

Assessment of current practice of Medical Equipment at Tangalle Base Hospital in Hambantota District, Sri Lanka

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Abstract- Introduction: Medical equipment have an important role in delivery of healthcare, which ranges from small and simple devices to complex devices. Comprehensive data availability is very important to establish a good medical equipment management system which is important for the reduction of accidents. It is extremely important to maintain equipment efficiency to provide quality care and to reduce healthcare costs. Proper medical equipment management is also important for the reduction of accidents caused by inappropriate handling of unsafe equipment to patients or staff.

Objective: To assess the current practice of selected medical equipment at Tangalle Base Hospital (TBH) in Hambantota District, Sri Lanka.

Methodology: A hospital based descriptive cross sectional study conducted with all staff categories involving with medical equipment handling for the study. A Self-Administered Questionnaire (SAQ), direct observation and Key Informant Interviews (KII) were the data collection methods.

Results: There were 184 participants including a medical administrator and clinical staff. Overall response rate was 95% for SAQ and 100% for KIIs. Non-availability of directive and assigned responsibility, uniform process and practices of equipment use, and maintenance guides in were highlighted deficiencies revealed by KIIs. Poor knowledge, poor record maintenance and unavailability of trained staff also revealed as key issues. All the staff categories have poor knowledge on medical equipment use and its usefulness. Less than 10% of the participants were aware about the availability of manuals and only 2% have read them. None of the staff categories were alert on preventive maintenance while record availability on medical equipment were minimal in every assessed units. Standard Operational Procedures (SOP) were not displayed near the medical equipment. Although one of the assessed unit had a medical equipment maintenance register, it was with many deficiencies and not updated. Receiving of medical equipment as donations without proper need assessment is one of the barrier in BHT.

Recommendations: Should be taken sufficient measures to improve knowledge and awareness among medical equipment handling staff. Strengthening of preventive maintenance process, imposing of limitations on donations to get according to hospital need and usage of information technology for medical equipment management process also considered as recommendations.

Index Terms- Medical equipment, Maintenance

I. INTRODUCTION

Medical equipment have an important role in delivery of healthcare mainly in diagnosis, treatment and monitoring of patients. It has a large range from small, simple devices such as sphygmomanometer to complex, big devices such as Magnetic Resonance Imaging (MRI) machines. This ranking is as a result of differences in utilized technologies and intended applications of such equipment in healthcare¹. Medical equipment requires calibration, maintenance, renovation, user training and decommissioning. Those activities mostly done by clinical engineers. Implantable, single use or disposable medical devices are not considered as medical equipment in healthcare². Medical equipment management in hospitals is not considered as a simple process. Availability of comprehensive data are very important in order to establish a good medical equipment management in hospitals^{3,4}. Healthcare technology management cycle has many domains such as, procurement of equipment, reception, inspection, installation, ensuring of performance within accepted standards, and effective use with proper maintenance and service, repair, and disposal.

Proper hospital equipment management is important for the reduction of accidents caused by wrong handling medical equipment by various category of staff^{3,5,6}. Most of the hospitals in developed countries have their own electronic hospital equipment management system. availability of accurate and updated records such as, nomenclature, manufacturer, nameplate model, serial number, cost are important to establish a proper hospital equipment management system^{4,7,8}. Equipment efficiency does not only provide high-quality patient care but also saves healthcare cost. Hospitals and health systems benefit by rethinking on factors like management of medical equipment. They can improve their overall capacity, quality of care, workflow and productivity by proper usage⁹.

The health sector is increasingly becoming complex with the introduction of new medical equipment. It is extremely important to maintain equipment efficiency to provide quality care and to reduce healthcare costs⁹. Medical equipment management is important as human resource management to function a hospital in a maximum capacity. Quality hospital equipment management

is also important to reduce accidents caused by improper handling of unsafe equipment to the patients and staff¹⁰.

Study done by Jayawardene revealed that, only few wards had an equipment maintenance registers in Sri Lanka, but all these registers also were lacking necessary details¹¹. The documents and programmes are important for use by health managers, biomedical engineers, donors, academic institutions and non-governmental organizations involved in health expertise at the district, regional, national or global levels¹².

II. JUSTIFICATION

It was evidence that, damage to the medical equipment due to improper handling, poor maintenance were common among most of the health institutions due to the poor knowledge of medical equipment handling. This led to frequent repairs and service interruptions, thus reducing the quality of the service as well as increasing the health expenditures. It also gives a bad image to the hospital and their services. Competency of equipment handling of healthcare employees is learned mostly from daily practice and from the seniors who have not had a formal training. Management of human resource is important in handling of medical equipment to achieve a good outcome¹³.

Standard operational procedures (SOP) for medical equipment are not available in the institutions except for few. After an equipment is ordered, established and installed, the management does pay poor attention until somebody comes and make complaints about the equipment. Most of the time, hospital administration pays attention following a breakdown or malfunctioning of medical equipment. This will be affecting to the system for healthcare resource wastage^{14,15,16}. Use of poorly managed equipment with fault may cause harm to the patient, staff as well as to the visitors sometimes. These problems occur in the institutions due to lack of proper medical equipment management plan^{17, 18}.

III. OBJECTIVE:

To assess the current practice of selected medical equipment at Tangalle Base Hospital (TBH) in Hambantota District, Sri Lanka.

IV. METHODOLOGY

Study Design

A hospital based descriptive cross sectional study was conducted to assess the practice of selected medical equipment at Tangalle Base Hospital (TBH) in Hambantota District, Sri Lanka.

Study Setting

The study was conducted at Tangalle Base Hospital (TBH) in Hambantota District, Sri Lanka.

Study Population

All staff categories involving with medical equipment handling were included for the study. Nursing officers, Health care assistants, unit in charge officers, chief pharmacist and hospital administrators were the participants. Different units within hospitals including Out Patient Department (OPD), Emergency Treatment Unit (ETU), medical units, surgical units, gynecology

and obstetrics units, pediatric units, radiology unit, laboratory were considered for the selection of medical equipment.

Study Instruments

A Self-Administered Questionnaire (SAQ), direct observation and Key Informant Interviews (KII) were used to collect relevant data on this study conducted at TBH.

Method of data collection

The quantitative data (SAQ) was collected with the help of staff in Quality Management Unit (QMU) in BHT. KIIs and direct observation was done by principal investigator and trained medical officer QMU. Direct observation was done by a developed checklist with the help of bio medical unit. The objective of the study was explained to the participants by the PI during the data collection and assured the confidentiality.

Methods to ensure validity and reliability of data

Face validity and content validity were assessed by the experts in the field of medical equipment management. Pretest of all the study instruments were done at a selected base hospital in Hambantota district. Identified problems with pretest were corrected and necessary modifications were made accordingly.

Data analysis

Quantitative data analysis was done using a statistical software application. Analysis of qualitative data was done after coding and grouping according to common themes by thematic analysis. Accuracy of data entry was ensured by introducing valid checks and re-entering a selected sub-sample and comparing them with the original data set.

Potential risks and benefits

There was no any identified risk with this study to the participants. There were no identified skill development programmes regard to medical equipment management in Sri Lanka. Therefore, given the study findings to the hospital managers at different levels. Recommendations of the study will improve the understanding of efficient medical equipment management in hospitals using available resources. Relevant health authorities can be taken evidence based decisions to improve hospital equipment management which leads to provision of better care.

V. RESULTS

There were 184 participants for this study including a medical administrator, chief pharmacist, two matrons, seven nursing sisters, 80 nursing officers, three overseers, 90 healthcare assistants. Voluntary participation was expected for the study, resulted overall response rate of 95% for SAQ. The participation was 100% for key informant interviews.

Important factors found with KIIs

Following important factors were highlighted during the KIIs conducted with relevant stakeholders.

- i. Non-availability of directive and assigned responsibility for regular use of medical equipment.
- ii. Non-availability of instructions for uniform process and practices in medical equipment handling.
- iii. Non-availability of maintenance guides in hospital/unit.
- iv. Poor knowledge among the staff on maintenance and how medical equipment works.

- v. Poor record maintenance in hospital related to medical equipment.

Knowledge of staff on medical equipment use

All the staff categories including supervisors have poor knowledge on medical equipment use and its usefulness. Almost all the operative staff have learned the ways of handling medical equipment from the previous staff although they were not having any type of formal training.

Less than 10% of the participants were aware about the availability of manuals of medical equipment and only 2% have read them during the service.

Preventive maintenance

Assess the knowledge on preventive maintenance of medical equipment among the participants. It was observed that currently no mechanisms exist in BHT for preventive maintenance. None of the staff categories were alert on preventive maintenance which reduce the corrective maintenance cost in healthcare. According to the participants, the regional biomedical engineering unit only concern the corrective maintenance due to their limited capacity. Record availability on medical equipment other than inventory were minimal in every assessed units of BHT. Standard Operational Procedures (SOP) were also not displayed around the equipment in BHT, even for very expensive medical equipment. Although one of the assessed unit had a medical equipment maintenance register, it was with many deficiencies as well as not updated for a long time.

Direct observation of selected medical equipment handling was assessed by using a validated checklist. There were many variations on use of medical equipment with staff every time. Average marks were calculated based on the check list and only 17% follows the proper steps in medical equipment handling.

Donations

BHT have received lot of medical equipment as donations from various organizations. According to the managers and unit heads, most of the donations were not based their requirement. There were many abundant, unused medical equipment in some of units were seen which were donations. Receiving of medical equipment is done by the chief pharmacist to BHT as a formal way. According to her, there were no technologically based method to communicate BHT with provincial, national health authorities and donors regarding specifications of required medical equipment. BHT have no authority to purchase their required medical equipment independently.

VI. DISCUSSION

This study results revealed the practice of improper handling of medical equipment in BHT. The study done in Sri Lanka showed the same results¹¹ while many other countries also showed the same results^{7,8}. Those studies revealed a real gap of developing a medical equipment use and maintenance system in Sri Lanka as well as in other countries. Hospitals in most of the developed countries have their own computerized hospital equipment management systems which enable good quality equipment management^{18,19}. This study revealed the use of minimal information technology on equipment management in BHT. Proper maintenance of medical equipment helps to improve the organizational productivity⁹. Handling of medical equipment

in TBH needs to be improved, which affects the overall organization productivity.

The documents and programmes are important for use by health managers, biomedical engineers, donors, academic institutions and non-governmental organizations involved in health expertise at the district, regional, national or global levels¹². This study also revealed the importance of the involvement of various stakeholders in the process of medical equipment management system.

Efficient and effective equipment management system includes correct selection, purchase, installation, maintenance as well as disposal equipment with necessary documents to be retrieved whenever necessary in order to deliver effective, safe and quality healthcare to the system^{8,19}. This study revealed the need of establishing of such system in such healthcare institutions.

VII. CONCLUSION AND RECOMMENDATIONS

Knowledge and awareness of staff on medical equipment handling was unsatisfactory among all categories. Majority of the hospitals have not use any developed medical equipment management plans including SOPs. Receiving of medical equipment to BHT has not match with the real need of the hospital which cannot purely control by hospital administration. Usage as well as maintenance of medical equipment in BHT including records keeping was not satisfactory. Most of the donations of medical equipment by various means were unproductive giving burden to condemn them following the damages.

Managers should be taken sufficient measures to improve the knowledge and awareness of medical equipment handling process among the staff. Strengthening of preventive maintenance process of medical equipment in BHT, imposing of limitations on donations to get them according to the hospital need and usage of information technology in the processes of medical equipment management process also considered as the recommendations.

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