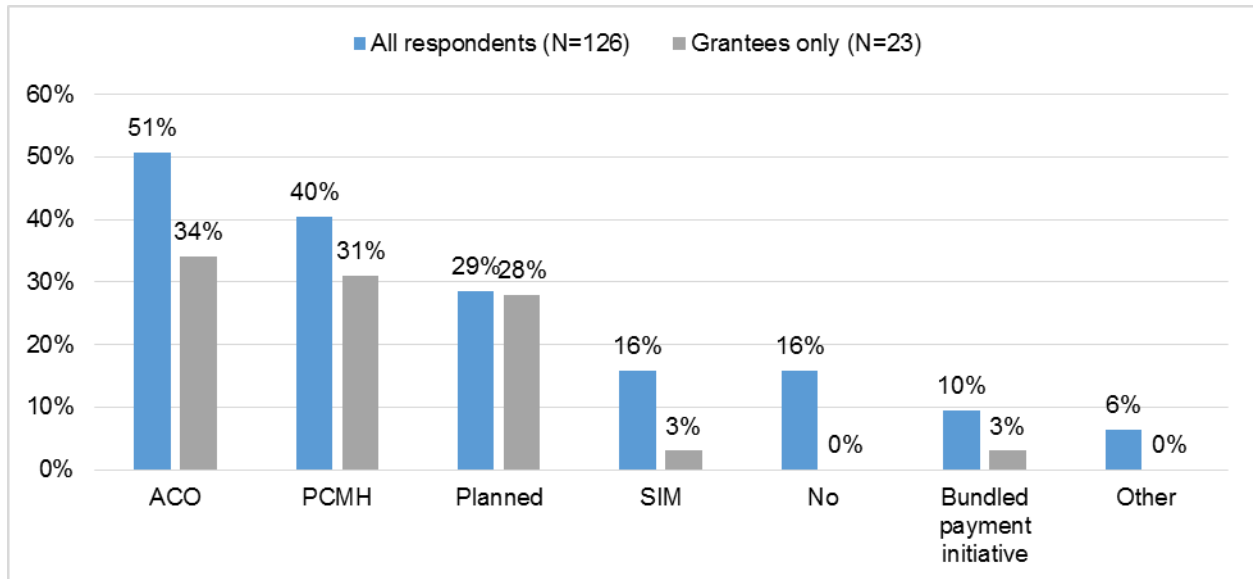
Important facets of the State HIE Program were building both HIE participation and capacity and ensuring HIE's long-term sustainability. Here, sustainability refers to HIE broadly, not limited to state services and infrastructure built under program auspices. Informants believed the program created two important conditions for HIE to expand and continue expanding:

Raising Awareness and Acceptability of HIE. Some informants praised the State HIE Program for raising awareness and drawing attention to HIE, stating that the program brought these topics to the forefront of health care conversations at all levels (local, regional, state, and national). Prior to the program, typically these conversations were limited to sharing within large hospital systems. Additionally, informants believed the State HIE Program created wider acceptance of information sharing among potential participants. One informant described the State HIE Program as a communications platform for stakeholders to discuss issues that affected them. Through technical assistance activities (such as communities of practice, boot camps, and listening sessions) grantees were able to convene and learn from one another's experiences, both positive and negative. The result was an attitude shift over the course of the program—from lack of understanding and unwillingness to share electronic health data to a shared belief among many patients and providers that data access is necessary to optimize care delivery and improve patient outcomes.

Creating Infrastructure that ACA Efforts Can Leverage. Stakeholders reported that the program created successful models of exchange, as well as infrastructure that delivery system reform/care transformation initiatives can leverage. For example, respondents to the eHI Annual HIE Survey indicated they are planning to leverage HIE infrastructure for various delivery system reform efforts (see Exhibit 33); 100 percent of respondents agreed with this statement, 84 percent agreed they would pursue solutions such as ACOs, PCMHs, and innovation projects with State Innovation Model (SIM) funding. Similarly, all but 4 percent of respondents to the 2015 RWJF survey agreed they were engaged in or planning efforts related to delivery system reform, such as supporting ACOs (56 percent) and PCMHs (55 percent).¹⁶⁵

Ultimately, as one stakeholder noted, the program ensured that all states now have the ability to exchange at some level, and delivery system reform offers additional use cases for those services and infrastructures. During interviews, a number of informants predicted that information exchange and interoperability will be tied to delivery system reform as a compelling business case for providers and developers, which will further contribute to sustainability. Another potential HIE use case is quality reporting. According to the RWJF survey, 59 percent of HIOs currently exchange data that can be used to assess quality mapped onto existing quality metrics, although only 45 percent currently do so and only 14 percent publicly report the results.¹⁶⁶

Exhibit 33: eHI Respondent Plans to Leverage HIE Infrastructure for Reform Efforts



SOURCE: 2014 eHI Annual HIE Survey

A recent article by the U.S. Secretary of HHS, Sylvia Burwell, shares these perspectives on the ongoing and expanded utility for HIE. Burwell identifies three areas of HHS strategic focus moving forward: (1) quality and performance-based incentives, including alternative payment models; (2) improved care delivery through better coordination and new transformation initiatives; and (3) using health IT to accelerate the availability of health information that supports clinical decision-making. Health IT—including EHR adoption, HIE, MU, and interoperability—will be at the forefront of these efforts.¹⁶⁷

VI. Lessons Learned: Key Drivers, Challenges, and Solutions

Chapter Summary

One of the evaluation's central goals was to extract important lessons from grantee implementation experiences—to guide and inform HIE expansion and improvement efforts at the federal, state, and local levels and to enable grantees to learn from one another. In this chapter, we present key drivers of grantee progress and strategies they used or are considering to overcome obstacles.

Key Drivers

Principal among the many lessons grantees said they learned were:

- Having diverse stakeholders is valuable to build relationships, establish trust, improve acceptance, align goals, leverage existing HIE assets, and create a sense of ownership for all involved.
- Initial service offerings played an important role in driving momentum for HIE. Some grantees recommended: (1) providing fewer services but choosing services that stakeholders value and that can be provided with high quality, and (2) pushing for universal adoption of those services.
- State HIE Program governing bodies varied in their official responsibilities, legal authority, members, and affiliation with government—all of which have implications for HIE design, pace of development, and sustainability.
- Delivery system reform has played, and will continue to play, a role in HIE expansion. State HIE Program efforts have helped providers meet MU requirements. Organizations participating in delivery system reform have helped HIE initiatives build their user base and ensure utility of their services.

Challenges

- HIE infrastructure and service development was more resource intensive than grantees anticipated.
- For successful interoperability, existing health IT/HIE standards need to be more broadly used and new standards developed, with support from incentives and other policies.
- Unexpected barriers in grantee relationships with EHR developers and HIE vendors led grantees to question whether developers and vendors were really prepared to accommodate HIE stakeholder needs. Deliberate and consistent engagement of these parties proved important to encourage cooperation and progress.
- Sustainability was a persistent concern, requiring that grantees seek out new financial contributors and offer reasonably priced services to meet their needs.

Conclusions

The usefulness of HIE depends on broad-based adoption of HIE-supportive technology and expansion of HIE networks. Expansion must occur within states, across state lines, and nationally. The paradox of HIE activities is that they need participants but will struggle for participants until the activities demonstrate value. More evidence and examples of HIE producing value are needed to motivate continued stakeholder commitment and investment. Significant progress on interoperability will be equally necessary if HIE is to achieve its potential in improving the quality and efficiency of patient care.

Introduction

A central goal of the evaluation was the distillation of important lessons learned from grantee implementation experiences—to guide and inform similar efforts moving forward and to provide an opportunity for grantees to learn from one another’s experiences. First, we present key drivers identified by grantees that helped facilitate and/or accelerate HIE. Identifying key drivers will help policymakers design future programs, service offerings, and policies to advance HIE. Next, we present key challenges grantees encountered, remaining gaps in connectivity, and strategies grantees used or are considering to overcome obstacles. This discussion will help stakeholders prepare for challenges ahead and set realistic expectations for current or future efforts. Highlighting successful strategies used by others can also help grantees address their own challenges efficiently. Finally, we briefly address issues involved in sustaining grantee activities after the end of State HIE Program funding.

Approach

To identify crosscutting lessons learned, we focused primarily on the final program performance reports all grantees submitted to ONC in April 2014, as part of their required closeout activities. We also drew on information collected through case studies, key informant discussions, and review of the relevant literature.

In their final program performance reports, all grantees answered the following specific questions related to their program implementations:

- **Lessons Learned:** “Provide a brief summary of your lessons learned and how you would address such issues in the future. Please provide both successful and not-so-successful lessons learned. Areas to consider could include governance, technology, adoption, or any other area you feel was particularly important or challenging.”
- **Gap Analysis:** “Provide a brief summary of where you still see gaps in HIE coverage both within your state, and in terms of inter-state exchange.”
- **Other:** “Use this section to provide additional comments, lessons learned, recommendations, etc. that haven’t already been covered above.”

We analyzed grantee responses with the qualitative research software NVivo, coding responses into categories representing the most commonly reported subjects. Coders created the initial categories based on a review of a sub-sample of ten grantee responses; three reviewers then used iterative coding to refine those categories. Once we coded all state responses into the appropriate categories, we again reviewed all response categories for accuracy and coding consistency.

Key Drivers

Across reports, grantees identified a number of common drivers that eased the development of HIE, encouraged participation, and accelerated progress, as described below.

Partnerships, Collaboration, and Stakeholder Buy-In

Many grantees noted the importance of diverse stakeholder collaboration in enabling HIE of value to the community. Grantees used a variety of techniques to involve stakeholders in the strategic vision and implementation of HIE. These efforts included engaging stakeholders in governing bodies, advisory boards, annual meetings, summits, roadshows, work groups, and webinars; sending newsletters and other communications; and using all these activities to solicit feedback. Such opportunities for collaboration and engagement helped to overcome potential competing interests and to build relationships, establish trust, improve acceptance, align goals, leverage existing HIE assets, and create a sense of ownership for all involved.

Stakeholder Partnerships

Many grantees reported the importance of diverse stakeholder perspectives in successful HIE development. Grantees singled out certain stakeholders as particularly important in leveraging the launch of HIE and development of more sustainable models:

- Regional Extension Centers (RECs) helped provider practices manage the planning and implementation of EHRs for information exchange, including trainings and workflow assistance. In addition, grantees benefited from leveraging the developer relationships of their REC—recognizing that RECs were a trusted local entity in helping promote the program and obtain stakeholder buy-in.
- Coordination with Medicaid became an increasingly important “driver to success,” as Medicaid enrollment expands under the ACA.
- Collaboration with public health established public health reporting capabilities.
- Obtaining buy-in from policy makers reduced adoption barriers and spurred expansion.
- Engaging with trading partners not eligible for MU incentives (such as behavioral health and long-term care) helped ensure smooth transitions of care, provided important patient health information to caregivers, and improved quality and efficiency for vulnerable groups.

Grantees also found partnerships important to establish a baseline of financial support for HIE. Contracting with Medicaid, public health, and other state agencies helped secure a steady stream of funds from diverse state sources. Collaborating with RECs and Medicaid brought grantees additional federal grant money. Kentucky, for example, was able to leverage the REC Program to secure more than \$161 million in Medicaid MU incentive dollars for providers. Similarly, Georgia used Medicaid EHR Incentive Program administration funds and Medicaid Management Information System (MMIS) funds to improve HIE for Medicaid beneficiaries. North Dakota drove systems adoption by offering providers low interest loans (at 1 percent with a ten-year payback) to install EHR systems.

“Interoperable technology is not the greatest challenge to promoting statewide HIE adoption. Rather, it is people and organizations working together toward a common goal within the context of their trading partnerships to establish a trust environment. This is the foundation that must be established before technology can be considered.”

—Grantee

Stakeholder Buy-In and Emphasizing Shared Benefit

Grantees found that initial service offerings can play a major role in driving momentum for HIE—as long as they address true local needs and satisfy expectations when delivered. Some grantees recommended providing fewer services, but ensuring their value and quality and pushing for their universal adoption. Implementation strategies tailored in this way not only helped build HIE initiatives’ reputation as useful and successful, they were also more likely to achieve buy-in from a wide range of stakeholders and circumvented potential delays associated with the design and implementation of more extensive services.

Grantees noted the wisdom of offering minimally controversial services initially, to help attract greater investment. Maryland’s example is instructive. Hospitals there were mandated to submit Admissions, Discharge, and Transfer (ADT) data through CRISP (Maryland’s entity responsible for statewide exchange and the REC).¹⁶⁸ The state will use these ADT data to measure hospital-specific performance on readmissions and enhance financial incentives linked with performance. Maryland put it this way: “The decision to start with basic, widespread connectivity through ADTs has proven highly supportive of the HIE’s sustainability longer-term.” Similarly, Massachusetts catalyzed adoption through identification of valuable use cases and their Mass HIway-sponsored grant program to help

“Success breeds success- If you have established a reputation for delivering core services extremely well, there is a ready market to adopt value added services. There is still work to do to demonstrate a value proposition, but you already have brand recognition and are already a trusted partner.”

—Grantee

providers connect to state-led services. Both grantees found success in identifying opportunities for improvement and pursuing use cases that would attract long-term participation.

A few grantees, noting HIE's broad social value, said ONC and state leadership should emphasize this shared benefit to overcome competing interests. Delaware reported, "The social value of the network is greater than the sum of the parts, but participants will only pay for what they perceive is of value to them personally, not what is of value to the greater community. The metrics of business success may not be the same as the metrics demonstrating social value. Measure both, and make the case to participants that they can achieve business goals while also contributing to the greater good."

Leadership and Governance

Prior to the State HIE Program, a single entity that controlled both policy and technology led many HIE activities.¹⁶⁹ Using a single lead entity was also the dominant model in early statewide HIE efforts, such as the Delaware Health Information Network (DHIN), the first statewide HIO.¹⁷⁰ Under the State HIE Program, in contrast, different entities often played governance roles—with these roles evolving over time to encompass the many aspects of leadership, strategic vision and development, and stakeholder relations.

Relationship to State Government

Grantees had diverse governance structures and management models—with considerable differences in official responsibilities, legal authority, type of membership, and affiliation with government. In their final reports and in data collection activities throughout the evaluation, grantees reported that ties with state government helped facilitate HIE, but presented challenges as well (see AIM 1).

Some grantees found that their State HIE projects, when housed within state government, did not have the deftness of their private counterparts—making developer solicitation, staffing, and contracting processes often lengthy and difficult. For example, Iowa reported being chronically under-staffed due to state government hiring restrictions. Rhode Island found aligning state government with an HIE governance structure to be challenging because that state's Department of Health—which serves as the regulatory HIE body—outsources implementation and operation of the HIE initiative through a lengthy competitive process. Other grantees maintained looser affiliations with state government from the outset, which allowed them to operate more independently.

Board Composition and Activity

Several grantees noted the benefits of a governance body with diverse stakeholder involvement. Michigan commented on the value of including industry outsiders to provide a fresh perspective and drive innovation. However, Nevada cautioned against board committees of unmanageable size: "Limiting the Board size to seven to nine members facilitates timely and prudent decision-making, particularly when the decisions impact business operations." Nevada found frequent executive board and committee meetings an important management tool to build relationships, secure buy-in, and receive feedback throughout HIE development and implementation.

Tennessee noted that multiple governance structures for different regional HIE activities made cooperation difficult—with 100 percent of its stakeholders reporting that the state should assist in developing a single governance structure for HIE activity. Other grantees reflected that fully staffing the governing body and minimizing leadership changes accelerated HIE progress.

Managing Expectations

A few grantees found managing stakeholders' expectations and sustaining their interest to be an important leadership task. Oregon grantee reported as an ongoing challenge the need to remind and reassure impatient stakeholders to maintain reasonable expectations regarding implementation timelines. New Mexico stated, "What was not apparent in the beginning was the length of time it would take to establish

HIE where end users would see the benefits of the electronic exchange of information. This is perhaps one of the greatest challenges, to continue to engage stakeholders over the long term, and to manage expectations without losing interest or raising concerns about the viability of the project and its sustainability.” New Mexico recommended providing reports to stakeholders on the challenges and benefits pilot users experienced, to establish realistic expectations among late adopters and validate the priorities set by leadership.

Transparency and Trust

Grantees recommended building trust through transparent communication with stakeholders. Washington State noted, “Of all the work we can do to build trust, we believe transparency is the single most important element. Particularly for the private side of a public/private partnership, [this means] being clear and open about what is being done and why it is critically important. This is a very low cost, yet very useful means for creating and sustaining trust in the marketplace.” Similarly, South Carolina noted that its consensus building approach to governance provided a platform for industry stakeholders to work through issues collaboratively and maintain transparency in the decision-making process. On the other hand, New Hampshire noted that, although it embraces transparency, the state’s “Right to Know” law, which mandates open conduct of government business and carries associated requirements, caused delays in decision-making during the program implementation process.

Early Adoption

In the case studies, grantees reported that early adoption of EHRs in their states and HIO development conferred an advantage—grantees could tailor their offerings to the needs and demands of the local market, and leverage existing relationships and collective knowledge about HIE’s value. For other grantees, however, early HIE development in their states meant entering a crowded local marketplace with competition for state HIE-related services.

However, other grantees noted early HIE adopters faced greater financial risk and risk of momentum loss. Developers, HIE capabilities, and regulations evolved throughout the HITECH expansion of HIE. As a result, some early adopters believed they were more likely to experience setbacks having entered the market and purchased products as HIE priorities and services were developing—sometimes in ways that diverged from their own efforts. Many of these grantees believed that incentives should have been in place to leverage the efforts of, and reward, early adopters. For example, Florida found it useful “to identify data that can flow immediately to or among the early adopters, such as the benefits of working with the Social Security Administration for disability determinations.”

Louisiana found that medium sized hospitals were in fact better suited to the challenges of early adoption than large hospitals because they were more nimble, had fewer competing priorities, were simpler to contract with, and had greater need of the technology to meet their MU objectives. In contrast, New Hampshire found “big market movers” signed up for HIE services early, because they were better able to absorb the risk and build trust in the program to attract other organizations. Grantee experiences suggest there is no one-size-fits-all solution; future initiatives must tailor strategies to local market needs.

Marketing

Several grantees reported marketing HIE as critical to build awareness and increase adoption. According to Montana, “‘Build it and they will come’ does not work.” Establishing a marketing and sales program early on ensuring potential participants understood the benefits. South Carolina created a successful capacity-building program, increasing the number of connected sites from 142 to 293. Kentucky noted the value of having “boots on the ground” to engage providers and connect stakeholders. Press events also helped sustain interest and further publicize HIE. The launch of the Massachusetts HIE, Mass HIway, was a major press event, featuring the governor as keynote speaker and including a demonstration of him sending his own records to a provider. South Carolina planned to engage a marketing company to analyze the market’s evolving needs and improve perception of its HIE initiative’s value.

ACA and Delivery System Reform

Delivery system reform and HIE activities have been complementary developments. Arkansas worked with Medicaid and became an integral player in the state's Patient Centered Medical Home (PCMH) Initiative—helping 400 primary care providers to meet the requirement of accessing inpatient discharge and transfer information, and to document compliance within the first 12 months of the PCMH initiative. In Hawai'i, HIE stakeholders were negotiating contracts to leverage the existing HIE infrastructure, to distribute data so providers participating in PCMHs did not have to manually enter laboratory data into the quality-improvement monitoring dashboard. Montana made HIE participation a requirement for PCMH participation and receipt of incentive dollars, which “encouraged and required the largest PPS [prospective payment systems] hospitals in the state to sign participation agreements. This allowed HSM [HealthShare Montana, the SDE] to obtain the data needed to demonstrate value to other providers and organizations that were not currently participating in the PCMH project.”

“Everyone learned that in order to attain HIE connectivity it was taking more money, time, and effort than everyone, even large sophisticated organizations, had originally planned.”

—Grantee

Key Challenges

Grantees reported encountering a wide range of challenges from the perspective of multiple stakeholders throughout their implementation periods, as well as lessons learned from navigating these challenges and recommended strategies. Grantees also identified outstanding gaps in coverage and continued barriers to HIE initiative progress.

Costs, Resources, and Time

Throughout the evaluation, stakeholders universally acknowledged cost as a central, ongoing challenge. ONC designed program funding to offset some of the cost associated with infrastructure and maintenance of services; however, cost concerns persisted across states, provider types, and technical approaches. In addition to the financial cost of investment, grantees and providers expressed concern over the resources and time necessary to establish and sustain operations.

About half of the grantees emphasized that implementing HIE was more resource intensive than they had anticipated. Important steps at all stages of development took longer than expected. During the design phase, grantees specifically mentioned difficulty developing a governance structure and a legal and policy framework, crafting data sharing agreements, onboarding participants, and getting ONC approval. Moving from design to implementation and operations was also resource intensive and time-consuming, with governing bodies having to provide support in areas they were not expecting. Florida stated, “The technical build has proved more complicated than expected because customization is often required in connecting with other HIEs.” The sense that everyone was “learning as they go” further slowed technical development.

Data Quality

Grantees reported both data completeness (i.e., not all necessary elements captured) and data accuracy (i.e., data appearing in the wrong fields following the data transfer process) as quality issues. Examples include the patient's address populating the name field or the name field displaying numerical values. Poor data quality has substantial consequences for entities planning to use data for quality improvement and care transformation.

In response to poor data quality, both data senders and receivers reported expending significant effort cleaning, and in some cases translating, data for sharing across systems. Data quality issues may have serious implications, such as wrongful disclosure and medical error (e.g., treatment based on another

patient’s health record),¹⁷¹ which erode stakeholder trust. The Utah Department of Health, for example, uses a specialized matching algorithm designed for the Utah population that it finds superior to other entities’ matching algorithms. Vermont, under its Blueprint for Health, implemented a robust data quality plan—including remediation strategies for issues such as inaccuracies in provider identities, patient matching problems, clinical data issues, and management of deceased patients.¹⁷²

Interoperability

Interoperability is a crosscutting topic with implications for HIE network expansion, data utility, and business models, among other areas. A recent JASON report stated, “The current lack of interoperability among the data resources for EHRs is a major impediment to the effective exchange of health information. These interoperability issues need to be solved going forward, or else the entire health data infrastructure will be crippled.”¹⁷³ In addition to being an essential element in achieving broad-based HIE, interoperability is the focus of MU Stages 2 and 3, which expand interoperability criteria.

Standards

Many grantees reported lack of technical standards for interoperability as the biggest hurdle to data exchange, and that interoperability issues will continue even with 2014 certification requirements. Grantees described how gaps in standards led to the need for customization for participants and extensive onboarding processes, which drained both time and money. This sentiment was echoed in a recent GAO report on HIE,¹⁷⁴ as well as in the literature^{175,176,177} and multiple evaluation activities (case studies, stakeholder discussions, key informant interviews).

“Interoperability needs a lot more standardization. Success of HIE [initiatives] is a function of the degree to which interoperability is implemented and maintained.”

–Grantee

Even when standards are in place, different developers may interpret them differently. For example, even though EHR developers supported the consolidated clinical data architecture (C-CDA) standard, implementation of the standard varied. Consequently, providers sometimes exchanged C-CDAs as PDFs or text instead of structured data, complicating integration into some EHRs. Some grantees noted that the federal government needs to do more to ensure providers, developers, and vendors implement standards uniformly and reporting requirements are aligned with standards to the extent possible. Some reported a desire for ONC to take a leadership role in educating stakeholders about standards and directing HIE certification programs to ensure consistency, affordability, non-duplication of effort, and clarity for HIE participants. One grantee noted its support for the Standards and Interoperability Framework and its interest in having a national body to ensure consistency in mandated standards.

Next Steps for Interoperability

Grantees questioned whether HIE developers and HIE participants are truly ready for interoperability. For example, Washington reported that while these developers may support interoperability between providers who have similar EHR platforms, exchanging information with providers on different EHR platforms remains a challenge. On the other side, Washington also reported that few stakeholders are prepared to engage in the exchange despite their demand for it.¹⁷⁸

Grantees are at different stages in their progression to interoperability. One grantee expected adoption to increase once International Statistical Classification of Diseases and Related Health Problems (ICD-10) implementation is complete and penalties for non-compliance are in effect. At the same time, competition in the rapidly developing market may compel developers to meet provider demands for lower investment and maintenance costs and improved usability. If these coincide, demand for HIE could increase significantly. Increased uptake by a critical mass could, in turn, help address the lingering issue of using exchanged data effectively, referred to as “the last mile of HIE connectivity.” Even supportive HIE stakeholders expressed concern over how to integrate and use the data they would receive, especially if

the data are incomplete. Although the issue of data quality and how to effectively integrate data remains, exchange creates more complete data sources for health analytics and use at the point of care.

EHR Developers and HIE Vendors

Developers and vendors are responsible for the design and building of infrastructure and services. As such, the services developers offer in a local marketplace inevitably influence the evolution of that marketplace. During the State HIE Program, developers offered a range of HIE solutions, of which some met grantee needs but others did not. Grantees offered lessons learned in procuring and managing developer and vendor relationships to ensure service delivery that meets expectations.

Product and Performance Limitations

Most grantees reported challenges dealing with EHR developers and HIE vendors. Several encountered unexpected barriers and fees for services or components they had assumed the original cost would cover. Some grantees found developers simply did not have the capability or availability to meet grantee needs. For example, some reported developers being unable to comply with legal and regulatory differences across states. Others encountered developers unable to meet simultaneous requirements (e.g., State HIE and MU), and familiar with old rather than current standards. In addition, developers' reluctance to collaborate led to variation in how they implemented policies (e.g., Direct and certification policies). For example, Iowa encouraged the use of HIE standards but found the available products did not always use the recommended standards.

Engagement with EHR Developers and HIE Vendors

Grantees found that deliberate and consistent engagement of developers was important to encourage cooperation, establish best practices, and avoid delays. For example, some grantees needed to facilitate developer engagement, including communicating about standards and technical vision, because other stakeholders did not absorb the responsibility. Some requested ONC's and other agencies' assistance in engaging developers; they believed that ensuring developers and vendors view themselves as part of the HIE community could improve relationships, products, and services. Rhode Island noted that some EHR developers view HIE as competition "limiting their ability to dominate the market." Rhode Island was able to convince local EHR developers to cooperate and expected resistance to HIE to decline with the rise of ACOs and PCMHs and increased regulation.

Developer Contracting

Variation in structure and governance across grantees resulted in a variety of developer-grantee relationships and wide-ranging lessons learned. A commonly reported lesson was to create a flexible HIE infrastructure able to cope with the evolving nature of health IT. For example, one way grantees were successful at ensuring flexibility was maintaining the option to contract with different developers when expanding their service offerings (see AIM 1). This gave grantees more control over their offerings and progress, such as firing developers without having to abandon infrastructure. Michigan used a flexible staffing model, which allowed its governing body to seek additional resources to compensate for developer shortcomings. Similarly, Delaware reported that dissatisfaction with system performance led to hiring staff "with deeper skill sets and the ability to take over some functions previously performed by our developer." Puerto Rico used an open source system to save money, which they then directed toward other aspects of the project.

"While implementing an HIE you must establish a plan up-front, but must be prepared to change it multiple times. Be agile in your approach and flexible in scope. Have a contract and a developer that can support this methodology."

—Grantee

Procurement Process

Grantees found establishing a developer procurement process that set the right tone was an important foundation of successful efforts. Arkansas helped the provider community by negotiating statewide

contracts with developers—creating an economy of scale that reduced developers’ interface fees to connect to HIE services. Nevada benefited from hiring an experienced project management firm to develop its Request for Proposals (RFP) and evaluation criteria, and to run the competitive procurement process. Using an outside firm allowed Nevada’s governing body to focus on other priorities.

Another procurement recommendation was to use a non-priced Request for Technical Proposal (instead of a traditional RFP) to acquire a developer, and then to negotiate and acquire technology at a sustainable cost. Illinois’ HIE bodies (OHIT and ILHIE) established a comprehensive developer discovery process that educates both client and developer on federal and state exchange standards. The process also provided ILHIE Engagement Managers the opportunity to “assess potential developer limitations and adjust the ILHIE service offerings to the clients offering value-added services such as ADT feeds, as developers adapt to higher standards.”

Managing HIE Development

Several grantees noted that enabling HIE services at the state level involves balancing operational, technical, financial, and governance responsibilities. In particular, managing developers and vendors required increasing technical sophistication as HIE efforts expanded in needs and participating clientele, services provided, and technical capability. Other grantees reported the value of having skilled, experienced people to manage large scale HIE efforts; however, competent project managers with HIE experience were in high demand and thus difficult to find and expensive to employ. On the other hand, grantees had mixed reviews about the benefit of contracted management and technical staff. Two grantees reported benefiting from expert third party involvement, while American Samoa reported that contracted management staff’s belief that they knew best resulted in mistakes and delays.

A few grantees identified the monitoring of HIE development activity as another important management task because it provides: (1) an unbiased assessment of what progress has been made and what needs to be done, and (2) an opportunity to raise awareness and educate stakeholders. Georgia used a balanced scorecard approach to monitor progress and measure success. Massachusetts developed a customer relationship system to monitor and report activity in a more meaningful way than a simple spreadsheet.

Privacy and Security

Both stakeholder engagement in HIE and patient consent to have their health data exchanged rely on the promise of adequate protections. All grantees were required to select a consent model and to develop robust privacy and security plans to protect patient rights and patient data, including abiding by HIPAA requirements. In doing so, grantees confronted a variety of privacy and security concerns. According to an RWJF survey, 86 percent of respondents viewed stakeholder concerns over confidentiality and privacy as a barrier to their HIE development efforts, and 81 percent believed managing the complexity of consent models represented another potential barrier to HIE.¹⁷⁹

Data Governance

Patients and other stakeholders expressed concerns about privacy and security, particularly as the number of providers accessing patient health information increases over time. Utah noted that organizations worried about their potential liability and reputational damage should a data breach occur, and that governing bodies have to “continually educate and keep their members apprised of the data security provisions employed.”

Data Segmentation and Confidentiality

Data segmentation is the process of isolating certain data elements to allow for different disclosure policies, which provides additional protection to sensitive patient health data but requires sophisticated technology and additional consent procedures.¹⁸⁰ Iowa worried that providers’ EHRs do not meet their legal requirements to differentiate between highly sensitive health information that providers may only

use for treatment (e.g., mental health treatment records) and less sensitive data they may use for payment and operations purposes as well as treatment.

The 42 Code of Federal Regulations (CFR) Part 2 regulation limits the use and disclosure of patient health records for substance abuse.¹⁸¹ Some grantees noted that 42 CFR Part 2 is an additional barrier to sharing patient data, but that they are continuing to work on compliance. Rhode Island noted that if substance abuse treatment is received in a setting that provides a broad range of health care services, such as a hospital, “the Part 2 information is not exchanged with CurrentCare [the Rhode Island HIE initiative], even if the patient consents. The reason is that the data exchange uses the Continuity of Care Document (CCD) exchange standard as the ‘data wrapper,’ and the CCD standard provides no explicit way to identify CCDs that contain [sensitive] information.”

Some grantees have made progress towards better aligning their state-level HIE activities with HIPAA. Delaware and Kansas successfully validated HIPAA-compliant interoperability via inter-network secure Direct Messaging. Massachusetts is updating its HIPAA Notice of Privacy Practices (NPP) to list the Massachusetts HIE initiative as a mode of exchange, although further clarification is needed to translate the legislative mandate into a functional consent process. In addition, Massachusetts providers have included permission to share health information with other providers on consent-to-treat forms.

Achieving Broad-Based Exchange

HIE has become a central strategy in improving the quality and efficiency of patient care; and its ability to achieve its potential depends, in part, upon broad-based adoption and expansion of HIE networks.¹⁸² Although HIE is promising in this respect, many grantees reflected that to maximize this potential, HIE expansion will need to occur within states, across state lines, and nationally.

Garnering Participation of Large Health Systems

Case study findings show that engaging large health systems in state-led HIE is both a principal goal and a practical challenge among the grantees. Large health systems play a significant role in local markets. Overall, case study grantees were successful in gaining interest from large health systems, but struggled in varying degrees to convince them to participate. For example, in Maine, large health systems participated in HIE pilot projects, but the somewhat limited state-offered services led many to consider private HIE instead. Wisconsin reported struggling to provide services of value in a highly developed marketplace. Many of that state’s providers were in, or affiliated with, large hospital systems with EHRs and needed query-based exchange that WISHIN (Wisconsin’s designated state HIE provider) did not offer. Consequently, hospital systems pursued IDNs and other private network solutions.

South Carolina found large hospitals viewed themselves as competitors to the South Carolina Health Information Exchange, and therefore did not connect. In Texas, large health systems expressed interest in local and regional HIOs, but were slow to sign up. Many health systems described their interest in investing for “the public good,” but others questioned the value public or community-based HIOs provide to large hospital systems, and suggested private options may better serve their needs.

Coverage Gaps

In spite of expanded HIE connectivity, service gaps within states remain. Several grantees noted that small providers and rural providers fell behind in connectivity. Two grantees noted that providers in rural communities did not have access to broadband with sufficient bandwidth for the transmission of large amounts of data or radiology reports with images. Such providers faced upload fees, slower download times, and fewer broadband provider options. Rural and critical access hospitals were not as able to absorb start-up and maintenance costs, and did not have the critical mass in terms of population and resources needed to maintain HIE activities. Small providers and territories faced similar problems. For all these reasons, inclusion in HIE of providers and areas with fewer resources has implications for population health management, policy development, and other longer-term use issues.

Some grantees came up with innovative approaches to target connectivity barriers for rural providers. Texas created the White Space program to help an estimated 160 hospitals and 3,000 physicians located in rural areas lacking HIE coverage.¹⁸³ The White Space program certified five HISPs to provide Direct messaging services, and then offered vouchers to providers to offset the initial connection costs. Similarly, Indiana’s Connectivity Matching Grant Program provided grants to rural hospitals, community health centers, and laboratories and imaging centers to fund interfacing with an HIO of their choosing.¹⁸⁴

Providers not eligible for MU incentives consistently lag in HIE connectivity. These settings include behavioral health, substance abuse, long-term care, home health, public health, school-based settings, corrections departments, and emergency medical services. Grantees believed that onboarding these providers will improve quality and efficiency of important transitions of care and that the value of HIE to hospitals will increase once these settings are connected.

Finally, some grantees experienced a lack of payer participation that created gaps in state-level networks. New Mexico reported that, despite the value of linking claims and clinical data, physicians were resistant to allowing payers access to clinical data—resistance that has lessened since payers clarified that they are interested in clinical data for care coordination and population health management. Virginia struggled to engage payers in sustainability efforts, though it planned to continue

“While there are pockets of local and organizational exchange in Oregon, including four community HIOs and [organizations with] Epic CareEverywhere, there remain geographical, provider type (behavioral health and long-term care), and technology capability gaps across the state.”

—Grantee

developing services targeted at payers to secure their investment. Nebraska demonstrated value to payers in a pilot project with BlueCross BlueShield of Nebraska that allows direct payer access to NeHII in order to streamline claims processing. At the time of its report, NeHII had engaged two major payers and was conducting a pilot program to expand insurer access for quality reporting.

Inter-state Exchange

Given that patients often seek care in neighboring states, many grantees noted inter-state exchange as both valuable and lacking. Grantees attributed the lack to variation in regulation among states, no common consent policies, absence of laws governing providers who serve multiple states, non-interoperable technologies and lack of technical standards, variation in the progress grantees have made on HIE, and a need to focus time and effort on developing intra-state initiatives. They also said they would like ONC assistance on these issues.

Some grantees focused their efforts on connecting to neighboring states, and several reported progress in achieving inter-state exchange. In some cases, providers and health IT systems were bridging gaps in inter-state exchange. Missouri prioritized inter-state exchange, since many patients live in major cities on the state border—and succeeded in connecting via Direct with six of their eight neighboring states and establishing data sharing agreements with three of those so far. Oregon noted that some Epic-based health systems could share information across state borders using Epic CareEverywhere. Finally, to incentivize inter-state exchange, Iowa developed a modified fee structure for organizations close to state borders that connect to more than one HIO.

Trust Communities

Several grantees noted a next step in the evolution of HIE will be to connect to broader communities for exchange. As a broader set of stakeholders engage in HIE—including long-term care, behavioral health providers and other community-based settings—it is becoming increasingly important to use shared standards to facilitate exchange across diverse entities, and to provide the necessary assurances to participants that their information will be managed securely. A number of initiatives focus on removing the barriers to exchange and creating trust communities to facilitate information flow, such as the eHealth Exchange, DirectTrust, National Association for Trusted Exchange (NATE), and CommonWell Health Alliance (CommonWell) (see Chapter I for discussion).

While grantees noted benefits of connecting to trust communities—including accessing federal systems such as the VA and Indian Health Service through the eHealth Exchange—they are still encountering challenges. One practical issue is upgrading to meet the software exchange standards required by the trust community. In addition, one grantee noted the cumbersome application and testing process, which places a burden on grantees and organizations. Finally, developing data use agreements for trust communities is difficult given the unique legal requirements of all the entities aspiring to participate. Some trust communities have comprehensive, multi-party trust agreements that build upon legal requirements participants are already subject to—such as the Data Use and Reciprocal Support Agreement (DURSA) for the eHealth Exchange and Federated Services Agreement for DirectTrust.^{185,186} However, as Kentucky reflected, “Many HIOs that signed the DURSA are not using it as the legal contract for connectivity with other state HIE activities. This will lead to numerous inconsistent state-to-state agreements.” Kentucky said grantees should be encouraged to use the DURSA as the platform for interstate exchange in general, not just for exchange through the eHealth Exchange.

Competing Priorities for HIE Users

Grantees noted that, given the activities and requirements of the State HIE Program, HIE users struggled to balance other concurrent policy and regulatory priorities. Among grantee concerns were delivery system reform, requirements for MU, ICD-10, HIPAA compliance, and 42 CFR Part 2 protection of sensitive data—all of which competed with the State HIE Program for time, attention, bandwidth, staffing, and financial resources.

Competing Regulatory Priorities

Five of the six case-study states reported that, while there is greater specificity around the various HITECH and other delivery system reform initiatives, multiple priorities and funding streams made prioritizing HIE a challenge. In Wyoming, many hospitals were in the midst of upgrading their EHRs to meet Stage 2 MU requirements when they shifted focus to ICD-10 because of financial incentives. These hospitals felt they simply did not have the capacity to focus on HIE. Similarly, several stakeholders in Iowa felt other priorities—including ICD-10, PCMHs, and the SIM grants—overshadowed the State HIE Program.

Some grantees reported that HIE standards and requirements are unclear, mistimed, and/or interpreted only as suggestions—which led to variation in adoption, delays, and lower quality products. Stakeholders felt that the value of connecting to an HIO increased under Stage 2 MU; however, in general, MU did not align with the timing of the State HIE Program in a way that allowed HIE users to adequately address both. Arkansas noted that, as ONC moves toward Stage 3 MU, increasing certification requirements for HIE-compatible functions will give providers confidence in the value of the products they are buying. In addition, as noted, grantees expressed the desire for ONC to provide leadership in developing standards for, and offering incentives to, provider settings not currently eligible for MU.

A few grantees reported a disconnect between State HIE Program requirements and stakeholder desires. For example, the District of Columbia noted the “phasing approach” of HIE meant grantees spent time trying to meet ONC goals rather than making progress on their HIE in the most efficient way. For example, they had to devote resources to ONC’s goal of achieving 300 active Direct users, which providers did not see value in, before moving on to other HIE services.

Workflow Pressures

To improve care, health IT and HIE activities must be convenient to practitioners. Health care workers must adjust to new technology systems as they continue to care for patients, meaning that proper integration into their workflows is critical to their use of the systems. Grantees found providers did not want to login to “yet another system” to access data, for example; if information was not easily accessible, providers were not willing to divert time and attention from patients. Similarly, if the system was not user friendly and easy to navigate, or if it did not effectively integrate data into existing patient

records, providers abandoned attempts to obtain data through the system. Providers exchanged information, but they did not necessarily use it to support clinical decision-making.¹⁸⁷

Some grantees created successful solutions to such issues. For example, Utah designed a notification service that allows practitioners to customize when and how systems notified them of admissions, discharges, and ED service. To maximize the use and utility of HIE technologies, most agreed there needs to be practitioner training and workflow redesign. Grantees reported it is difficult to establish provider access to useful information at a reasonable, not overwhelming, volume.

Given that provider workflow remains a pervasive challenge, new policy efforts could be tremendously helpful. Stage 2 MU EHR certification criteria require inclusion of the Direct standard and usability standards to address provider workflow issues.¹⁸⁸ At the state level, HIE leadership could engage RECs to develop strategies to support providers in incorporating exchanged data into their workflow.

Meaningful Use

Stakeholders revealed that, while MU has been a strong driver for providers to adopt EHRs, this has not translated to greater focus on HIE—largely because the initial HIE requirements for MU only require that providers have the capability for HIE, not that they engage in exchange. Relatedly, some participants felt that MU requirements, such as current MU “transitions of care” requirements, are a regression for them. While requirements to meet Direct standards were useful for some, those standards detracted attention from the development of query-based exchange, which would have been more useful. Grantees recommended that Stage 3 MU have more certification requirements for HIE compatibility, to give providers confidence in the value of health IT. Grantees would also like Stage 3 to provide greater support for query-based exchange.

“The health information exchanges’ sustainability models are inadequate for long term sustainment without public support due to the high cost of evolving technology, low reinforcement by CMS/ONC of health exchange for meeting meaningful use, and lack of standardization in technical specifications.”

—Grantee

A few grantees reported concern about whether sufficient technical expertise and support among developers and vendors are available to help providers meet HIE needs and ongoing MU requirements. One grantee reported that its developers were adequate for Stage 1 MU, but were not prepared to provide the updates necessary to meet Stage 2 requirements. Others reported that providers who wanted to participate in HIE were delayed by Stage 2 requirements, most notably those surrounding (Logical Observation Identifiers Names and Codes) LOINC and Systematized Nomenclature of Medicine (SNOMED). One grantee reported, “The most challenging aspect of Meaningful Use public health reporting is the proper formatting of ELR [electronic laboratory reporting] messages. Although the use of standardized LOINC and SNOMED CT codes to report laboratory results will greatly improve the reliability of data,” the majority of products and provider processes do not support LOINC and SNOMED CT. Instead, providers tended to use local codes, and the process of mapping these local codes to LOINC and SNOMED CT codes was beyond the capacity of most providers and their IT departments. To address this issue, that grantee sponsored LOINC and SNOMED CT educational sessions, to educate hospitals to the tools and techniques for the mapping process; however, the grantee sees this as only a short-term solution. For the long-term, developers must support LOINC and SNOMED CT coding and encourage clients to use them.

Sustainability

Sustainability was an important concern for both the program and grantees. A recent national survey found that 74 percent of HIOs reported sustainability concerns, and fewer than 25 percent reported being able to cover operating costs.¹⁸⁹ However, in response to an RWJF survey, 81 percent of grantees reported they were definitely or likely to be sustainable, 13 percent that they “may or may not” be sustainable, and 6 percent that sustainability was unlikely.¹⁹⁰ While many grantees reported qualitatively that incentives

and grants were critical to HIE connectivity, many had not achieved financial sustainability before the end of program funding, and will need more resources for future stages of MU. For Minnesota, this includes “resources to support state health departments meaningful use activities; shared services for statewide HIE interoperability; ongoing assessment and evaluation for measuring e-health progress statewide; and support for state implementation of use cases related to the ACA, such as those necessary for implementing accountable care.” In outside surveys, evaluation activities, and final reports, grantees noted that identifying a business case that draws stakeholder investment was both central to achieving sustainability and difficult.^{191,192} Pennsylvania noted that, while there is a broad assumption that HIE activities will improve quality and control costs, robust evidence is still needed to get private sector investment—making it difficult for grantees to establish HIE’s value.

Thus, post the end of program funding—which for the majority of grantees was February 7, 2014 and for a small group was March 14, 2014—seven grantees (Nevada, Wyoming, Montana, Connecticut, Puerto Rico, New Hampshire, and Illinois) no longer remain operational. Nevada, Montana, and Illinois decided to end operations shortly after the end of the program. Connecticut had limited success in developing any HIE infrastructure during the program period. Wyoming ended operations post the funding period, reporting “a continuous struggle to define a common business case and associated functionality for HIE. Due to the limited timeframe for the SDE to become operational; implement the technical, financial, governance, and business operations; and become sustainable; valuable time was lost seeking a common business case.” This grantee recommended that others undertake a needs assessment before offering services to stakeholders. Puerto Rico and New Hampshire faced time constraints at the end of the program period, driving them to limit their program to only providing Direct services.

The paradox of HIE activities is that they need participants to be valuable, but will struggle for participants until they demonstrate value. Rhode Island felt it had nearly reached the “tipping point,” where the value of their HIE services was better than available alternatives. South Carolina recommended conducting market testing throughout the program, so financial shortfalls can be identified and grantees can plan for financial sustainability accordingly. Delaware used a third party firm to examine results from a usage study that showed Delaware had “achieved measurable and significant savings from DHIN, including a reduction in a sub-set of high cost laboratory tests through the past five years. Additionally, significant savings have been realized by data senders with providers who use the DHIN as the primary method for receiving results based on the average cost to send results, [rather than] using traditional methods of fax and mail.” Further evidence of HIE producing value will motivate stakeholders to continue their commitment and investment. A few grantees noted that although participants initially agreed to make financial contributions to achieve sustainability, they were hesitant when the time came.

Pursuing long-term sustainability requires that grantees expand their payment base (e.g., payers, ACOs, and long-term care providers) and offer reasonably priced services to meet the exchange needs of these parties. The 2015 RWJF survey found that the most common participants in current HIE efforts included private medical/surgical acute care hospitals (58% of operational efforts); independent physician practices (55%); hospital-owned or health system-owned physician practices (52%); and publicly owned hospitals (42%), all of whom paid for services. Stakeholders such as independent pharmacies (7%); vendors (6%); employers (3%); and consumers (1%) were less likely to pay to participate.¹⁹³ For some grantees, in addition to attracting new contributors, expanding the payment base may also require removing policy barriers and leveraging funding streams (e.g., medical claim taxes, Medicaid 90/10 matching, and activities related to SIM grants).

VII. Policy Implications

Chapter Summary

In this chapter, based on stakeholder interviews, we present policy implications for the future of ongoing HIE activities and suggestions for state, federal, and shared roles to maintain progress and momentum.

Policy Implications

Despite the end of State HIE Program funding, sweeping changes to the health care system in recent years provide major opportunities at both state and federal levels to continue supporting HIE progress.

State Role. States can play an important role in convening stakeholders, developing policy, assessing needs, and contributing to HIE demand—all of which will be crucial to the future of MU and delivery system reform. The participation of State Medicaid offices, in particular, will be a strong influence on the HIE ecosystem, given their growing populations and their role as a large payer. Should states continue the position, Health IT Coordinators can serve as an ongoing liaison between federal and state partners, and a resource for stakeholders interested in pursuing additional funding under delivery system reform.

Federal Role. Strong, ongoing federal support related to governance, technical standards, and interoperability will be vital in expanding HIE use and utility. Interoperability, in particular, is being emphasized as an important federal goal and is the subject of new federal efforts and initiatives launched to support these areas of inquiry since the program ended. Federal agencies have the opportunity to coordinate new and existing initiatives related to HIE and delivery system reform (e.g., Stage 3 MU and the new MACRA legislation)—to ensure efforts align, are mutually supportive, and are non-duplicative.

Shared Needs and Responsibilities. A provider- or federal-led effort is needed and warranted to obtain buy-in from EHR developers and HIE vendors for overarching HIE goals. Such buy-in is essential to motivate development of fully interoperable systems to meet MU standards and new benchmarks for reimbursements, as well as provider demand. Policy pressure may be necessary to ensure these systems meet expectations for interoperability. Meanwhile, federal and state entities have an important role to play in assessing how technical solutions evolve in different markets, and disseminating best practices to assist new and ongoing state-level HIE implementation efforts and to continue HIE progress. These assessments and focus on best practices will also be necessary to ensure the sustainability of HIE investments—they must continue to evolve to meet provider needs and help them address delivery system reform initiatives.

Conclusions

Stakeholders articulated an ongoing desire for federal and state leadership, federal guidance, and facilitation on multiple fronts in our interviews, case study visits, and expert discussions. In particular, their comments highlight the roles individual states, the federal government, and shared state and federal responsibilities can and should play—along with EHR developers and HIE vendors—in: (1) maintaining the momentum the State HIE Program created, and (2) leveraging the program’s contributions to current and future HIE initiatives. The key conclusions from these interviews should help guide policy makers as they set course for the next phase of HIE development.

Introduction and Methods

The State HIE Program’s four-year span has witnessed unprecedented growth and development in the nation’s HIE infrastructure, as well as broader changes in the health care delivery system. As program funding ends, and states and other organizations pursue e-health efforts, major federal and state opportunities to continue supporting HIE clearly exist.

The synthesis of policy implications presented in this chapter derives from conversations held (over the course of the program’s evaluation) with numerous HIE stakeholders in 16 states and with 21 additional key informants across the state, federal, and private sectors. Key informants include individuals from ONC and CMS, state, and regional HIE initiatives—as well as private organizations such as DirectTrust and the Hospital Corporation of America. State-level discussions took place onsite as part of the Round 1 and Round 2 Case Studies (late 2011 to early 2012 and early 2014, respectively) and via phone for the Stakeholder Discussions (fall 2011). We administered a final round of key informant interviews via phone (summer 2014), to gather opinions about program implementation, impact, and lessons learned. Here we discuss interviewee perspectives and the policy implications for future HIE efforts that emerged from this comprehensive set of discussions.

Policy Implications

Our crosscutting findings fall into three categories: state role, federal role, and shared needs and responsibilities. Within these categories we emphasize the state role in leadership and coordination; federal leadership in standards and interoperability; and the important roles EHR developers, HIE vendors, and providers can play in fostering sustainability.

State Role

The State HIE Program highlighted the role states play in leadership and coordination, particularly in convening stakeholders, policy development and delivery system reform, and needs assessment.

With Stage 2 MU under way and future stages to follow, plus health care and delivery system reform efforts taking hold, key informants see a need for further definition of the role and function of state government in the continued transformation of the health care delivery infrastructure. For example, states are well equipped to play the role of convening relevant parties, setting high-level policy, and legislating change. Interviewees reflected that states have so far been able to create a neutral forum in which stakeholders can come together to engage in conversation about information exchange. They believed states can help future HIE efforts by continuing to build state-wide consensus in support of HIE in general—as well as in specific, relevant use cases—in a way that individual entities cannot.

States will have an important role to play in future HIE efforts, via Medicaid and social services.

Because Medicaid populations are growing across the country, state governments are becoming more involved in the HIE ecosystem and have a vested interest in facilitating HIE conversations. According to informants, states have the potential to be a significant resource. This is because they are large payers, manage Medicaid, license health care providers, and are often the largest employer in a state. As such, their participation is, and will increasingly be, tied to HIE sustainability.

Health IT Coordinators themselves, and through partnerships with other state entities, can make substantial contributions to HIE. Because of the State HIE Program, each state now has a Health IT Coordinator—a dedicated official focused on pursuing health IT/HIE opportunities in the state. For states that choose to retain the position, Health IT Coordinators will continue to have access to different levers and collaborators to prompt state action—Medicaid, state insurance, state employer program, and state public health department—in support of HIE. SIM awards, for example, have brought together State Health IT Coordinators and Medicaid offices to strategize about how HIE can help meet the demands of new service delivery models.

On the assumption that the Health IT Coordinator/Medicaid/SIM collaboration will continue over the next few years with SIM funding, this joint presence represents a major ongoing federal/state partnership with opportunities to advance HIE. In the opinion of informants, the federal government has the opportunity to: (1) engage with state and federal partners who have control over delivery system reform levers (e.g., CMS, state Medicaid); and (2) continue to convene, educate, and champion HIE among state-level stakeholders whose participation will greatly increase the impact of such efforts.

States are strongly positioned to drive/sustain demand for HIE and to leverage existing HIE investments as part of delivery system reform. Provider investments in HIE are expected to add significant value under Stage 3 MU, which will focus on interoperability and data use to change care processes and improve patient outcomes. Until Stage 3 goes into effect, however, ongoing communication about, and commitment to, HIE from the states will do much to reinforce the value of HIE in the eyes of providers, hospital systems, and developers and vendors. Interviewees felt states would do well to leverage State HIE Program investments, capitalizing on that pre-existing work and contributing to its ongoing utility and sustainability. From their perspective, not only will HIE prove valuable under Stage 3, but states should also market HIE's utility in the near term in relation to current delivery system reform objectives. Similarly, states should pursue HIE-supportive policies, such as those that promote ACOs and other models of care that leverage technology—as well as, in some states, incentives. Such actions will both support existing HIE investments and prepare providers for the increasing emphasis on electronic exchange and interoperability planned under delivery system reform and MU.

Federal Role

The federal government provides crucial guidance for HIE governance and technical standards. Informants praised the State HIE Program and ONC for leadership in raising awareness about the potential benefits of information sharing, bringing stakeholders to the table, and establishing “rules of engagement.” In particular, they valued guidance on creating user agreements, and wanted more direction on trust agreements and policy frameworks that did not have to rely on each state building its own. Now that State HIE Program work is completed, ONC is ideally positioned to: (1) further disseminate best practices gleaned from the program, and (2) provide informed guidance on governance and technical structures to those newly interested in HIE.

Many informants noted the importance of continued ONC leadership on issues such as privacy and security, particularly through integrating providers (like those in behavioral health) into exchange and policies on secondary data use. During the State HIE Program, ONC published a privacy and security guide¹⁹⁴ to help states and providers properly manage and protect health information. This guide included chapters and sections on securing health information in the context of MU and HIE. Informants were emphatic that ONC should continue to provide such guidance.

Federal regulations regarding the privacy and security of behavioral health information (HIPAA, 42 CFR Part 2, for example) currently deter many providers from attempting its exchange. Informants saw a small but growing demand for behavioral health data exchange, and said providers would like ONC's guidance in navigating the complexities involved. Increasing emphasis is also being placed on patient-centered outcomes and comparative effectiveness research, which rely on and benefit from the secondary use of clinical data for research. Informants envisioned ONC and its federal partners playing a vital role in developing and encouraging widespread use of standards and policies to mobilize data for research.

Informants also wanted ONC's continued leadership in solving important technical questions, such as patient matching algorithms and certifying HIE products. ONC activities are under way to support improved patient matching, including a recently published report on the topic.¹⁹⁵ ONC will continue to publish rules with certification criteria for the Certified Health IT Product List (CHPL)—which means the products have been tested and certified as meeting MU requirements by ONC-approved testing laboratories and certification bodies—and will continue to accredit and oversee these entities. Some informants expressed interest in ONC's certification guidance on a broader range of products, to ensure that HIOs use consistent standards and capabilities across the market.

Building on HIE progress, strong federal support for interoperability is critical. One of the State HIE Program's central goals was to build capacity for HIE. MU initiated a phased approach to such exchange, but did not emphasize interoperability in its earlier stages. ONC is now emphasizing interoperability as an important federal goal. In pursuit of this goal, ONC's Connecting Health and Care for the Nation: A Ten Year Vision to Achieve Interoperable Health IT Infrastructure (interoperability

vision),¹⁹⁶ Connecting Health and Care for the Nation A Shared Nationwide Interoperability Roadmap DRAFT Version 1.0 (Interoperability Roadmap)¹⁹⁷, and the Federal Health IT Strategic Plan 2015-2020¹⁹⁸ articulate a clear stance on the importance of, and steps toward, interoperability. However, ONC will need support from, and participation across, the health care system to achieve this goal. In addition, to fully achieve health care transformation, the scope of interoperability efforts needs to extend to settings that are critical to care transformation (e.g., long-term care, behavioral health, and home health), but MU does not yet encompass them.

To make further progress toward full interoperability, informants agreed on the need for both common data standards (mentioned above) and standards-based application program interfaces (APIs) to support greater data liquidity. APIs enable data liquidity by creating a platform on which one can exchange, integrate, and use data from different sources. A recent JASON report suggests that exchange and interoperability goals hinge on creating an architecture that uses “public APIs and open standards, interfaces, and protocols.”¹⁹⁹ Although future MU stages may incentivize use of open APIs and standards to gain traction (e.g., per a recent Notice of Proposed Rule-Making),²⁰⁰ federal and state joint efforts can be important in supporting standards around shared services for statewide interoperability and state-level implementation of use cases related to the ACA.

ONC will continue to focus on HIE, with added emphasis on interoperability, in its new Community Interoperability and HIE Cooperative Agreement Program. In June 2015, applications were due from organizations seeking funding to build on State HIE Program efforts and lessons learned in ways that extend HIE access in their communities (particularly to non-MU eligible providers). The new program aims to enable information flow and to ensure timely use of the information for patient care and improved care coordination. To achieve this goal, developing solutions to overcome interoperability challenges is a central program requirement for grantee efforts.^{201,202,203}

Federal agencies should align HIE efforts across their organizations to leverage existing investments and plan future ones. The health care delivery system’s HIE goals, as noted above, require development and use of consistent technical standards for information flow. To achieve this goal, informants believed the federal government will need all relevant agencies to pursue an aligned “policy push,” with federal incentives for establishing information standards. According to informants, this will ultimately have much more effective impact than different agencies emphasizing non-overlapping (but not necessarily supportive) standards efforts, and/or states defining their own standards and seeking their implementation through national EHR developers and HIE vendors. Key informants reported that the federal government has an essential role in leading consensus building around the development, dissemination, and use of standards. ONC, in particular, is uniquely positioned to fill this role.

Informants noted that coordination among federal agencies on new and existing initiatives will continue to be important—including federal coordination with, and support for, CMS on future MU stages. The JASON report suggests, and others echo, that interoperability should be the focus of MU requirements in the immediate future—meaning that agencies must work together to define the standards and architecture they will implement. Further, if ONC continues steer governance and technical standards (as described above), it must work closely with CMS to fulfill this role. Some informants suggested that the federal government needs to lead by example. This should include: (1) breaking down silos between federal health information sources (for example, by linking the Medicare, the U.S. Department of Veterans Affairs (VA), and U.S. Department of Defense (DoD) systems to each other and to outside systems/networks exchanging information); and (2) overcoming associated barriers to exchange and interoperability among those systems.

HIE should be emphasized as part of delivery system reform activities. According to informants, the federal government can reinforce HIE via delivery system reform—particularly through provider payment structure changes. As the single largest payer and a leader in delivery system reform efforts, CMS has a significant role to play. It currently supports several health care transformation initiatives—including the SIM Initiative and Medicaid 90/10 funding—that explicitly leverage HIE and emphasize interoperability.

CMS could expand other efforts as well, including CMS quality initiatives, to further encompass and encourage interoperable health IT and HIE. Since these interviews, the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) passed and was signed into law in April 2015. MACRA changes current and future payment rates for Medicare physicians, creating a merit-based incentive payment system (MIPS) effective as of 2019. MIPS will replace the current value-based purchasing system and its benchmarks, and tie payment directly to: (1) quality measures; (2) efficiency measures (i.e., controls on total cost of care); (3) MU of EHRs; and (4) clinical practice improvement activities. ONC will be required to: (1) submit a report to Congress on performance measure development in 2016 and (2) begin reporting on achievement of its interoperability goals in 2018.²⁰⁴

Shared Needs and Responsibilities

A provider- and/or federal-led effort to obtain buy-in from developers and vendors for overarching HIE goals is warranted to change perceptions of interoperability. Developers, vendors, and service providers have substantial control over the HIE arena and could significantly advance HIE if effectively motivated. Given the trajectory of MU requirements, provider demand for certified technologies with HIE capabilities will continue to rise. Rather than work solely on EHR upgrades and limited services that leave providers dissatisfied, informants believed EHR developers and HIE vendors would do well to look ahead to future requirements, current needs, and persistent complaints; and to embrace the business opportunity HIE presents.

Since many hospital systems have had HIE-capable systems within their networks for years, the only issue that remains is broadening deployment and/or building HIE capabilities into every basic system. Many developers and vendors recognize that: (1) interoperability is a federal and a provider priority, and (2) they will need to embrace it to best serve their customers. Nevertheless, informants believed that until developers and vendors agree to these priorities, the government needs to take additional policy actions related to HIE and interoperability—to ensure providers have the options they want and need to achieve their patient care and quality goals.

There is an urgent need for continued assessment of how technical solutions evolve in different markets and dissemination of best practices. Informants felt that the State HIE Program demonstrated the feasibility of implementing HIE in different ways in different environments. From their perspective, the most successful HIE operations have embedded themselves in the community to ensure they understand what stakeholders want and need from HIE. Informants felt that opportunities for states to confer and learn from one another—through communities of practices, boot camps, and listening sessions—strongly supported their efforts through demonstration of market-based solutions and the generation of best practices in different environments. Informants also thought that such sharing and facilitating should continue at both state and federal levels. This finding further emphasizes the importance of ONC's role in disseminating best practices, emphasizing the importance of tailoring services to local needs, and convening communities of practice.

Informants reflected that states could tailor best practices put forward by ONC to their own needs—through supportive legislation, removing barriers to information flow, and aligning more closely with federal laws such as HIPAA. A particular priority is passing state legislation and developing policy related to privacy and security. According to informants, progress on this front can reassure both patients and providers by establishing data ownership and use policies, including: (1) prohibiting the sale and unauthorized transfer of data, and (2) establishing protections against data breaches and unauthorized access.

Provider organizations should foster sustainability by monitoring findings and best practices from existing federal and state initiatives that leverage value-based care. Many informants expected grantees, as part of their program and post-program efforts, to find mechanisms for successfully sustaining the HIE investments built or expanded under the program. Concern over sustainability was a recurrent theme throughout the evaluation. Many grantees intended to secure additional financial support

from community stakeholders in the mid-term and/or charge subscription fees in the long term. However, in many states, the requisite amount of work to even initiate services was considerable. Taking the next step—building high value services, acquiring sufficient users, and amassing enough data to attract the stakeholder investment and subscription fees necessary for financial stability—was a significant challenge that grantees recognized and reported early on. In addition, many hospital systems operate private networks that support HIE among all affiliates. Although many grantees did successfully engage these systems into partnerships, some struggled to provide them with additional value for their investment. Other grantees found that private networks were not interested in partnerships, and instead considered grantees as competition that threatened those networks' sustainability.

In the final evaluation interviews, informants noted two crucial financial realities associated with continued HIE expansion that all stakeholders must recognize. First, future MU stages establish increasingly difficult requirements. Second, grantees will continue to need financial and technical support if they are to meet these requirements. ACA delivery system reform initiatives, as well as new requirements to be developed under MACRA, carry heavy expectations for care coordination and team-based care that will serve as a catalyst for HIE expansion and will require additional investments. Several initiatives provide accompanying financial support from public and private sources—for example, SIM awards, HCIA, Medicaid 90/10 funding, and ACO incentives and development grants. Informants emphasized the need to maximize all opportunities to help states and health care organizations to secure the funding necessary to participate in these delivery system reform efforts. In addition, informants stressed that findings from the SIM test states and HCIA grantees should be studied carefully; those findings will provide important lessons and guidance on how HIE sustainability plans can be tied to the multitude of value-based care initiatives now in place.

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