

Application Research of Blockchain in the Field of Medical Insurance

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Abstract

At the current stage, a triangular relationship has been formed in the field of medical insurance, that is, the insurance company, the hospital and the patient, but in the relationship between any of them, there are a series of problems such as cumbersome service process and long service process, and disputes between the policyholder and the insurance company often occur, and the reasons for this are that the insurance parties have a deviation in the understanding of the terms in the claim settlement process. With the development of science and technology, medical information is gradually developing digitally, and the reasonable introduction of blockchain technology in the field of medical insurance will bring great benefits to medical institutions, patients and insurance providers.

In recent years, with the rapid development of blockchain technology and continuous updating and iteration, more and more experts, scholars and practitioners pay attention to it. At the same time, its application scope is expanding, more enterprises and institutions find the advantages and importance of blockchain technology, and start to devote themselves to the application of blockchain technology, development and research, etc Great influence and change are likely to bring about a second revolution in the field of the Internet. In contrast, with its advantages and characteristics, blockchain technology has been applied in the financial industry, power industry and other aspects.

Keywords

Block chain; decentralization; intelligent contract; medical insurance; distributed storage.

1. Introduction

The health insurance system has always been a policy advantage of our country, and its emergence has allowed us to stop looking ahead at the cost when we need to be treated when we are sick, but it is undeniable that as it becomes more functional, problems are constantly being discovered. As an emerging achievement in the field of information technology today, blockchain technology has its technical characteristics that can solve the existing problems in the field of medical insurance and further promote the development of the medical insurance field.

In recent years, chinese medical insurance system is constantly reforming, and the scope of application has gradually expanded, and inevitably some problems have followed, such as: there is a lag in diagnosis and treatment information, relevant data exposure and a series of problems. Through the survey, it can be found that in the world, medical-related events are endless, in the malignant events in developed countries, medical-related up to ten percent, and in China, the number of outpatient clinics a year has reached about 7.8 billion, and the number of patients who need surgery has reached 50 million, so for such a large amount of data, the development of medical insurance is particularly important.

In recent years, Chinese blockchain technology and its application direction has attracted a wide range of attention from all walks of life and their industry, many cities have now established various forms of organizations related to blockchain technology, in the initial development, blockchain is first of all in the financial field as a breakthrough, in this process, the news media wide attention and reports make the relevant process into the field of vision of some ordinary people, more people to begin to pay attention to related achievements and development. Under the influence of various forces, the development of blockchain technology is extremely rapid, and it has also gained everyone's attention and support, and blockchain technology can well solve the current problems in the field of medical insurance.

First, the recording method of blockchain is different from other technologies. It is decentralized, so the data recorded through it can trace the source, making each step of the process performed by patients more transparent than before; In addition to this, blockchain technology also has a special property - it cannot be tampered with, so it has security capabilities. Using this feature, it can solve the security problem of core data in business very well and protect every piece of data in the transmission process; Finally, the consensus mechanism can well strengthen and improve the credibility of the whole process. Therefore, from the three characteristics of the blockchain, it can be found that this technology can greatly help the medical insurance field to complete the content sharing between users, within the field and between a large number of decentralized nodes in the field, as well as the connection between nodes. In a word, it can greatly increase the speed and space of innovation in the medical insurance field.

2. Literature Review

At present, the application of blockchain technology in the field of digital currency, especially Bitcoin, has lasted for a long time. However, the research on the combination of smart contracts such as Ethereum and blockchain is still in its infancy. In particular, the specific application in the field of medical insurance is still in the research stage.

Dorian S. Nakamoto (2008) put forward the concept of "blockchain" for the first time in the article. He put forward in the article that: blockchain is to combine each data into a specific data structure in the form of blocks in a specific way. Its order is based on time. This specific way is called chain. In addition, it is also a shared general ledger guaranteed by cryptography[1]. Buterin (December 2013) released the Ethereum White Paper[2], which proposed a universal cryptocurrency, committed to implementing a smart contract, which is complete and programmable[3-5]. The Linux Foundation (2015) launched the Hyperledger project, which is an open source project based on blockchain and cross industry applications. Some overseas representatives are more than: the business of PokitDok is dedicated to medical API services. The company will work with Intel to design a blockchain based medical solution. The project can manage and verify the identities of doctors and patients. After successful verification, the project will continue to be executed according to the smart contract. In addition, the relevant data of prescription drugs are placed in the blockchain to realize the openness of drug prices. When doctors fill in patients' prescriptions, they can also query the relevant information of these drugs in a timely and rapid manner, greatly improving the efficiency of medical insurance compensation[6-10].

For China, 2016 is a breakthrough year for blockchain research. The relevant research in this year has witnessed a great growth, which can be said to be explosive. All industries, especially financial institutions, have started relevant exploration and research, but there are still no fully mature achievements. Now it is still in the conceptual research or prototype modeling trial stage. All walks of life are taking various methods to constantly improve the application scope of blockchain based on the actual situation of their respective industries. For this reason, China

has also created various relevant alliance organizations, including ChinaLedger Alliance and Zhongguancun Blockchain Industry Alliance. Ma Yixin and Fu Sen (2016) pointed out that a new platform launched by Ant Financial, the Love Donation Platform, is actually a blockchain project, which is of a public welfare nature. Its purpose is to make the donations of users more open and transparent, and it has been welcomed by users. Baiwang Co., Ltd. and Wanda have cooperated to promote the solutions of comprehensive taxation and POC verification, which are respectively "blockchain+electronic invoice" and "blockchain+supply chain"[11-15].

3. Problems in the field of medical insurance

In recent years, with the continuous release of dividends from relevant policies and the continuous improvement of national awareness of self health security, medical insurance plays an increasingly important role in society. In the specific claim settlement, the system is still implemented that reimbursement is made after discharge, and the materials to be submitted in this process are very complicated, which greatly reduces the user's use experience and hinders the further development of medical insurance.

3.1. Medical information is difficult to share

Medical information is the patient's personal information, cases, medical orders and relevant monitoring data, which are closely related to patients and the basis and basis for each doctor to treat and judge the condition. Therefore, the integrity, reliability and easy access of relevant information are particularly important, which can not only avoid repeated examinations, waste medical resources and extra money expenditure, but also promote doctors' judgment of patients' status and more efficient and accurate treatment. In addition, patients often have other diseases in the process of diagnosis and treatment. Most doctors use the method of inquiry to understand patients' past symptoms and physical conditions, but there are two obvious problems in this method: first, patients are not clear about their own history of diseases, and many patients will forget or even remember their own health information due to lack of professional quality; Second, the patient was unable to give a professional description, resulting in misunderstanding and misleading the doctor's judgment in the treatment process.

3.2. Information Asymmetry

The medical industry is different from other industries, and its professionalism is very high. However, the professional quality and resources that doctors have enable them to master much more information than patients. Patients are at a relative disadvantage in the doctor-patient relationship due to their limited ability and lack of familiarity with relevant medical technologies and professional terms, which often leads to some moral problems, and is also the fundamental reason for the current tense doctor-patient relationship. For insurance institutions, there are problems in obtaining the patient's health status, diagnosis and treatment, as well as the diagnosis and treatment programs provided by medical institutions. Insurance institutions have great difficulties in the supervision and authenticity of the insured and medical institutions, which makes the moral hazard in the whole process continuously improve.

3.3. Difficulty in risk control

Due to the existence of the above two characteristics, insurance companies, as the "middlemen" of hospitals and patients, should have played their own role, so that medical resources can be used more reasonably. However, because its current system is to complete all treatments before reimbursement after discharge, the insurance company is completely unable to play the role of supervision in the whole process, and does not play its due advantages.

3.4. Cumbersome claims processing

Under the current system, patients should pay their own medical expenses after diagnosis and treatment, and then provide relevant vouchers (diagnosis certificate, discharge medical record, diagnosis and treatment invoice, etc. In addition, during the diagnosis and treatment, most of the relevant information is in an opaque state. When some policyholders are making claims, they often have missing or missing certificates, which need to be supplemented many times. This has caused the problem of cumbersome claims processing and long claims processing time.

4. Principle analysis of blockchain application in medical insurance field

In the specific application process, for the problems in the current medical insurance field, we can start from two aspects, namely, building a medical and health data model and effectively using smart contracts. By building a medical health data model, the relevant patient's health status, medical records, and medical insurance purchase and claim data are stored on the blockchain in a distributed form. When the applicant chooses to purchase insurance, the insurance company first checks the applicant's health status in all aspects through the account book shared with the medical institution after obtaining its needs, which can largely ensure the accuracy of the information, Avoid insurance fraud; The medical institution can also view the patient's medical treatment record and check the relevant insurance information submitted by the applicant by sharing the account book; It can effectively solve the first three problems mentioned in the previous chapter. The effective use of smart contracts means that during the treatment process, insurance companies can receive the relevant materials automatically sent by the hospital. Once the compensation conditions are met, the smart contract will automatically and forcibly execute the compensation procedures to pay compensation to the policyholders, which greatly improves the efficiency of the process, reduces the payment time, and improves the security and tamper resistance of the data.

4.1. Medical health data model

Store relevant data records on the distributed blockchain. The whole database is composed of nodes in each network, and does not have a central storage database. This is a big difference between blockchain and other traditional databases. This enables all network nodes to share data, and does not affect other nodes due to damage to one or more nodes, and can be jointly monitored by the entire network. To sum up, based on blockchain technology, relevant records are stored on the corresponding blockchain in a distributed form. This method has great benefits for ensuring data security on the blockchain and effectively avoiding contract disputes[16-19].

The accounting books will be shared between hospitals and insurance companies. The account book shares the patient's medical records and other relevant medical data, among hospitals and between hospitals and insurance companies. On the one hand, patients do not need to cause unnecessary trouble due to the change of treatment location during the treatment process. On the other hand, we can check the insurance information of the applicant by checking these data, which effectively guarantees the rights and interests of the insurance company.

According to the distribution of relevant medical resources, the level of medical equipment and the level of medical institutions, hospitals are divided into two levels: hospital level 1 and level 2 nodes. Level 2 nodes have the functions of verification and supervision, and their competitiveness is improved through regular updates.

In terms of medical and health data, the consensus mechanism is used to combine the public key of the user who uploaded the data, the hash value of the uploaded data, and the upload time. A TX is used to replace it, calculate its hash value, and then store it on a leaf node of the Merkle tree structure. After the two leaf nodes are merged, they are hashed and placed on the root node,

which can largely ensure that the data is not tampered with, It greatly improves the authenticity of medical data.

For medical and health data, three services can be provided: upload, query and storage. Uploading service means that patients request to encrypt and upload relevant data after any medical institution finishes treatment, and medical institutions use storage services to request storage from hospital level nodes, so that patients can use query services to obtain relevant data when they go to other hospitals for treatment. Query service refers to the query of some medical information, which is targeted at patients or other hospital organizations. Storage service refers to the external interface provided by medical institutions to store the acquired medical and health data.

4.2. Effective use of smart contracts

Smart contract (i.e. on chain code) was first proposed in 1994. At that time, it was defined as a set of commitments in digital form. Since there is no way to find a background where there is no trusted third party to guarantee the execution of the contract, the concept of smart contract has not developed rapidly since it was proposed[13]. The decentralized trusted platform in blockchain technology is just the ideal environment for smart contracts. The emergence of blockchain technology provides new possibilities for it. It can accept various requirements to process data, receive, transmit and save information, and manage and control various functions such as data in various types of blocks. Ethereum has just created a more comprehensive smart contract, so it also has a wider range of application scenarios.

Use smart contracts effectively. One of the most important innovations of blockchain technology is the introduction of "scripts", which makes it possible for the programmability of program contracts, namely "smart contracts". It contains automatically executed code at the bottom of the code. It is mandatory and automatic according to the code definition, and no intervention is allowed in the process. The whole life cycle of a smart contract consists of three parts - contract generation, contract release, and contract execution. When applied to the medical insurance field, when the relevant medical insurance meeting the compensation conditions occurs, the smart contract can be automatically executed, and the next step of medical insurance related claims processing can be carried out according to the code. In this way, the entire medical insurance related process can be automatically executed in the edited code environment, thus reducing a lot of manual operations, while ensuring authenticity, it greatly improves the efficiency of the entire claim process, shortens the claim time, and saves many complicated programs for the three parties[20-22].

In the triangular relationship in the field of medical insurance, medical institutions and medical insurance providers act as administrators, insurance providers designate medical institutions, and patients' relevant medical data are uploaded by medical institutions, and insurance providers can obtain corresponding medical insurance after review.

When the patient purchases medical insurance, the medical insurance contract is provided by the insurance provider, which includes the type of disease. The patient can purchase as needed, and decide whether the purchase is successful and the purchase amount based on the purchaser's previous health data. If the conditions are met, contracts can be generated, and relevant data information, such as insurance contracts, health data, and insurance amounts, can be stored on the blockchain in the form of smart contracts.

The medical institution can upload the amount of treatment and health data of the patient within the validity of the contract as the basis for the insurance provider to make compensation. When the patient needs to obtain compensation, the medical institution reviews the relevant health data and obtains the corresponding compensation authorization. The insurance provider uses the compensation interface of the smart contract to automatically execute the

smart contract when the compensation conditions are met, and the patient receives compensation.

5. Conclusion

With the progress of society, the continuous development of blockchain technology, and the increasing number of problems in the medical insurance field, how to reasonably apply blockchain technology in the medical insurance field is an urgent problem to be solved. This paper analyzes the current problems in the medical insurance field in our country, combines the advantages of blockchain technology, proposes the specific application of blockchain technology in the medical insurance field, introduces two specific aspects in detail, and elaborates its principles and advantages. In addition, there are still problems of long-term preservation and efficiency, which still need our attention and further research.

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