

RESEARCH REPORT

# Opportunities to Improve Data Interoperability and Integration to Support Value-Based Care

## Lessons from Stakeholder Interviews

*Fredric Blavin*  
URBAN INSTITUTE

*Laura Barrie Smith*  
URBAN INSTITUTE

*Christal Ramos*  
AMERICAN INSTITUTES FOR RESEARCH

*Gary Ozanich*  
HEALTHTECH SOLUTIONS

*Alex Horn*  
HEALTHTECH SOLUTIONS

July 2022





## ABOUT THE URBAN INSTITUTE

The nonprofit Urban Institute is a leading research organization dedicated to developing evidence-based insights that improve people's lives and strengthen communities. For 50 years, Urban has been the trusted source for rigorous analysis of complex social and economic issues; strategic advice to policymakers, philanthropists, and practitioners; and new, promising ideas that expand opportunities for all. Our work inspires effective decisions that advance fairness and enhance the well-being of people and places.

# Contents

<b>Contents</b>	<b>3</b>
<b>Acknowledgments</b>	<b>iv</b>
<b>Opportunities to Improve Data Interoperability and Integration to Support Value-Based Care</b>	<b>1</b>
Introduction	2
Methods	3
Selecting Case Study Sites and Interview Participants	4
Interview Structure, Content, and Analysis	6
Findings	6
What Data Integration Looks Like in Practice	7
Uses of Data Integration to Support Value-Based Care	9
Barriers to and Facilitators of Data Integration	12
Conclusion	18
<b>Appendix. Site Selection Memo</b>	<b>21</b>
Site Selection	22
Interviewee Selection	24
<b>Notes</b>	<b>31</b>
<b>References</b>	<b>32</b>
<b>About the Authors</b>	<b>33</b>
<b>Statement of Independence</b>	<b>35</b>

# Acknowledgments

This report was funded by the US Department of Health and Human Services' Assistant Secretary for Planning and Evaluation and the Office of the National Coordinator for Health Information Technology. We are grateful to them and to all our funders, who make it possible for Urban to advance its mission.

The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute's funding principles is available at [urban.org/fundingprinciples](https://urban.org/fundingprinciples).

The authors are grateful to Teresa Manocchio, Amanda Cash, Ryan Mintz, Vaishali Patel, Talisha Searcy, Jordan Everson, Julia-Adler Milstein, Steven Lane, Jeff Chin, Catherine Olexa, Hans Buitendijk, David Horrocks, Rim Cothren, and Jitin Asnaani for their input throughout the project. In addition, the authors would like to thank Sarah Coquillat, Haley Samuel-Jakubos, DaQuan Lawrence, Diane Arnos, and Anthony Gray for their assistance with interview data collection.

# Opportunities to Improve Data Interoperability and Integration to Support Value-Based Care

In value-based models of health care delivery, providers are financially rewarded or penalized on the basis of the quality of care they provide to patients, typically measured by patient outcomes. The specifics of value-based care models can take several forms, but in many cases—such as in accountable care organizations (ACOs)—they involve risk sharing or shared savings arrangements between multiple payer and provider organizations. To achieve the goals of value-based care, all involved organizations must be able to effectively share and integrate data from multiple sources.

Using qualitative case study interviews, this report aims to inform efforts to improve data integration to support value-based care. We conducted interviews with individuals across 21 organizations selected for the prevalence of value-based care or evidence of advanced data integration. These stakeholder interviews focused on the current state of data integration, the uses of data integration in value-based care, and the barriers to and facilitators of data integration. Our approach was guided by a framework that focuses on the technical, organizational, and environmental factors affecting data integration. Our main findings are as follows:

- The organizations selected had inconsistent definitions of data integration and varying levels of integration. This suggests that context is critical for interpretation, and generalizing about data integration across organization types, settings, and uses of integrated data is challenging. Interviewees' understanding of data integration depended upon their roles within an organization and how they used or supported the use of data.
- Interviewees identified four primary uses for data integration in value-based care: point of care, care coordination, quality measurement and reporting, and population health.
- Higher levels of integration are not necessarily required or even desirable across all use cases. Interviewees across organizations indicated that viewing data from outside sources at the point of care in a consistent location within the electronic health record (EHR) is preferable to integrating (e.g., parsing) the outside data into the local incidence of the patient record. However, higher levels of data integration are needed for quality measurement and reporting and population health, because both require special effort in data curation and standardization.

- Interviewees identified the following as barriers to data integration in value-based care: problems with EHR developers, technical issues associated with Continuity of Care Documents and standards, the high costs of data integration relative to its benefits (i.e., value), legal concerns, and the relationships between payer and provider organizations. Interviewees also indicated the roles of the patient and workforce development within organizations are often overlooked in existing data integration frameworks.
- Facilitators of data integration included supportive public policies such as those encompassed in the 21st Century Cures Act (Cures Act),<sup>1</sup> the expansion and increased support of value-based programs, the trend toward increased data sharing between provider organizations, interoperability between large vendor systems, and data sharing with state agencies.

The findings from this report suggest various interventions could further promote data integration. First, the Office of the National Coordinator for Health Information Technology (ONC) could do more to hold EHR developers accountable for facilitating data integration. Second, payment reform could be designed to incentivize data sharing and the use of shared data. Third, incentive payments could be used to support infrastructure development for data sharing and the integration of other high-value data, including population health data, social determinants of health data, and imaging studies in standardized datasets. Finally, the implementation of new policies directed by the Cures Act—such as the United States Core Data for Interoperability (USCDI), applications based on Fast Healthcare Interoperability Resources (FHIR), information blocking rules, and the EHR Reporting Program—could facilitate data integration while simultaneously improving data liquidity, lowering costs, and enhancing health information technology.

## Introduction

Public and private payer value-based care initiatives are attempting to reform health care by providing incentives to deliver higher-quality care at a lower cost. For health systems to succeed in value-based payment models that hold them accountable for the health of the population they serve, they need to be able to use shared data from multiple places where their patients receive care.

Under the Health Information Technology for Economic and Clinical Health Act, the federal government made a substantial investment to build infrastructure for interoperable health information exchange. Additional public policies under the Cures Act complement that legislation and are designed

to promote interoperability and data integration. Though progress has been made in the adoption of EHRs, more progress is needed to achieve widespread interoperability.

Interoperability is often defined as the ability to send, receive, find, and integrate data from outside sources. As such, data integration could be considered the final step of interoperability, where the shared data reach their intended recipients in a usable way. However, providers across health care settings report they are less likely to be able to integrate data from outside sources than they are to send, receive, and find such data (Ozanich and Ramos 2020), suggesting more work is needed to promote data integration. Improving the integration of data is essential to facilitating the widespread use of shared patient data to inform decisionmaking at the point of care, enhance care coordination, manage population health, and enable quality measurement—all of which are necessary to achieve the goals of value-based care.

Though some evidence shows that technical, organizational, and environmental factors affect data integration (Ozanich and Ramos 2020), research on what data integration currently looks like in practice and research on specific facilitators of and barriers to integration are limited. The purpose of this report is to inform future efforts to improve data integration by summarizing findings from interviews with stakeholders on

- what data integration currently looks like in practice,
- uses of data integration to support value-based care, and
- barriers to and facilitators of data integration.

## Methods

We first conducted an extensive literature review and engaged with a technical expert panel (TEP) to develop a framework for understanding the current state of, uses of, and barriers to and facilitators of data integration. The researchers identified the TEP with input from the US Department of Health and Human Services' Office of the Assistant Secretary for Planning and Evaluation and the ONC; it consisted of a diverse group of seven professionals in varied roles engaged with data integration across settings, including value-based care. Using information from the literature review and TEP, we then wrote a brief that included models contextualizing data integration and factors affecting data integration (Ozanich and Ramos 2020).

Next, we applied these findings to conduct case study interviews that focused on data integration and lessons learned, the subject of this report. Our approach involved selecting case study sites; conducting interviews with key informants; and summarizing themes from the interviews to report on the state of data integration, uses of data integration to support value-based care, and barriers to and facilitators of data integration.

## Selecting Case Study Sites and Interview Participants

We targeted interviewees in locations with different types of infrastructure to support health information exchange and with provider-reported engagement in data integration; we also considered the maturity of value-based care in the state. We initially selected Colorado, Indiana, Michigan, New York, and Utah and aimed to interview key stakeholders involved with data integration in each state, including those from health information exchanges (HIEs), hospitals or health systems, ambulatory providers, and payers driving value-based care. We identified interviewees through a network analysis of referral patterns to detect hospitals that share large volumes of patients with other organizations, the project team's knowledge of the sites and professional networks, and the snowball technique (i.e., allowing study participants to make recommendations for other interviewees). Our aim was to interview representatives of organizations where a higher degree of data integration is likely occurring. See the appendix for additional details on the site and interviewee selection processes.

We began recruiting interviewees in June 2020. Because of difficulty engaging providers during the COVID-19 pandemic, we expanded our targeted locations to include Maryland, Georgia, and North Dakota, which also met our criteria. Each of these states has HIEs receiving substantial support from payers, an upgraded infrastructure, broad provider reach, and evidence of value-based initiatives. Because of potential overlap, we ultimately excluded Utah from the sample of sites after technical integration occurred between Utah's state HIE and another HIE in Colorado already included in the interviews. Table 1 lists the locations where we recruited interviewees and summarizes the infrastructure to support HIEs in each location.



TABLE 1

**Key Features Relevant to Interoperability in Interviewee Locations**

<b>Location</b>	<b>Key features</b>
Colorado	The state has multiple state health information exchange organizations focused on different areas and provider types (CORHIO, Quality Health Network, Colorado Community Managed Care Network).
New York	The state has high maturity in value-based care and relatively low hospital use of national exchange networks, and it lacks a highly dominant vendor.
Indiana	Indiana has a CMMI ACO and low hospital use of national exchange networks, and it recently consolidated multiple RHIOs into one statewide entity.
Michigan	Successful data integration efforts have been undertaken by Michigan Medicine, and interoperability is driven by the dominance of a single vendor. The state has high hospital use of national and vendor exchange networks, and a centralized entity integrates the network of networks (MiHIN).
Maryland/DC	The region has a strong HIE (CRISP). Maryland has a CMMI ACO and a unique all-payer model for hospital payments.
Georgia	Georgia Health Information Network (GaHIN) was separated from state government but maintains close links and integration with state agencies and is the largest HIE; it is a recipient of the ONC STAR HIE program.
North Dakota	North Dakota's HIE (NDHIN) has replaced its technological infrastructure. With the update, the state is experiencing a substantial uptick in data exchange and integration and appears to have highly cooperative and engaged stakeholders and an increased movement to shared-risk reimbursement models. Payers pay an annual per member fee to support the interoperability infrastructure. North Dakota has five tribal nations, all of which are integrated with the NDHIN.

**Source:** Urban-HealthTech team's knowledge of locations.

**Notes:** CMMI = Center for Medicare and Medicaid Innovation. ACO = accountable care organization. RHIO = regional health information organization. HIE = health information exchange. ONC = Office of the National Coordinator for Health Information Technology.

In all, we spoke with representatives of 21 organizations, including chief executive officers, chief medical information officers, chief information officers, chief technology officers, practice managers, and practicing physicians. In most locations, we spoke first with staff at the state or regional HIE, who recommended provider organizations with experience using integrated data from outside sources. Therefore, the perspectives we heard are more representative of examples where state or regional HIEs served as a primary exchange modality and facilitator of data integration (as opposed to Direct Secure Messaging, vendor networks, eHealth Exchange, or CommonWell).

Organizations in Colorado and Michigan were most heavily represented (table 2). HIEs and ambulatory providers were the most common organization types represented. The ambulatory provider organizations included a Federally Qualified Health Center and primary care, pediatric, and gastroenterology practices. EHRs used by provider organizations included Athenahealth, Cerner

Corporation, eClinical Works, EPIC Systems, Meditech, and Practice Fusion. Staff at the HIEs reported interconnection with an array of EHR products, but principally Epic and Cerner.

**TABLE 2**  
**Characteristics of Interviewee Organizations**

<b>Characteristics</b>	<b>Number of interviewee organizations</b>
<b>Location</b>	
Colorado	5
Georgia	1
Indiana	2
Maryland/DC	3
Michigan	7
New York	1
North Dakota	2
<b>Organization type</b>	
HIE	8
Hospital or health system	6
Ambulatory provider	6
Long-term, post-acute care	1

**Source:** Interviews conducted by Urban-HealthTech team.

**Note:** HIE is health information exchange.

## Interview Structure, Content, and Analysis

Interviews lasted 60 minutes and were conducted over Zoom using a semi-structured interview guide that covered the current state of data integration in the interviewee’s organization; how interviewees are using data integration to support value-based care; and technical, organizational, and environmental facilitators of and barriers to data integration. Based on recommendations from the TEP and findings from the research brief (Ozanich and Ramos 2020), the interview instrument focused on four use cases of how data integration supports value-based care: point of care, care coordination, quality measurement and reporting, and population health management. We recorded, transcribed, and coded interviews using NVivo qualitative analysis software to facilitate thematic analysis.

## Findings

This section first describes the definitions and uses of data integration in practice. The second section assesses the uses of data integration for value-based care as described and prioritized by the interviewees. The final section provides an analysis of barriers to and facilitators of data integration.

## What Data Integration Looks Like in Practice

### DEFINING LEVELS OF DATA INTEGRATION

As the initial part of this study, we assessed the state of data integration and employed a TEP to develop models for defining levels of integration and analyzing the factors affecting integration (Ozanich and Ramos 2020). During the second phase of the study, we asked interviewees to assess the appropriateness and validity of these models, recommend any changes or enhancements, and apply them to what data integration looks like in practice.

Figure 1 depicts three principal domains (workflow, usability, and technology) of data integration and descriptions of relative levels of integration. While interviewees generally agreed that the model captures the key elements of data integration, they suggested nuances are not represented. One interviewee suggested that “the model is too flat”; that is, the model is linear and does not capture complicated processes and interrelationships between the domains. In practice, different levels of integration may occur across the domains and act as constraints or catalysts between one another.

**FIGURE 1**  
Levels of Data Integration

	Lower levels of integration	Higher levels of integration
<b>Workflow</b>	Data is shared but <u>siloed</u>	Data incorporated into user workflows
<b>Usability</b>	Data is not in a useful format	Data is usable for patient care, analytics, reporting
<b>Technology</b>	Focus on exchange modality & local storage	Technology agnostic; Support of semantic understanding across settings

**Source:** Gary Ozanich and Christal Ramos, “Maximizing Data Interoperability and Integration to Support Value-Based Care” (Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation, 2020).

For workflow and usability, while higher levels of integration should enable end users to more easily access and use data, not every use or setting requires the same level of integration. As such, the definition of integration and associated levels of integration varied across the study organizations. For example, most representatives of ambulatory providers considered the ability to log into a view-only portal with a separate sign-on to see information and the manual scanning of faxed data into an EHR to be data integration. However, staff at HIEs and health systems generally did not classify these activities

as data integration; rather, they expected a greater degree of workflow and system integration for data to be considered integrated. These differences appeared to be linked to an interviewee's relative level of experience with technology and, more importantly, to the perspective that all used or viewed data from an outside organization are considered integrated. As depicted in figure 1, degrees of support for data integration vary by workflow and other processes based on organizational or technical factors. As further described in the next section, not all use cases need to be supported by higher levels of data integration or maximum use of technology, even within the same organization. Rather, providers view data integration as an optimization process that balances trade-offs between workflow, usability, and technology and that considers the relative position of a use case and the organization within the process depicted in figure 1.

Technology was less of a focus in the discussion than workflow or usability. As one interviewee indicated, “[It] does not matter where data is stored. The question is, can the user get access to the right information at the right time in a response time that is acceptable for the job at hand?” In addition, interviewees described data standardization as more important than exchange modality or storage issues. As one interviewee pointed out, “The more standardized, normalized we can make the data, by far the better, because it just makes things much more efficient, recognizing that there’s a lot of different workflows and ways that people need this data.”

#### VARIATION IN RESPONSES BY ORGANIZATION TYPE

The use of data integration across the three organization types differed significantly, with staff from health systems and HIEs providing more examples of advanced data integration than those from ambulatory care providers. For example, Michigan Medicine and Luminis Health (Maryland)—health systems in markets with greater integration with payers—provided examples of high levels of integration (e.g., integrated social determinants of health data, such as housing and school data; care team alerts providing notification of care plans across systems; networks to exchange images; and registries to share data between ACOs and health systems). These examples cover the uses discussed in this analysis, from point of care and care coordination (e.g., care team alerts and registries to share data) to population health management (e.g., social determinants of health data).

Interviewees from HIEs also described examples where they are integrating multiple data sources made available to all providers. The most common example was providing data exchange with state agencies, primarily with public health and Medicaid agencies and data from Prescription Drug Monitoring Programs (PDMPs). One HIE described a recent ACO initiative where “[they are doing] much more with data quality and analytics...for diabetes, it’s mining the claims data and clinical data to

determine who is potentially prediabetic and then [generating] a care alert or a score in some kind of push notification to say this person is eligible for a program.”

Across all interviewed organizations, most examples of data integration relate to point-of-care use; examples of data from outside organizations being parsed into the patient record were limited. Even within a single vendor ecosystem, information from external systems (e.g., templates for notes, labs, and reports) tended to be viewed rather than incorporated into a local instance of an integrated or unified record. As an interviewee from an HIE described, “We find that people don't want all the discrete data [from outside sources] throughout their system; they'd rather just train providers to look in the section they want to look in. So, if you're [a provider] interested in images, you know how to find the images.”

Another observation from clinical care users was an assumption that higher levels of integration may not necessarily reflect greater use of data from outside sources. It appears that an optimal level of integration represents a trade-off between costs, technical functionality (e.g., EHR capabilities), workflow, and use that evolves over time. Workflow may effectively be supported by a lower level of integration in some organizations; that is, viewing a single record from an outside source may be preferable to having that record integrated into the local instance. Only viewing a record may provide quick access to key information and the context of associated notes and data for that specific encounter in one location.

To summarize, these findings suggest that context is critical for defining and interpreting data integration, and that data integration should not be perceived as simply occurring or not occurring. For the interviewees, the difference in defining and interpreting data integration appears to be driven by two factors: (1) lower levels of integration meeting the needs of many providers and (2) different levels of technical expertise and understanding of potential functionality within the types of organizations interviewed. The interviewee definition of integration is focused on fitting into workflow and being usable for the task rather than being a technical definition.

## **Uses of Data Integration to Support Value-Based Care**

Value-based care encompasses various payment and delivery models, typically where health systems and payer organizations have some element of shared risk or reimbursement linked to specific performance outcomes. Our interviews identified numerous use cases and activities associated with data integration that support or enable value-based care. Interviewees at all organizations suggested that higher levels of data integration are needed to achieve value-based care, but they also argued that the limited number of value-based programs and patients covered was preventing any catalyst that

might drive higher levels of data integration. Interviewees suggested that the rate of value-based care was also slowed by shifts in policy and organizational priorities amid the pandemic.

This section focuses on four principal use cases associated with data integration for value-based care: point of care, care coordination, quality measurement and reporting, and population health management. Interviewees indicated that the availability, utility, and effort required to drive higher levels of integration vary by these uses of the data.

## POINT OF CARE

All interviewees identified information availability at the point of care as being a principal use for data integration. Interviewees from several organizations indicated that requests by frontline clinicians for patient information are the principal driving force and use case for integration at this time. Examples of the types of point-of-care data identified, which move beyond standard clinical information, include COVID-19 tests, social determinants of health data, PDMP information, lab results, imaging studies, and claims data.

For the point of care, efficient and consistent access to information is paramount. However, the nature of the data needed at the point of care varies by specialty, use, and setting. Interviewees from both health systems and ambulatory providers described viewing data from outside sources rather than having them integrated into local records for this use case. Interviewees from all the HIEs noted the importance of having that access through a single sign-on within the EHR to support workflow.

## CARE COORDINATION

Care coordination is another key use of data integration in value-based care. Although similar to point of care, care coordination differs in that it provides data across organizations that touch a patient, including specialists, community organizations, and payers. Sharing data is central to organizing patient care activities such as transitions in care between facilities, specialty referrals, and social support. Improved care coordination in value-based care settings can lead to improved outcomes, which also benefit payer organizations.

Data integration affects care coordination in various ways, including through admission, discharge, and transfer alerts (ADTs), which notify stakeholders (e.g., the care team, payers, consulting providers) of a change in the location of care for a patient and provide access to a patient's record during the transition in care or during care at a new location.

Other examples of care coordination mentioned by interviewees included the integration across payer and provider organizations of clinical and claims data for precertification to prevent redundant tests and ensure appropriate treatment. Another example is closing the loop on patient referrals. These require different levels of integration; while precertification only needs a view of the patient's record, closing the loop requires integration of a consult note into the patient record. Interviewees also mentioned more challenging opportunities for closed-loop referrals, such as closing the loop between a provider and a social service agency (e.g., a food bank).

Interviewees described the level of data integration required to support care coordination as similar to the level required for point-of-care use. While the range of information is expanding, the exchange and integration of the type of information needed for the point of care and care coordination are very much in line with the traditional vision for health information exchange and the Health Information Technology for Economic and Clinical Health Act programs (e.g., getting the right information to the right place at the right time for patient care). Both the care coordination and point-of-care use cases do not require the level of data integration required for advanced uses, such as outcome measurement or predictive analytics.

## QUALITY MEASUREMENT AND REPORTING

Quality measurement and reporting is a third use of integrated data. Performance measurement and incentives, often based on quality indicators, are principal mechanisms underlying value-based care and payment models. Interviewees indicated data sourced from a broad range of providers, particularly those outside a health system, provide a more accurate picture of the care provided and thus represent important inputs for quality measurement. Interviewees indicated that in many cases, providers showed improved quality measurement and were more likely to reach incentive targets when a fuller set of integrated data was available. On the technical side, the integration of data into a single record makes reporting electronic clinical quality measures more efficient, reliable, and valid.

A high level of data integration is needed to facilitate quality measurement and reporting, including data curation consisting of cleaning and standardizing information. Having more patient data may be associated with improved quality performance and reimbursement but comes at a cost of the time, effort, and technical sophistication required to achieve this level of data integration. Interviewees also indicated that while this advanced level of data integration is impossible to accomplish across all data within a system at this point, it may be achievable for target populations or key datasets.

## POPULATION HEALTH MANAGEMENT

Interviewees identified population health management as another important use of data integration in value-based care. Interviewees provided a distinction between quality measurement and reporting and population health. Quality measurement and reporting is a process that has a financial component linked to reimbursement. Population health focuses on value-added uses of the data (e.g., predictive analytics) and is viewed as a newer or future use for integrated data. Population health management involves the analysis and review of patient populations to promote public health and identify emerging issues, gaps in care, and disparities. A robust set of integrated data available from multiple sources on a timely basis is central to the effectiveness of population health management.

Like for quality reporting, an advanced level of data integration is required to support effective population health management and analytics. Data from disparate sources and various outside entities are critical to building insights into population health. Much of these data, such as data on social determinants of health, may be unstructured or semi-structured, presenting an even greater challenge and requiring a level of data integration that perhaps exceeds what is necessary for day-to-day clinical care. Interviewees also identified access to protected data, including behavioral health, as a challenge to the integration of data to support population health management.

### **Barriers to and Facilitators of Data Integration**

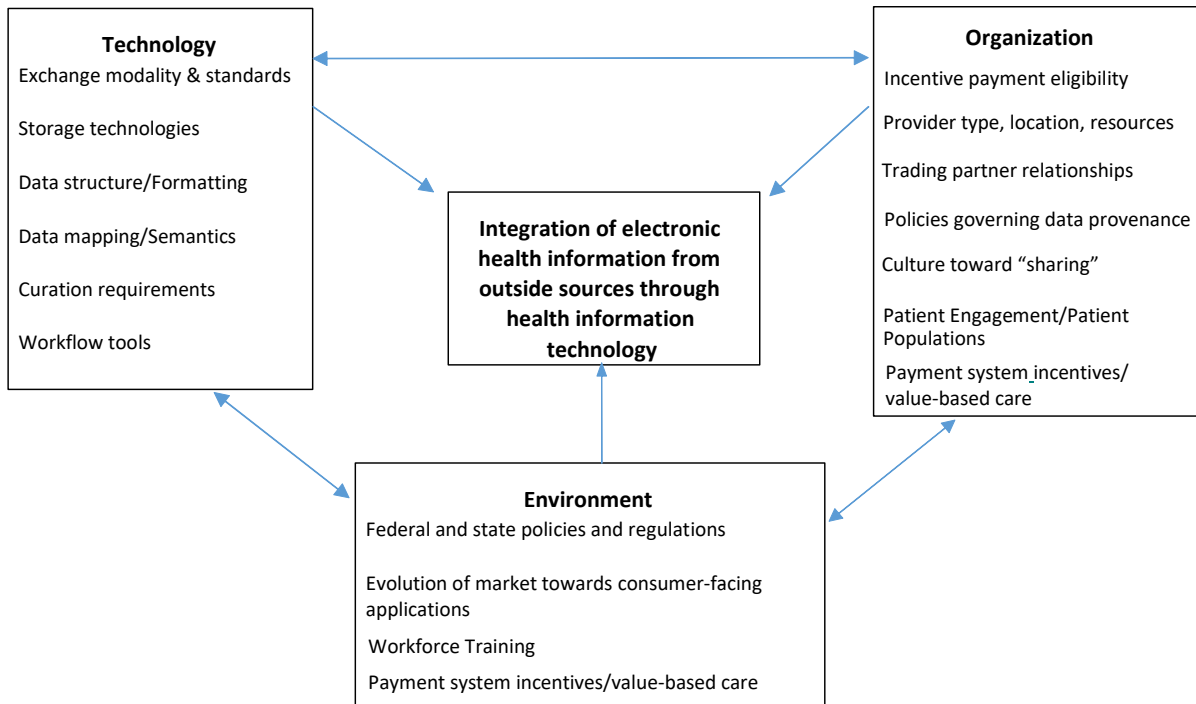
Our interviews revealed many different barriers to and facilitators of data integration. Below, we discuss these findings according to the Technology-Organization-Environment framework (figure 2). This framework has been used in other research on health information exchange and highlights how the adoption of innovations is based on these three factors (DePietro, Wiarda, and Fleischer 1990). Overall, we found that these three factors interact with one another and have different impacts on data integration uses and organizations.

Some criticisms of the original framework emerged from the interviews. Specifically, interviewees were concerned that patient engagement and workforce development were missing from the framework. Figure 2 provides an updated model that incorporates these additional factors.



FIGURE 2

**Technical, Organizational, and Environmental Factors Affecting Data Integration**



Source: Adapted from R. DePietro, E. Wiarda, and M. Fleisher, "The Context for Change: Organization, Technology, and Environment," in *The Processes of Technological Innovation*, ed. Louis G. Tornatzky and Mitchell Fleischer (Lexington, MA: Lexington Books, 1990), 151–75.

Overall, interviewees clearly stated that the use case and environment and organization types shape the importance of technology in data integration. As described by an HIE interviewee, an organization is limited by “two factors—what your EHR can do and then also what your providers want.” The first factor, technology, cannot be considered without the context of the environmental and organizational factors.

**TECHNOLOGICAL BARRIERS AND FACILITATORS**

The technology category encompasses various elements required to support data integration that can be facilitated or hindered by EHR developers’ capabilities. Vendor selection and capability emerged as a significant technological facilitator of data integration. Several interviewees noted substantial and efficient exchange and integration capabilities provided between Epic customers, although implementation of products from the same vendor does not guarantee interoperability (Pylypchuk et al.

2021). In general, our findings are consistent with research that finds that providers that share the same vendor are, on average, more interoperable and likely to share records (Bernstam et al. 2022).

Numerous interviewees identified data integration problems with specific vendor products. As described by one HIE interviewee, “Some EHRs are more integrated than others and [one ambulatory product vendor] that a lot of clinics use hasn’t been easy to work with...We’re really looking forward to a day where the interoperability is better, but we are definitely not there.” Another interviewee identified the problem of “small providers trapped in [bad] technology, who don't have access to a lot of capital.” They added, “Those folks are really struggling, but they’re also the people more inclined to use these other tools, so not just their EHR for everything.”

All organization types identified Continuity of Care Documents as a barrier to data integration because of their complexity, size, and limited flexibility. While some interviewees acknowledged that Continuity of Care Documents are good in theory, they also expressed that they do not work well in practice. The major issues cited concerned the size and amount of information contained in the documents and the ability to find sought-after information.

The HIE interviewees exhibited substantial knowledge of the use of application programming interfaces (APIs), such as the SMART on FHIR, and the USCDI as an alternative approach to Continuity of Care Documents. At the time of the interviews, interviewees from both health systems and provider organizations indicated very little knowledge of these approaches. All the HIE interviewees reported some API initiatives using the SMART standard. Initiatives described in Michigan and Maryland included population health–focused activities and used custom-built solutions developed by the HIE organizations.

Another technology-related barrier included the personnel, time, and effort required for data standardization to support functional integration and useful applications. Effective data standardization, cleaning, and general curation are central to all uses of integrated data. Furthermore, the higher levels of data integration associated with value-based care, such as quality measurement and reporting and population health management, require even greater effort in standardization.

Relatedly, several interviewees expressed concerns that even when technologies are employed using some established standards, data integration may not be supported. As one interviewee stated, “I'm following the data standard. Well, that's nice, but what if there's garbage in the data standard, and for whatever reason, if you're looking at from a technical integration perspective? It's flowing through because, quote, it meets the standard, but the data may not be useful.” This pointed observation was indicative of frustration about how standards are implemented. Interviewees described data exchanged

using a current standard such as HL7 version 2.x as not reliably received and unusable without efforts to transform the data for use at the receiving location. Interviewees who discussed the newer standards using FHIR and the USCDI expected that these standards would tighten up the specifications and help solve the data integration problem.

Finally, workflow tools were also identified as a barrier to or facilitator of data integration. Interviewees mainly identified workflow factors as facilitating integration, such as grass-roots adoption, and demand for specific functionality among frontline clinicians, a single sign-on for data access, the value of applications such as PDMPs, alerts, and access to notes and summaries. These factors drive providers' demands for data integration; providers know what information they need depending on the specialty focus (e.g., the problem list, allergies, medications, and immunizations in family medicine) and want to know where they can find that information within the EHR interface and the data provenance for the information.

## ORGANIZATIONAL BARRIERS AND FACILITATORS

Organizational facilitators and barriers surrounding data integration are wide ranging. The primary issue identified in the interviews was the financial resources required to support the technology and effort needed for data integration. As previously mentioned, a clear trade-off exists between the benefits of advanced data integration and the cost of implementing high-level integration. As organizations increasingly adopt value-based care, increased availability of financial resources will be necessary to facilitate the adoption of richer, more integrated data to support the delivery system.

Relatedly, several interviewees identified a lack of payment incentives for data sharing and integration. In identifying financial value, one interviewee described that the “value of the health information exchange is realized by organizations in the data they receive, not in the data that they share.” This suggests an asymmetric relationship between the utility of contributing data to external entities and the information received from those entities. While this has been a traditional challenge with health information exchange, providers indicated concerns about this issue when sharing information with payer organizations and about the implications for care-making decisions linked to reimbursement or care approval.

Under value-based care models, more clinical information is shared between payers and providers than in traditional fee-for-service (FFS) models. For example, interviewees raised concerns about sharing data with outside trading partners under FFS models, particularly payer organizations. Under FFS models, reimbursement can be an issue between payer and provider organizations, with payers

pointing to potential waste in care and providers pointing to declines in approval for care. Providers were concerned that data sharing could result in this information being used by payers to shape care services and providers losing some autonomy. In contrast, one interviewee pointed out, “If you’re looking at data through a value-based purchasing or value-based care lens, there’s also the trust between the provider and payer, and we hear from providers that being able to talk the same language and measure the same way...is really the key to having trust and succeeding in value-based care.”

Though they described data sharing between provider organizations as a barrier to data integration, interviewees did not cite competition between health systems as a barrier to data integration; rather, they cited such competition as an area of improvement in recent years.

Interviewees also described legal issues as an organizational barrier to data integration and exchange, including

- the liability risk from low-quality and unreliable data being integrated into a record;
- data sharing with government agencies that may hinder patient privacy protection, including for undocumented individuals;
- concern about data breaches at organizations where data have been shared;
- receiving data that an organization should not have received (e.g., nonpatient or restricted data); and
- a lack of understanding of information blocking rules.

Finally, interviewees identified organizational culture and how organizations view data sharing as potential facilitators or barriers. One interviewee described organizational culture as being “a culture of sharing and trust” driven by the providers. An organization also needs to trust that the entities it is sharing data with will use the data appropriately and only for patient care. Overall, the interviewees in our sample were part of organizational cultures that support data sharing, which could have been driven by our sample selection process that intentionally selected organizations engaging in robust data exchange and adoption of value-based care.

## ENVIRONMENTAL BARRIERS AND FACILITATORS

The environmental factors centered on federal regulations, incentive payments, quality reporting, and practices of EHR developers. Most interviewees had significant experience in the field and had direct engagement with federal policies and regulations. While aware of new policies developed under the

Cures Act, interviewees did not have fully formed opinions on information blocking rules and other regulatory changes. Across the three types of organizations, interviewees did not mention the future role for consumer-directed exchange through third-party applications enabled under the Cures Act.

Incentive payments through the Merit-Based Incentive Payment System were also cited as incentivizing providers toward data integration to support quality reporting. As an interviewee observed, “[Centers for Medicare & Medicaid Services] value-based programs...influenced the features that the EHR developers developed to allow practices to participate [in] them.” Interviewees typically cited the collection and reporting of Merit-Based Incentive Payment System information as facilitators of data integration, and they did not indicate that alternative payment models have yet shaped EHR features. Technical modifications supporting these models were described as sponsored by the participants and undertaken on a local or customized basis. Interviewees also discussed the importance of providing additional incentive payments to further develop the infrastructure to support value-based care on the condition of participation in federally supported programs. This could create the critical mass needed for the creation and adoption of common technologies that support alternative payment models, such as those created by EHR developers to support the Merit-Based Incentive Payment System.

Alternatively, interviewees criticized various measures required to be reported for different value-based programs. One respondent commented, “All the value-based programs are all asking for different measures and they’re all being calculated slightly differently. That’s just driving the providers crazy because they are participating in all these programs....One wants it on a fiscal year, one wants it on a calendar year, and one wants it quarterly.” This could create inefficiencies and require an increase in resource allocation to support data integration for quality analysis and reporting. These findings suggest efforts should be made to standardize major measure specifications and reporting requirements.

In addition to playing a role on the technical side, the performance and behavior of EHR developers also acted as major environmental barriers to or facilitators of data integration. Interviewees had mixed views of developers; they ranged from an observation that, as one stakeholder said, “there is no love lost for [electronic medical record] vendors...[providers] feel nicked and dined by them and don’t necessarily trust them” to some providers’ positive observations about the largest developers, particularly related to the availability of data from outside sources. An interviewee suggested that prodding from ONC can help get vendors all in the same place and improve EHR performance and behavior for EHR developers. Interviewees were not aware of proposed policies and certification

requirements by ONC designed to improve and further standardize EHR performance, such as the EHR Reporting Program.

Finally, interviewees identified payers' active support of health information exchange as an environmental facilitator of data integration. Payer support took two forms: Most important is direct financial contribution to the operating budget of HIEs. The second form is through the contribution of data as a participant in the HIE. Two models exist: one uses a state fund created from capital from payer organizations that is dispersed to the HIE, and the second is a fee paid by payers based upon the number of lives covered. For example, a key to the development of data exchange and integration in Michigan was that the largest payer, who represents 90 percent of the population, partnered with the state-designated entity (MiHIN) and "heavily [incentivized hospitals] to send data for their covered lives." North Dakota is an example of the second approach, in which payers facilitate data integration, because the payers licensed in the state are required to pay an annual per member fee to the state HIE. This financial support provides the payer organization with a vested interest in the scope and types of data integration provided by HIEs while making HIEs more accountable to payers. These approaches may expand as value-based payment programs increase the incentives for payers to coordinate more closely with HIEs and provider organizations.

## Conclusion

Rather than thinking of data integration as an end goal, or as simply occurring or not, it is important to recognize different levels of data integration may support different goals for value-based care. Levels of data integration are best viewed on a continuum, with specific uses being based on the optimization of costs, workflow, and application. Higher levels of integration are not necessarily required for point-of-care use but are important to support population health management and quality measurement. Assuming the highest level of integration is appropriate for all settings ignores the costs associated with high levels of data integration and distracts from the potential for customization for different uses. Instead, the end goal should be to provide appropriate care to patients by ensuring providers can send, receive, and find what they need in the most efficient and effective manner, regardless of whether data are integrated into the EHR. It is possible to have too much information in an EHR, and customization in terms of what providers can view and when is needed.

Our interviews revealed both successful and unsuccessful examples of data integration in practice. Prescription drug monitoring programs were frequently mentioned as an example of successful, highly useful integrated data in which the federal government has significantly invested. Other successful

examples included the improved ability to sign into an HIE or vendor network (e.g., Epic’s Care Everywhere) and readily view a patient’s record (e.g., prior encounters at other locations). Less successful examples of data integration included quality measurement and population health management applications; interviewees described these activities as costly and technically challenging. However, interviewees noted potential for improvement through increased payer engagement and supportive public policies.

Technical, organizational, and environmental factors are key determinants of data integration, and value-based care will shape and be shaped by these factors. On the one hand, value-based care will drive the need for higher levels of integration, (e.g., by increasing the need to streamline quality measurement and reporting). On the other hand, the realization of value-based care will depend on how successfully data integration facilitates care coordination and population health. For example, using predictive analytics to identify high-risk patients, care gaps across provider organizations, and eligibility or need for social services requires high levels of integrated data from multiple sources.

The findings from this report suggest numerous interventions could further promote data integration.

- First, policymakers could do more to facilitate data integration. The implementation of new policies directed by the Cures Act—such as USCDI, FHIR-based applications, information blocking rules, and the EHR Reporting Program—have potential to facilitate data integration while simultaneously improving data liquidity, lowering costs, and enhancing health information technology. These policies can help providers overcome some of the technical barriers (e.g., USCDI and FHIR, by improving standards), organizational barriers (e.g., information blocking rules, by preventing or discouraging the access, exchange, or use of electronic health information when an actor knows or should know that these practices will likely interfere with accessing, exchanging, or using electronic health information), and environmental barriers (e.g., the EHR Reporting Program, by holding developers more accountable) to data integration (Blavin et al. 2022).
- Second, payment reform could be designed to incentivize data sharing and the use of shared data. As our interviewees noted, more clinical information is shared between payers and providers under value-based care arrangements than in traditional FFS arrangements. To further promote value-based care, federal funding could be used to support the development of infrastructure for sharing and integrating other high-value data, including population health data, social determinants of health data, and imaging studies in standardized datasets. This

could include incentivizing the use of new standards such as FHIR that make it easier to support data exchange and integration.

The successful exchange of electronic health data is key to ensuring the success of value-based care models. The current landscape of data exchange includes many successful examples of data integration in practice. However, technical, organizational, and environmental barriers continue to inhibit the full potential of data sharing and integration in supporting value-based care. Recognition that successful data integration is not a one-size-fits all objective and providing continued financial support and policy incentives to promote data sharing are key to ensuring data sharing and integration are successful and promote value-based care.



# Appendix. Site Selection Memo

The purpose of this memo is to describe our site and interviewee selection processes and propose 5 case study sites from an initial list of 10, as specified in the scope of work for this project, as well as initial contacts for proposed sites. The case studies will collect in-depth information on what levels of data integration are occurring, the barriers to and facilitators of data integration, and its use to support value-based care. Case studies will include interviews with hospitals and their trading partners with whom they share a large volume of patients and are engaged in efforts to share and integrate data about their patients, as well as other stakeholders such as payers and health information exchange organizations. The case studies will inform future efforts to define, measure, and promote more widespread, advanced levels of data integration to support value-based care.

Based on our background research for the issue brief, available data, and the input of the technical expert panel (TEP), we've selected our proposed list of locations, displayed in table 1.

**TABLE 1**

**Proposed Case Study Sites**

Hospital referral region	Most common EHR developers for hospital	Most common EHR developers for PCP	Rationale
Denver, CO	Meditech (25%) EPIC (25%) CPSI/Evident (18%)	Epic (29%)	Strong state health information exchange organization (CORHIO), HRR includes some rural areas
Manhattan, NY	Allscripts (30%) Meditech (20%) Epic (20%)	Epic (13%) Allscripts (11%)	High state VBC maturity Relatively low hospital use of national exchange networks Lack of highly dominant vendor
Salt Lake City, UT	Cerner (48%) Meditech (19%) Medhost (11%)	Epic (28%) Cerner (10%)	High reported data integration among hospitals (70%) Presence of CMMI ACO and rural areas in HRR Large share of hospitals using Commonwell (52%) and other national networks
Indianapolis, IN	Meditech (29%) Allscripts (29%) Epic (18%)	Cerner (54%) Epic (8%) Athena (6%)	Presence of CMMI ACO and rural areas in HRR Low hospital use of national exchange networks Indiana has multiple RHIOs using subscription model
Ann Arbor, MI	Epic (60%) Cerner (40%) Meditech (14%)	Epic (62%) Cerner (22%)	Successful data integration efforts by Michigan Medicine Interoperability driven by dominance of a single vendor High hospital use of national and vendor exchange networks Centralized entity in Michigan integrates network of networks (MiHIN)

Additional details on the proposed locations are displayed in tables 3 and 4, along with the additional locations that were among the initial 10.

## Site Selection

We've selected Hospital Referral Regions (HRRs) as the potential locations given the organizations within these regions are more likely to share patients and therefore have incentive to share data with one another. Criteria used to narrow down to 10 and then to 5 potential case study sites include the following:

- sufficient number of hospitals and skilled nursing facilities (SNFs) for analysis
- reported hospital and SNF engagement in data integration
- maturity in value-based care and/or presence of accountable care organizations (ACOs)
- variety of EHR developers dominant across sites
- variety in national health information exchange networks used across sites
- other features of the health care and interoperability landscape relevant to data integration

Data sources used in the selection process are displayed in table 2.

**TABLE 2**  
**Data Sources Used in Site Selection Process**

Data source	Information
AHA IT Supplement Survey, 2018	Number of hospitals in HRR Share of hospitals reporting regularly integrating data EHR vendor used by hospital
SNF Survey, 2016 and 2017	Number of SNFs in HRR Share of SNFs reporting regularly integrating data
IQVIA Physician Database, 2019	EHR vendor used by primary care physicians
Meaningful Use data, 2016	EHR vendor when vendor information missing from IQVIA
Change Healthcare Review of State Value-Based Payment Initiatives	Value-based payment maturity in state
CMMI website	Presence of ACOs participating in CMMI initiatives
Project team and TEP knowledge	Other features of health care and interoperability landscape relevant to data integration

TABLE 3

Characteristics of Potential Case Study Locations (Recommended Five Highlighted)

HRR	Integrating data (%)	State VBC maturity	CMMI ACO	Includes some rural	Primary hospital vendor (%)	Primary physician vendor (%)
Orange County, CA	Hosp: 42%, SNF: 40%	Medium	✓		Epic (38%)	Allscripts (13%)
Denver, CO	Hosp: 48%, SNF: 21%	Medium		✓	Meditech (25%)	Epic (16%)
Manhattan, NY	Hosp: 40%, SNF: 33%	High	✓		Allscripts (30%)	Epic (13%)
Erie, PA	Hosp: 44%, SNF: 29%	High		✓	Meditech (40%)	Epic (14%)
Minneapolis, MN	Hosp: 52%, SNF: 11%	Medium	✓	✓	Epic (70%)	Epic (39%)
Portland, OR	Hosp: 80%, SNF: 33%	Medium	✓	✓	Epic (76%)	Cerner (27%)
Salt Lake City, UT	Hosp: 70%, SNF: 7%	Low	✓	✓	Cerner (48%)	Epic (28%)
Indianapolis, IN	Hosp: 26%, SNF: 41%	Low	✓	✓	Meditech (29%)	Cerner (54%)
Baltimore, MD	Hosp: 23%, SNF: 5%	Medium	✓	✓	Epic (55%)	Epic (23%)
Ann Arbor, MI	Hosp: 80% SNF: 0%	Medium		✓	Epic (60%)	Epic (62%)
Manchester, NH	Hosp: 18% SNF: 40%	Medium	✓	✓	Meditech (27%)	GE (23%)

TABLE 4

Hospitals in Regional and National Health Information Exchange Networks (%)  
(Recommended Five Highlighted)

HRR	Regional health information organization	Commonwell	DirectTrust	eHealthExchange	Carequality	Patient Centered Data Home	Surescripts	Vendor network	Other
Orange County, CA	100	38	46	62	31	0	77	38	0
Denver, CO	75	26	19	30	22	0	59	30	0
Manhattan, NY	100	5	10	24	10	14	62	29	24
Erie, PA	70	20	20	30	10	0	50	40	30
Minneapolis, MN	42	0	21	28	12	1	51	40	19
Portland, OR	81	19	48	62	24	33	90	52	0
Salt Lake City, UT	85	52	41	44	44	0	59	11	44
Indianapolis, IN	96	14	7	0	7	4	57	18	11
Baltimore, MD	100	0	45	36	41	0	82	55	9
Ann Arbor, MI	100	50	30	50	50	10	80	60	40
Manchester, NH	27	18	18	0	0	0	73	45	9

## Interviewee Selection

Our background research and interaction with the TEP did not result in any specific organizations known to be at the forefront at integrating data, except for Michigan Medicine, whose manager of HIE and interoperability, Jeff Chin, is a TEP member.<sup>1</sup> He was unable to make the TEP discussion but reported through written feedback to the issue brief that Michigan Medicine is maximizing use of Epic functionalities and also receiving a broad range of data through HL7 feeds, which they are parsing and integrating through a landing database funded by payer incentives. He also reports they've seen a return on their investment, suggesting Michigan Medicine could provide valuable lessons for the field.

---

<sup>1</sup> Project team members Julia Adler-Milstein and Jordan Everson also have former affiliations with Michigan Medicine.

TABLE 5

Proposed Initial Contacts at Each Case Study Site

Case study site	Proposed initial contact(s)	Rationale	Vendor
Denver, CO	Kate Horle, CORHIO	Knowledge of status of interoperability across Denver region	N/A
	Dick Thompson, QHN	Knowledge of status of interoperability across western Colorado	N/A
Manhattan, NY	New York Presbyterian Hospital	Largest hospital in network analysis, participant in value-based care initiatives, has FHIR-based terminology server and multiple initiatives leveraging health IT	Allscripts
	Jason Shapiro, Mt. Sinai	Large hospital and referral center in network analysis	Epic
	SHIN-NY	Knowledge of status of interoperability statewide in NYC	N/A
Salt Lake City, UT	Brian Chin, UHIN	Knowledge of status of interoperability statewide in Utah	N/A
	University of Utah	Major referral center in network analysis	Epic
	Intermountain Health	Major referral center in network analysis	Cerner
Indianapolis, IN	John Kansky, IHIE	Knowledge of status of interoperability in Indiana	N/A
	Josh Vest, IU	Subject matter expert, largest hospital and major referral center in network analysis	Cerner
	Peter Embi, Regenstrief	Subject matter expert	N/A
Ann Arbor, MI	Jeff Chin, Michigan Medicine	TEP member who gave compelling information to include Michigan Medicine as a site. Also, network analysis shows Michigan Medicine as key center for referrals	Epic
	Tim Pletcher, MiHIN	Subject matter expert	N/A
	Doug Dietzman, GLHC	Knowledge of state of interoperability in the region	N/A

Other than Michigan Medicine in Ann Arbor, Michigan, we will identify hospitals and trading partners to interview within each case study site through a network analysis of referrals to identify organizations with the largest volume of shared patients using the CareSet Labs DocGraph Hop Teaming Dataset. Our network analysis for hospitals in the five selected HRRs is included at the end of this document (figures 1–5). Based on the analysis and additional knowledge of the sites, we propose to make initial contact with key stakeholders at each site to obtain input on potential interviewees and to confirm whether the hospitals identified through the network analysis are likely engaging in data integration. It is our experience from the site selection that actual interoperability in a region may not be well reflected in what the data suggest. For example, although data from Orange County, CA, suggest data integration to be common in the HRR, project team communications with key stakeholders located there suggest otherwise. Therefore, it will be important that we confirm what the data suggest

with someone on the ground before proceeding with selecting health care organizations to interview as well.

**FIGURE 1**  
**Denver Colorado – Network Analysis of Shared Patients between Hospitals**

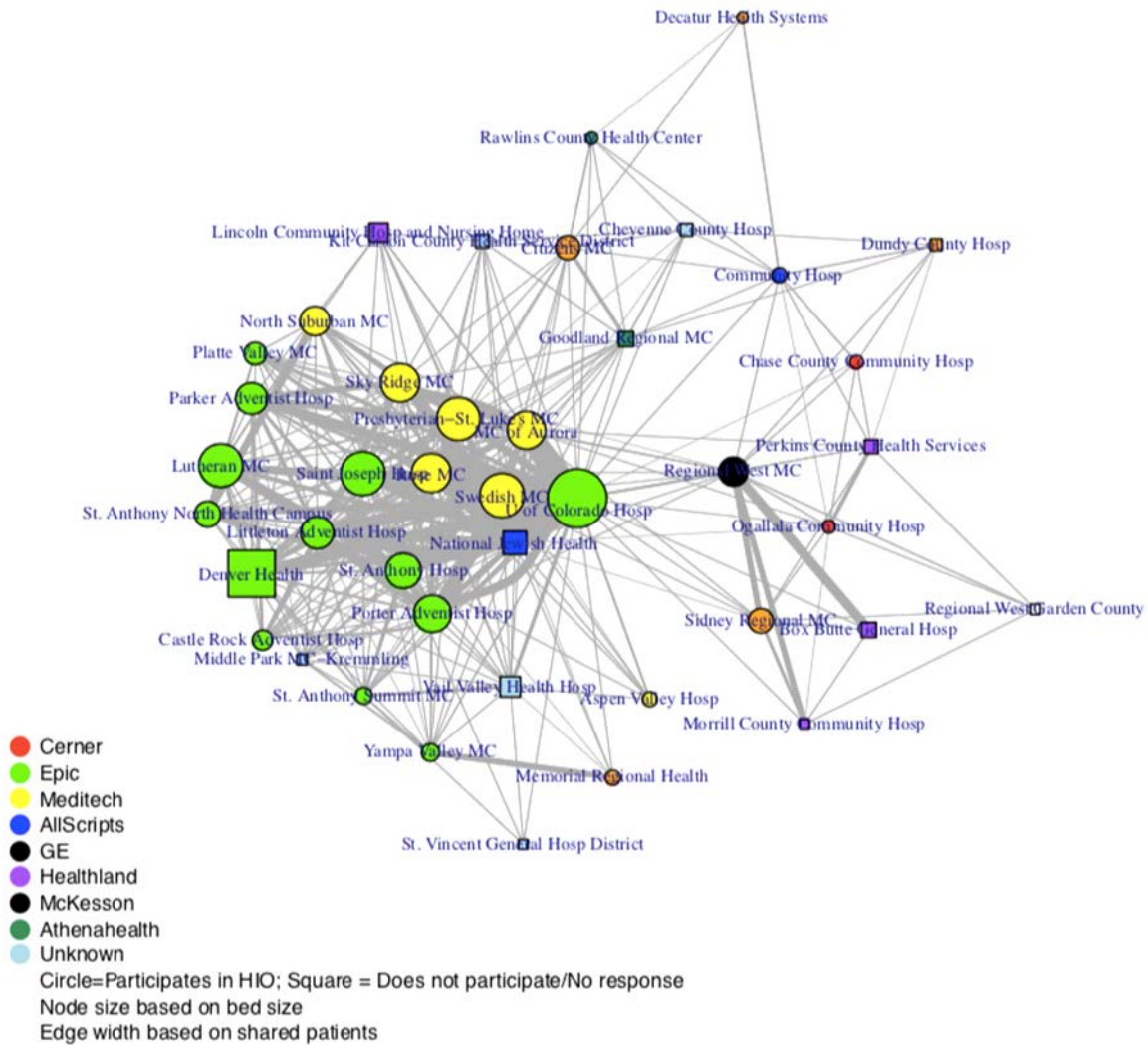


FIGURE 2

Manhattan, NY – Network Analysis of Shared Patients between Hospitals

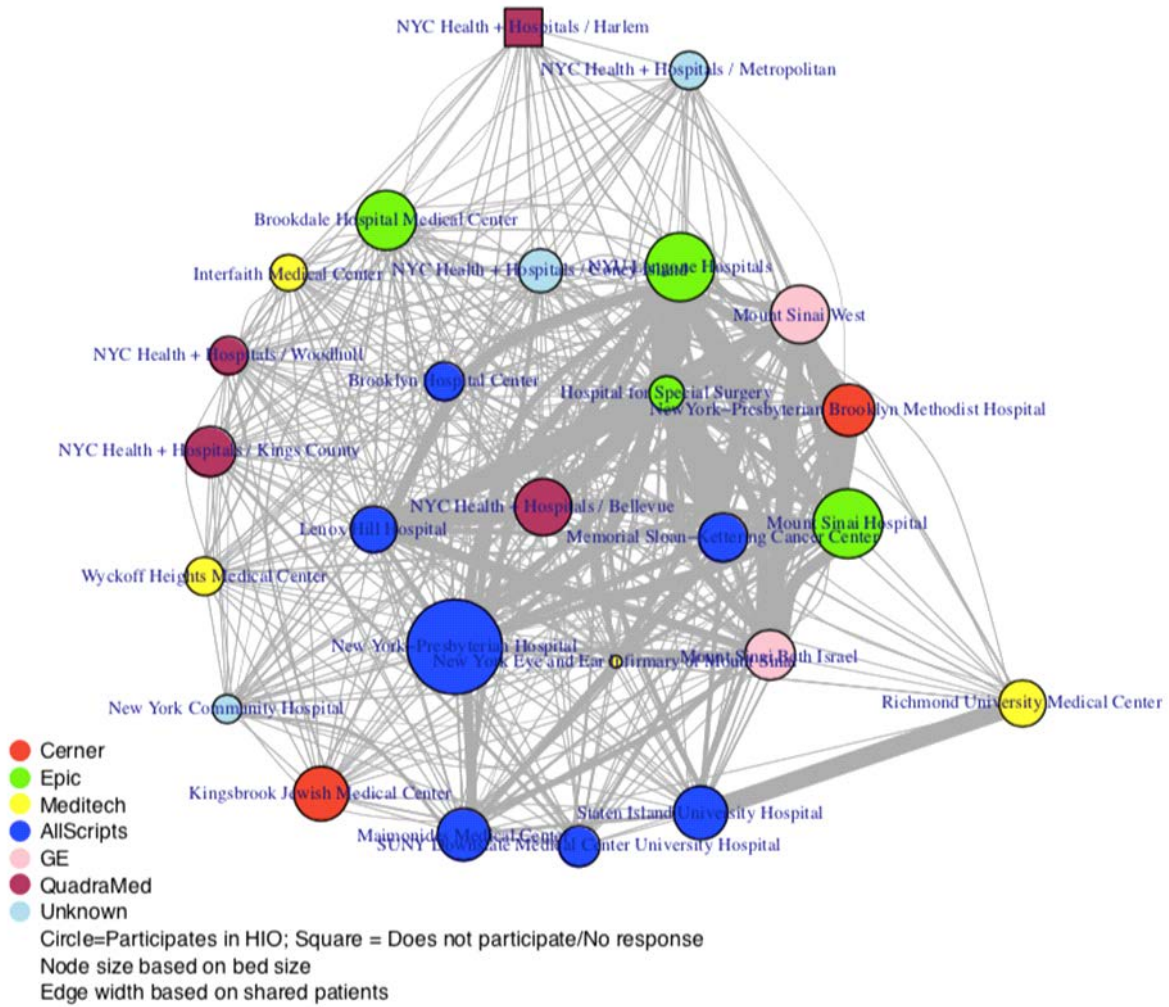


FIGURE 3

Salt Lake City – Network Analysis of Shared Patients between Hospitals

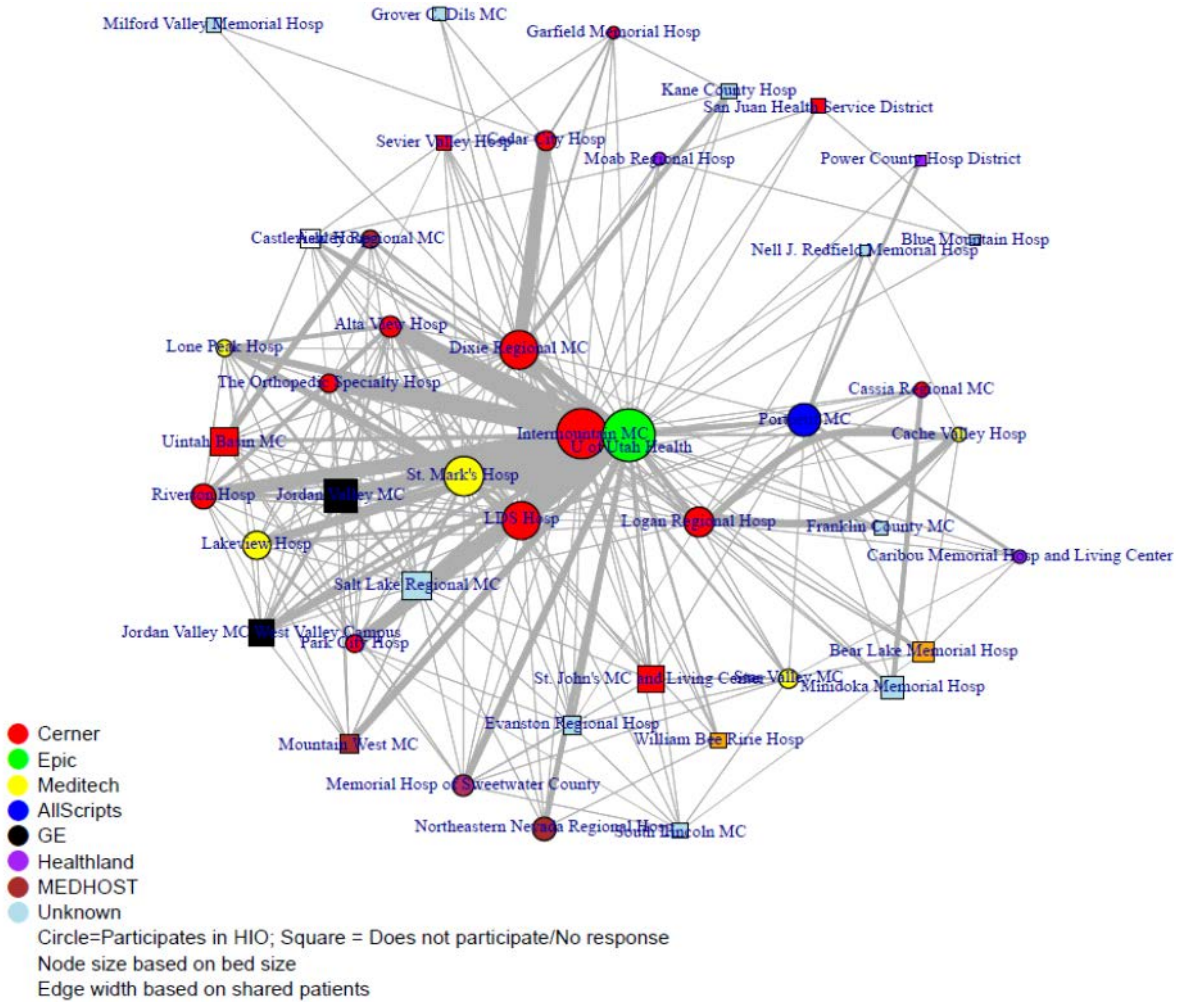




FIGURE 4

Indianapolis – Network Analysis of Shared Patients between Hospitals

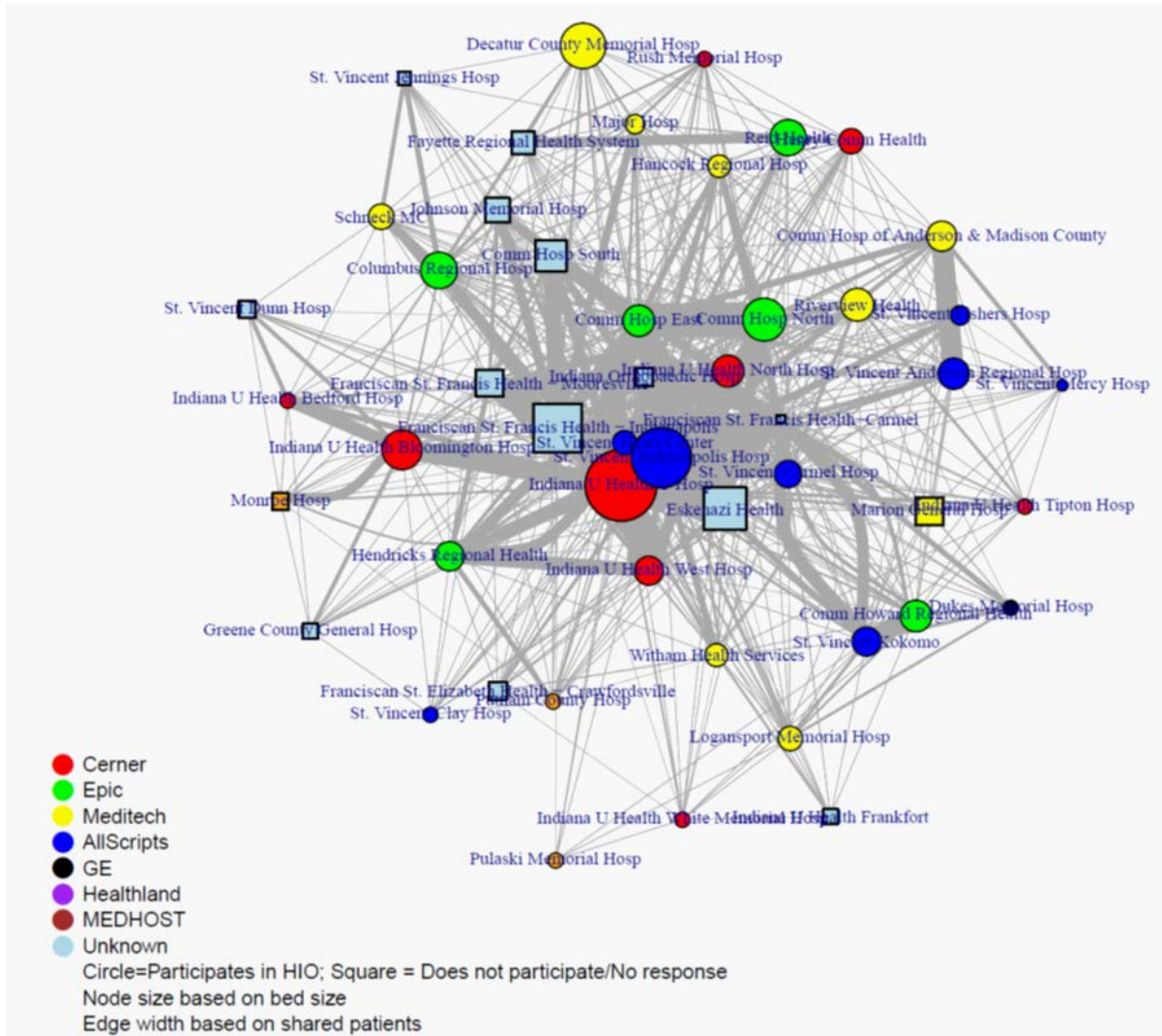
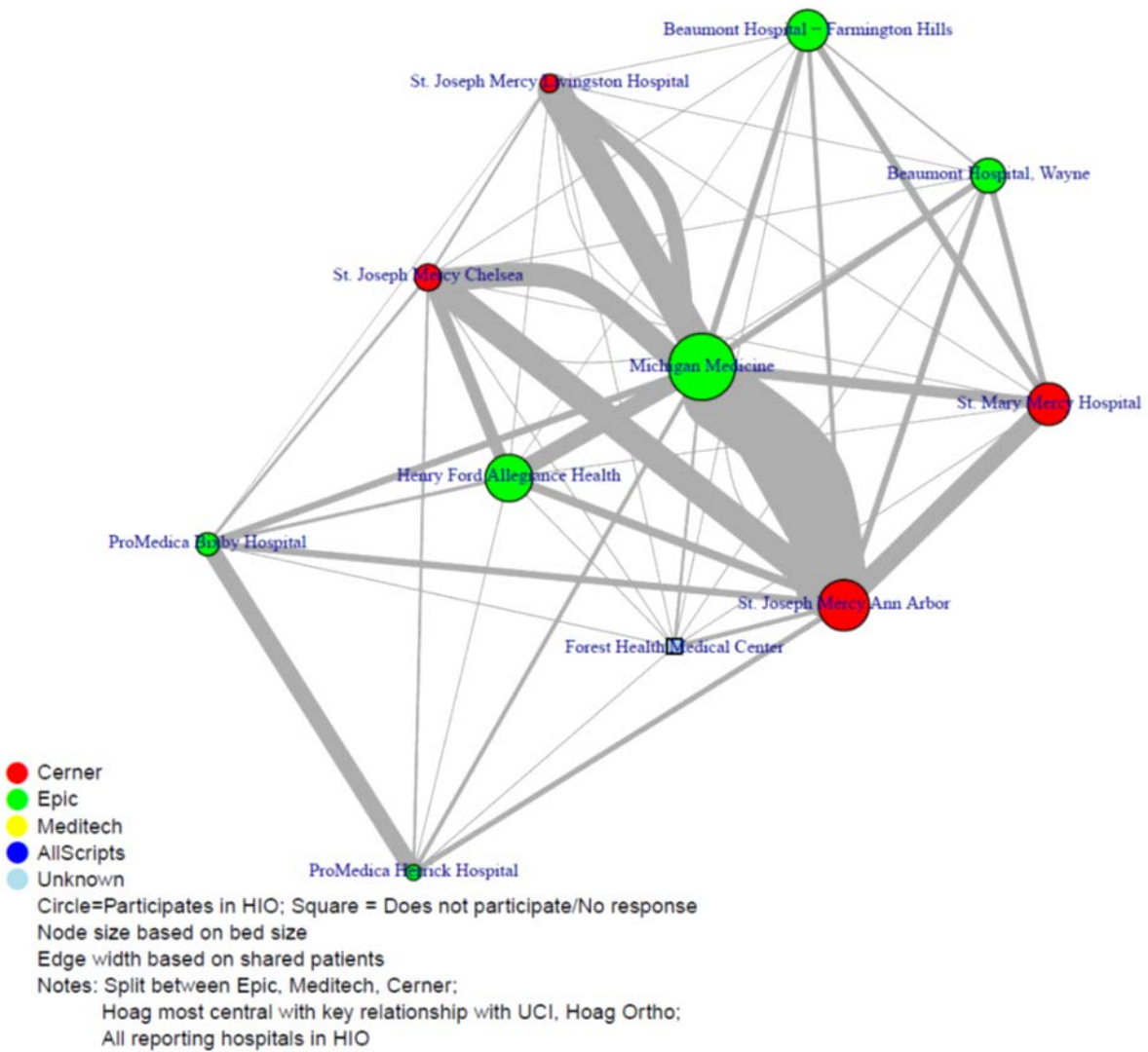


FIGURE 5

Ann Arbor – Network Analysis of Shared Patients between Hospitals



# Notes

- <sup>1</sup> 21st Century Cures Act: Interoperability, Information Blocking, and the ONC Health IT Certification Program, 85 Fed. Reg. 25642 (May 1, 2020).

# References

- Bernstam, Elmer V., Jeremy Warner, John C. Krauss, Edward Ambinder, Wendy S. Rubinstein, George Komatsoulis, Robert S. Miller, and James L. Chen. 2022. "Quantitating and Assessing Interoperability between Electronic Health Records." *Journal of the American Medical Informatics Association*, ocab289. <https://doi.org/10.1093/jamia/ocab289>.
- Blavin, Fredric, Emily Johnston, Laura Barrie Smith, Christal Ramos, Gary Ozanich, Kathy Frye, and Alex Horn. 2022. *Electronic Health Record (EHR) Reporting Program: Developer-Reported Measures: Final Report Prepared for the Office of the National Coordinator for Health Information Technology (ONC)*. Washington, DC: Office of the National Coordinator for Health Information Technology.
- DePietro, R., E. Wiarda, and M. Fleisher. 1990. "The Context for Change: Organization, Technology, and Environment." In *The Processes of Technological Innovation*, edited by Louis G. Tornatzky and Mitchell Fleischer, 151–75. Lexington, MA: Lexington Books.
- Ozanich, Gary, and Christal Ramos. 2020. "Maximizing Data Interoperability and Integration to Support Value-Based Care." Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation.
- Pylypchuk, Yuriy, Chad D. Meyerhoefer, William Encinosa, and Talisha Searcy. 2022. "The Role of Electronic Health Record Developers in Hospital Patient Sharing." *Journal of the American Medical Informatics Association* 29 (3): 435–42. <https://doi.org/10.1093/jamia/ocab263>.

# About the Authors

**Fredric Blavin** is a principal research associate in the Health Policy Center at the Urban Institute with expertise on a wide range of topics, including private health insurance markets, health care reform, health information technology, provider supply, health care spending, child and maternity health, Medicaid/Children's Health Insurance Program (CHIP) policy, and the Health Insurance Policy Simulation model. In addition, Blavin has extensive survey development experience, including Urban's Health Reform Monitoring Survey and the National Ambulatory Medical Care Survey Physician Workflow Supplements. Before joining Urban, Blavin worked as an economist at the Office of the National Coordinator for Health Information Technology within the US Department of Health and Human Services. Blavin has published widely in peer-reviewed journals on various topics, including the impact of express lane eligibility programs on Medicaid/CHIP enrollment, trends in health care financial burdens and prescription drug spending, measuring and forecasting electronic health record adoption, value-based insurance design, the role of private health insurance in developing countries, and the cost and coverage implications of various state and national health reform policies. Blavin received his PhD in managerial science and applied economics from the University of Pennsylvania in 2011.

**Laura Barrie Smith** is a research associate in the Health Policy Center at the Urban Institute. She studies a broad range of health policy topics related to primary care services delivery, access to care, and the health care workforce. She has extensive experience using large claims and electronic health record datasets in her research. Before joining Urban, Smith worked at the Lewin Group, where she focused on Medicare and Medicaid policy research. Smith holds a BA in mathematics from St. Olaf College and a PhD in health services research, with an emphasis in health economics, from the University of Minnesota. While at the University of Minnesota, she was awarded an R36 dissertation grant from the Agency for Healthcare Research and Quality for her research on nurse practitioner scope of practice laws.

**Christal Ramos**, now at the American Institutes for Research, is a former senior research associate in the Urban Institute's Health Policy Center, where her work focused on a range of topics, including payment and delivery system reforms, health information technology, and opioid use disorder and treatment, particularly in Medicaid. She has experience with both qualitative and quantitative research methods and has played a key role in a number of federal evaluation and technical assistance contracts. Ramos was previously a senior research associate in the Health Policy Department at the George

Washington University, where she studied health care quality and health disparities. She received her PhD in public policy and administration and MPH in health policy at the George Washington University. She has a BA in public health from the Johns Hopkins University.

**Gary Ozanich** is a nationally recognized health information technology and health information exchange (HIE) expert. He has more than 30 years of experience as an industry and technology analyst. He has conducted extensive research and consulting projects on HIE structure, interoperability, services, and sustainability, as well as projects examining care coordination and transitions in care. He is an active member of the Healthcare Information Management Systems Society (HIMSS) and served as the cochair of the HIMSS Interoperability and HIE Community and as the national chair of the HIMSS Interoperability & HIE Committee. His academic career includes positions at Columbia University, Michigan State University, and the State University of New York at Buffalo, and he is currently the director of health informatics at Northern Kentucky University. He spent over 12 years as a vice president for large investment banks including Bear Stearns & Prudential Securities as an industry analyst. Gary holds a PhD from the University of Wisconsin–Madison.

**Alex Horn** is a consultant with HealthTech Solutions, where her work focuses on Health Information Technology (HIT) initiatives. She has particular experience in the areas of Electronic Health Records (EHR) programs and Promoting Interoperability programs. She has assisted with numerous HIT- and HIE-related research projects, supports Medicaid policy research, and is experienced with developing audit strategies for state clients. She is currently working on her MS in health informatics at Northern Kentucky University. She received her BS in health service administration from Eastern Kentucky University in 2020.

## STATEMENT OF INDEPENDENCE

The Urban Institute strives to meet the highest standards of integrity and quality in its research and analyses and in the evidence-based policy recommendations offered by its researchers and experts. We believe that operating consistent with the values of independence, rigor, and transparency is essential to maintaining those standards. As an organization, the Urban Institute does not take positions on issues, but it does empower and support its experts in sharing their own evidence-based views and policy recommendations that have been shaped by scholarship. Funders do not determine our research findings or the insights and recommendations of our experts. Urban scholars and experts are expected to be objective and follow the evidence wherever it may lead.



500 L'Enfant Plaza SW  
Washington, DC 20024

[www.urban.org](http://www.urban.org)