

# Design and Implementation of Chronic Disease Management Platform Based on WeChat Applet

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## Abstract

**Objective:** Design and develop a platform to meet the needs of tracking, follow-up and management of patients with chronic diseases in the hospital, realize the information management of chronic diseases in the hospital, and improve the level of monitoring and management of chronic diseases in the hospital. **Methods:** Taking the People's Hospital of Hainan Province as the research background, relying on the Internet, and making full use of WeChat miniprogram technology, an integrated chronic disease information management platform is established, which includes the chronic patient management information system, the chronic disease medical and nursing management system, and patient intelligent service application system. **Results:** The implementation and application of the platform not only provides high-quality and convenient medical and health services for patients with chronic diseases, but also improves the quality and efficiency of follow-up work of chronic diseases in the hospital, and provides strong data support for the hospital's medical, teaching and research.

## Keywords

WeChat Mini Program, Chronic Disease Management Platform, Follow-Up, Chronic Disease Monitoring

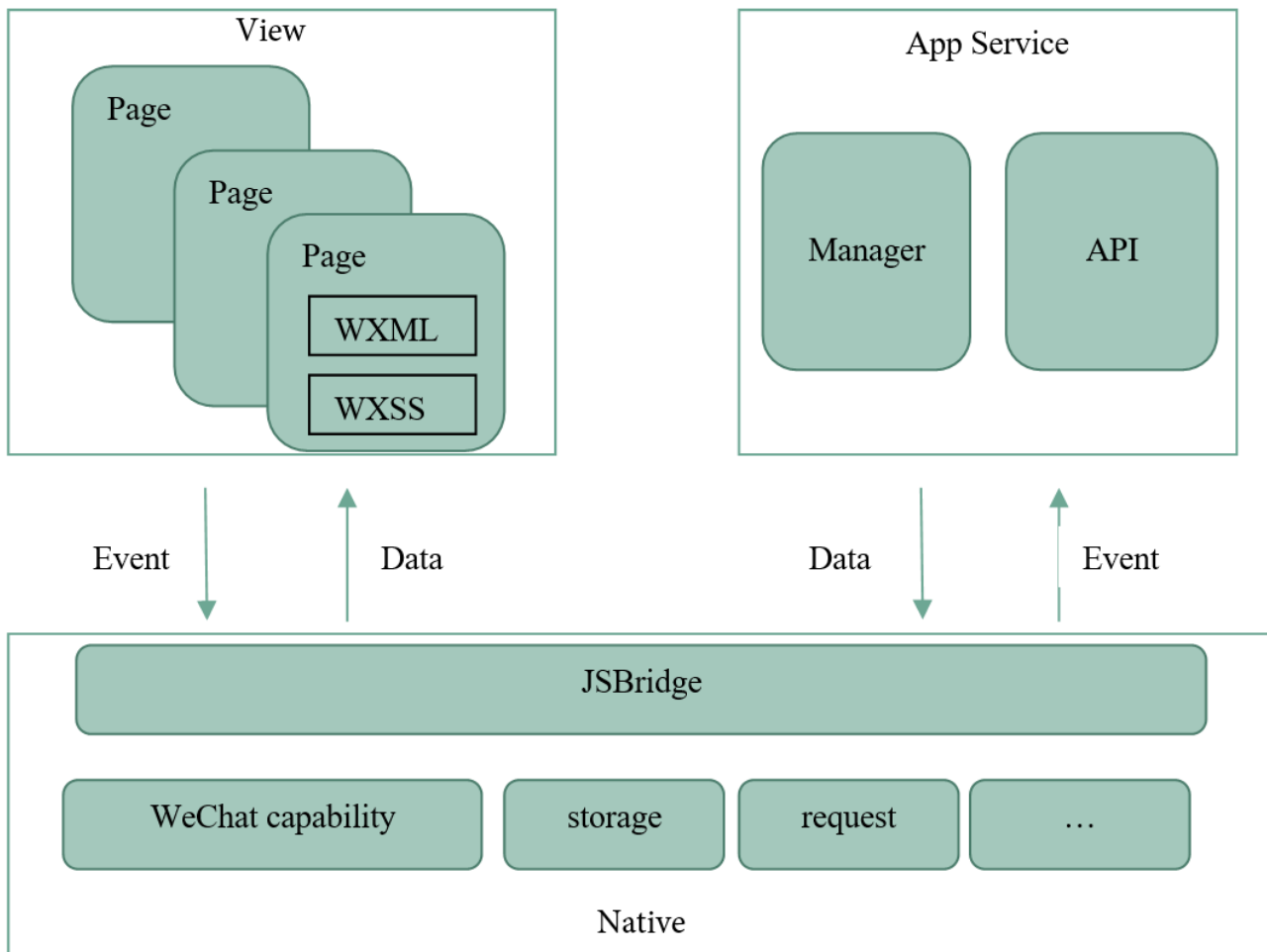
## 1. Introduction

At present, chronic non-communicable diseases (hereinafter referred to as "chronic diseases") become a serious global public health problem that seriously threatens human health, and are also the main cause of human death and disabil-

ity. There are about 260 million with chronic diseases in China, and the number of deaths due to chronic diseases accounts for 86.6% of the total number of deaths, and the burden diseases caused by chronic diseases accounts for 70% of the total burden of diseases, which is also the leading cause of death and disease burden in China [1] At present, with the deep development of national chronic disease prevention and control work and the development of community health service work in various places, there is an urgent need to a chronic disease follow-up management system to achieve reliable, accurate and rapid management of chronic disease prevention and control work. Follow-up management is a long-term process, for patients with chronic diseases. With the development of follow-up work, the number of patients is getting larger and larger, and patients with different diseases may need different diagnosis treatment, laboratory tests, and follow-up requirements, which is convenient for managers and clinicians to manage chronic diseases and conduct scientific research. Therefore, the construction of hospital chronic management information platform, which realizes the mutual connection and effective integration of inpatient electronic medical record system and outpatient system, is an important technical support means for the development of disease follow-up work.

The First People's Hospital of Hainan Province is the largest comprehensive third-class A hospital in the province. In the process of creating a-class business environment for Hainan Free Trade Port, our hospital is making full use of Internet technology combined with chronic disease follow-up work, establishing a chronic disease management for the hospital, promoting the application of online follow-up, disease management, health management and other network services, and making full use of information technology to enrich chronic disease follow-up and management, and providing high-quality and convenient medical and health services for residents of Hainan Province and patients with chronic diseases who come to Hainan tourism and recuperation.

**Technical Architecture of Chronic Disease Management Platform** The chronic disease management platform is built for medical staff, constructing an integrated service system from screening, early warning and intervention, providing continuous and effective, more valuable diagnosis and diagnosis information and reference information for chronic disease management, facilitating the tracking and management of patients, and assisting doctors in decision-making; and pushing health education information, chronic disease early warning information and self-management rehabilitation programs to patients and their families. The chronic disease platform should adopt a unified, standard and secure information architecture. Fully considering the development needs and application characteristics of "Internet Medical Health", we adopted a microservice based on WeChat Mini Program as the technical framework, which realized the minimization of chronic disease management business and flexible combination, so as to meet the needs of different in different scenarios, and ensure the purpose of sustainable and stable expansion of the architecture [2]. Its overall technical architecture is shown in **Figure 1**.



**Figure 1.** The technical framework of the chronic disease management platform.

WeChat Mini-Program is an application that can be used without downloading and installing. It realizes the “touching the application” and users can open it by scanning or searching. It has strong extensibility. The framework of WeChat Mini-Program contains parts: View page view layer and App Service logic layer. The View layer is used to render the page structure, and the AppService layer is used for logic processing, requests, and interface calls. They run in two processes (two Webviews). The view layer uses WebView to render, and the logic layer uses JSCore to. The view layer and the logic layer communicate through the system layer’s JSBridge. The logic layer notifies the view layer of data changes, triggering the view layer to the page, and the view layer notifies the logic layer of the triggered events for business processing [3]. The View page view layer is written by WXML and WX, and is displayed by components. It reflects the data of the logic layer into the view, and sends the events of the view layer to the logic layer. W supports data binding, supports logical arithmetic, operations, supports template references, and supports adding events. The WXML compiler converts WXML files into JS execution scripts. WX supports most CSS features, and the size unit Rpx can be automatically adapted according to the screen width. The @import statement can

be used to import external style sheets. The WXSS compiler converts WXSS files into JS execution scripts. App Service (logic layer) can be understood as the H5 page, which provides UI rendering, the underlying layer provides a WWeb-view.js to provide underlying functions, and to encapsulate message communication, and to encapsulate the log component Reporter. The API under WX object processes the methods related to UI display, and realizes the registration of small program components and the triggering of page events through the Virtual DOM.

## **2. Functional Design the Chronic Disease Management Platform**

The chronic disease management platform is divided into three parts: the chronic disease patient management system, the chronic disease medical staff management system, and patient intelligent service application system:

### **2.1. Chronic Disease Patient Management System**

The chronic disease patient management system mainly realizes the following functions:

1) Chronic disease health management: With the patient's main index as the clue, the system obtains various diagnosis and treatment and rehabilitation related data of the patient, so that the clinical data of patient can be presented to the medical staff in a complete and unified way. The data content supports multimedia data formats such as text, images, and videos. At the time, using a variety of technical means, it provides powerful data retrieval and other personalized comprehensive inquiries, personalized index data trend analysis, data export and other functions for the original clinical data, converting data into information, so that the department doctors can fully master and use the relevant data [4].

2) Specialty case identification: By setting identification of specialty cases, patients are classified and identified according to different chronic diseases, as well as complications and treatment plans, and at the same time, combined with the of clinical research, a patient can be attributed to multiple categories, and the target sample for clinical specialty data collection is selected

3) Follow-up tracking management of chronic diseases: Establish a follow-up system for chronic disease patients, and the follow-up registration, follow-up reminders, and tracking of chronic disease management cycle data. Track the intervention items of patients, such as the changes in blood sugar of patients, changes in diet, exercise, psychological stress, lifestyle, etc., record relevant tracking data, and users can provide health education, regular follow-up, and reminder to patients in this process.

4) Chronic disease management: Support the management of diseases such as hypertension, diabetes, obesity, hyperlipidemia, coronary heart disease and stroke. Chronic disease management is mainly classified according to the type of disease, and targeted and customized management plans are provided for different chronic disease patients. Management plans formulated according to the spe-

cific conditions of patients, and health intervention is carried out for patients after the management plan is generated. Track the intervention, summarize and evaluate the health of patients, and then carry out a new round of management.

5) Closed-loop management of medical history: Through characteristic medical history management, record the first diagnosis information condition records, treatment plans, and special examinations of patients who meet the requirements. On the one hand, it is to grasp the progress of patients' diagnosis and treatment and provide monitoring of the quality of diagnosis and treatment; on the other hand, it can continuously track and evaluate the actual treatment effect of the diagnosis and treatment plan, use information technology to achieve the continuous diagnosis and treatment of specialized patients, and achieve the closed-loop treatment cycle management of chronic diseases. By constantly optimizing the treatment plan, treatment level is improved.

6) Statistical management and other functions: Carry out statistical management of the management and intervention work and results of chronic disease patients.

## 2.2. Disease Medical Care Management System

The chronic disease medical care management system mainly realizes the following functions:

1) Patient management: Add patients through scanning QR codes and other, and manage patients in groups. Patients who come to the hospital for treatment will generate patient files, and doctors with corresponding permissions can collect patients to achieve continuous management of after discharge. You can set personalized follow-up and health education tasks for patients, and you can also set personalized schedule reminders; achieve consultation and communication through telephone, voice and mobile messages from the medical staff end; achieve the management of external medical and health data of patients, such as laboratory tests, pathological reports, etc., by taking and entering them [5].

2) Medical record discussion: Medical staff with the authority to view patients' medical records can share the medical records authorized by patients with other doctors or peers, and achieve functions such as medical record analysis and academic discussion [6].

3) Doctor-patient interaction: Medical staff can provide online consultation services for patients, the formulated follow-up questionnaires and health education to their own patients, effectively improve the efficiency of doctor-patient communication, and reduce communication barriers

4) Medical record inquiry: Medical staff view patients' in-hospital diagnosis and treatment information, physical examination, hospitalization records, examination and inspection reports, etc., under the authorization of patients.

5) Chronic disease knowledge base: By integrating and classifying common complications, data, case data, diagnosis data, and treatment plans related to chronic diseases, the system establishes a knowledge base graph with basic disease symptoms as nodes, and different types data are interrelated.

6) Decision support application: The system provides medical staff with information such as recommended medications, medication standards, adverse reactions, recommended dosages, rehabilitation plan development, to assist medical staff in developing appropriate diagnosis and treatment and rehabilitation intervention plans for patients in different situations.

### 2.3. Patient Smart Service Application System

This system provides users with smart service applications for the whole process of chronic disease from appointment, diagnosis, treatment, to rehabilitation, and precisely customizes personalized service plans for, diagnosis, and treatment (see Figure 2). The main functions include:

1) Personal physical sign data monitoring: By connecting with various wearable devices and nursing equipment, the system records the patients' temperature, pulse, respiration, blood pressure, blood sugar, and other indicators, and then intelligently evaluates these indicators. At the same time, colors are set for early warning reminders, such as green for normal, orange for secondary alarm, which needs to be paid attention to; red for primary alarm, which to be highly valued or dealt with in time. Medical staff can also view patients' data information in time.

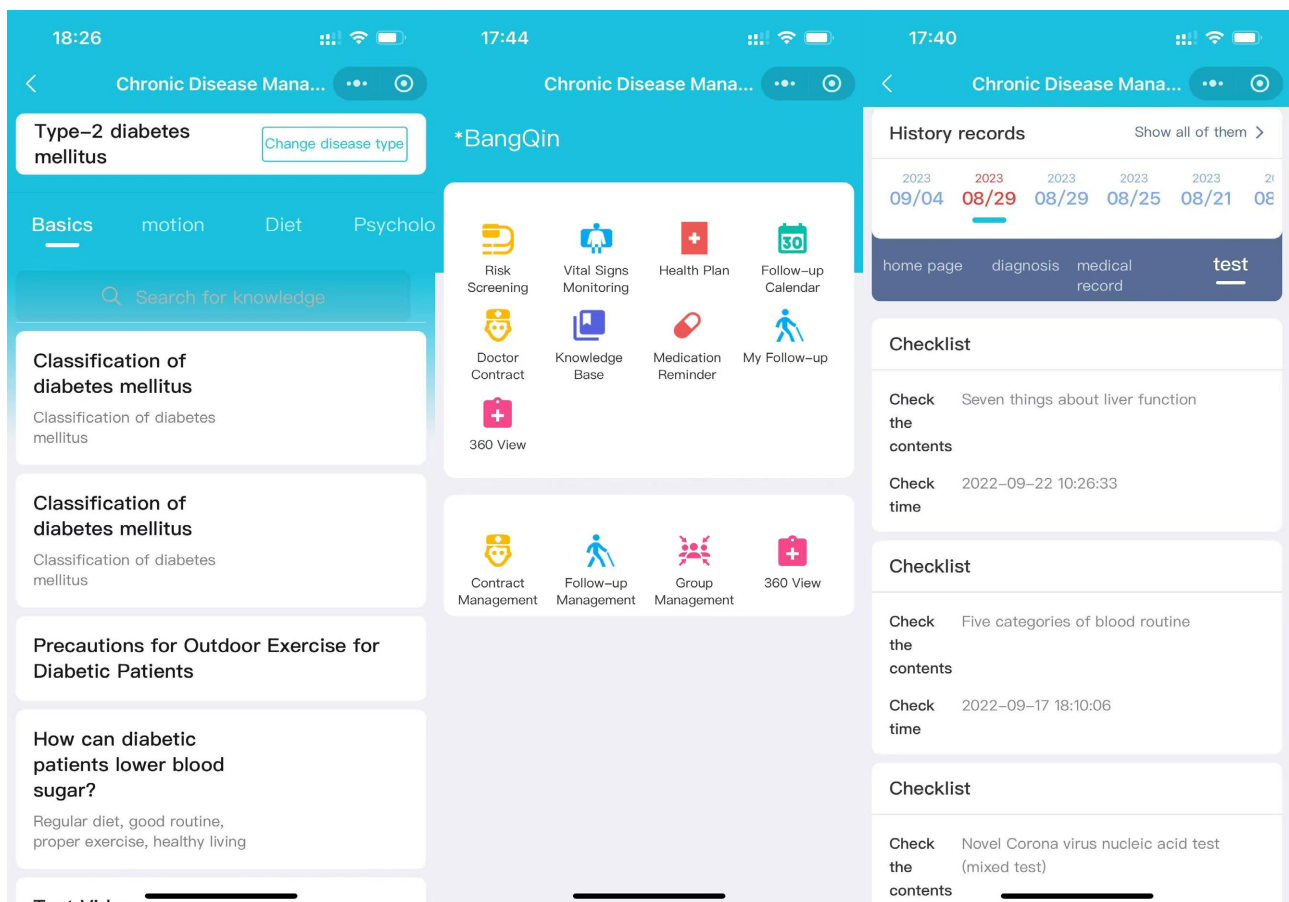


Figure 2. Screenshot of the interface of the chronic disease management platform.

2) Follow-up plan execution: Doctors establish follow-up based on personal experience and follow-up plans provided by the intelligent analysis platform, and regularly remind patients to execute the follow-up plans, such as medication reminders, exercise reminders and diet recommendations.

3) Internet diagnosis and treatment: Patients can make an appointment with their attending doctor for a follow-up visit at any time during the follow-up process. Through the Internet medical method, patients can communicate with their attending doctor at home, and the attending doctor arranges further guidance, examination, prescription, drug delivery, or of the follow-up plan according to the follow-up situation.

4) Health education: The system regularly and timely pushes health knowledge, dietary reminders, and other health knowledge, and patients complete better rehabilitation treatment through self-learning.

5) Patient smart service: Provide patients with offline and online full-process smart medical services, including appointment, payment, inquiry of examination and inspection reports, inquiry of imaging reports, inquiry of electronic medical records, recharge of hospital prepayment, and inquiry of hospitalization list etc.

### **3. Conclusion**

By constructing the “Internet Chronic Disease” platform, the traditional low-efficiency, irregular, and rough offline chronic disease model is transformed into a new model of efficient, standardized, and refined online chronic disease health management services. By screening patients into management groups, setting health goals, management, and follow-up plans, and conducting phased follow-ups and lifestyle health interventions, patients can accurately receive health tasks, follow-up surveys, and educational knowledge issued by doctors the hospital, and conscientiously implement them. Doctors can also interview them face-to-face during outpatient visits, record their health conditions, and finally analyze the management effectiveness on goal comparison and health statistics, achieving a virtuous cycle of management. The chronic disease management platform can establish a set of perfect hierarchical diagnosis and treatment management system based general practitioners, family doctors, and doctor assistants through retrospective analysis and research and prospective diagnosis and treatment exploration, which can better benefit the vast number of chronic disease patients.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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