# HOSPITAL MANAGEMENT SYSTEM

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**ABSTRACT**

The increasing demand for medical services not only leads to an uneven distribution of medical resources, but also intensifies the management burden within hospitals, affecting the efficiency of patient treatment and the quality of medical care. To address this critical issue, we have developed a website-based hospital management system, aiming to establish an information bridge among patients, doctors, and hospital managers, and to achieve efficient scheduling of medical resources and intelligent management of service processes(Ragaupathy & Mittal).

This system is designed for all hospital staff and patients. It has specifically taken into account the usage habits and operational convenience of doctors, nurses, managers and patients. The system is accessed through a web platform and does not require the installation of additional applications, thereby enhancing compatibility and usability. Its main functions include patient registration, doctor scheduling, and electronic medical record management, helping hospitals achieve digital office operations.

To achieve these goals, our website adopts a simple and intuitive user interface, and through role-based permission division, ensures that different users can quickly complete the required operations. The system also supports real-time data synchronization and secure backup, guaranteeing the integrity and confidentiality of medical information.

This system not only enhances the operational efficiency within the hospital, but also provides patients with a faster and more transparent medical experience. It is a promising start for promoting the development of smart healthcare. To a certain extent, it will improve the current situation of public medical services and drive the digital transformation of the medical industry(De Carvalho et al. 2017).

## INTRODUCTION

We must recognize that the efficiency of hospital management is of great significance in ensuring people's health and promoting social medical equity. With the intensification of population aging, the increase of chronic diseases, and the frequent occurrence of public health emergencies, the global medical system is facing unprecedented challenges. Therefore, enhancing the intelligence and informatization level of hospital management has become one of the core issues in the reform of the global public health system(López Martínez et al. 2023).

On a global scale, issues such as uneven medical resource allocation, long waiting times at hospitals, and excessive workload for doctors have seriously affected patients' medical experiences and treatment quality. Especially in developing countries, the backward basic medical facilities and inefficient manual management methods with high error rates have further eroded public trust in the medical system. Even in developed countries, complex hospital operation processes and information silos still persist.

The United Nations, in its "2030 Agenda for Sustainable Development", clearly states that it is necessary to achieve universal health coverage (UHC) and enhance the accessibility and efficiency of medical services. To achieve this goal, all countries should actively promote the digital transformation of healthcare, strengthen the functional construction and application promotion of hospital management systems, and ensure the transparency, fairness and efficiency of medical services.

The World Health Organization (WHO) and the United Nations Development Programme (UNDP) are guiding countries to carry out modernization reforms of their health systems, aiming to establish a more sustainable and inclusive medical ecosystem.

Currently, many countries and regions are attempting to build hospital management systems based on network platforms in order to address multiple chronic problems in traditional hospital operations.

The hospital management system integrates multiple modules such as patient registration, electronic medical records, doctor scheduling, etc. of the hospital, achieving centralized information management, automated processes, and optimal allocation of resources. This not only helps to enhance the efficiency of medical services, but also effectively avoids phenomena such as duplicate examinations and loss of medical records.

However, in reality, many hospital information systems suffer from problems such as poor collaboration capabilities, restricted data sharing, and poor user experience. Some hospitals still rely on manual operations, with fragmented systems that are difficult to respond promptly to the actual needs of patients and doctors, resulting in waste of human resources, management chaos, and dissatisfaction among patients.

Meanwhile, the large number of patients also place higher demands on the stability and scalability of the hospital's operation system. If the system experiences delays or failures, it may result in failed registration, disrupted shift scheduling, and incorrect drug distribution, thereby affecting the safety of patients' lives and the reputation of the hospital(Junaid et al. 2022).

Therefore, developing an efficient, intelligent, stable and user-friendly hospital management website system has become a crucial factor in enhancing the overall medical service level. Such a system will not only serve the hospital's internal management staff and medical staff, but also provide patients with a complete medical experience through a convenient network interface, thereby promoting the realization of medical equity and public health goals.

## RESEARCH METHODOLOGY

This project aims to design a hospital management system that is suitable for all users, ensuring that the system is inclusive and has wide usability. The system will focus on

optimizing the coordination and scheduling of various resources within the hospital (such as doctor schedules, patient information, etc.) to enhance overall operational efficiency and reduce management costs and patient waiting times.

The main target users of this system include doctors, nurses, hospital administrators and patients. Doctors and nurses will use this system to manage patients and arrange treatments. Administrators can use the system to view patients' past medical records, issue prescriptions and record their conditions. Patients can also use the web interface to make appointments, check their medical records, and obtain medication guidance.

To achieve the aforementioned goals, this project adopts a website-based development approach, using common Web development technologies such as HTML, CSS, JavaScript, PHP and MySQL. It has excellent maintainability and scalability. This development method not only meets the access requirements of different terminal devices, but also ensures the stable operation of the system and provides a good user experience.

By integrating user role requirements, function module division and technology tool selection, the approach of this project ensures that the system can effectively meet the actual usage scenarios of various users, while promoting the informatization construction of the hospital and enhancing the intelligence level and overall efficiency of medical services.



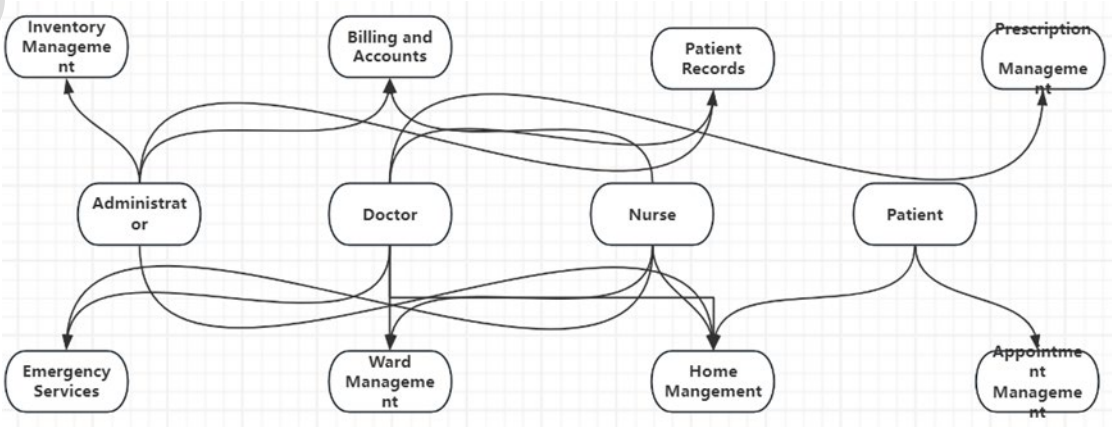


Figure 1. 1 Develop System Flow Chart

Figure 1. 2 is the requirement diagram that we clarified during the requirements analysis stage. We need to clearly understand the actual requirements of the system users, including the input of patient information, the appointment and registration function, the doctor scheduling management, and other core modules. By referring to relevant materials and having in-depth communication with potential users such as doctors, nurses, and hospital managers, we can more accurately grasp the expectations and actual usage scenarios of the users, thereby further improving the requirements list.

When the system requirements are clearly defined and confirmed, the next step is the system design stage. During this stage, the overall architecture of the system needs to be formulated, and the functions of each module as well as the interaction logic among them need to be defined. At the same time, database design is required, where the types of data to be stored and the relationships between the data need to be determined, such as the association between patient basic information and registration records, and between doctors and shift schedules(Sikiru & Oyekunle 2021).

During the implementation phase, we will write the code based on the system design, following unified programming standards and best development practices to ensure the quality and maintainability of the system code. At the same time, we also need to pay attention to the performance of the system in different devices and usage scenarios, ensuring that it can still run stably under high concurrent access and data-intensive operations.

Testing holds an indispensable and crucial position in the software development life cycle, ensuring that the system meets the expected functional and quality requirements. The testing phase consists of multiple levels: unit testing is used to verify the basic logic of each functional module to ensure correctness and detect problems as early as possible; integration testing checks the interface interactions between each module to identify potential coordination issues; system testing simulates the actual hospital operating environment to conduct a comprehensive validation of the entire system; user acceptance testing is conducted by actual users to ensure the usability and practicality of the system in real scenarios. Through these rigorous testing processes,

potential problems can be identified and fixed to the greatest extent, enhancing the stability, reliability, and user satisfaction of the system.

After the system is launched, continuous maintenance work is still required, including operation monitoring, fault troubleshooting, function optimization and development of new requirements, to ensure that the system remains efficient and stable throughout its long-term operation and can continuously adapt to the actual needs of hospital operation management. Through these five stages, we can build a stable, practical and user-friendly hospital management website system. During actual operation, we will also continuously iterate and optimize based on user feedback to make the system increasingly perfect and provide better medical management services.

## RESULTS AND DISCUSSIONS

### a. Result

#### i. System Function Testing

The system has undergone comprehensive functional testing for all core functional modules, including user registration, patient information management, appointment scheduling, doctor shift arrangement, etc. The test results show that the system functions well and no serious functional errors were found during the testing process. All user roles (such as doctors, patients, administrators) can successfully complete their respective operational tasks, verifying the good integration and stability between the user interface and the backend logic.

#### ii. User Interface (UI) Testing

The user interface has undergone usability, intuitiveness and accessibility evaluations. Test users have reported that the interface design is clear, the operation logic conforms to usage habits, and the navigation path is clear. The interface follows modern UI design principles and can provide a good user experience on various terminals such as desktop computers, laptops and smartphones(Kim 2024).

**iii. Performance testing**

To evaluate the system's response capability and stability under different load conditions, performance tests were conducted. The system performed stably under the condition of concurrent access by multiple users. The page loading speed and operation response time remained within the acceptable range. Users were able to complete operations such as login, reservation, and information query smoothly, without any obvious lag or delay, and the operation was smooth.

**iv. Safety testing**

The security test confirmed that the system has implemented a multi-level identity verification mechanism and data encryption technology, which can effectively safeguard the security of user information.

**b. Discussion**

**i. System Efficiency**

The results of functional and performance tests indicate that the hospital management system operates efficiently in areas such as patient information management and appointment registration. The automated processing procedures in the system, such as doctor scheduling and patient appointment matching, have significantly improved the operational efficiency of the hospital, reduced the error rate of manual operations, and enhanced the overall service quality.

**ii. User Feedback**

The overall user feedback is positive. Many doctors and patients have expressed that the system is easy to operate and has a clear interface. Especially the appointment registration and examination result query functions have significantly improved the visiting experience. Based on user suggestions, the system can further optimize the mobile interface and strengthen the notification reminder function to better meet the actual needs of users.

### iii. Impact on Hospital Operations

This system has achieved remarkable results in optimizing hospital management and service processes. By centrally managing patient information, automatically generating statistical reports, and supporting multi-departmental collaborative work, it significantly reduced the workload of medical staff and improved the efficiency of hospital resource utilization. Additionally, the electronic management also reduced the use of paper documents, contributing to environmental protection and modernization.

### iv. Future Optimization Direction

The future version plans to further enhance the security and data backup functions of the system to ensure the safety of sensitive medical data. It will also consider adding functions such as automatic reminder of drug inventory, online payment, and remote video consultation to improve the practicality and coverage of the system. Additionally, the system will gradually expand its support for multi-language capabilities to facilitate the use by hospitals in different regions.

Table 1. 1 Compatibility Test Sheet

| ID | Requirement | Description | Result |
|---|---|---|---|
| C001 | Browser compatibility | The system should function properly on mainstream browsers (such as Chrome, Firefox, Edge, Safari, etc.) | Pass |
| C002 | Operating System Compatibility | The system should be able to operate normally on various operating systems (such as Windows, macOS, Linux, etc.) | Pass |
| C003 | Device Compatibility | The system should be able to operate normally on various devices (such as desktop computers, laptops, tablets, mobile phones, etc.) | Pass |
| C004 | Network Compatibility | The system should be able to function properly in various network environments (such as wired, WiFi, 4G, 5G, etc.) | Pass |

Table 1.1 presents the results of the compatibility testing, which is a type of software testing aimed at ensuring that the software system can operate normally in different environments. These environments include operating systems, hardware configurations, network environments, browsers, databases, etc. The main purpose of compatibility testing is to ensure that the software has good compatibility with other systems or components, maintaining stable functional performance under various conditions and

avoiding functional failures or performance degradation due to environmental changes(Li et al. 2022).

Table 1. 2 Usability test form

| ID | Question | Description | Score |
|---|---|---|---|
| U001 | Is the registration and login process convenient? | Does the user manage to complete the registration and login successfully and enter the system smoothly? | 92/100 |
| U002 | Is the main function easy to find and operate? | Are functions such as patient management, appointment registration, and fee settlement easy to use? | 88/100 |
| U003 | Does the system provide clear guidance and assistance information? | Are there clear prompts or explanations of help when users encounter problems? | 85/100 |
| U004 | Is the user interface aesthetically pleasing and clear? | Are the visual effects such as layout, color scheme, and font size comfortable and professional? | 87/100 |
| U005 | Is the system response quick and stable? | Includes system page loading speed, data submission speed, and overall interaction smoothness | 90/100 |

Figure 1.2 presents the results of the usability test. Usability testing is a method that assesses the usability of software products or systems by observing real users interacting with the system. Its goal is to identify the problems users encounter during use and promptly address them, thereby enhancing the user experience and satisfaction of the system.

The usability test of this system is evaluated based on several key dimensions, including the ease of registration and login, the ease of use of the main functions, the clarity of system prompts, the aesthetics of the user interface, and the smoothness of system operation.

## CONCLUSION

Through a comprehensive inspection and testing of the hospital management system, we can draw the conclusion that this system performs well in all key parameters and can operate stably as expected.

The system successfully achieved the preset core functions, providing users with practical tools such as effective patient management and appointment registration,

helping users complete hospital management-related operations efficiently(Brommeyer et al. 2023).

Although the system performed well in the tests, there is still room for improvement. In the future, it is necessary to combine user feedback and continuous testing to continuously improve the system functions, ensuring that key modules such as the addition, editing, saving and querying of patient information are more smooth and stable during use. At the same time, the user experience should also be continuously optimized to make the system more in line with actual usage needs and improve overall satisfaction and operational efficiency(Bazel et al. 2022).

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