



# A STUDY ON ASSESSMENT OF BIOMEDICAL EQUIPMENT UTILIZATION IN SURGICAL INTENSIVE CARE UNIT (SICU), IN ONE OF THE PREEMINENT HOSPITALS IN SOUTH ZONE OF TAMILNADU

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**Abstract:** The heed administered to the patients depends on feasibility and utilization of medical equipment. The quality of care rests on proper conservation and employment of medical equipment. The intention of the study is to calculate utilization rate of medical equipment and escalating competence over defeating the factors which influence the utilization of equipment in Surgical Intensive Care Unit (SICU). Observational study was conducted at one of the leading hospitals in south zone of Tamilnadu in the year of 2020. All the equipment in Surgical Intensive Care Unit have Annual Maintenance Contract (AMC) & Contractual Maintenance Contract (CMC). One by fourth of the equipment in SICU is underutilized. Medical equipment utilization paves the way to attain maximal return on wealth invested. Each and every equipment present in healthcare institutions has on urge to be entirely and properly utilized followed by periodical Preventive Maintenance periodically. In this paper, it is evident that, overall progress of heed was favorable, at the same time, there were few grey areas of negligible utilization of resources.

**Index Terms - Annual Maintenance Contract, Contractual Maintenance Contract, Equipment, Utilization, Hospital, Maintenance**

## I. INTRODUCTION

### 1.1 Definition:

(a) Biomedical Equipment:

Biomedical Equipment are intending to accomplish the Diagnosis, Monitoring and Treatment of medical conditions.

(b) Equipment Utilization:

Utilization is the percentage of available time that equipment is actively working.

### 1.2 About the Study

Biomedical equipment is playing a significant role in hospital & healthcare sectors. These are mainly used for Prevention, diagnosis, treatment and rehabilitation process for diseased / ill patients and also for defecting, measuring, correcting, modifying and restoring the structure of human body. Biomedical equipment is accomplished for providing patient care and these are classified based on needs and method of care.

Medical equipment requisites calibration, maintenance, repair, training and downgrading endeavors usually administered by clinical engineers. This equipment is used individually (or) combined with other piece of medical equipment. Conversely, medical equipment prohibits implantable, disposable, single-use medical devices, explains WHO Medical Device Technical Services. Utilization advertence the asset (equipment) utilization, which is an assessment of use & performance of medical equipment aid treatment, Diagnosis and Recovery of patient.

Intensive Care Units refers specialized treatments given to the patients who are critically ill and who needs secondary options for their daily activities. ICU's are different types such as Neonatal Intensive Care Unit (NICU), Pediatric Intensive Care Unit (PICU), Cardiac Intensive Care Unit (CICU), Medical Intensive Care Unit (MICU), Trauma Intensive Care Unit (TICU) and Surgical Intensive Care Unit (SICU). Intensive Care Units have some medical equipment which is used continuously and periodically such as, monitoring, infusing drugs & fluids, ventilating, feeding, laboratorial, radiological and other equipment which is vitally used for patients.

It is quantified that 50% of biomedical equipment in developing countries are not used, not maintained & not functioning properly. This is because of the equipment in particular area / department was not needed / not working/ need to replace spare parts / excess in use. It is captious; hence a medical device management policy endure that includes Financial Provision for maintenance, spare parts and user trainings in commencing cost of the equipment.

Henceforth, proper study on biomedical equipment utilization made demand on regular basis. In proportion of medical equipment utilization, the chart was prepared and analyzed.

### 1.3 Objectives of the Study:

- To study the utilization of biomedical equipment in Surgical Intensive Care Unit in the selected hospital
- To identify the factors influencing the utilization of equipment
- To suggest measures to improve utilization of equipment

## II. LITERATURE REVIEW

According to Vaibhav Gupta<sup>1</sup>, Nitin Gupta<sup>2</sup>, Gargi S Sarode<sup>3</sup>, Shankar Gouda Patil<sup>4</sup>, Sachin C Sarode<sup>5</sup> (2017), the study was conducted to assess the utilization of equipment by calculating utilization coefficient (UC). An observational study was conducted in the year of 2015 for the medical equipment with the maintenance schedule. Findings of this study stated that, around 50% of this medical equipment were underutilized. Only four equipment had preventive maintenance schedule under which services usually provided every 4 months. Most of the equipment did not have any maintenance contract. Every equipment being installed in health care institutions need to be fully and properly utilized. Findings of this study will enable the administrators to ensure that the equipment is in proper working condition to provide optimal patient care.

According to Dr. Anil Pandit<sup>1</sup>, Ms. Neha Unadkat<sup>2</sup> (2017), this study was conducted among critical care areas to evaluate utilization of equipment. modern hospitals utilize wide range of equipment for providing diagnostic & therapeutic care to the patients. Many times, this equipment is purchased without prior assessment of availability of knowledge and facilities for repair and maintenance. Hospitals have biomedical department to service and maintain the equipment by technicians and through contract. Hospitals efficiency is evaluated by the quality indicators. Accessibility and optimal utilization of equipment is necessary to improve the quality of service. Wealth invested to purchase, maintenance and repair of medical equipment must be reliable. Inadequate management of equipment may lead to financial losses. Findings of the study reveals that the overall process of care with quality was good and however there is some areas of sub-optimal utilization of resources.

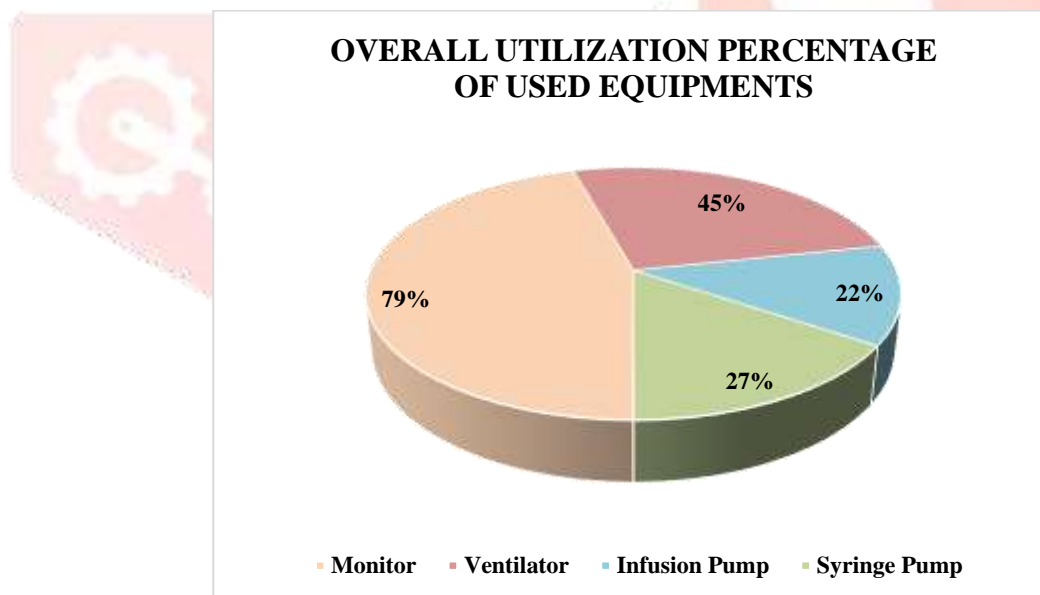
According to Poonam Chaudhary<sup>1</sup>, Pankaj Kaul<sup>2</sup> (2015), this study was focused to find out the deficiency in the utilization coefficient (UC) of medical diagnostic equipment and the various factors causing the under-utilization of these equipment. 30 medical diagnostic equipment were studied for their UC and simultaneously a perception-based analysis was conducted, where the faculty and staff members concerned with the administrative matters and use of that particular medical diagnostic equipment were concerned. Findings of the study was 23% of this medical diagnostic equipment were not adequately utilized due to one reason or the other. Lack of preventive maintenance, non-availability of spare parts, manpower, maintenance delays are the factors which affects the utilization of equipment.

## III. METHODOLOGY

This is an observational research that employs the medical equipment utilization. Totally 180 equipment were present in the Surgical Intensive Care Unit and in this, some equipment was vitally utilized. Based on the, sample size is 98 and the equipment include Monitor, Ventilator, Infusion Pump and Syringe Pump. Hence, the purposive sampling method is used for the study. For this, the checklist was framed and data were collected on time.

## IV. ANALYSIS

**Fig 1.1: CHART SHOWING THE OVERALL UTILIZATION PERCENTAGE OF EQUIPMENTS**



**Figure 1.1:** It was found that, monitor has 79% of utilization, ventilator has 45%, infusion pump has 22% and the syringe pump has 27%

Fig 1.2: CHART SHOWING THE FACTORS AFFECTING THE UTILIZATION OF EQUIPMENTS

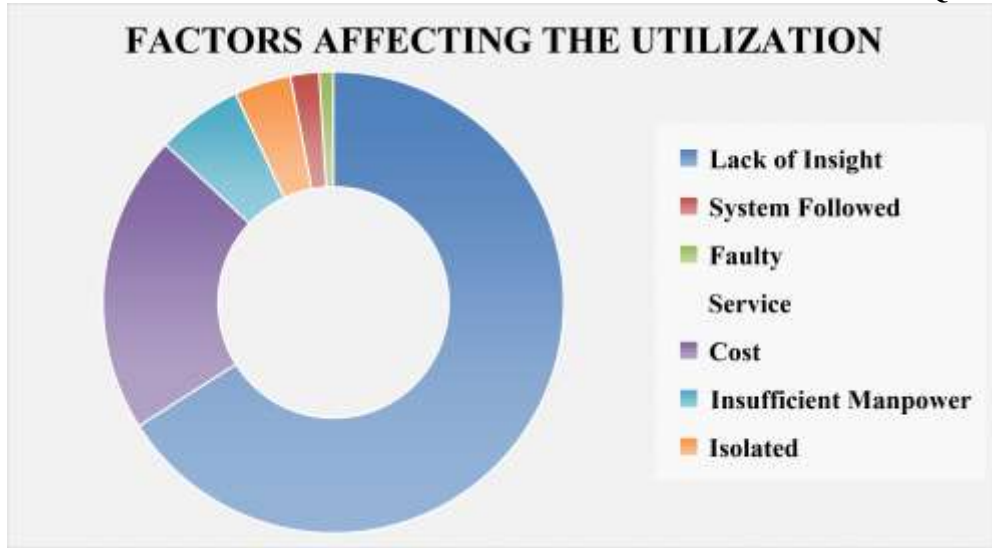


Fig 1.3: CHART SHOWING THE OVERALL PERCENTAGE OF UNUSED EQUIPMENTS

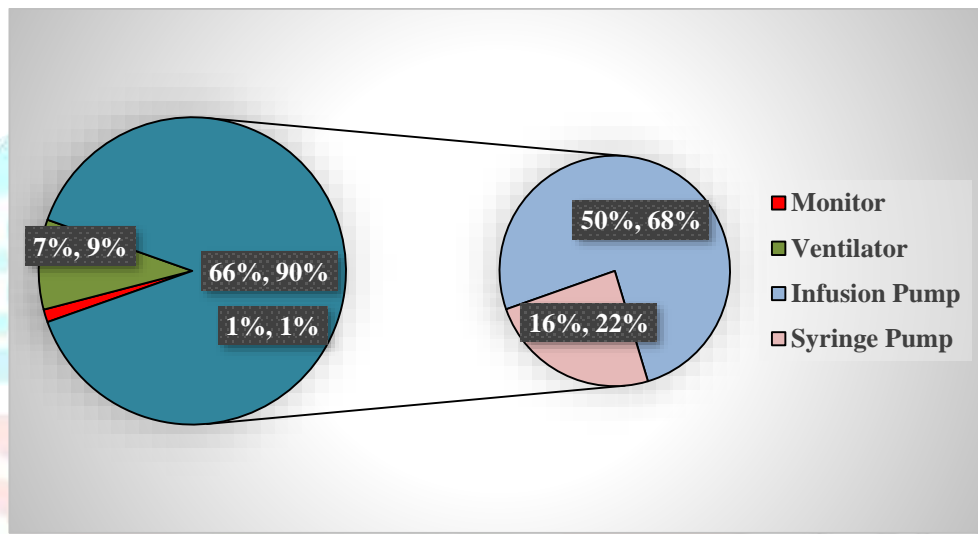


Figure 1.3: It was found that, Infusion pumps (50%) are underutilized, syringe pumps (16%) are moderately utilized and monitors (1%) & ventilators (7%) are highly utilized.

Fig 1.4: PARETO DIAGRAM

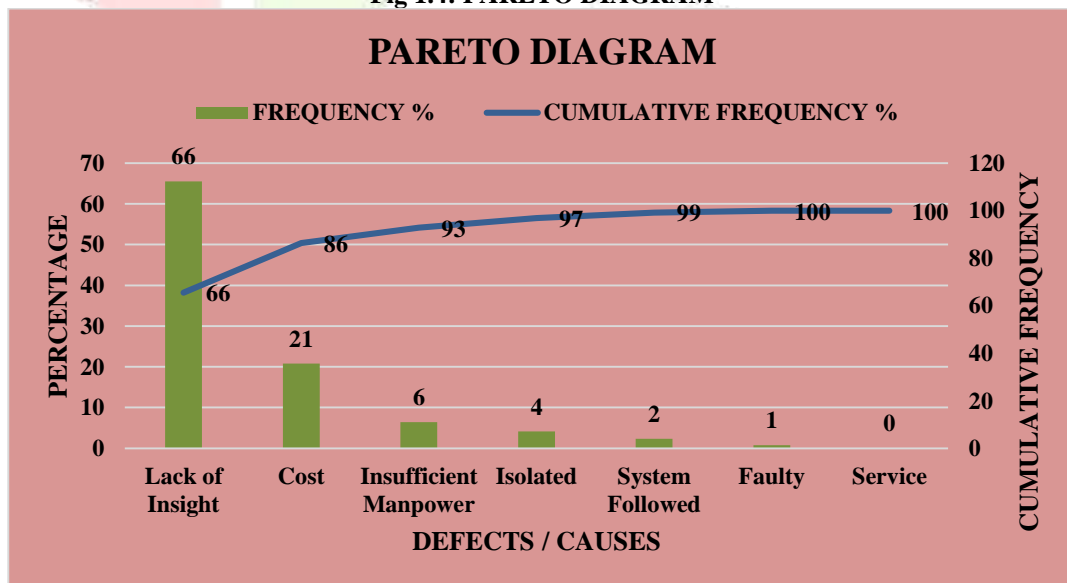
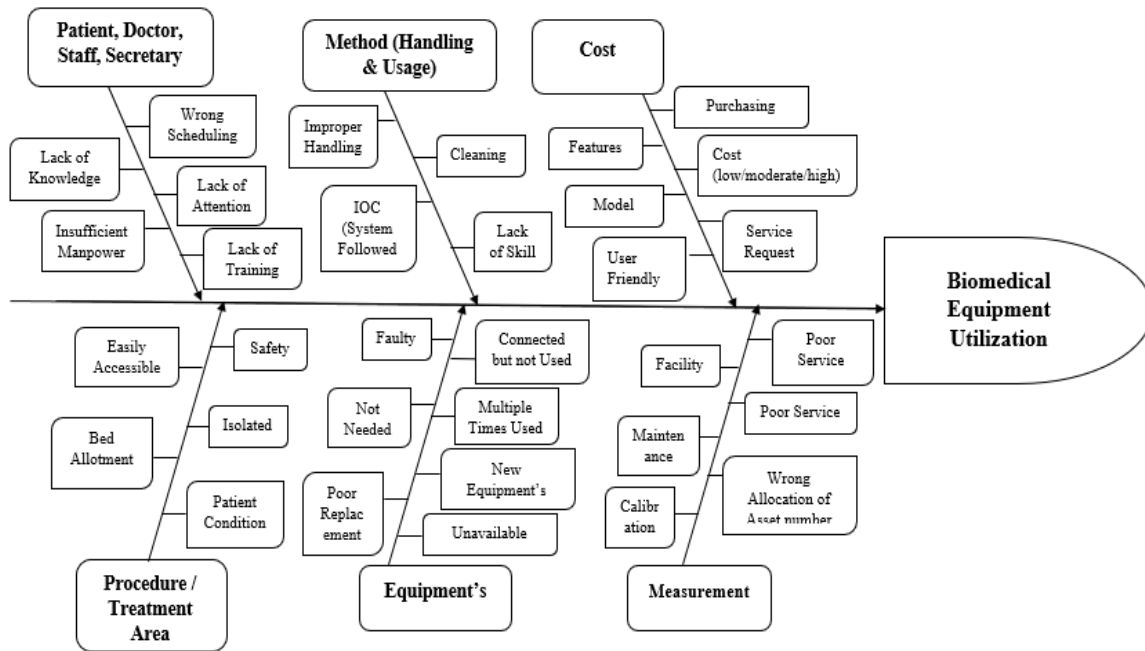


Figure 1.4: 20% of lack of insight leads to 80% of improper utilization of equipment

Fig 1.5: CAUSE AND EFFECT DIAGRAM WITH ADDITIONAL CHARTS



## V. MAJOR FINDINGS & RECOMMENDATION

### (a) Findings:

- Strategic planning has to be done by the management to administer the medical equipment in the acquisition of right medical equipment at the right working place and right time with right maintenance contract
- Breakdown of the equipment should be handled & serviced with in minimum time
- Equipment which are shared to other user departments were not replaced on time
- Lack of training programme to the user departments and freshers for handling of equipment resulted in the underutilization of equipment.

### (b) Recommendation:

- Provide efficacious and hands on training to the user department
- Scrutinize the usage rate of each equipment and minimize the downtime of the equipment
- Go through the preventive maintenance schedules and calibrations
- Track the equipment with proper asset number
- serialized equipment inspection needs to be practiced along with assessment of quality of the performance of equipment
- Each equipment must be taken in to account and utilize respectively.

## VI. CONCLUSION

It is concluded that the study was conducted on utilization of equipment in Surgical Intensive Care Unit (SICU). This in turn helps to understand the proper utilization of equipment and workflow of Surgical Intensive Care Unit (SICU). For understanding the utilization of equipment, Monitor, Ventilator, Infusion Pump, Syringe Pump were taken for the study. Three by fourth of the equipment were used adequately. The analysis and the suggestions will serve as a useful reference to the hospital for optimizing equipment utilization to increase operational efficiency. This study might serve as a hint for future researchers.

## VII. REFERENCE

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