Exploring Health Information Exchange Implementation Using Qualitative Assessments of Nursing Home Leaders

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Abstract

Objectives: Limited research exists on nursing home information technologies, such as health information exchange (HIE) systems. Capturing the experiences of early HIE adopters provides vital information about how these systems are used. In this study, we conduct a secondary analysis of qualitative data captured during interviews with 15 nursing home leaders representing 14 nursing homes in the midwestern United States that are part of the Missouri Quality Improvement Initiative (MOQI) national demonstration project.

Methods: The interviews were conducted as part of an external evaluation of the HIE vendor contracting with the MOQI initiative with the purpose of understanding the challenges and successes of HIE implementation, with a particular focus on Direct HIE services.

Results: Emerging themes included (1) incorporating HIE into existing work processes, (2) participation inside and outside the facility, (3) appropriate training and retraining, (4) getting others to use the HIE, (5) getting the HIE operational, and 6) putting policies for technology into place.

Discussion: Three essential areas should be considered for nursing homes considering HIE adoption: readiness to adopt technology, availability of technology resources, and matching of new clinical workflows.

Keywords: health information exchange, long-term care, nursing home, health information technology, qualitative methods

As of 2014, there are 15,600 nursing homes in the United States, where nearly 1.7 million residents live and receive healthcare services.[1] Unlike hospitals, US nursing homes are not eligible for electronic medical record incentive programs that enhance health information exchange (HIE). Nonetheless, a significant amount of HIE occurs between nursing homes and a variety of stakeholders, including nurses, physicians, physicians' offices, pharmacists, and diagnostic testing services. Currently, this healthcare information is not systematically exchanged in an electronic format across settings and services. A consequence of not having electronic HIE in these settings is that resident information is not shared across organizations, vendors and geographic boundaries efficiently.[2] US national priorities include HIE integration into these settings.

Very little is known about HIE implementation and the value of shared patient records across multiple community-based settings, including nursing homes. Our research team had a unique opportunity to close this knowledge gap. The Missouri Quality Improvement Initiative (MOQI) is one of seven Enhanced Care and Coordination Providers funded by the Centers for Medicare and Medicaid Services (CMS) to reduce avoidable hospitalizations within 16 Missouri nursing homes.[3] One of the main goals of the technology aspect of the MOQI is to develop knowledge of HIE implementation across nursing homes and hospital boundaries, describe HIE use between hospitals and nursing homes, and determine its value to users of these systems. Findings from the MOQI will inform nursing home and hospital leaders interested in using HIE to improve resident care outcomes.

Background and Significance

HIE Platforms

HIE platforms are computer systems on which technology applications are built to enable the use of secure and encrypted communication systems for healthcare. The most robust type of HIE is a bidirectional platform that provides historical contexts for nursing home residents across multiple organizations and facilities, and allows greater access to information by stakeholders because the platform supports multiple access points and queries about resident-specific healthcare information. To have bidirectional capabilities, an electronic medical record must be actively used to capture clinical data, which is stored in a data repository for later use. Only a few nursing homes in the United States have fully functional electronic medical records implemented, so there are few bidirectional platforms implemented.[4]

The second type of HIE platform is Direct secure messaging. Information in this platform is shared via email in a 1:1 communication format. All that is required for this platform is a good Internet connection and an accessible browser that allows access to e-mail. Other platforms, called portal views, only allow delivery of results, such as lab and imaging results, and have view-only capability. In portal view platforms, there is little support for interaction between HIE stakeholders. Many nursing homes in the United States have partial portal view-only capability implemented for disparate information technology (IT) systems, such as laboratory, pharmacy, and radiology systems.[5]

HIE Implementation Approaches in Nursing Homes

Little research has been done on the topic of HIE implementation in nursing homes. To close this gap, the MOQI team used a three-phased approach to successfully implement HIE in the form of Direct secure messaging in nursing homes.[6] In phase 1, the team conducted organizational IT readiness assessments of 16 nursing homes in eastern Missouri, using an investigator-developed IT sophistication assessment tool.[7] The readiness assessments allowed team members to identify each organization's readiness to adopt HIE, establish potential gaps in existing technologies, and determine the number and types of interfaces to be created. The assessment identified a starting point for each facility where the team could begin facilitating health IT adoption including HIE. For example, the team identified gaps in wireless connectivity in facilities that initially prevented use of the HIE technology. Identifying these problems early in the adoption phase enabled us to react strategically during the implementation phase. In phase 2 the team conducted workflow observations of nursing home staff involved in transitions of care episodes. Specifically, two members of the research team observed and systematically documented communication activities occurring during transitions in patient care in the 16 facilities, including event types, duration, and interactions. Six use cases were developed to illustrate how HIE can be used to facilitate communication activities during care transitions.[8] Existing use cases were adjusted after each observation session to fit clinical workflows observed in each nursing home. During phase 3, the MOQI team validated existing workflows in each facility with HIE use cases. The MOQI team helped each nursing home select an appropriate implementation strategy based on organizational readiness, existing information technology infrastructures, and current business models identified in the use cases. In phases 2 and 3, the MOQI pursued an engagement strategy that included a regional stakeholder learning

community to foster adoption among existing internal and external stakeholders in our HIE network, including hospitals, state and federal government, technology vendors, and specialty associations.

External Evaluation of HIE

After the three-phase HIE implementation in the MOQI nursing facilities, the MOQI operations team was asked to collaborate with an independent external evaluation team that was evaluating the MOQI HIE vendor that was providing the HIE services to the facilities as part of the initiative. This external evaluation was intended to evaluate the process used to implement and maintain the HIE and identify how to improve the services of the HIE vendor. The external evaluation team conducted a series of qualitative interviews with nursing home leaders from the 14 MOQI nursing homes who were purposively selected to provide input about the use of HIE in nursing homes. The nursing home leaders were selected to be interviewed because of their involvement in the design and implementation of the technology networks used in their nursing home, and because they used the HIE system during the first two years of implementation. The interviews were designed to better understand the challenges of HIE implementation across nursing home and hospital boundaries, describe HIE use between hospitals and nursing homes, and determine its value to users of these systems. These interviews were made available to the MOQI team for secondary analysis in order to describe the challenges and successes of HIE implementation using Direct messaging from the perspective of the nursing home stakeholders participating in the MOQI project.

Method

A secondary analysis of interviews was undertaken for this research. Original interviews were conducted by an external evaluation team composed of PhD faculty and researchers from a midwestern university consulting with the Office of the National Coordinator for Health Information Technology to evaluate the HIE vendor for the MOQI initiative. The purpose of this secondary analysis was to understand, on the basis of the nursing home's participation in the MOQI project, the challenges and successes of HIE implementation of Direct messaging in their homes, given their current IT readiness. The MOQI project received institutional review board approval no. 1203541.

Sample and Organizational Characteristics

The nursing home sample ($N = 14$) was characterized using the IT readiness assessment tool (see Table 1) as described in the background section.[9, 10] One nursing home (facility L) had a fully integrated electronic health record (EHR). All other facilities ($n = 13$) in the MOQI project had paper-based documentation systems supported by partial EHRs, mostly used for nursing assistant documentation and aggregation of minimum data set requirements (i.e., MDI, MatrixCare, DartChart, and CareTracker). Assessing readiness and overall experience with IT is important to understand differences in nursing home HIE expressed by leaders who participated in the interviews. Every nursing home had some type of technology network that mostly consisted of desktop computers and laptops. All facilities had wireless networks, but at least two reported having unreliable connections to wireless routers from parts of their nursing home. Facility L, which had a full EHR, also implemented into its network more sophisticated handheld technology that was used for documentation. No leaders in MOQI project facilities reported use of iPad or iPhone technology (see Table 1).

Analysis

Interview data were obtained from the external evaluation in Word documents and were uploaded to Dedoose qualitative software (www.dedoose.com) for analysis by the team. A list of interview questions was obtained from the transcribed interviews (see Table 2). A PhD nursing student, with experience in technology evaluation, user-centered design principles, and qualitative design, read and classified segments from 321 excerpts collected during primary interviews into six themes. Themes are chunks of text that represent a pattern of ideas that serve to unify the data, communicate the web of experience, and are woven throughout the data.[11] Next, two PhD-prepared nurses with a combination of experience in nursing homes, informatics, and qualitative data analysis reviewed the coding sequences and confirmed the presence of the themes and representative quotes.

Results

Data included interviews with 15 nursing home leaders from 14 nursing homes in the MOQI project that had participated in the HIE implementation. Leaders from two of the MOQI nursing homes (facilities M and P [see Table 1]) declined to participate. Participating leaders held a variety of positions: seven were nursing home administrators, one was an assistant administrator, six were directors of nursing, and one was an assistant director of nursing. Essentially all of these nursing home leaders had some experience maintaining computer networks and were currently users of the MOQI HIE. Six themes surfaced from qualitative excerpts drawn from these interviews:

1. Incorporating into existing work processes,
2. Participation inside and outside the facility,
3. Appropriate training and retraining,
4. Getting others to use the HIE,
5. Getting the HIE operational, and
6. Putting policies for technology into place.

Incorporating into Existing Work Processes

Nursing home leaders described efficiencies in patient care work processes that are being realized by the use of HIE in these facilities. Several instances were discussed that illustrated the process of aligning and integrating electronic communication, such as e-mail, into staff workflows. A nurse administrator and a director of nursing (corporate facilities L and N [see Table 1]) indicated that work processes affected by HIE need to be strategically thought out before implementation to maximize alignment with the work being done: *"I think when they were here for the [HIE] training, we did have an opportunity to do that [align our work processes] and that's why we wanted to start with the pharmacy, because we think that's the best way to align it. We have our own internal pharmacy that we use and that would copy the best for us and then go out from there, see what else we can do with other providers."* A director of nursing (corporate facilities L and N) also indicated that HIE can lead to better work processes by improving wait times, use, and trust that messages are sent and received by the communication system: *"There will be an increase [in use] because you are not having to wait for fax to go through and make sure it went through, . . . we are able to see on email that it [the message] went through. I would say it's more reliable."* A nursing home administrator (facility L) identified specific clinical benefits from using HIE, for example in communicating lab results: *"I think it's going to be good to use when we are asking for [a doctor's] order, or we are telling them [the doctor] what the lab is and then calling and saying, it's a high lab or it's a critical lab. [Using the HIE, we could] e-mail exactly when there is an order even if they don't get it right away . . . but even [now] when we call the doctor, we usually get the office and we have to leave a message and wait for them to call back, anyway."*

Two participants (nursing administrator and director of nursing) (facility O) raised the challenge of current communication systems having multiple access points, but went on to state that the HIE could condense access points: *"You have your own personal e-mail, then you have a work e-mail and then you probably have another e-mail and then, in my mind adding another e-mail you would have to check, it could be nice to get all those condensed into one. I think the Direct will be able to do that."* Two participants (nursing home administrator and director of nursing) (facility O) also voiced concern over potential delays in communication caused by staff who do not want to use e-mail for patient-level communication: *"We have several different [healthcare providers] that come in here, which [providers] would want to do that [use HIE] you know, sort of really anti e-mail . . . the [providers] receive the e-mail, I know we can get e-mail responses back when they open it, but concerned about the delay."*

Participation Inside and Outside the Facility

To establish a network of people who are going to communicate with each other through HIE, participation by both senders and receivers is necessary. The second theme, participation (internal and

external), relates closely to this fact. The internal and external portions of this theme relate to internal and external stakeholders who may participate in the exchange of information.

One underlying issue related to participation is organizational readiness to participate. Readiness implies that an organization has the infrastructure, technological resources, connectivity, and desire to make the HIE work. Connectivity was an issue in some of the participating MOQI facilities because infrastructure was not well established. Problems included the lack of dedicated e-mail addresses for all nursing home staff and lack of accessibility of Internet connections at the edges of nursing units. One nursing home administrator (facility O) referred to barriers to use of HIE related to organizational readiness: *"I just think, there are some organizations out there that don't have e-mails and they are not equipped, and I think the Direct is very big for them. I think the challenge and the barrier is, when I think of hospital organization, they all have their own e-mails, like a local spine center place we have around here. So, bringing those altogether* [sic]*, I think can be a challenge from Direct at the end point. And kind of like I said before, I just don't see organizations and companies paying into, something that they already have."* Another participant, a director of nursing (facility L), expressed similar concerns about barriers to participation in the HIE network: *"We also have other barriers. Outside sources not utilizing this, I think that getting our pharmacy integrated in using it. Some centers uses* [sic]*, some don't. I think it would [help if] they try to work on one system that works for everybody."*

Appropriate Training and Retraining

The importance of ensuring that personnel were appropriately trained before commencing use of HIE emerged as a theme. Participants expressed the value of having recurring training with multiple opportunities to practice with the technology and interfaces using hands-on training. A nursing home administrator and director of nursing (facility C) described training processes: *"It was group training directly from the source. Hands-on was fabulous. It's much easier than sitting and listening or looking at a presentation. The hands-on, in my opinion, is very important, so that was great. I think maybe some reinforcement once you learn it once, and like [someone] said, there's this time lapse, because we are not that connected on the other end with anybody yet. And yeah, we could probably sit there and go through it, it would all sound familiar but I think [due to] the time lapse, everybody will have to have a refresher before you know, we could launch and get it going."*

Participants indicated that training sessions were a good time to communicate about technical challenges to get help solving problems before actual use started in order to avoid frustration. A director of nursing (facility C) involved in education also indicated that an iterative approach to training, alternating assessment of work processes and training, was helpful but needed to be completed in rapid cycles with short time intervals and little wait time between cycles: *"Maybe doing the work process study first and then having a common goal, to say, okay, we are going to train you and then you are going to use it, as of that day instead [of] training [then] waiting, assess work process [then] waiting."*

Getting Others to Use HIE

Assembling a network of providers who are willing to use the HIE system is essential for proper implementation of HIE. Getting others to use the HIE system required significant shifts in staff expectations and organizational culture. For example, one administrator (facility O) explained that nursing home staff expect positive outcomes from significant organizational changes, and if positive outcomes are not realized, future change will be more difficult. She stated: *"Yeah, I think you just have to show that it serves the purpose, that it makes a difference, and then people will see that and start using [HIE] because right now people are just using what they know. I think everybody knows that change is hard to do and I think with anything, if you change anything, you have to show that it's going to be a difference maker."* Another nursing home administrator (facility G) agreed that resistance to change by some members of the HIE network created some major problems in completing work, and one of these staff members noted: *"[Our] only barrier so far is the lack of outside providers being users of Direct system. This creates an extra step in work processes for clinicians, or at least we perceive this to be a problem once we start using Direct regularly."*

Getting the HIE Operational

Participants were asked to describe some challenges and opportunities associated with implementing and using the HIE system. One participant who was an administrator (facility O) described that there were many steps associated with the implementation, and when turnover occurred, this complexity caused problems because people had to be retrained. The participant indicated: *"When you have turnover, that's been difficult for us. Just to do the technical part of getting myself identified for the approval stuff and all that again. I just wish it was easier to get set up, it seems like a lot of steps."* In this comment the participant is referring to a step called identity proofing, which is conducted by the HIE vendor at the beginning of the implementation to ensure that appropriate people have access. Identity proofing is a time-consuming step, involving checking the identities of people with appropriate documentation, which had to be completed prior to giving people access to the HIE system. Still other challenges related to perceptions of this technology during implementation, such as that is it just one more thing the staff have to do and that it really does not make their work more productive or efficient (facilities L, N, and O). One administrator said: *"I mean, I think it's kind of, it's the same thing. I mean, you spend just as much time to fax and e-mail, I don't think there is a law for productivity, and it's just a different way of doing it."*

Some participants described important opportunities for sharing how other facilities and staff external to their own organization were using HIE. These opportunities seemed to be important avenues for cross-fertilization of ideas about how to connect to one another. For example, an administrator (Facility N) described: *"We go to a monthly meeting with some other [facility]. They are involved with Direct care mail. That gives us opportunity that we use [to] talk to other centers [nursing homes] outside of our own and then outside of our company as well."* Other participants, including an administrator and director of nursing (facility O), described internal negotiations during quality improvement meetings to raise awareness about the use of HIE: *"I know we talked about [it] in our quality improvement meetings every month, with the physicians who are there. We talked to get their awareness and kind of question them."*

Putting Policies for Technology into Place

The development of new policies to guide the implementation and use of technology were also discussed by participants. There was some variation in participants' comments about the use of policies to guide the HIE implementation. One administrator and her director of nursing (facility C) implied that policies were a critical part of the work process: *"We live by policies, so everything has to have a policy and a procedure . . . in case there is a question about it . . . that's how we are monitored."* At least one participant (nursing home administrator and director of nursing; facility O) indicated that they had not adopted formal policies for the use of HIE, but they did indicate other policies, such as for e-mail: *"We have policies right now for e-mail and you know, I don't think they drive us, using or anything like that."* One administrator and her assistant (facility H) remarked that lack of guidelines on proper use created delays in use of technology: *"Corporate office looking into it now. That is one of the delays. Should be robust guidelines once put in place. However, this aspect is causing a delay for the rest of us in terms of usage."*

Human resources experienced with technology and with knowledge of what types of technology policies needed to be implemented seemed to be important. One nursing home administrator and director of nursing (facility C) described a need for human resources knowledgeable about technology to assist with developing policies. The participant described how some policies were created: *"I think that [HIE] representatives have helped with some policies and I think they have some overall policies but we haven't really sit* [sic] *down with any hardcore policies."*

Discussion

Implementation of HIE in nursing homes is a new and different clinical process. In general, nursing homes are not as sophisticated as hospitals in the use of electronic health records and electronic communication technology.[12] Trends indicate that some types of technology like HIE are becoming more prevalent in nursing home settings.[13, 14] Some technologies, such as patient portals that allow for communication between residents, families, providers, and the organization, are not commonly seen in

nursing homes, but it is believed that these technologies will improve delivery of care.[15] Nursing homes and nursing home providers are not commonly using e-mail as a way of communicating with external partners.[16] Unlike hospital and clinic systems, nursing homes may not have a formal relationship with the hospital, clinic, or provider office that allows ease of HIE. Three essential areas, including readiness, availability of technology resources, and matching clinical workflow, can be used as a starting point for nursing homes considering HIE adoption.

Readiness

Nursing home leaders were clear in their desire to have a say about how the HIE implementation unfolded. Tailoring the start-up plan to meet the facilities' needs is essential because every facility has a different degree of readiness to adopt technology. Participants from the facilities also recognized that turnover is a problem and affects readiness. Turnover is an ongoing issue when working with nursing home facilities. Corporations who are not used to working with nursing facilities often underestimate the impact of turnover on training costs and processes.[17] It is necessary to have well-defined training processes that can be administered by the homes, taking into account that frequent turnover is the norm. Facilities need to decide where their greatest need is internally to support technology adoption, but this may need to be balanced with finding outside stakeholders who will support immediate technology use so that the workflow can be tested and revised as needed. Building stakeholder input could prevent delays in technology uptake and increase technology use.

Technology Resources

The availability of technology resources in clinical settings is crucial for successful implementation of HIE. Placement of technology in and around areas where nursing staff work, such as at nurses' stations, hallways, or business offices, requires additional thought during implementation.[18] A study of 119 nursing home staff showed that placing computers at nursing stations can improve usage of HIE from no use (15 percent) to use often or extensively (73 percent).[19] In the MOQI project, we found during our readiness assessment that technology resources varied according to the types of IT systems being used. Often, computers were located in business offices that were locked after hours, prohibiting use by staff. A lack of investment in technology resources, poorly designed technical infrastructure to support technology use, and a lack of sufficient technical support, in the form of human resources knowledgeable about IT, are barriers to adoption.[20]

Matching Clinical Workflow and Processes

Organizational workflow is highly specific to each facility. Having a plan to review workflow and match HIE use with current processes, but also identify which processes need to change completely and which can be modified, is essential. In a 2014 study, workflow and efficiency of work processes was identified as one of 16 major barriers to full HIE implementation, and was also identified consistently as a major barrier in the literature each year from 2010 to 2014.[21] Use case development is an excellent mechanism to help nursing home staff conceptualize the clinical workflow when shifting from traditional paper-based clinical documentation to electronic documentation. In the MOQI project, use cases were used to conceptualize how technology can be integrated into clinical processes to support exchange of consistent documentation across stakeholder groups and have increased uptake of the HIE technology into everyday workflows.

Limitations

The MOQI team was not present during the interviews. This analysis was based on transcribed interviews completed by consultants for the Office of the National Coordinator for Health Information Technology. There was representation of leadership from 14 of 16 MOQI nursing homes using the HIE, but one home had two participants. It is likely that their interviews are not independent of each other.

Conclusion

The current state of HIE in nursing homes is very basic. Nursing homes will need to change rapidly to meet the demands of public policy, meaningful use regulations, and public pressure pushing the nursing

home industry to communicate patient needs more efficiently. The tipping point has not yet been reached, but we anticipate that this point will occur in the near future as demand increases for technology in these settings.

Support

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Table 1

Facility Readiness for Technology Adoption

Nursing Home	Clinical Software (Vendor)	Wireless Internet Access			Browser Type and Version	Available Technology and Types				
		Yes/No	Reliable	Problems		Desktop and Monitor	Laptop	Handheld	iPad	iPhone
A	CareTracker (AOD)	Yes	Yes	No	IE 7/8	28	0	0	0	0
B	CareTracker (AOD)	Yes	Yes	No	IE 9	25	4	0	0	0
C	DartChart	Yes	No	Limited access	IE XP	13	0	0	0	0
D	MDI (MatrixCare)	Yes	Yes	No	IE 9	15	0	0	0	0
E	MDI (MatrixCare)	Yes	Yes	No	IE 7/8	18	0	0	0	0
F	MDI (MatrixCare)	Yes	Yes	No	IE 7/8	11	1	0	0	0
G	MDI (MatrixCare)	Yes	Yes	No	IE 7/8	21	1	0	0	0
H	MDI (MatrixCare)	Yes	Yes	No	IE	32	4	0	0	0
I	MDI (MatrixCare)	Yes	Yes	No	IE 7/8	12	0	0	0	0
J	MDI (MatrixCare)	Yes	Yes	No	IE 7/8	16	1	0	0	0
K	MDI (MatrixCare)	Yes	Yes	No	IE 8	20	0	0	0	0
L	SigmaCare	Yes	Yes	No	IE 9	14	16	14	0	0
M	OmniCare	Yes	Yes	No	IE	12	0	0	0	0
N	DartChart, Unix	Yes	Yes	No	IE	10	1	0	0	0
O	DartChart, Unix	Yes	Yes	No	IE	17	0	0	0	0
P	American HealthTech	Yes	No	Limited access	IE	28	6	0	0	0

Table 2

Semi-structured Questionnaire Used for Interviews about Health Information Exchange

- Have you been involved in any sort of health technology programs in the past?
- How did you come to being involved with adopting Direct and being part of the whole implementation?
- When you were first introduced to the concept of Direct how did you envision you would use it?
- Are you using electronic charting?
- Do you think Direct is a good idea for long-term care facilities?
- How are you envisioning using Direct?
- How much capability is there in using Direct and how much effort is required to implement it and use it?
- Are you planning on embedding Direct into another system or will it be an independent system?
- What are the challenges to using the Direct system?
- Can you describe your initial and ongoing training required for Direct?
- What type of feedback are getting from your users?
- Is Direct aligning with the users' workflow? Is the technology making things more efficient or is there a loss of productivity?
- Describe any sort of policies that have been established as a result of the Direct.