

A Survey of Health Information Exchange Organizations in the United States: Implications for Meaningful Use

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Background: To receive financial incentives for meaningful use of electronic health records, physicians and hospitals will need to engage in health information exchange (HIE). For most providers, joining regional organizations that support HIE is the most viable approach currently available.

Objective: To assess the state of HIE in the United States through regional health information organizations (RHIOs).

Design: Survey.

Setting: All RHIOs in the United States.

Participants: 179 U.S.-based RHIOs that facilitated HIE as of December 2009.

Measurements: Number of operational RHIOs, the subset of operational RHIOs that supported stage 1 meaningful use, and the subset that supported robust HIE; number of ambulatory practices and hospitals participating in RHIOs; and number of financially viable RHIOs.

Results: Of 197 potential RHIOs, 179 (91%) reported their status and 165 (84%) returned completed surveys. Of these, 75 RHIOs

were operational, covering approximately 14% of U.S. hospitals and 3% of ambulatory practices. Thirteen RHIOs supported stage 1 meaningful use (covering 3% of hospitals and 0.9% of practices), and none met an expert-derived definition of a comprehensive RHIO. Overall, 50 of 75 RHIOs (67%) did not meet the criteria for financial viability.

Limitations: Survey data were self-reported. The sample may not have included all HIE efforts, particularly those of individual providers who set up their own data-exchange agreements.

Conclusion: These findings call into question whether RHIOs in their current form can be self-sustaining and effective in helping U.S. physicians and hospitals engage in robust HIE to improve the quality and efficiency of care.

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In 2009, Congress authorized more than \$30 billion in incentives to stimulate the adoption and meaningful use of electronic health records (EHRs) by eligible professionals and hospitals (1, 2). Guided by the 3 central components of meaningful use outlined by Congress—**electronic prescribing with decision support**, **automated quality measurement**, and **health information exchange**—the Obama administration defined the specific criteria for the first stage of the program (3). Stage 1 meaningful use includes core criteria, which all providers must meet, and menu criteria, of which providers must select a subset. Core criteria include entry of **basic patient data**, **electronic prescribing**, **decision support**, and the ability to **perform health information exchange (HIE)**. Menu criteria include items relating to improved coordination between care settings and the provision of educational and clinical information to patients. Ambulatory physicians who meet meaningful use

criteria are eligible to receive incentive payments of up to \$44 000 through Medicare (3).

A **central goal of the legislation was to promote broad-based electronic HIE**, in which key clinical data flow among providers and between providers and other stakeholders, such as public health departments. **Cost-benefit models suggest that broad-based HIE could result in large savings, and these projections have been central to promoting EHRs as potential cost-saving tools (4)**. Therefore, stage 1 meaningful use requires initial types of HIE—that clinicians electronically submit prescriptions and clinical quality data—and also requires that clinicians demonstrate the capability for broader electronic exchange (3). The more flexible menu criteria require providers to electronically exchange data with laboratories and public health departments and provide a summary-of-care record with referrals.

Most EHRs do not automatically enable the types of HIE required to achieve meaningful use, which leaves providers to bridge the gap. To promote HIE, policymakers have primarily focused on **regional health information organizations (RHIOs)**, entities that facilitate clinical data exchange in a local area, and RHIOs have received grant support under both the Bush and Obama administrations. **The inclusion of HIE in meaningful use has bolstered interest in RHIOs, because current alternative approaches to HIE have substantial challenges**. For example, providers can set up technical interfaces and individual data-sharing

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agreements with others in their community; however, such interfaces are expensive (4) and require maintenance. Providers could also use the technical standards and services established through the Nationwide Health Information Network (NHIN) Direct Project (<http://wiki.directproject.org/>), which rely on the Internet to securely exchange data; however, these are still in their infancy, enable only certain types of data exchange, and may require more technical expertise than a provider has.

An RHIO offers several advantages for achieving HIE. Through a single connection, providers can exchange data with other participating providers and stakeholders (such as laboratories or public health departments). Because RHIOs are locally based, they more easily engender trust in the community and can customize their offerings on the basis of stakeholder needs. They also rarely require substantial technical expertise from providers. Joining RHIOs, which are viewed favorably by both providers (5) and patients (6, 7), may therefore be the most feasible way for most providers to comply with meaningful use criteria for HIE and to ensure that clinical data flow among a large swath of providers in a community (8).

Despite the important benefits that RHIOs offer, we lack current data on how these organizations are faring or whether they are likely to help physicians and hospitals meet meaningful use criteria. We therefore surveyed all U.S. RHIOs to answer 4 questions. First, **how many operational RHIOs exist in the nation, and how many such organizations currently support the types of data exchange required to meet stage 1 meaningful use criteria for HIE?** Second, **how many operational RHIOs support the types of data exchange that, in the opinion of an expert panel, are required to produce the projected quality and cost benefits from HIE, and therefore will probably be part of future stages of meaningful use?** Third, **how many ambulatory practices and hospitals participate in RHIOs?** Finally, **how many RHIOs are financially sustainable?**

METHODS

Definitions

We defined an RHIO as an organization that facilitates the exchange of clinical data between independent entities (those with no shared financial or governance relationship) in a geographic region. This inclusive definition is consistent with the meaningful use criteria, which do not specify the arrangement under which HIE must occur. An operational RHIO was defined as any organization that actively facilitated the exchange of clinical data between independent entities as of 1 December 2009. Those that pursued clinical data exchange as of 1 December 2009 but were not yet exchanging data were classified as “planned.” Any RHIO that was or planned to be operational at any point between 1 June 2008 and 1 December 2009 (the 18 months since our previous survey) but had stopped pursuing clinical data exchange as of 1 December 2009 was

Context

Financial incentives are available for providers that meaningfully use electronic record systems to facilitate health information exchange. Few systems automatically enable the types of information exchange necessary to achieve meaningful use. Some policymakers think that regional health information organizations (RHIOs) could help providers achieve such use.

Contribution

This 2009 survey found 75 operational RHIOs that covered approximately 14% of U.S. hospitals and 3% of ambulatory practices. Only 13 facilitated the types of data exchange required to meet meaningful use criteria. Most RHIOs were not financially viable.

Implication

In their current form, RHIOs are an insufficient means of achieving meaningful health information exchange in the United States.

—The Editors

considered defunct. A financially viable RHIO was defined as one that could at least cover its operating expenses with revenue from participants in data exchange (those who sent and received data).

Identification of RHIOs

To identify all U.S. RHIOs, we used a multipronged approach that identified 247 potential organizations: 136 organizations from our previous survey, including nonresponders (9); 61 organizations in the eHealth Initiative directory of HIE initiatives (10) that were not on our list; and 50 organizations listed on state HIE Web sites that were not previously identified.

Survey Instrument

Our survey instrument, which was modified from our previous surveys (9, 11), included 2 parts. The first part screened respondents to determine whether they met our definition of an RHIO during the period of interest. Respondents that met these criteria were prompted to complete the second part of the survey, which asked for organizational characteristics (number and types of patients included, number of each stakeholder type involved in data exchange, and governance), types of data exchanged, and funding sources. Cognitive testing of the instrument was performed with a small number of RHIOs, and questions were modified on the basis of feedback.

We administered the survey between December 2009 and March 2010. First, the director of the organization (or an alternative contact if the director was unavailable) received a link to an online version of the survey instrument. Alternative methods of completing the survey, including by Word document or by telephone, were also available. Respondents were offered a small financial incentive (a \$25

gift card) to complete the survey. Responses were reviewed for errors and inconsistencies and clarification sought from respondents as needed. Nonresponders received a minimum of 3 follow-up e-mails and 3 telephone calls.

Expert Panel

Because stage 1 meaningful use criteria do not require the robust HIE necessary to produce substantial quality improvement and savings, the Obama administration has signaled that future criteria will include more stringent requirements that emphasize demonstrated improvement in care. After collecting the survey data, we convened a panel of 9 national health policy experts with a range of HIE expertise to specify the characteristics of an RHIO that would improve the quality and efficiency of care. Panelists defined a basic RHIO, which facilitates only the essential exchange of clinical data needed to generate at least modest quality or efficiency gains across a minimum set of stakeholders, and a comprehensive RHIO, which facilitates robust exchange of clinical data across all key types of stakeholders in a region. The experts focused on characteristics that defined types of participants in data exchange, types of data exchanged, governance, patient population size, and patient population focus. Consensus among panel members was reached over e-mail by following a 3-week, modified Delphi process (12).

Statistical Analysis

We calculated the number of planned, operational, and defunct RHIOs, and we compared these numbers with those from our 2007 and 2008 surveys (9, 11) to provide a longitudinal assessment of progress. The failure rate was calculated by dividing the number of defunct organizations by the number of organizations that had previously pursued HIE plus nonresponders (this assumes that all nonresponders are RHIOs). The organizational characteristics for operational RHIOs were summarized, and their current ability to support the capabilities required under stage 1 meaningful use criteria was assessed. The criteria defined by our expert panel were then applied to assess how many RHIOs qualified as basic or comprehensive. For each group of RHIOs, the proportion of engaged U.S. provider

organizations was calculated by dividing the total number of hospitals and ambulatory practices that received data through the RHIO, as reported on the surveys, by estimates of the number of hospitals and ambulatory practices in the country (taken from the American Hospital Association and the Medical Group Management Association, respectively). Finally, the proportion of RHIOs that were financially viable was calculated.

Role of the Funding Source

Our study was supported in part by the Office of the National Coordinator (ONC) for Health Information Technology at the U.S. Department of Health and Human Services. Staff at the ONC reviewed the survey instrument and suggested additional questions, a subset of which was included. The ONC was not involved in the analysis or interpretation of the data or the preparation of or the decision to publish the manuscript.

RESULTS

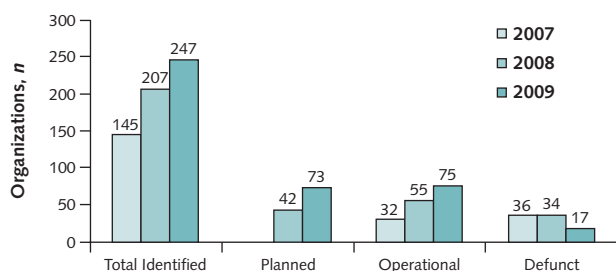
Of 247 organizations initially identified as potential RHIOs, 50 did not meet our inclusion criteria because they did not or were not planning to facilitate clinical data exchange between independent entities, leaving 197 organizations. We determined the status of 179 of these (91%) and received completed surveys from 165 (14 of 179 reported only their status), a response rate of 84%. As of 1 December 2009, 75 organizations were operational, 73 were planned, and 17 were defunct. More RHIOs were operational, using the same definition, than in either mid-2008 or early 2007 (75 vs. 55 or 32) (Figure). The number of planned RHIOs also increased, whereas the number of defunct RHIOs declined over time (Figure).

The operational organizations had pursued HIE for an average of 66 months (Table 1). Nearly two thirds of these organizations operated independently, and most focused on providing clinical data exchange for a patient population of at least 50 000.

Thirteen RHIOs (17%) supported the required types of data exchange under stage 1 meaningful use criteria, of which 6 (8% of all RHIOs) could support both the required (core set) and optional (menu set) data exchanges (Table 2). Of the RHIOs that supported core set measures, 44 supported exchange among ambulatory practices and hospitals, which should enable participating providers with a certified EHR to demonstrate their ability to exchange data; 21 supported electronic prescribing; and 18 offered quality reporting. Of the RHIOs that supported menu set measures, 39 supported exchange of laboratory results, which should enable participants to meet the requirement of incorporating clinical laboratory tests results into their EHRs as structured data; 32 supported the exchange of summary records; and 19 enabled providers to submit data to public health departments.

The expert panel defined a basic RHIO as an organization that facilitates the exchange of test and imaging re-

Figure. Number of regional health information organizations over time.



sults, patient demographic characteristics, medication lists, outpatient problem lists, and discharge summaries among hospitals and ambulatory practices for at least 5000 patients (Table 3). A comprehensive RHIO had to meet all of the requirements of a basic RHIO and facilitate additional types of data exchange (physician notes, inpatient problem lists, and public health reports) among a broader group of stakeholders for at least 50 000 patients. The expert panel also felt that a comprehensive RHIO should operate as an independent organization with a formal governance structure. When we applied these definitions, we found that 14 organizations (19%) met the definition of a basic RHIO and none met the definition of a comprehensive RHIO (Table 3). Although many RHIOs met individual criteria, most were narrowly focused and could not meet all criteria. In sensitivity analyses, removing any requirement or set of requirements did not substantially increase the number of organizations classified as basic or comprehensive.

Overall, 721 U.S. hospitals (14% of U.S. acute care hospitals) and 6879 ambulatory practices (3% of U.S. practices) participated in the 75 operational RHIOs. The 13 RHIOs that supported the core meaningful use criteria included 168 hospitals (3% of all acute care hospitals) and 2007 ambulatory practices (0.9% of all U.S. practices). The 14 entities that met the expert panel definition of a basic RHIO included 145 hospitals (3%) and 1145 ambulatory practices (0.6%).

Among all operational RHIOs, 25 of 75 (33%) reported being financially viable (able to cover operating expenses with revenues from participating entities). Only 40% of the operational RHIOs that were not financially

Table 1. Characteristics of Operational RHIOs

Characteristic	Value
Total RHIOs, n	75
Mean time pursuing health information exchange (SD), mo	66 (44)
Governance, n (%)	
Operates as an independent organization	48 (64)
Operates from within another organization	24 (32)
Other	3 (4)
Region, n (%)*	
Northeast	21 (28)
Midwest	18 (24)
South	20 (27)
West	18 (24)
Size, n (%)	
<5000 patients	5 (7)
5000–49 999 patients	11 (15)
50 000–499 999 patients	31 (41)
≥500 000 patients	28 (37)

RHIO = regional health information organization.

* Values sum to more than total because 2 organizations operate in 2 regions.

viable reported that they expected to become so in the future. Of the 13 RHIOs that could support meaningful use, 6 were financially viable; a similar proportion of the basic RHIOs was financially viable.

DISCUSSION

Health information exchange is central to improving our health care delivery system, because it offers providers the ability to have complete, timely information at the

Table 2. Operational RHIOs That Support Stage 1 Meaningful Use Criteria for Health Information Exchange

Meaningful Use Criteria	Required Characteristics	RHIOs, n (%)
Core set measures		
Transmit prescriptions	Electronic prescribing is a supported functionality	21 (28)
Capable of exchanging key clinical information among care providers and patient-authorized entities	Ambulatory practices provide data Hospitals provide and receive data	44 (59)
Report clinical quality measures	Ambulatory practices provide and receive data Quality or performance reporting is a supported functionality	18 (24)
Total that support core set measures	Hospitals provide data Ambulatory practices provide data	13 (17)
Menu set measures		
Incorporate clinical laboratory test results into electronic health records as structured data	Results are a type of data exchanged Laboratories provide data Ambulatory practices receive data Hospitals receive data	39 (52)
Provide summary-of-care record for patients referred or transitioned to another provider or setting	Patient summary record exchange is a supported functionality Hospitals provide and receive data Ambulatory practices provide and receive data	32 (43)
Capable of submitting data to immunization registries and providing syndrome surveillance and laboratory data to public health agencies	Hospitals provide data Ambulatory practices provide data Public health departments receive data	19 (25)
Total that support both core and menu set measures		6 (8)

RHIO = regional health information organization.

Table 3. Expert Consensus Panel Definitions: Characteristics of Basic and Comprehensive RHIOs

Characteristic	Basic	Comprehensive
Participants in data exchange		
Independent laboratory or radiology center		Yes
Pharmacy		Yes
Hospital	Yes	Yes
Ambulatory practice	Yes	Yes
Public health department		Yes
Private payer		Yes
Public payer		Yes
Types of data exchanged		
Test or imaging results	Yes	Yes
Public health reports		Yes
Inpatient data		
Patient demographic characteristics	Yes	Yes
Physician notes		Yes
Medication lists	Yes	Yes
Problem lists		Yes
Discharge summaries	Yes	Yes
Outpatient data		
Patient demographic characteristics	Yes	Yes
Physician notes		Yes
Medication lists	Yes	Yes
Problem lists	Yes	Yes
Governance		
Operates as an independent organization		Yes
Has a formal governance structure and governing body		Yes
Size		
≥5000 patients	Yes	
≥50 000 patients		Yes
≥500 000 patients		
Focused on the population		
Yes, RHIO focuses on ≥1 specific population		
No, RHIO does not focus on specific populations	Yes	Yes
Total organizations that meet definition, n (%)	14 (19)	0 (0)

RHIO = regional health information organization.

point of care. This has been a focus of substantial efforts from policymakers, and Congress specified it as a key part of meaningful use. After they adopt an EHR, providers face complex decisions about how to send and receive their patients' clinical data. Our findings offer reasons for optimism but also concern. Although the number of RHIOs has grown substantially and nearly 14% of hospitals now participate in an RHIO, the participation rate among practices is much lower. Only 13 RHIOs in the country seem capable of supporting stage 1 meaningful use criteria. These entities cover only a small proportion of hospitals and ambulatory practices, which means that most providers must identify alternative ways to meet HIE-related meaningful use criteria. Of greater concern, we found no organizations that support the robust data exchange that is probably required to realize the projected quality and efficiency gains from HIE.

A partial explanation for our results may be the mixed approach the United States has pursued, in which substantial start-up funding for RHIOs comes from the public sector, but RHIOs are expected to find stakeholders willing to pay for the value they create and become self-sustaining. This creates an incentive for RHIOs to start up in communities where interest in long-term support for HIE is limited, and also to focus on a narrow set of transactions with clear value to providers (such as exchange of test results) as opposed to a broader data exchange that might offer more substantial benefits. Although the first stage of meaningful use lays a foundation for HIE by requiring capability of clinical data exchange and engagement in activities (such as electronic prescribing or quality reporting) that need not be done through an RHIO, the Obama administration has signaled that future criteria will require broad clinical data exchange. This will increase the demand for RHIO-like entities; however, our results suggest that RHIOs will have to substantially expand their scope to meet this new demand.

The infrastructure for and provider engagement with HIE are both still in their infancy. Low levels of EHR adoption hamper HIE, because RHIOs provide significantly more value to providers who use EHRs. In addition to promoting EHR adoption, the ONC plan for achieving widespread HIE has 2 main facets: using \$548 million in grant funding and technical assistance to states to expand HIE, and developing technical standards and the NHIN to connect state and community entities (including NHIN Direct for individual providers who wish to connect through this approach). Most states will probably partner with existing RHIOs. Once state-level policies and infrastructure are in place, policymakers hope to increase HIE meaningful use requirements. Our findings point to a long road ahead for state–RHIO partnerships that seek to create options for providers to exchange clinical data. It is unclear whether a more viable approach exists to support the breadth and depth of data exchange necessary for substantial gains in quality and efficiency.

Because a substantial portion of the financial benefits of HIE accrue to payers (4), providers and patients have been reluctant to pay for data exchange (13). A recent memo from the U.S. Department of Health and Human Services to state agencies that administer HIE funds (14) made clear that federal support for HIE is short-term and that states need to identify and implement sustainable business models. States can elicit support from private-sector stakeholders (private payers) or provide ongoing public support. Because of strained state budgets and new responsibilities for Medicaid expansion under the Affordable Care Act, it is unclear whether state governments will be willing to take on this new liability. If states do not develop sustainable options for providers to meet HIE-related meaningful use criteria, strong resistance to making robust HIE a future component of meaningful use could

result, which would substantially limit the benefit of the national investment in health information technology.

Our study has several limitations. First, we relied on self-reported data and could not independently verify the accuracy of responses. Any reporting bias probably led to an overstatement of the degree to which HIE was occurring; for example, we could have double-counted a practice that exchanged data through multiple RHIOs. Also, although data were collected in early 2010, data exchange could have accelerated in the interim. However, progress in actual data exchange is probably limited because of the time required to develop and implement HIE policies and infrastructure. Second, we may not have identified some operational organizations. We used a comprehensive, multipronged approach that included the eHealth Initiative directory (10), which is considered the most comprehensive list of HIE initiatives. Any missed organization was probably not engaged in broad, community-wide HIE. We would also have missed individual providers who have set up their own private data-exchange agreements (15). Finally, our survey had several limitations, including our inability to assess the size of participating hospitals and ambulatory practices or the number of transactions that took place.

In summary, we examined the state of HIE through RHIOs in the United States and found that although the overall number of organizations increased, few organizations could support meaningful use, which limits providers' options for complying with the criteria. No RHIO in the nation met our expert-derived criteria for the comprehensive HIE needed to substantially improve care quality and efficiency. These data from regional exchange efforts represent a baseline for HIE in the nation and suggest that substantial work remains before clinical data will flow seamlessly across health care organizations.

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