Design of Hospital Beds Center Management Information System based on HIS

Lu Ren[1],Xiaofei Zhang[1],Jingxia Wang[1],Siyuan Tang[1,a,*]
[1]Xiangya Nursing School ,Central South University, Changsha,China
a. renlu818@126.com

Ni Gong[2,b,*]
[2]The Third Xiangya Hospital, Central South University, Changsha,China
b. 1805278220@qq.com

Abstract: **Hospital information system is considered as one of the most important branches of the Medical Informatics by the International Academia Community, with the essence of integrating all the hospital departments into a large information network to facilitate the whole hospital system. Given the issue of "difficult to be hospitalized" in China, a set of safe, stable and easy-to-handle beds resource management information system was developed by the Hospital Information Department (HID) using PowerBuilder, the MVC model and the Oracle database. according to this article HIS functional specifications. This system improved the efficiency of bed resource management, enabled interdisciplinary collaboration across departments, significantly reduced the average hospital stay of patients.**

Keywords: **hospital management；HIS；bed management**

I. INTRODUCTION

In the highly advanced medical information environment, how to make full use of information technology to optimize the hospital's internal operation and management processes has become an important task for each hospital[1]. Therefore, hospital information system (HIS) has been considered as one of the most important branches of the Medical Informatics by the international academia community , with the essence of integrating all the hospital departments into a large information network to facilitate the whole hospital system. At present, people's needs for health care are no longer limited to treatment, have extended to prevention of disease and improvement of health process. As a result, the number of hospitalized patients has been increasing in recent years, meanwhile, patients have higher requirements for physicians, nurses hospital as well as condition and environment. To address this problem, the key is to reduce the average hospital stay and improve the bed turnover. Consequently, developing an efficient and scientific management system of bed recourse has become a priority.

A number of Japanese hospitals began to use HIS to deal with information in 1980s with the rapid development and large scale[2]. A new concept, so called Electronic Health Records of (HER), was put forward. HER closely combined the Electronic Medical Records (EMR) with Computerized Physician Order Entry (CPOE). And it means the Japanese government pays the increasingly attention to the spread of computerized method, for example, Telemedicine[3].

In China, HIS has become an essential infrastructure for the operation of the hospital because of its widespread use in an increasing number of hospitals[4-5]. However, exploration on management of hospital bed information is still scarce. Therefore, addressing the problem of computerization of management of bed information is necessary.

II. THE KEY TECHNOLOGIES

A. HIS

The concept of HIS was first raised by Professor Morris. F. Collen in 1988, the design was to use computer and communication equipment to collect, store and process hospital information[6]. In this research, we considered the HIS as a software that enabled the comprehensive computer-based hospital information management in all aspects. The function of HIS consists of transaction management and information services. Transaction management is used to manage outpatient, hospitalization, medicine, financing and integrated information, while information services is mainly employed for medical care, scientific research and education.

B. PowerBuilder

Launched in 1991 and reached a peak at 100,000 users, PowerBuilder is an integrated development environment developed by SAP. It's native data processing project is called a data window that can create, edit, and display data from a database. The project provides the programmer with tools to specify and control the appearance and behavior of the user interface, and also supplys a simplified access to the content of the database. To some certain extent, the data window allows the programmer to choose different vendors among different database management systems. Users can use multiple presentation styles to display data that can be connected to various data sources[7].

C.MVC

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MVC is the abbreviation of "Model-View-Controller", MVC application program is always composed of these three parts. Event causes Controller to change Model or View, or both. As long as the Controller changes the Models data or properties, all Views dependent on it will be automatically updated. Similarly, as long as the Controller changes the View, View will receive data from the potential of Model to self-refresh themselves[8]. View is on behalf of the user interface. For Web applications, it can be summarized as the HTML interface, but it is also likely to be XHTML, XML and Applet[9]. With the complexity and scalability of the application, the processing of the interface also becomes a challenge. An application may contain a number of different views, the MVC design pattern for view processing is limited to data acquisition and processing on the view, as well as the user's request, but do not cover the business process on the view. Then, Business process will be handled by Model. Model is the process of business process / state and the development of business rules. The design of business model is something of the core of MVC. MVC design pattern tells us that if we want to extract the application of the model according to a certain rule, the level of extraction is very important, which can be design basis for judging whether the developer is excellent .The controller can be understood as receiving requests from the user, then match the model with the view, and complete the user's request together.

D. Oracle Database

Oracle database, often known as Oracle RDBMS or Oracle, is a object relational database management system. It is produced and sold by Oracle Corporation. It keeps tracking data storage in computer as well as SYSTEM tablespace. The SYSTEM tablespace contains data dictionaries metrics and clusters, where the data dictionary is contained by a specialized collection table that contains information about all user objects in the database[10].

III. REQUIREMENT ANALYSIS

A. The overall requirement analysis

It is important to establish a normative, safe, stable and simple bed resource management system based on the demand of patients, users and leaderships in hospital. The overall requirement analysis was shown in figure 1.

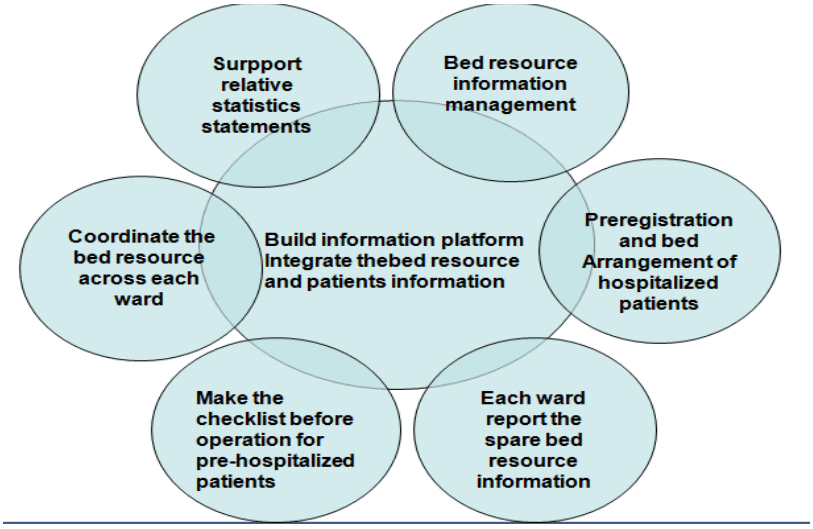

Figure 1. Overall requirement analysis of Beds Center Management Information System.

B. The functional requirement analysis

The functional requirement analysis includes the following 5 aspects:

1)Bed appointment management;

2) Bed report management;

3)The overall bed list in department;

4)Appointment and transfer between different departments;

5)System settings.

C. The non-functional requirement analysis

The non-functional requirement analysis comprises 4 aspects:

1) Accuracy and timeliness in system processing

2) Safety of system

3) Scalability of system

4) Maintainability of system

D. Feasibility Analysis

The feasibility analysis consistss of business feasibility analysis and technical feasibility analysis.

IV. SYSTEM INTERGRATED DESIGN

The overall structure of hospital management information system is divided into the execution environment layer, data layer, application support layer, business logic layer and presentation layer. At the same time, the information system also comply with the relevant policies and regulations, professional standards, the security support, system operation and maintenance support in the construction process. The overall system structure was illustrated in figure 2. In the overall system structure, our research mainly designed the Hospital Beds Center Management (HBCM) and implemented it. Its main task is to allocate, replace beds for new patients, and evacuate beds when patients are transferred out or discharged. Details were demonstrated in figure 2.

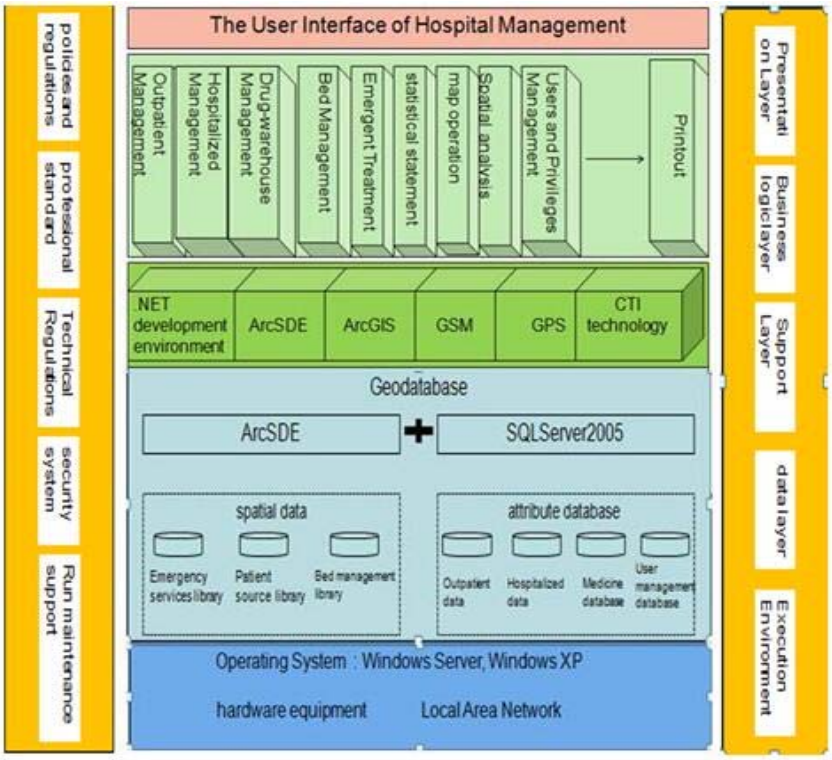

Figure 2. The integrated system structure.

V. SYSTEM MODULE IMPLEMENTATION

A. Implementation of bed reservation management module

This module can achieve the following functions:

1)Reserved record;

2)Scheduled record;

3)Canceled Records;

4)Hospitalized Records.

B. Bed report management

C. List of beds in ward

1)The entire bed information of hospital;

2)The emergency bed list.

D. Appointment transfer branch management

E. System settings

VII. CONCLUSION

The overall architecture and function flow of the system were analyzed and introduced in detail by using the overall system architecture diagram and the bed center function flow chart in this paper. We also presented the three-tier structure of presentation layer, business logic layer and data layer respectively in detail. According to the requirement of HIS function as well as combining the intrinsic HIS preferably, our research has designed and achieved a set of safe, stable and easy-to-handle beds resource management information system which aims at addressing the problems of 'difficult to be hospitalized'. This system provides the hospital beds centralized management with comprehensive information solutions [11]. Although the hospital's bed management mode was optimized, the average length of hospital stay was reduced, and the problem of hospitalization was markedly relieved, how to protect the quality of patients under the premise of the quality of care, make the average hospital stay with a more reasonable arrangement, still need a better communication between hospital management and patient, to complete a more perfect bed management.

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REFERENCES

[1] W.Pinggen and G.Yunsuo,"Preliminary Study on the Distribution Plan of Hospital Beds in Large General Hospital,"J.Chinese Journal of Hospital Statistics.vol.13. 2012,pp.7-8.

[2] S.Schneeweiss, "Learning from big health care data,"J.N Engl J Med 2014, 370,2161-2163.

[3] R.C.Parkinson,"Tying supply chain costs to patient care,"J. Healthc Financ Manage.vol.68.2014,pp.42-45.

[4] Y.J.Ge,W.Xiong,"Disscusion on Hospital Bed Management,"J..Journal of Suzhou University (Philosopy and Social Science) .vol.18.2010,pp.49-51.

[5] Y.Chen, "Present Situation and Countermeasure of Hospital Bed Management,"J.Management Observation.vol.14. 2010,pp,154-155.

[6] H.L.Li,Research and Design of Enterprise Management Improvement Project Management Platform Based on JMS,Tianjin University,2014.

[7] Microsoft Corporation,ASP.NET MVC: The Official Microsoft ASP.NET Site[EB/OL], http://www.asp.net/mvc2012-2.

[8] Scott Klein.Pro Entity Framework 4.0.2010.

[9] H.S.Ku,S. Kim,and H.Kim,"DialysisNet:Application for Integrating and Management Data Sources of Hemodialysis Information by Continuity of Care Record,"J.Healthc Inform Res.vol.20. 2014, pp, 145-151.

[10] J.M.Nguyen,P.Six,and D.A Antonioli,"Simple method to optimize hospital beds capacity,"J.Journal of Health Geographies.vol.74. 2015,pp,39-49.

[11] M.Utley,,S.Gallivan,and K.Davis,"Worrall Estimating bed requirements for an intermediate care facility,"J.Eur. J. Op .2013, pp,92-100.