

A Review on Secure Storage, Transmission and Challenges In Healthcare Records Using Blockchain Technology

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Abstract

Blockchain technology is emerging as an innovative tool for ensuring secured data management, cyber security and financial services. Healthcare industry has also started taking benefit from this technology like delivery of secure and safe healthcare data, treatment through secure sharing of data and effective diagnosis. This paper reviews various studies already taken place and elaborate the potential of Blockchain to describe sharing of superior medical data along with assistance in several other diagnostic applications. This paper also highlights some challenges in blockchain with references to future perspectives.

Keywords

Blockchain technology, health-record, cloud storage, privacy and security.

1. Introduction:

Blockchain technology is emerging as a revolutionary tool with a lot of advantages being offered to the medical industry. With the high speed internet and emerging secure methods, telemedicine and online transactions are common procedure in healthcare. Taking the legacy forward, blockchain technology is expected to change the scenario in the field of medical science to the next level in near future. Blockchain technology will help the administration in proper managing of medical data by having a central server, lowering down the cost of monitoring and configuring data. This would

further help in reducing the processing time by many folds, since the complete related data of a patient would be available instantly because of the availability of distributed ledger.

The doctors would be able to view in real time the original, accurate and high quality documented records, that will help them give the patients an honest prescription; thus reducing any possible medical-history errors. On the other side, because of the transparency of data, the patients would not require to have second opinion of other doctors. Patients would have a complete sovereignty on their records, thus having full control on sharing of records with others.

2. Review of Literature:

Many different studies have been devised that elaborate the potential of Blockchain to describe better sharing of medical data and to assist in various other related applications.

Yue et al. [1] introduced a private blockchain method to store and monitor individual medical data. This method enables restricted access control wherein patients can monitor and manage their personal healthcare summary and medical data stored on private blockchain.

Griggs et al. [2] worked upon a 'private – blockchain' method to enable secure and safe use of medical-sensors.

A. Roehrs, et. al. in their paper [3] have suggested a distributed model OmniPHR for healthcare providers and patients. With the help of this, patients can keep record of their health history. Healthcare people can also retrieve appropriate data related to their patients.

Abdullah Al Omar, et.al. have proposed in their paper [4] about the use of Blockchain technology to store the data of patient data and to achieve its privacy. They have highlighted that so-as-to guard patient's data, cryptographic functions can be used which guarantee Pseudonymity, so that the system must preserve accountability, integrity, security and privacy of healthcare data.

H. Kaur, et al. in their paper [5] have suggested a blockchain based platform to store and handle electronic-medical-records in a Cloud based environment.

K. Fan, et al. in their paper [6] have proposed a secure and efficient Medical-Data-Sharing method named MedBlock that is a blockchain-based Information-Management-System to manage the information of patients. With MedBlock, information can be accessed and retrieved efficiently through the electronic health record. MedBlock also reveals high information security merging symmetric cryptography and the customized access control protocols.

H. Li, L. Zhu, et al. in their paper [7] puts forward a blockchain-based data preservation system which uses cryptographic algorithms and prudent-data-storage strategies to ensure user privacy.

G. Dagher, et al in their paper [8] have proposed a blockchain based framework Ancile is proposed for efficiently accessing the medical records by patients, providers and 3rd parties. It uses smart contracts with blockchain based on Ethereum for the access control and hiding the sensitive data. In this, various cryptographic techniques are used for security.

Y. Chen, et al in their paper [9] have designed a storage scheme based on blockchain and cloud storage for handling and sharing personal health records of patients. A service framework has also been outlined that do not rely on any third party concern and also, no single party has the complete control to affect the processing.

Ekblaw A., et al. in their paper [10] presented a blockchain based structure founded on distributed ledger protocol related with bitcoin. It uses public key cryptography along with proof of work algorithm in which nodes participate to solve computationally intensive puzzles before a new block can be added to the blockchain. To make medical data available to researchers and to support the MedRec, a data mining scheme is offered.

R. Guo, et al, discusses in their paper [11] about the use of attribute-based-signature-scheme and blockchain-with-multiple-authorities. Further to prevent collision attack among multiple authorities pseudorandom function seed is proposed.

S. Khezr, et al. in their survey paper [12] presented an inclusive analysis of evolving blockchain-

based healthcare technologies and associated applications. It also revealed the prospective of blockchain technology in renovating healthcare industry.

Kyoung-jin Kim, et al. proposes in their paper [13] the use of Trusted Model for Sharing Medical Data (TMSMD) based on permissioned blockchain and smart contracts for exchanging the medical data and sharing information.

S. Parvatikar, et al. have discussed in their paper [14] that to encrypt patients' PHR file, the use of attribute based encryption techniques and Key management complexity is reduced by dividing the users into multiple security domains. Multi-authority ABE is used for achieving patient privacy.

A. Omar, et al in their paper [15] proposes patient-centric-healthcare-data-management system based on blockchain technology which helps in achieving privacy of data. For encryption of patient's data cryptographic functions are used which confirm pseudonymity.

3. Challenges In Blockchain

After the study of the literature available, we have found some challenges with references to future perspectives:

- a. Privacy and Security of the Health Records:** The most serious and important issue urging the use of Blockchain Technology is the security and privacy of medical-data. The privacy and security risks of medical records becomes apparent because blockchain allows the entire community to verify those records.
- b. Managing Storage Capacity:** With huge record available in healthcare, management of storage of health records is another challenge. Blockchain was designed with restricted scope to process and record the transaction data, but with time, storage challenges became apparent.
- c. Interoperability Issues and Standardization Challenges:** Blockchain additionally suffers from the difficulty of ability that refrains blockchains to communicate with providers and services. This is a big challenge that interrupts in the effective data sharing. Also, blockchain

faces hurdles in practical implementation in healthcare because of various standardization challenges.

- d. **Social Challenges:** Blockchain-technology faces certain social challenges as well as it is still developing.

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