Solve the Problem of Expensive Drugs in Hospitals by Blockchain

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Abstract. Effective treatment of major diseases has always been one of the key research topics for doctors. Some researchers have found that the lack of drugs and the proliferation of counterfeit drugs have a great impact on disease treatment, especially in developing countries. However, there is still a gap in research on drug cost control and hospital official drug pricing. As we all know, blockchain technology has been used in securities trading and other fields to reduce the costs of both parties. Therefore, the research topic of this paper is how to reduce the cost price of drugs purchased by hospitals nationwide or even globally, so that the price of drugs can be reduced to a win-win situation for hospital patients. The structure of this article is as follows: First, it introduces the current status of the application of blockchain technology at home and abroad, so that people can more clearly understand which transactions around them have used this technology. Later, this article will describe the working mechanism of blockchain technology, and finally introduce how to use this technology in drug trading. Through research, it is found that the point-to-point transaction of blockchain technology can greatly reduce the cost and time for hospitals to purchase drugs, reduce the price of expensive drugs in hospitals, enable more patients to get effective and rapid treatment of diseases, and reduce the phenomenon of family decline caused by illness. This shows that the effective reduction of drug purchase costs through blockchain technology is conducive to overcoming the problems of diseases and maintaining the stable income of hospitals.

Keywords: Drug; Cost; Blockchain; High Price.

1. Introduction

Since Nakamoto put forward the concept of Bitcoin, an electronic cash system and blockchain, people have realized that this data is hard to tamper with and decentralized chain can be used in commercial transactions, data sharing and other fields, so people begin to attach importance to the development of blockchain related technologies [1]. Even more and more countries have upgraded the blockchain industry to the national strategic level and promulgated many measures to encourage and protect the innovative development of blockchain technology [2]. However, so far, blockchain technology is mostly used in the virtual and financial fields, such as bitcoin trading, securities trading, digital copyright, etc. The idea of applying this technology to other fields may still be in the planning process [3]. There are few papers and research achievements on medicine, but people also begin to attach importance to this research [4]. For example, Keping Yu and others believe that blockchain technology can be used to share patient medical record data, this cannot only ensure that the hospitals where patients visit can quickly obtain patient information, but also protect the privacy and security of patients [5]. This research proves that the medical field can take advantage of the characteristics that blockchain data is difficult to tamper with. Therefore, it is possible that blockchain technology can be applied to other aspects of the medical field.

At present, the prices of many drugs in hospitals are still very expensive, and it is still common for people to become poor because they buy drugs. One of the reasons is that hospitals cannot directly complete point-to-point transactions with drug manufacturers [6]. Usually, they need to go through some third-party intermediaries to complete the purchase of drugs. The intermediaries earn profits in the transaction process. Therefore, hospitals have to raise the prices of drugs in order to maintain normal operation, Therefore, the drug procurement process needs to be simplified, and blockchain

technology can solve this problem well. Next, this article will introduce how does blockchain work and how this technology is applied to medical procurement.

2. Working Principle of Blockchain Technology

2.1 Core Technology: Distributed Ledger, Asymmetric Encryption, Consensus Mechanism

2.1.1 Distributed Ledger

Distributed ledger is a database in which all nodes share synchronous data information in different places. Distributed ledger will record the record information of both parties in the network, and each node will record a complete copy [7]. If there is data tampering or other changes, they will be reflected in the copy of the node quickly, so it can be used to monitor the legitimacy of the transaction and query the details of the transaction. The traditional storage method often stores data in a host and transmits it to other nodes by means of backup [8]. If the central point server is turned off, other backup sub nodes cannot be updated in time. Each node in the distributed ledger is relatively independent. As long as one server is turned on, the data of all servers will be updated, this prevents attackers from maliciously tampering with data and can effectively improve some high cost and low efficiency problems, such as welfare distribution and urban infrastructure, as shown in Fig.1.

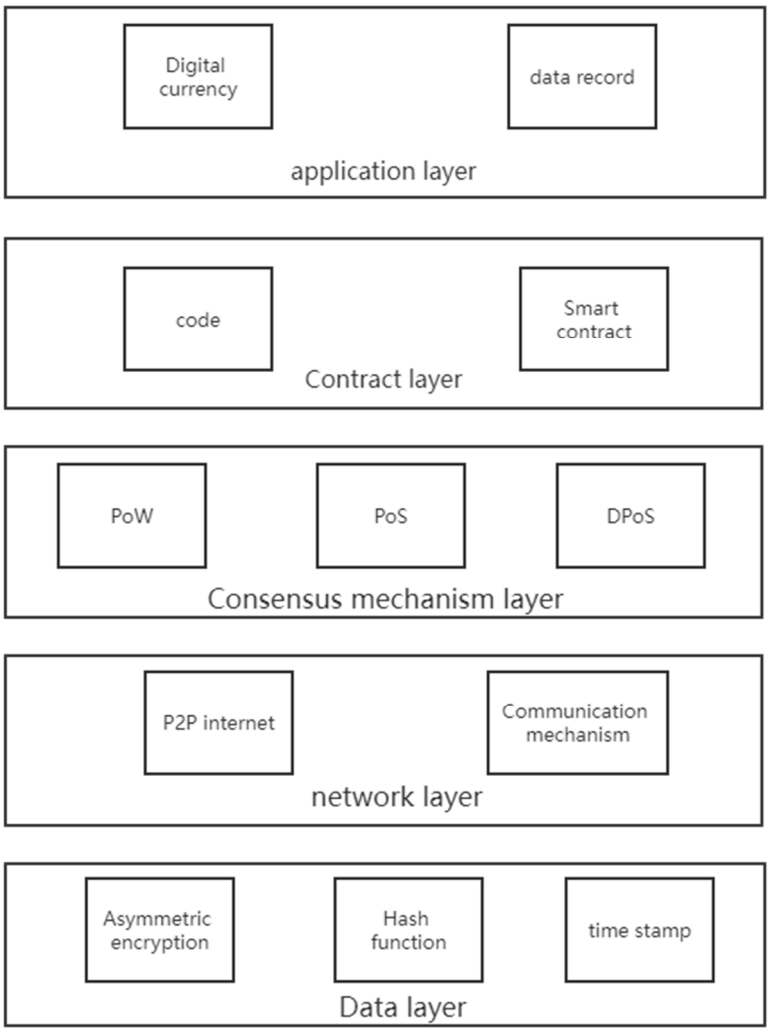

Fig 1. Structure of blockchain system

2.1.2 Asymmetric Encryption

Asymmetric encryption technology is an encryption technology that requires public key and private key encryption and decryption [9]. In an asymmetric encryption system, the public key is made public to the public, and the private key is only known by the decrypting person. The specific steps of this technology are as follows: First, B generates a pair of keys and makes the public key public, then A uses the public key to encrypt the plaintext and then sends it to B, and B uses the private key to decrypt the information in it, Therefore, even if the attacker cracked the public key, he could not get the real information, because the attacker could not know the private key. The advantage of this encryption technology is that it can ensure the privacy of private conversations between strangers, while the disadvantage is that if the public key file is changed, the encryption system will be destroyed.

2.1.3 Consensus Mechanism

The consensus mechanism is a mechanism for blockchain nodes to reach consensus on blockchain information. Multiple nodes on the blockchain can vote to verify and confirm transactions in a short time. Nowadays, consensus mechanisms can be divided into four categories, namely, proof of work, proof of stack, delegated proof of stack and pool verification pool [10]. PoW distributes rewards and bookkeeping rights according to the workload of miners. The higher the computing power, the longer the computer works, the more rewards and bookkeeping rights it gets. This mechanism is simple and convenient, but it wastes resources. Therefore, a PoS mechanism is generated. PoS requires the certifier to provide a certain amount of ownership of cryptocurrency. The more it provides, the more benefits and bookkeeping rights it gets. This mechanism greatly saves resources, but mining still needs to be continued. Then came the DPoS mechanism, in which all nodes first selected node representatives according to their votes, and node representatives were responsible for fair voting of transactions. This mechanism greatly reduced the number of nodes participating in transaction voting, but still did not get rid of the dependence on tokens. Pool authentication pool is similar to the DPoS mechanism that does not need to rely on tokens, and is more suitable for commercial transactions.

2.2 Advantages

Blockchain can prevent cybercrime and fraud, the use of smart contracts with no centralized entity (e.g., banks or logistics service providers) to control operations, increases the transparency of transactions and therefore trust among agents on the blockchain network [11]. Use of blockchains promises improved regulatory compliance, increased speed in transactions and local and international exchanges, and digitized assets for ease of trade, especially in global supply networks (Tapscott and Tapscott 2016). Blockchain technology can also reduce costs in a variety of ways. For example, it can prevent the information asymmetry between trading parties from causing the third party to intervene to earn the price difference. At the same time, the transparency and traceability of information make it impossible for some egoists to earn illegal money in the transaction process, making the cost of enterprises clearer, and preventing attackers from making profits by using the information gap.

3. Blockchain Application in the Medical Field

As we all know, the transaction cost not only includes the price negotiated by both parties, but also the time and effort spent by the buyer to search for information and compare goods and types before purchase. In addition, it also includes the cost of verifying the authenticity of goods. Almost all transactions in real life include the above points. According to the survey, most physical transactions in real life still use centralized transactions [12]. For example, when buying goods on Amazon, people first need to retrieve the goods they want, and then select the style, color and size they like. In addition, they also need to compare the same goods in different stores, and finally determine the goods they want and submit orders on the platform, in this process, people have been unconsciously made profits

by a third party in the transaction process. When people get the goods, they also need to identify the authenticity of the goods to ensure the security and authenticity of the transaction. This process will allow the third party to earn profits. Therefore, the cost of buying an ordinary commodity online is far higher than the value of the commodity itself. At present, blockchain technology is more used in the virtual currency and financial fields. When the transaction mechanism in the housing leasing field was not perfect before, information asymmetry between customers and sellers often occurred, so customers could not find houses and sellers could not find customers. Therefore, many housing leasing intermediaries appeared, which would obtain user information in a large range at low prices, Convert the customer information matched with the seller into public information. In this process, the third-party intermediary may drive up the cost, and the blockchain technology can achieve the effect of sharing information and data.

So far, hospitals and medical institutions often purchase drugs from third parties. Therefore, the opaque data and high costs lead to expensive hospital pricing. Therefore, in terms of drug procurement, medical institutions and hospitals can also use blockchain technology. First, hospitals and drug manufacturing plants within a certain range are regarded as nodes on the chain, and then various drugs are certified, the price and materials of each drug are marked in detail. After the drug is produced by the drug manufacturing factory, the blockchain is used to package this information into blocks and add them to the chain. The hospital can also obtain information in a timely manner and purchase in a timely manner. This point-to-point transaction method greatly saves the cost of the hospital to constantly consult information and find third-party sellers, and the drugs purchased by the hospital are also traceable, Hospitals do not need to verify the authenticity of drugs after purchase. In addition, the application of blockchain technology can effectively prevent some profit seeking personnel inside the hospital from selling scarce drugs of the hospital without authorization, because every transaction of the hospital will be recorded in the blockchain. The hospital can timely trace the origin and whereabouts of the missing drugs according to the information in the blockchain. Even if someone tampers with the information without authorization, the hospital can timely find and correct data errors, as shown in Fig. 2.

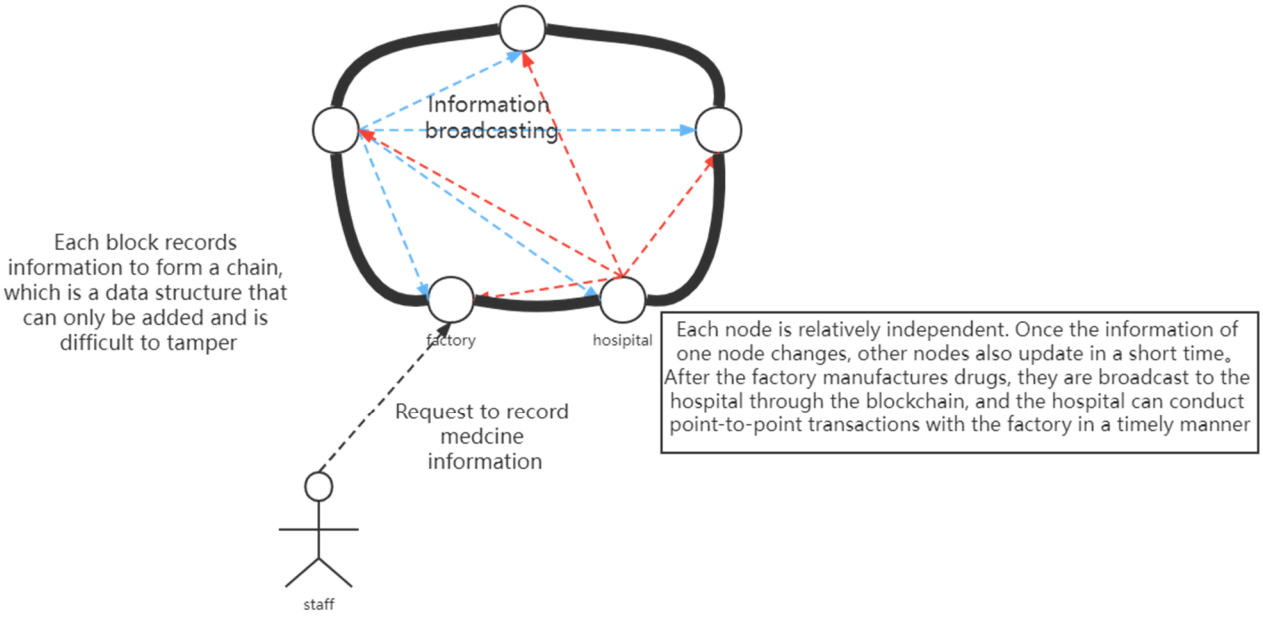

Fig 2. How does blockchain being used in drug procurement

4. Conclusion

Through research, this paper finds that the application of blockchain technology to drug procurement is conducive to reducing drug prices. According to the successful application of blockchain technology in real estate and finance, this paper finds that blockchain technology is indeed

conducive to synchronizing the data information of both parties to the transaction. This highly transparent and symmetrical data phenomenon is conducive to promoting the interests of both parties. Sellers can let buyers know the goods information in a timely manner through data sharing, The buyer can also bypass the third party to directly contact the seller and purchase products at a lower price. Although people still prefer centralized transaction at present, with the continuous in-depth development of blockchain technology, the point-to-point transaction between hospitals and drug manufacturers will be accepted by more people by using blockchain technology. Hospitals reduce the cost of purchasing drugs, and naturally lower the sales price of hospital drugs, which can gradually reduce the pressure of patients to see a doctor, and can combat the phenomenon of selling counterfeit drugs in society. This research is not only the development of blockchain technology in the medical field, but also represents the trend that decentralized transactions with blockchain technology as the core will gradually replace centralized transactions, which is more conducive to the conclusion of transactions and promote the development and flow of social economy. The only disadvantage of this study is the lack of sample data collection. If blockchain technology can be applied to drug procurement in the future, this study should collect more cost comparisons before and after blockchain technology is used to judge the specific percentage of blockchain technology that can save costs for drug procurement.

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