Interoperability Report

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Executive Summary:

More now than ever, with an increasing dependence on health information technology, healthcare organizations need the ability to exchange patient information on a regular basis. There are many departmental systems within a healthcare facility that need the ability to communicate with each other in order to provide patients with the right care. In an environment where time is critical there needs to be ease of exchange of information that can save a patient. This exchange of information amongst systems is called interoperability.

With interoperability, efficient access can be accomplished when utilizing healthcare data that is being provided across multiple platforms. Interoperability is about complex computerized frameworks talking and communicating with each other to provide information from within organizations and across systems. The exchange of data between multiple entities provides users with the necessary information that is needed. During the time of exchange there is simultaneous work within the system that occurs in order to provide the information that is being searched.

Today in current state, interoperability is vital to the survival of any organization and soon maybe the make it or break for technology developers. Government entities like the ONC, CMS, and the VA have noticed the value interoperability brings by fostering a more efficient and effective organization to better provide care to the people it cares for.

What is Interoperability:

Interoperability within a Health ecosystem further optimizes health information by providing seamless exchange of information across multiple covered entities. Health information exchange frameworks and standards allow important data to be exchanged securely and effectively across the whole healthcare spectrum including stakeholders and the individuals whose data is being exchanged. Interoperability allows for connections and integrations to happen no matter information's origin or destination and makes certain that the information is user friendly and easily accessible to ensure that the end user does not have to intervene. Furthermore, interoperability optimizes health as it allows access to necessary data that is needed in order to understand and effectively address health issues that affect individuals and populations (HIMSS, 2019). Systems that are interoperable have different ways in which they can exchange data and these exchanges may happen simultaneously in one healthcare setting. The ways in which an organization can exchange information is the following; foundational, structural, semantic, and organizational.

Functional exchange is the foundation of data being transferred between contrasting systems by creating inter-connectivity requirements that are necessary for data to be shared and received. This type of exchange does not allow for end users to receive and interpret data without additional interventions. Next is structural exchange, a uniformed way of exchanging data so that it can preserved and unaltered (HIMSS, 2019). Additionally, it can be characterized as the syntax

of exchanging information. Then there is semantic exchange, which allows multiple systems to exchange, interpret and use the data that is exchanged. Lastly, organizational exchange incorporates technical, policy, organizational and social factors.

How it Works:

With interoperability there are objects and components (Vallecillo, et. al., 1999). Components are the binary units of possibly "independent production, acquisition, and deployment that interact to form, a functioning system (Vallecillo,et. al., 1999). Objects and components are not the same but are similar in that they have an encapsulation characteristic meaning their "capabilities and usages can be specified by a means of interfaces" (Vallecillo, et. al., 1999). Interfaces are "a service abstraction, that defines the operations that the service supports, independently from any particular implementation (Vallecillo, et. al., 1999).

There are two main levels of interoperability; the signature and semantic levels (Vallecillo et. al. 1999).The signature level is composed of the signatures (the names and profiles) "of the components' operations" (Vallecillo, et. al., 1999). With this information, there are two major things that can be done within components; compatibility and substitutability (Vallecillo,et. al., 1999). Compatibility can be characterized by the ability of two objects being able to work together properly if connected (Vallecillo, et. al., 1999). On the other hand, substitutability can be defined as one component being able to replace another component (Vallecillo, et. al., 1999). Semantic interoperability tries to make sure that data exchanges among components in large systems are understood in other words that senders and end users have a common understanding of the data being requested (Vallecillo, et. al., 1999). DCOM and COBRA are object and component platforms that provides a means for interoperability (Vallecillo, et. al., 1999). Furthermore, these platforms gives way for different components to interoperate according to their "syntactic" agreements (Vallecillo et. al., 1999).

In healthcare, records are composed of two parts one: the structure that contains the individual's data plus relevant data and two: the content that is entered in by the authors. As the information in one system needs to be interpreted and exchanged with another, there should be means as to how these two systems are able to do that correctly. In order for semantic interoperability to work in healthcare, aligning the structures of the records in the different systems and interpreting them is the way to do this (Bhattacharyya, 2017).

There are two ways that a record structure can be aligned, one being the use of a common information framework for exchanging data while the other is using a common messaging framework (Bhattacharyya, 2017). Structural issues are easier to solve compared to content issues. In order to avoid having content issues, it should be in the form a processable code which can be executed with a model that uses linguistics, and, computer and information science (Bhattacharyya, 2017). There are two models that have these components and they are the information and concept models. The information model is one that is shareable, stable and organized in structure and at the basic level, tends to the syntactic factors of interoperability

(Bhattacharyya, 2017). This model could be used in creating records and data messages. The concept model provides a means in which data can be represented and codified thus, tending to the semantic factors of interoperability (Bhattacharyya, 2017).

What is working:

Interoperability in hospitals and other medical entities has not reached its full potential. Recent studies have revealed that as few as thirty percent of all hospitals in the United States have met the four metrics of "true" interoperability (Castillo, 2018). The world of IT has been trying to make progress in having electronic health records better communicate with each other in order for healthcare providers to better deliver quality care to their patients. As of now, many of theses EHRs are siloed and trying to get them to be more compatible is a challenge (Castillo, 2018). Part of the issue of interoperability with EHRs was studied in 2015. It was found that hospitals that had more comprehensive EHRs were typically found participating in Health Information Exchanges (HIE), but other organizations that had basic EHRs did not. (Holmgren, 2017). The reason for this may be due to the limitations of this EHR systems. With medical facilities now shifting to "value-based care" there has been priority to enhancing interoperability in these healthcare environments and identifying how we can get even basic EHRs to communicate to other systems.

The industry is constantly changing and the IT component of the healthcare industry needs to involve and keep up with the ever changing world. Better improving interoperability within hospitals will enhance the patient experience and a more optimal level of quality care can be delivered. With many advances in technology taking place, it is crucial that medical entities upgrade their IT systems to keep up with the changing times.

The Barriers for Interoperability:

One barrier with interoperability is the fact that there are a variety of EHRs and EHR interfaces (Marbury 2017). Even though there are government standards that EHRs need to meet in order to be efficient, they require many customizations to meet the needs of the organization that is using it. This causes a higher level of complexity as it makes it harder for the systems to be uniform. Another barrier for interoperability is that the data sources are growing in size (Marbury 2017). This is illustrated by the number of devices, like the apple watch, that track patient data. The current technology does not have the interfaces that are capable of keeping up with the data collected from wearable health devices (Marbury 2017).

The next barrier is the partnerships. When hospitals acquire other health organizations or two hospital systems merge together, it is often difficult for the two systems to integrate. Lastly, the government standards that are in place does not mean that different systems are uniform thus not having the ability to be interoperable (Marbury 2017). This is due organizations not implementing the standards the same exact way.

Literature Review:

Progress:

Recently, there has been an increased pressure on the healthcare industry to obtain interoperability amongst their health information technology (HIT). This push for interoperability was initially started with the HITECH Act. This legislation enforced the adoption of Electronic Health Records (EHR) with the goal in mind in being able to share protected health information (PHI) amongst providers to optimize their patients care.

Progress that has been made since the adoptions of EHRs was the partnership between the American Health Information Management Association (AHIMA) and Integrating the Healthcare Enterprise (IHE) in 2015. The partnership created the "Health IT Standards for HIM Practices". These standards were the first published guide for HIT standard developers about information management in healthcare (Eramo, 2016). Though this created standards in how HIT, specific with Health Information Management (HIM) systems, could be interoperable, there was no precedent for systems or health entities to follow these ad-hoc standards.

Further progress has been made as of this year. The Office of the National Coordinator (ONC) has proposed a rule that the standard development organization, Health Level Seven's (HL7) standard Fast Healthcare Interoperability Resources (FHIR) shall be a requirement for developers in order to be compliant with the 21st Century Cures Act (Slabodkin, 2019). The standard FHIR requires technology to implement Application Program Interfaces (API) in order to be able to communicate amongst each other and share data (Braunstein, 2018).

Challenges:

A major challenge that lies ahead of interoperability in healthcare with regards to the proposed rule of implementing APIs, is the creation of a shared information exchange infrastructure (Eramo, 2016). Though the function of APIs are to be able to facilitate data exchange amongst different systems, there is still the need to build an infrastructure that will dictate how information is carried, sent, received, and communicated. It's essential to build this infrastructure because patient information is scattered amongst many entities (Siyal, 2019). Without this infrastructure, APIs will transfer unreliable data and healthcare organizations will not be able to capture the patients full health history.

Another challenge facing the ability to share information is the extreme volume of data systems will experience. With such large volumes that systems never experienced there is a question about storage space and the security of all this data (Siyal, 2019). Many facilities store their data internally on their own servers. With such a large amount of data about to come in

there is a concern that they will not have enough storage space on their servers nor the man power to be able to maintain all that data.

Overcoming Challenges:

To address the challenge in building an infrastructure for information to be sent and received amongst different covered entities would be the adoption of a blockchain technology. Blockchains creates an infrastructure that facilitates digital access rules, data aggregation, data liquidity, patient identity, and data immutability (Gorden, 2018). The overall infrastructure of blockchains was to address the weakness that Health Information Exchanges (HIE) posed. This weakness was the utilization and creation of multiple HIEs with no standard external repositories, and having no formal governance identified. With the integration of APIs, blockchains will allow information to flow between entities without the use of a external repositories so the governance of the information stays with the covered entity verses a third party vendor.

An idea to overcome the second challenge of storage space would be for entities to utilize cloud-based storage. With this type of storage it can be used for information sharing and file backup in a cost-effective way (Yaegar, 2019). It is more cost-effective to convert to cloud-storage because entities will only pay a flat rate for their storage. That cost would be less than buying more servers and paying for maintenance and repairs.

Appendix:

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