Blockchain in Healthcare and Management of COVID-19 Pandemic

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A B S T R A C T

Blockchain technology is a digital method that can be used in conjunction with artificial intelligence (AI) and refers to a verifiable permanent accounting system that can be used to store healthcare-related information. Bitcoin is a cryptocurrency and payment system. It is a kind of electronic money that seems to redefine money, one of the most important inventions of human beings. There is no authority such as the central bank of the countries in the Bitcoin system. There is a chain for cryptocurrencies called Blockchain. Any kind of money transfer in Bitcoin system is written on digital blocks instead of books, and recorded in a public distributed ledgers all over the world. How can such a system be useful in the healthcare sector when necessary security measures are taken? In electronic health records, according to the standards, a secure environment is provided by encrypting the data transmitted via e-mail, protecting personal health history and verifying the identity of users. Although the health sector attaches importance to ensuring patient privacy, it cannot prevent medical records from being exposed to cyber-attacks from time to time. The electronic ledger in which blockchain data records are kept is an open source that is accessible to everyone and any change on records cannot be made [1]. One of the parties of a transaction initiates the transaction by creating a block, and this block is verified by thousands, perhaps millions of computers distributed around the network. The verified block is added to another chain with a fully verified chain with error-free history. It is not stored in a single location, but also stored in a network that forms chains. If a single record is erroneous, it means that the entire chain is faulty for millions of cases, which is almost impossible. Blockchain is of critical importance to meet the need for effective provision of healthcare services during the COVID-19 pandemic days. In this article, we aimed to reveal the technological foundation called Blockchain and its usability in healthcare services.

1. Introduction

Advances in the delivery of effective healthcare services are largely dependent on improvements in information technology. Blockchain technology is a digital method that can be used in conjunction with artificial intelligence. It is a verifiable and reliable platform that can be used to store healthcare information. Starting with bitcoin, we aimed to demonstrate the technological foundation called Blockchain and its usability in healthcare in this review article. Bitcoin is a kind of electronic money system that seems to redefine money, one of the most important inventions of humanity. In this system there is no authority like the central bank of the countries. There is a chain for cryptocurrencies called blockchain. Any kind of money transfer using bitcoins is written on digital blocks, instead of account books, and then recorded in a public distributed ledgers all over the world. The blockchain system was announced on October 31, 2008, in a review article written by Nakamoto et al. When you send a bitcoin three kinds of information; in other words, the account number of the sender, the account number of the recipient and the amount sent are written in the ledgers all over the world, and each of the data blocks ("block") are fixed and linked using the principles of encryption ("chain"). This means applying a standard and transparent method to ensure data security. Since the computers in question do not belong to a single legal entity, blockchain technology creates a network having no central authority / management.

In short, blockchain technology is a decentralized, digitized database. However, from the time of its introduction to the market as an open source software, It has become a crucial driving force for various industries including technology; finance, gaming, healthcare, engineering and agriculture. So how will this important technology change the healthcare industry? How can such a system be useful when necessary security measures are taken in the healthcare sector? In electronic health records, according to the standards, a secure environment is provided by encrypting the data transmitted via e-mail, protecting the personal health history and verifying the identity of the users [1,2,3]. Although the health sector attaches importance to ensuring patient privacy, it cannot prevent medical records from being exposed to cyber-attacks from time to time. The electronic ledger in which blockchain data records as shown figure 1 are kept is an open source that is accessible to everyone and modifications on them cannot be made [2].
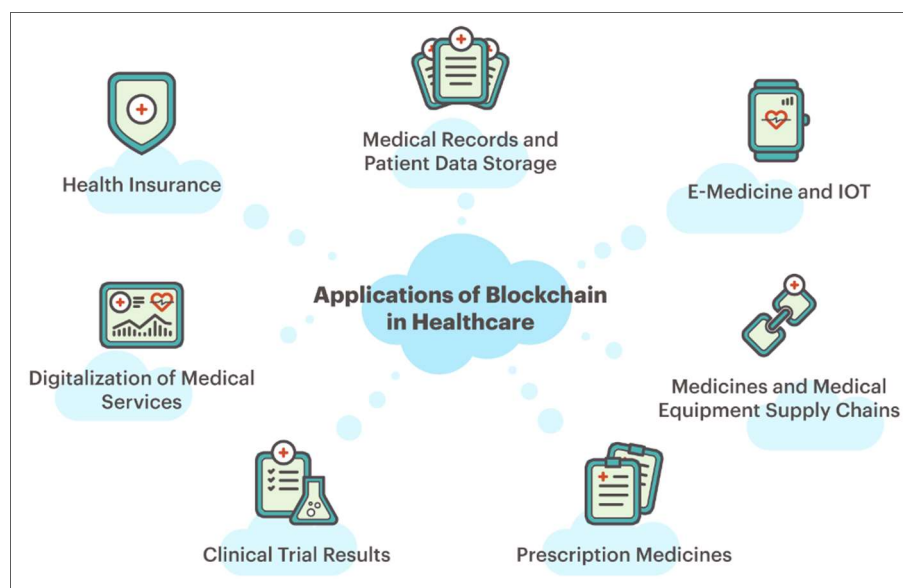
Figure 1. Blockchain data records in Healthcare.

One of the parties of a transaction initiates the transaction by creating a block, and that block is verified by thousands, perhaps millions of computers distributed around the network. The verified block is added to another chain with a fully verified and error-free history. It is not stored in a single location, but also stored in a network that forms chains. If a single record is faulty, it means that the entire chain is inaccurate for millions of instances, which is almost impossible. Blockchain conveys a crucial importance to meet this requirement. The skill to share the information by storing the information easily, and cost-effectively is very important for this system to be effective in healthcare services. Everything built on the blockchain is transparent as per the system. These records are not only stored on the blockchain, but also,

- The health professional's responsibility is protected
- If personal health information of the patient is violated, it can be easily monitored
- Unauthorized access of third parties to sensitive information can be prevented
- Doctor's identity can be verified quickly and economically.
- Allows patients to set access rules for their own health records, granting doctors to access health records. For a certain period of time. Patients can be connected to other hospitals and collect their health records automatically.
- As Internet of Things (IoT) technology becomes widespread, healthcare providers can directly extract health data from smartwatches and phones and upload them to the patient's clinical records. Blockchain prevents medical errors [4]. It has been observed that 35% of the doctors in the USA experience frustration due to e-health records. The reason for this frustration is that doctors bear the burden of the said security-based electronic health records systems [5].

With the widespread use of blockchain in the health sector, it is possible to solve these problems of doctors. It can also be used by clinicians to verify the identity information of patients, control access to their records, secure the medical supply chain and validate clinical tests. Hashed Health, iSolve, Patientory, Medical Chain, Chronicled, FarmaTrust, SimplyVital Health, The Link Lab, IBM, Change Healthcare, Microsoft and Optum are major blockchain providers. Smart contracts inside the blockchain are designed for different medical workflows and then arranged to manage data access permission between different entities in the healthcare ecosystem [6]. The purpose of designing these medical smart contracts is to make it easier for patients, doctors and healthcare institutions to overcome their administrative or systemic inadequacies. This system will assist in the acquisition, analysis, and management of medical data of complex healthcare data and procedures. Personalized medical practices will shape the future of Delivery of the Healthcare Services and the blockchain will serve with a reliable network system in its provision [7]. Blockchain technology can monitor the entire process beginning from the delivery of the medical products and equipment from the production site to their arrival to the hospital. Besides, the market value of the required masks, gloves and other equipment can be monitored, and sudden changes made by the manufacturers can be reported and directed to the appropriate manufacturers. Thus, the emergence of opportunists in the health sector seen in every crisis will be precluded.

By simplifying all processes such as safely, and securely uploading data to the blockchain and having the advantage of simultaneous access, it is possible to save time and cost [8]. In the process of the 19 pandemic, it has been stated that the blockchain technology can play a key role in the world's fight against the coronavirus epidemic, as it can be used for contact tracking while providing privacy. Considering the

practices that need to be developed to help combat COVID-19 disease; a platform where doctors can store and evaluate the information of patients infected with COVID-19, by ensuring that these information has not been changed , the necessary permissions have been obtained and shared reliably, and safely by healthcare personnel comes to the forefront [9].Speaking at a blockchain conference in Tokyo, Japanese Finance Minister TaroAso said that blockchain technology offers a powerful solution for fighting common infectious diseases and for contact tracking. In May 2020, the CEO of finance giant SBI Holdings stated that technology could be useful in monitoring the supply chain of essential materials, including masks. The problems caused by the COVID-19 pandemic, which have taken hold of the whole world, have increased the demand for digital technologies in this process, as well as significantly increasing the interest in blockchain technology [10].

Blockchain, which offers an important benefit especially for supply chains with its transparent and secure structure, can play an important role in this process for tracking virus contact. Blockchain now shows ample opportunities to be an integral part of the fight against COVID-19, as it will provide efficient monitoring and tracking solutions, a transparent supply chain of vital products and donations, and secure payments. Civitas, an app dealing with blockchain solutions initiated by a Canadian entrepreneur, is helping various government and local authorities in controlling the COVID-19 outbreak [11]. With this system, you can find out if a person in quarantine has left his/her home. This is a very important issue as this tracking system helps minimize the spread of the virus. Additionally, this system can allow physicians to track their patients' findings with their permission or monitor their symptoms for any side effects following administration of a medication. In return, these doctors can send their reports on the medication procedure to be followed to their patients.

Long supply chains create extreme uncertainty in the provision of necessary medical equipment, which makes it difficult to estimate and plan the supply. Blockchain is the best option for supply chains as it shows transparency and can safely fragment data warehouses while connecting all stakeholders to a single universal supply chain network. Therefore, during the COVID-19 pandemic, many blockchain arrangements are under the supervision of supply chain management [12].

2. Results

Blockchain in healthcare is seen as the most suitable system for its reliability, cost reduction and personal health applications in the future. In particular, information security has become more important with the pandemic we are experiencing in the health sector, and all data related to drug corruption or the supply of medical equipment, vaccine production have been recorded in the chain in the most appropriate way [13].

It has been revealed that blockchain whose importance gradually increases with the pandemic, will develop further, and become widespread with the decrease in the costs of controlling the supply systems, and subsequently it will become the most appropriate storage and data access system of the future,. Blockchain is of critical importance in order to meet the need for effective healthcare services during the days of COVID-19 pandemic.

Its widespread use in the healthcare field will reduce the cost of being included in the system with the gains acquired and will disburden healthcare providers within the framework determined for high patient information security with reduced costs.

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