Strategies for Building a Platform for the Supply of Combined Medical and Nursing Care Services Based on Big Data Technology

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Abstract: Population aging is accompanied by the arrival of the big data era, and the contradiction between the supply and demand of senior care services is becoming increasingly serious, and the supply of senior care services under the traditional senior care service model can hardly meet the needs of social transformation. In order to adapt to the development of the big data era, this paper constructs a platform for combined medical and nursing care services based on big data technology, aiming to improve the intelligence level of combined medical and nursing care services in China. By using qualitative and quantitative analysis methods, we study and explore the development trend of aging in China and the scale of development of combined medical and nursing care and intelligent nursing care industry, and we conclude that intelligent combined medical and nursing care industry has great development prospects. The intelligent medical and nursing care service supply platform uses big data and cloud computing technology to analyze and calculate the collected health data of the elderly, and provides professional nursing care services to the elderly accurately based on the analysis results. The development of this platform can further promote the development of China's intelligent medical and health care combined elderly service model and provide more quality medical and elderly services for the elderly, but the development of the intelligent medical and health care combined model needs to pay attention to issues such as privacy and security and aging-friendly transformation.

Keywords: Big data; Intelligent elderly care; Medical and health care integration

1. Introduction

China's aging is deepening and the aging process is accelerating, with the number of people aged 65 and above increasing from 143.86 million in 2015 to 20.56 million in 2021, accounting for 14.2% of the total population, up from 10.5% of the total population, and the total number of people aged 60 and above is expected to exceed 300 million by the end of the 14th Five-Year Plan period, accounting for more than 20% of the total population and entering the stage of moderate aging. It is expected that the total number of people aged 60 and above will exceed 300 million, accounting for more than 20% of the total population, entering the stage of moderate aging; around 2035, the number of people aged 60 and above will exceed 400 million, accounting for more than 30% of the total population, entering the stage of heavy aging. China's aging trend is shown in Figure 1. Due to the deepening trend of population aging, the number of elderly population is surging and the needs of the elderly are rising. The traditional elderly care model can hardly bear the needs of social transformation, and the traditional

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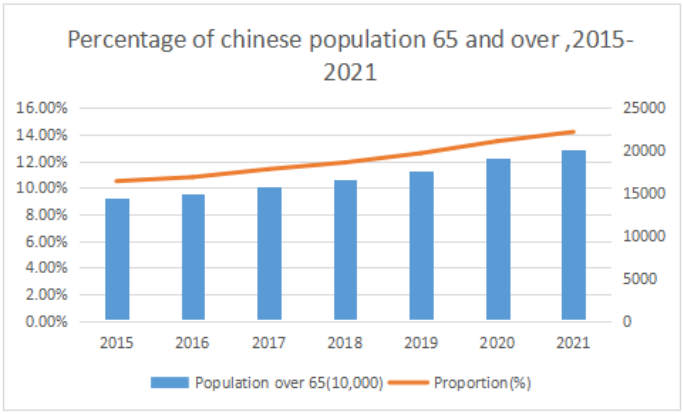
technical means can hardly undertake the changes in the business needs of elderly care services, so the healthy development of aging society is facing a great dilemma, and new elderly care models have emerged[1] . In recent years, the emergence of new senior care models such as smart senior care and medical care integration has promoted the development of new industries.



Percentage of China's population 65 and over, 2015-2021

Year	2015	2016	2017	2018	2019	2020	2021
Population over 65(10,000)	14386	15003	15831	16658	17603	19064	20056
Proportion(%)	10.50%	10.80%	11.40%	11.90%	12.60%	13.50%	14.20%

Figure1 Development trend of aging in China

Since 2014, the trend of rapid growth of the wisdom of the elderly and the combination of medical and health care services industry, the output value has been rising. According to statistics, the scale of the intelligent elderly industry rose from 1.41 trillion yuan in 2014 to 3.76 trillion yuan in 2020, up 16.8% year-on-year from 3.22 trillion yuan in 2019, accounting for 42.9% of the total scale of China's pensioner industry, showing a rapid growth trend. The scale of combined medical and nursing care industry rose from 4.56 trillion yuan in 2014 to 5.73 trillion yuan in 2020. According to statistical predictions, the combined medical and health care elderly industry will reach RMB 13 trillion by 2030, and the market size is expected to reach RMB 106 trillion in 2050, accounting for 33% of the entire GDP. The growth and change trend of the output value of China's smart senior care and combined medical and health care industry is shown in Figure 2. Due to the strong development momentum of new industries such as smart senior care and medical and health care combination, many enterprises see their development prospects and combine smart senior care with medical and health care combination senior care service model to create new smart medical and health care combination senior care service model. The wisdom medical and health care combined elderly service model will become the trend and direction of the future elderly service [2].

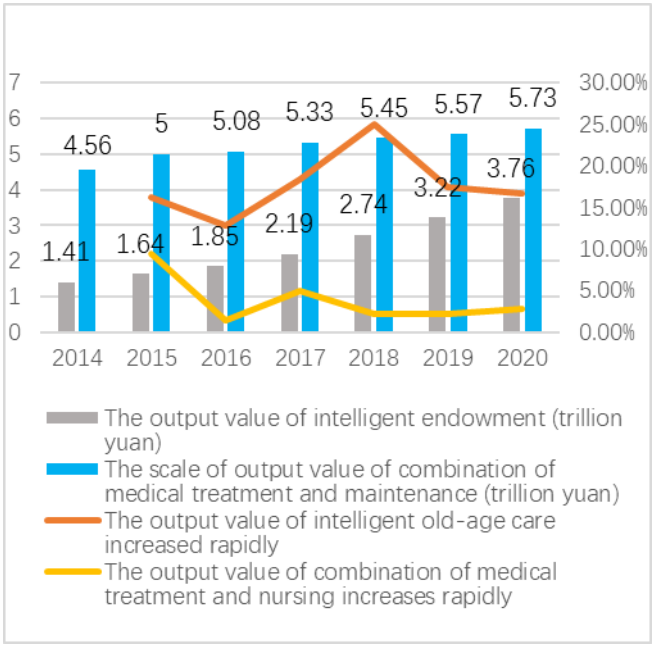


Figure2 Statistics on the scale of output value of China's intelligent elderly and medical care industry

2. General framework of intelligent medical and health care service supply platform

This paper defines the basic idea of the intelligent medical and nursing care service supply platform as embedding intelligent nursing care into the medical and nursing care model, relying on the intelligent medical and nursing care model, uploading the basic health information of the elderly to the intelligent medical and nursing care service supply platform through the information collection of intelligent devices, understanding the real medical and nursing care needs of the elderly through big data and other technical calculations, and transmitting the calculation results to the medical and nursing care service supply side. The platform provides personalized senior care services to senior care institutions, medical institutions and communities under the combined medical and senior care model. The platform further promotes the development of the smart combined medical and nursing care model by providing top-down and bottom-up services, medical and nursing care demand prediction and data sharing. The overall framework of the smart combined medical and health care service supply platform is shown in Figure 3.

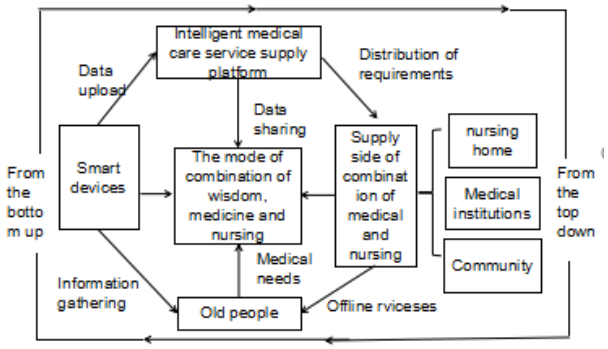


Figure3 The general framework of intelligent medical and health care service supply platform

3. Intelligent medical and nursing care service supply platform design Problems and challenges of the integrated construction of "Internet + government services" under big data

3.1 Architecture of intelligent medical and nursing care service supply platform

The basis for the operation of the wisdom medical and nursing care combined elderly service supply platform is the advanced technology such as big data and cloud computing. The use of big data and cloud computing. The data collection, analysis and computing functions are the basis for building the operation of the wisdom medical and nursing care combined elderly care service platform. Through the integrated wisdom medical and nursing care combined elderly care service supply platform, information is built and shared to provide the elderly with dedicated and personalized medical and elderly care combined services. The intelligent medical and elderly care service supply platform contains five layers of modules, and the functional architecture of this platform is shown in Figure 4.

3.1.1 Perception layer

Elderly people collect health data through smart wearable devices, smart mattresses, physical sensors and other basic devices based on the health indicators given by the platform.

3.1.2 Data layer

After the data collection is completed, it forms vital signs data of the elderly, positioning data of the elderly, exercise data of the elderly and diet data of the elderly.

3.1.3 Data processing layer

Big data processing applies distributed technology, which needs to be carried out according to the storage form and business data. The computational models in processing big data include Map and Reduce distributed computing frameworks, in-memory computing systems, and stream computing systems [3].

3.1.4 Data application layer

The supply side of the combined medical and nursing care model supplies precise nursing care services according to the data processing results, and various medical and nursing care service suppliers arrange professional medical personnel to provide specialized nursing care services for the elderly according to their own health assessment and the nursing care service supply requirements indicated by the platform. In addition, the geriatric professionals in medical institutions can conduct remote monitoring and minor illness consultation for the elderly who have been discharged from hospitals online, avoiding the waste of medical resources and reducing the cost of repeated consultations. The medical staff of community health service centers can open online minor illness consultation and treatment function for the health condition of the elderly, forming a joint online and offline consultation and treatment mode, further promoting the development of combined medical and nursing care model.

3.1.5 User layer

The elderly people understand their health status through the terminal device and carry out self-care and disease prevention. The platform client provides medical knowledge popularization, medical checkups for the elderly and medication reminding functions based on the health assessment results of the elderly, providing practical convenience for the elderly.

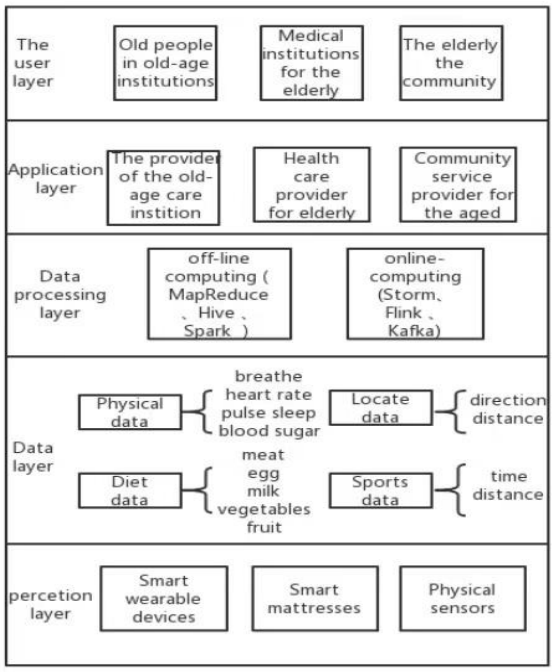


Figure 4 Structure of the supply platform of intelligent medical and health care services

3.2 Operation mechanism of intelligent medical and health care service supply platform

The wisdom medical and nursing care service supply platform takes the use of big data and cloud computing technology as the key technology of the platform, and the operation mechanism of the platform is shown in Figure 5.

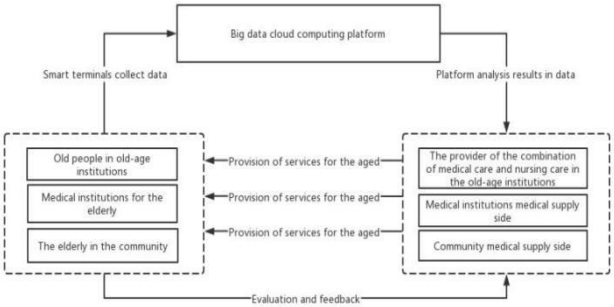


Figure5 Operation mechanism of intelligent medical and health care service supply platform

3.2.1 Operation Mechanism I

The acquisition of basic health data is that the elderly who participate in the combined medical and health care service model monitor their basic health data through smart wearable devices such as smart bracelets. The smart monitoring mattress monitors the sleep time and quality, heart rate, respiratory rate, HRV heart rate variability, fatigue stress index, etc. of the elderly. The devices uploaded to the intelligent medical and nursing care service supply platform. These basic data provide data support for big data and cloud computing technology.

3.2.2 Operation Mechanism II

On the basis of the basic health data of the elderly collected and uploaded to the intelligent medical and nursing care service supply platform, the intelligent medical and nursing care service supply platform uses big data and cloud computing technology to process, analyze and compare the data of the elderly, and the platform predicts potential diseases of the elderly based on daily data changes, combined with health warning indicators, and makes early warnings of major changes in physical conditions, and the medical and nursing care The supplying party of combined medical and nursing care services will provide medical and nursing care services according to the physical condition of the elderly in order to carry out health intervention. The early warning mechanism of the intelligent medical and elderly care service supply platform is shown in Figure 6.

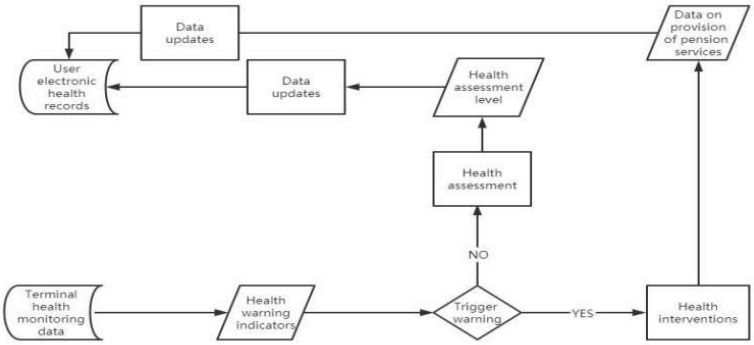


Figure 6 Flow chart of the early warning mechanism of the intelligent medical and health care service supply platform

3.2.3 Operation Mechanism III

Based on Operation Mechanism II, the precise elderly service requirements are determined. The supplier of the combined medical and elderly care service mode provides the elderly with exclusive elderly care service according to the medical and elderly care service requirements given by the platform.

3.2.4 Operation Mechanism IV

After the elderly have received the combined medical and elderly care services, the elderly evaluate the combined medical and elderly care service supply and put forward the problems and improvement suggestions.

4. Wisdom medical and nursing care service supply platform technical support

4.1 Big data and cloud computing technology

Another key technology of the intelligent medical and health care service supply platform is big data and cloud computing technology. The platform mainly uses big data and cloud computing technology to collect, analyze and process data. Big data processing is applied to distributed technology and needs to be carried out according to the storage form and business data. The computational models in processing big data include Map, Reduce distributed computing framework, memory computing system, stream computing system, etc [4]. The technical support architecture for the operation of the intelligent medical and health care combined elderly service supply platform is data collection layer, data storage layer, data processing layer, and data access layer, in that order. The operation process of the intelligent medical and nursing care service supply platform is to collect the basic health data of the elderly through intelligent terminal devices, forming the data collection layer. HDFS technology and Hbase technology are important components of big data storage technology. HBase is a highly reliable, high performance, column oriented, scalable distributed storage system database is more adaptable to massive data business scenarios compared to traditional relational databases be-

cause of its easy scalability, high reliability, and massive data storage [5]. After the data is stored, it enters the data processing layer. The data processing layer mainly includes offline processing module and real-time processing module. The offline processing module of big data includes MapReduce distributed computing framework, Hive, Spark, Yarn. real-time processing module includes Storm, Flink, Kafka technology. The above technologies can process the huge amount of data from the supply platform of intelligent medical and health care services for the elderly and analyze the real demand of medical and health care integration for the elderly.

4.2 Internet of Things Technologies

Another key technology of the intelligent medical and nursing care service supply platform is the Internet of Things (IoT) technology. Using the comprehensive sensing function of IoT technology, the basic health data of the elderly is monitored by wearable devices, smart mattresses and other devices, including blood pressure, heart rate, blood sugar, daily movement track and movement time, sleep quality and other basic daily health data. The intelligent wearable devices upload the basic data to the intelligent medical and nursing care service supply platform, so as to monitor, evaluate and warn the physical condition of the elderly.

5. Conclusion

With the arrival of the era of big data, the emergence of new technologies such as big data and cloud computing provides the possibility of intelligent combined medical and nursing care service model. China must take the initiative to adapt to the requirements of the big data era and develop intelligent medical and nursing care combined with elderly care services. First, to ensure the security of database information. For the supply side of combined medical and nursing care services need to strengthen the firewall construction; for the platform to carry out user authorization management, login management, access management; smart combined medical and nursing care services model supply platform to implement data security and privacy protection to all levels of the platform operation, so as to protect the privacy of the elderly. Secondly, it ensures that the medical and nursing care service supply platform is highly age-appropriate. The platform needs to do the design and application of client APP and intelligent wearable and other high-tech products need to be age-appropriate transformation, and more pictures and videos should be used to explain. Fourth, the training of medical and health care combination supply side talent training and utilization. So that the medical and health care combination supply side can provide more professional elderly services and better meet the needs of the elderly.

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