

Research on Optimization Design of Hierarchical Medical System in Post-epidemic Era Based on Sociological Perspective

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Abstract: In the post-epidemic era, which is undoubtedly a long-term and complex era, the development of hierarchical medical system is widely concerned as an effective solution to the "difficulty in accessing medical care" in China. Based on the perspective of sociological structural functionalism, this paper analyzes the organizational relationships of various stakeholders in the hierarchical medical system, and discusses the operating mechanism of each organization. Taking the optimization of the organizational relationship between patients and primary medical institutions as the starting point, it advocates that the community-level hospitals' service platform should be the main body, innovate and expand the service model of primary medical institutions, and increase the "community embeddedness" of primary medical institutions. In addition, we will establish a close two-way referral system between primary medical hospitals and higher-level hospitals based on Internet technology, so that each organizational structure can form a benign and friendly interaction.

Keywords: Social Structure, Structural Functionalism, Hierarchical Medical System, System Optimization Design

1. Introduction

Since the emergence of the Covid-19, all parts of the world have been affected by the epidemic. In today's globalized world, due to the differences in the epidemic prevention policies of different countries and the uninterrupted economic and cultural exchanges, the epidemic will persist in the global environment to a certain extent, and the post-epidemic era is quietly coming. The inherent problems in China's medical system, such as the lagging development of the public medical information system, the two-tiered medical resources, the lack of resources in community-level hospitals, and the imperfect medical supervision mechanism, will become particularly prominent in the post-epidemic era. In order to alleviate the contradictions in my country's medical field, the General Office of the State Council clearly proposed the implementation of the medical system of "hierarchical medical system" in 2015. This paper will explore the design mode of hierarchical medical system services based on the perspective of sociological structural functionalism, and try to provide new design ideas for Intelligent Healthcare in the post-epidemic era.

2. Social Structure and Structural Functionalism

2.1 Social Structure

Sociology, as a social science that systematically studies social behavior and human groups, arose in the 1830s and 1840s as a modern discipline that evolved from social philosophy^[1]. In his book *Essential Concepts of Sociology*, Anthony Giddens pointed out that sociology is a product of modernity, and its disciplinary purpose is to obtain reliable knowledge about the social world by scientific methods and then intervene appropriately in society, which can then achieve the effect of transforming society for the benefit of all human beings. As a widely used term in sociology, "social structure" is usually considered to be the relatively stable relations of the elements of a society and the way they are constituted, that is, a relatively stable network of mutual relations in a certain order. It is formed naturally or artificially by social needs, and the process of its operation is also a reflection of the social function of the social structure. When a social structure encounters some obstacle in the process of operation, or some

pathology occurs, its predetermined social functions will be destroyed, resulting in the degradation and distortion of the function of the social structure, deviating from the intended track. It follows that the social structure provides us with the necessary order of life, and many social spheres depend on it for organization and coordination [2].

2.2 Structural Functionalism

Structural-functionalism is an important school of modern Western social theory, which proposes to view society as a balanced, ordered and integrated system in terms of structure and function and the interconnectedness of the two [3]. The components of the system are interconnected and play an integral role in the existence, balance and integration of the system as a whole. The entire social system and the operation of the systems are essentially in a state of coordination, which in turn expresses the dominant state of the society. The sociologist Parsons considers the health care system as a prerequisite for the proper functioning of the entire social system, which has the function of preventing mass epidemics of diseases and repairing the social organism [2].

3. Exploration on System Optimization of Hierarchical Medical System

3.1 The Optimization of Hierarchical Medical System from the Perspective of Structural Functionalism

Structural functionalism shows that to study a system, it is necessary to study the internal structural problems of the system more deeply. The theory of structural functionalism based on sociology can enable designers to see the structural relationship between social roles in the system more rationally, and use efficient ways to plan the relationship between organizations in the system, which is more conducive to the virtuous circle of the system and development. Therefore, it is important to optimize the organization of patients, primary medical institutions and medical institutions at all levels in the hierarchical medical system, and to effectively plan the relevant factors such as people, facilities, communication and materials in the organization, so that the three-party organizations can form interrelatedness and undertake responsibilities and perform their respective functions. Forming a definite and stable connection and an obvious sequence hierarchical relationship is the first problem that needs to be solved to ensure the order and balance of the entire hierarchical medical system.

3.2 Stakeholder Optimization Analysis

According to the severity of the disease and the difficulty of treatment, hospitals at all levels are responsible for the treatment of different diseases, thus forming a medical system from general practice to specialist. In this system, patients, primary medical institutions, secondary and tertiary medical institutions, health management departments, government decision-making departments and other different stakeholders undertake different responsibilities and perform different functions to ensure the harmonious operation of the social medical system. Judging from the development of my country's hierarchical diagnosis and treatment system at the current stage, there are certain differences in the interest demands of different stakeholders, which leads to the existence of contradictions and competition among the various entities. It makes it impossible to form a virtuous circle of medical interaction between organizations.

As an important part of hierarchical medical system, the thoughts and behaviors of patients are often determined by their medical treatment concepts and perceptions, and their behavior patterns greatly affect the development of the hierarchical medical system process. With the development of the times, patients' demand for medical services has gradually increased. The core demands they pursue in medical treatment include a good medical environment, a high level of medical care, and affordable medical expenses. At this stage, most patients are limited by the stereotyped perception that the level of primary medical services is low and cannot provide a good medical experience, and they lack trust in the level of primary medical care. There is always no effective link between patients and primary medical institutions, so patients often choose to ignore primary medical institutions and go straight to overcrowded large hospitals. This disorderly medical treatment behavior of patients will lead to the situation that the primary medical institutions are unattended and lose the momentum of development, forming a vicious circle between the three organizational structures.

In the implementation of hierarchical medical system, hospitals at different levels undertake different

levels of medical tasks and meet the needs of different levels. The core demands of secondary and tertiary hospitals in the hierarchical medical system are to maintain medical resources and strength and expand their influence. It is precisely because of these demands that hospitals cannot give up the economic benefits brought by the number of patients. In addition to the strong resources they already possess, most higher-level hospitals have not responded positively to patients transferred. However, community-level hospitals have always been in a disadvantageous position in competition and cannot reach cooperation with higher-level hospitals, resulting in frequent failures in the diagnosis and treatment of patients and medical resources. Therefore, it is necessary to establish a reasonable two-way referral process in the system, so that patients and medical resources can flow effectively in medical organizations at all levels, and ensure the continuity of patients' medical treatment.

Figure 1 shows the analysis of various stakeholders in the hierarchical medical system structure. It can be seen from the model diagram that the government and health management departments undertake the basic supervision responsibilities of improving the social medical level and medical environment, and maintaining social stability in the hierarchical diagnosis and treatment. At the same time, primary medical institutions are at the same level as secondary and tertiary hospitals, which changes the traditional vertical medical structure. This flattening approach can effectively improve the long-standing defects of uneven distribution of medical resources and imperfect service system in China's medical system.

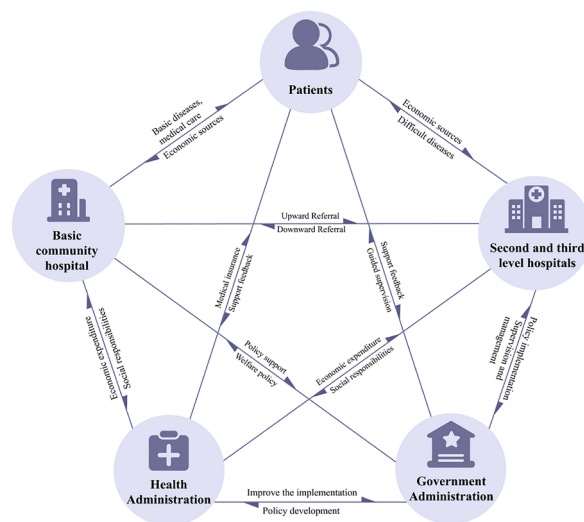


Figure 1: Stakeholder hierarchy analysis

3.3 Organizational Structure Optimization Design

The ideal pattern of medical treatment in the system is "slight illnesses go to the grassroots level, serious illnesses go to the hospital, and recovery goes back to the grassroots level" [4]. It can be seen from the above analysis that the realization process of hierarchical diagnosis and treatment is essentially a game process of various stakeholders. The government plays a leading role, rationally diverting patients to achieve an orderly medical order, and at the same time, hospitals at all levels are interconnected and information shared to form a collaborative and mutually beneficial referral pattern. Therefore, the core of the optimization design of the relationship between organizations in this system is to use network technology to establish systems such as medical services, two-way referral, and supervision and management, so as to optimize the interaction between the relationships between organizations to achieve a point-to-surface grid layout for hierarchical medical system.

3.3.1 Optimization of Medical Service System

The operation management of a medical institution mainly relies on the construction of its medical platform. In the optimized system in Figure 2, the medical service system mainly includes three subsystems: information service, talent management, and equipment management. In the Internet era, primary medical institutions should speed up the construction of their own information services, change the traditional service model of "waiting" patients to "finding" patients, face patients with a more positive

face, and quickly lay out links to various medical service information window. Build an information sharing platform between upper and lower medical institutions, form a close relationship with higher-level hospitals, share data, allocate medical resources reasonably, encourage high-quality talents to work at the grassroots level, establish a telemedicine consultation service model, and form an online "medical alliance". Clear responsibilities, division of labor and cooperation are conducive to the realization of mutually beneficial cooperation between medical institutions.

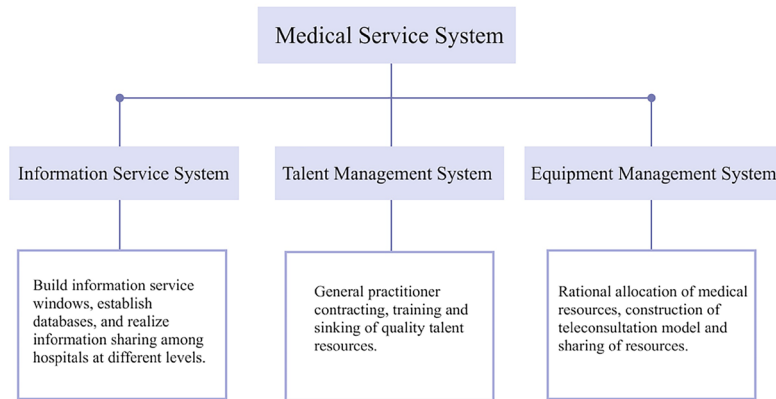


Figure 2: Medical service system

3.3.2 Two-way Referral System Optimization

The goal of hierarchical medical system is to classify patients according to the difficulty of diagnosis and treatment of diseases. For example, primary medical institutions are responsible for common diseases and chronic diseases, while secondary and tertiary hospitals are responsible for diagnosis and treatment of difficult and critical diseases [5]. The flat-structured two-way referral system shown in Figure 3 is based on this goal. It makes full use of the Internet's network connectivity technology to develop the multi-user end of the service platform, and establishes a "medical alliance" between upper and lower medical institutions to help better achieve two-way referral. After the first consultation in the primary hospital, through the doctor's preliminary diagnosis, if the patient needs to be referred, the doctor can share medical information and send a referral request through the service platform. Patients can also go to primary hospitals for rehabilitation treatment through the same route. The upper and lower hospitals share data, allocate medical resources reasonably, establish an online "medical alliance", and form a smooth two-way referral mechanism.

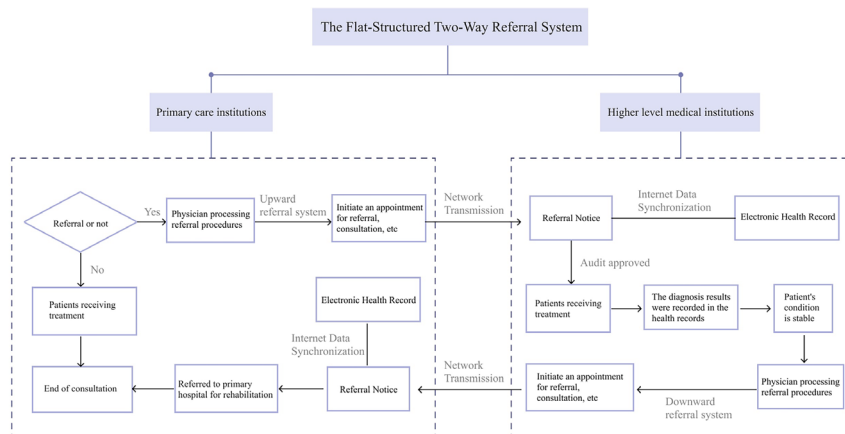


Figure 3: The flat-structured two-way referral system

3.3.3 Supervision and Management System Optimization

In the structural-functional theory, the harmonious development of society is a functional response to the differentiation of social structures and functions, while the government mostly intervenes in the role of supervision and management to solve social conflicts in order to achieve the integrity and balance of the entire social system. We can think of this as a "functional necessity" of the social structure. Therefore,

in the rational operation of the hierarchical medical system, the supervision and policy support of the government and relevant departments are naturally indispensable. In terms of policy support, the health management department can ensure a balanced distribution of interests among hospitals at different levels through price and management, and ensure their respective interests and needs. In terms of supervision, hospitals should establish a corresponding supervision system to carry out self-supervision work, and work with government administrative departments to maintain the operation of the hierarchical medical system.

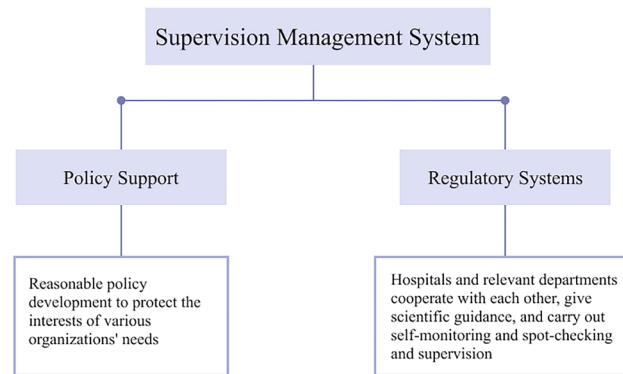


Figure 4: Supervision management system

3.4 Patient Journey Optimization Analysis

Affected by the Covid-19, Internet healthcare has changed from an emergency measure tool in the outbreak stage to an important strategic layout need in the post-epidemic era. In recent years, various medical institutions have gradually paid attention to the huge benefits brought by "Internet plus", and capable hospitals have begun to deploy their own "Internet plus" medical service platforms. At present, most patients' medical treatment process is a combination of online and offline methods. Combing the patient's journey map during the medical treatment process helps to analyze the specific contradictions and problems between various organizations in the process.

During online medical consultations, patients can independently choose a doctor through the Internet platform. However, in fact, most of the platforms will choose to push the well-known doctors of major hospitals on the homepage with the label of " grade 3A hospital", in order to achieve the purpose of attracting patients. This push method invisibly intensifies the siphoning of higher-level hospitals, and also makes primary medical institutions lack channels to gain the trust and attention of patients. Therefore, from the perspective of the concept of hierarchical medical system, this type of commercial medical platform should change the existing push method, use the platform to build a bridge, and change the relatively isolated medical communication mode of the three parties.

During offline medical consultations, large hospitals are often overcrowded. Coupled with the complexity of the epidemic, the patient's medical experience becomes poor. At the same time, the unsmooth referral system leads to complicated procedures for consultation and follow-up, and the contradiction of information asymmetry also makes it impossible to form a definite stable connection and an obvious sequence hierarchical relationship between hospitals at all levels. For patients, it will make their referrals willingness has also dropped significantly.

It can be seen that the establishment and development of the Internet medical platform is a mixed blessing, which hinders the implementation of the hierarchical medical system policy and the complete establishment of the system to a certain extent. Therefore, based on this main contradiction, in the subsequent construction of the " Internet plus " medical service platform we must base ourselves on the policy of the national medical and health system reform, and optimize the community-level hospitals' services through a combination of online and offline. These methods can effectively promote the vertical flow of high-quality medical resources and help to form a new pattern of medical treatment.

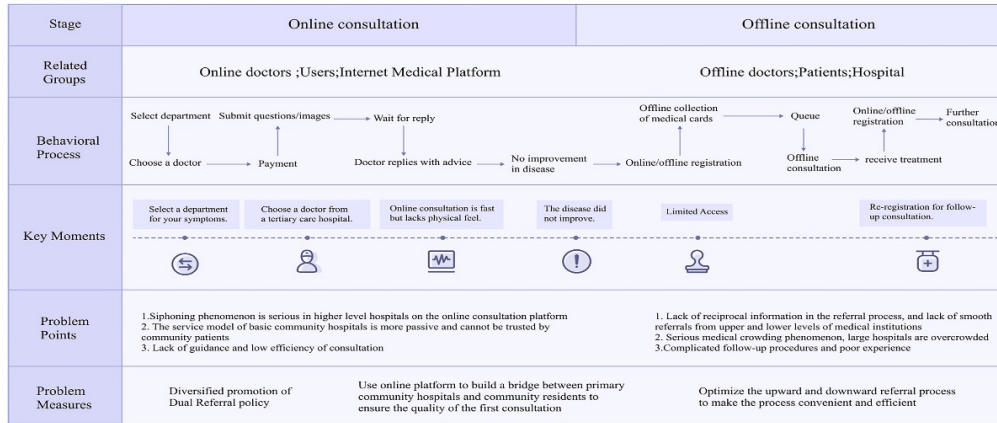


Figure 5: Patient journey map optimization analysis

4. Hicare Hierarchical Medical System Optimization Service Design

From the perspective of structural functionalism, the Hicare service case we designed focuses on the process of patients seeking medical treatment in the entire hierarchical medical system. Through the online app service platform and the innovative service model of primary medical institutions, the connection and communication between residents and community-level hospitals are enhanced. Guide patients willing to go to the nearest community-level grass-roots hospital for treatment on their own, and further increase the proportion of residents' first consultation at the grass-roots level. At the same time, the Internet big data technology is used to help form a good cycle of smooth referral and linkage between upper and lower hospital organizations.

4.1 Functional Optimization Design of the Relationship Between Patients and Primary Hospitals

The first diagnosis at the grassroots level is the first step in the smooth operation of the hierarchical medical system. To further implement the first diagnosis at the grassroots level, it is necessary to start from both the grassroots community medical institutions and the patients. Based on the in-depth analysis and design requirements of the contact points between primary hospitals and patients, the corresponding design opportunities and service values are proposed.

In the pre-diagnosis stage, the policy promotion channels are first expanded through the "knowledge" module in the app. In this module, various online forms such as popular science videos, live explanations, and interesting quiz games are used to enrich patients' understanding of policies. This has a good effect on improving patients' interest and awareness of actively understanding the policy, clarifying the corresponding procedures for hierarchical medical system, and broadening residents' cognition at the theoretical level, so as to smoothly help patients to actively accept the overall medical model and ensure the operation of the system. On this basis, we can also try to guide residents to sign up with community general practitioners to settle in the app platform through preferential consultation prices. Taking the community as the service center, the "community" module of the app provides residents with daily health management and disease diagnosis services, enhances the communication between patients and primary hospitals, further improves residents' recognition of this, and strengthens the first diagnosis at the primary level.

At the stage of consultation, the homepage takes the medical service section as the main functional module, providing four main functions of "first consultation at the grassroots level", "nearby clinics", "smart self-diagnosis", and "referral service". Diversified selection methods can effectively improve the efficiency of users' consultation. Among them, the first diagnosis at the grass-roots level matches the grass-roots medical and health center of the current residence through mobile phone positioning, and provides online appointment services. In order to understand the patient's situation and provide corresponding treatment or referral suggestions to achieve process optimization, under the development trend of emerging technologies, the application of intelligent medical technologies such as remote imaging, remote ultrasound, and remote pathology will greatly improve the diagnosis of community-level medical institutions and remote diagnosis and treatment capabilities. At the same time, we will continue to innovate and enrich the service model of primary hospitals, and establish an information

sharing platform, which is embodied in the establishment of personal health files for patients and the connection between relatives and friends. In terms of user experience optimization, we hope to support users to obtain case information on the user side, users can export the electronic version and print the paper version. They can share the problems encountered in the treatment, and answer the frequently asked questions through the online platform, so as to make basic preparations for the subsequent referral and follow-up, and improve the service efficiency of primary medical institutions.

In the post-diagnosis stage, users can independently view their personal electronic prescriptions. This method effectively realizes information exchange between actual users and primary medical institutions, and greatly reduces patients' doubts about the diagnosis results. Inspired by the actual medical treatment process of patients, the App has added the functions of providing medication reminders and medication distribution in the design, providing users with services from selecting medicines, purchasing medicines, to after-sales services. The user places an order to buy medicine through the electronic prescription after diagnosis, and the pharmacy will deliver the medicine to the door at the corresponding time. The software's medication reminder function provides users with reminders of medication time, medication dosage and precautions during the entire medication period, ensuring that the entire process of prescribing, purchasing, and medication is more complete. The design of this module makes the whole service design more humanized.

4.2 Optimal Design of Organizational Relationship Between Primary Hospital and Higher-level Hospital

An important factor supporting our design concept is the current in-depth development of 5G technology, which greatly improves the transmission speed and connection efficiency of information and data. The collection and integration of big data provides reliable technical support for the communication and collaboration between upper and lower hospitals and the sharing of medical resources.

After the user logs in to the app, the platform will conduct research on the user's personal basic health data to build a comprehensive medical database for each user. This research enables us to help users establish "one person, one file", so as to achieve a full range of medical information management. If patients have medical needs, they can use the online platform to complete the appointment before the first offline consultation or choose to directly seek medical treatment online. After the initial diagnosis by the grass-roots doctor, if the patient needs to be referred, the platform information network transmission can be used to realize the rapid upward referral, and then the doctor of the higher-level hospital will make the downward referral through the same path. Higher-level hospitals and primary-level hospitals reasonably share patient data and information, create electronic medical records, and simplify the referral process. The three-structure organization of patients, primary medical institutions and higher-level medical institutions achieves an efficient and fast referral experience in the up-and-down cycle. The optimized two-way referral process is shown in Figure 6.

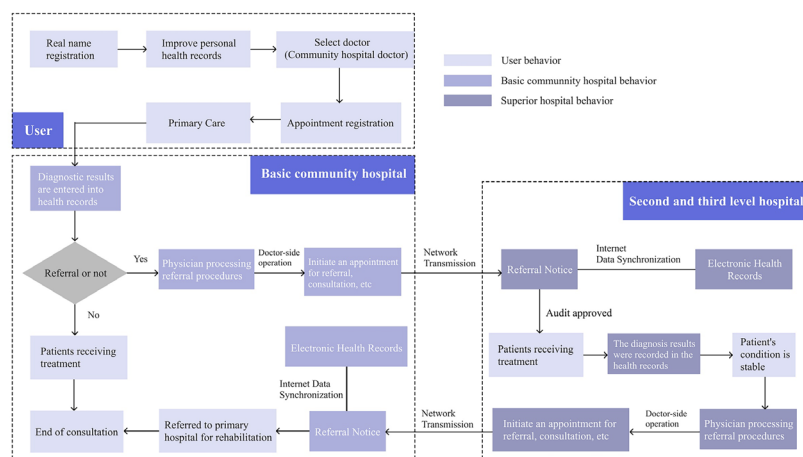


Figure 6: Two-way referral system

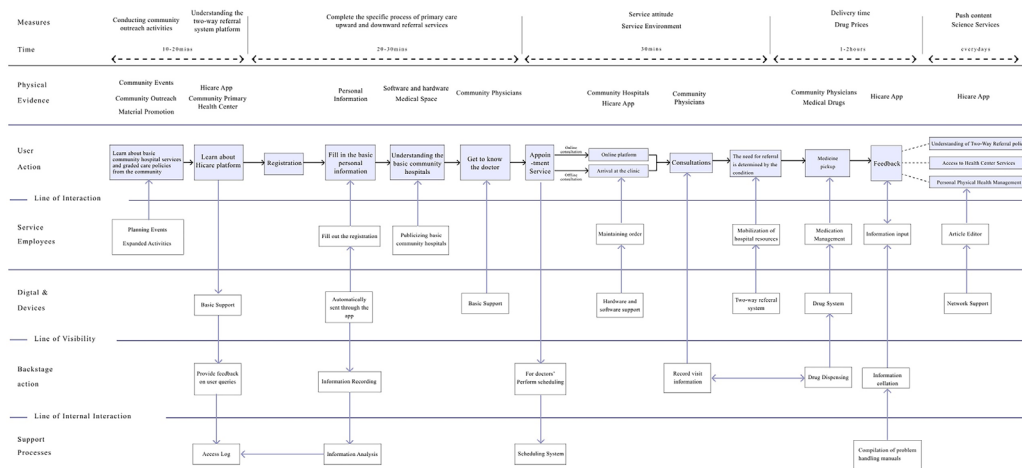


Figure 7: Service blueprint

4.3 App Information Architecture and Functional Design

Reviewing the previous review of the service strategies for optimizing the organizational structure relationship between patients, primary medical institutions and higher-level hospitals, here we take the patient side of the "Hicare" smart medical service app as an example to focus on optimizing the organizational relationship between patients and primary medical institutions. The entire platform is mainly divided into five modules: "Home", "Knowledge", "Community", "Medicine", and "Personal". On this basis, the levels and main functions of information expression are highlighted, and the information framework of the app is sorted as shown in Figure 8.

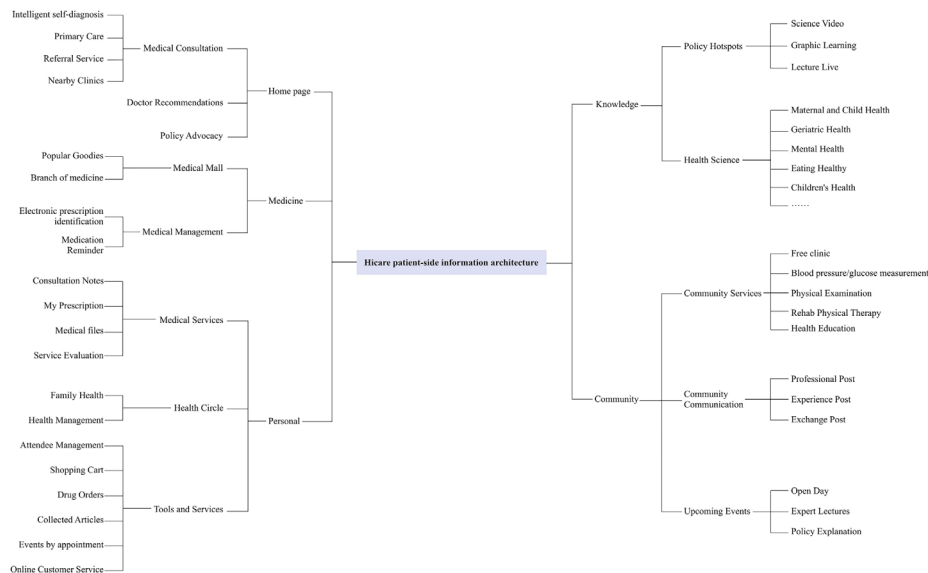


Figure 8: Hicare patient-side information architecture

5. Conclusion

Establishing a hierarchical medical system is a key link in realizing the rational allocation of medical resources, promoting the equalization of basic medical and health services, deepening the reform of the medical and health system, and establishing a basic medical and health system with Chinese characteristics [6]. In the post-epidemic period, the hierarchical medical system is facing unknown and new challenges. Based on the perspective of sociological structural functionalism, using design to

empower organizations and relying on Internet technology to optimally optimize organizations at different levels in the system. Based on the perspective of sociological structural functionalism, using design to empower organizations, relying on Internet technology to optimize organizational plan design for organizations at different levels in the system, and good organizational relationships between patients and primary medical institutions, help to rationally promote the development of hierarchical medical system, enhance the public's sense of trust, and ultimately better achieve the effect of "universal medical care".

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