

MAINTENANCE OPTIMIZATION TECHNIQUES IN THE MEDICAL EQUIPMENT MANAGEMENT SYSTEM.

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Annotation: *The paper proposes a model for prioritizing medical equipment for making maintenance decision. This model uses a multi-criteria decision-making methodology to prioritize medical devices in a healthcare facility according to their criticality.*

Key words: *maintenance, medical equipment check, failures, malfunction reliability, preventive maintenance.*

Аннотация: *В статье предлагается модель определения приоритетов медицинского оборудования для принятия решения о техническом обслуживании. Эта модель использует многокритериальную методологию принятия решений для определения приоритетов медицинских устройств в медицинском учреждении в соответствии с их критичностью.*

Ключевые слова: *техническое обслуживание, проверка медицинского оборудования, отказы, надежность неисправностей, профилактическое обслуживание.*

Recently, the introduction of new medical equipment and technologies in the health care system requires the organization of effective and high-quality technical maintenance of medical equipment. Effective and high-quality functioning of medical equipment ensures the quality of medical services provided to the population. There is a tendency for the development of equipment of medical institutions (medical centers, clinics and hospitals) of the healthcare system from simple to high-tech medical equipment. Healthcare providers must ensure that their medical devices and systems are safe, accurate, reliable, and perform at the required performance levels.

To achieve these goals, healthcare institutions must establish and regulate a medical technology management system. Inspection and prevention is a fundamental aspect of such a system, and it must be constantly reviewed and improved in order to keep up with the pace of modern technological advances in medical technology, as well as to increase the expectations of healthcare organizations.

Cost-effective and efficient maintenance solutions can be made after careful understanding, implementation and improvement of service quality in healthcare organizations [1-4].

Maintenance of medical equipment and their working conditions can be very diverse: long-term continuous use, intermittent use, work in conditions of high temperature and high or low reliability, humidity, etc. Maintenance of medical equipment consists of the following stages:

- control of technical condition;
- maintenance during operation;
- restoration of the failed equipment.

Most of the research in this area shows that there is work to evaluate or improve the reliability of medical devices at their design or manufacturing stages. Unfortunately, not enough attention has been paid to the tasks of servicing medical equipment.

In order for medical equipment to function normally, it is necessary to ensure the safety and reliability of both itself and the auxiliary equipment [5,6].

This paper explores methods for improving current service strategies in the healthcare industry. To this end, we propose a prioritization model that can be used to determine which

medical devices should be included in a healthcare facility's service management system. Service optimization models are then developed based on the evidence from the maintenance of medical devices.

In doing so, particular attention is paid to the nature of the data, checks and maintenance, as well as the various types of failures. The results of these observations indicate the need to develop certain required data trending methods or models. Then, based on the results of the statistical analysis, several optimization models can be developed for complex repairable systems, such as medical equipment.

In medical technology, performance degradation and safety degradation occur over time due to failures of individual units or the system as a whole. Maintaining the performance and safety of the equipment requires daily routine checks, periodic checks and failure checks, which requires the establishment of an appropriate system. During such inspections, it is imperative to prepare checklists for each equipment and carefully maintain data on the results of inspections to track temporary changes and take appropriate security measures.

When checking medical equipment, depending on the types of checks, the following main categories are distinguished: external examination, check of work, check of technical condition.

These types of checks are included as needed in start-up checks, post-job checks, periodic checks, and other types of checks that are carried out during the maintenance cycle.

The start-up check and the post-run check are routine checks and, together with periodic checks, fall under the category of preventive maintenance to help prevent medical equipment failures early.

In contrast, a fault check, carried out upon detection of a fault, is categorized as restorative maintenance, carried out to identify the cause of a fault, repair or change over.

Preventive maintenance provides a preventative check. It can be classified into the following types of tasks.

a) The check at the beginning of the operation of medical equipment is carried out in order to ensure the safety and basic performance of the equipment before its use and includes a grounding check, calibration, etc. According to the classification of equipment verification, it is carried out mainly by external inspection and verification of correct functioning.

b) Inspection during the use of medical equipment is carried out during the use of medical equipment to check its safety. This category includes recording a calibration curve and checking for blood leaks during blood pressure measurements. This is carried out mainly by external inspection and by checking the functioning of the equipment.

c) Post-use inspection of the equipment may reveal problems in terms of reduced safety or performance. Verification is also carried out by external inspection and by checking the functioning of the equipment.

There are three main requirements for satisfying the maintenance of medical equipment:

- develop a model. which must decide what equipment to include in the medical equipment management program of a medical institution.
- develop models to ensure reliability and trend analysis of failures in medical technology.
- develop optimization models for a repaired medical system during periodic inspections.

Based on the fulfillment of these requirements, a model for determining the priority of medical equipment for making decisions on maintenance has been developed. This model uses a multi-criteria decision-making methodology to prioritize medical devices in a healthcare facility according to their criticality.

In this case, devices with a lower criticality rating can be given a lower priority in the medical device management system. However, for devices with high ratings, a root cause analysis must be performed to find the root causes of a high severity number. To reduce their risk, it is necessary to take appropriate measures such as “preventive maintenance”, “user training”, “redesign the device”, etc. In addition, some guidelines are offered on the selection of appropriate service strategies for different classes of medical technology. Timely detection of failures in medical equipment is important here.

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