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Comparative Study of Domestic and Foreign Health Care Platform

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Abstract—In recent years, China has continued to accelerate the pace of health informatization, promote the continuous recording of electronic health records and electronic medical records, and the authorized use of information among medical institutions, and encourage qualified regions and areas to advance the trial of health big data applications. Through the analysis of relevant literature and major health care service platforms' websites at home and abroad, the development process, service characteristics, and service content of health care service platforms in the United States, the United Kingdom, Australia, and China are analyzed and compared to provide references for the construction of China's health care service platform. Finally, the construction of the N-A-C(Nation-Area-Community) health care cloud platform model under the big data environment was proposed.

Keywords—health care, e-health; big data, cloud platform, comparative analysis

I. INTRODUCTION

In recent years, with the rapid development of big data and cloud platform, more and more traditional industries are combined with big data to meet the needs of modern development. Hospital informatization is a significant component of health informatization so accelerating the advancement of informatization in medical and health systems has an important strategic significance for effectively implementing medical reform measures, improving the quality and efficiency of medical and health services, lowering medical costs, and promoting the realization of the goal that all will have an access to basic medical and health services [1]. With the development of the country's economy, China's medical level is gradually increasing. The traditional medical service model can no longer meet the needs of modern development. The application of cloud computing and big data core technologies and concepts to health care and establishing a health care cloud platform service model have important and practical significance for improving platform service flexibility and efficiency, platform integration service capabilities, and enriching platform management methods. This article will analyze the development status of foreign health care platforms and compare the health care service platforms of the United States, the United Kingdom, and Australia with the existing health care service platforms in China to provide reference for the construction of China's health care service platform. We have learned from the experience and then proposed the construction of a three-tiered health care cloud platform model for the country, area, and community under the big data environment.

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II. RESEARCH STATUS OF FOREIGN HEALTH CARE PLATFORMS

This article will analyze and contrast the operation subjects, funding sources, service content of the three countries' health care service platforms—Veterans Integrated Service Networks (VISNs), National Health Service (NHS), National Electronic Health Transition Authority (NEHTA).

A. Introductions of Foreign Health Care Service Platform

The United States provides veterans with a very special American veteran medical system——Veterans Integrated Service Networks (VISNs). It is now the largest integrated healthcare system in the United States, the nation's largest provider of graduate medical and other health professionals training, and one of the largest research enterprises in America. [2]. The National Health Service (NHS) is the unified name for each of the four public health services in the United Kingdom: National Health Service in England, NHS Scotland, NHS Wales and Northern Ireland Health and Social Care. In July 2005, Australia established the National Electronic Health Transition Authority (NEHTA) to accelerate the adoption of electronic health throughout the health department. Based on a collaborative approach, NEHTA is jointly funded and managed by all federal, state, and district health jurisdictions [3].

B. Comparison of Foreign Health Care Platforms

1) Comparision of operation models: In general, open sharing of scientific data in a country or region is run through two modes which are the government-led public welfare operation mode and market-oriented commercial operation mode [4].Currently, the operating modes of domestic and foreign health care platforms are also divided into these two modes.

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The U.S. Veterans Medical System is an independent healthcare system owned by the U.S. Department of Veterans Affairs. The National Health Service (NHS) which is invested by the UK Department of Health is a business model regulated by the government. However, the NHS stated in its published white paper that it was necessary to reform public medical institutions. All medical service providers would become fund trust institutions in 2014 and compete with other providers—profit and non-profit medical institutions[5]. The federal government of Australia allocated $466.7 million in budget for the Australian health care system in 2010 [6]. And the federal government takes some financial incentives (the federal government's practice incentive plan for general practitioners) to promote Australia's e-health reforms and constructs the country's largest electronic database of clinical information.

*2) Comparision of service content:*VistA is the basis of management information technology and clinics of U.S. Veterans Affairs. It comes from a client/server architecture (C/S architecture) that connects a PC to a workstation via a graphical user interface. Not only can it run on a computer, but also it can even run on mobile devices such as smartphones. At present, VistA can be divided into four major categories according to function: clinical services, administrative and financial services, infrastructure, and resource databases [7].

The NHS system can be divided into two levels. The first level is community-based primary care services. Every British citizen needs to register at a general practice clinic. The general practitioner will establish an electronic medical records file for each resident. The second level of medical care is based on hospital. Through a two-way referral system, patients can be referred to different levels of the medical service system.

The Australian NEHTA allows each user to understand and register and start digital health and utilizes a self-health record system to allow users to improve their self-care capabilities. And through the health record system, doctors can communicate with patients and provide care services.

3) Evaluation of foreign health care platform: On the one hand ,a health care service platform can avoid medical errors effectively and promote the scientization in medical decision-making, improve the efficiency of doctor services and improve the country's medical management greatly.On the other hand, if the country wants to build a health care platform, it will definitely invest a lot of money. For example, the UK NHS published a white paper, reforming that although it is expected that the efficiency of NHS will increase in the range of 15-20 billion pounds, the cost of management will be reduced by 45%[8].

III. Research Status of Domestic Health Care Platforms

A. Introduction of Domestic Health Medical Platform

At present, the health medical platforms in China mainly include Ali Health and Baidu Medical Big Data Health Platform. Ali Health is a health care service platform created by Alibaba Group. At present, Alibaba's health business mainly focuses on product traceability, medical e-commerce, intelligent medical and other fields, covering the entire process of the medical field [9]. Baidu's medical big data health platform is a health care big data platform built by Baidu. It uses big data to help healthcare and serve the people's livelihood.

B. Comparison of Domestic Health Medical Platforms

1) Comparision of operation models: From the actual point of view of the current level of health care in China, the government departments have not yet established a state-owned capital-based medical platform, and government agencies have not funded or directly assumed the funds for the management, operation and maintenance of the existing health care platforms. At present, the construction of China's health care platform is still in the exploratory stage. It is a model that drives the whole. It is a gradual process of exploration from point to line and then into face. A large-scale Internet company invests in small and medium-sized Internet medical companies to build a health care system. Therefore, most of the health care platforms in China are operated by companies and market-driven commercialization.

2) Comparision of service content: Ali Health pays more attention to technology and its business mainly focuses on product traceability, medical e-commerce, smart medical care, and health insurance. Ali Health established a smart medical platform and officially cooperated with the People's Liberation Army General Hospital of the Beijing Military Region in 2015 to enable electronic prescriptions to be transferred from hospitals to Ali Health [10].

Baidu medical big data health platform provides users with Baidu medical chat, disease prediction and medical brain. Combining cloud computing, big data and artificial intelligence with traditional medicine with the help of an open cloud platform, the platform provides patients and doctors with intelligent simulation of medical consultations, symptom collection and other medical services to improve the efficiency of the inquiry [11].

C. Evaluation of Domestic Health Service Platform

The cooperation between e-commerce platforms and pharmaceutical industry has revolutionized the way of purchasing drugs. The medical data cloud platforms can not only help medical institutions break the phenomenon of "information isolated islands", but also improve their big data storage, processing, and analysis. But most of the existing health care service platforms in China are operated by enterprises and the government has not issued corresponding rules and regulation. At present, China's hospital information construction lacks the medical information standard interface between hospitals[12].

IV. Suggestions for China's Health Care Platforms

Based on the comparison of health care at home and abroad, the author of this paper proposes to construct a three-tiered medical health system called N-A-C model (national-area-community model) and the architecture of health care platform,

technology implementation plan, data acquisition and the construction strategy of the management mechanism. Combining big data analysis, telemedicine, and wearable device monitoring, we have opened up "prehospital prevention," "in-hospital clinical pathways," and "community rehabilitation pathways," to achieve "patient-centered" communities and hospitals interoperating and forming an entirely new type of graded diagnosis and treatment model in which doctors and patients actively participate in disease diagnosis and treatment and health management [13].

A. National Health Service Cloud Platform

The National Health Care Cloud Platform Model integrates the latest medical researches' results and the resources of various area medical cloud platforms to form a data warehouse. It also strengthens cooperation with other medical sharing platforms, breaks through the inherent boundaries of the area scope, and achieves effective connection between resources and demand. At the same time, multi-platform data collection, big data analysis and mining should be established.

B. Area Health Care Service Cloud Platform

The area platform can select the appropriate service plan or send experts to follow up and guide to achieve the docking of supply and demand so as to serve the users better [14]. The area health care cloud platform provides a large number of advanced medical technologies, solutions, and correct guidance for the community health care cloud platform to improve the medical level. At the same time, it can also provide certain reference for the national health care cloud platform.

C. Community Health Care Service Cloud Platform

Community health medical platform consists of application system, data exchange sharing system, data warehouse, data mining analysis, database, IT infrastructure (computing, storage, network), data collection, health care platform operation, maintenance system and big data health medical platform information security system, as shown in Fig 1.

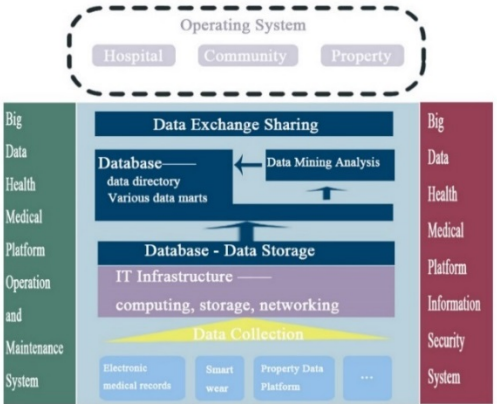

Fig. 1. Community health care model

1) Data storage: Data storage is an important part of the data center and can be divided into two types: centralized and distributed. In addition, the health care big data platform not only needs to store large amounts of low-density and unstructured data, but also provides real-time data services and analyzes a large amount of data. In other words, a distributed storage structure based on hard disk is used which not only ensures that system storage performance is not affected, but also reduces storage costs.

2) Data mining analysis: Utilizing algorithms such as association rules, clustering, decision trees and combined with big data + deep learning technology, data mining analysis implements structured and unstructured data processing [15]. Through data processing techniques such as Hadoop, column storage, and heterogeneous data fusion, combined with the massively parallel processing architecture and efficient distributed computing model, the interactive and repeated processes of data mining are completed.

3) Data exchange sharing: Data exchange sharing platform not only provides data sharing and integration, data collection, data cleaning and data conversion, but also can exchange data based on documents, web, DB and other modes. It can achieve the unification of information management and the interconnection between community hospitals, community properties and residents.

4) Examples of community health care services: The community medical system collects physiological data such as personal physical data and rehabilitation medical data of the residents through smart wearable devices, laboratory reports, disease knowledge bases, and other health service front-ends [16]. By extracting and analyzing the corresponding pathological features of cardiovascular diseases, ophthalmologic diseases, and diabetes, the corresponding data were obtained. Then, the data is passed through a multi-dimensional resource classification system and resource integration model and standard, and then combined with a service platform such as a health service resource pool and a traditional e-commerce resource to provide corresponding service integration and scene matching. In addition, a full quality assessment of the process will be conducted as shown in Fig. 2.

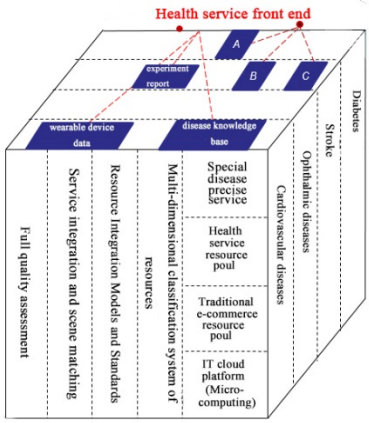

Fig. 2. Example of community health care services

V. Conclusions

At present, with the development of the national economy and the level of science and technology, both domestic and foreign countries are committed to establishing their own

health care platform. Health care at abroad generally implements health care services in one area or community and adopts the community's first or two-way referral system. VISTA, NHS, and NEHTA are non-profit service platforms funded by the state and the government. In contrast, China's current platforms are commercial service platforms built by enterprises. In foreign countries, each citizen will have his own electronic medical record, and the user's health information can be interconnected at all levels of hospitals. In different countries, each patient can be referred to hospitals at different levels through different referral systems. At present, China's health care platform has only shared medical information with some hospitals. This article combines the advantages and disadvantages of health care service platforms at home and abroad and draws lessons from it and puts forward the concept of constructing a three-tier health care cloud platform model for the country, area, and community under the big data environment.

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