

Analysis on the Construction and Operation Mode of Internet Hospitals

Lianggang Nie^{1*}, Liangquan He¹, Geng Lan¹, Huimin He²

¹Guangxi University of Finance and Economics, Guangxi, China

²Guangxi Medical University, Guangxi, China

Abstract: Internet + medical health have become a national key strategy, and the industries of medical information have ushered in new development. Internet hospitals have broken through the limitations of diagnosis and treatment. Diagnosis, doctor's education, family doctors, and post-hospital tracking have been introduced to the Internet hospital system, the whole process of medical management service including 'health management, diagnosis, in-hospital, rehabilitation' has been gradually established, and coordinating to the medical resources, family doctors and channels of medicine, to realize the real circulation of medical resources. The authors screened six Internet hospitals and comprehensively analyzed their construction and operation modes, with a view to providing reference for the construction of Internet hospitals.

Keywords: Big Data, Internet, Hospital, Medical treatment, Informatization

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***Corresponding author:** Lianggang Nie, NZQW@163.com

1 Introduction

In March 2018, Premier Li Keqiang asked relevant departments to speed up the construction of "Internet + medical care" when participating in the deliberation of the Ningxia Group report. On April 28th, the General Office of the State Council issued the "Opinions on Promoting the Development of "Internet + Medical Health", allowing medical institutions to use Internet technology to provide safe and appropriate medical services on the basis of physical hospitals. Allow some online common diseases and chronic diseases to be reviewed. After the doctor has mastered the patient's medical record data, it is allowed to prescribe some common diseases and chronic diseases^[1].

The construction of Internet hospitals has begun to flourish. According to the components, construction mode and business model of the Internet hospital, the current operation mode of the Internet hospital can be analyzed, which can provide strong support for the construction of the Internet hospital. Therefore, the author starts from the actual case, and analyzes the business composition and practical experience of Internet hospitals of different starting points in order to help the construction of Internet hospitals.

2 Case analysis

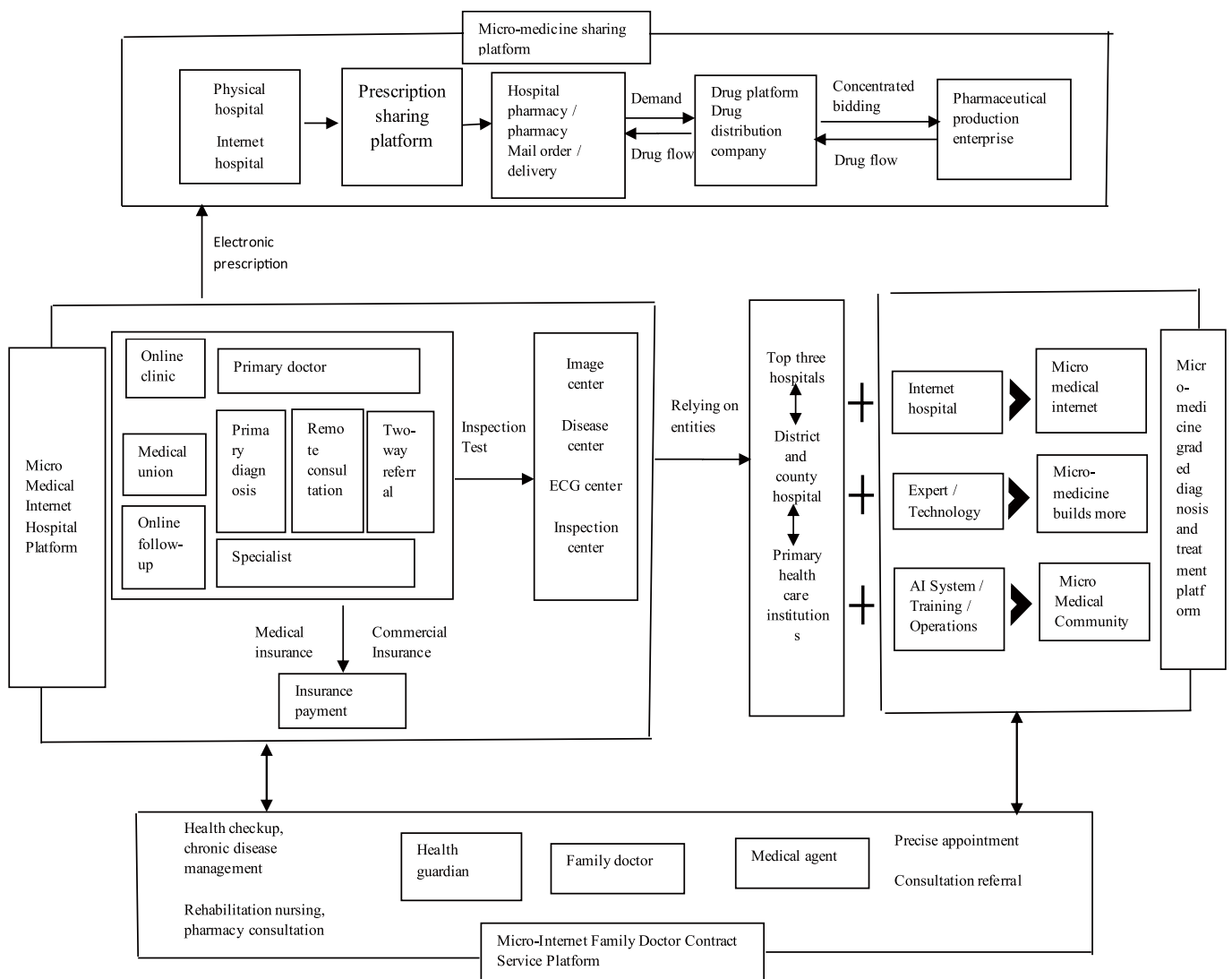


Figure 1. Micro medicine internet hospital operation mode^[2]

2.1 Enterprise-led integrated Internet hospital - Micro-medical Internet Hospital

In December 2015, the Micro-Medicine Internet Hospital was established, and it was the first in the country to open up a new format of “Internet + Medical Health”. It breaks the traditional medical model, connects doctors and patients across the country through the Internet, and explores new models of medical services such as online prescriptions, online referrals, and remote consultations. After three years of development, the Micro-Medicine Internet Hospital

has been established in 19 provinces and cities such as Ningxia, Sichuan and Gansu through its joint construction with the local top three hospitals (Figure 1). Its service scope has covered more than 30 provinces and cities.

The Micro-Medical Internet Hospital has built a multi-platform integrated service model with the micro-medical Internet hospital platform as the core, and the micro-medical graded diagnosis and treatment platform, the Internet family doctor contracting platform, and the micro-medicine prescription sharing platform (Table 1).

Table 1. Micro-medical Internet Hospital Multi-platform Integration Service

Platform name	Features	Content
Micro-Medical Internet Hospital Platform	Online outpatient, remote consultation, two-way referral, medical joint coordination, online follow-up and other service modules; Medical payment, online medical insurance settlement.	Remote consultation, provided by the top three hospital experts and grassroots doctors for disease treatment services; Through the Internet hospital system, patients are provided with imaging, pathology, electrocardiogram and other inspection and testing services.
Internet family doctor contract service platform	With the help of the micro-medical Internet hospital platform, family doctors can conduct health consultation, chronic disease management, and follow-up visits for contracted residents.	Family doctors can monitor the medication status of chronically ill patients in real time through the platform; Provide contracted residents with services such as precise appointments, referrals, and green channels for medical treatment.
Micro-medicine prescription sharing platform	Electronic prescriptions are accepted through the prescription sharing platform and distributed to hospital pharmacies or pharmacies for drug delivery.	Patients can realize convenient services for online medical treatment and receiving medicine at home.
Micro-medical grade diagnosis and treatment platform	Integrate online and offline resources to jointly build a micro-medical Internet medical association, empower grassroots medical institutions, and transfer expert experience and technology to grassroots doctors.	Through telemedicine and other means, patients are willing to stay at the grassroots level to complete the treatment of diseases, and help the country to grade the diagnosis and treatment.

Since the multi-platform of the Micro-Medical Internet Hospital has been put into use, the operational results have been remarkable, as shown in Figure 2.

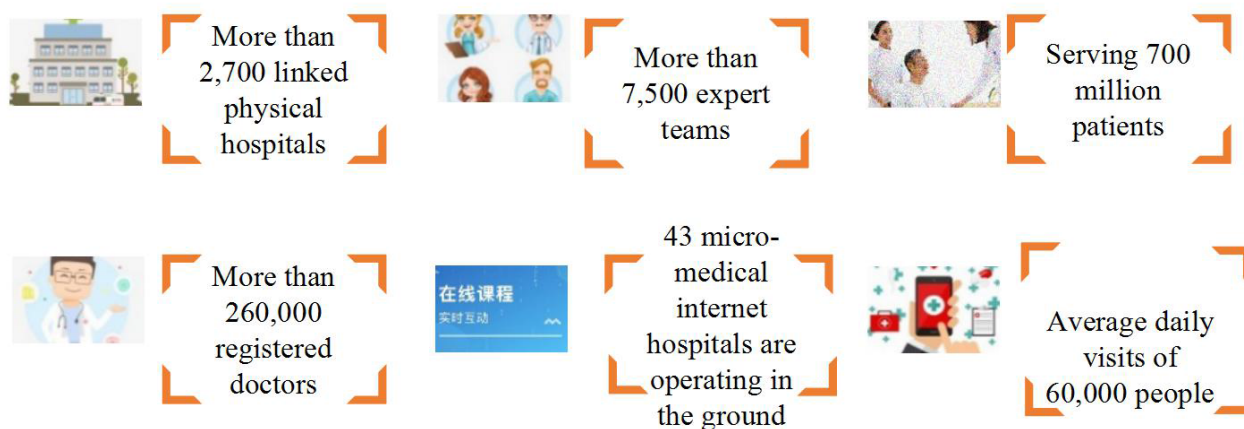


Figure 2. Micro-Medicine Internet Hospital Operational Results

2.2 Public hospital leading integrated Internet hospital - Zhejiang University First Internet Hospital

In February 2016, “Zheyi Internet Hospital” was officially launched and became the first online hospital of the public top three hospitals in China^[3]. Its establishment breaks the space limitation of medical

services, narrows the regional differences in medical service capabilities caused by the uneven distribution of medical resources, and provides Internet medical related services for foreign patients in cities and counties^[4].

The operation mode of Zhejiang University’s First Internet Hospital is mainly supported by four major technology platforms, as shown in Table 2 and Table 3.

Table 2. Four major technology platforms and functions

Platform name	Features
Design and development platform	Provide relevant technical standards and specifications for Internet medical services, including process design and standards, network security and specifications, etc. .
Medical service and management platform	Provide Internet medical related service content range, service qualification and evaluation criteria
Logistics distribution platform	Provide pharmacy related services, including Internet medical drug trial platform construction, drug logistics distribution platform construction, remote pharmacy services and other content.
Legal and public relations platform	Provide guidance on Internet medical regulations and policies, including compliance research and patient safety assurance system construction.

Table 3. Eight service systems and functions

Service business system name	Features
Network clinic	It provides online consultation services covering 15 specialist clinics and hundreds of well-known experts. Patients can consult with experts through video or graphic.
International Pathology Consultation Center	For some patients with severe illness, an international pathology consultation service is provided. The patient submits an application to the Internet Hospital Operation Center. After the staff member passes the examination, the consultation expert and time are arranged.
International Imaging Consultation Center	The application is requested by the patient, and the operation center is responsible for coordinating the coordination of image consultation, and the experts from Zhejiang University and international experts will complete the consultation.
Prescription review and drug treatment management center	Realize regional electronic prescription review and irrational drug use supervision and early warning to ensure the rationality of drug use. To achieve drug evaluation and drug integration and guidance for individual patients, to ensure the safety of medication for individual patients.
Chronic Disease Management Center	Through the chronic disease management center system, the registered chronic disease patients are classified and managed, and medication guidance and rehabilitation status tracking are provided to realize the whole process management of chronic disease follow-up, and the family hospitals are interconnected.
Elderly Health Management Center	The health care group builds a community of sympathetic health sciences for the elderly, and dynamically monitors their health through online communication. At the same time, it provides remote consultation and two-way referral services for the sick elderly.
School of Nursing	By providing specialist training such as pregnant women, wounds, and kidney diseases, nurses' growth education, patient education, and remote technical guidance, we can comprehensively improve nursing skills and protect patients' health throughout the process.
Personal Profile	The personal files include patient personal data, clinics, prescriptions, inspections, hospitalizations, etc., to achieve comprehensive online management of patients.

In the past three years, Zhejiang Yi Internet Hospital has made many achievements in network clinics, international pathology/images, prescription review, and chronic disease management^[3], as shown in Figure 3.



Figure 3. The effectiveness of the operation of Zhejiang Yi Internet Hospital

2.3 Information technology enterprise operation comprehensive internet hospital - 39 Internet Hospital

In June 2016, 39 Internet Hospital officially built a remote consultation platform for difficult and

critically ill patients, which solved the problem that the grassroots personnel traveled to the top three hospitals in large cities for a long time. 39 Internet Hospital became the first Internet hospital to be cut from difficult and intensive consultations. It is the first platform for the “medical consultation” model in China (Figure 4).

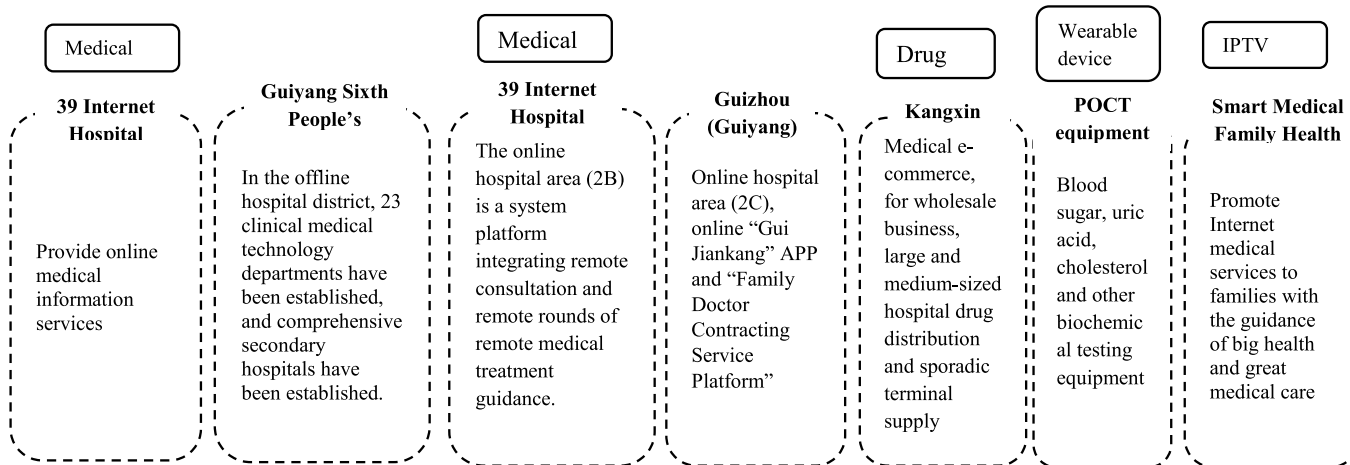


Figure 4. 39 Internet hospital operating model

Focusing on the three elements of “user entry, big data analysis, medical resources”, 39 the layout of Internet hospitals covers the three links of “medical

+ medicine + management”: medical services, pharmaceutical services, and health management, as shown in Table 4.

Table 4. 39 Internet Hospital “Medical + Drug + Tube” Three Links

Link	Content
Medical service	39 Health Network provides quality online medical information services; Build an online and offline hospital service system, provide online medical services such as remote consultation, remote rounds, and telemedicine technology, and provide offline medical services including 23 clinical medical departments.
Drug service	Relying on Kangxin Pharmaceutical to build an e-commerce brand, it has established a long-term cooperative relationship with sporadic terminals and can provide pharmaceutical services for electronic prescriptions.
Health management	The main research and development production POCT biochemical testing equipment, collecting user data; Connect home terminals through IPTV services to disseminate health management information and promote medical services.

At present, 39 Internet Hospital has reached cooperation with nearly 300 medical institutions and signed more than 1,000 expert-level doctors in more than 50 well-known hospitals. The number of registered users has exceeded 1 million, and the number of daily consultations has reached 6,000.

2.4 Doctor community comprehensive internet hospital - Yinchuan Clove Internet Hospital

In March 2017, the first Internet hospital in Liyuan Park settled in Yinchuan, and the Internet Hospital built an online and offline business system (Figure 5), except for early consultations, online consultations,

and other light consultations. In addition to business, the company has increased its remote consultation business by cooperating with the top three hospitals and community hospitals nationwide. The clove garden has established cooperative relationships with a number of chain pharmacies. After completing the doctor’s prescription and pharmacist’s trial online, the chain pharmacies undertake electronic prescriptions and complete the dispensing and drug delivery services. In addition, Internet hospitals actively carry out health management business, providing online science promotion, patient education, and health consultation^[5].

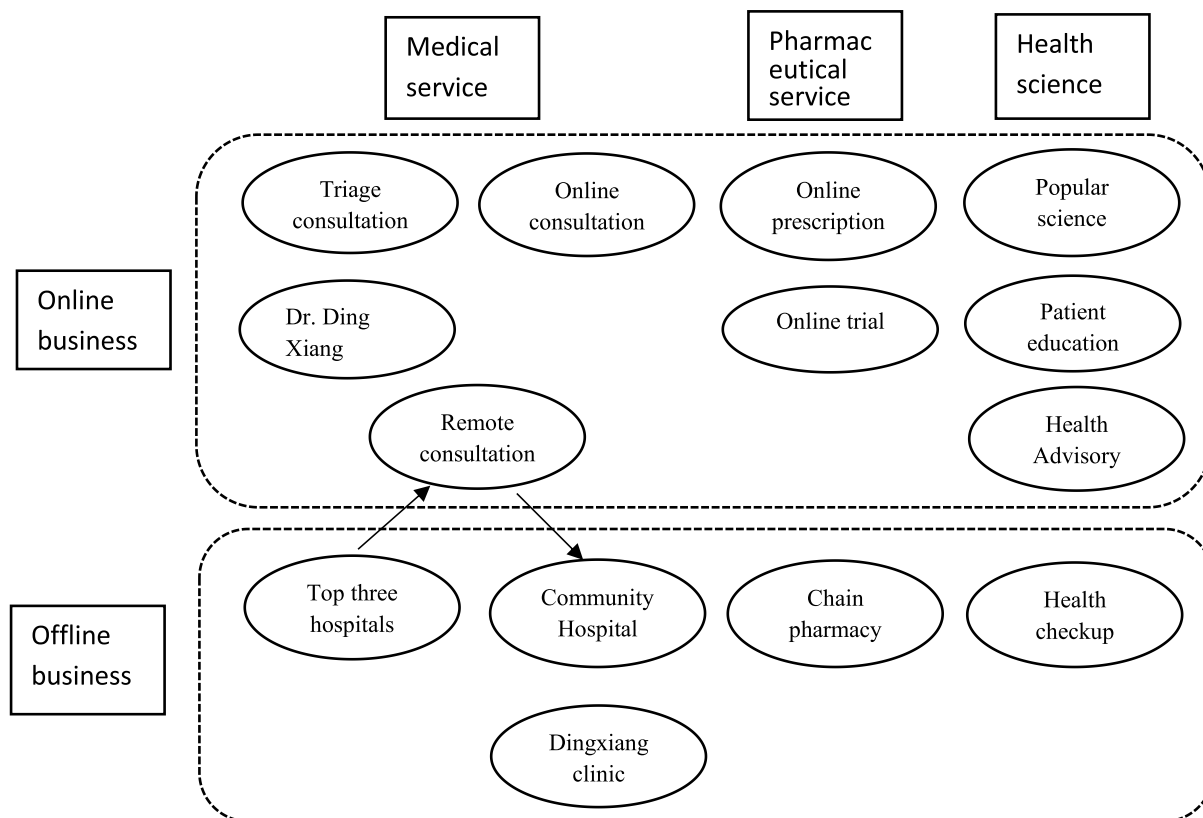


Figure 5. “Online + offline” Internet hospital business system

Table 5. Main features of Yinchuan Clove Internet Hospital

Characteristic	Content
Light interrogation core areas rose to the clinic level	Launch online consultation, remote consultation business, and explore the core value of medical services.
“Online + offline” interoperability of medical care service	Relying on the lilac clinic and community hospital to establish a consultation site to achieve remote consultation; Through chain pharmacies, undertake electronic prescriptions and complete drug distribution.
Health science	Guide patients to health management, and medical services will change from “disease treatment” to “disease prevention”.

At present, the number of registered doctors in the Lilac Garden Internet Hospital has reached 50,000, of which the chief physician accounted for more than 60%. More than 50 million patients have been served, and 7 million patients have been paid for consultation.

2.5 Chronic disease specialist internet hospital - pomegranate cloud doctor

In August 2018, “Pomegranate Cloud Medicine” completed the upgrade and was committed to creating

the only “medical, medicine, disease, inspection, and insurance” closed loop internet medical service platform. The chronic disease management Internet medical platform can strengthen the doctor-patient relationship and form a one-to-one long-term management model. After the initial diagnosis of the chronically ill patients, the follow-up and post-patient management through the platform cannot only timely monitor the patient’s medication, but it can also improve the chronic disease treatment.

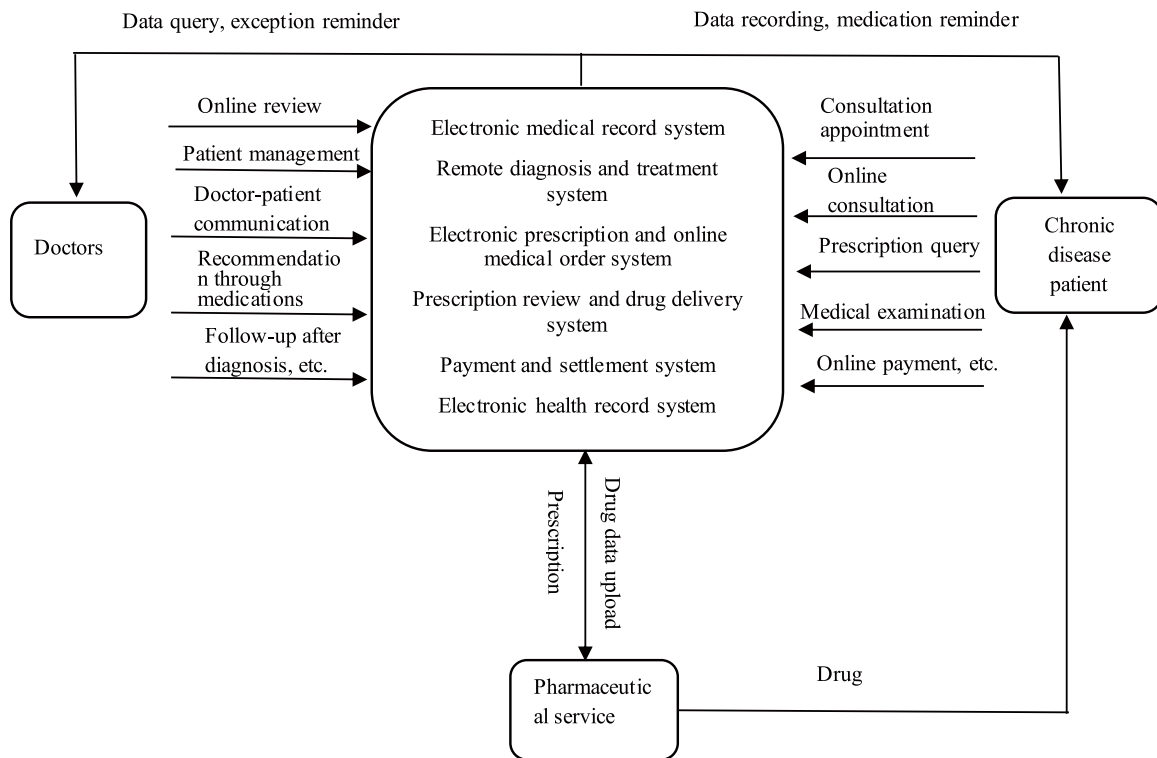


Figure 6. Pomegranate cloud medical slow disease review Internet medical service platform

Pomegranate cloud doctor chronic disease Internet medical service platform is used by the doctors to retrieve patient medical records and provide a basis for subsequent medical consultation through the electronic medical record system. The doctor uses the remote diagnosis and treatment system to communicate with patients, giving medical consultation online and treatment plan. At the same time, the electronic prescription and online medical system is used for online prescription and the prescription can be submitted to the pharmacist online for review and confirmation. Moreover, the patient's medication status can be tracked in real time to ensure that the patient can use the medication correctly. The patients can make appointment for medical consultations, seek for consultation online, make prescription inquiry, make online payment and other services through the platform^[6]. Through the electronic health record system, the platform can establish a health record for each patient registered on the platform and continue to provide health management services for patients.

At present, the number of registered doctors on the platform exceeds 400,000, and the number of consultations reaches 10 million. In 2018, the number of prescriptions exceeded 100 million.

2.6 Psychiatric specialist internet hospital - Warm Heart Treatment Internet Hospital

In 2017, Warm Heart Treatment established a

psychiatric specialist Internet hospital, connecting experts and patients to bring quality medical services to patients with mental illness. Through remote consultation, the district and county doctors can be empowered to improve the level of diagnosis and treatment, so that patients can enjoy high-quality medical services at the grassroots level. At the same time, through online follow-up, patients can be assessed for later rehabilitation, adjustment of treatment options, and reduced troubles for returning to the hospital.

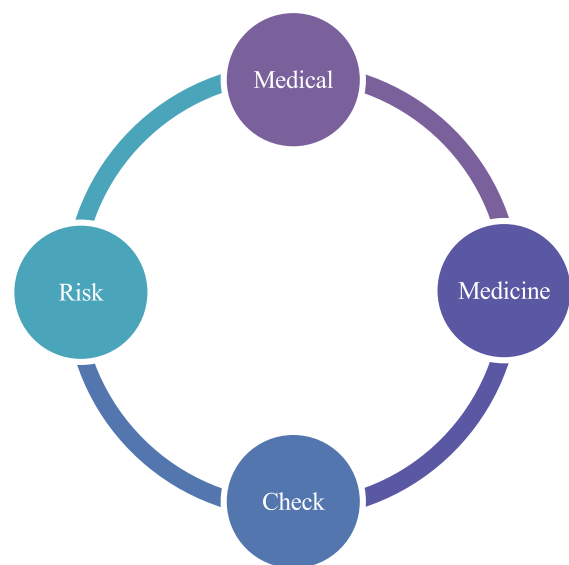


Figure 7. "Heart + Medicine + Inspection + Insurance" closed loop business model

The Warm Heart Treatment Internet Hospital revolves around the mental and psychological disease field, encompassing different aspects such as “medical + medicine + inspection + insurance” in the closed loop of the full industrial chain service (Figure 8). In terms of “medical”, by setting up an Internet hospital solution for provincial and municipal psychiatric specialist hospitals, patients can make appointments for the main doctor to conduct remote referrals and enjoy drug delivery to home. In the “medicine” aspect, after the doctor prescribes the patient through the psychiatric cloud pharmacy, the patient can purchase the relevant medicine through the electronic prescription on the mobile phone side, and the medicine is mailed to the home. In the aspect of “inspection”, the development of psychological CT system can provide psychological assessment, mental health education, psychological hotline, psychological expert consultation, and green channels for higher-level medical treatment for the masses. In terms of “risk”, the first is to provide personalized value-added services for insured customers as insurance value-added services, such as providing crisis intervention services when major accidents occur in insured customers; second, to develop personalized customized mental illness insurance prevention for healthy people, such as providing postpartum depression insurance for pregnant women, and autism insurance for children.

At present, warm heart therapy has reached cooperation with dozens of hospitals, and has accumulated more than 30,000 patient patients.

3 Summary and outlook

Through analysis, we found that the existing Internet hospital operating model has the following characteristics:

(1) Operational mode combining online and offline

The existing Internet hospitals have basically realized the combination of online and offline operation modes, online diagnosis and treatment, follow-up, offline dispensing, and health services.

(2) Realizing the sharing of medical resources

The existing Internet hospitals are concentrated on the sharing of medical resources, and the construction of collaborative medical associations^[7,8] not only brings great convenience to grassroots personnel, but also enjoys the excellent service of urban hospitals.

(3) Health management highlights effectiveness

The concept of health management has gradually

begun to receive people’s attention. Internet hospitals can better guide patients to do a good job in health management, and promote the transformation of medical services from “disease treatment” to “disease prevention”.

There are still some challenges in the development of Internet hospitals that require continued research and practice: policy and regulatory challenges, technology and talent challenges, database building challenges, business model and operational challenges, and legal and ethical challenges.

In the future, with the development of the modernization process and the need to build a modern and powerful country, Internet hospitals will surely move towards modernization^[9]. The Internet Hospital will realize the closed-loop operation mode of the “health management-questioning-in-hospital-rehabilitation” medical service process, and showcase the new achievements in the development and application of Internet frontier technology in the medical field. Only by grasping the latest developments in relevant policies, laws, and ethics we can promote Internet hospitals to serve the people.

Research project: Development and application of regional Internet + smart medical insurance service system based on big data (project number: 2017AB18048), Guangxi key research and development plan project.

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