

Design for the Nursing Scheduling System

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ABSTRACT. *The objective is to develop the connotation and the extension functions of the nursing scheduling system and improve the efficiency of the nursing management. The method is to expand the connotation and the extension functions of the nursing scheduling system, including the job description links and queries, the personal needs submission, the shift constraints and reminders, the emergency allocation of the human resources and other connotative functions, and to extend the functions of the nursing data exchange and sharing. The results are that after using the nursing scheduling system, the head nurses' scheduling time was significantly shortened and their satisfaction with the nursing scheduling system was significantly improved (all $P < 0.01$). The conclusion is that the development of the intension and the extension functions of the nursing scheduling system can realize the intellectualization and refinement of the nursing management and improve the management efficiency.*

KEYWORDS: *Nursing scheduling, System hierarchy, Design mechanism*

1. Introduction

Nurses are the basis of the daily operation of hospitals. The scientific and rational arrangement of the working hours of the nurses can not only relieve their pressure and improve the quality of the nursing, but can also reduce the cost of the operation costs of the human resources in hospitals. Therefore, the nurse scheduling has become an important part of the hospital management [1].

2. Analysis of the Common Nursing Scheduling Methods

According to the needs of the nursing work, we should arrange the shifts reasonably, and ensure the adequate staff and the appropriate collocation. At the same time, a flexible scheduling scheme suitable for the emergency situations in the undergraduate departments should be formulated. Reserve the effective contact information for all nurses in the department, and replenish it in time when the additional nurses are on duty. Departments with insufficient temporary nurses submit the written requests to the nursing department. After verifying the facts, the nursing department supports the internal medicine system with the medical system

and the surgical system with the principle of the flexible support[1].

2.1 Weekly Scheduling Method

The scheduling in a week is the method of the weekly scheduling. Generally, the head nurse of the ward arranges the nursing work according to the condition of the ward. The weekly shift arrangement is characterized by the short duty cycle and the flexibility of nurses. The head nurses can dynamically adjust the nurses according to their specific needs to make the rational use of the nursing manpower. Some unpopular shifts, such as the night shifts and the holidays, can be undertaken by the nurses in turn[2].

2.2 Periodic Scheduling Method

It is also known as the circular scheduling method. Generally, it takes four weeks as a scheduling cycle and one cycle. Its characteristic is that the mode of the shift arrangement is relatively fixed. Each nurse can know his own long shift in the future, so as to make their personal arrangements in advance, which can provide convenience for meeting the nursing work while taking into account the personal needs of the nurses. Because the periodic shift scheduling can save a lot of time for nurses, it also has the characteristics of saving time and labor. This method is suitable for the nursing units where the structure of the nurses in the wards is reasonable and stable, and the number and the severity of the patients do not change much. Many hospitals abroad use the periodic scheduling to meet the needs of different nurses[3].

2.3 Self-Scheduling Method

The nursing staff should select the specific working shifts according to their individual needs. This method is suitable for the nursing units with the higher overall maturity of nurses. Some foreign hospitals adopt this method. The self-scheduling can better meet the personal needs of the nurses, but it also brings some problems to the managers. The three-shift scheduling method is widely used. It divides the 24 hours of a day into three basic shifts. It is arranged according to the morning shift, the small night shift and the big night shift. Each shift works for 8 hours, usually by 7-8 nurses. The single three-shift system: Only one nurse is assigned in each shift, with helpers in

The morning and the evening, and the proper day shifts. The responsible nurses hand over the patients, illness and articles between the early, the small and the large night shift nurses. It is mainly applicable to the ward where the number and the severity of the patients have little change and the workload of the night shift is less. The two-person three-shift system: Two nurses are arranged in each shift, and the day shift is arranged appropriately. The responsible nurses hand over the patients, the conditions and the articles between the early shift and the night shift. It is

mainly suitable for the areas with more critical patients, the heavy nursing workload and the strong specialty (such as the cardiovascular medicine, the neurology, and the brain surgery and so on).

That is, when the personnel for the key department stage are fully arranged, the surplus personnel are evenly distributed in other departments. Fill the intersection space and extend it as appropriate (referring to the possible extension of one according to the requirements of the diversion staff due to the need of the arrangement). Others practice in a department for a period of time, on the basis of not affecting the internship needs of the person and not exceeding the maximum number of the interns in the department. Therefore, when checking the results of the scheduling, the number of the departments in one week, two weeks and three weeks should be classified and checked, so as to achieve a balanced arrangement between the departments in the same internship time, in order to achieve the best state.

3. Advantages and Notices of the Nursing Scheduling System Design

3.1 Assessment of the Nursing Staff's Time Use

To evaluate the application value of the standardized schedule in the nursing management, it is necessary to understand the situation of the time utilization of the nurses after the formulation of the traditional nursing model and the standardized schedule, and to compare the two. The formulation of the standardized schedule should first evaluate how the medical staffs use their nursing time, and analyze the utilization of all and some of the nursing staffs. The head nurse should list the action catalogue of the day before working and divide the nursing time into the professional time, the flexible time, the management time and the contact time. The head nurse

should also make a preliminary estimate of each work according to the actual situations of the department on the day, calculate the time needed for each work and then allocate it scientifically and reasonably. In this way, the use of the time by the nurses will be greatly improved.

3.2 Formulate the Specific Working Objectives and Priorities

In the past, the working objectives and priorities of hospital nurses were not very clear. Perhaps hospitals also have requirements for nurses, but most of them are not very effective, unable to play the most effective role in the work of nurses, or even just a decoration. The nursing staffs only work and leave work in accordance with the hospital's time regulations, without considering other things, lacking motivation and enthusiasm for goals. However, in the standardized schedule, hospitals can formulate the specific and practical nursing objectives for nurses. It should be noted that if the goal is too high, it will be difficult for the nursing staff to achieve, so it is easy to frustrate the enthusiasms and passion of the nursing staff. However, if the goal is too low, it will lose the significance of the goal-setting

management. Therefore, formulating the specific work objectives, on the premise of highlighting the keypoints, and taking into account the general nursing staff, we can provide some cards for nurses to record the important events, so that when working, nurses can remind themselves of the important things that need to be completed first and the scientific and reasonable arrangement of their work. This method can effectively improve the

Working efficiency of the nurses and mobilize the enthusiasms of the nurses.

3.3 Advantages of the Scheduling Software

The nursing staff scheduling system is generated under the clinical needs. By studying and analyzing the overall process of the existing scheduling practice and the thinking mode of the scheduling staff, a mathematical model is established, which enables the personnel scheduling to achieve the intelligent arrangement. After the intelligent scheduling on demand, the personnel who fail to achieve the goal can be detected and understood, and then the manual arrangement can be made up. After the manual arrangement, the system can be re-imported. By checking whether the number and the distribution of the staff in different departments are uniform or not, and re-deploying among the similar departments, the demand of the staff can be guaranteed, and the arrangement of the teaching and the medical care in different departments can also be facilitated. The intelligent shift scheduling system can make a list of the departments, schools and individuals individually. Departments and individuals can inquire about the internship arrangements through the network. The changes made by the teaching and research departments according to the needs can be timely reflected to the departments and individuals. The program is omitted to avoid errors.

4. Design and Implementation of the Nursing Scheduling System

In this paper, we use the three-tier J2EE architecture based on the Web and B/S mode, and use the development framework of Spring MVC, Spring and Hibernate to realize the design and development of the system. The three-tier system of J2EE includes the presentation layer, the business logic layer and the data access layer. The presentation layer is mainly implemented by the Spring MVC combined with the Java Servlet API. It is mainly responsible for the page display, and receiving and distributing the requests. The business logic layer mainly operates on the data layer and processes the data logic layer. The data access layer, also known as the persistence layer, is implemented by the Hibernate. It consists of the data access factory layer, the data access interface layer, the custom query layer and the temporary layer. It is mainly responsible for the database access.

These three frameworks are combined to realize the three-tier architecture of J2EE. With this architecture, developers only need to pay attention to one layer of the whole structure, which can effectively reduce the dependence between the layers and facilitate the independent standardization of the layers. Through the low

coupling between the layers and the high reusability of the logic in each layer, it is conducive to the separation of the architecture design and the business changes of the whole system, thus achieving a convenient, efficient, safe and stable system application of the enterprise level.

Secondly, some pages in this system are rendered by Freemarker, which is superior to the traditional JSP in dealing with a large number of the complex pages such as the judgment and the date amount. At the same time, it supports the JSP tags well, and adopts the strict MVC separation, which makes the system structure clearer and the page rendering friendlier.

The system framework of the integrated SSH framework is divided into three layers: the view presentation layer, the business processing layer and the data persistence layer. In the view layer, the interaction interface is realized through the Struts2 JSP page. The request generated by the Struts2 view layer is submitted to the control layer, which decides which interceptors and action classes to use according to the configuration file.

Requests are processed by the Struts2 series interceptors according to different request level interceptors. Calling the Struts2's Action, the Spring container automatically assembles the Action through the BeanID in the configuration file. The Spring container locates the corresponding business logic of the Action. The new business logic component interface is established, which defines the query, adding, updating, deleting, and the main business functions. The new business logic component implementation class is constructed, which implements the business logic component interface. The business logic component interface realizes the business logic operation by calling the DAO component.

The business logic layer forwards the corresponding business processing requests to the DAO layer. Using the SSH integrated development, the original DAO class can be discarded. And give it to the Spring container to inject. Similarly, SessionFactory in the Hibernate framework can be handed over to Spring to manage the new XxDao interface. After the data encapsulation in the business logic layer is completed in the DAO layer, POJO objects mapped by the Hibernate framework in the persistence layer interact with the database.

The advanced structure system is designed with the B/S architecture, making full use of the hospital network information resources, so that the attendance management can be the centralized control and the distributed management. Whether the user's office location is centralized or decentralized, through the LAN or WAN, within the scope of the authorization, the attendance management can be divided layer by layer, and the information exchange is timely and smooth, and the query statistics are convenient and accurate. There is no need to install the client to install the free system. All the computers with the Windows operating system can use the attendance system through the Internet. Therefore, the attendance management can be easily carried out, even if it is not on its own computer, which makes it possible for the business trips to have a general view of all the attendance situations.

5. Conclusion

The development of the hospital information system is a process of the continuous improvement. The nursing system has been put on line to meet the basic nursing needs of the clinic at this stage. However, with the changing needs of the clinic, the system functions need to be constantly improved. In the daily operation of the nursing system, we also need to consider the problem of the system information security. By setting up a good network management system, setting the user rights, the password protection, the network security equipment and other measures, ensure the patient information and the financial security.

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