

# Protecting and securing medical records using blockchain technology

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**Abstract**— E-health is a developed infrastructure, in which usage becomes important to collect, secure and protect personal patients' data, as well as to various medical resources. According to this aspect of view, trying to protect and secure data considering its reliable storage is more important than ever. The necessity of proving a stable and trust-base system is a big challenge in healthcare. Offering a way to consider saving, securing and protecting the data anonymously blockchain technology application in E-health, is the main purpose of this paper.

**Keywords**— *medical data; blockchain technology; medical blockchain; blockchain in healthcare; information security in healthcare; data information security; information security in blockchain, decentralized healthcare system; protected health information*

## I. INTRODUCTION

E-health paradigm shift has resulted in innovative technologies in healthcare industry that differ from traditional health care. The primary goal of e-health is to facilitate access to necessary information on delivery of assistance to the population in the field of cooperation of medical organizations and the establishment of practical analysis instruments of healthcare system administration. The effectiveness of administration includes the provision of unified tools of collective work with information for data analysis, formation of standard accountability, implementation of operative monitoring of various indicators of activity [1,2].

Most healthcare information, from electronic-based medical records in health systems to patient registries and histories, in these days grew up organically for example from custom in-house systems, little or Medium Medical department and largely standards or protocols-free. Databases of healthcare data containing the histories of many patients (medical records) are of enormous value: They can be mined for correlations between patient and a huge range of behaviors, seemingly unrelated conditions, and demographic factors to identify early warning triggers that can be used to bolster preventative care management. We need access to as much of this data as possible. The problem, then, is accessing several claims sources in a way that's secure enough to satisfy all stakeholders. And one security technology rises above all

others to meet this challenge: blockchain. blockchain may have the potential to make it easier for approved entities to exchange protected health information [3-8].

IBM Global Business Service Public Sector, said we see strong potential for blockchain applications in healthcare 16 uses of blockchain in healthcare ranging from identity verification to genomics research. IBM Global Business Service Public Sector. “We are seeing emerging interest from health systems”- considers National Institute for Standards and Technology (NIST) [9].

The topics and applications for blockchain technology in healthcare following:

- Improving interoperability for information exchange, patient tracking.
- Improving healthcare claims processing, including using “smart contracts”.
- Opportunities for using blockchain in health information exchange to satisfy national healthcare objectives.
- A prototype decentralized record management system for electronic health records.
- Storing patient health data securely.
- A blockchain-based access control management system for health records.
- Sharing patient data with network consensus instead of a single centralized source [9-12].

## II. BLOCKCHAIN TECHNOLOGY ACCOUNTS FOR THE ISSUES OF SECURITY

The word "block" is made up of two words "block" and "chain" means a chain, which means ultimately a chain of blocks. Blockchain is a decentralized information and reporting system. In the blocks, any information can be entered and recorded. In the Blockchain, these blocks of information are linked together in a chain, forming a sequence of information. This technology is, in fact, a distributed database that anyone can check in on those transactions. In simpler terms, blockchain is a platform that enables the transfer of information from one location to another with high

security. One of the interesting things about the Blockchain is that its open source technology. This technology has no owners and no one at the top of the network, which increases the trust of its members because no one can change the network and transactions in his or her benefit. In other words, to control and access to transactions by every member of Blockchain network can significantly increase the security and trust. So, the most important and at the same time strangest feature of the block is and has the power to do so. For example, group of 4 people takes a picture with their cellphone. Now if everyone deletes or modifies that information, it will no longer be acceptable to the public because they have a copy of the original unless I remove everyone's mobile and delete it. Now, this crowd can be public and above the millions of people, we see in Bitcoin, Ethereum and other Blockchain currencies, or privately for a specific community. Blockchain is an example of a private Blockchain chain. When you connect to a Blockchain, you get a copy of the entire Blockchain. No change is possible in the Blockchain unless more than 5% of the data on networked computers is changed.

Blockchain technology is not in itself a fundamental technology, but rather a set of hashing and encryption, mass distribution, and so on processes that have created the idea of a blockchain. Consider the Blockchain as the archive on which information is recorded. A Blockchain may not be much different from Wikipedia. Using a blockchain, many people can import different reports into one type of information archive, and users can control how the information is recorded and updated. Similarly, Wikipedia articles are not the product of a publisher. On Wikipedia, a user, with the permissions assigned to his account by the system, can modify all or some of the Wikipedia entries stored on a centralized server. But the main concern is that database control remains with Wikipedia administrators, and that access to permissions and permissions is maintained by a central authority. Some Wikipedia executives can delete an article at any time, but in blockchain users own the database information and the information on the Blockchain is not deleted. Wikipedia's digital strength is similar to the security of centralized databases of today's governments, banks, or insurance companies. The control of centralized databases is in the hands of their owners. Administrators of a site can have access to and control over This is another important feature of blockchain technology. Wikipedia's Master Copy database is edited on one or more specific servers by users and all users view the new version. In the case of blockchain, each node logs an independent report on the network, and each independent record becomes a set of official reports with other records [13-16].

### III. BLOCKCHAIN TECHNOLOGY IN HEALTHCARE

Any information can be recorded in any block, from a person's crimes to the display of account information for assets. In the Blockchain, the information is contained in the

blocks and linked together in a chain. The difference with other systems is that the information stored on this type of system is shared among all members of the network and it is almost impossible to delete and manipulate the recorded information using encryption. Consider the following blockchain, for example, each block showing a clinic where patients' names and records are recorded. If a character is added to the hospital's patient name information, the hash block will change and subsequent blocks will be invalidated, which is why this technology is called the blockchain or blockchain technology.

The blockchain chain or blockchain chain is a system for recording data. This data can be for example bank transactions or medical data, appointments, personal messages or other information. The blockchain feature is that it is possible to store this data without a central manager and authority, and it cannot be distorted or destroyed by destroying a central point. Fig. 1 shows the created 3 blocks of a block chain that starts from genesis (first block) to 3<sup>rd</sup> one, here we have genesis block hash as genesis hash and every next block has the hash of the previous block as an inseparable part of each block. In a block chain each block contains 3 major parts 1st of that is the block hash 2nd is the hash of first, depended and pervious block, it means that a chain provided with dependent blocks and every edit or change in each block inside the chain changes the chain all, it means chain brakes or new chain creates.

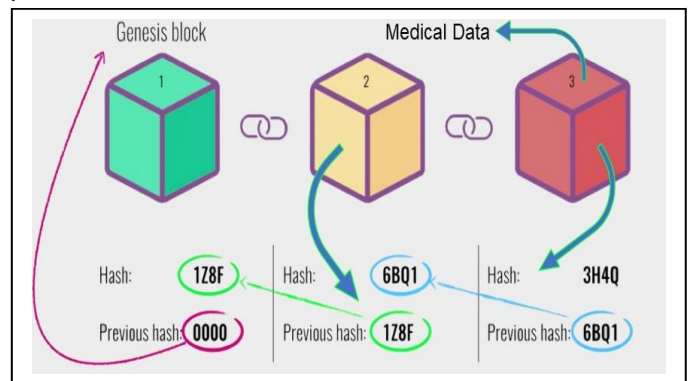


Fig. 1. Hash of pervious block as an inseparable part of each block

This is possible that someone changes the content of a block, therefore the subsequence of a block hash will update, but you did not consider distribution. Blockchain data is not stored on a specific computer or server. Each computer or system connected to the network receives a copy of the Blockchain. Each of these blocks has something called a hash. A hash is a string of characters made with specific functions. It is clear that to hash is a one-way security role and to find the hash or algorithms cannot cause to find the clear data, on the other hand, the security provided by huge and safe hashing algorithms such as MD5, etc.

Protected health information (PHI) as the personal or health care information of persons are so important and to save, secure, safe transfer, protect and accessibility is very important and supplies in this method.

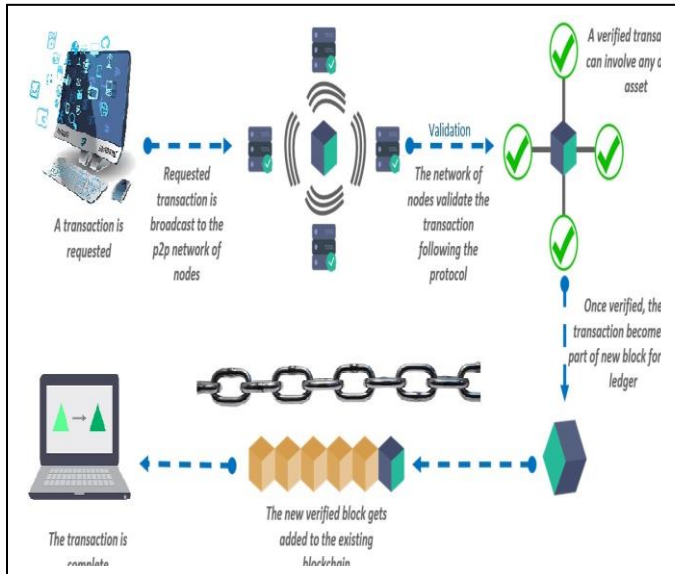


Fig. 2. Emerging a new block, add and structure of joining to block chain

Fig. 2 tries to show how a new block creating, first of all, a block prefers to chain network and after passing the structure and giving the publishing rights, it confirms or rejects by taking-vote and peer to peer protocols. For accessing the best purpose every confirmation takes up to 10 minutes, on the other hand this time increases the security as well as possible. The block chain can facilitate secure online transactions. The block chain is a decentralized, democratic, Vote-based, distributed digital library used to send, receive and record transactions across multiple, unlimited computers so that values can be recorded the transactions without changing all or a part of subsequent blocks and without network collaboration and in each level savings are changing. This allows participants to review and audit cheap transactions. Their authenticity is verified by collective collaboration through the sharing of their interests. Consequently, a workflow It is strong enough that participants' uncertainty about data security is marginal . Using a block chain eliminates the characteristic of infinite replication of a digital asset. This confirms that each unit of value is transferred only once and has resolved the longstanding problem of double costs. The blockchain chain is defined as a cryptographic validation protocol. This blockchain-based exchange can be completed faster, more safely and cheaper than traditional systems. The blockchain can assign or offer title rights because it holds a record that provides presentation and acceptance. The Batch Chain is a distributed, consensus-based database that continuously maintains a list of records (categories) that each reference to

previous list options, thereby reinforcing the challenge of undermining or unauthorized revision and improve the security. The blockchain itself is a subdivision of Distributed Ledger technologies. In other words the Blockchain is a type of data architecture used in distributed office technology in which transaction records are stored in interconnected chains.

In this technology, with multiple users simultaneously recording and modifying data that may overlap, the network is able to maintain database content integrity. Due to the encrypted data structure that the Block Chain has, integration is maintained without any central controller. Intentional or unwanted these days concept of Blockchain ties to cryptocurrency especially Bitcoin. In Bitcoin's distributed headquarters, it is difficult to solve a mathematical problem in order to sort out transactions and avoid inconsistencies, Once the problem is resolved, verification is easy. This mechanism is called "Proof of work". In the bitcoin block chain method, one can arrange the transactions of each step that find the answer to this difficult question while simultaneously making changes that it intends to apply (the new block) to the previous steps of the chain. The way to discover the inconsistency is that the transactions of each block enter the hash function and all members have a hash response if the one who arranges and adds the transactions even makes a minor change to the previously confirmed transactions, the hash response changes and Without having to know which part has changed, they can oppose the unauthorized change [12,17].

In this paper, we decided to prefer blockchain for using in healthcare but first, we need to have a quick view to compare a traditional system with a new one we prefer. In a traditional medical clinic or system, we face different and island form networks and systems. In this system, each clinic uses own data base, systems or network. The main problem is if the system fails or being attacked or being destructed. But if we use a big, compatible, secure, fast, decentralized and truth base network as Blockchain we have a specified amount copy of information that has a good resistance against destruction, attack, rubbish, unauthorized modify, etc. In this proposal each person doesn't have to go to the repetitious medical center if he or she doesn't like, on the other, hand he/she can use every medical center and don't worry about transfer his or her medical records, to lost, to destruction or incorrect human mistakes. Health data can be shared across the distributed network and would be accessible to approved individuals or entities.

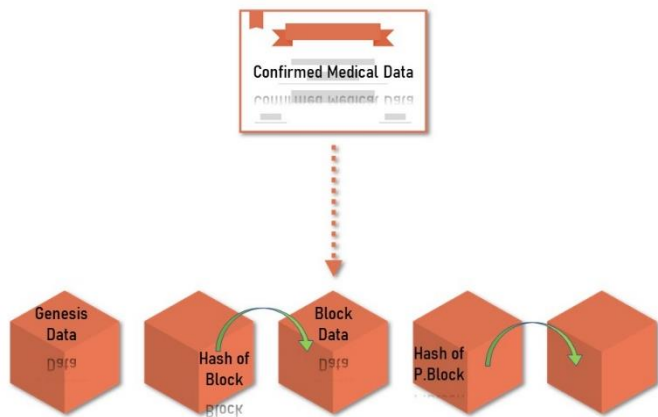


Fig. 3 Protect and secures in every block of blockchain according to medical records and with passing the time everybody achieve his own MBC

Fig. 3, explains clearly that how the confirmed medical data saves, protect and secures in every block of blockchain according to medical records and with passing the time everybody achieve his own “Medical Block Chain”( MBC) securely and time lapse can improve, extend, protect and complete his/her MBC. In other hand every problem in the past genre of everybody can be process, view, study and help every medical centers PHI and secure ways to solve many problems in next genre such as genetic problems. The database distributed by Blockchain Technology essentially creates a completely different digital backend. This is another important feature of blockchain technology.

#### CONCLUSION

We, as proponents of blockchain technology in healthcare, see it as an opportunity to overcome the data exchange and security challenges surrounding PHI. Succeeding in healthcare today means navigating the intersection between policy and technology. Medication prescribing errors are common and inseparable part of medical data, also it can causes harm to patient or big disease or death.in this paper we offer using Blockchain by create update edit and record new information such as excepted usable drugs, analyses, process of treatment and etc.in this paper we showed that how blockchain base medical records can improve the percent of exact diagnostic and expected therapies in the secure, protected and fast decentralized method.

This method can be used from any aspect but we try to work, research and bolding the protecting, securing and developing the Medical Block Chain that we called it “MBC”.

Here we show, check and analyze the possibilities of using the Blockchain as a protected, secure, decentralized and trustworthy way to collect, save and PHI in time-lapse mode, even genre to genre to solve the genetic problems.

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