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Blockchain Application with Health Token in Medical & Health Industrials

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Abstract—Blockchain refining is a tool that can prove the existence and exact content of any document or other digital－asset at a particular time.It can economically involve human-computer interaction, machine-to-machine (M2M), Internet of Things (IoT) , payment network integration and automation. In the future there will be different types of blockchains (ledgers) for recording and tracking different types of processes, exchanging and providing information on each and every part of the population including digital health assets Access to assets. Blockchain Health The idea behind the use of blockchain technology for health-related applications is that the main benefits behind provide a structure for storing health data on the blockchain. So that the analysis can be done but privacy is maintained and compensate data contribution and use.

Keywords— Blockchain, Shared Health Research, Health Token, Big data analysis

I. INTRODUCTION

Blockchain is the new Internet & economic model. This is a coordination mechanism and attribution, credit, proof and reward incentive tracking mothed. It encourages any intelligent agent to participate in any collaboration, and at the same time is a "distributed trust network" that can be used for community money distribution and transactions, which in turn can enhance the cohesiveness and effectiveness of any group. The blockchain is a cross-disciplinary cloud (medical & health data) that provides "personalized decentralized services" to facilitate data economy shifts. A blockchain is the existence and exact content of any file or other digital asset that can be authenticated at a given time. It can effectively involve human-computer interaction or M2M, machine-to-machine, IoT, big data, payment network integration and automation. Blocks refinement is comprehensive and can be used to register to confirm and transfer all assets and social exchanges. A public chain that records medical databases, an unprecedented organizational mechanism that guarantees privacy and promotes large-scale social progress. A public and secure big data record, this will lead to an unprecedented way to promote the progress of large-scale human health services. It is a large-scale consensus model, and we have been waiting for the benefit cover to be returned to the all users.

II. MEDICAL HEALTH BLOCKCHAIN

In future, there will be different types of blockchains (ledgers) for recording and tracking different types of processes. Exchange and provide access to various assets including digital health assets. Blockchain health: the idea of block chaining technology for health related applications. The main benefits behind provide a structure for storing health data on block chains. It can be analyzed but kept private, and the layer compensates for the contribution and use of data, (TABLE I). To a centralization structure (high efficiency, low cost) Achieve complete and transparent data information (comply with the law and follow up). Distributed Accounting and storage (high fault tolerance) Intelligent contract programmable (no burdened evolutionary model) Anonymity behind the transparent world (protection of Privacy). Because of these characteristics, the core application advantages of block chain technology in the field of medical informatization are very significant.

TABLE I. THREE HYBRID CHAIN SERVICES IN BLOCKCHAIN

Private Blockchain	Health care organizations use internally oriented information to circulate.
Consortium Blockchain	Each hospital is a node, the hospital in the region is applied.
Public Blockchain	Society is used to individuals, generating the right of system revenue.

De-centralized distributed architecture can save a lot of intermediary cost in reality. Non tampering time characteristics can solve data tracking and information security problem. Secure trust mechanism can solve the defects of modern medical information technology security authentication. Flexible programmable special helps hospitals build extended applications.

Practical application: the establishment of standardized and completely transparent medical information infrastructure. Compliance requirements are easily traced. Use of Distributed Accounting and storage Improve the ability of medical institutions to have high error tolerance and error correction. Providing customizable intelligent contracts. Medical and medical service providers for the development of capacity. Provide an evolutionary model with no burden to achieve process conversion and prescription verification.

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III. PERSONAL HEALTH RECORD STORAGE ON THE BLOCKCHAIN

Personal health records can be stored and managed by block chain. Such as the large electronic medical record (EMR) system.

Kana using block chaining technology and its privacy (private key access only). David Randall et al[1] say the advantage of coding as a digital address rather than a name. Personal health records can be encoded as digital assets and placed in block chain digital currency. Individuals can provide necessary health records to doctors, pharmacies, insurance companies and other parties through private keys. In addition, the service of electronic medical record (EMR) in block chain can promote general format. It helps to solve this problem, even though most large health service providers have turned to the electronic medical record system. They are also widely divergent and can not be shared or interoperable. Block chaining can provide a universal interchange format and repository for EMR across the country. Patients' personal information leakage, medical record data leakage, medical record data confusion. The difficulty of cross regional hospital referral and the disconnection of clinical data become the main pain points in this field. Lack of standardization and rigorous, complete and coordinated electronic medical record (EMR) is the main reason for these problems. It causes the efficiency of medical and administrative personnel in hospitals and throughout the medical system.

For Example the book information is recorded on the block chain, Ensure the accuracy of all data through consistency algorithm. For example, if one of the medical information records your blood type is A type. But type 0 blood is recorded in the "data block" from other medical institutions. Then the information will not be recorded in the block chain, and the information will not be matched in the system.

In this way, Beninger P and Ibara MA[2] declare that the patient's medical record information is protected. So that patients do not have to record medical records at every time they visit a new medical institution.

IV. BLOCKCHAIN - SHARED HEALTH RESEARCH

One advantage of creating standardized electronic medical records database is that they are repositories. Storing a large number of standardized health information databases in standardized format. It can be used by researchers. So far, almost all health data are in the hands of private organizations. For example, one of the largest longitudinal health studies in the world, data from the Framingham heart study. Block chaining can provide a standardized security mechanism. These data can be used by researchers in private. One of the examples is DNA.bits. A start-up company that encodes patients' DNA records into block chains. And the private key is provided to the researchers

However, it is not only possible to build private health data sharing areas through block chaining. And a public health data sharing area can be established. Block chaining technology can provide a model for establishing a cost-effective public health data sharing. Quantify personal tracking equipment data (FitBit) and health and fitness application data (MapMyRun) individuals. (for example, personal genome data) provided to data research utilities.

To varying degrees of openness / privacy, there is no such place. These data can be concentrated in a public health public place (such as Wikipedia for health). Public scientists and institutional researchers can conduct data analysis. The assumption is to integrate large health data streams (genomes, lifestyles, medical history, etc.). It may produce correlation and data relationship with machine learning and other algorithms, which may help maintain. In general, personal health record data stored in blockchains are collected. (means that the chain indicator is stored in the outer chain) . Health research can be carried out more effectively. The economic characteristics of the block chain can also promote research. The first is because it is private [3]. The second is in the form of healthy money or other types of digital integrals.

A. *The Health Notarization of the Blockchain*

Notarization certification service is the common demand of health industry. Insurance certificate, test result, prescription, status, illness, etc. Treatment and physician referral are only health documents related services. The "Notarization function" as a standard block chain application is also good in the middle of the blockchain health environment. Health documents can be encoded as digital assets into block chains, and then encrypted data can be used to enter data.

Instead of using traditional technology for hours or days. The private key function of the block chain can also make some health services and results delivery (such as venereal screening) more effective.

B. *RKF, Private-key Functionality*

Blockchain health can create more double-sided markets for all healthcare services, and medical and health practices can strive to provide the medical services that patients and consumers need. The doctor's approach may bid for hip replacement and other medical services, such as health coins, to at least bring a degree of price transparency and efficiency to the health sector. This tender can be automated through the trade network to increase efficiency and equality, and then several services set up guarantee contracts with blockchains.

C. *The Challenge for Personal Record Privacy*

There is currently no corresponding service provider on the market, and there is no medical service provider that can provide solutions, because the growing medical record information has now become astronomical, and the creation and maintenance of this information will consume a lot of resources. Every time a patient visits a doctor, especially a hospital, he or she needs to re-enter various cumbersome personal information and medical record data to make the medical treatment process more difficult.

There are many problems that need to be addressed. For example, individuals can safely store personal records and link them with pointers and blockchains. If all your data is online and the secret key is stolen or exposed, you have nothing to search for. In the current cryptocurrency structure, this may happen. Just as today's personal and corporate passwords are stolen or the database is hacked, thousands of people are often inconvenient to handle. If a thorough personal record is stolen, the impact on the individual may be staggering, and the extent of identity theft will no longer be your identity. A more serious problem is that when medical record data is transmitted between different medical institutions, there is a great possibility of recording, shifting and adding errors. If a patient who is not allergic to a drug is mistaken for a severely allergic patient, it

will have very serious consequences during treatment or even surgery.

D. Alliance-chain to Integrate the industry

The alliance chain refers to the blockchain whose consensus process is controlled by pre-selected nodes. For example, there are 15 medical institutions in the same region that form an alliance. Each organization runs a node, and in order to make each block effective, it needs to be obtained. Confirmation of 10 of them. Blocking or licensing allows everyone to read, or is limited to participants, or take a mixed route, such as the root hash of the block and its API (application programming interface), the API allows the outside world Used to make a limited number of queries and to obtain information about the state of the blockchain, these blockchains can be considered as "partial decentralization." The word “data” is plural, not singular

V. Health Token

Health certificates (Tokens) may become more widely a coin or symbol of health spending, forcing the entire health service to price discovery and rationalization. Services in the National Health Plan can be valued and paid for in the Health Pass. This may help improve the economic inefficiency of the health care industry. Price transparency and a general price list may result in each time a certain medical service is performed, for example, a $5 health pass, rather than the current system (in the US), each consumer may pay a different amount. Complex calculations that connect different insurance companies and planned composite systems.

The world's hundreds of trading platforms are transferable, tradable and trusted by medical institutions; a Certified Cargo is a digital asset designed to use cryptography as an exchange medium to secure transactions and control additional currency units Creation. In the process (Chart 1), customers or investors can get the first release of the Token project. The tokens issued by the program can be used to purchase products or services offered by the company and its partners. Once these companies receive the token, they can sell the tokens and get the rights, but better yet, there is an ecosystem that allows the company's partners to spend their tokens instead of trading [4]. The pass issuance process can also be completed without IDO (Initial Digitalize Offering).

By setting up (or cooperating with) exchange services, customers and investors can purchase certificates directly in ETH / BTC / legal tender and purchase products and services as prepayments. Companies can exchange for legal currency after receiving payment & the way to sell the pass.

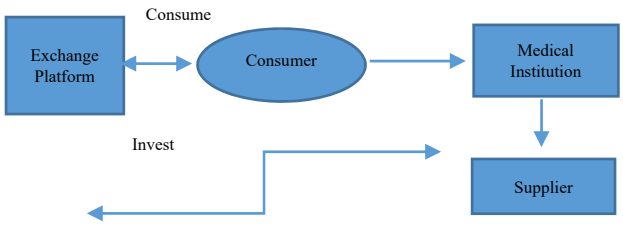

Chart 1. shows the process of using the medical certificate

VI. Extended Health Care Related Business

A. Personal Health Report

At any time, check the personal diagnosis and treatment of the medical records, the weight and side effects of the medicines; in the study, especially medical consumption such as physical examination records, the record of human genetic DNA is most suitable for storage in the blockchain.

B. Big Data Analysis

Breaking the traditional practice of patient records only in the hands of hospitals or doctors, through the patient's voluntary "personal health report" and "past medical record" stored in the private chain, authorize the alliance chain to analyze, to analyze the group characteristics of different diseases, it can also predict the use of different diseases, and even clinical research. Big data analysis is formed by small data [5]. In the context of health care big data, health archives and electronic cases are recreated by blockchain technology in the context of medical big data. This information can be used in hospital pharmacies, physical examinations, pensions, Internet medical care, and insurance. Sharing and utilizing can create huge possibilities for future life insurance, especially health insurance. A typical scenario that can be applied now is health insurance. There are many insurance frauds for health insurance. It is difficult to verify whether the documents he provides are from the hospital. If you use blockchain technology, you can solve this problem [6].

C. Auto Insurance Insurance and Claims

After receiving the medical record, the smart contract is used to insure the insurance company, and the risk cost and the premium can be calculated directly by actuarial science and sub-insurance. In the event of an accident or a patient, the customer has completely simplified a series of procedures through intelligent block-and-match claims and audits in the blockchain. What's more interesting is that some special risks are uninsured items or subject matter. They have the opportunity to use the blockchain to break through the risk calculation of “Pool” Pooling, so that the insurance cannot be guaranteed, for example, the journey of human space. Blockchain insurance coverage. In the future, through the blockchain and intelligence and agreement, we can explore a new risk dispersion model, the core of which is to replace this overall model with a new plane mode. You can see that this may happen in the future. Insurance companies face smart contracts based on blockchain. He participates as a platform, while others are participants who are called risk financing institutions. The most typical representative of a venture capital institution is an insurance company. The most typical application scenario that can be seen now is the linkage of the industry.

Sales staff is a relatively autonomous center model. He can support the back-end of blockchain according to customer needs. The core is to provide various financial products to meet customer needs through smart investment, and to know the matching process through smart contracts and companies. Realize settlement of sales benefits and reduce insurance procedures.

D. Teletherapy or Second Medical Advice

Medical consumers have a diverse demand for medical services, which is a cross-regional and cross-disciplinary diagnosis and treatment; through medical alliances and smart contracts, fair medical referrals or second overseas medical advice, to obtain more professional doctors The disease breaks through the boundaries of medical services and sovereignty returns to the patient's own rights.

E. Medical Counseling with Social Services

The treatment can be carried out online by face-to-face consultation with a doctor. Even after reading the doctor, the patient is given absolute social security, social networking (of course, under the confidential patient status) for individual or group counseling, follow-up and so on. Specialized services based on specialist treatments are particularly significant.

VII. Conclusions: China's Medical Chain Market Prospects & Forecast

The number of applicable medical institutions, as of the end of June 2016, the number of medical and health institutions nationwide reached 989,000, including: 28,000 hospitals, 927,000 primary health care institutions, 31,000 professional public health institutions, and 33,000 other institutions. Among the primary health care institutions: 34,000 community health service centers, 37,000 township health centers, 643,000 village clinics, 199,000 clinics (medical offices), and 3,484 public health institutions: 3,484 disease prevention and control centers. 3,173 health supervision offices (centers). All medical institutions that are applicable to the National Health and Welfare Commission's 10-year standardized medical record system can apply this system, and the current market coverage and growth rate are very large.

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