Using web technique in the managing regulatory requirements of medical equipment for the nursing department

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Abstract - The centralized and information management are in common use technique of modern management. The management of the medical equipment emphasized in the purchase and the maintenance management in early days, and cost down now is import factor for medical equipment management because the health insurance system causes the hospital budget reduced, so in the cost down strategy is to reduce the amount of money and promoting the efficient of use . Another important subject in medical equipment management is patient safety, so how to ensuring the quality of medical equipment is also having to notice.

In the paper, we will provide an architecture for assistant the nursing department to develop a information system on the centralized and information management of valuable medical equipment. Through the system operation we hope can promote the effect and the quality of the medical equipment usage.

This system implement up to now has more than half a year, and could acquired some concrete result: the utilization rate promotes doubly, the rate of breaking downs, the borrowed time cuts 75%, the cost downs for equipment purchase and satisfaction increases for user. In this paper, in addition to explaining the above-mentioned result, also discusses the design principle and structure on the whole system. We hope the protocol could be used as for clinical unit to control their valuable equipments and match the authority expectation.

Keywords: managing regulatory requirements, medical device, ODBC , Web-based , information management

I. INTRODUCTION

With hospitals having to live in a more conserva-tive fiscal environment for the first time, in-house clinical engineers were asked to downsize and to concentrate on areas related to cost reduction and compliance with the equipment [1].Beside on the equipment cost down , the information management and the quality are also important topics for the clinical engineering , as the "New Health System for the 21st century" states that the "development and application of more sophisticated information technology systems is essential to enhance quality and improve efficiency" [2]. So today the clinical engineering began with the application of engineer-ing principles to the economic solution of clinical problems and the quality of patient safety. [3] IT technique has used in differing methods, including new responsibilities, new departments (e.g.,C.I.S), and depart-mental mergers and reorganizations, will be used to organize IT and clinical technology support organizations. CE and IT departments both need to evolve in order to keep pace with the techno-logy and provide healthcare institution leadership with the knowledge required to make optimal technology-related decisions. [4] In the paper we will proposal a tool using the web-based technique to assist the nursing department, and hope the system can efficient control the cost and quality of the medical device.

In the hospital, the IV pump, Infusion pump and patient monitor they are belong to the quantity is many and the usage is multifarious and the price is in the valuable. Usually they are used in patient's urgently condition to keep monition on the patient's life condition and to provide expensive drug, such method is for insure patient's life security.

However at the hospital, each sickroom has its own equipment and uses it by self don't share it to another department. The results cause the resource wasted and increase the hospital cost. Therefore, if we can establish a centralized management center to manage the valuable equipment and adjust it to the need department at any time, then not only reduce the waste

of the resource and prompt the nursing work efficiency and make patient the life security acquires the better guarantee.

Analysis of the current conditions

Each sickroom always keeps out of normal use quantity on the medical equipment (ex. Infusion pump, IV pump and patient monitor) for the convenience on clinical care. These nursing sections own valuable equipment could not share they for another section, always many equipments are long-term idle on the few usage frequency department, but they are not enough on high usage frequency department. So when the department needs more equipment for clinical care they must take much time to ask other department to support their requirement. The result wastes the manpower time even may endanger the patient safety, influence the work efficiency and quality and these units increase budget to buy the equipment every year.

These medical equipment resources can not share each other has one reason is that concerns borrowed machine can't take back as soon when they need.

So in the study we will build an information management system for this valuable equipment, using the system we hope to provide the detailed list data that can be used equipments and borrowing it on line. And if the borrowing time is so long the system will auto send message to remind user.

II. METHODOLOGY

The design's principle of this system is focused on the easy-to-use, detail information and Open Database Connectivity.

Since we estimate the usage of this system is small, the performance of the database will be ignored here.

In order to consider that most users are not familiar with the manipulation of PC, we adapt the easy style to design the user interface of this system. These features include displaying the information in the large font size, reducing the chance to use keyboard to input data and providing the window menu design to let user to select the designated function by a mouse.

It is a web-based software. We use the Microsoft Explore to logon to the system. As for the database, we adapt the Microsoft Access in the initial stage. Though the performance of Microsoft Access is not good as the Oracle, Microsoft SQL or Sybase, it is popular and easy to use in the windows system. Besides, it has already met the requirements of our system. However, once the performance of the database will be concerned, it is easy for us to migrate the Access database to the SQL or the Oracle.

This system provides two different functions for the different role of users. One of the roles is the administrator; the other is the general user. For the administrators, this system will help them to manage the equipments efficiently including viewing the specifications of equipments, checking the current status of equipment and processing the requests of equipment demands. For general users, they can borrow the equipments or check the status of equipments online.

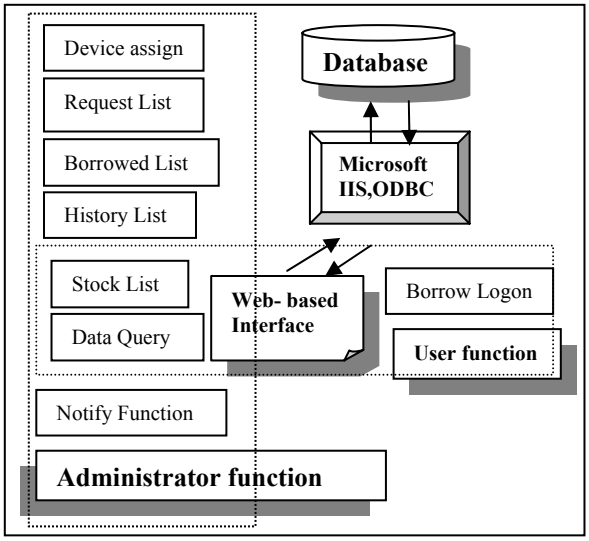

Figure 1. The frame of managing regulatory requirements for the information system

Functions for Administrator

We provide five functions to the system administrator including Stock List, Request List, Borrowed List, Data Query and History List. We will describe the functions of each module below:

1. Stock List: The function of stock list is used to show the detail quantities of all the equipments. The data items include: a. Equipment's picture, b. Brand, c. Model number, d. Channel number f. Current quantity g. Total amount i. Operator manual j. Lending list
2. Request List: This function provides the system administrator to manage the requests of equipments from users. According to the request list, the administrator can assign the equipments being requested to the users efficiently. The data items include: a. request delete b. Serial number of request c. Device name d. Model number e. Request department f. Borrower g. Telephone number h. Login date and time i. Property ID of equipment.

3. Borrowed List: This function provides the administrator to view the records of the borrowed equipments. It also provides the administrator to update the loaning status when the equipment has been returned. The data items in this module include a. Serial number of request, b. Device name, c. Device model number, d. Request department, e. Borrower, f. Telephone number, g. Date of request, h. Property ID of equipment, i. Date of return and j. Acceptor ID.
4. Data Query: This function provides user to find the specific records from the borrowed list. Using this function, administrator can group the borrowed records by department or equipment. It uses the keyword to find the wanted records from the database. The keywords used in here can be the device name and the department of user. The data items include: a. Serial number of request b. the Property ID of equipment c. Device name d. Model number d. Borrower e. Telephone number f. Login date g. Date of return.
5. History List: In the history list module, it will list all the borrowed records. These records can be used to calculate the usage time and frequency of equipments. The data items in the history list include a. Serial number of request b. the Property ID of equipment c. Device name d. Model number e. Department of user f. Borrower g. Telephone number h. Login date i. Acceptor j. Date of return
6. Notify Function: When equipment has been borrowed over three weeks, the system will send an E-mail to the manager of the borrower automatically to notify the borrower to return the equipment.

Functions for general user

This system provides three functions for the general users including: Borrow Logon, Stock List and Data Query. We will introduce each function below:

1. Borrow Logon: It provides user to login to the system and register the equipment they want to borrow. The new request will be added to the database and show on the Request List of the administrator module. The data items in this module include a. Unit b. Equipment type c. Borrower d. Contact telephone number
2. Stock List: Same as the Stock List function for the administrator.
3. Data Query: Same as the Data Query function for the administrator

III. RESULTS

Before the system execute, we explore three stage to record usage data, the first stage is to do a questionnaire of these been collected equipments to know the usage rate, and second stage is to use artificial process to finish the equipment adjust work, and the final stage is to execute the web information system.

In the project, the total amount number of the medical equipments is ninety that is include 15 patient monitors, 59 IV pumps and 16 infusion pumps. The total static period time are eight months (2005.07~ 2005.02), the first stage is one month (2005.7) and the second stage is three months (2005.8~2005.10) and final stage is four months (2005.11~2006.2).

Below the statistic data show the usage rate in executing the web information system before and after it.

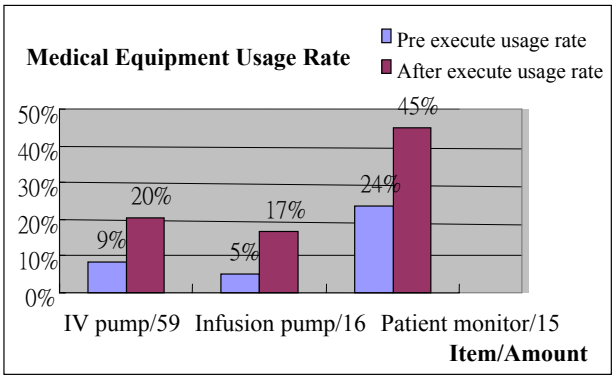

Figure 2: the usage rate change of using our system

The usage rate calculation formula: (the borrowed days of the equipment)/(the total amount of the equipment × total days of the month)

From the result, we find the equipment usage rate is promoted to double. In the borrowed processor time, we compare the second stage and the final stage and find the borrowed time from 40 minutes reducing to 10 minutes. The result increases clinical employee time in taking care her patient and gets a good emotion.

In the cost down condition, the budget of the nursing departments purchase the three type equipment is 243,062 us dollars at 2005 and 86,062 us dollars at 2006, after executes the project (2005,7) these departments don't provide any requirement on these equipments.

From these results we can find the benefit of developing the information system on medical equipments, such as above the result and some invisible benefit such as the satisfaction exaltation of the user, the idle space of the sickroom is increment exploitation and reduces the risk of patient infection on the equipment centralization management etc.

IV. CONCLUSION

The information management is the important progress that the hospital promotes and now hospital spends many money and people on electronic clinical information. But it is also expected on the electronic information of clinical support department to get a efficient administer-ation management. The biomedical engineering department needs to evaluate the medical equipment of the usage effect and quality besides doing the good maintenance on these equipments, so to development electronic information on medical equipment management is needed. The advantage of the electronic information are include the manpower's reducing and providing the real time and transparency information, the governor can effectively get the more valid information to control and assign these resources, so the result to this hospital under the tightens condition of the budget is a good way to reaching the goal of cost down and income up.

In the future this system wants to enhance items as below:

1. Using RFID technique applies on the log on application of the equipment receives and dispatches to reducing the artificial mistake and the storage management of the equipment and the legal power control of the system.
2. Increasing the on-line statistic information of equipment management, currently the related data are through the off-line way to make and using of the EXCEL or SPSS statistic software to reach it. In the future we will increase some statistic function for decision references, the function as the utilization rate, break down rate and the using period. Besides, the system combines the repair information system of the medical equipment to providing each device more complete usage and the maintenance record.
3. The system will include more equipment and clinical department such as the bedside monitor, anesthesia machine, ultrasound machine and Laser machine etc.

The present clinical engineer is expected to have more actions; this study provides the clinical engineer with more exertive imaginable spaces that knows how to handle the technique of the electronic information management to strengthen the equipment management in cost, efficiency and quality.

Through across the cooperation of the department will promote the rank and importance of the biomedical engineering department at the hospital and bring larger benefit for the hospital.

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