

# THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

## Opportunities and Challenges for Blockchain in Healthcare

Yue Yu

Student, College of Business, California State University, Chico, U.S.A

Harish C. Bahl

Professor, College of Business, California State University, Chico, U.S.A

### **Abstract:**

*Storing, transferring, and sharing patients' healthcare information without violating patients' privacy is essential for the healthcare industry. Manual paper records are being converted to electronic health record in several healthcare organizations. Block chain, which is a new technology, can revolutionize the storing and sharing of patients' healthcare information. It will give control of information to the patients and provide access to healthcare providers with stricter confidentiality and privacy.*

**Keywords:** Blockchain, health Records, healthcare, privacy

### **1. Introduction**

Storing, transferring, and sharing patients' healthcare information without violating patients' privacy is essential for the healthcare industry. Prescriptions, medical histories, and other healthcare records are personal information that belong to the patients. Patients should be able to have full control of their own healthcare data and decide when and with whom they would like to share their private information. In this paper, we first outline blockchain technology concepts. Then, we analyze relevant current problems in the healthcare industry. Next, we illustrate the benefits of adopting blockchain, which can provide solutions to those problems. Finally, we discuss the risks and challenges when trying to adopt blockchain.

### **2. Block Chain Concepts**

What is blockchain? Blockchain is defined as "a peer-to-peer distributed ledger technology for a new generation of transactional applications that establishes transparency and trust" (Linn, 2016). It has three main components, including a distributed network, a shared ledger, and digital transactions. For example, a doctor, a patient, and a pharmacist can constitute a distributed network. Each party within the network obtains a copy of the blockchain; and, together, all of them will ensure that the healthcare information is correct. A shared ledger is the place that contains the records. Everyone can add a record; however, to add the record, the other members in the network must agree to what one party is about to add. Once the record is added, all copies will be updated automatically. No one single party can change the record on its own. The concept of digital transaction signifies that the network implementing the blockchain defines the nature of information contained in the transaction. Information is encrypted and digitally signed to guarantee accuracy and authenticity. Transactions are structured into blocks, and each block contains a cryptographic hash to the prior block in the blockchain (Linn, 2016). Blocks are always added in a linear and sequential order.

Blockchain technology can also be defined from a data processing perspective. Underlying taxonomy is divided into distributed ledger, consensus, cryptography, and smart contracts (Dinh, 2018). Blockchain is successfully being used for Bitcoin, and the rising popularity of crypto currency has brought attention to the technology behind it.

### **3. Current Issues in Healthcare Records**

Why do we need to change what we currently have with regard to storing and sharing patients' healthcare to blockchain? What issues are we facing today in the healthcare industry? As of today, almost all healthcare data are stored using an electronic health record (EHR). The emergence of the EHR represents a step forward from hard-copy files to record large volumes of patient information. However, the current EHR is not providing the best service. Some healthcare providers only share a patient's record when they must, and providers even consider having control of patients' medical records as a competitive advantage in the industry. Many healthcare providers believe that having sole access to patients' data will prevent those patients from transferring their care elsewhere (Ivan, 2016). According to Ivan (2016), "Healthcare providers perceive the patient's medical record as their property rather than the patient's." Healthcare information should be available to patients all the time, and patients have every right to decide with whom they want to share those data. The process by which a patient can access his or her medical information should be easy and quick but not inconvenient and costly. There is

an additional problem with the EHR. According to Ivan (2016), "Broader adoption of electronic health records has enabled previously unknown levels of health data breaches." The EHR should be stored in a safe place. Current EHR systems are not linked to other systems. If the information is recorded by healthcare providers, the information will always be under the providers' control. The process is not transparent and creates more opportunities for data breaches.

#### 4. Benefits of Blockchain Application to Healthcare

Adopting blockchain for storage of records will ensure patients' privacy, allow for safe sharing, and secure the whole process. In effect, patients will become their own healthcare information providers. As owners of the information, patients can share and transfer all the records freely and safely. Since the blockchain is a decentralized system, there will be no single party that can alter the recorded information without notifying other parties. All the data are coded into the blockchain, and it can be decoded only by the patient's unique key. Even if the system is hacked, the hacker cannot read the coded data correctly. The structure of the blockchain has features that can self-check the system. Multiple effective methods to add data to the blockchain include "tamperproof timestamps, account IDs, etc." (Ivan, 2016). A blockchain-based technology stores healthcare data that meets all the expected criteria of a medical record keeping system; and, in addition, it improves patients' access to their records and provides much better security against data breaches.

#### 5. Application of Blockchain to Healthcare Records

Blockchain can be adopted by patients easily and efficiently. Over the years, more and more wearable devices are being used by customers to track their health. It is even more effective when the device is linked with smart phones. People can simply use an app on their phone to manage their health information. According to Liang *et al.* (2017), there are six entities including the user: wearable devices, the healthcare provider, the insurance company, the cloud database, and the blockchain network. The user will collect data while wearing the device, like a smart watch, and the wearable device will convert all the information to readable data. The healthcare provider can request health data from the user. Data can also be requested from the user to determine the best healthcare insurance for the customer. Access to the customers' health information can be cancelled after use. The function of the blockchain in this process is to ensure that all users' health data is well protected. Both the healthcare provider and the insurance company need the users' permission to be able to access to the information. In addition, all of the transactions and changes will be recorded on the blockchain for future needs. The cloud database stores users' health information and the requests from the healthcare provider and the insurance company (Liang *et al.*, 2017).

#### 6. Risks and Challenges

How can we implement blockchain from the healthcare provider's perspective? Cyran (2018) has noted that "Our blockchain-based data-sharing solution addresses two of the most critical challenges associated with using blockchain for health data sharing: protecting sensitive health information and deploying and installing blockchain software across diverse hospital environments." Currently, most of the hospitals are using the EHR system for data sharing. To successfully adopt blockchain in hospitals, a system needs to be created that will connect to the EHR system. Blockchain technology allows for sharing of data across multiple information technology infrastructures of hospitals, insurance companies, and pharmaceutical companies.

The use of blockchain in the healthcare industry has the potential to be tremendously beneficial. What are some of the risks and challenges? First, there is no blockchain that is ready to be used for the healthcare industry right now, and more research and development are needed. Second, if the blockchain is adopted, the users need to be educated about proper use in order to maximize efficiency of the system. Since the users will be in charge of their health data, ensuring that only correct and accurate information is recorded on the blockchain is essential. Third, it may be challenging to persuade individuals and institutions to change the current system. To make blockchain work, all the "nodes" within the network must be connected and working together. Patients and healthcare providers, including clinics and hospitals, must be on board. In addition, regulations, laws, ethical concerns, and possible technical issues must be taken into consideration. Implementing blockchain into the healthcare industry is a large project, which will require time and financial resources.

#### 7. Conclusion

We have examined the potential benefits that blockchain can bring to the healthcare supply chain and the possible ways to implement it from both the users' point of view and healthcare providers' perspective. There are risks and challenges when trying to adopt blockchain, but the potential benefits seem to outweigh such challenges. Healthcare data will be well protected, and the process of sharing information will be safer. The supply chain of the entire healthcare industry will be more efficient and effective. There is interest in the application of blockchain to the healthcare industry, and there are opportunities for innovation in this area. We believe that, in near future, blockchain will be the new system for our healthcare supply chain.

## 8. References

- i. Cottrill, K. (2018). The Benefits of Blockchain: Fact or Wishful Thinking? Blockchain is still a largely unproven innovation in the supply chain, but it's also one that companies can't afford to ignore. *Supply Chain Management Review*, 22(1), 20-25.
- ii. Cyran, M.A. (2018). Blockchain as a Foundation for Sharing Healthcare Data. *Blockchain in Healthcare Today*. <https://blockchainhealthcareday.com/index.php/journal/article/view/13>. Retrieved May 1, 2018.
- iii. Dinh, T.T.A., Liu, R., Zhang, M., Chen, G., Ooi, B.C., & Wang, J. (2018). Untangling Blockchain: A Data Processing View of Blockchain Systems. *IEEE Transactions on Knowledge & Data Engineering*, 30(7), 1366-1385.
- iv. Ivan, D. (2016). Moving Toward a Blockchain-based Method for the Secure Storage of Patient Records. [https://www.healthit.gov/sites/default/files/9-16-drew\\_ivan\\_20160804\\_blockchain\\_for\\_healthcare\\_final.pdf](https://www.healthit.gov/sites/default/files/9-16-drew_ivan_20160804_blockchain_for_healthcare_final.pdf). Retrieved April 14, 2018.
- v. Liang, X., Zhao, J., Shetty, S., Liu, J., & Li, D. (2017). Integrating Blockchain for Data Sharing and Collaboration in Mobile Healthcare Applications. [https://www.researchgate.net/publication/320337312\\_Integrating\\_Blockchain\\_for\\_Data\\_Sharing\\_and\\_Collaboration\\_in\\_Mobile\\_Healthcare\\_Applications](https://www.researchgate.net/publication/320337312_Integrating_Blockchain_for_Data_Sharing_and_Collaboration_in_Mobile_Healthcare_Applications). Retrieved May 1, 2018.
- vi. Linn, L.A., & Koo, M. B. (2016). Blockchain For Health Data and Its Potential Use in Health IT and Health Care Related Research. <https://www.healthit.gov/sites/default/files/11-74-ablockchainforhealthcare.pdf>. Retrieved April 14, 2018.