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Study on Medical Equipment Management Program (MEMP) and its Preventive Maintenance

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Abstract – The approach of quality management of medical equipment based on key performance indicators (KPIs) could be employed to quantify all elements of MEMS. It was also agreed that the plan for managing medical equipment in public hospitals in an integrated and comprehensive way should be authorized, as long as it is based on a conceptual framework with four domains of input, process, output, and result. . The degree of correlation between the four domains of the MEMS framework ranged from a moderate to a high level. The underperformance of one domain has a ripple effect on the performance of other domains as well. The linear regression model confirmed that there was a statistically significant relationship between overall KPI scores and the usage coefficients of the medical equipment under investigation.. The percentage completion of planned preventive maintenance (PPM) was found to be the most statistically significant predictor of UC among the four variables studied (Preventive maintenance, Accuracy and Quality Control, Corrective Maintenance, and Percentage completion of planned preventive maintenance).

Keywords – Medical, Equipment, Management, Program, Preventive

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INTRODUCTION

Issues in management of medical equipment

In the field of health care, it is well-known that equipment is one of the most important infrastructural aspects in the delivery of services. Also noteworthy is the fact that, together with medications and other gadgets, medical equipment has played a significant role in the rapid advancement of healthcare during the previous 100 years. Although clearly important, equipment is sometimes overlooked when it comes to the design, incorporation, and maintenance of a facility.

This is particularly true in poorer nations, when the situation is dire. Based on findings from studies conducted by the World Health Organization (WHO) and other international organizations, it is estimated that between 25 percent and 50 percent of all health equipment in developing countries is inoperable for a variety of reasons, severely impeding efforts to improve the delivery of health services to their citizens. While some of the idle equipment was given, the majority of it was acquired with loans from bilateral and multilateral organizations, which would require substantial sacrifice on the part of the recipients. While one of the primary reasons for equipment inactivity is a lack of cash, particularly for covering recurrent expenses, there are other factors to consider. According to the findings of foreign specialists, the most significant underlying reason is a lack of adequate management of the situation.

To be more explicit, the absence of well defined rules and processes for the planning, purchase, usage, and maintenance of health-care equipment is the most significant obstacle. Once the equipment has been integrated into the organization (or health system), the organization (or health system) is responsible for managing the equipment during its full life-cycle. Installation, acceptance testing, and approval, clinical usage, preventative and corrective maintenance, and final deactivation due to obsolescence or economic need are all part of the life-cycle of a medical device. Other critical tasks, such as technology evaluation, usage standards, quality assurance and improvement, safety and risk management, facility and utility management, and relationships with manufacturers and third-party service providers, must be considered as part of the lifecycle. One of the most serious shortcomings of most management programmers is the lack of feedback of positive or, more importantly, negative experience from every block back to the previous blocks, all the way up to the beginning block. This is

one of the most serious shortcomings of most management programmers. Accordingly, it is critical to comprehend the phases of the equipment's lifetime, which begin with the identification of a need and continue through research & development, manufacturing, sales and utilization by healthcare facilities. The following chapter includes information about the medical equipment industry's lifetime.

Medical Equipment Management Program (MEMP)

In today's hospitals, anything from 5,000 to more than 10,000 different types of medical gadgets can be found in a medium to big size facility. Health-care facilities and organizations must make certain that the key medical equipment in their care are safe, accurate, and dependable, as well as performing at the needed level of performance. In order to attain these goals, hospitals must develop and implement a Medical Equipment Management Program (MEMP), which specifies how to control the risks associated with medical equipment. Inspection and preventative maintenance are essential components of such a programmed, and they should be examined and modified on a regular basis in order to keep up with the speed of technical advancement in medical equipment, as well as the rising demands of healthcare organizations.

Maintenance choices in healthcare organizations may be made more cost-effectively and efficiently if they were completely understood, implemented, and led by people who are experts in maintenance. Maintenance excellence is achieved by a careful balancing of performance, risk, resource inputs, and cost in order to get the best possible solution (Campbell and Jardine, 2001).

Medical devices are essential components of current health-care services, and they are used for a variety of purposes including diagnosis, treatment, and patient monitoring. As they become more widely available, they will be used to improve the diagnostic and treatment capacities of health-care facilities. On the other hand, the ability to handle and maintain medical equipment in the majority of poor nations is still limited in most cases (World Health Organization, 1998). When dealing with the issues of an ever-increasing quantity and utilization of medical devices, it is essential to have realistic ways and effective management strategies in place.

OBJECTIVES OF THE STUDY

1. To study on Preventive Maintenance of Medical Equipment

2. To study on Medical Equipment Management Program (MEMP)

Medical Equipment Management

A critical role in the delivery of healthcare services is played by medical equipment. Small and basic equipment such as the sphygmomanometer are included, as well as more complicated and large devices such as Magnetic Resonance Imaging (MRI) machines are included. This ranking is the consequence of variations in the technology used and the purposes for which they are designed. As a result, it is critical that healthcare organizations manage their assets in order to keep their expenditures under control while also maintaining the highest possible level of quality in healthcare delivery. Management of medical equipment (MEM) is carried out in the context of available resources such as human beings, physical materials, structural, organizational, and financial resources. It is a procedure that assists hospitals in the development, monitoring, and management of their equipment in order to promote the safe, effective, and cost-effective usage and maintenance of their facilities. Responsible organizations should set up and review MEM on a regular basis to ensure that a suitable medical device is used in accordance with the manufacturer's instructions, that it is maintained in a safe and reliable condition, and that it is disposed of in an appropriate manner when its useful life has expired.

The Medical Equipment Management Program (MEMP) is a hospital-based programme that is designed to ensure the safe and dependable operation of medical equipment while also encouraging its optimal application (Stiefel, 2009). This programme describes processes and regulations to be followed in the management of operations involving medical equipment, from the selection and procurement of the equipment until its decommissioning. MEMP guarantees that devices can give doctors with trustworthy and accurate information, that they work safely for patients, and that they are used to their maximum potential (University of Michigan Hospitals, 2010) The life cycle of medical devices should be extensively studied in order to ensure that they are managed effectively. It is possible that deficiencies in managing each stage of the life cycle, particularly in the earlier phases, will result in greater issues in the subsequent stages. For example, if the maintenance capabilities of the equipment are taken into consideration at the acquisition stage, it can reduce the number of issues that may arise during the equipment's maintenance stage.

Preventive Maintenance of Medical Equipment

Medical devices are frequently complicated repairable systems that are made up of a large number of interacting components that work together to execute the duties that the system is designed to do. When a repairable system fails, it is possible to restore it to adequate functioning using any means other than complete replacement of the system

(Ascher and Feingold, 1984). As noted in Atles (2008), medical devices are subjected to a variety of testing and inspections throughout their life cycles. These include the following:

1. Acceptance Test a series of qualitative and quantitative tasks designed to verify the safety and performance of newly received equipment, as well as conformity to applicable codes, regulations and standards.

2. Operational Check Visual and operational check of the equipment's safety and functionality typically performed at the beginning of the day or work period, or just before using equipment on a patient.

An inspection programmer that includes both qualitative and quantitative activities that are meant to check the safety and performance of each piece of equipment by identifying possible and concealed defects and taking necessary action. SPIs are planned to be performed on a regular basis once an acceptance test for a newly received device has been successfully completed. During the inspection process, if any problems are discovered, corrective steps are conducted to bring the device or its problematic parts back up to an acceptable level. Additional failure prevention measures may be implemented in order to avoid future failures and/or to restore device operation; these measures may include part replacement, calibration, lubrication, and other measures to address age- or usage-related degradation, among other things. The operator must notify the failure of a device while it is in operation in order for the relevant procedures (corrective maintenance) to be conducted once again. When repairing a gadget is no longer technically viable or economically effective, replacing the equipment becomes the best or only choice available to the user (Atles, 2008). The primary tests and activities conducted during the life cycle of a device are depicted in Figure 1.

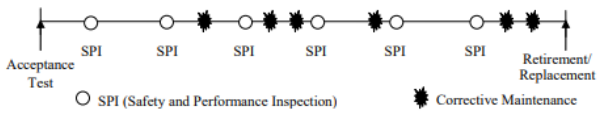

Figure 1: Major tests and actions performed during a device's life cycle.

► Standard EC.02.04.01: The Organization Manages Safety And Security Risks.

When it comes to selecting and procuring medical equipment, the company follows a methodical approach.

A documented inventory of all medical equipment or a written inventory of chosen medical equipment that is categorized according to the physical risk associated with its usage as well as the equipment incident history is maintained by the organization. Before putting new types of equipment into service, the organization assesses them to determine whether or not they should be included to the inventory list.

The organization outlines the maintenance, inspection, and testing operations that will be performed on every medical equipment that is in its inventory. Depending on the kind of equipment, different maintenance procedures may be employed by different organizations. Sharareh Taghipour has highlighted the need of having set intervals for inspecting, testing, and maintaining equipment in the inventory in their strategy. The defined intervals are determined by a variety of factors, including manufacturer's recommendations, risk levels, and the present experience of the business. Predictive maintenance, reliability-centered maintenance, interval-based inspections, corrective maintenance, and metered maintenance [which implies maintaining a device according to its working age] are all options for ensuring dependable performance in addition to preventive maintenance.

1. Based on factors such as manufacturer's recommendations, risk levels, and existing organization experience, the organization determines the frequency with which medical equipment in the inventory should be inspected, tested, and maintained.

2. In accordance with the Safe Medical Devices Act of 1990, the organization monitors and reports on any events in which medical equipment is suspected of being involved in or linked to the death, serious damage, or serious illness of any people (including children) (Samuel, 1991).

3. There are documented protocols in place for the organization to follow in the event that medical equipment fails, including the use of emergency clinical interventions and backup equipment.

4. For organizations that provide the technical component of advanced diagnostic imaging and choose to use The Joint Commission CMS imaging supplier accreditation option (Joint Commission Accreditation Ambulatory Care, 2010), the organization identifies activities and frequencies that are necessary to maintain the reliability, clarity, and accuracy of the technical quality of diagnostic images generated.

Status of Medical Technology in India

As a result of the emergence of cost-effective medical equipment, the vision and plans of all healthcare organizations have been mobilized. The landscape of healthcare services is shifting all across the world. India, like many other countries, has made remarkable progress in this intriguing field. As a result, technology serves as the foundation for

many governmental projects and health programmers. The development of systems in a variety of healthcare disciplines has assumed a major position in the country. Furthermore, the role of technology has had an influence on the growth of the public health sector's system development as well.

As a result of a number of national initiatives undertaken by the Government of India, innovative medical technology have been accessible to improve the running of public hospitals during the last few years, allowing them to better serve their communities. This has made a significant contribution to the achievement of an early diagnosis of illness and the prompt application of clinical judgment. Medical diagnostic equipment, such as auto-analyzers and automated cell counts, has largely taken the role of manual diagnostic techniques in the medical field today. There is no longer a requirement to send a large number of employees to conduct laboratory investigations around the clock. In the absence of such equipment, a greater amount of personnel was required to complete the manual tasks (Upadhya, 2004). Using a laboratory and radiology information system, for example, can allow you to submit your laboratory and radiological data to a central portal, making them easily accessible to physicians and patients alike. Such precautions have shown to be quite effective in reducing patient harassment and abuse. Despite the fact that there was no actual progress in the treatment processes, a significant amount of time was lost on tracking their reports, sometimes even days (Bajpai, & Bajpai, 2014). In the recent decade, the healthcare and medical device industries have experienced substantial growth. An enormous gap exists between current demand and supply for medical equipment in India, creating a substantial potential for companies producing medical devices in the country to grow their businesses.

CONCLUSION

As a result of the input received from specialists throughout the study's development phase, it was determined that the approach of quality management of medical equipment based on key performance indicators (KPIs) could be employed to quantify all elements of MEMS. It was also agreed that the plan for managing medical equipment in public hospitals in an integrated and comprehensive way should be authorized, as long as it is based on a conceptual framework with four domains of input, process, output, and result. More importantly, the comments they provided on the Likert scale for data items reinforced the notion that the MDS for MEMS serves as a decision support system for healthcare administrators, allowing them to assess and make appropriate decisions to improve the efficacy of management. While conducting the research, many statistical tests were conducted to determine how well MEMS performed at four public hospitals. The hypothesis testing also revealed that administrators and personnel may always enhance their performance if they follow industry best practices. Every one of the four domains of the conceptual framework had a relationship with the others. The degree of correlation between the four domains of the MEMS framework ranged from a moderate to a high level. The underperformance of one domain has a ripple effect on the performance of other domains as well. The linear regression model confirmed that there was a statistically significant relationship between overall KPI scores and the usage coefficients of the medical equipment under investigation.. The percentage completion of planned preventive maintenance (PPM) was found to be the most statistically significant predictor of UC among the four variables studied (Preventive maintenance, Accuracy and Quality Control, Corrective Maintenance, and Percentage completion of planned preventive maintenance). As a result, PPM can ensure that medical gadgets are used to their full potential. According to the findings of the study, the KPI technique may be extremely useful in the quality management of expensive medical equipment. The implementation of the aforementioned conclusions will ensure that public resources are used in an efficient, effective, and cost-effective way.

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