

Up to Date Inventory System for Effective Management of Healthcare Technology: Case Study in Jimma University Specialized Hospital (JUSH)

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Abstract - The tradition of healthcare technology management in our country, Ethiopia, is one of the big problems affecting the quality of healthcare practices as well as the financial expenditure in different health institutions. This is because there is no up to date system showing the status of healthcare technology and the information of the healthcare technology available in each specific healthcare setting. Even though some hospital use file based (paper based) inventory system to manage healthcare technology, it is not up to date and difficult to access the history of each healthcare technology using this system. The objective of this project is to replace manual inventory in different hospitals by taking Jimma University specialized hospital (JUSH) as a reference by implementing web based inventory system. Supervision made in JUSH indicates that, currently the hospital is using excel based medical equipment inventory system and looking for advanced system. So based on the objective of this research up to date inventory system is developed using PHP programming language and Apache server. The sample inventory data from the hospital is added to the system for testing and the test was successful as it helps the user perform each tasks i.e. adding inventory, displaying equipment details, searching for specific equipment and updating each equipment as desired. Finally even though the system is designed for Jimma university specialized hospital, other hospitals in our country can use this system to effectively manage their healthcare technology assets for better health practice.

INTRODUCTION

In most health facilities in Ethiopia, problem of improperly using healthcare technology is affecting the quality of healthcare practices as well as the financial expenditure of the health facilities. The aim of this research project is to establish a framework to develop effective management of health care technologies, to improve healthcare practices in different health institutions by ensuring safety of healthcare technologies¹ and to reduce the unwanted financial expenditure on the management of healthcare technologies.

Identifying what items are to be managed and developing healthcare inventory system is head of everything in effectively managing healthcare technology. The inventory is a working document that is regularly checked and updated to accurately reflect the status of healthcare technology assets in healthcare facilities (1). Inventory plays a crucial role in improving the management of important healthcare technology, if used effectively. In order to be effective in assisting with various healthcare technology management activities, the inventory must be updated continually so that it provides at any given moment a correct look at the status of medical equipment within the healthcare facility. Update points include initial data collection; as information is updated, such as when a new piece of equipment arrives or is retired; and during annual inventory audits. The inventory of medical equipment is used in conjunction with inventories of additional supportive assets, such as consumables, spare parts, and testing and safety tools and equipment. Inclusion of equipment in an inventory is decided through a risk-based analysis in order to ensure appropriate time and resource allocation, and to eliminate unnecessary work (1).

According to WHO, inventory management is done through a paper-based or computer based system, as determined by the resources available. Even though paper-based inventory system is good option in resource limited areas, computer based inventory system is preferred to have up to date information about the status of healthcare technology and easily access each healthcare technology (1). But in case of our country some health institutions use paper based inventory which is not up to date and difficult to access the information of each healthcare technology while most health institution do not have inventory system (4). This is also true for Jimma University specialized hospital, because there is no up to date inventory system. This research project is designed to implement computer based inventory in Jimma University specialized hospital.

¹Healthcare technology is a device used in healthcare facilities for diagnosis and treatment of disease

To be worthwhile, an inventory must be continually maintained and updated to reflect the current status of each asset. Depending on the nature of the organization and its associated assets, different details are tracked and updated as changes occur. The goal is to have an accurate, up-to-date record of all assets held by the organization, reflecting the current status at any given moment in time. Within the scope of HTM, an inventory is the first and most important tool for achieving several broad aims (1):

- ❖ A medical equipment inventory provides a technical assessment of the technology on hand, giving details of the type and quantity of equipment and the current operating status.
- ❖ The inventory provides the basis for effective asset management, including facilitating scheduling of preventive maintenance and tracking of maintenance, repairs, alerts and recalls.
- ❖ The inventory can provide financial information to support economic and budget assessments.
- ❖ The inventory is the foundation needed to organize an effective HTM department. Items such as equipment history files and logbooks, operating and service manuals, testing and quality assurance procedures and indicators are created, managed and maintained under the umbrella of the equipment inventory. Furthermore, accessories, consumables and spare parts inventories are directly correlated with the main medical equipment inventory.

LITERATURE REVIEW

The inventory is a working document that is regularly checked and updated to accurately reflect the status of healthcare technology assets. In health institution inventory management is done through a manual (paper-based) or computer based system, as determined by the resources available. A manual inventory system relies heavily on the actions of people, which increases the possibility of human error. People might forget to record a transaction or simply miscount the number of goods. This results in needless additional orders that increase the health institution's inventory carrying costs and use up precious storage space. A computerized inventory management system makes everything from inputting information to taking inventory easier. Doing a hand count of inventory can take days, but with a computerized inventory management system, the same process can be done in a matter of hours. With a manual system, the data is only as accurate and up to date as the last hand count. With a computerized inventory management system, the management team can pull a report and instantly see how many units are on the floor, how many have sold and which products are selling the fastest (1).

According to World Health Organization document on inventory, computer based inventory is preferred to paper based inventory. This is because computer based inventory ease inventory management, especially for large inventories and it can also be integrated in computerized maintenance management system which combines inventory, repair and maintenance history, and work-order

control into one system. Once the inventory has been established, it can be a very helpful tool within the clinical engineering department and the health-care facility as a whole (1).

To summarize these documents show the importance of implementing effective inventory system for management of healthcare technology to improve the quality of healthcare delivery. Therefore it is necessary to implement this system in different hospitals in our country to achieve the desired outcome.

METHODOLOGY

The system is designed using XAMPP open source software for database section and HTML and PHP for web template section. In order to get best out of the project different phases of engineering design process were followed. The first phase is conceptual design. During this phase conceptual design of database i.e. specifying number of tables, determining the attributes of the table, determining the relation between the table and web application interface conceptual design were done. The second step was initial supervision. During this phase assessment (initial observation) of the current inventory management technique of the JUSH was done to get the information of healthcare technology management system in the setting. The third phase was developing initial prototype. In this phase database was designed using XAMPP open source software, web application template was developed using HTML and PHP, and user registration and login system and medical equipment inventory management system interface were designed. The final phase is final design of the system in which the complete system was developed using Apache server and adobe Dreamweaver.

RESULT

Observational finding in Jimma university specialized hospital (JUSH) indicates that currently there are 5(71.43%) biomedical engineers and 2(28.57%) biomedical technicians working on Healthcare technology in different departments of the Hospital. The hospital is using excel based medical equipment inventory system (using excel book to register equipment details) which is not up to date because update point of one person will not reach the other. In addition to this the discussion result of different Biomedical engineers in the hospital shows that up to date inventory management system is very important for the hospital in terms of planning capital purchase of equipment, reducing maintenance cost, addressing the status of each equipment any time efficiently, reducing unwanted financial expenditure by the hospital and many more. So using this as a baseline and comparing different programming languages like C#, ASP.Net and PHP, we have decided to use PHP programming language to design web based up to date system to manage healthcare technology in the setting. The complete system is developed using Apache server and adobe Dreamweaver.

Table1 Demographics of healthcare technologist

Variable		Number	Percent(%)
Gender	Male	5	71.43
	Female	2	28.57
	Total	7	100
Specialty	Biomedical Engineers	5	71.43
	Biomedical Technicians	2	28.57
	Total	7	100

DISCUSSION

Importance of the system

All respondents (100%) up laud the importance of the up to date system for management of healthcare technology, especially in terms of monitoring the asset and planning of capital purchase. Previously there were no inventory management system in the setting and the current system (Excel based system) was developed by the biomedical engineers in 2015. But when one person updates the status of one equipment, the update is only limited to the data on that person's computer and that is why they are eager to get the system which allow the update point of one person reach the other for effective communication.

Developed system

The developed system has different section. The first section is the home page that allows users registered by administrator of the system to login to their account. After signing in to their account users can access inventory page to add new equipment, search specific equipment, update any equipment based on update point and also delete unwanted record in case the disposal is necessary. The system is quite secure since only the users registered by administrator can access the inventory management system interface.

Figure 1: Inventory page of designed system

CONCLUSION AND RECOMMENDATION

Comparing our system with the current excel based medical equipment inventory system in JUSH which we were able to investigate during our supervision, the system we have developed is efficient and up to date since every responsible body can easily access the system from their own office. In addition to this the system displays the exact date of equipment registration which plays important role in disposing aged equipment, and it helps the hospital to quickly go through the technology in hand so that things will be easy to plan purchasing of new equipment. Finally even though the system is designed for Jimma university specialized hospital, other hospitals in our country can use this system to effectively manage their healthcare technology assets for better health practice.

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