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Weathering the Storm:
Disaster Preparedness and the Florida Health Information Exchange

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ABSTRACT

The Florida Health Information Exchange has grown over the years since its inception in 2004. Harris Corporation was contracted to provide some basic services to the health care industry in 2011 and this relationship has continued to the present time. As services have expanded, challenges have arisen. With disaster preparedness and business continuity an important part of continuity of care and health information technology initiatives, this paper will consider how a "network of networks" can be of assistance when natural disasters strike.

KEYWORDS

Disaster Preparedness, Health Information Exchange, Privacy, Security

INTRODUCTION

Efforts toward building a Health Information Exchange (HIE) in Florida began in 2004. The Agency for Health Care Administration (AHCA) laid the foundation for a statewide HIE by organizing health care stakeholders and providing initial funding to local Regional Health Information Organization (RHIO) projects through its grants program. Florida is working to achieve a secure and sustainable approach to health information technology adoption and exchange resulting in better health care outcomes with lowered total costs. The development of a HIE that protects privacy and aligns with national exchange standards is the goal of AHCA. Leveraging existing networks to best achieve widespread adoption is one way to achieve the goal. In 2010, the Office of the National Coordinator for Health Information Technology (ONC) provided grant funds to significantly advance Florida's plans to build a statewide health information infrastructure. The provision of sustainable services to meet the meaningful use criteria established by ONC is an important focus of the HIE.

Key services implemented to date include:

- Patient look-up
- Secure messaging
- Event notification-

This case study aims to describe the services of HIE in the State of Florida. As networks are established throughout the state, the ability to access health information in times of disaster becomes an added benefit for the citizens of Florida. As has occurred throughout the nation, privacy concerns

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have been at the forefront of all networking efforts in Florida. In addition to describing the current structure and services available, ways the Florida HIE can improve communication among providers during natural disasters will be explored.

SETTING THE STAGE

The initial goal of the Florida Health Information Network (FHIN) was to provide a data set consisting of hospital inpatient and outpatient encounters including laboratory results and diagnoses, as well as medications and demographic information (Rosenfeld, Koss, Caruth & Fuller, 2006). Claims data for Medicaid patients would also be included, as well as Department of Health (DOH) public health information.

In 2007, the FHIN released a White Paper, Architectural Considerations for State Infrastructure (Greaves, et al., 2007). Recommendations from this document provide more detail as to how the FHIN planned to address technical concerns. One of the major obstacles encountered in implementing a statewide network was legal and regulatory issues surrounding existing privacy laws (Rosenfeld, et al., 2006).

In March 2010, the Office of the National Coordinator (ONC) announced the State Health Information Exchange Cooperative Agreement Program awardees as part of the Health Information Technology for Economic and Clinical Health (HITECH) Act. Florida received $20,738,582 (HHS, 2012). Following an Invitation to Negotiate, this federal funding resulted in Florida awarding a contract to Harris Healthcare Solutions to create the Florida HIE infrastructure.

Through the designated state entity (AHCA), Florida looked to Harris to create a Florida Health Information Exchange Infrastructure under the ONC funding. The infrastructure includes open source technologies where appropriate and gives the highest priority to privacy, security, and interoperability with existing and future electronic patient medical records. Agreements that establish the obligations and assurances between the FHIN, Harris Corporation and other health care organizations in the network were created for the exchange of health information (AHCA, 2011). Consumers are given the ability to explicitly grant permission for disclosure and use of sensitive data as required by state and federal law through the use of consents and authorizations. In the event of a medical emergency when the patient or his/her legal representative is unable or unavailable to authorize access, the participant user may access the information. Written documentation in the patient's record immediately following the disclosure is required by the requesting participant user.

The structure of the HIE is a network of networks without a centralized master patient index. The patient lookup service enables participating users to locate and retrieve patient records. An authoritative provider directory facilitates communication between participating providers. Secure messaging to facilitate sharing of clinical summaries (a meaningful use criterion) uses national standards to ensure security. Event notification services (ENS) is the newest service, alerting providers and payers when patients are admitted, discharged or transferred from a participating facility. ENS allow for improved continuity of care and case management.

CASE DESCRIPTION

The American Recovery and Reinvestment Act (ARRA) provides incentive payments to hospitals and physicians who engage in the meaningful use of electronic health records. Meaningful use is a set of standards meant to ensure that EHRs are not only purchased, but utilized for certain key functions. The HIE meaningful use standards aim to provide health records for the treating physician (from a prior episode of care) to improve the quality and coordination of care, as well as patient access to health information. HIE services must take into account the scope of data exchange and location of the records.

In Florida, the HIE is federated, meaning data is housed locally, not in a centralized format (AHCA, 2011). The HIE serves as the location for patient information exchange but the provider maintains the data. This allows providers to query for patient records across various participating networks via the Patient Look-Up.

Patient Look-Up Services

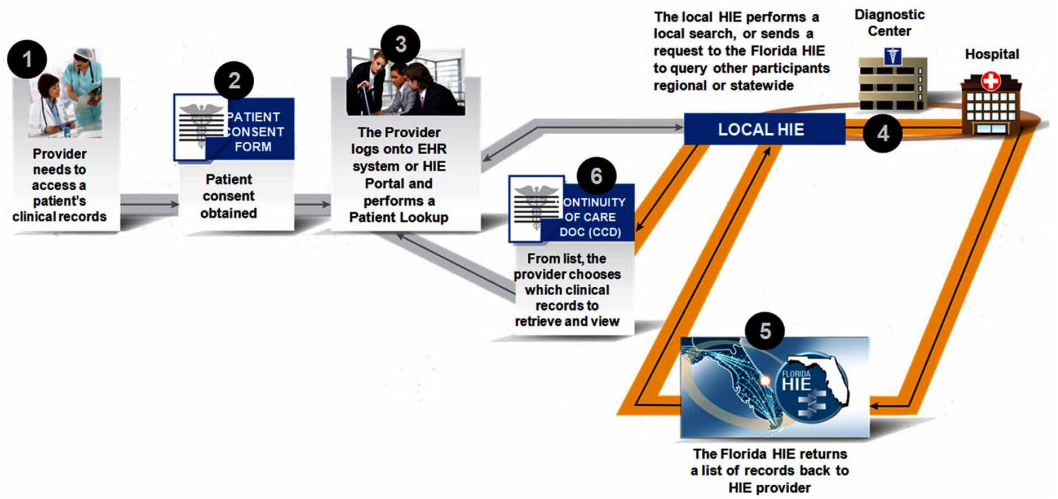
Patient Look-Up enables the search and retrieval of a patient's health information, such as labs, medication history, and discharge summaries from different sources ("pull" function). AHCA recognizes that the majority of patient care is local, and that the goal of local HIE efforts will be connecting providers with local sources of patient data. Public health officials will also use the HIE to prevent disease outbreaks and to investigate reported disease cases of significance to the public (FHIE, 2015).

The typical workflow for Patient Look-Up Services is illustrated in Figure 1.

If the provider has a Master Patient Index (MPI) in place, the Florida HIE provides an Express Lite option which will allow the provider to connect directly to the FHIN. If the provider does not have an MPI in place, then a different option is available, called Express, which the provider can use to connect to the FHIN or potentially create its own HIE (Shim, 2011). Both Express and Express Lite need to connect to appropriate provider systems to create and package information conforming to the required standard profiles. These profiles are variations of the base standards such as the Clinical Document Architecture (CDA), Continuity of Care Document (CCD), Continuity of Care Record (CCR), and HITSP C32 which builds upon the HL7 CCD component. A Minimum Data Set for Patient Look-Up and Delivery Services has also been established as follows (FHIE, 2015):

- Encounter information for each emergency department visit, primary care or hospital visit (depending on participant type) shall include: patient demographic information, reason for visit, treating health care provider(s), date and place of visit, diagnoses, and procedures.
- Vital signs, discharge summaries, medications, alerts (i.e., allergies), immunizations, patient functional status, laboratory test results, and other diagnostic test results which are available electronically.

Figure 1. Patient Look-Up service



DIRECT MESSAGING SERVICE

The Florida HIE provides a Direct Messaging Service (DMS) to all subscribers to support communication between physicians or organizations for transition of care or referral purposes. DMS can also support the provision of clinical documents or information in response to medical information requests. Supported national and best practice security standards enable the transmission of encrypted information directly to trusted recipients via the Internet. The service is hosted at the Florida HIE data center and can be accessed securely by subscribers using a Web enabled client. In this manner, providers are able to meet the requirements of meaningful use incentives. The Florida HIE DMS is nationally accredited through Direct Trust. The Direct specifications represent a national standard model meant to streamline transmission of encrypted health information directly to known trusted recipients over the Internet.

EVENT NOTIFICATION SYSTEMS

In 2013, the Florida HIE developed the Event Notification System (ENS) which sends admit-discharge-transfer (ADT) notifications to participating health plans and providers when a patient is admitted or discharged from a hospital (system) or when the patient is seen in the emergency department (AHCA, 2013). To participate, subscribers (health plans or providers) provide patient rosters to the Florida HIE, and these names are matched against hospital ADT events. If a match is detected, the subscriber is notified. The ENS improves coordination of care by lowering readmission rates and diverting non-urgent care to the primary care provider (AHCA, 2015). In addition to real time monitoring of events, the ENS can be used to alert hospitals if a patient is admitted to another facility within 30 days of discharge from the initial facility (AHCA, 2015).

CURRENT CHALLENGES

In executing the HIE statute, AHCA has required the Harris Corporation to develop a security and disaster back-up plan designed to counteract disturbances to business activities and protect critical business from the effects of major failures. The disaster back-up plan aligns with HIPAA requirements for developing a disaster recovery plan and procedures for testing the network and remediating any faults. Harris Corporation has developed and maintains a tested and actionable plan for back-up of software and data, and a disaster recovery plan for restoring the system in the event the production systems are destroyed or damaged. However, as with any system or plan, challenges inherent to the process may exist. As natural disasters are an annual threat in Florida during hurricane season, we have reviewed the literature to provide a basis for our recommendations for Florida HIE disaster recovery considerations.

The primary challenges to the management and functioning of health information exchanges during and initially following natural disasters have been identified as disaster recovery plans; need for coordinated communication; insufficient or lack of reserves; and, cost and funding issues for technology.

Disaster Recovery Plans

While emergency management or disaster recovery plans are required by AHCA, the presence of such a plan by no means ensures its quality or effectiveness. Even if disaster recovery plans exist, they oftentimes are not publicly documented, distributed, or made accessible to middle and lower-level employees. Frequent training sessions and disaster preparedness tests also may go unpracticed, leaving employees without the proper know-how or training of how to appropriately respond to disasters within their business or organization (Cook, 2015; Yang, Yuan, & Huang, 2015). Many disaster recovery plans are outdated or not continually updated as companies grow and age (Cook,

2015; Mccafferty, 2015). Most plans contain major errors, mistakes, or contradictions that cause even more difficulty and confusion (Mccafferty, 2015). While these plans identify what to do, they may fail to specify a proper order of action or identify high versus low-priority areas. When coupled together, these challenges oftentimes result in a failure to launch or properly execute disaster recovery plans as a whole.

Coordinated Communication

If the disaster recovery plan of an HIE fails to launch, this may greatly hinder coordinated communication between emergency operation centers and groups. For instance, one business reported that a lack of dialog between upper and lower-level management and between satellite and corporate offices during times of emergency resulted in an inability to identify the emergency protocol passwords and logins for their back-up systems (Mccafferty, 2015).

The challenge of coordinated communication between organizations and response teams may become even more limited when patient confidentiality and data sharing laws vary by state, when patients are displaced and relocated, and when numerous states are impacted. Fragmented health systems, closed-source databases, and multiple stakeholders can each negatively influence the functioning of health information exchanges, especially during times of disaster (Charleston et al., 2015). While ensuring a continuum of care is an essential function, it is also important to consider the additional challenge of privacy concerns, at the individual, state, and federal levels.

The Health Insurance Portability and Accountability Act (HIPAA) preempts state laws that undermine its privacy protections; however, state laws regulate the transfer of information if the laws are equal to or offer more protection than HIPAA (Parver, 2006). HIPAA's three primary components-to promote electronic transmission standards, to regulate the privacy of electronic medical records, and to regulate the security of medical data storage and transmission—seek to ensure that physicians, hospitals and insurance companies have safeguards in place to protect information and files from access by unauthorized persons (Conn, 2006).

Reserve Systems

One of the most crucial resources necessary during disasters is reserve systems. These systems may range from back-up power systems, such as generators, to the reserve storage of data and records (Cook, 2015; Pingel et al., 2012; Yang, Yuan, & Huang, 2015). It is also beneficial for all organizations, including the Florida HIE particpants, to recognize their labor force, be it employees, volunteers, or external professionals, as valuable resources. Something as simple as having a plan in place to call in extra off-duty staff and personnel to help mediate any breakdown in the disaster plan is crucial (Cook, 2015).

Cost

Inadequate funding for telehealth technology following Hurricane Katrina in 2005 negatively impacted personnel and patient engagement as well as the implementation of health recovery programs (Kim et al, 2013). Other costs included technical support, staffing requirements, and transportation expenses. Because these initiatives were completely reliant on external funding, mainly from grants and private donations, many necessary medical services were financially unsustainable (Kim et al., 2013). Yang, Yuan, and Huang (2015) discuss a similar cost dilemma, but in terms of data reserves and storage located at off-site server centers, in the cloud, or in virtual servers. A smooth transition from primary to reserve data and records is vital to ensure continued patient care, and this may be improved by the HIE. Additional cost factors include a lack of information technology support for setting up equipment, unreliable equipment and transmissions, and low levels of information technology expertise. (Cook, 2015; Kim et al., 2013; Mccafferty, 2015).

The issue of cost and funding also plays a significant role in whether or not companies or organizations are able to have in-house information technology teams, back-up data storage, or

additional firewalls for protection (Charleston et al., 2015; Cook, 2015; Kim et al., 2013; Mccafferty, 2015; Yang, Yuan, & Huang, 2015). Unfortunately, many smaller clinics or clinics located in poor or rural areas during Hurricane Katrina did not have the financial capital to support in-house IT teams and IT infrastructure (Kim et al., 2013). However, because Hurricane Sandy made landfall in mostly urban and developed areas, the businesses and organizations did have adequate funding for IT teams, equipment, and electronic health record reserve systems (Sebek et al., 2014). In addition, internet connectivity and bandwidth problems are likely to occur during disasters, and frustration over these technological issues may discourage adoption of more IT or IT solutions (Kim et al., 2013).

SOLUTIONS AND RECOMMENDATIONS

Given the challenges to the management and functioning of health information exchanges during times of disaster, it is important to have practical solutions in place to address these issues. Solutions identified in the literature include interoperability; communication networks; increased surveillance systems; and utilization of new technologies.

Interoperability

The first solution is true interoperability, which includes open data sharing between different states, agencies, facilities, and hospitals and would allow an HIE in an affected region to work with their connected peers to recover full functionality. This can best be achieved through the use of electronic health records (EHR), particularly for primary care situations, as was demonstrated following Hurricane Sandy (Sebek et al., 2014). Other areas may utilize telemedicine and telehealth as in the case of Hurricane Katrina (Kim et al., 2013). Because both EHRs and telehealth involve protected patient records and data, it is vital that this information be stored either at a secure off-facility site on physical servers or on the web in data clouds (Yang, Yuan, & Huang, 2015).

Communication Networks

The second solution, communication networks and coordinated care, go hand in hand with interoperability in that open lines of communication and data sharing are necessary for success. Central planning units at the regional or state level would enact virtual operation centers and electronic command boards (Sebek et al., 2014).

Increased Surveillance Systems

Communication channels at the multi-state or national level would include tracking and surveillance networks, to monitor data ranging from disease outbreaks to infrastructure problems or environmental hazards (Charleston et al., 2015).

While these surveillance plans may be disaster-specific, they should also take into account business continuity, contingency operations, and risk management (Cook, 2015; Mohamed, 2014; Morgan et al., 2015; Pingel et al., 2012; Suginaka et al., 2014). Cook (2015) suggests modeling a six-stage continuity and recovery plan comprised of governance structure, plan initiation, business impact analysis and risk assessment, improved design and updates, testing and training, and maintenance. Similarly, Suginaka and colleagues (2014) suggest applying a ranking criterion to different priority operations based on each separate organizational department, their necessary uses, and possible substitutes to continue normal operations.

Utilization of New Technologies

While financing options and organizational budgets may be limiting, new technologies can greatly improve communication, monitoring, and efficiency during emergency situations. For instance, personal digital assistants can accompany healthcare workers in the field and greatly assist in triage

situations. Wrist devices and global positioning satellites provide real-time tracking of individuals' physical locations. Bar codes and implantable data chips, like the VeriChip, provide quick and easily accessible patient histories and medical information (Gaudio, 2006; Streitfield, 2002). Other technologies, like smart phone enabled heart rate monitors, Google Glass (hands-free communication system), and automated prescription alerts make it easier for healthcare workers to identify and treat patients (Gillis et al., 2015).

CONCLUSION

Within less than a decade, two large storms wreaked both physical and technological disaster previously unprecedented in United States history. Hurricane Katrina and Hurricane Sandy both presented various health information exchange challenges and ultimately required modernized solutions for dealing with natural disasters and crisis management. All in all, having an accessible, up-to-date disaster recovery plan which employees have been trained to respond to is crucial to an organization's success. Interoperability and open communication networks are also vital to ensuring continuity of care during times of disaster.

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