Smart Medical and Nursing Platform Based on 5G Technology

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Abstract. In order to solve the problem of aging population and to relieve the massive impact on the pension service system, a design scheme of smart medical and nursing platform based on 5G technology is proposed. The model of participants and services related to the medical and nursing systems are established. Based on the information flow in the process of service, the intelligent vital signs monitoring system, pension service management system and decision-making system are introduced into the design of the smart medical and nursing platform. Specially, by utilizing 5G technology, the health information of the elderly, disease early warning and implementation of pension scheme are guaranteed by the perception layer, network layer and application layer, respectively. The proposed scheme can benefit the elderly health records, personalized pension plan, telemedicine diagnosis, etc.

Keywords: 5G technology · Smart building · Smart medicine · Aging issue

1 Introduction

Family planning policy has effectively controlled the growth rate of China's population, but it has also brought the problem of population aging. China has entered an aging society in 2000 and it is estimated that the elderly over 60 will be more than 25% of the total population by 2030. This proportion will increase with the time, which means that the aging problem will be more serious in the future [1]. At present, home-based care is still the main mode of care for the aged in China, and with the increase of the elderly population, "421" type of "inverted pyramid" pension model is more common, which undoubtedly increases the burden of young people [2].

With the development of society and the improvement of medical technology, people's average life expectancy continues to extend, and with the increase of age, the probability of the elderly is also increasing, so the conventional home-based care has disadvantages, and now the increasing work pressure of young people makes them have less time to take care of the elderly, which makes it difficult to find accidents in time, resulting in unexpected consequences [3]. At the same time, the service level of the current social pension institutions is uneven, and the fees of the better pension institutions are mostly higher, while the facilities of the institutions with lower prices are not complete, and the service level is low [4]. So most of the elderly are not willing to spend their old age in the pension center. In order to provide a better pension

W. Xiang et al. (Eds.): BROADNETS 2021, LNICST 413, pp. 285–295, 2022.
https://doi.org/10.1007/978-3-030-93479-8_20

environment for the elderly, the Ministry of industry and information technology, the Ministry of civil affairs and other departments have put forward the action plan for the development of smart and healthy pension industry, which uses the existing Internet technology to build a pension community with the functions of nursing home and hospital for the elderly, and realizes the pension mode of combining medical care with pension [5]. At the same time, it can provide better care and service for the elderly through the internet platform health management and spiritual care [6].

The application and promotion of internet in medical and nursing services partly depends on the transmission rate and reliability. With the appearance of 5G network, tele-medicine becomes possible. Compared with 4G, 5G takes full account of the connection requirements between people and things, things and things, and pays more attention to performance indicators such as speed, delay, connection density, etc. [7]. The transmission rate is increased by 10–100 times, and the transmission delay is greatly reduced. Conventional equipment has only 1 ms delay time [8]. The application of 5G high-speed rate and low delay in elderly care can greatly reduce the waste of medical resources, and provide 24-h comprehensive medical care, medical diagnosis and remote control for the elderly [9–11].

Based on 5G network technology, this paper proposes a pension mode of regional sharing medical and nursing combination. Starting from the needs of the elderly, we build a pension model that is in line with the combination of medical care and pension. And then, according to the information flow of the service mode, the implementation process is analyzed, and a reasonable and new service architecture is designed. Finally, 5G technology is used to build the medical care management platform, and the construction scheme of each layer network is given to realize the functions of intelligent nursing, medical diagnosis and service platform management.

2 Design of Old-Age Service Mode Combining Medical Care and Nursing

At present, China's pension service resources are relatively lacking and the distribution of resources is unbalanced, and the service level of pension institutions is uneven, there is no better charging standard, resulting in the majority of the elderly are still home-based care. In order to solve this problem, the new mode of medical and pension service is shown in Fig. 1. Through the construction of a reasonable service supervision platform, we can not only standardize the pension industry, but also optimize the allocation of pension resources, and provide high-quality services for the elderly with limited pension resources [12, 13].

Differing from the traditional medical and pension service institutions, this paper advocates the elderly service market as the leading, through the current existing market demand, integration of pension resources, improve the medical and pension service industry, so as to make it competitive and dynamic. According to the pattern analysis, can be combined by building the medical raise pension service platform, the elderly can choose or pension institution endowment in the home, the elderly and their families,

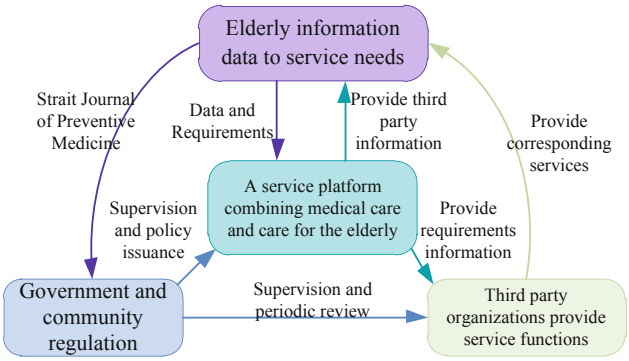

Fig. 1. A service platform combining medical care and nursing care

management and service providers to participate, to ensure effective communication between, ensure quality of pension services, and effective supervision of the implementation services market [14].

Through this platform, children and the elderly can check the health status of their parents through APP, telephone consultation and other ways, and can choose effective medical care or medical diagnosis for the elderly according to relevant data. It should be noted that in order to protect the personal information of the elderly from disclosure, the health data platform for the elderly has no right to view and call. At the same time, children can also choose housekeeping services, care services, nutrition catering and other services for their elders through the platform, which can greatly reduce the burden of children and maintain social stability. Third-party institutions, after passing the review of the platform, can log into the platform in the form of a unit and provide relevant old-age care services, such as housekeeping services and medical services. However, government departments can supervise third-party institutions through the information already available in the database, and implement a points-based system [15]. Institutions that have received more complaints are not allowed to log on to the platform. At the same time, the annual general examination system is adopted, so that institutions with substandard service level and institutions with safety risks can withdraw from the platform, so as to realize effective supervision of service and protect the vital interests of the elderly. If the elderly have an accident, the medical equipment carried by the elderly can immediately alarm the platform, urgently call the nearby medical resources, provide medical assistance to the elderly according to the registration information, and at the same time, the platform will notify the children through the APP in an emergency. The business operation mode of the platform is shown in Fig. 2.

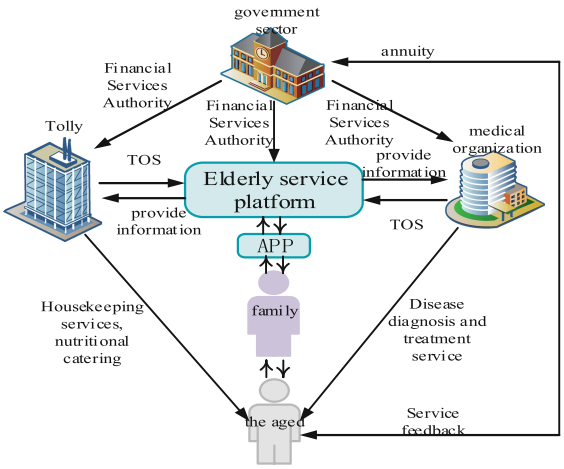

Fig. 2. The way of operating

3 Medical Care Model Framework Design

3.1 Flow of Service Information

In order to realize the model of intelligent medical care for the aged, it is necessary to acquire, process and analyze data quickly and accurately, and ensure that the information collection, processing and feedback are correct and effective. With the rapid development of the Internet, cloud computing, intelligent information acquisition platform, 5G communication and other technologies, the intelligent medical and nursing mode has the foundation to realize the combination of medical and nursing mode from small families and apartments to large communities and nursing homes.

In order to make the elderly service platform run efficiently, it is necessary to determine the specific flow process of service information, so as to collect, process and analyze service information reasonably. First is information collection, because the old man belongs to individual privacy information, so information collection should be led by the government departments, multi-sectoral cooperation, using the Internet, 5G technology integration in a safe environment health and pension service resources, gathering the elderly health information related to the pension service and the information of all participants. Then the collected data of the elderly are analyzed and compared with the data in the database to generate a health log. Finally, according to the analysis results, appropriate quality services are formulated for the elderly to make them satisfied, so as to improve the elderly's nursing experience, let their children rest assured, and reduce their burden.

In the established database, the information of all participants in the service mode is stored in the cloud server in the form of registration by government departments, collection by medical institutions, Internet of Things device records and electronic health records. At the same time, multiple service sub-platforms such as housekeeping service, medical and health service and catering service are supported. According to the

elderly's personal needs, living habits, health status, past medical history, diagnosis and treatment, family medical history, present medical history, physical examination results and the occurrence, development, treatment and prognosis of the disease, the system management personnel will feed back the processed information to each sub-platform. Based on their own advantages, each sub-platform develops satisfactory services for the elderly according to their needs, and finally sends the service information to the service provider (personnel and institutions), the elderly and their relatives respectively through mobile APP, official website and wearable devices. Furthermore, the elderly can enjoy daily services such as caring care, housekeeping cleaning, health lectures, disease prevention, disease diagnosis and treatment, regular physical examination, nutrition and catering, rescue for serious diseases, psychological counseling and index monitoring. Figure 3 shows the transmission direction and data processing mode of the service information of the intelligent medical and nursing platform, so as to ensure the efficient collection and processing of information and provide high-quality services for the elderly.

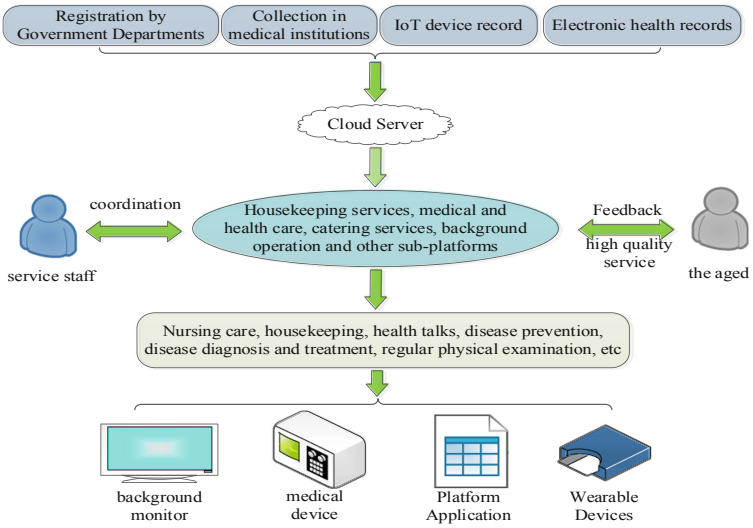

Fig. 3. Information flow diagram

3.2 Logic Design of Medical and Nursing Service Platform

As a result of current endowment resources is still very limited, so you need to maximum efficiency to use the existing service resources, so need to integrate reasonably the resources platform, the platform inside the service personnel in accordance with the professional and technical group, coordination and cooperation to improve the pension service, design service logic, pension service process was optimized by using advanced optimization, rational utilization of resources endowment. According to the characteristics of information flow, the service platform is divided into health consultation sub-platform, medical diagnosis and treatment service sub-platform, user

nursing sub-platform, housekeeping and nursing sub-platform, background management and coordination service sub-platform and elderly meal matching service sub-platform, so that the elderly can choose relevant services according to their actual needs.

The platform takes the needs of the elderly as the service direction and provides corresponding services by using the divided sub-platforms. Through health consulting platform provide consultation service for health, when health problems may come up, can further complete medical diagnosis and treatment by a medical treatment service platform service function, through the two platforms, can satisfy the elderly body care, mental health counseling and medical consultation and so on demand, for the elderly to provide more convenient, more comprehensive medical services; Through the elderly meal matching service sub-platform, the daily healthy diet needs of the elderly can be realized. At the same time, all information and service contents can be sorted out through the backstage management and coordination service sub-platform, so as to realize disease prevention, customize more reasonable services for the elderly, and supervise the services of other sub-platforms. The service logic of the intelligent medical and nursing service platform is shown in Fig. 4.

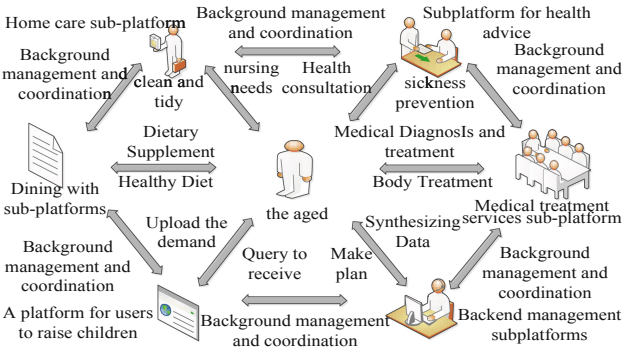

Fig. 4. Service logic

4 Application of 5G Technology in Smart Medical Treatment

The old-age service platform combining medical care cannot be separated from the support of medical institutions, and the old-age service is mainly limited by the shortage of medical resources. In order to solve the impact of medical resources on elderly care services, 5G technology has advantages such as high rate, low delay and large capacity, which can realize the Internet of Things of medical devices, provide technical and infrastructure support for tele-medicine, and alleviate the imbalance of medical resources.

5G is the fifth generation of mobile phone mobile communication standard, also known as the fifth generation of mobile communication technology. Compared with the previous generation of mobile communication technology, 5G has the characteristics of fast transmission rate, low delay and high connection density. Its enhanced mobile

bandwidth has an experience rate of 100M bit/s, and the peak rate is more than 1G bit/s. It is suitable for high-definition video business, 2K/4K video, VR/AR and other aspects, which lays a foundation for the realization of telemedicine medical detection and care, medical diagnosis and guidance, remote control and other functions, and provides the possibility for the intelligent development of the medical industry. With the help of the ubiquitous 5G high-speed Internet, vigorously developing smart mobile medical services will be an effective way to solve the pain points of the current medical industry [5]. Based on 5G wireless network, smart mobile medical services can connect patients and doctors in different Spaces closely, so as to ease the problem of seeing a doctor and improve people's health.

The use of 5G can improve the scope of high-precision medical equipment detection, disease data analysis, remote clinical diagnosis and other services. In the field of medical testing and nursing service, data of medical monitoring and nursing equipment need to be collected. 5G technology can monitor these devices constantly for a long time, making the obtained data timely and accurate. In order to facilitate the monitoring of various indicators of patients, patients are usually equipped with portable monitoring devices and mobile terminals, etc., and the patient's health status, physical condition and location information is transmitted, processed and alerted by 5G technology. These can monitoring services for the elderly, seriously ill patients, the newborn, patients with chronic diseases, such as the provision of real-time, remote monitoring, health not remind, disease prevention, such as service, gathering data related to the patients, the disease killed in the initial stage, have the effect of prevention and treatment, safeguarding the health of patients, improve the level of medical treatment, as shown in Fig. 5.

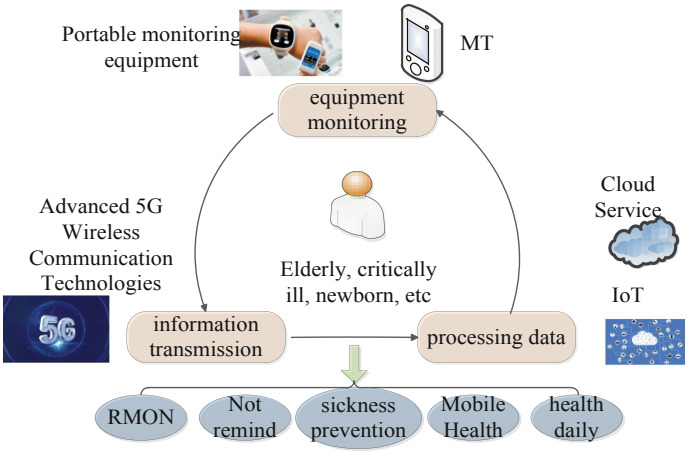

Fig. 5. Medical monitoring and nursing application architecture diagram

During the construction of smart hospital, it need to integrate a large number of medical resources, make use of the characteristics of 5G large capacity, realize the interconnection of hospital equipment as far as possible and build local network in the

hospital, so that the hospital is no longer an independent low efficiency mode of resource sharing, but an efficient mode of linkage and medical information sharing, and reduce unnecessary waste of time. Besides from providing convenience for patients and doctors, it is conducive to the harmonious development of doctor-patient relationship, and to realize the real-time monitoring of patients' disease indicators, efficient management of medical staff, hospital asset management and equipment maintenance, medical resource scheduling, real-time navigation and security services.

However, 5G technology is still in development and its combination with medical treatment is full of many possibilities, which is worth exploring. At present, the intelligent construction of the medical industry has a long way to go. Mobile medical services, tele-medicine, precision equipment medical, big data comparison and other services have not yet been popularized, and the society needs a process of transition and adaptation to accept the changes brought by smart medicine gradually. At the same time, the promotion of smart medicine will inevitably lead to a series of new problems, and the implementation of specific policies is also related to the local actual situation. Smart medicine is not outside the law, and the relevant departments of smart medicine should improve the corresponding laws and regulations. When the early technology is not mature, we should adopt strict qualification approval mechanism for institutions with intelligent medical services, standardize medical diagnosis and treatment behavior, establish and properly keep patients' medical records, and reasonably solve doctor-patient disputes. At the same time, in order to ensure that patients' personal information and medical technology are not leaked, relevant departments need to supervise and provide security.

If intelligent medical care is popularized, the medical care service platform will be easier to realize. Through the sharing of information resources of various platforms, the elderly can get better mobile medical services, making it no longer difficult to see a doctor, and provide health protection for them.

5 Construction and Application of Medical and Nursing Platform

The intelligent medical and nursing platform based on 5G technology provides a new model for elderly care services. Differing from the previous pension model, the intelligent pension platform provides personalized services for the elderly pays more attention to the analysis of the needs of the elderly and it relies on the computing power of the big data platform, refines the needs of the elderly, and serves a variety of pension needs. The platform can also provide a variety of choices for the elderly, whether it is home-based care, community care, institutional care, the platform can monitor the indicators of the elderly, and through the 5G network real-time transmission of information and data, platform analysis data timely protection of the elderly. Intelligent platform enables the elderly to enjoy the maximum pension resources, secure pension services, optimize the allocation of social resources, and promote the development of pension service related industries. Therefore, it is particularly important to build an intelligent, digital, diversified, networked and information-based medical and pension platform.

The core of the intelligent medical and nursing platform is to serve the elderly. The most basic thing is to provide the elderly with nursing homes, so that the elderly can live comfortably. Combined with the situation of the residence, the intelligent medical and nursing service can be accessed. The second is to provide supporting service-oriented equipment for the elderly and optimize the control process to provide convenience for the elderly life. Finally, the combination of 5G, cloud platform and other technologies will organically integrate all kinds of resources through continuous collection, analysis, processing, and improvement of data in the database. The application of intelligent pension system is shown in Fig. 6.

The intelligent medical and nursing platform based on 5G technology is built from three levels, the perception layer, the network layer and the application layer. In the sensing layer, wearable devices and monitoring devices are used to collect the information of the elderly, as well as the information of all participants, forming a sound health monitoring, disease early warning and elderly care service system. 5G technology ensures the timeliness of uploaded data, with little interference from the outside world, and stable synchronization of data on the transmission belt. The network layer uses 5G, Internet of Things and cloud platform to realize the analysis, sorting and optimization of the collected data and to build the elderly service database, accurately call the elderly care resources, and transfer the service information to the terminal device to promote the development of the elderly health records, personalized pension plan, tele-medicine diagnosis, etc. The application layer is responsible for the specific implementation of the pension plan formulated by the smart pension platform. 5G transmits data without delay, provides real-time feedback on users' needs and service feelings, and provides services such as health consultation, disease diagnosis and treatment, housework arrangement, meal matching and so on for the elderly. The framework of the system is shown in Fig. 7.

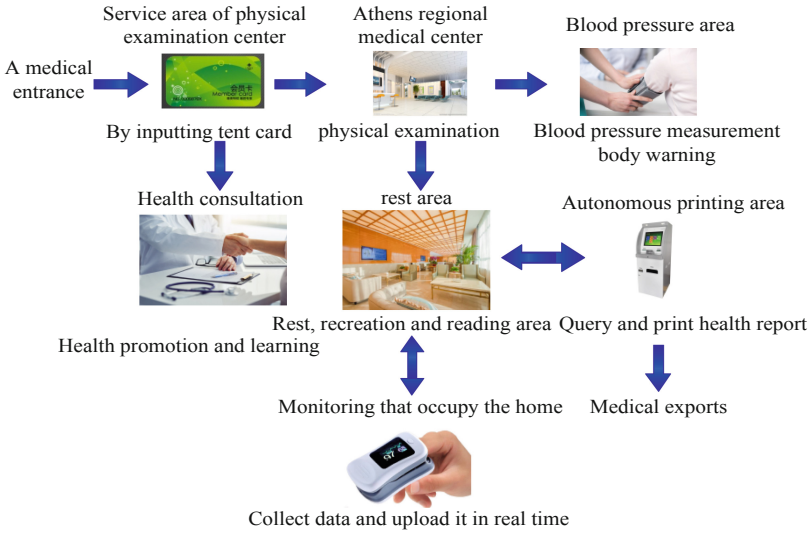

Fig. 6. Intelligent pension system application

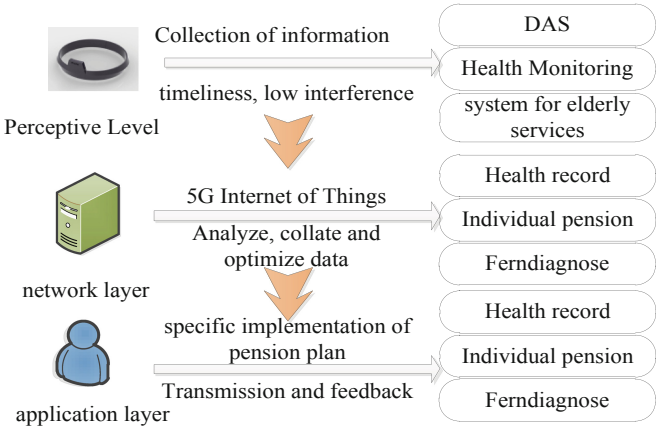

Fig. 7. The framework of smart pension system

(1) Perception layer is the basic structure of intelligent medical and nursing system. Its main function is to collect and transmit data, so as to realize the real-time monitoring and automatic management of data for the elderly. In the smart pension system, the needs of the elderly should be fully considered, and the health records of the elderly should be improved through the collected data.
(2) The network layer is the transition layer of the intelligent medical and nursing system. It analyzes, sorts and filters the data collected by various devices and uploaded by service institutions. It can transmit and feed back data through wireless network, Bluetooth, 5G and other technologies. It can process and analyze data by 5G, Internet of things, cloud platform and manage and supervise the platform.
(3) The application layer is the specific implementation layer of intelligent medical care. The network layer sends the processed data to the application layer. The application layer formulates elderly care services for the elderly according to the internal situation of the building and the needs of the elderly, realizes the reasonable allocation of medical resources and elderly care resources, provides an efficient and comfortable living environment for the elderly, and provides health consultation, disease diagnosis and treatment, household chores and other services Dining collocation, safety inspection and other services really provide the elderly with a living and security building environment.

6 Conclusion

In order to alleviate the problem of the lack of medical and pension resources, this paper designs a pension model system based on 5G network technology. Based on the analysis of the flow of service information and the needs of the elderly population, the platform architecture and service logic analysis are realized. The medical and nursing service platform is designed, and the service sub platforms are reasonably divided to improve the operation efficiency. With the advantages of 5G technology, the

combination of medical and nursing and the allocation of pension resources can be optimized. Finally, the construction scheme of each layer network is given to realize the functions of intelligent nursing, medical diagnosis and service platform management. Through the medical care service platform, we can provide high-quality services for the elderly at home with limited pension resources, so that the elderly can enjoy their old age and reduce the burden of their children.

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