

Design and implementation of an Android-based medication reminder APP

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Abstract: In the prevention and control of disease in older people, particularly in the management of chronic diseases, patient adherence to medication has a significant impact on treatment outcomes and healing. Low medication adherence may worsen the condition and lead to increased morbidity mortality and healthcare costs. Therefore, in order to help remind the elderly population to take their medication on time to ensure relief and treatment, the project team will design an Android medication reminder app for the elderly, which will provide a simple and convenient medication reminder service for the elderly and reduce the associated burden for their children.

Keywords: Medication adherence; Androids; Medication administration records; Reminders.

1. Project Overview

As China's population ages, the health of the elderly and the rational use of medication are becoming more and more important. The elderly is often seen in multiple departments, using multiple medications, and have complex medication regimens, making them prone to misuse and omission of medication. In this paper, we propose an Android-based medication reminder system that can remind patients to take their medication on time and provide medication records to facilitate the monitoring and management of patients' medication taking process. A medication reminder app was designed and developed based on the Android platform to quickly set up personalized medication reminders and to record patients' medication taking times, and to improve and study subjects' medication adherence. A Wilcoxon matched-sample signed-rank sum test was performed to determine the difference in the amount and rate of medication taken by the subjects in the two cases. The results of the experiment show that the use of this medication reminder app can indeed improve the medication dosage and dosage rate of the subjects, and the use of this method provides a richer technical tool for clinical research, and also reduces the burden for the general medical staff and patients.

2. Summary of current functional status

2.1. Use of medication reminder apps for Android

Of the 269 patients, 72 chose to use the design and implementation of the Android medication reminder app, with a usage rate of 26.8%. 52 out of 188 males chose to use it, with a usage rate of 27.7%; 20 out of 81 females chose to use it, with a usage rate of 24.7%, with no statistically significant difference between the two ($\chi^2=0.25P>0.05$). 35.4% (67/189) of the 18-44 age group chose to use the Android medication reminder app, 8.8% (3/34) of the 45-59 age group chose to use the Android medication reminder app, and 4.3% (2/46) of the 260-age group chose to use the Android medication reminder app, a statistically significant difference. significant ($\chi^2=24.65, p<0.01$). The difference was statistically significant ($\chi^2=10.28, P<0.01$). 13.6% (11/81) of the patients

were domiciled in the city and 32.4% (61/188) of the patients were mobile.

2.2. Use of medication reminder apps for Android and their main usage releases

Android medication reminder apps are mainly used in hospitals, homes for the elderly and homes for the elderly; Android medication reminder apps are mainly used for those who are suffering from multiple diseases, taking different kinds of medication and taking medication at different schedules; some Android medication reminder apps are used to remind the elderly who are suffering from dementia or have no relatives with them; There are more elderly people left behind in the mountainous and underdeveloped areas, and most of the children who work outside the home use Android medication reminder apps in order to take care of the sick elderly and remind them to take their medication.

2.3. Reasons for patients' reluctance to use Android's medication reminder app

197 patients were reluctant to use the assistant app, 88 (44.7%) patients found it cumbersome to clock in daily, 44 (22.3%) patients were reluctant to download the app, and 56 (29.0%) patients felt that using the medication reminder app for Android exposed their privacy.

In the course of long-term research and development, as well as in the prevention and control of disease, especially in the management of chronic diseases, patient compliance with medication has a significant impact on treatment outcomes and recovery. Low adherence to medication may worsen the patient's condition and lead to an overall increase in morbidity, mortality and health care costs. There are currently a number of approaches to measuring or assessing medication adherence, each with its own advantages and disadvantages, and the choice of measurement and evaluation method should depend on the purpose of the study and the resources available. Generally, poor patient adherence to medication is a multifactorial issue and can be broadly categorized as a result of the disease, the patient and the healthcare provider, the treatment plan and the health system and environment. Forgetfulness is the most common reason for poor adherence. Therefore, many scholars have used medication reminders to improve patients' adherence to medication, for example, by

turning on alarms or text messages from within an app, or by using dedicated devices to remind patients with chronic diseases.

According to QYR (HQB), the global medication reminder app market reached US\$300 million in 2021 and is expected to exceed US\$500 million in 2028, growing at a compound annual growth rate (CAGR) of 3% (2022- 2028). At the regional level, the Chinese market has changed rapidly over the past few years, with a market size of US\$2 million in 2021, accounting for approximately 46% of the global market, and is expected to reach US\$5 million in 2028, when the global share will reach 60%.

The next analysis of China's pharmaceutical industry development status and development trends. Since the founding of the country, China's pharmaceutical industry has developed rapidly, especially in the past 20 years of reform and opening up, most pharmaceutical enterprises have been transformed or expanded, through the introduction of foreign advanced technology and equipment, and through their digestion, absorption and innovation, etc., to improve the overall level of technology and equipment of China's pharmaceutical industry, China's pharmaceutical industry in recent years to maintain to maintain high growth. With the rapid growth of China's macro economy, coupled with the increasing level of urbanization and an ageing population, it is expected that China's pharmaceutical industry will continue to maintain a high growth trend. At present, China's pharmaceutical enterprises in the "small two more three low" phenomenon, the scale of enterprises and multinational pharmaceutical giants generally small compared to the number of pharmaceutical companies, the number of pharmaceutical companies, homogeneous competition phenomenon is serious, while corporate efficiency is low, the key reason for these phenomena is that China's pharmaceutical enterprises innovation capacity is seriously inadequate, the lack of core competitive advantage. With the development in recent years, the innovation ability of Chinese pharmaceutical companies is still weak. The pharmaceutical app can integrate pharmaceutical information to improve the ability to collect drug information in China.

According to a national survey, about 80% of older people over 65 years of age suffer from chronic diseases such as heart disease, hypertension, arthritis or diabetes, and 35% of them suffer from 2 or more chronic diseases. Usually 80% of older people need medication, and about 25% of them take 4-6 medications at the same time, usually for a longer period of time.

Also, according to Australian statistics, 35 doses of anti-inflammatory analgesics are consumed per 1000 people per day, of which 36% are due to osteoarthritis and 42% to sprains or back pain, and about 35% of patients are aged >60 years. The use of large quantities of medication makes them vulnerable to pharmaceutical disasters. Wrong medication use is common among older people, with illegal prescriptions, unregulated medication and lack of appropriate monitoring causing adverse drug reactions in older people. Multiple chronic diseases, such as hypertension, diabetes and respiratory diseases, are often seen by several physicians at the same time, which can easily lead to over-prescription and duplication of medication. The current situation of medication use among the elderly in China shows that unscientific medication use, such as overuse, misuse, indiscriminate use and abuse, is more common. A patient is considered to be over medicated if he/she has 1 of the following the patient has one

or more diseases and is using too many drugs. The patient is given multiple medications, especially for the same disease, and multiple medications are mixed in one or more prescriptions. Use of medication for lack of obvious indications. Use of drugs to treat adverse reactions to other drugs. Factors contributing to overmedication i) Multiple chronic diseases. ii) Multiple physician consultations, especially specialist consultations. iii) Mixed prescribing of trade names and generic names. IV) Self-medication and over-the-counter treatment. V) Increased mobility of patients. (vi) Drug advertising. (vii) Difficulty for physicians to stop medication prescribed by another physician. (viii) Lack of medication endpoints and patients unable to assess whether to continue medication. IX) Failure to take medication as prescribed and to achieve therapeutic concentrations.

So it seems that using smartphones as a carrier and Android as a platform has good prospects for development, being more friendly in terms of economy and more convenient in terms of operation, and more operational for the general public. In addition to the fact that more and more elderly people are using their smartphones, the app will also remind them to take their medication together with their children, which will improve their compliance and deepen the bond between their children and the elderly.

The medication administration system adopts a design architecture with time as the vertical sequence and events as the horizontal sequence (including elements of medication administration activities, such as medication administration time, medication dosage, precautions, etc.). The cloud server is interfaced with the hospital's information system to obtain electronic prescriptions, get information on patients' medication taking, and with the medication database, automatically generate reminder messages on medication taking time, dosage, precautions, etc., which are pushed to the client in the patient's mobile phone. For hospitals that have not yet opened their HIS interfaces to the system, the electronic prescriptions printed by the hospital can be automatically recognized through optical character recognition technology.

When the patient first logs into the system, he or she enters his or her personal work and diet schedule, as well as information about his or her height, body mass and eating habits in relation to his or her medication dosage. The system automatically reminds the patient to take the medication at the correct time, records the patient's prescription and medication history, and establishes a database of patient medication information.

In summary, a series of questions and methods prove to us the feasibility of a medication app, which is a very good reminder not only for the elderly, but also for young people and children.

3. Implementation programme

3.1. Marketing strategy

3.1.1. Initial promotion

At present, across the board, and from a social perspective as a whole, as our population ages, a large number of health problems are bound to arise, and older people are more likely to forget about taking medication or misuse it resulting in their condition not being improved. After a survey, we understand that most elderly people have a low level of knowledge and education, so for the medication reminder app, we will first target local governments, township governments

and rural cooperatives that have close ties with the elderly, so that through their publicity and introduction, the government can better grasp the use of the medication reminder app by the elderly and facilitate our further promotion.

3.1.2. Medium-term development

Through the initial promotion and government publicity, we have been able to make the elderly have a better understanding of the medication reminder app, and through the use of the app, enable them to take their medication scientifically, promote healthy physical and mental development, and improve their condition, for which we have gained a group of loyal users. But at this point we can't let up even more, how to increase user dependency and attract more new users and further promote our product is our most pressing goal at this stage. To this end, we will expand our market and provide a more convenient service by explaining the app to seniors in various local areas through the government. At the same time, we will also explain to the elderly the importance of taking their medication in the right amount, so that they can understand the dangers of misusing or forgetting to take their medication, and further promote the features of our product so that they can use our app with confidence and safety once they are fully aware of it, and so that the users will become inertial, dependent and loyal.

3.1.3. Late development

After the initial promotion and mid-term development, there will be more users who understand our product and a larger market. To this end, we need to develop our app even further, upgrade and improve the app's functions and services, and further develop new features to enable the elderly to take their medication on time and at the same time reduce forgetfulness. At the same time, we will be liaising closely with the government to obtain more information on the problems of elderly people taking their medication on time, as well as further improving the medication reminder app through feedback and suggestions from our users.

3.2. Channel strategy

3.2.1. Online promotion

(1) Internet platforms. With the development of technology and the Internet, online shopping, online live streaming, Jitterbug, Racer, Weibo, Xiaohongshu and various other software have emerged, we can use the most popular and popular of these platforms at present to attract the masses through Jitterbug live streaming or shooting small videos. At the same time, we will open a WeChat public number and a Weibo public number for tweets to introduce our products, so that more people can understand our products and then use them.

(2) "Rural net celebrities". In this era of continuous development of the Internet, there are many people who have become net celebrities through platforms and the Internet, and many farmers have become "rural net celebrities" by live-streaming their goods. We can make full use of these "rural weblebrities" to promote our medication reminder app to the majority of farmers, and practice it to showcase the various functions of our app, so that the public can understand it and use it with confidence, gaining loyal customers and increasing the popularity of our products.

(3) Advertising. Advertise on major media platforms and major websites to raise awareness.

3.2.2. Off-line promotion

(1) Farmers' cooperatives. Get in touch with rural

cooperatives around the world for long-term cooperation, and introduce our app to the majority of farmers through rural cooperatives, which will not only allow the elderly to use their medication in a better scientific way.

(2) Government departments. By contacting local governments to promote this app to local farmers, the elderly can not only use their medication correctly and rationally, but also facilitate government regulation.

(3) Seniors. We can reach out to the elderly to understand their awareness of the medication reminder app, and then introduce our medication reminder app to them, as well as its various functions and convenience and practicality, and at the same time, we will demonstrate it on site so that the majority of the elderly can use the app with peace of mind.

3.2.3. Branding strategy

To develop your own products, you need to have your own brand and to be deeply rooted in the market. From the aspect of domestic and international markets, the development of each good product is inseparable from its own brand, if in a short period of time it can make its own product brand, then it can lay a good foundation for future development.

Developing a brand is no easy task in this era of advanced technology and fierce market competition to gain a foothold in your own brand. We have to take the path of brand development and add non-easy things by optimising and upgrading our app. We have to take the road of brand development, by optimising and upgrading our app, adding a variety of features to enable users to apply it easily and effectively, and doing a good job of pre-sales, in-sales and after-sales services to build our own brand and gain customers.

3.2.4. Raising brand awareness

Quality is the cornerstone of a brand. Through brand marketing, multi-faceted publicity, to enable more people to understand our products, and thus better build the brand, before creating a good brand we should do a good job of optimizing the functions of the product, so that our app has good quality, to gain the trust of the public, and thus enhance the visibility of the product.

3.2.5. Sales services

In the road of product development and promotion, we should do a good job in this aspect of the customer, establish adhere to the establishment of a sound sales and service network to provide customers with sound and quality service.

(1) Pre-sales services. Through publicity, communication and training, we promote the app to a wide range of farmers so that customers can understand the functions of the app and receive on-site guidance on how to use and introduce the usefulness of each function.

(2) In-sales service. Establish a perfect sales network, so that the majority of customers can pinpoint, find the service website, raise their queries, and we will respond quickly to meet their needs.

(3) After-sales service. The establishment of information feedback channels, the majority of users can make their own suggestions and feedback on product quality, our services, etc., we will further improve and optimize their products and enhance our services according to the suggestions.

4. Risk Forecasting and Risk Control

4.1. Market uncertainty risk

4.1.1. Risk assessment

(1) There has been greater development in recent years in

the use of emerging technologies such as big data and the Internet of Things to help analyse people's health, but the lack of understanding that people are sceptical about taking medication reminder apps may result in the marketing sector having an inaccurate grasp of the consumer demand landscape and its changes;

(2) Inadequate analysis and forecasting of the consumer market in the process of capturing market share and app promotion, inability to collect the most effective information to make accurate offers on the market situation in the first place, inappropriate publicity methods and uncertainty about the time of acceptance of new products and market capacity, and lack of effective marketing tools can all have a negative impact on the company's products;

(3) In a developed market economy, the existence of sector competitors' every move has an impact on our marketing activities and the formulation of our business strategies, and many companies are now adjusting their prices more frequently with a view to combating competitors and grabbing more market share, and the company is always under threat from competitors;

(4) The sensitivity of the Company's products to price may be important in causing adverse changes in product prices to cause losses to the Company. At the early stage of the products' entry into the market, customers are not loyal to the products enough to attract target customers to make purchases, and there may be situations where product sales are low and profits are low when the business first starts.

4.1.2. Circumvention

(1) the company to strengthen product promotion in the early stage, combining online and offline two ways to expand the influence, on the basis of continuous improvement of marketing strategies, improve the competitiveness of comprehensive services, so that the majority of app users to further understanding of our products, from the concept of acceptance of our products;

(2) Implement whole process customer relationship management, maintain close contact and regular communication with the government, agricultural regulatory authorities and large farmers, maintain efficient analysis of new needs of users of the medication reminder app and adjust products according to users' wishes, thereby striving to improve customer satisfaction and loyalty.

(3) On the basis of a full market survey of competitors' product prices and consumers' ability to accept prices, based on which the product prices are reasonably set. Understand the strengths and weaknesses of competitors and marketing model, to know yourself and your competitors, and then take appropriate preventive measures against competitors' decisions.

4.2. Technical risks

4.2.1. Risk assessment:

(1) Risk of technical talent loss, where core technical talent jumps ship or is enticed, resulting in stagnation or loss of core technical achievements;

(2) The risk of failure of the company's product development, as an independent and autonomous innovation and entrepreneurial team, the large amount of funds invested in technology development may lead to ineffective use of funds and stagnation or failure of the technology due to the development progress not keeping up with the development plan;

(3) the risk of technological backwardness, where similar

more technologically advanced and efficient medication taking reminder apps may appear in the market to compete with us, which could result in the loss of market for our products if the other products perform better and are more cost effective;

(4) The subsequent maintenance of the medication reminder app requires mature technical support, we belong to the primary stage of entrepreneurship, and the imperfection of various technologies will bring related problems;

(5) platform network and information security risks: the company platform operation process may be subject to network attacks and information stolen resulting in the risk of theft of core technology;

(6) Platform operation sustainability risk: whether the company's platform is built to meet market demand and whether it can run in the long term directly affects the development of the company.

4.2.2. Circumvention:

(1) Create a good team ethos and culture, advocate that we all integrate our personal values with those of the team, develop a sense of team responsibility, and adopt a variety of incentives to retain technical staff as much as possible while attracting other new technical talent;

(2) Systematic management of the process of new product development activities, strengthening of product development information security work and market research work for new product development;

(3) Selecting the appropriate time to enter the market for new products and reducing the market risk of new product development by, for example, cooperating with other companies in new product development;

(4) The platform is well-designed and detailed, the security system is perfect, the core development of the platform is developed independently in chunks, the core technical documents are separated and kept by separate persons, and the person responsible for keeping them signs a confidentiality agreement with legal effect, in order to dispel the user's concerns about information security;

(5) The Technology Department and the Marketing Department maintain close communication and keep an eye on market trends, while making reasonable use of funds to continuously develop and innovate technology to ensure that product technology remains at the forefront of the market;

(6) The company should train a group of network security personnel with high technology, and from the consideration of the equipment environment, our company will configure a higher server environment, so as to better protect the security of the company's data.

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