# WorkingPAPER

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# How Early Adopting Hospital Systems View the Business Case for Health Information Exchange

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# ABSTRACT

**Purpose**

The effective exchange of electronic health information is critical to supporting the meaningful use (MU) of health information by providers, as intended under the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009. Previous research has highlighted the challenges faced in creating such exchanges and the critical role that large providers in the markets play in making this feasible. This paper summarizes information learned from selected hospital-based systems that are in the forefront of such exchange efforts about how they are engaged in these activities, their views on the business case for this exchange, and what policies might advance their collective progress. The paper distinguishes between health information exchange (HIE) as a desired activity or action (the primary focus) and the alternative means or organizational supports that may be used to accomplish such exchange.

**Methods**

This study involved structured telephone interviews with senior executives responsible for health information exchange (HIE) in selected large hospital-based systems. The systems were selected using information from the American Hospital Association (AHA) 2012 survey, aggregating hospital-based systems by the size of the system and exchange characteristics. Systems with five or more reporting facilities were eligible for the study. Ten systems with relatively high rates of outside exchange, as well as a diversity of ownership and geographic locales, were selected to participate in facilitated telephone interviews. Officials with six systems of varying size were ultimately interviewed. Those interviews provided the basis for this report.

**Findings**

All six systems had made some form of electronic health information exchange a priority; some had been committed to it for many years. In each system, external exchange decisions were made locally and favored providers involved in the care of the system's patients. Information exchanged externally with providers was more limited than the information available internally within systems. Although exchange models varied, the most common model involved localized exchange around a single core health system. Most hospital system officials interviewed said they supported broad based public exchange models, but mechanisms for this did not exist in most markets—and, in any case, those exchanges were viewed as supplements to their own efforts, rather than replacements. Among the barriers to exchange were (1) limited interoperability, both within and across systems; (2) diversity in the electronic health record (EHR) products used by providers, within as well as across systems; and, (3) limited EHR uptake among some important provider groups. Each of the hospital systems seemed to prioritize their exchange initiatives in ways that gave preference to system providers or those providers who are most often sharing patients with the system.

System representatives viewed federal policy as important in advancing electronic exchange efforts. They identified five areas for future attention: (1) setting standards and vendor policies to encourage more interoperability across health care systems at lower cost, (2) helping localities better address limitations to exchange created by concerns about disclosing sensitive information, (3) establishing an improved approach to identifying unique patients, (4) expanding providers eligible for MU payments to facilitate interoperability across the care continuum, and (5) continuing to align payment and delivery incentives.

**Conclusions and policy implications**

Although the study was small, its findings are consistent with prior research on the means and barriers to electronic health exchange. The study also documents the growing sense—at least among some large provider systems—that electronic information exchange is perceived as a valued asset. In light of both historical and more recent experience, policymakers may want to review their broad expectations for external information exchange to consider more realistic goals that take into account the "use cases" or targeted priority areas most valued by diverse stakeholders.

## PURPOSE AND RESEARCH QUESTIONS

The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 set ambitious goals for nationwide adoption of electronic health records (EHRs) and electronic exchange of health information, which would be "meaningfully used" to improve health care outcomes, efficiency, and population health (Blumenthal 2010). Viewed at the time as a "down payment on health reform" (Blumenthal 2010), the HITECH provisions of the American Recovery and Reinvestment Act of 2009 are critical to developing the infrastructure needed to reform health care delivery and payment, as articulated in the Patient Protection and Affordable Care Act (ACA) of 2010 (Buntin et al. 2010).

In earlier work to create an "interdependency framework," we examined the factors that influence the adoption of EHRs and the related means of exchanging health information electronically across the various providers and settings in which care is delivered (Gold et al. 2012). Getting provider to buy into the value of electronic health records and establishing effective means of information exchange were identified as critical challenges not fully addressed by the HITECH Act but vital to its success. Without them, providers lack the tools to make meaningful use of health information technology (IT) and will not be able to fully realize the improved health outcomes and other important policy goals the HITECH Act attempted to address.

This paper examines in more detail the current situation with HIE, focusing specifically on information gathered from structured interviews in fall 2013 with large hospital-based systems that seemed to be ahead of the curve. The paper distinguishes between health information exchange (HIE) as a desired activity or action (the primary focus) and the alternative mechanisms or organizational supports that may be used to accomplish such exchange.

The interviews sought to answer four key research questions:

1. Within hospital systems, where does the authority for external exchange reside, and how does it relate to the system's overall responsibility and infrastructure for health IT?

2. What are the main mechanisms for external exchange of electronic health information with providers outside of the system?

3. To what extent do systems see a business case for external exchange with outside providers?

4. What actions could federal policymakers take to encourage hospital systems to become more engaged in HIE?

The paper begins with background on the issues of concern related to electronic HIE. We then describe the methods used to select the systems invited to participate in the interviews, present the overall findings from the analysis of the interviews, and summarize the key conclusions and potential policy implications. Table 1 below provides definitions of key concepts and terms used in the paper, drawing on work by the Office of the National Coordinator for Health Information Technology (ONC) and others.

**Table 1. Overview of Key Concepts and Terms**

**Health Information Technology for Economic and Clinical Health (HITECH) Act.** This law provides the U.S. Department of Health and Human Services with the authority to establish programs to improve health care quality, safety, and efficiency through the promotion of health IT—including, EHRs and private and secure electronic HIE.

**Medicare and Medicaid EHR Incentive Programs.** Authorized by the HITECH Act, the EHR Incentive Programs provide eligible professionals and hospitals with incentive payments as they demonstrate meaningful use of certified EHRs. Incentive payments were first available in 2011 to organizations meeting Stage 1 requirements. Expanded Stage 2 requirements were being phased in, starting in 2014. These requirements reinforce the emphasis on interoperability.

**Interoperability.** Interoperability allows EHRs and other health IT systems to communicate with one another and seamlessly exchange patient health information. Interoperability facilitates health data exchange and information sharing with disparate providers with ease, speed, and convenience. (ONC refers to actions associated with interoperability as "health information exchange.")

**Forms of HIE**

   **Directed exchange.** Directed exchange is the ability to send and receive secure information electronically between care providers to support coordinated care. The information is sent over the Internet in an encrypted, secure, and reliable way. This form of exchange is commonly compared to the act of sending a secured email. "Direct exchange" is one tool developed to support this kind of exchange.

   **Query-based exchange.** Query-based exchange is the ability for providers to find or request information on a patient from other providers, and is often used for unplanned care. ONC classifies query-based exchange in states in four categories: (1) statewide through a single service or entity, (2) statewide through multiple services or entities, (3) available in regions but not statewide, and (4) no operational query-based exchanges currently available.

   **Consumer-mediated exchange.** Consumer-mediated exchange is the ability for patients to aggregate and control the use of their health information among providers. (This form of exchange is not included in the study.)

   **Terms used to describe HIE and the organizations that support it**

   **Health information exchange (HIE).** HIE or data exchange is the electronic mobilization of health care data across organizations within a hospital system, community, region, or state.

   **Health information organization (HIO).** HIOs are formal organizations, including community-based organizations and statewide initiatives that support data exchange. Historically, such organizations have been referred to as regional health information organizations (RHIOs) or "public HIEs."

   The eHealth Initiative notes that health care data exchange also occurs in organizations that are not formal HIE organizations, such as between a hospital and affiliated independent practices. (That is, enterprise-level or private exchanges.) The 2013 eHealth Initiative survey included organizations with both types of data exchange. With the growth of this sector and increasing emphasis on sustainability, it is more challenging to differentiate community exchange (public) from enterprise-based exchange (private) that also may include outside providers with some form of affiliation.

Sources: ONC, "Glossary," available at http://www.healthit.gov/policy-researchers-implementers/technology-standards-certification-glossary; eHealth Initiative, "Health IT Interoperability," available at http://www.ehidc.org/resource-center/publications/view_document/320-fact-sheet-health-it-interoperability; ONC, "What Is HIE?" available at http://healthit.gov/providers-professionals/health-information-exchange/what-hie; ONC, "State HIE Implementation Status," available at http://healthit.gov/policy-researchers-implementers/state-hie-implementation-status; eHealth Initiative, "Results from Survey on Health Data Exchange 2013," available at http://www.ehidc.org/resource-center/surveys/view_document/333-survey-results-results-from-survey-on-data-exchange-2013-data-exchange.

**BACKGROUND**

Since HITECH was enacted in 2009, there has been substantial growth in the number of providers who have adopted EHRs—including, recent rapid increases in adoption rates of EHRs among many subgroups of providers that previously had adoption rates that were below average (Hsaio et al. 2013). Although there is now greater exchange of electronic health information, both the volume and kinds of information being exchanged still are limited. For example, recent analysis of hospital surveys shows that the share of hospitals exchanging clinical information with providers outside their organizations grew 41 percent (from 41 percent to 58 percent) between 2008 and 2012 (Furukawa et al. 2013). However, only 36 percent of responding hospitals reported being able to electronically exchange health information with hospitals outside of the organization and some kinds of information, such as clinical care summaries and medication lists, were less likely to be exchanged than other types of information, such as laboratory and radiology results.[1] A 2012 survey of health information organizations (HIOs) that support the exchange of electronic health information found that only one in three hospitals and only one in ten physician practices were engaged in the exchange of any type of clinical data with outside entities (Adler-Milstein et al. 2013). Recent data shows an uptick in exchange activity in 2013 among hospitals, with 62 percent exchanging health information with those outside their system (Swain et al. 2014). However, the exchanges were more likely with outside ambulatory care providers (57 percent) than with outside hospitals (40 percent).

Some studies have detailed factors that can facilitate electronic information exchange. For example, as part of an evaluation of the State Health Information and Exchange Program[2], Dullabh et al. (2013) examined the experience that five states had with exchange prior to HITECH. They found that market characteristics played an important role in shaping the extent of HIE, with the centralization or decentralization of health care services shaping exchange needs and forms. They also found that the patterns of exchange varied across urban and rural areas. Large health systems played a critical role in shaping exchange because of their technical infrastructure, dominance in certain markets, and preference for supporting electronic health information through private HIOs or community-based provider affiliations, rather than state-based HIOs. The state HIE Bright Spots Initiative found that a variety of implementation practices and approaches can work.[3] Although the number of exchange entities with a sustainable business model (that is, one that does not rely on short-term grants) is growing, establishing a successful, self-sustaining model is a challenge for most entities. Many stakeholders believe that the challenge will not be addressed adequately until such HIOs are based on models that align revenue with the value to participants who will support and pay for it (ONC 2013). To accelerate HIE, ONC and the Centers for Medicare & Medicaid Services (CMS) released a "Principles and

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[1] Although the American Hospital Association (AHA) does not define outside providers, this paper assumes these are providers not formally owned, in whole or part, by the organization in any of its various geographic areas.

[2] This program, funded under the HITECH Act, authorizes four year cooperative agreements with state governments or nonprofit organizations designated by states to develop context appropriate exchange strategies. For more information see, http://www.healthit.gov/policy-researchers-implementers/state-health-information-exchange

[3] This initiative seeks to identify and disseminate successful HIE implementation practices. For more information, see http://statehieresources.org/bright-spots/.

Strategies" document. The document lays out an approach that aims to leverage federal policy to reinforce the value proposition through increasingly exchange-focused requirements for MU incentives under HITECH, as well as payment reform incentives, among other means (ONC and CMS 2013).

Past studies show that provider participation and support for exchange were influenced by the "free rider" phenomenon, confidentiality concerns, as well as competitive concerns regarding what some providers view as proprietary data (Gold et al. 2012). Historical case studies of communities with local health exchange (Grossman et al. 2008) illustrated that, from a business perspective, organizations assessed the value of HIE against up-front and ongoing participation costs. In 2007, physicians were uncertain how HIE would influence their efficiency and the potential value of clinical messaging. Both physicians and hospitals were concerned that data would be used for performance reporting. Hospitals, in particular, were critical to creating exchange in mature markets; their greatest concern was control over data, viewed as a key strategic asset tying physicians and patients to their organizations. Hospitals and physicians also agreed that a critical mass was required for exchange value.

Although the value proposition likely has evolved in response to legislative and environmental changes, work by the National eHealth Collaborative—based on case studies of 12 diverse, self-sustaining HIEs—found that charges to participants remain key to the exchanges' self-sufficiency (National eHealth Collaborative 2011). Trust, provider competition, and willingness to pay remain important issues. The belief that payers such as health plans pay less than their fair share of the costs of HIE can also undercut provider support because the prevalent business model is to charge all participants. An analysis in Arizona of providers that were not affiliated with an HIO showed that key barriers to participation were (1) cost, (2) insufficient business reasons to participate, and (3) the absence of an EHR upon which to base exchange (Arizona Strategic Enterprise Technology Office 2012). Not viewing exchange as economically viable or a high priority also were barriers to participation. These perspectives were shaped by an understanding of each organization's business partners.

Although there is growing interest in aligning HIE to business needs, strategies for achieving this alignment still are evolving. The 2012 survey of HIOs showed that only 10 percent met all six Stage 1 MU exchange criteria (CMS 2014), although 91 percent supported some form of electronic clinical information exchange (Adler-Milstein et al. 2013). Exchange capacity also varied greatly across health service areas in the core and menu items in Stage 1 MU. Most HIOs also were not viewed by provider interviewees as supporting delivery reform, particularly through the development of accountable care organizations (ACOs) (Adler-Milstein and Jha 2013). However, self-sustaining HIOs reported using a number of value-enhancing services—including, identity management to facilitate individual patient tracking, secure messaging, analytics, ACO or patient-centered medical home support, patient data availability, MU support, medication management, support for patient engagement, care coordination, population health management, risk management tools, quality outcomes analysis, and clinical decision support. However, many of these HIOs still noted that among the barriers were provider trust, provider competition, limited quantitative analysis of the benefits of exchanges, provider concern about cost burden, and an unwillingness of some small providers to participate.

## METHODS

The 2013 research by Dullabh et al. highlighted the role that large health systems play in shaping local exchange. To learn more about how these organizations pursue exchange, this study focused on a diverse set of large multihospital systems, stratified by size and selected to favor those systems having experience with exchange. The intent was to help reveal the forces that make the business case for exchanging health information electronically and the barriers to doing so. By focusing on multihospital systems, the intent also was to better distinguish the relative role of national and local market forces in establishing or participating in exchange.

### Data set for selection

To inform our selection, ONC provided us with a data set of hospital systems drawn from the AHA 2012 annual hospital survey. The data set identified 321 hospital systems, based on self-reported affiliations of responding AHA reporting units—that is, individual hospitals or clusters of facilities. According to the data set, 1,598 such units owned by these systems were among the respondents to the AHA survey.[4] The distribution of multihospital systems by size is highly skewed, with a limited number of large multihospital systems and a much greater number of smaller systems with a geographically circumscribed footprint (see Figures 1 and 2).

**Figure 1. AHA reporting health units by system size (n = 1,598)**
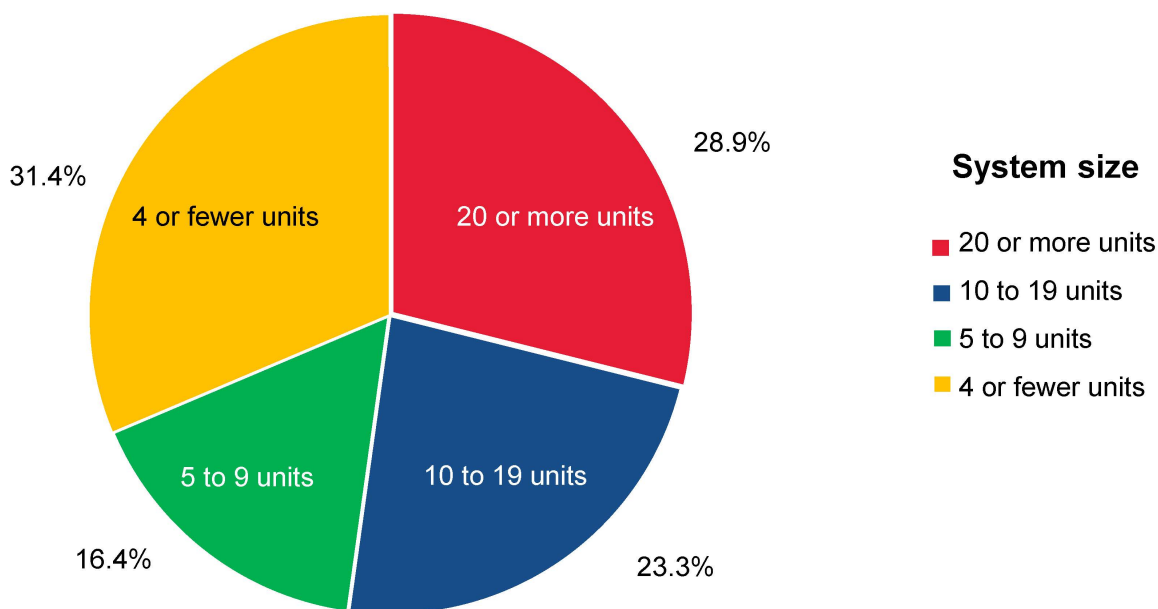


Source:   Mathematica analysis of 2012 hospital survey data provided by ONC

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[4] Not all hospitals within a system necessarily responded to the survey; the data do not reveal the number of hospitals in the system, only the number that responded.

**Figure 2. Average system size (AHA reporting units) for AHA reporting systems**
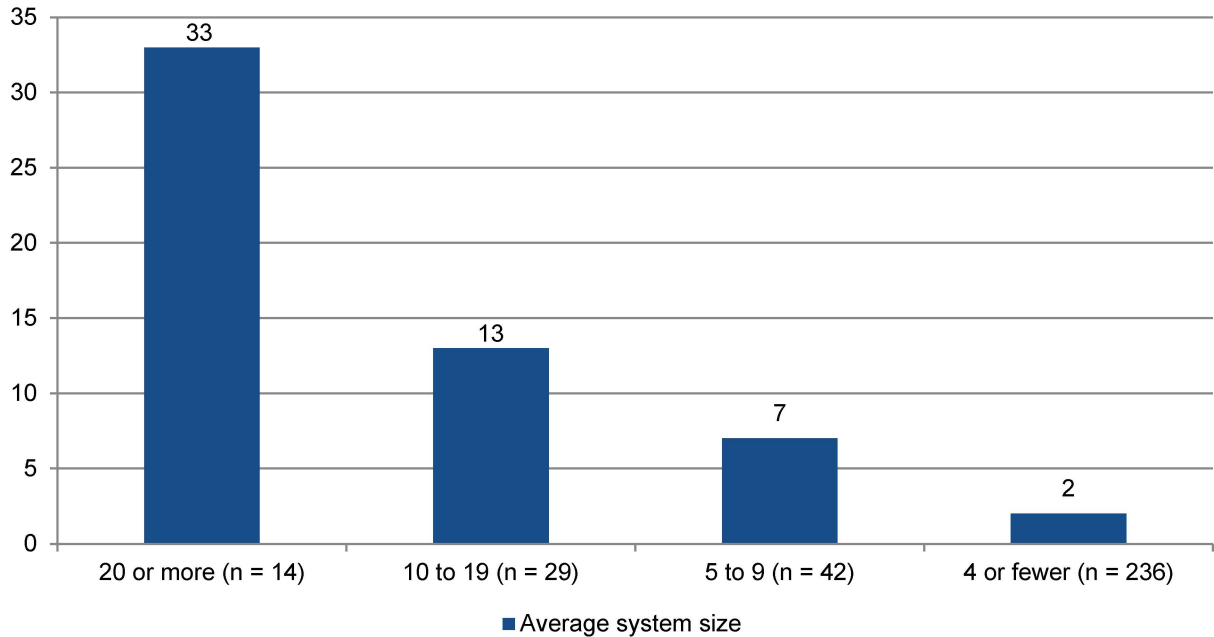


Source: Mathematica analysis of 2012 hospital survey data provided by ONC.

## Eligibility criteria

To be eligible for inclusion in the study, the project team required a hospital system to have five or more entities reporting separately to the AHA. Originally, plans called for limiting the selection to systems with ten or more such units. However, the higher threshold led to systems located mainly in the South and West, which may be atypical of the large systems dominating other markets. Considering systems with five or more hospitals allowed for a more diverse selection that included 58 percent of all systems and 68 percent of all hospitals, or other AHA reporting units, in these systems.

## Allocation of available interviews

Because federal Office of Management and Budget rules restrict reporting burden, the study limited itself to no more than nine interviews. We initially selected 10 systems for interviews, assuming that at least one would not respond. Selection criteria favored larger systems, with four slots allocated to the largest systems (20 or more hospitals) and three each to the other size categories of hospitals (10 to 19 and 5 to 9 hospitals, respectively). Our selection was informed by a spreadsheet that listed systems by size and showed, for each system, the share reporting various exchange capabilities captured in the AHA survey, as well as other characteristics (for example, geographical distribution, teaching hospitals, and region).

## Selection criteria

The selection criteria favored systems reporting more extensive experience in the electronic exchange of health information. Within each size category, selection criteria favored hospital systems reporting that they shared data with ambulatory care providers and other hospitals outside of their own system. For large systems, these criteria could be met by a lower percentage of hospitals than for smaller systems. The selection criteria also favored systems already

participating in an HIO and hospitals with robust EHRs, because providers with a more sophisticated IT infrastructure were more likely to have the capacity to actively exchange information. Within these core criteria, we also aimed to achieve a geographical mix and a diversity of ownership.

**Response rates**

Each of the 10 selected systems was asked to participate through an invitation sent to the most senior executive in the system—those shown on the AHA leadership list and websites as having most responsibility for external exchange. The invitation asked for the executive's cooperation in participating in an hour-long telephone interview with our staff, which would cover the specified topics (sent with the invitation letter) and involve those executives with (1) responsibility for system-wide decisions on the exchange of electronic health information with outside providers and (2) the most experience in exchange. The executives were given the option of including more than one individual in the interview if they felt it would be useful in addressing the topics of concern. The two national systems also were asked to have a representative on the call from among the more advanced of their locations to provide locality-specific information on exchange practices. Systems also were informed that the interviews would be confidential and specific system names would not be associated with the responses. We made multiple follow-up contacts when necessary.

Ultimately, six of the ten systems agreed to participate in the study. Of the remaining four, one declined and the other three never responded, despite multiple attempts using different modes of communication. Respondents included two of the four largest systems, and two out of three from each of the other size categories. In total, 16 people participated in the calls, with each system having an average of 2 to 3 people interviewed. Table 2 shows the basic characteristics of the participating hospital systems, which reflect a diversity of ownership types and experiences. The main gap was the lack of a dedicated West Coast system.[5]

**Interview techniques and analysis**

Interviews were conducted by the lead study author using a semi-structured protocol that was developed by project staff with input from ONC (see Appendix A). An experienced analyst took detailed notes, which were finalized within a few days of each interview and reviewed for accuracy. Because the topics covered were complex and technical, a two-page analytical summary of each system's responses to the major topics of interest was developed. Each system was asked to review the summary for accuracy; four of the six did so. Given the small number of interviews, this report was developed using the interview notes and individual system summaries as data sources.

**Limitations**

The small number of systems interviewed and the relatively short interview time are obvious limitations of this study that affect its scope and depth. The systems interviewed also are among the most advanced and also not necessarily representative of the nation. However, the consistency of certain themes creates a compelling case for many of the findings.

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[5] We attempted replacement, but we did not continue to pursue this arrangement after we found this too challenging to manage in the time available. In addition, we perceived as rich the six interviews we had and were uncertain that other systems selected would add much to the themes already identified.

**Table 2. Characteristics of interviewed health systems, by strata**

| System size strata | Tax status | Location | Affiliations | Percentage with basic EHR | Percentage with RHIO | Percentage that share with outside ambulatory providers | Percentage that share with outside hospitals |
|---|---|---|---|---|---|---|---|
| 20 or more AHA reporting units (n = 14) | | | | | | | |
| A | For profit | Operates in 23 states | Publicly traded | 45 | 15 | 50 | 25 |
| B | Nonprofit | 1,500 locations in 23 states and DC | Catholic based | 24 | 63 | 73 | 34 |
| 11 to 19 AHA reporting units (n = 29) | | | | | | | |
| C | Nonprofit | South central, largely urban market in one state | Methodist based | 100 | 100 | 100 | 100 |
| D | Public | Northeast system, located in a large urban city | Academic medical center affiliations | 100 | 60 | 50 | 70 |
| 5 to 9 Reporting units (n = 42) | | | | | | | |
| E | Nonprofit | Midwest system based in three states, though one is primary | Catholic based | 100 | 100 | 100 | 100 |
| F | Nonprofit | Northeast market in parts of three states; 25% rural | Academic medical center based | 100 | 13 | 100 | 100 |

Source: Mathematica's construction from AHA-reported information.

Note: Statistics refer to the percentage of system hospitals that indicated "yes" to a particular item. Terminology is based on the AHA survey.

**FINDINGS**

**Characteristics of internal health IT**

Consistent with the selection criteria, each of the system executives interviewed said that all or most of their member hospitals had EHRs and had received Stage 1 MU payments.[6] Most were getting ready to satisfy Stage 2 requirements, although one large system still had a few hospitals that needed to qualify for Stage 1. Despite their generally advanced situations regarding health IT, almost all of the interviewed systems still were dealing with migrating data from multiple legacy systems, which created challenges and limited communication among providers within their systems. Use of multiple EHR products within systems was very common in the largest and most geographically diverse systems, but this situation also existed in some of the smaller and more geographically concentrated systems.

Across all six systems, only one system (System E) indicated current use of a single unified health vendor product for its EHR across all hospitals. The same vendor product also was used by most employed physician practices, although newly acquired practices were still transitioning to the product. Another hospital system (System D) was moving toward consistency and planned to replace its current use of multiple versions of a vendor product that could not communicate with one another with the same product used by System E. The intent was to establish a single longitudinal record for uniquely identified patients across the system. A third system (System C) also used that same product within its fully owned hospitals, but a variety of products were used across its joint-venture hospitals and its employed physicians.

The other three systems had more diversity in EHRs. One system (System F) used products from five different vendors across its system, with different products for inpatient facilities for adults, inpatient facilities for children, physician practices, medical and radiation oncology, and psychiatric hospitals. To support exchange within the system, it used dbMotion's interoperability platform to create common standards.

Each of the two largest hospital systems used a variety of EHRs. One system (System A) used one EHR product for most of its inpatient EHRs and another for the rest of them. A total of six ambulatory care EHRs were used across System A, although one predominated. To improve clinical care, this system was building a clinical data warehouse that would store information from all of its hospitals and those ambulatory care settings within the system that use the system's predominant ambulatory care EHR. The interviewee emphasized that the system's focus was on data normalization and standardization.

The other large system (System B) was pursuing a mixed model, with centralized health IT support and guidance that supports multiple EHR platforms. This system was relying heavily on products from four vendors but some of its facilities use other vendor products for ambulatory care. At the time of the interview, System B had no capacity for system-wide exchange. The system had identified key information gaps and had a capital plan to address priority areas

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[6] Interviewees were not asked whether these payments were from Medicare or Medicaid payments. (Hospitals can receive both if they qualify.)

related to exchange of information. These priorities were to better support locally based exchange rather than achieve system-wide uniformity.

**Authority for health IT**

Each of the systems had centralized authority to guide health IT development and standards across the system. However, they varied in how much discretion they granted to individual facilities or clusters of facilities. The four smaller and more geographically compact systems (Systems C through F) indicated that authority for health IT was centralized to promote consistent standards and provide efficient support, even if vendor products differed. The two largest and most geographically decentralized systems (Systems A and B) left authority for external exchange with local market organizations. The executives interviewed explained that they believed local organizations were best equipped to assess the merits of outside exchange with other providers as well as the relevant regulatory and market climate.

**External exchange platforms**

All of the health systems interviewed for this project focused their external exchange models locally; most used exchange structures that emphasized the providers most closely involved in the care of the system's patients. Of the six systems, one system (System E) used a centralized statewide health exchange platform open to all providers (see Table 3), while three systems (Systems C, D, and F) used localized exchange platforms with more limited provider participation (see Table 4). One of the other two systems (System A) used Direct, a tool for simple one-way exchange (see Table 5) to share limited information with physicians hospitalizing patients in their system. The other system (System B) also did this but it was piloting efforts to support a more integrated exchange through the EHRs where possible (see Table 5).

Executives in the most advanced systems noted that their leadership had been investing in building health IT and exchange mechanisms for some time. For example, two of the systems have been working on EHR development for 20 years, and another had been involved with public exchange for 10 to 12 years.

**Nature of exchange**

In general, interviewees said that external exchange was much more limited than internal exchange across providers in the system. Some systems indicated support for integrated exchange within the context of user EHRs (such as System F), but many did not or did so only for a subset of providers in the system. Most commonly, external exchange was a one-way street, with exchange mechanisms geared toward sharing data from large systems with others, based on a query about a specific patient. All but one system (System E) used decentralized architecture for exchange, with data residing on individual system servers.

Because the mechanisms for exchange just described were not necessarily very accessible to small independent providers with more limited health IT, some of the hospital systems added complementary, simpler means of access. One system used a lower-cost PDF option to support exchange with practices that have incompatible or less-advanced health IT. Another developed a separate approach that combined a referral management system and a care management system. Officials were planning to replace this approach when they finished converting to a single EHR,

but some system managers were concerned that the conversion would mean less integration with work flow.

**Table 3. Statewide Mature Public HIO (System E)**

System E was one of five charter hospitals that had been sponsoring a long-running statewide public HIO over the past 10 years. System E used the HIO as the main mechanism for exchange of clinical information with community and referring providers. Records were sent by Health Level Seven (HL7) secure interface to the HIO. The information included admission, discharge, and transfer (ADT) information; laboratory results; and, transcriptions and imaging reports. The information did not include other components of the individual hospital's EHR, such as nursing documentation and daily progress notes. In addition to supporting the secure exchange of information, the state HIO used the information it received to maintain a clinical data repository. When physicians on staff or referring providers ordered services at System E, the results were transmitted back electronically through a portal run by the HIO in a format requested by the recipient provider. This meant that the results could be received as a fax, secure email, or as standardized data that interfaced with the physician's EHR. The HIO also provided a clinical summary of the patient record to the repository when a patient arrived in a participating hospital's ER. Physicians also could log on to the HIO's EHR portal to review a patient record if there was a relationship to the patient and proper authority. The exchange had more than 30 million patient records from approximately 60 hospitals, and additional hospitals were in various stages of participation.

Although System E continues to support the HIO by contributing data, providing financial support, and using the HIO operationally, the hospital system was becoming concerned that it provided considerable data to the HIO but other providers received more of the benefits. A growing concern was that the exchange of continuity of care documents (CCDs) during transitions of care may not be the most efficient way for an ACO, such as the one this system was part of, to manage its patient population. For example, although sending or receiving a CCD electronically may be an effective transfer mechanism, it could generate as many as 100 pages of information. Providers lack the time to process such a large quantity of data. System E was working with other hospitals to better define what goes into the CCD and structure global summaries. It also was seeking other means of communicating information that might be needed for certain use cases (for example, whether a chronic care patient has presented at an ER). It also was working to identify how to streamline, integrate, and communicate all of the information requested by multiple states and agencies so that it is useful for the provider systems. System E wanted to meet its data needs with the statewide HIO but remained concerned that the lack of state funding for the HIO would limit the ability to develop new services.

Source:   Mathematica interviews with system executives

**Table 4. Three Examples of Localized Private External Exchange**

**Private RHIO created with outside grant support (System D)**

System D formed an RHIO several years ago, leveraging outside grants to fund the secure exchange of electronic health information between hospitals and physicians that were part of System D. The exchange was limited to ADTs and patient demographics, medications, laboratory results, and limited information on visits. Health information was maintained and updated in real time at local facilities on an edge server. When providers logged on through a portal, the data could be pulled from the edge server to provide a unified view at the patient (not population) level. At the time of the interview, a number of large, community-based organizations had access to information on the RHIO. Post–acute care providers were not part of RHIO, but System D was in the process of deploying a care management system that would interface with the RHIO and allow access to information on discharge instructions and appointments.

Despite the infrastructure, however, System D indicated that access to data through the RHIO was limited. In addition to requiring that patients affirmatively consent to have information shared, there were additional levels of consent required for sensitive data, such as mental health or HIV services. System D is a public hospital system and its patients include a disproportionate number of patients with conditions that require this extra level of consent. Recent policy changes had aimed to streamline the consent process with hopes that this would allow increased exchange of patient-level information.

**Private RHIO developed with private funds for a consortium of hospital systems (System F)**

System F reported participating in a private RHIO that was established in part with its strong leadership and in cooperation with eight other local hospitals. The RHIO was financed solely from private funds and set up as a separate nonprofit that launched in mid-2012. The RHIO supported information exchange between System F's facilities and independent hospitals and other care providers. An XML-based interface within EHRs in System F's facilities allowed authenticated RHIO users with access to those data to query others in the RHIO for information about common patients who were using multiple providers. (Common patients were identified at point of care by an ADT interface through a master system index designed to match against a patient registry.) The user then received aggregated data based on encounters, problem lists, medications, allergies, and laboratories. The system reportedly has more than 8.2 million patient records.

Any provider in the area could become a member, but members and others seeking to access data had to pay a membership fee. This fee partially supported the RHIO. (New members also had to support the interface development costs.) Membership fees varied with the size of the provider system and type of EHR. Provider systems belonging to the RHIO decided individually whether they also would contribute data to it, rather than just receiving information—three systems did, and others were expected to contribute over the next four to six months. To provide data, a provider's EHR must support a CCD. In the future, developers hoped to refine the system to support two-way exchange (that is, alerts, not just queries).

As an alternative to using the RHIO, System F reported offering Medlink, a lower-cost option for smaller providers such as independent practices. Medlink allows access to a smaller set of similar data transmitted in a PDF format.

Table 4 *(continued)*

**Private exchange for health system providers (System C)**

System C began exchanging electronic health information in 2012 using Medicity. All of the system's hospitals participated and so did some employed physicians and joint-venture facilities. System C reported plans to add the rest of the employed physicians who were using different EHR products. This private HIO had a single portal through which system providers and other users could view the patient's longitudinal record, which was aggregated across the system's multiple EHR platforms. Providers outside of the system could not submit data but had the opportunity to view available aggregated data, subject to appropriate privacy and security protections. At the time of the interview, reported data included ADTs, laboratory test results, radiology reports, dictated reports, and physician notes. There were plans in the future to expand the types of data available for exchange to include imaging results, medications, problem lists, and allergies. System C expected the number of providers participating in electronic information exchange would continue to grow.

Source: Mathematica interviews with system executives

## Table 5. Exchange Strategies in Large National Systems

**Direct-based exchange (System A)**

At the time of the interview, most of the facilities within System A had some ability to electronically exchange health information with outside physicians whose patients used System A's facilities. In most cases, exchange was based on simple processes or "direct" protocols, with some exceptions for outside physicians using the same EHR vendor. Philosophically, the system believed that standards for EHRs should allow providers to exchange standardized information directly, consistent with business and care needs. This was not possible at the time of the interview because MU certification requirements were being phased in and Stage 1 requirements did not necessarily require this—leading to limited interoperability across systems. Executives with System A said the system had engaged in some more sophisticated private exchanges but had found success difficult to achieve technically, given current interoperability standards.

**Mixed modes based on market constraints (System B)**

System B supported the electronic exchange of health information with outside providers. Such exchange generally was through private HIOs. System B expressed a belief that private HIEs were important to achieving standards that meet the needs of communities. The mechanism for external exchange differed across the health ministries into which different hospitals within the system were clustered. For example, some used Medicity to share clinical information on a specific patient's care from the system's EHR to outside physicians. Efforts also were under way to support early ACO efforts by establishing a physician alliance to exchange laboratory results, text reports, and radiology reports. System B also made results from its imaging services available as discrete data (though not the images themselves, which were securely shared externally through a separate system). Elsewhere in System B, other methods were being used to allow physicians to see patient data to fill gaps, using tools from acute care EHRs.

System B had recently tested exchange using dbMotion in one locale. This software allows for data to be shared with hospitals and employed physicians in a health ministry. In contrast to Medicity, the dbMotion platform was more directly integrated into the EHRs, the interviewees

Table 5 *(continued)*

said, so physicians could see when a patient may have used the system's providers and then directly pull that information into the relevant EHR. Based on the pilot test, System B was considering expanding the use of dbMotion elsewhere within the system to facilitate private exchange of information.

Source: Mathematica interviews with system executives

Although in a brief interview it was difficult to learn exactly how electronic exchange worked, most HIOs that were described seemed oriented to share admission, discharge, and transfer (ADT) message protocols, laboratory results, and radiology reports. Systems had plans to expand the amount of information shared and the user base, but interviewees generally said their goals were to share limited information with outside providers—not all the data contained in their EHRs about specific patients.

**Relationship to state health information exchange**

For the most part, broad-based statewide HIEs (statewide HIOs) were not operational in the service areas of the systems whose executives we interviewed, either on a centralized or decentralized basis. (System E was an exception.) The three systems with the most developed localized private exchanges (Systems C, D, and F) indicated that statewide models had faltered or were still under development. To address the challenges to date, state officials were seeking to develop platforms that allowed for sharing information across the private exchanges in the state or locality. State officials and hospital systems were addressing such issues as (1) maintaining the unique governance arrangements inherent in private exchanges, (2) identifying a subset of data that could be standardized and exchanged across them, and (3) exploring feasible financial models to support sustainable public exchange.

All three systems were engaged in and supportive of these efforts, as were most other systems. For example, System B's corporate policy for information exchange called for connecting to public HIOs where they exist. An exception was System A, whose interviewees reported that their organization perceived there were lower-cost ways to support exchange when needed. System A's preference was to emphasize standards embedded in EHR certification and MU requirements.

Even though most systems were supportive of broad-based exchange, they did not seem to be counting on publicly financed HIO models (whether centralized or decentralized) to be financially viable or essential to their own exchange priorities. While they were collaborating with public exchange efforts, they also were refining their own exchanges, connecting with other systems using the same vendors (particularly the largest vendors), or considering using the Healtheway connection.[7] The latter promotes common standards and tools for exchange across systems, as well as support for specific functional needs.

The executives who were interviewed cited many reasons for pursing these alternative approaches to HIE. Several expressed a lack of confidence in states' abilities to effectively develop successful public HIOs, concerns over the long-term financial sustainability of such systems, and a lack of confidence in the ability of public exchanges to provide all that they

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[7] Information on the Healtheway connection is available at http://healthewayinc.org/index.php/exchange.

needed internally. From their perspective, private exchanges allowed greater control over the way data were structured and used to provide analytical support.

Even the system that had been actively engaged and supportive of public exchange the longest (System E) expressed disappointment that the statewide public HIO's data repository could not meet the system's needs. As a Pioneer ACO, system officials wanted real-time access to well-structured and comprehensive metrics on the totality of care received by patients in their Pioneer ACO. To fill that need, officials were building a parallel analytical tool, using claims and quality measures to construct Healthcare Effectiveness Data and Information Set indicators.

Among the hospital systems included in this study, one vendor's EHR product was more heavily used than others. Yet, although some systems were relying on it as an exchange mechanism, they also seemed to recognize potential barriers for broad-based exchange with providers that use other EHR products. None of the more broadly based external exchange mechanisms relied exclusively on the dominant vendor's EHR product. Some interviewees also noted instances in which they were pushing back on the vendor's business model, encouraging the vendor to pursue more open exchange mechanisms that would better meet their exchange needs. They said they were encouraging development of post–acute care modules to better share information with providers using other vendor products and conscious use of other vendors or approaches for external exchange. However, interviewees also noted that heavy use of a single EHR product within a market did create incentives to share among providers using the same product because implementation of exchange was easier.

## Business case for exchange

Each of the system executives we interviewed said their systems were investing heavily in health IT, including platforms that would enhance the ability to exchange information across providers both in the system and outside of it. They cited a desire to improve care for patients as well as long-standing commitments. But they also noted increasing cost consciousness among payers as another driver, with a focus on information exchange to increase efficiency by eliminating duplicate tests or reducing medical errors. Most saw a growing shift from fee-for-service payments to payment systems based more around patients, making it more important for them to track the care of patients across settings and providers. Some systems were more engaged than others in the movement toward ACOs, and at least two systems owned their own health plans. Executives from these systems noted that such engagement was a strong impetus for capturing useable information on outside physicians and the totality of care for patients.

Across systems, providers seemed to set their priorities for exchange in three consistent tiers (Figure 3).

**Figure 3. Hospital and health care system priorities for exchange**



Tier 3: All other providers
(competing systems often lowest in priority)

Tier 2: Outside providers that refer or
hospitalize many patients in the system

Tier 1: System
providers
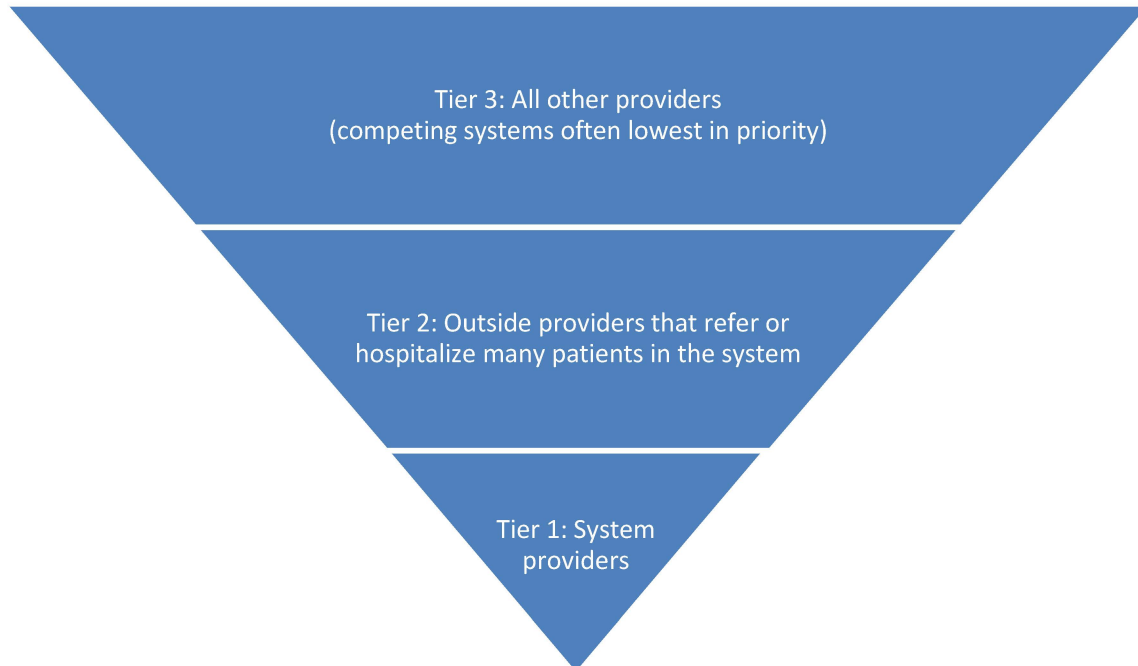
Source:   Mathematica's analysis of findings on system practices.

The first tier or highest priority was to share information on patients across providers that are formally within that health system. Such internal exchange was most fully under a system's control and probably financially most important to them. The second tier or second priority included outside providers that used the health system a lot or shared substantial numbers of patients with system providers. Systems wanted to facilitate electronic exchange of patient information with such outside providers but they were finding that doing so was challenging because of limitations in office-based physician health IT capacity and lagging capacity among post–acute care providers. The third or last tier is broadest and includes all providers in a community regardless of whether they have close connections with the system. Including third-tier providers along with others aligns with the original concept of a community or public exchange.

For individual provider systems, the value of a third-tier exchange is greater when systems are more "permeable" and have more patient crossover. Some interviewees reported only limited patient flow outside, although we had no available data to assess the accuracy of such perceptions. Without the kind of data that comes from interoperability, it could be that providers underestimate the diversity of care used by their patients.

Hospital systems also may be reluctant to share data with providers (especially other hospital systems) that they see as potential competitors. Some interviewees expressed more concern about this than others, seeming to reflect differences both in leadership philosophy and the dominant style within particular markets (for example, cooperation versus collaboration).

In considering whether to pursue third-tier exchange, hospital systems in our study seemed less focused on the costs than on the perceived limited benefits relative to other health IT investments they might make. As one interviewee, who felt that the hospital-affiliated providers met most patient needs internally, said, "At times, there is a pragmatic view that if we are going to invest in something to help our physicians with patient care, it's going to be something we put inside our four walls. The [external] HIO is seen as sort of nice to have but not necessary for hospital operations." Yet, another interviewee from a system that is sponsoring a Pioneer ACO noted that "interoperability can't happen fast enough for me"—especially, given the mix of electronic and paper health record products used across providers and the new transitions-of-care requirements under MU.

Hospital system needs also shaped the way the systems and their providers desired information. In particular, interviewees said their systems needed information that could be used efficiently at the point of patient-to-provider contact. Too much information was as much of a concern as too little, because a large volume created inaccessibility for busy providers. Interviewees also supported information that could be integrated directly into their system's own health IT infrastructure and used to support the development of appropriate analytical metrics, such as reports relevant to patients in accountable care arrangements.

In most of the hospital systems interviewed, the priority, particularly for external exchange, appeared to be placed on relatively simple "use cases" that support priority care management needs. One executive from a relatively advanced system noted, for example, the value of knowing when a patient presented in its ER; basic ADT information, such as demographics, medications, allergies, and laboratory results; basic visit data; or, what outside facilities a patient has visited, so that patient history and patterns of care can be identified and incorporated in the care management plan. Another system was trying to build exchanges to anticipate support for specific problems—for example, implementing bundled payment effectively by using alerts to identify when patients may need targeted intervention (for example, rapid weight gain with congestive heart failure).

**Role of federal policy in promoting exchanges**

In general, interviewees viewed HITECH's establishment of the MU incentives as valuable in moving health IT forward and thought that the attention to exchange standards resulting from the act was good. Even though its activity on exchange preceded the legislation, one system official noted that HITECH's requirements and deadlines had put "wind in its sails." Another system's representative hoped that the federal government would continue to advocate for exchange—something the interviewee said was particularly important to smaller hospitals. On the other hand, one system executive expressed concern about "how fast you can move without blowing up the engine," given the limited resources available. Many of those interviewed felt that much of the work of creating interoperability needed to take place locally. But they also saw areas in which federal policy intervention could be valuable.

The first area in which federal policy could prove helpful involves more standardization of vendor EHRs to facilitate exchange. Many interviewees expressed concern that vendors, particularly long-established legacy vendors, were structuring their systems to make open exchange across systems more difficult and expensive. As one observed, "We are all hostage to the transport issue." Interviewees wanted more standardization of some features (such as the

CCDs) to allow more "plug and play" or typical HL7 interfaces. Such standardization would lessen the ability of vendors to charge fees for exchange transactions supported by the vendor's products if providers doing so were meeting standards for MU payments. Interviewees wanted the certification process to include a stronger assessment of the capacity of vendor EHR products to support multiple types of exchange. Such standards might make it harder for vendors to ask providers to incur additional costs to purchase exchange modules not incorporated in the EHR.

A second area for possible federal policy support, according to interviewees, is help in navigating the complex regulations surrounding disclosure of sensitive data, such as data related to HIV, mental health care, and sexually transmitted diseases. The executives were concerned about the risks of inadvertent potential disclosure through exchange of medication data or information sharing using unstructured text. All the systems participating were concerned about such inadvertent disclosure, but the urban public hospital system participating was particularly concerned because it serves a disproportionate share of patients with these conditions. Interviewees also said that patient release was complicated by inconsistencies between federal and state laws or requirements for release of patient information. They hoped that establishing a federal "opt out" policy could increase the amount of data available for disclosure in states that had not adopted such a policy for any kind of information exchange (not just for particularly sensitive information).

Third, the health care executives interviewed wanted federal help in developing methods to better identify unique patients, an issue recognized as both technically challenging and politically sensitive. They expressed concern over error rates associated with "fuzzy logic" matches and perceived the lack of a reliable patient identifier as a big barrier to exchange as well as a serious patient safety concern.

Fourth, health system executives interviewed were concerned about providers that were excluded from MU payments. They were particularly concerned about post–acute care providers, given increased imposition of readmission penalties by Medicare and other payers. Some favored (at least privately) shifting some of the funds used to support MU payments for hospitals or physicians to facilitate the inclusion of post–acute care providers in the MU program so that they could create better mechanisms for exchange.

Finally, these health systems were concerned with aligning payment and delivery incentives with MU incentives that encourage investments in health IT. As one interviewee noted, "Payment policies have to be clear, so that institutions making strategic investments can know that payment will reward such care—for example, e-visits and telemedicine." This interviewee perceived the convergence of payment and delivery models as a powerful motivator of exchange but recognized that, ultimately, expectations needed to be rewarded. Another interviewee, who was not as convinced that payments would shift from the fee-for-service base currently in place, suggested modifying fee-for-service payment to reward providers for sharing information openly. A third interviewee suggested paying more attention to the need for new exchange standards to support emerging support services—such as those that act as referral centers, assigning patients to providers based on clinical documentation and provider availability.

**DISCUSSION**

This paper examined the approach to HIE and priorities in six large hospital-based systems that are in the forefront of exchanging information with external providers. All six reported that they made external exchange decisions locally, even if the system spanned a wide geography. Generally, exchange favored providers involved in the care of the system's patients and gave preference to providers sharing the same EHRs. The kinds of information shared externally were much more limited than those exchanged internally and were generally based around private exchange models. Although most systems supported public exchange, the interviewees generally saw pubic exchange as a supplement to their own efforts and did not appear to have high expectations for it—although, they might not say that publicly. Systems prioritized exchange, focusing first internally and then on those providers most closely affiliated with them. Some of these systems were reluctant to share data with competing hospitals, although they might do so if conditions were right.

Each of the six systems has made some form of exchange a priority—in some cases, for many years. In doing so, they have had to balance competing demands and environmental constraints. All else being equal, large systems have put what they view as substantial resources into support for exchange. However, limited internal interoperability, limited uptake of EHRs among some important provider groups, and the fact that external exchange solutions needed to be uniquely tailored to each community all have created challenges.

In most markets, systems reported that there were few broad-based mechanisms for external exchange before HITECH, so these have had to be built from scratch. Many of the system executives interviewed were in the forefront of developing such mechanisms through public or, more often, private means. In most cases, current external exchange still was relatively rudimentary, particularly between hospitals and the outside physicians and specialty providers using their services. From the hospitals' perspective, officials would like better ambulatory and post acute care data on their patients. But they say getting this information from outside providers was challenging when many post acute providers and outside physicians did not have a functioning EHR and those that did used a diversity of products that complicated electronic exchange with them. Yet, systems saw a business case for exchange and were continuing to pursue it as a goal. They did not, however, necessarily see a case for comprehensive exchange across all providers and indicated their interest was on more targeted exchange that can grow over time.

These findings about what external exchange currently means reflect the experiences of only a small number of hospital systems. Even though these systems were more active in health information exchange than many of their peers, what they exchanged still fell far short of the free flow of data envisioned by HITECH to support clinical care and to address such public goals as population health and health services research (Blumenthal 2010). Among the six systems interviewed, there were few instances in which comprehensive data were shared widely. More often, exchange mechanisms required an initial contact to assess whether a patient was in a database, followed (if affirmative) by a query and receipt of a limited set of data for that patient—only some of which could be directly imported into the electronic medical record. The one public HIO that stored a considerable amount of data was seen by its supportive hospital

system member as experiencing challenges in managing the data in a way that provided timely information to providers. Yet, interviewees viewed limited exchange to have considerable potential value to those they served, particularly if such exchange focused on a specific need in a timely fashion.

From the authors' perspective, in light of these and earlier findings on the challenges of broad-based external exchange, it is perhaps appropriate to review expectations with respect to electronic interoperability and to set more realistic goals. Such goals should focus on enhancing information exchange incrementally, starting with exchange of information in areas that providers and other stakeholders appear to value most.

Several potential priorities stand out from our small study. First, the federal government could do more to make exchange more feasible across providers by limiting the ability of vendors to create barriers to interoperability across systems. For example, certification requirements could encourage open architecture and mandate that core features of CCDs be standardized so they are truly "plug and play." Second, despite work by federal and state governments, there remain uncertainties on disclosure of sensitive information that complicate data sharing and make it harder to support care for vulnerable patients who receive care across a variety of settings. Although removing uncertainty is a challenging goal, providers could receive more guidance, operational tools that help identify problem areas, and standards for best practices that might serve as safe harbors. Third, more resources could go into supporting tools for the specific types of exchanges sought by users (such as open source software for population-based care management with ACOs or communities) and using EHR certification requirements to encourage vendors to support such functionalities. Such effort need not be restricted solely to "use cases" valued by providers but also could include specified public health goals.

In conclusion, this study adds to existing research highlighting the challenges in establishing effective broad-based exchange mechanisms that are sustainable at the community level. Among the large systems that participated in this study, there has been an evolution toward more comprehensive EHRs and the associated infrastructure to support electronic exchange of information both within and across providers. The challenge facing policymakers is to effectively harness such activities to maximize the value to health care delivery—for individual patients and for the broader societal goals of effective health care and public health that improves the health of the population.

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**APPENDIX A**
**TOPICS FOR INTERVIEW**

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We are interested in learning more about your organization's specific experience and thinking over the past few years and, going forward, about the value to you of sharing electronic health information with those outside your organization through some form of HIE.

**Background**

- How is the responsibility for decisions about health IT—particularly decisions about the exchange of information with outside physicians and hospitals—assigned?

- What is done centrally within individual hospitals or markets?

- For background information, of all the hospitals in your system, roughly what proportion have attested for Stage 1 Meaningful Use payments? Do you intend to attest for Stage 2?

- Does your system use a common EHR vendor? Which one? To what extent are providers in your system linked internally to one another?

**Experience with exchange**

- To what extent do the hospitals in your system participate in the exchange of information with physicians or hospitals outside your system? (If this does not occur, probe why that is).

- What information (data) do you share? With whom? Since when?

- Do these exchanges involve post–acute care, long-term care, or behavioral health care settings or do they involve mainly acute care medical settings?

- What kind of organizational interfaces do you use? (Probe for information about vendor versus community and HIE versus other forms of exchange.)

- Why did you pursue these arrangements?

- What benefits do you derive (for example, value-added services)?

- What do you contribute to the exchange in return (for example, data, financial support, and so on)?

- Can you provide more detail on how exchange works in the hospitals where it is most developed and extensive?

- What reasons explain why exchange is more extensive there than elsewhere (for example, the role of market, firm, national environment, policies, and so on)?

**Organizational perspectives on the business case for exchanges**

We are interested in how your organization views the business case for exchange of electronic health information on your patients with providers outside your system. (Business case refers to the factors you consider trading off in terms of value to your organization.)

- What are the main strategies your system is pursuing to compete in the market given the growing concerns surrounding delivery reform, cost control, and enhanced quality?

- To what extent is exchange via HIEs critical to the success of your organization?

- How important is the ability to exchange information with outside providers to you in addressing delivery and payment reforms—for example, the push to accountable care or penalties for readmissions? Why?

- To what extent is your strategy relating to delivery reform and exchange and responding to Medicare interest versus interest by other payers (for example, Medicaid or commercial payers)?

- What products of exchange are most valuable to your organization? Do exchanges currently provide these?

- Are there particular kinds of data that you are more reluctant to share?

- How do costs factor into the discussion of exchange of data?

- Does it cost more or less to use private versus public exchanges? How has that affected your decision making?

- To what extent are you participating in the public exchanges that are up and running in your markets? Why or why not?

- To what extent do you look at who participates in an exchange as determining value? Which participants are most valuable to you?

- When you are making decisions, for whom are you deciding (that is, what parts of the organization you are involved in committing)? How does that compare to how you think about your organization strategically in terms of key partners?

**Influence of federal policy**

- How important are HITECH's Meaningful Use incentives in your decision to share information? Will Stage 2 requirements increase your interest in sharing?

- How important are payment changes (for example, ACOs or readmission penalties) under the Affordable Care Act to your interest in sharing?

- Are there specific policies that ONC or CMS could consider to enhance the business case for exchange?

- Are there actions that the federal government could take that would encourage you to be more willing to exchange? Less willing?

- What else could be done to make exchange more valuable to you?

- Is there anything else you think ONC would find useful to understand about issues for your organization with HIE?

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## AUTHORS' NOTE

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