Original Research Article

Research on Big Data Application of Medical Health Management and Service

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ABSTRACT

This paper discussed the background of medical information; summarizing the current situation of medical information, market analysis and construction process. The big data applications of medical health management and service in our daily life, including clinical decision-making, remote treatment, personalized medical care and etc., were also discussed. Finally, the current challenges of medical big data were analyzed, and suggestions were proposed to improve the current situations.

KEYWORDS: Big data; Medical health; Management Services; information

1. Medical big data information background

Medical industry is a very important industry of a country as it is closely associated with the well-being of people and economic stability of a nation. Effective improvement on the medical standards and services has been brought to the focus of our nation.

With the development of computer networks, the medical industry is also constantly building their own applications to meet the application of information systems. However, due to the early lack of knowledge of the construction of the medical industry, the hospital's own investment in the medical industry and awareness are low, leading to our national medical industry information technology started late, and the medical industry information construction relative Other industries to build a lot of information technology, and the various hospitals there are very different.

Information construction for the promotion of the medical industry's own development and high body productivity, at the same time, to provide patients with more timely and more accurate services have played a crucial role. Therefore, it is to see the information technology on the development of the important role of the medical industry and the current medical industry information behind the status quo. The government and the hospital itself are constantly strengthening the construction of information technology, not only issued a variety of related development planning outline to encourage the medical industry information construction, at the same time, the hospital itself is also constantly increasing investment in information construction.

Medical industry information construction of the second wave has come, but also the hospital for their own information construction investment and another peak period. As a network equipment provider, we have to pay attention to the medical industry's information technology development. For us, the construction of the medical industry is still a blank, but by in-depth analysis of the application and development of the medical industry, will be a very big pie.

1.1. Current situation of Medical data information

Since the invention of computer, after several years of development the birth of the computer network; the birth of the network, greatly improving the information exchange speed and efficiency of each industry. With the development of computer technology and network technology, in order to achieve more efficient information exchange and resource sharing, improve production efficiency, the size of the network construction of various industries are constantly expanding, each industry are preparing to start or are developing their own information Construction, as the relationship between the livelihood of the medical industry from a decade ago began the industry's information construction. The Fifth Plenary Session of the 15th National Congress of the Communist Party of China put forward the policy of ‘vigorously promoting the national economy and social information, and it is a strategic measure to cover
the overall situation of modernization. The industrialization of information drives the advantages of development and the development of social productive forces by leaps and bounds. Since the Ninth Five-Year Plan, China's medical information construction has made significant progress: the implementation of national health information network construction projects, information infrastructure construction has been effective. However, due to the characteristics of the medical industry itself, the medical industry information construction started late, weak technical force, lack of capital investment, compared with the actual needs of other industries and health, is still in the initial stage, there is a considerable gap.

At the same time, the medical industry because of its own application of the particularity of the hospital network construction cannot copy other industries network construction, in order to adapt to the medical industry's own network applications, in 2002, the Ministry of Health released ‘Development Layout of the National Health Informatics (2003 – 2010)’. The layout outlined the basic principles of the medical industry: Constructions of national standardization, safety assurance, enforcement of laws and regulations, implementation of measures in line with local conditions.

1.2. Medical data information system analysis

'National Health Information Development Plan (2003-2010)’ put forward the goal of health information construction in 2010, that is, 'to establish a more complete, standardized standards, the system safe and reliable, and health reform and development to adapt to the health Information system, the economically developed areas of health information construction and information technology applications to achieve the level of moderately developed countries, the rest of the regional health information construction and the forefront of the developing countries.

Ten years ago, we talked about how to build a hospital management information system based on a commercial database. Today, we are talking about filmless, paperless, wireless, mobile computing, clinical information systems, PACS, management and clinical Decision making, system integration and security, process reengineering, and even digital hospital implementation.

Digital hospital standards:
Standardization of three aspects:
1. Digital medical equipment
2. Computer network platform
3. Medical software’s
Implementation of 'three eliminations’ in hospital:
1. Elimination of papers “paperless”
2. Elimination of films “filmless”
3. Wireless network

The fundamental objective of hospital information is to reduce medical errors, improve the quality of medical services, control rising costs and expenses in medical care. Today, China's medical industry is facing all the challenges, hospital information is a powerful coping weapon. This is the fundamental cause of today's medical and health information become a global boom.

1.3. Medical data information construction process

1.3.1 Funding sources of information construction

The current construction of the medical industry, including the construction of information technology, a three-level hospital to implement the hospital's information technology, at least tens of millions of dollars or even hundreds of millions of dollars of investment. China's national investment in hospital information less, the hospital itself because of policy constraints, information investment cannot be included in the cost, but cannot consider the recovery. Hospital due to profit restrictions, more willing to invest in the soon to produce benefits of medical equipment, and it is difficult to come up with a huge sum of money into the construction of information technology. But the development of the hospital and the urgent need for the management of information systems.

And China's venture capital mechanism is not mature enough. Many foreign hospitals to this large-scale information system, are relying on bank loans or to attract venture capital to carry out. Venture capital as a middle bridge plays a catalytic role in promoting new technologies. However, although China has the so-called high-tech funds and venture capital, but it is a 'post-venture investment', that is to say in the assessment, to get the project, and then wait for funding. Often delayed a lot of good opportunities.
1.3.2 Information construction decision-makers

Medical information center has been in a more embarrassing position; in some information construction of a better hospital, the status of the network center is relatively high, but also in the construction of various hospitals in the planning have a certain right to say, you can say The hospital's CIO and CEO is sitting on a bench; and in some information technology construction relatively backward small and medium-sized hospitals, the network center position is relatively low, at the same time, in some hospital construction planning and so on are not too many The right to speak, and some information centers and even in the hospital is considered to be the same as the electrician, in such small and medium-sized hospitals, information technology construction of the right to focus on the dean or vice president of the hands, and sometimes even assigned to infrastructure Branch of the hands of the network center has not been a very good position to enhance.

Information system is to serve the enterprise strategy, CIO from the information technology point of view to design and plan the enterprise development and competitive strategy, so he should not only be the auxiliary decision information provider, and should be one of the decision makers. In the Chinese hospitals, the real establishment of the CIO system has yet to be. At present, it is the responsibility of the vice president and the director of the computer room to assume the responsibility of the CIO. The understanding and attention to information technology often vary, policy lack of coherence. A stable, well-owned CIO position related to the success or failure of information systems, but also related to a modern, digital hospital operation success or failure. 'China's hospital CIO system is established when the Chinese e-hospital is the date of realization.'

From the current medical center network center itself, a lot of network centers are constantly for their own departments to strive for a higher status, but also for the network center in the hospital for a variety of construction for a certain decision-making power. [11]

2. Medical big data applications in medical health management and service

The traditional data application of the medical industry has important reference value. It must be clear that the development of big data is based on the existing technical basis and the accumulation of data. New information analysis technology and communication technology for the traditional medical network applications and data analysis has brought new ideas.

Based on the diagnosis and analysis of the user's medical data and health monitoring data, it is possible to realize the prediction and monitoring of the physical condition of the user and even determine the type of disease that the user is susceptible to. Improve the user's health status, reduce the risk of the user's illness. Accurate analysis of big data sets, including patient signs data, cost data and efficacy data, can help physicians determine the most effective and cost-effective treatment in clinical practice. Medical care systems will likely reduce over-treatment, such as avoiding side effects that are greater than therapeutic options.

2.1. Clinical decision support system

Clinical decision support refers to a variety resources that assist medical personnel in decision making during diagnosis and treatment. Common scientific research literature, online journals, expert consultation advice, evidence-based medicine evidence, clinical decision support system (CDSS) and so on. Clinical decision support system, through the data, models, etc., to human-computer interaction to assist clinical staff decision-making computer application system.

Clinical decision support systems are becoming more intelligent with the aid of big data analysis techniques thanks to the growing ability to analyze unstructured data. For example, you can use image analysis and identification techniques to identify medical imaging data, or to dig out medical literature data to establish a database of medical experts to advice physicians. In [1], a cloud computing medication decision support system based on physiological data is used. Historical data based on physiological data and drug dose and clinical manifestations are used to guide the dose of preterm infants. In [2], the technical challenges of remote clinical counseling service system in some areas with inconvenient reach were discussed, and the remote clinical decision support system based on mobile terminal was introduced. Previous study discusses the use of clinical cardiac imaging data support artificial intelligence and advanced computing, in order to achieve personalized treatment [3]. The use of machine learning to model clinical data to achieve disease prediction, rehabilitation and clinical decision support for the treatment of doctors to provide a new way of thinking.

2.2. Remote medical and remote patient monitoring

Data is collected from the remote patient monitoring system for chronic patients and the results of the analysis are fed back to the monitoring device (see if the patient is following the advice) to determine future medication and
2.4. Gene sequencing

With the rapid development of big data, it has touched the antenna to many areas. In the field of health care, the United States has begun to use big data applications to prevent the spread of the flu, and with the continuous development of science and technology, but also to the previous very expensive gene sequencing becomes no longer distant, the cost of gene sequencing has been approaching 1,000 US dollars. At present, the United States has more than 2,000 companies engaged in human gene sequence analysis, and predict the future there will be more companies will be involved in this area. This means that the era of personalized medicine is approaching.

Bina Technology, a start-up company founded in 2011, recently received $6.5 million in venture capital, and Bina Technology's main work is to use big data to analyze human genetic sequences, and their results will be for research institutions, clinicians and other downstream medical The service industry provides the most basic research material. Research universities, pharmaceutical companies, and clinicians use Bina Technology's technology to analyze genetic data that can use these data to identify rare pathological information in genes that are causing cancer, neonatal disease, sickle cell Anemia and so on. The results achieved at different stages of gene sequencing are shown in the following figure.
Bina Technology plans to collaborate with a medical center in Wisconsin to conduct a complete genome sequencing of children in the neonatal intensive care unit. In the next few years, the team hopes that every newborn will be able to accept the complete genetic analysis data provided by Bina Technology. Dr. Michael Snyder of Stanford University's Genetics Research conducted an initial pilot work before the Bina Technology platform was officially released. Experiments show that the Bina Technology platform can complete several hundred people in 5 hours of gene sequence analysis, according to the traditional analysis method, which takes a week to complete.

As more and more genetic information is obtained from gene sequencing solutions, there is a clear need for future scalable analysis of the genome. Although it takes years for the technology to develop, but in the long run, they may have a great impact on our health, after all, medicine is a whole. We also have reason to believe that the age of personalized medical is no longer far away from us [2].

2.4.2 Personalized drug development

Another great innovation in the field of research and development is the development of personalized treatment by analyzing big data sets (such as genomic data). The application explores the relationship of the genetic variation, the susceptibility to a particular disease, and response to a particular drug. This information will be used in the development of personal drug and medication. In many cases, the patient with the same treatment program but the effect is not the same, in part because of genetic variation. For different patients to take a different treatment program, or according to the actual situation of patients to adjust the drug dose, can reduce side effects.

Personalized medical care is still in its infancy. McKinsey estimates that in some cases, by reducing the prescription dose can reduce the cost of medical treatment by 30% to 70%. For example, early detection and treatment can significantly reduce the burden of lung cancer on the health system, because the early cost of surgery is half of the cost of the latter part of the treatment.

Apple's legendary president, Steve Jobs, used a different approach in the fight against cancer to become the first person in the world to sort all of his DNA and tumor DNA. To this end, he paid up to hundreds of thousands of dollars in the cost, he did not get a series of only a series of marked samples, but the entire genetic code, including the data file. For an ordinary cancer patient, the doctor can only expect his or her DNA arrangement to be sufficiently similar to the sample used in the trial. However, Steve Jobs’ doctors can be based on the specific composition of Steve Jobs, according to the desired effect of medication. If the cancer caused the drug failure, the doctor can replace another drug in time, that is, Steve Jobs said, 'from a lotus leaf jump to another piece.' Through the big data technology to develop personalized drugs will Steve Jobs life extended for several years.

2.4.3 Personal health management

The use of big data technology, the entire life cycle of personal health management, at any time, any place can access the relevant information, thus ensuring the consistency of health information continuity, such as Google Health, Microsoft's Health Vault platform. The most important feature of a health management system is that the individual's health state is continuously observed and that the health analyst can effectively analyze the individual's health status so that the body is in a state of non-health. The most important problem to be solved in the field of health management is the timely detection of physical health and early warning of the risk of disease. In the traditional case, we will meet
this requirement through the annual physical examination, but the physical examination time span is large and the geographical coverage is not enough, wearable equipment (see below)

Able to achieve cross-regional large population abnormal real-time discovery. Respond to vital physiological activities by monitoring the signs, such as heart rate, pulse rate, respiratory rate, body temperature, heat consumption, blood pressure, blood glucose and blood oxygen, hormones and BMI, body fat content. At this stage can be used signs of data sensors include:

- **Body temperature sensor**
- **Heat flux sensor**: used to monitor calorie expenditure, can be used for blood glucose-assisted calculation and metabolic capacity projections
- **Weight measurement sensor**: used to calculate the BMI index
- **Pulse wave sensor**: calculate the blood pressure, pulse rate and other data
- **Bioelectric sensor**: can be used for ECG, EEG data collection, can also be used to calculate fat content
- **Optical sensor**: calculate the blood oxygen content, blood flow rate

The device will initially set dozens of detection points, just accumulate 28 test results to establish a personal primary model, the use of big data technology for all the data generated by analysis, summarized into a health risk index, the user can see their own Of the health risk index and the same age, the average risk index for the same sex population, and can identify their own health risks in the rankings of the same age. At the same time, the use of big data technology, equipment will be adjusted according to the actual situation of the user, once the data shows abnormal, it will increase the detection density, and vice versa will lengthen the detection interval, dynamic adjustment.

These numerical cross-analysis results can be used to analyze the current physical condition of the user, conduct a health risk assessment, and combine data to give several key physiological activities: sleep, diet, exercise and medication personalization recommendations that allow users to stay in one stable physical condition. [13]

**Conclusions**

This article first from the medical information of the background, outlined the current medical information construction of the status quo, market analysis and construction process. And then elaborated on the current medical health management and service data in our daily life applications, including clinical decision-making, telemedicine, and personalized medical care.

The accumulation of massive data in the medical field is not a complete new concept, but in the clinical treatment of medical institutions, the experiment has been there, with the degree of information to deepen, more and more medical data to analyze Way to gradually accumulate. At the same time, with the development of mobile Internet and wearable medical care, the daily monitoring of users becomes feasible, and the data and data sources have been greatly expanded.

But we also see the current medical data faced by the challenges: the data is not scattered, if the patient to a number of hospital interrogation will lead to data is not continuous; data storage technology is more difficult, many hospitals still use the old The old medical records originally stored patient information; medical information security is difficult to protect, once the data disclosure, will lead to personal privacy exposure, more terrible is the disclosure of genetic information will let terrorists have the opportunity to create genetic weapons. The use of large medical data is a double-edged sword, the use of a good country and the people, the use of bad can cause social confusion.
In view of this, we call for the establishment of a complete, comprehensive, safe, private medical data management system, so that our personal health information can be the most effective and most secure use. Use modern technology and our knowledge, for the world to make our contribution. Through the simultaneous change of data management, establish a sound regional health information standard system, and actively explore the use of data mining technology, improve the medical early warning mechanism, improve the medical privacy protection mechanism and so on for the community to create a more convenient and practical security of medical management system.

In conclusion, medical health care is closely related to human life. With the development of technology, how to make better use of technology to serve mankind and promote human development is becoming more urgent in the context of big data age. The application of large medical data can not only bring better health care services to mankind, but more importantly, in the application, big data methods can continue to discover new knowledge content, promote medical knowledge and medical technology progress. Let our generation of young people, shoulder the task of the times, pay close attention to the opportunity of medical data era, for the healthy development of human add a force!

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