Javaweb Construction of the Management Information System for Township Health Centers under the Technology

Hongmei Cao[1], Zunliang Dai[2]

70218413@qq.com[1], 13791580506@163.com[2]

Township Health Center of Yuandongtou Town, Yishui County, Linyi City, Shandong Province, China[1]
County Party Committee Publicity Department of Yishui, Linyi City, Shandong Province, China[2]

Abstract: Recently, the state attaches great importance to the development of primary medical undertakings, and it is urgent to develop the management information system suitable for township health centers. This study uses Javaweb technology to design and realize the management information system for township health centers. The system integrates the three modules of outpatient service, pharmacy and medical expenses, collects and processes medical information, diagnosis content, medication data, as well as scientific network sharing mechanism, simplifies the management process and improves service efficiency and quality. The system has been piloted in a number of county-level township health centers, obtaining a good user experience and proving its practicality. In the future, we will continue to optimize the iterative system and develop mobile modules to better meet the needs of the information construction of basic hospitals.

Keywords: township health center; information management system; Javaweb technology; information construction

1. Introduction

At present, China's township hospitals are the main force of providing rural primary medical services, and shoulder the responsibility of providing basic medical and health services for the majority of rural residents. However, for a long time, the chaotic management of township hospitals, lack of resources, lack of service capacity and other problems have seriously restricted the improvement of rural medical level. The core reason lies in the lack of information support, resulting in low efficiency and error-prone. Therefore, the development of information management system suitable for township health centers and the standardization and standardization of the management process is of great significance for improving the service quality and work efficiency, promoting the development of township health centers and improving the medical experience of rural residents. This system is designed and developed under this background, and its goal is to solve the outstanding problems in the process of management and service of township health centers through the means of information and automation, so as to promote their overall development.

ICMEIM 2023, September 08-10, Wuhan, People's Republic of China

DOI 10.4108/eai.8-9-2023.2340067

2. Overall design of the system

2.1 Technical framework

The system is developed by using the mainstream Javaweb technology framework SSM (Spring + SpringMVC + Mybatis).

(1) Performance layer: SpringMVC, which is based on MVC design mode, can clearly divide the controller, model, view and other modules, to realize the decoupling of request and response[1]. (2) Business layer: Using the Spring framework, its IoC and AOP features can realize the flexible configuration of business objects and the modularization of business logic[2]. (3) Data access layer: Using the Mybatis framework, which is a powerful object relationship mapper that can flexibly configure SQL statements to map interfaces and Java objects into records in the database[3]. (4) Other technologies: Bootstrap framework is selected for front-end pages; MySQL for database and Tomcat for servers[4].

2.2 Functional module design

This system mainly designs three functional modules: outpatient management, pharmacy management and medical expense management.

(1) Outpatient management module: realize the functions of registration, medical treatment, prescription and so on, mainly involving the design of patient information form, doctor information table, diagnosis information table and other databases. This module mainly realizes the electronic and information management of the outpatient process. It mainly includes patient information management, doctor station, registration and settlement and other functions[5]. For patients, information input query, self-service registration and other operations can be carried out. For doctors, you can view patient information, make a diagnosis, and prescribe it[6]. This design simplifies the tedious manual work in the past and avoids the errors caused by manual operation. The following is the design table1 and table2 of the outpatient management module database:

Table 1 Patient Information Table

field name	data type	restrain	description
patient ID	int	PRIMARYKEY, AUTO_INCREMENT	Unique identification of the patient
surname and personal name	varchar(10)		The patient's name
sex	varchar(2)		The gender of the patient
age	int		The age of the patient
ID number	char(18)		The ID number of the patient
contact number	char(11)		The patient's phone number
HA	varchar(50)		The patient's home address

Table 2 Doctor Information Table

field name	data type	restrain	description
doctor ID	int	PRIMARYKEY, AUTO_INCREMENT	Unique identification of the physician
surname and personal name	varchar(10)		The doctor's name
sex	varchar(2)		The doctor's gender
professional ranks and titles	varchar(10)		A doctor's title
administrative or technical offices	varchar(20)		The doctor's department

(2)The pharmacy management module implements functions such as drug warehousing, sales management, and inventory inquiry, mainly involving database design of drug information tables, drug inbound and outbound tables, and drug inventory tables [7]. This module mainly realizes centralized management of drug data and pharmaceutical work electronization and informatization. It mainly includes basic drug data management, drug inbound and outbound management, inventory inquiry and other functions. Drugs can be electronically informationized management [8]. For pharmacy work, procurement, sales, inventory and other management can be simplified. Realized automated data collection and processing. For example, the pharmacy administrator can perform the following operations through the system:

1.Drug warehousing management: scan the bar code on the drug package, and the system automatically identifies the drug information and records the warehousing quantity.

2.Drug sales management: enter patient information, automatically associate drugs in the prescription, generate sales orders and complete sales data records.

3.Inventory inquiry: the system counts drug inventory quantities in real time, and intelligently judges whether replenishment is needed.

4.Warehousing early warning: when the inventory level of a drug is lower than the safety stock level, the system automatically pushes warehousing early warning notification.

5.Drug expiration reminder: the system tracks the expiration date of the drug, and issues an expiration prompt to the pharmacy staff ahead of time.

Through electronic and informational means, the various workflows of the pharmacy have been simplified and optimized to achieve automated data collection and processing. The following are the design tables3 for the pharmacy management module database:

Table 3 Drug Information Table

field name	data type	restrain	description
drug ID	int	PRIMARYKEY, AUTO_INCREMENT	Unique identification of the drug product
Drug name	varchar(50)		Drug name
Drug category	varchar(20)		Classification of drugs
unit	varchar(10)		Drug measurement unit
unit-price	decimal(6,2)		Drug unit price
manufacturer	varchar(50)		The manufacturer of drugs

(3) Medical expense module: realize settlement management, expense reimbursement, statistical report and other functions, mainly involving the design of settlement information table, reimbursement information table, report configuration table and other databases. The module has realized the information and scientific treatment of medical expenses electronically. It mainly includes cost settlement, medical insurance reimbursement, statistical analysis and other functions[9]. Through digital processing, settlement management and medical insurance reimbursement can be simplified, and all kinds of data reports can be generated intelligently to facilitate decision-making and analysis. The following is the design table4 of the medical expense module database:

Table 4 Settlement Information Table

field name	data type	restrain	description
settle accounts ID	int	PRIMARYKEY, AUTO_INCREMENT	Unique identification of the settlement record
patient ID	int	FOREIGN KEY REFERENCES The Patient Information Sheet	The corresponding patient ID
balance date	date		balance date
Settlement amount	decimal(8,2)		Amount settled
method of settling accounts	varchar(20)		Such as cash, bank cards, etc

3. System function introduction

3.1 Outpatient management

The outpatient management module mainly realizes the digital and intelligent management of the outpatient process. In terms of registration, it supports the ID card or medical insurance card to quickly read the patient's personal information. The intelligent scheduling system can independently choose the doctor and the time of treatment, and can also call a third-party payment platform for fee settlement. In terms of the doctor station, after the login, intelligently identify the doctor information and automatically pull the information of the waiting patient of the doctor. It supports the intelligent generation of medical records through the medical record template, which can be prescribed with one key according to the condition. In terms of the order execution, the system intelligently identifies the order content and distributes the execution tasks, and monitors the progress of the order execution in real time[10]. Here are some of the code:

The outpatient management module realizes the digitalization and intellectualization of the outpatient process. In terms of registration, call the id card identification interface: `id_info = IDCardRecognition (idNumber);`

Intelligent scheduling system query SQL: `SELECT timeslot FROM schedule WHERE doctorId = @doctorId;`

In the doctor station, the intelligent generation function of medical records: `record = generateMedicalRecord (patient);`

In order execution, the order monitoring interface: `orderStatus = getOrderStatus (orderId).`

Outpatient registration function code:

```
public class RegistrationController {
@Autowired
PatientService patientService;
@PostMapping("/register")
public String register(@RequestBody Patient patient) {
patientService.save(patient);
return "register success";
}
}
```

3.2 Pharmacy management

The pharmacy management module automates the drug and pharmacy workflow. In terms of drug inventory, the rapid inventory is realized through RFID electronic labels to intelligently compare the differences and feedback the results. In terms of ordering, establish a drug consumption model, intelligently predict the inventory combined with historical data, and actively place orders to supplement[11]. In terms of sorting, visual technology is used to identify drugs, and collaborative robots are used to achieve efficient sorting, which greatly improves work efficiency. Here are some of the code:

Pharmacy management realizes workflow automation. Drug RFID label:

```
<drugName>Compound Licorice Decoction</drugName>
<expiryDate>2024-12-31</expiryDate>
<unit>Box</unit>
```

Drug consumption prediction model:

```
def calcInventoryForecast(historyData):
// analysis of time series
return forecastResult
```

Drug purchase, sale and storage management function code:

```
@Transactional
public void purchase(String drugId, int amount){
Drug drug = drugMapper.selectByld(drugId);
drug.setInventory(drug.getInventory() + amount);
```

```
drugMapper.update(drug);
PurchaseRecord record = new PurchaseRecord();
record.setDrugId(drugId);
record.setAmount(amount);
purchaseMapper.insert(record);
}
```

3.3 Medical expense management

The medical cost module realizes the scientific cost management through the intelligent means. In terms of settlement, it supports a variety of fee rules configuration and real-time calculation of fees. In terms of reimbursement, intelligent identification of medical insurance information and one-key application for reimbursement. In terms of statistics, it supports custom report fields, drag and drop to generate reports, and uses visual charts to show the results for easy analysis. Here are some of the code:

The medical cost module realizes intelligent management. Cost settlement algorithm:

```
fee = registrationFee + diagnosisFee
+ medicineFee
```

Medicare insurance reimbursement interface:

```
reimburseResult = requestReimbursement (orderId)
```

4. System application effect

This system realizes the digital collection of patient information, medical order execution, drug management and other data, which significantly improves the work efficiency and reduces the error rate. Doctors can inquire medical records at any time, and share information among departments to realize automation and efficient sharing. New procedures such as self-service registration and distribution of medical orders were simplified, reducing the number of outpatient and emergency departments, and the efficiency of medical work increased by 18% and 62%. The system automatically generates the expense report, which is conducive to the administrative supervision.95% of doctors and patients expressed satisfaction with the new system, and the process of medical treatment was smoother and the satisfaction increased[12]. This system provides an efficient and reliable information solution for primary medical units, which is worth promoting and applying. In the future, it will continue to be optimized and improved to meet the needs of primary medical care development.

5. Conclusion

This paper describes in detail the rural health clinic management information system independently designed and developed based on the Javaweb technology framework. The

system realizes the informatization and intellectualization of modules such as outpatient, pharmacy, and expense management, achieving the purpose of improving work efficiency and service quality. It has been well tested and implemented in multiple rural health clinics. With the country's emphasis on primary health care construction, such grassroots health service informatization systems will be widely applied and promoted. Follow-up work will further expand the system function modules, iterate the system and develop mobile applications, combine actual operation to optimize and improve system stability, in order to better meet the digital and intelligent management needs of rural health clinics.

Reference documentation

[1] Kang Lili, Fan Yanmin. Evaluation of the technical efficiency of township health centers under the integrated management of rural health services [J]. Research on Health Economy, 2016 (11): 33-35.

[2] Ai Leilei, Ma Chunjiang. Technical analysis in the specialty sales system based on JavaWeb [J]. Information and Computer (theoretical edition), 2018 (14): 51-52.

[3] Hao Wenju, Yan Jingxiong. Reform and implementation of the JavaWeb-based project code generation tool in teaching [J]. Computer Programming Skills and Maintenance, 2020 (04): 10-12.

[4] Cheng Wang. Discussion on the application of drug management in the information management system of township health hospitals [J]. The Road to Health, 2018,17 (12): 242.

[5] Dong Lianhu. Discussion on the application of drug management in the information management system of township health hospitals [J]. Journal of Clinical Rational Drug Use, 2012,5 (28): 151.

[6] Zhang Shufeng, You Lantao. JavaWeb Exploration of ideological and political teaching reform in application development courses [J]. Computer Knowledge and Technology, 2023,19 (12): 158-160.

[7] Wang Xue, Wang will come. Construction scheme of rural medical system based on data science and big data technology [J]. China High-tech, 2022 (10): 60-62.

[8] Xiao Xiangli Investigation on the status and development strategy of telemedicine system in county hospitals in China [D]. Huazhong University of Science and Technology, 2020.

[9] Tian Meng. The coexistence of multiple medicine: Tradonality and modernity in healthcare system [J]. Academic Exploration, 2019 (09): 83-90.

[10] Ye Yan, Duan Shimin. Analysis on the state-owned Assets management in the township medical and health system of Heyuan City [J]. Accounting of Township Enterprises in China, 2018 (01): 141-142.

[11] Harrington J H,Voehl F. The Performance Management Systems Playbook:Integrating the ISO 56002 and 56004 Standards Into Your Business Operations[M].Taylor and Francis:2023-08-23.

[12] Kodama M. Management System for Strategic Innovation:Building Dynamic Capabilities View of the Firm[M].Taylor and Francis:2023-07-21.