# Research on Smart Medical Cloud Application Service System Against the Backdrop of Smart City

Jun Tan

Zhuhai College of Jilin University

Zhuhai, Guangdong, China

*Abstract*—**In order to better implement the relevant national policies, we will provide medical reform to guarantee and improve people's livelihood and benefit the health of residents. This paper proposes to make full use of cloud computing, big data, Internet and other information technologies to build a smart medical platform to benefit for people, medical treatment, and policies on the basis of conforming to unified standards; and utilize all kinds of medical and health information systems in the region of China Unicom to achieve intra-domain centralized management and resource sharing of health information, finally achieving close collaboration and business linkage between medical institutions, promoting the rational distribution of quality medical resources, improving the quality of medical services, promoting the construction of healthy Guigang and to improving the health of the city.**

*Keywords—Smart city; Smart healthcare; Information technology; Internet of things*

## I. INTRODUCTION

In recent years, with the continuous development of the Internet, people are increasingly dependent on the Internet. The development of the medical field has been closely related to the intervention of the Internet in recent years. On July 6, 2015, the State Council issued the "Guiding Opinions of the State Council on Actively Promoting the "Internet +" Action", which officially linked the "Internet +" concept to medical care [1-3]. 2016 is the first year of development of the 13th Five-Year Plan. In the "Proposal of the Central Committee of the Communist Party of China on Formulating the Thirteenth Five-Year Plan for National Economic and Social Development," it is mentioned in promoting the construction of a healthy China, deepening the reform of the medical and health system, and implementing medical care, medical insurance, medical linkage, promoting the separation of medicines, implementing graded diagnosis and treatment, establishing a basic medical and health system covering urban and rural areas and a modern hospital management system. In the same year, the "Guiding Opinions on Promoting and Regulating the Development of Big Data Applications for Health Care", "Health China 2030 Plan", and "13th Five-Year Plan for Hygiene and Health" clearly proposed to increase Internet applications to promote healthy population exchange sharing, full population information, electronic health records and electronic medical records are the same data fusion, exchange and sharing.

## II. STATUS ANALYSIS

### A. Smart health service/great health industry system, great health and people's sense of gain

While the country vigorously promotes the implementation of healthy China, Internet+ and other policies, the construction of smart service cities and the construction of medical service systems have become the key areas for local government construction at all levels. On the basis of medical and health information, we will vigorously advocate the promotion of people in medical services and build urban or regional medical service platforms.

The Smart City Smart Medical Platform can build a city-based Internet service system with a big data platform (or regional health information platform) as the core for hospitals, public health, government and people, so that big data can benefit medical services, public health care, government administration, and residents. At the same time, we focus on population health, promote resource integration and collaboration among industry sectors in the region, and provide health big data support services to industries other than medical care (such as education, insurance, transportation, etc.).

### B. Verification of regional health informationization results and values

The regional information platform has precipitated and accumulated a large amount of data. In the use of data, in addition to trying to explore scientific research projects such as data mining, it can also open up and support the service applications of residents, doctors, institutions and government and industry, in order to reflect the true value of the platform. Only mobile and applied data can effectively solve data quality problems and generate more valuable data [4]. Therefore, the construction of an urbanized medical service system can increase the sense of access to the platform construction benefits of data producers such as the public, doctors, and medical institutions, and thus more actively produce more valuable data.

### C. Internet extension requirements for medical practitioners' offices

For the current medical service application system, the information system that satisfies the business management of medical institutions and administrative organizations is very mature, and provides a large amount of valuable data for the big data platform. However, these system platforms are mostly based on pc terminals, so that users can never leave the desk and cannot meet the requirements of mobile services and mobile management. Therefore, in terms of Internet-based services [5], a large number of extended service systems need to be built. Internet service platforms need to be built to meet government, hospitals, public health services, doctors and residents, so that management and services can break through time and space limit.

Therefore, in the hospital's Internet service, public health Internet service, there are corresponding application products to match, and through the Internet technology, the services in these areas can be integrated and combed, and then manufacture more efficient platform for collaboration and service.

## III. PROBLEMS

### A. Platform technology upgrade is difficult

Most of the regional medical information platforms have been built for many years, and the amount of data storage has increased. With the development of industry technology in recent years, most of these regional platforms have difficulties in upgrading technology and are difficult to solve performance bottlenecks. Under the guidance of the relevant national big data industry strategy, local regional platforms need to transform or expand big data and cloud service.

For many years, many vendors' softwares have been named after the concept of "cloud" or "big data", but most of them are implemented by traditional technologies. They have not truly realized cloud computing technology and big data technology, and have not realized real big data governance and a massive system supported by computing technology. Therefore, under the joint promotion of the big data industry, cloud computing, and Internet + three new concepts, many regional-level platforms have reached a need for technical upgrades to achieve a platform that is supported by true cloud-level and big data technologies to cope with the future society demand.

### B. Data structuring and standardization are difficult

Too much standardized data collection and processing requirements, using traditional data processing and recognition techniques are subject to technical bottlenecks and data validity constraints, making a large number of unstructured data (such as electronic medical records) far from improving the value of use.

### C. Data quality supervision is difficult

In the absence of effective data application, the large amount of information data gathered by the regional medical information platform cannot pass the validity test of the end user. Therefore, without the data that is effectively operated by the application, the quality problem will not be discovered in time, and the dangers will be hidden for the data in the future due to the inability of the quality.

### D. Platform elastic expansion is difficult

The early regional platforms were affected by technical constraints, and the expansion of SAAS virtualization was insufficient, which could not satisfy the extended subordinate management organizations to manage their respective jurisdictions and other more refined and job-oriented management needs.

### E. Lack of internal coordination mechanism, low platform effectiveness

The current multi-level medical platform construction, their own governance, lack of unified construction standards, weak synergy, resulting in low-level platform quality "kidnapping" high-level platform construction.

## IV. SMART MEDICAL CLOUD PLATFORM SERVICE SYSTEM

The cloud platform information resource system is based on the Hadoop technology ecology, and builds an ecological platform for medical and health information resources including population information, medical resources, electronic health records, and electronic medical records. It is connected to the health care related fields and establishes corresponding information storage, standard system of exchange and sharing. A standardized medical information resource platform centered around patients.

### A. Unified Health Service Portal

Establish a unified health service portal for smart medical platforms, provide a unified service portal for residents, doctors, administrators and other service objects, open up various service platform account systems, and support each service platform to be divided into roles (doctors, residents, administrators),implement single sign-on and unified authentication for users. The Unified Health Service Portal can be customized to display application services distributed on different service platforms based on different user roles. It is used to meet the display needs of the unified health service portal when it is open to different role users, and to build an unified, convenient and simple Internet service platform for residents, doctors and administrators to use.

The platform integrates existing medical resources, through pre-diagnosis (smart triage, disease screening, appointment registration, family doctor signing, etc.), consultation (network consultation, online diagnosis advice, etc.), post-diagnosis (follow-up intervention, health management, health education, intelligent equipment access, etc.) Full-process services, to achieve online medical treatment and collaboration between hospital experts/specialists, family

doctors, and patients, to improve the quality and accessibility of regional medical services.

### B. Government Integrated Service Platform

Information management of medical institutions, medical personnel, medical equipment and other medical services resources in their respective jurisdictions. The platform implements the whole process supervision of the process of medical services at all levels of medical institutions in the region, and supports the medical and health management institutions to achieve a large number of data aggregation, statistical analysis, and comprehensive display of business information platform. Realize the interactive sharing and full utilization of information, reduce the workload of data collection, improve data quality, and promote standard management. Mainly realize human resource analysis, material resource analysis, health institution analysis, health fund analysis, hospital service analysis, health file analysis, drug cost analysis, satisfaction survey analysis, disease prevention and control, medical cost monitoring, grading diagnosis and treatment monitoring, primary medical monitoring and other service features.

### C. City Internet + Medical Health Management Service Platform

The City Internet + Medical Health Management Service Platform deeply connects and integrates service resources in the fields of grassroots public health, hospitals and health care, and builds a large database of medical service resources and an Internet medical service ecosystem that are truly "people".

Through the creation of an integrated family doctor service ecosystem, the goal of "primary diagnosis, two-way referral, rapid division and treatment, and linkage" is achieved. The platform uses the "Internet +" model to enable family doctors to sign services in a more humane way, so that can build a new service platform with interaction as the core.

The platform enhances the service level of family doctors by co-management mode, provides daily health care services for residents, and can connect to more professional medical service resources through platform resources.

Provide residents with online family doctors to sign up applications, and through a variety of signing methods to meet the needs of different groups of people, different application scenarios, enrich the user signing experience, and improve the signing rate. The main signing methods include doctor's business card scanning, doctor invitation, agent signing, and WeChat sharing.

### D. Resident health management system

Daily management of residents' health, including residents' health records, health label management, early warning analysis of remote IoT equipment collection information, health guidance, assessment and early warning, follow-up, health education, appointments and other services.

Provide social online doctor-patient interaction, patient question and answer function, divided into family doctor consultation, famous doctor consultation, public consultation (patient circle).Through a variety of consultation channels, consultation objects to facilitate user questions, increase the scope of consultation, improve the quality of consulting services and answer authority and convenience.

Provide a customized, long-term, temporary follow-up plan, and follow-up plan reminder for the family doctor, and obtain a resident health record through the docking follow-up package.

Health Archives Management is an online health record management for residents, which enables long-term and comprehensive health tracking of residents, records all health records, medical records and disease records of residents, including online documentation, medical record review, prescription management, check the inspection report query and other functions.

The docking area reservation platform provides an appointment service for registration of hospitals at all levels within the domain. Residents can make appointments through the appointment of the platform or the appointment of the family doctor on behalf of the appointment, avoiding the situation of going to the big hospital to queue up and the number is hard to get.

### E. Family health management system

By managing family members, children can receive and manage parent and child health information as family representatives, and interact with family doctors to manage family health. At the same time, the family representative can also achieve the problem of family member signing and long-term prescription renewal by binding family members, and solving the problem that some family members such as the elderly or children will not use WeChat signing and long-term prescription service.

The collection and entry of health signs through wearable devices are transmitted to the platform in real time, which is convenient for patients and doctors to view health indicators. The doctor pre-sets the normal physical threshold to monitor the warning, reminding the doctor and the patient to pay attention to the abnormal signs, and then follow-up adjustment.

In order to improve the service level of family doctors by means of team co-management, and to provide daily health care services for residents, it is also possible to connect more in-depth professional medical service resources through the resources of the platform. Team members can have a single chat or group chat through an instant messaging system, and the team leader can assign or transfer residents to the general practitioner and health manager for management. The system automatically generates a team work report.

### F. Basic information management system

Work management: Provide managers with daily work arrangements, including famous doctor management, performance management, organization management, doctor management, patient management, contract management and other background management functions.

Basic information management: Provide organization information, user information, family doctor team, authority information management and maintenance, and assign corresponding management rights to each user.

Provide managers with analysis and display of business development of various Internet services, including: contract analysis, analysis of family doctor services, analysis of return and change, and resident analysis.

### G. Service pack management

In order to better serve contracted residents, realize classified contracting, differentiated services, and provide medical service package management functions, the family doctors can sign the service package according to "the Content Options and Charging Standards for Family Doctors in Guangxi Zhuang Autonomous Region". Service packs can be published online for sale, and residents can view various medical service package details on the mobile phone side and make online purchase payments.

The system supports family doctors to view the service packages that they can carry out, as well as service instruction manuals to assist doctors in managing service packages. The system can automatically calculate the number of remaining services in the service pack. At the same time, it need to support the doctor to query the added service records at any time.

### H. Hospital (medical union) internet service platform

The platform aims at grading diagnosis and treatment strategies, integrates and optimizes medical resources, and provides online and offline medical services to provide "pre-hospital, in-hospital, and post-hospital" integrated services:

Integrate and optimize regional medical service resources, build a regional and unified hospital Internet service platform, form a standardized hospital network service model, provide internal services, and provide external support to help shape the brand of urban medical service.

Before, during and after the construction of the hospital, the online and offline collaborative three-dimensional service model provides patients with full-process services before, during, and after diagnosis.

Prescription online trials and circulation, pharmacies/hospitals can provide distribution channels.

An appointment service between clinics, hospitalizations, and health checkups is realized.

A full-process informatization guidance service for online and offline treatment.

Integrate medical insurance, commercial insurance, and bank-to-party construction to improve online service capabilities and medical experience in payment and settlement.

The platform mainly implements intelligent consultation, appointment management, network consultation, triage center, post-diagnosis service, health management, pharmacy management, prescription management, drug delivery and other service functions. The platform can make

complementary advantages in resources of the Public Health Service Platform (City i Health) and provide specialist service support.

## V. CONCLUSION

Establish the Internet platform of the smart medical cloud application service system, provide a unified service portal for residents, doctors, administrators and other service objects, integrate existing medical resources, and provide full-process services before, during, and after diagnosis to achieve online medical treatment and collaboration between hospital experts/specialists, family doctors, and patients, to improve the quality and accessibility of regional medical services.

### REFERENCES

[1] Guo Yuansheng, Zhang Jianguo, Lu Jing. Modular architecture and core technology of smart cities, National Defense Industry Press, 2015.

[2] Liu Jia. Artificial Intelligence: Inciting Wisdom Medical. China Informatization, 2018, (6): 142-146.

[3] Chen Jiayang, Wang Linlei. Cloud computing and smart medical system construction. Information Systems Engineering, 2018, (2): 38-41.

[4] Zhao Wei, Zhang Wenying, Smart Logistics and Perception Technology, Electronic Industry Press, 2016.

[5] Liu Wei. Design and implementation of community wisdom medical service platform. Medical Informatization. 2016, (12): 12-15.