Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 11, No. 3, 2023

The Application Progress of Apps in Chronic Disease Health Management

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Abstract: With the increasingly severe aging of China's population, the incidence of chronic diseases and the difficulty of treatment continue to rise, which provides an excellent environment for the emergence of APP (Application), which is generally praised by society for its convenience, speed, and easy popularity. Moreover, the popularity of mobile medical technology has not only changed the previous face-to-face treatment model but also optimized the distribution of medical resources, thus effectively filling the gaps in the traditional medical model. However, in the field of chronic disease health management, the popularity of APP brings many challenges. Therefore, to facilitate the sustainable and steady development of the mobile medical industry, active measures must be taken to solve these problems.

Keywords: Chronic disease; APP; Health management.

1. Introduction

Chronic diseases are a complex group of diseases that include heart disease, lung disease, digestive system disease, immune system disease, and endocrine system disease. However, China is rapidly moving toward an aging society. In the past decade, the number of people aged 60 years and above has increased dramatically to 254 million[1]. With the growing population of chronic diseases in the elderly year by year, limited healthcare resources are no longer able to cope with the aging society, and effective solutions for the aging society need to be updated. In this context, the widespread application of emerging information technologies in the health field, such as big data, artificial intelligence, cloud computing, the Internet of Things, and 5G, has created new opportunities to meet the challenges posed by an aging society. Especially the Internet-based health management model has been developed unprecedentedly during COVID-19. With the introduction of the *Tutorial for Outline of the Healthy China 2030 Plan* and the *"13th Five-Year Plan" for Healthy Aging Key Division of Tasks*, we can clearly see that in this era, the emerging IT-based health management has become a key measure to address the aging population. Figure 1 shows the available health management big data covering the whole life course[2].

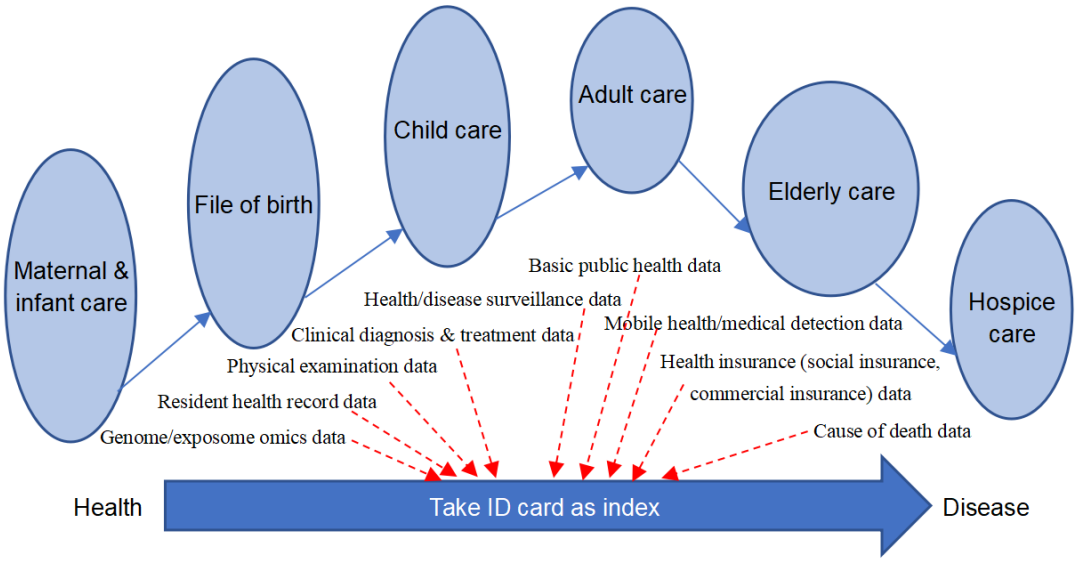

Figure 1. Available health management big data

2. Current Problems in Chronic Disease Health Management

First, patients' awareness of self-management is weak. For doctors and managers, most of the problems in chronic disease health management lie in patients' own lack of management awareness, lack of corresponding knowledge about chronic diseases, and patients' disapproval of grassroots community work and poor compliance with chronic disease management.

Secondly, there is a lack of a primary medical care management force. The large workload of chronic disease management at the grassroots level, the lack of primary care physicians, drugs, and equipment, and the limited energy of primary care physicians are other problems of current chronic

disease health management.

Third, the management system is not perfect. Although China has proposed the strategy of hierarchical diagnosis, there are difficulties in implementing it at the grassroots level, and there are often problems of cross-level transfer and irregular management.

Fourth, inadequate health education is another problem in chronic disease management. Many patients are not familiar with their diseases, leading to a lack of attention and, thus, poor compliance.

3. The Role of The Mobile APP for Chronic Disease Health Management

3.1. Monitoring and recording of health indicators

Currently, many patients with chronic diseases use applications such as "Ping An Good Doctor", "Utang" and "Kongtangweishi" to check and record their health status. However, "Utang" provides a more intuitive blood glucose monitoring tool for diabetics, with a miniature dynamic blood glucose meter, superior detection sensitivity, and personalized control strategies to accurately record and monitor blood glucose levels so that insulin injections can also be accurately measured. With the development of technology, APPs such as "DASH Mobile" can monitor various health indicators such as heart rate and blood pressure in real-time to better protect and improve health conditions; by monitoring and recording uric acid levels in real-time, it can effectively help patients understand the changes of the uric acid level in time to improve the treatment effect. By using big data and Internet IT, patients' conditions can be tracked, monitored, and recorded in real-time, and an electronic calendar can be created so that patients can clearly understand the changes in their conditions and can view relevant treatment plans and preventive measures through the APP, thus helping doctors to manage diseases more scientifically. (As shown in figure 2)

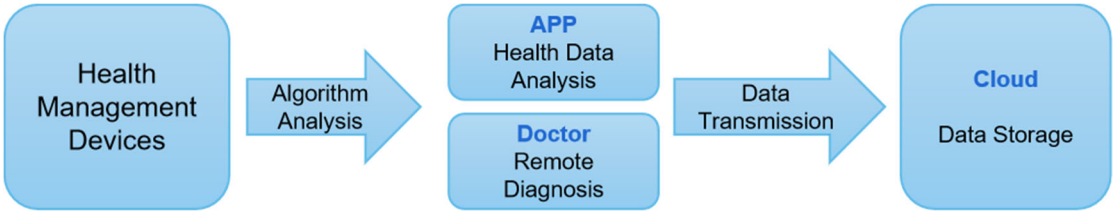

Figure 2. Process of health data monitoring and management

3.2. Instruct patients to take medication on time

Although patients with chronic diseases need to take medication for a long time, the inability of healthcare professionals to provide guidance about their daily lives leads to low compliance with medication and the inability to obtain more accurate diagnoses, which will seriously hinder effective treatment of the disease. However, by strengthening medical interventions, patients' enthusiasm and initiative in taking medication can be stimulated, thus effectively preventing adverse reactions, such as overdose and missed doses. The APP has a variety of personalized reminder functions, and users can easily set the time and type of medication, which is simple and convenient to operate and greatly improves the efficiency of medication administration. Through the "medication reminder" in the app, patients can easily view the details of "taken", "missed" and "skipped" medication compliance and record them easily; through the use of medication, we can record the reaction of the day in time to understand our condition better; through the customized medication service for different users, we can enable them to use the medication more scientifically and rationally; through the use of Excel format to store the information of medication use and send it to the doctor with whom the agreement is signed, thus the patient's condition can be better grasped, and the treatment strategy can be adjusted in time.

3.3. To meet the needs of patients

Data show that type 2 diabetes and disease detection are the most popular APP, where 50% of patients with chronic kidney disease who download such APP expect to establish a professional diagnostic institution for kidney disease; after the survey, 85. 71 % of patients with chronic diseases expect to use health monitoring, 85.71% of patients expect to control hypertension, and 62.75% of patients expect to manage diabetes.[3] Therefore, the specific needs of various professions shall be taken into account when developing an APP. However, in accordance with the needs of patients with chronic diseases, the demand for specialty APP is very high, which provides the necessary basis for the design work. Therefore, during the development process, we must provide the required health information and functions in a timely manner, which strictly follows the needs of the patients.

3.4. Symptom management for patients with chronic diseases

Patients with chronic diseases may experience a variety of uncomfortable symptoms due to a variety of factors, such as treatment and the disease itself. However, by taking effective management measures, patients can effectively improve their quality of life and thus achieve better recovery. The edgeAPP can help COPD patients better manage their clinical symptoms by allowing them to record their symptoms and upload them in a timely manner into a symptom diary. By remotely monitoring oxygen saturation, healthcare professionals can provide personalized health guidance to patients based on their specific conditions, thus effectively managing various discomfort symptoms.[4] For patients who have colon cancer and breast cancer, the use of APP can make it easier to manage the side effects caused by chemotherapy drugs, thus effectively improving the adverse reactions. By using APP, the treatment mobility of patients with chronic pain combined with depression can be effectively improved, depressive symptoms can be reduced, various uncomfortable symptoms can be detected and monitored in a timely manner, and scientific and reasonable guidance can be given, thus

effectively improving the quality of life of patients.

4. Development Challenges of APP in Chronic Disease Health Management

4.1. The engagement value of chronic disease APP users has to be verified

For patients, mobile healthcare brings not only convenience but also provides new access to information, health management, and lifestyles. It is gratifying that m-health technology has great potential to change patients' lifestyles and health behaviors through patient education and improved self-discipline. However, many uncertainties in the actual chronic disease user use process do not guarantee that the APP will achieve the prospective results: (1) Although mobile health technology can improve the convenience of doctor-patient communication and patient intervention, too frequent interventions may make patients feel bored or affect patient use due to habit. (2) Patients' pre-existing attitudes toward APP (e.g., distrust of m-health or difficulty learning the technology) may affect patient use. (3) The APP's tracking of patients' personal behavior may cause potential privacy concerns for users. Patients may perceive highly personalized mobile text message alerts as intrusive, and frequent personalized messages may also cause patients to feel stressed or feel mentally or interpersonally oppressed. This perceived control and judgment will significantly reduce patients' ability to self-regulate their health behaviors and lead to lower levels of health behavior change engagement, which in turn will affect patient adoption of the APP. (4) Most current APP manage patients through self-reported data, which is ineffective due to potential self-selection errors and higher APP usage attrition rates. Therefore, due to these problems, further scientific and rigorous methods are needed to assess and quantify the effectiveness of m-health platforms.

4.2. Effective incentive way of continuous user participation in APP needs to be explored

APP, especially chronic disease APP, must ensure continuous user engagement in order to achieve prospective results. To attract users to engage with APP, various m-health platforms have waged a war of monetary incentives. Although monetary incentives can lead to short-term improvements in patient registration rates and behaviors based on the direction of monetary incentives, the following problems remain in actual business activities: (1) Users' internal motivation is negatively affected. With monetary incentives, a user may register on multiple platforms at the same time because of the presence of monetary incentives, but the upload rates are all low, not seriously used, and do not improve the user's health status. (2) The incentive effect after the withdrawal of monetary incentives is unknown. There are certainly cases where monetary incentives have remained in effect after they were withdrawn. However, the long-term effectiveness of monetary incentives in the m-health field needs to be further verified. (3) According to self-determination theory, non-monetary incentive strategies to change patients' usage behavior by changing their internal motivation are to be explored. How to enhance users' intrinsic motivation to participate in APP to change health through non-monetary motivation and then maintain the long-term incentive effect is a topic worth exploring in depth.[5]

4.3. Difficulties in reconciling personalized health management service options for an APP with patients' privacy concerns

In the future, personalized healthcare will be a new trend, especially in the area of chronic diseases such as diabetes. As the users in these areas grow increasingly larger, their needs go beyond traditional health education and blood glucose monitoring and are more focused on more personalized health management. For example, the provision of precise nutritional guidance, personal exercise advisors, customized health checkups, and specialist clinics can meet the needs of these patients. However, the value of personalized services cannot be fully effective due to privacy concerns. Since privacy concerns are a constant concern along with patients, both patients and platforms have the problem of balancing privacy concerns with personalized services. How to avoid the phenomenon that patients' usage behavior is hindered by privacy concerns in the process of mobile medical health management and clarify the bilateral transformation relationship between users' personalized services and privacy concerns are crucial to the value of APP and the realization of incentive mechanism effect.

5. Suggestions to Improve the Efficiency of APP Application in Chronic Disease Health Management

5.1. Comprehensively promote the development of APP support facilities for chronic diseases

The usage rate of health management APP shall be increased to improve the health literacy level of chronic disease patients, enhance self-management awareness, and promote the integrated development of mobile health technology and traditional chronic disease health management. The contribution of m-health to self-health management in areas other than chronic disease patients (such as weight loss, smoking cessation, infant health care field, etc.) is widely recognized, which shows that the m-health market is promising and worth promoting. At the same time, the services and hardware supporting the APP also need to be developed rapidly, such as professional and precise medical knowledge services, online intervention services for doctors, intelligent health indicators measuring external devices, and hospital clinical data breaking the information isolated island, etc. need to be developed urgently.

5.2. Promote positive incentive mechanisms led by enhancing patients' internal motivation

Although material incentives such as monetary incentives can be helpful in the short term to increase patient engagement, their incentive effects disappear in the long term when monetary incentives are withdrawn. Such high costs and limited effectiveness of blind monetary subsidies are widely used by the market in any case. Non-monetary incentives such as quantified self are sustainable, although their short-term effects are not as significant as monetary incentives. The design of apps shall be oriented to users' needs, develop easy-to-use and powerful apps, focus on health monitoring and health education, strengthen information security and privacy protection, avoid unnecessary content,

and establish effective regulatory mechanisms to maximize the effectiveness of Internet technology and improve the quality and efficiency of health management. Therefore, chronic disease APP platforms shall try more non-monetary incentive mechanisms that enhance internal motivation.[6]

5.3. Negative incentives represented by privacy concerns are of concern

Privacy concerns are a negative incentive issue that cannot be ignored during the development of the APP. In particular, privacy concerns have a two-way transformative effect on patient participation in personalized and non-personalized services. Especially for the development of personalized services in chronic disease APP in general, it is worth exploring how to weigh privacy concerns and personalized services properly. The operation and maintenance of disease management APPs are highly dependent on the Internet and communication technology, and in the application process, patients are required to enter a number of personal information, which usually involves patients' current health status, past medical history, occupation, economy, family situation and other personal privacy, and once their network security is attacked, patients' medical data and information can easily be leaked, lost, or even maliciously altered. In addition, if the mobile medical platform is lacking in professional ethics and the platform is not well supervised, it will more likely lead to the illegal exploitation and use of patient data, which will harm the interests of patients and society. It is suggested that chronic disease APP shall pay attention to the frequency of personalized service interventions, content presentation forms, and intervention intensity when developing personalized services.[7]

6. Conclusion

With the advancement of diagnosis and treatment technology, the survival rate of patients with chronic diseases is increasing, but the traditional medical model still makes it difficult to manage the health of patients with chronic diseases effectively. With the introduction of "Internet+medicine", m-health has become a dynamic new industry that not only helps to improve the traditional chronic disease health management model but also allows chronic disease patients to quickly and accurately record their health status so that they can receive more personalized medication guidance and rehabilitation treatment plans. However, due to the limited level of existing technology, many shortcomings still exist. Therefore, in order to better regulate the development of the industry, a series of effective laws and regulations must be formulated and introduced according to the current reality in order to ensure that people's needs for health management are continuously met.

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