Intelligent Medical Applications White paper

Preface

A major transformation that the medical industry is experiencing is the "digital decentralization" transformation of the medical service model. The digitalization of drugs (therapies), equipment, services and business models has contributed to the democratization of the current healthcare system, unleashing new value by replacing high cost controllers and opening up previously inaccessible areas. Digital transformation has become the strategic focus of all medical participants, who are also trying to find the value of data-driven and result oriented reimbursement systems. Today, at the government level, most countries have developed policies or strategies targeting digital health care, greatly increasing the use of digital health records (EHR / EMR) and other health information technology (HIT) systems or infrastructure. However, no matter what these digital plans are, at present, there are still many restrictions on the security, integrity and access control of personal health data, which makes the innovation of nursing service encounter a great bottleneck. In turn, it

leads to the inefficiency of digital medical workflow, which leads to data islands among different providers, hospitals and payers, and even among departments within the health system, hindering the normal operation of medical coordination. When the medical industry is struggling to balance risk and return, the potential application of blockchain technology provides a timely solution to alleviate these urgent needs. The combination of blockchain and medical treatment meets the technical needs to support the landing trend of other complex application scenarios other than pure digital information technology. The processing of electronic medical data is one of the hot research fields of blockchain. However, the pain point of medical data sharing mainly lies in the privacy protection of patients' sensitive information and the security sharing of data by multiple organizations. As a multi-party maintenance, full backup and information security distributed accounting technology, blockchain will be a good breakthrough point for the innovation of medical data sharing. The characteristics of blockchain without central server make the system not fail at a single point and maintain the system stability well.

Catalog

1、 Current situation of medical and health field

1. Basic concepts

Medical and health industry - according to the definition in the medical and health industry report released by China industry information network, the medical and health industry aims to maintain and promote the physical and mental health of the people, mainly including medical services, health management and promotion, health insurance and related services, involving supporting industries such as drugs, medical devices, health products, health food, health Island products, etc, Wide coverage and long industrial chain. At present, the understanding of the medical and health industry is not only the traditional treatment, but also the whole industrial chain.

According to Deloitte's 2020 life science and medical trend report, with the improvement of social and economic level, the global average life expectancy has increased by 55 years, from 75 years in 1990 to 805 years in 2015, so people's

demand for medical health is growing. According to the analysis report on investment in the field of medical and Health issued by prospective industry research institute, by 2015, the market scale of China's health industry has reached 2 trillion yuan. According to its forecast, the market scale of China's health industry will reach 8 trillion yuan in 2020.

Although China's medical history has a history of thousands of years, Chinese medicine has always been another independent medical system outside the Western medical system. The word "medical treatment" mainly comes from the Western medical system, and with the progress of social civilization, people are not only concerned about the treatment of diseases and injuries, but also gradually enlarged to the whole range of health. In addition to the expansion of the scope of medical ecology, the medical means of the whole industry are also changing dramatically. From "listening, listening and listening" in ancient China to all kinds of modern medical diagnostic equipment, the update and iteration of medical equipment has also brought the progress of the medical industry. With the development of the Internet and mobile Internet, the speed of telemedicine is also accelerating. By 2018, the interaction of mobile devices will account for 65% of the interaction of medical institutions. 80% of doctors have used smartphones and medical applications to provide medical services.

In general, the development of the field of health care is mainly due to the increase of the global population and the change of population structure (the increase of aging), the improvement of social and economic level, the provision of urbanization level and the increase of the demand for chronic disease treatment. With the continuous development of social economy, people's demand for medical health has been improved, and people's growing demand has brought new pressure to the existing medical technology or medical system, thus effectively promoting the development of the industry. In addition, the continuous development of the industry is inseparable from the progress of science and technology level and the support of the government and other relevant units to jointly promote the development of the industry.

2. Problems in the field of medical health

Although the field of health care is growing, there are still many challenges and obstacles in the development of the whole industry. According to a survey conducted by the healthcare executive group, the three main challenges in the field of health care in 2018 are clinical data analysis, the status of population health service institutions and efficacy based payment system.

2.1 low degree of data

With the development of the Internet, the digital level of the medical and health field has been continuously improved. No matter from the perspective of medical equipment or medical services, the trend of electronization is becoming more and more obvious. However, the overall degree of data is still relatively low, and the level of medical equipment and medical services in some top three hospitals is relatively high, but the lower middle hospitals are still in the stage of upgrading, and the data-based ability is poor. In clinical medicine, there is basically no data collection and utilization, the communication between patients and doctors or pharmaceutical manufacturers is in a broken state, and the clinical data can not be analyzed and utilized, which greatly hinders the progress of clinical medicine.

2.2 mutual isolation of medical institutions

Due to the low degree of data, there is obvious information asymmetry between hospitals. For example, everyone will have such a medical experience. When you go to the hospital, the doctor will ask you to do any possible relevant examinations. However, each of these examinations has been dealt with in many hospitals. However, due to the isolation between hospitals, patient information cannot be synchronized, which leads to a huge waste of human and material resources and reduces the efficiency of the industry, Hinder the rapid development of the industry.

2.3 high pressure of network security

Although the laws and regulations clearly guarantee the data security and privacy in the field of medical health, the rapid development of the Internet makes more and more devices begin to enter the network, which brings huge hidden dangers to the network security work. In 2017, research by BM security and Ponemon Institute showed that the cost of preventing medical data leakage increased, with an average of $380 per record, while the cost of data maintenance in other industries decreased by 10%. Therefore, data and network security issues will become more and more concerned by the industry.

In addition, there are many problems in the field of medical health, such as high cost of medical treatment, mismatching of medical resources, poor medical experience of patients, and so on.

3. Development trend of medical and health field

On the one hand, with the significant improvement of people's living standards, the demand for health and a better life is growing. On the other hand, with the development of the Internet, digital development in the field of medical health has become the primary development direction in the field of medical treatment in various countries.

3.1 digitalization of medical health

With the development of the Internet, all walks of life are carrying out data transformation, and the field of medical health is no exception. From the traditional handwritten medical record to the present electronic medical record system. At present, the level of digitalization in the field of medical health is still in the middle and lower reaches, but from the perspective of the policy support of countries in the field of medical health, the digitalization process will continue to accelerate. From the perspective of market performance, the digital transformation of the mainstream top three hospitals is relatively mature, and the digital level of lower middle hospitals is relatively low. In the future, it will gradually settle down and realize digitalization in the whole industry.

3.2 medical and health data sharing

At present, hospitals are isolated from each other and information is not connected with each other. There are two main reasons. On the one hand, medical and health data is not electronic and information circulation is difficult. On the other hand, data security and privacy are difficult to solve. With the development of technology, digitalization has been developing continuously. With the security and privacy issues being effectively resolved, data will be shared in the future. Data sharing brings about

the transparency of industry information, which can effectively promote the efficiency of the industry and maximize the value of the industry.

3.3 precision customized medical treatment

With the increasing demand for health care, professional medical services will continue to upgrade and iterate in the future. People can capture body data in real time through wearable devices and feed it back to professional medical teams. The medical teams carry out customized precision medical treatment according to the individual situation of users, including drugs, medical devices and corresponding medical insurance services. Users will not only be sick to go to treatment, but also from prediction, prevention to start corresponding medical services, the whole medical service covers its entire life cycle.

2、 Blockchain + advantages in medical field

1. Analysis on the feasibility of blockchain + medical field

Blockchain + medical health field is feasible and restrictive, which can be illustrated from the essential attributes of blockchain, the development trend of medical health and existing problems.

1.1 distributed storage ensures information security

The blockchain adopts data multi node and distributed multi access to get rid of the dependence on Internet central server and avoid the possibility of central server tampering with data and losing data. And users can view the patient's historical data and user data at any time, thus avoiding the risk of data loss. This can also effectively improve the efficiency of the industry. When patients go to see a doctor, the doctor does not need to check the relevant data of the patients, but directly view the historical data, which greatly saves human and material resources.

1.2 asymmetric encryption to ensure user privacy

With the development of society, on the one hand, people pay more and more attention to personal respect and privacy, on the other hand, the characteristics of the medical and health field require users to disclose their own information, at least in the medical stage of the hospital is open, so as to effectively solve the problem of medical treatment. The encryption and decentralization characteristics of blockchain cater to the demands of users' privacy information protection. On the one hand, it can make relevant information public to the hospital, so that patients can receive the best medical services, on the other hand, it can effectively handle anonymity, even if the information is open, the protection of users themselves can be maximized.

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1.2 **community autonomy of alliance chain promotes**

information sharing Most of the medical data are
stored in various hospitals and medical equipment manufacturers. Different providers often use different database systems to store the medical data. There is no good cooperation between each system. On the one hand, blockchain can guarantee the realization of data sharing function technically; on the other hand, it can promote everyone's data sharing from the perspective of community autonomy, similar to R3 alliance, in which all participants share relevant data according to the rules of the alliance, and therefore will be subject to corresponding incentive measures or punishment mechanisms.

1.4 smart contracts improve industry efficiency

The biggest function of smart contract is to automate the execution of relevant procedures, reduce the participation of personnel and improve efficiency. Blockchain system can realize the automation of most billing and payment procedures, so as to skip the middleman, reduce administrative costs, and save time for both patients and medical institutions. And this series of funds and process data can provide an effective basis for the later insurance claims and bill management. On the one hand, it can reduce the gray costs in the field of health care, such as fraudulent insurance, false accounting, on the other hand, it can improve the efficiency of verification.

At present, blockchain application in the field of health care provides a feasible solution, mainly from the data protection and data sharing aspects. In addition, the blockchain records can not be tampered with and can be traced. They can be applied to drug traceability and other aspects. This is mainly the application of supply chain, which is not described too much.

2.Blockchain + advantages in medical field

Combined with the most prominent features of blockchain - decentralization, point-to-point network, distributed ledger, time stamp, information transparency and non tamperability, etc., applying blockchain technology to the field of health care will have the following advantages:

2.1 improve data security and reduce network risk

Through encryption and distributed storage, blockchain can ensure the security of data exchange system and prevent data from being modified. With the increase of all kinds of self-use medical devices, and the vast majority of them are Internet of things devices in the future, people's healthy life data will be more and more, people's requirements for data leakage and privacy protection are higher and higher. Blockchain can provide data interoperability between devices while ensuring security, privacy and reliability, and effectively reduce the risk of data in the process of storage

and transmission. At present, blockchain related encryption technology has made great progress, and even many blockchain projects allow.

It focuses on the field of data encryption technology. For example, multiparty computing technology (SMPC) encrypts the data needed to be calculated by decomposing it into multiple pieces, and assigns it to multiple nodes for calculation, so as to ensure that each node cannot decrypt the original data according to a single piece. Blockchain can encrypt the user's privacy information that needs to be kept secret to ensure that the information can only be spread or shared in specific scenarios, and other parties cannot decrypt the original information even if they intercept it.

2.2 data encryption and sharing

The blockchain's medical and health platform uses a distributed accounting method. No longer like the traditional medical and health data platform, the platform holds all the user's information, but each user has an account book. The account book can record all the user's information, which may be encrypted according to the different importance of the information. Each user's information is in his own hands, not owned by any platform. Users can share or sell information at different prices according to their own different information values, so that the control power of user information is better than that of user blockchain. While ensuring the security, privacy and reliability, the blockchain itself also has the transparency. From the hospital to the patient, the whole process can be guaranteed. Take the electronic medical record as an example, a blockchain electronic medical record system can be built in the future. All the medical and physical health data of patients are stored on the chain, which is convenient for doctors to have a comprehensive understanding of patients, and can avoid the information asymmetry caused by transfer between hospitals, requiring patients to repeatedly carry out the same diagnosis.

2.3 improve industry transparency and reduce gray area

From the perspective of service institutions, after the application of blockchain technology, in the process of patients' medical treatment.

The medical records, expense records and the patient's physical condition can be recorded in the chain in real time. The service organization can quickly and accurately

query the relevant data, and on this basis, the patient can reduce the disputes between the service and the organization. From the perspective of patients, drugs flow into the hands of individual consumers from pharmaceutical manufacturers, and the whole process can be guaranteed. The problem of fake medicine can be solved well, and patients need not worry about it.

3.Application of blockchain in medical field

The application scenarios of blockchain in the medical field can have the following four aspects, which can be realized.

Now many parties share the data on the blockchain platform to obtain the historical data of patients, use the shared data for modeling and image retrieval, assist doctors in treatment and health consultation, etc.

2.1 privacy protection layer: the transmitted medical data is encrypted and stored in the block safely, which is difficult to be tampered with

All users' real information is anonymous and hard to trace the source of data. In addition, the form and content of stored data can be changed according to the needs of data sharing type.

For example, for image type data, image features can be stored as encrypted data.

2.2 access control level: the point-to-point transmission of central decentralization needs to solve the problem of trust mechanism

Medical insurance process is complex, settlement is difficult, access barriers exist between medical institutions, and the problem of non information circulation can be solved through the blockchain platform personal library.

Historical medical records of patients in different medical institutions can be uploaded to Different data providers on the sharing platform can authorize users on the platform's personal library to access the data (announcement) on the channels that their network requests permission. For example, a third party medical institution can model and analyze specific types of diseases through the patient data shared by the hospital, so as to achieve better auxiliary decision-making adverbial clause: the purpose of treatment, or use of a large number of patients Data to develop new drugs. The existing access control mechanism on blockchain can be implemented by smart contract or some asymmetric encryption algorithms. By using the process automation of smart contract, the cost is reduced and the trust problem is solved.

However, the continuous expansion and development of blockchain technology will bring greater growth to the medical field. Innovation, industry definition, medical institutions, pharmaceutical factories, insurance companies, communities, equipment manufacturers, governments, etc. can benefit from it. Health care data can be more secure, fast and local sharing of the whole network, and better help the development of smart medical.

3、 What is IMA?

The Intelligent Medical applications (hereinafter referred to as IMA) is a kind of virtual cryptocurrency issued for the future smart medicine. It combines 5g network with Internet of things and telemedicine by using the concept and advantages of blockchain, so as to realize the new mode of future smart medicine.

1. Basic concepts of IMA

China's China's novel coronavirus pneumonia in December 2019 has raised alarm bells for the global medical system and global medical workers. If the next outbreak is going to happen, how will China face it? China's strategy, one province, one city, the whole people self isolation, blocking the transmission of the virus, but also suffer great losses. The infection rate and mortality rate of medical workers in China's front-line is increasing, and the medical system abroad is overburdened. In the face of collapse, a sudden outbreak of disease has tested the major problems of the medical system in various countries around the world.

In this war epidemic without tobacco sales, we have experienced the hardships of medical workers and seen their great contributions to the whole human race. At the risk of being infected, many medical workers have been infected and even sacrificed their lives in the front line of medical treatment day and night. This painful price makes us have to reflect on it, This is not a matter for one or several people, but a problem for all mankind to face together. The human community is not aimed at a certain country or a certain human group. How to get rid of all kinds of disasters brought about by nature is a topic of common research for all mankind, especially for diseases. Different medical systems in different countries around the world and different ways of dealing with outbreaks are also different, So in the next outbreak, will we still be as helpless as we are now? The answer is No. after continuous analysis and research, a revolutionary medical system (SHI) will emerge.

2. 5G + IoT + telemedicine

With the popularization of 5g technology and the continuous development of the Internet of things, the advantages of the combination of the two are becoming more and more obvious. Therefore, the medical system of the future model is gradually showing in the public's vision. 5g + Internet of things + telemedicine has become a new model of future medical treatment. The existing more common ones are: telemedicine consultation, online registration, online consultation, and remote operation of medical equipment for surgery. Just imagine, if we use 5g + Internet of things + telemedicine to face the next outbreak, what kind of results will we get? Virus detection no longer requires people to people contact, but CDC operates telemedicine rescue vehicle for virus detection and screening, which reduces the infection rate of many medical staff, so that limited medical resources can be used to

more needed places, Reduce the pressure of the medical system, so that more infected people can get more effective treatment. During the epidemic period, shopping does not need to go to the supermarket to rush to buy, but through online orders, the supermarket delivers the goods to the door through the remote delivery truck, so as to further reduce the human contact during the epidemic period and block the transmission of the virus, which is also the reason for the birth of Shi.

5g technology has been fully put into use in China, and the Internet of things has gradually matured. With the support of 5g technology, the Internet of things will enter a new era. The application of 5g and the Internet of things in medical treatment will promote the re upgrading of the medical system, home diagnosis, home treatment, and strive for golden rescue time, which will become a reality, reducing some cases of disability and death caused by major diseases.

3. Smart pension

Smart elderly care intelligent terminal refers to the intelligent equipment embedded with modern advanced technology. The main technology is 5G+ Internet of things, which provides all-round, multi-level and diversified elderly care services for the elderly in a timely and efficient manner in different forms of wearable, mobile, portable, fixed, non-contact and unconscious touch.

Wearable intelligent elderly care intelligent terminal. Wearable equipment has the characteristics of carrying, high sensitivity and good interaction. According to the wearing position, it can be divided into four categories: head, upper limb, hand and foot. The head category includes smart glasses and smart headband; the upper limbs category includes smart chest band, smart armband and smart brooch; the hand category includes smart bracelet, smart watch and smart ring; the foot category includes smart shoes and smart foot ring. Wearable intelligent elderly care terminal can provide positioning, navigation, emergency call and other elderly care services.

Mobile intelligent elderly care intelligent terminal. It is installed on the mobile tools to provide the elderly with intelligent positioning, emergency call, navigation, lighting and other pension services, such as intelligent crutches. In addition to assisting the elderly to travel, the handle of crutches can be installed with a flashlight and a radio for lighting and listening to the radio.

Intelligent elderly care intelligent terminal can detect the basic condition of the body and regularly measure the physical condition of the elderly. For example: blood pressure, heartbeat, etc., will regularly transmit the physical condition of the elderly to the big data center and monitor their physical functions. In case of a major emergency,

they can use the recent physical function information as a diagnostic aid to strive for the golden rescue time and reduce the sudden death rate of major diseases of the elderly.

Emergency call for help: one button SOS type intelligent home-based pension product is an essential function. Yishenpei technology pension package contains two one button call for help modes, the emergency call button and the emergency call button on the intelligent telephone. When the elderly is not comfortable at home or in an emergency, they can send a call for help signal through these two modes, which is characterized by fast transmission speed (within 3 seconds) and more Warning methods (automatic voice dialing, automatic management software High reliability and stability.

Intelligent smoke alarm: before being controllable, it can sense the smoke of the elderly's living environment, reduce the risk of fire, and connect to the Internet wirelessly, with the functions of dust prevention, insect prevention, light interference resistance, etc.

Gas leakage alarm: when the concentration of combustible gas and carbon monoxide exceeds the standard, multi-mode alarm is carried out, which has the characteristics of high stability and small sensitivity drift. It is mainly used to detect whether the combustible gas in the living environment of the elderly leaks, so as to ensure the life safety of the elderly.

Human perception: a pair of human perception instrument monitors the activity frequency of the elderly at home, and gives an alarm when the activity is frequent or inactive for a long time. At the same time, when the old people go out for activities, they only need to set up the system with one key. At this time, the system will enter the state of setting up the system. When there is a thief or illegal invasion, it will automatically alarm.

Family care reminder: if the children or pension service center does not contact or care for the elderly for a long time, it will remind you to communicate with the elderly at home in a timely manner; the length of time can be customized according to the user's needs.

One button dialing: one button dialing refers to that the user can get the corresponding service or call with one button. If life help and family call are omitted, the dialing will not be changed, making the elderly more relaxed, and the intelligent elderly care service more efficient and fast.

4. National medical and health big data

1. Through the establishment of national medical big data, the basic body information of the whole people will be managed uniformly through the big data center (for example, blood type, disease history, drug allergy information, etc.). For example, some serious diseases to death are caused by untimely rescue. If there is big data, the basic health information of the patient can be queried directly, so as to strive for valuable time for rescue.

2. The physical health of the elderly over 60 years old is detected and monitored, and the daily health information is transmitted to the big data center through the detection terminal, so as to reduce the incidence of serious diseases of the elderly.

3. To open up a green channel for some serious diseases requiring transplantation matching, the most difficult part of organ transplantation is matching, even among relatives, there is a certain probability of matching. Often some patients who need organ transplantation lose their lives because they cannot find the right matching. Finding the right match in big data will solve many serious problems and prolong the life of patients.

4. Big data will show the recent physical condition, and play a very good auxiliary role in the diagnosis of many diseases, such as: whether the recent blood pressure is normal, whether there are other diseases.