Blockchain's Role in Health IT

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By Allison Viola, MBA, RHIA

When innovative technologies make a splash on the international stage, healthcare professionals wonder how these technologies can translate or be scaled for the healthcare industry. Health information management (HIM) professionals are always seeking ways to improve healthcare through accurate and timely information, ensuring patient privacy and confidentiality, reducing costs, and improving patient safety. When the US government injected several billions of dollars into electronic health record (EHR) implementation, the healthcare industry believed this financial push would help solve the fragmented, duplicative, and proprietary structure of systems as we know it. Unfortunately, that effort has not yielded the anticipated results.

However, a relatively new technology called blockchain may hold some promise. Blockchain was invented by an anonymous individual using the alias Satoshi Nakamoto in 2008 that served as the public transaction ledger of the cryptocurrency Bitcoin. Blockchain was used to bypass centralized intermediaries in making financial transactions, allowing the direct transfer of encrypted data or currency between two parties through a peer-to-peer network. It has made headlines in the financial sector, and the design for Bitcoin inspired other applications aiming to disrupt the way we securely access and exchange patients' health information.[1]

As the healthcare industry transitions from a fee-for-service (FFS) model to one that is value-based, there is increasing pressure to securely share patients' health information and make clinical decisions based on that information.

Several years back, the Office of the National Coordinator for Health Information Technology (ONC) published a document called "Connecting Health and Care for the Nation: A Shared Nationwide Interoperability Roadmap (Roadmap)," which "describes its efforts around health IT interoperability and the policy and technical actions needed to realize their vision of a seamless data system" through 2024.[2] Milestones outlined in the Roadmap include a ubiquitous, secure network infrastructure, verifiable identity and authentication of all participants, consistent representation of authorization to access electronic health information, and several others. Perhaps blockchain technology can help move the healthcare industry in that direction, but first, healthcare professionals need to understand how this technology works.

In its simplest terms, a blockchain is a digital, distributed ledger of transactions that use an "append only" data structure, which are recorded and stored in blocks of data on every node of the network. A node is anything that is connected to the internet that has an IP address, and its role is to support the network by maintaining a blockchain. Participants in a blockchain have identical copies of the ledger that have been digitally signed, timestamped, and posted to the ledger. This technology builds upon three core concepts:

- **Transaction Ledger:** Any type of information or digital asset can be stored in a blockchain. This content may include clinical data, claims information, patient and family history, and patient-generated data submitted through a device. The information is then encrypted, digitally signed, and stored in the blockchain in linear fashion. Once the data has been captured and stored on the chain, it remains immutable and therefore cannot be erased or modified. Amending or updating must be accomplished through successive blocks of data that is then approved and locked into place by blockchain technology. Each time data is added to the chain it is timestamped, and the location and entity making the addition are included.
- **Distributed Network:** As with many industries, healthcare has traditionally maintained a strong central authority to safeguard identities of participants, ensure transactions occur safely and securely, and establish trust with the users. A centralized infrastructure can be costly to support, as well as vulnerable to attack and failure. Blockchain technology replaces this centralized approach with one that is distributed across the network with potentially thousands of participants that are represented by nodes. Completing a transaction requires all nodes to verify and reach consensus to accept the new transaction in the ledger. Because all members of the network have a complete copy of the blockchain, no one member can modify the data once it has been added.

- **Private Key Cryptography:** All transactions are signed with a private key which in turn establishes participants' identities. Though transactions are openly stored on the network, information can only be accessed via a private/public key. Caregivers, clinicians, and other intended users who are authorized may also gain access to a patient's records.

As health information becomes more digitized, fragmented, nonstandard, and siloed within a variety of sources, blockchain technology has the ability to alleviate these challenges and improve efficiencies.

Interoperability, Accessibility, and Data Integrity Issues

The healthcare pain points of interoperability, accessibility, and data integrity present challenges such as lack of clear data sharing and ownership. Blockchain reduces data siloes and aggregates EHR clinical data and thereby supports interoperability between healthcare systems. Patients have the ability to better control who has access to what data, which can also support personalized medicine.

Privacy and Security Issues

Healthcare faces increasing cyberattacks which in turn make providers and hospitals more vulnerable to data breaches, trust and access control issues, and diminished confidence in the integrity of health information. Because of its peer-to-peer network (distributed ledger), blockchain enhances security against direct attacks on a centralized repository and supports data encryption and the management and enforcement of complex permission settings for third parties through the use of smart contracts. Because the blocks remain immutable, it is nearly impossible to modify data as there are multiple checkpoints through the distributed network.

Compliance with Regulations

With a patchwork of privacy and security laws across the United States, compliance with HIPAA, and other regulatory requirements, blockchain introduces efficiencies and transparency through the use of smart contracts that automate the maze of permissions and other requirements with complex logic and rules that are built into the system.

Fraud and Abuse

The healthcare industry is fraught with false claims, corruption, improper billing, illegal prescriptions, and unnecessary care. With smart contracts, blockchain simplifies subrogation and fraud is reduced through traceability and accountability. External auditing is made easier and each block that is added is timestamped and data rendered immutable.[3]

Despite its promise of application, several issues must be addressed before the healthcare industry can realize blockchain's full potential and ensure wider adoption of the technology. The regulatory environment has traditionally been slow to catch up with technology and right now healthcare professionals are in the midst of implementing provisions from the 21st Century Cures Act to address interoperability, information blocking, and other issues.[4] Regulatory uncertainty will contribute to the slow adoption, but once a regulatory framework that supports blockchain applications is developed, the healthcare industry will likely embrace it and boost implementation.

Currently there is an absence of standards and best practices to support developing blockchain technology, which can hinder usability and consistent implementation. As with health information technology, it is imperative for industry stakeholders to collaborate and work together to develop uniform standards and protocols. Lack of awareness and understanding also slows growth and acceptance, therefore industry leaders and federal agencies can take the helm at educating and engaging industry players during this nascent stage.

Healthcare continues to transition from a paper-based system to one that captures electronic health information, and blockchain technology can serve as the catalyst to explore the promise and opportunities of this technology. Blockchain will have an increasing role in health IT with its ability to engage and securely connect providers, patients, and researchers with social determinants of health, genetic data, patient-generated data, and other sources of health data. It will be interesting to watch where innovation, coupled with policy, will take the healthcare industry. HIM professionals have the opportunity to sit front and center and be part of the change.

Notes

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