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Hospital Administration

LEVEL OF KNOWLEDGE AMONG INTENSIVE CARE UNIT NURSES REGARDING BIOMEDICAL EQUIPMENT MANAGEMENT.

Saramma Koshy	Former Ward Sister, Sree Chitra Tirunal Institute of Medical Sciences and Technology (SCTIMST), Trivandrum, Kerala.
Jawahar SK Pillai*	Additional Professor and HOD, Department of Hospital Administration, All India Institute of Medical Sciences Bhubaneswar, Bhubaneswar, Odisha. *Corresponding Author
Ramkrishna Mondal	Senior Resident Department of Hospital Administration, All India Institute of Medical Sciences Bhubaneswar, Bhubaneswar, Odisha.

ABSTRACT

Background: Technology management is very important aspect since a good share of the health budget is spent on health equipment and devices. Intensive Care Unit (ICU) nurses should have knowledge, technical skill and expertise to deliver high quality and safe nursing care. They need to be well versed in advanced technology, require quick decision-making skills to deal life threatening condition, stay abreast of changing technology to preserve organ function and coordinate the care with multiple influencing factors. This study is formulated to assess the knowledge of nurses regarding equipment operation, maintenance, safety and optimum utilization in ICU setup.

Methods: Randomly selected fifty nurses from ICU were subjected to a pre-tested questionnaire related to knowledge and practical experience in managing commonly used biomedical equipment. Simple statistical methods and Chi square test were used to find out the association of variables and scoring method was used to assess the knowledge of the nurses.

Results: A good percentage of nurses who scored higher marks had an education qualification of Post Basic Nursing (69.05%) and B Sc Nursing (62.40%). Most of the respondents who belonged to middle age group (67.46% for 41-50 years age group) with good working experience in ICU (65.87% with above 20 years' experience) are having reasonably adequate knowledge.

Conclusions: The study concluded that in order to effectively manage ICU in relation to biomedical equipment operation, maintenance and safety, well qualified and experienced Nurses should be employed and regular training is mandatory.

KEYWORDS : Biomedical Equipment Management, ICU Equipment, Knowledge Study, Equipment Operation, Equipment Maintenance

INTRODUCTION

With the advancement of technology and medical sciences, more and more health care technologies are involved in the patient care. Majority of the equipment are handled by nursing staff only. Critical care nursing is highly technical in Intensive Care Unit (ICU) setting. Nurses are like human boy, the heartbeat of a sound operation in any health care setting. ICU are loaded with sophisticated complex equipment. Technology management is very important aspect as a major part of the health budget spent on health equipment and devices [1]. A well-prepared technology management policy helps to maximize the gain from equipment [2]. Much of the health care equipment in public sector hospitals are non-functional, non-usable or badly maintained. According to WHO, nearly 50-80 % of the equipment remain non-functional [3]. Medical devices are assets that directly affect human lives with considerable investments and in many cases have high maintenance costs. A well-planned maintenance ensures that the equipment is operating well and is safe for both patients and operators as well as it extends the life of the equipment and reduces failure rate or down times. Critical care areas are special units of a hospital where patients require constant observation, intervention and evaluation and usually require the assistance of monitoring equipment [4]. Early detection and prevention are key concepts in the provision of nursing care to critically ill patients. Critical care nurses must have knowledge, technical skill and expertise then only they could deliver quality and safe nursing care [5]. According to a study the nurse's role is shaped by nursing education [6].

The competence of health care personnel is based on their prior education and the knowledge gained [7]. High technology and technical advances used in the management of health and illness have a tremendous impact upon nurses and nursing care [8]. In addition, the nurse is the person who provides emotional support in a high technology environment. In the majority of ICUs, nursing staff were expected to manage the computerized equipment, report malfunctions and maintain a standard of practice in their dealings with the equipment [9]. ICU nurses are responsible for the supervision of computerized equipment with regard to troubleshooting, alarms, assembly, dismantling and cleaning requirement [10]. In a study by Pelethetrie (2004) it reveals no significance in nurses' knowledge of intensive unit and that the nurses concern in practice [11]. In another study there is a specific need-based training should be there for the health care team within the unit according to standardized management practices [12]. A study outlined that nurses were an important aspect of maintaining hope for the patients and revealed that prolonged ventilation had an impact on patients to get COPD [13]. Healthcare technology has become increasingly complex, transforming the way nursing care is conceptualized and delivered.

Critical care unit is a highly complex area in the presence of specialized equipment. This has led to improved patient outcome and increased nurse's decision-making responsibilities. Nurses in critical care areas entered in to the decade of technology [4]. ICU nurses are required to understand the working principles of these equipment and based on the data from the equipment, nurses need to make decisions quickly, accurately and often independently based on the condition of the patient [14]. Since the equipment are continuously used for the patient, it is essential that it should be maintained at a higher safety level. Nurses in charge of the medical equipment need to take initiatives for proper and periodic maintenance of the equipment.

The aim of this study is to assess the knowledge of nurses regarding equipment safety, operation and maintenance in the intensive care units.

METHODS:

The study is exploratory and descriptive in nature. The study was carried out at a tertiary care hospital at South India. A pre-tested questionnaire was prepared related to the knowledge and practical experience in managing few selected bio-medical equipment. The equipment mainly highlighted were Ventilator, Monitor, Defibrillator and Infusion pump. Out of total 26 questions, 5 were for demographic data and 21 were for assessment of the knowledge level of the nurses related to equipment operation, maintenance and safety. Nurses of all Intensive Care Units were the respondents. A random sampling was taken and a total of 50 respondents were given the questionnaire. The study used four independent variables, age, education, total experiences and ICU experience. Dependent variables were knowledge on operation, maintenance and safety of biomedical equipment.

A scoring method was used to find out the overall knowledge of nurses according to various parameters like education, age, experiences etc. Chi-square independence test was used to find out the association between the variables.

RESULTS:
50 Nurses were given the questionnaire to respond. Area wise or Speciality wise distribution of the Nurses found that majority belongs to Adult cardiac surgery (44%) followed by Congenital cardiac Surgery (16%), Neurology (16%), Cardiology (14%) and Neurosurgery (10%).

Educational Qualification is one of the of the most important parameter in deciding the knowledge of nurses. Different educational qualifications wise detailed analysis of Knowledge level is provided in figure I.
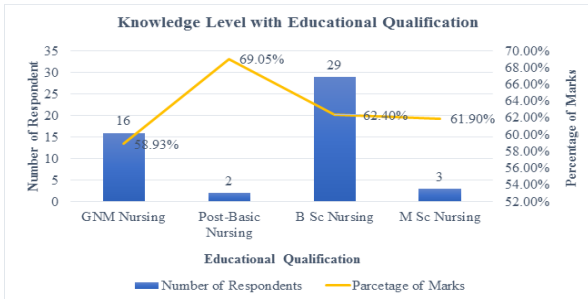

Figure I: Knowledge level with Educational Qualification.

Age is also an important parameter regarding the maturity and gaining of practical knowledge Distribution of the Nursing age and analysis of Knowledge Scoring was made in relation with age in figure II.
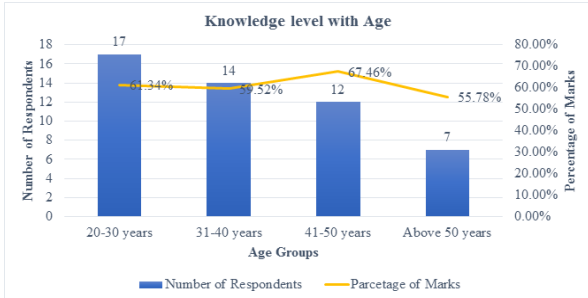

Figure II: Knowledge Level with Age.

Along with age, the experience as a professional also mattered a lot for the knowledge level. Total Years of experiences are depicted in different group of experience level along with the knowledge scoring in figure III.
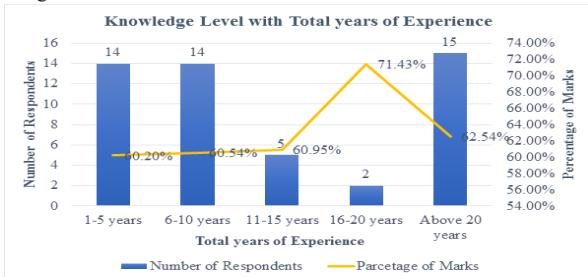

Figure III: Knowledge Level with total Years of Experience.

Out of the total experience, experience in ICU or Critical care experience are also considered and the results of the knowledge Score with years of ICU experiences shown in figure IV.
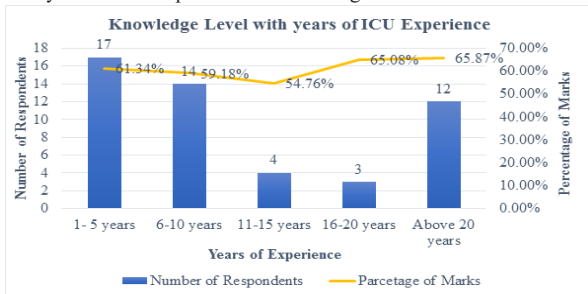

Figure IV: Knowledge Level with years of ICU Experience.

Opinion among all the Nursing staff regarding Reason for Failure of Health Equipment is shows that almost majority (82%) were in opinion of all four reasons of poor procurement procedure, inadequate finance for maintenance and poor maintenance. 18% were in opinion of poor maintenance only.

DISCUSSION:
As per speciality or area wise distribution it was found that majority of the nurses were from Cardiac Surgery ICU (44%) and least from Stroke ICU (10%). A scoring method was used to find out the overall knowledge of nurses according to various parameters like education, age, Total experience and ICU experiences.

It was found that in the study, majority of the respondents are having educational qualification of B Sc Nursing (58%). It is found that most of the nurses are well educated at the study setting. It is found that Post Basic Nursing respondents have scored highest average marks (69.05%) followed by B Sc Nursing (62.40%). It is evident that nurses with higher qualification had better knowledge. The institute is offering Post Basic Nursing course in Cardiac and Neuro for one year.

In age distribution of the respondents it was found that 34% were in the very young and active age range of 21-30 years. As age increases, experience also increases. It was found that 52% respondents were in the age range of 31-50 years. Only 14% were above 50 years of age. Overall, majority of the study population are of young to middle aged. When comparing the age range of the respondents, it was found that the respondents age group of 41-50 years have acquired highest marks (67.46%). Lowest marks were acquired by the age group of 31-40 years (59.52%). At this age group, the respondents are not so stable and do not have adequate experience, which may be the reason for low values among them.

Knowledge increases with the experience. It was found that 30% of the respondents were more than 20 years of experiences. Followed by 28% in the group of 1-5 years and 28% in the group of 6-10 years of experiences. Based on the Total experience of the nurses, general belief is that when experience increases the knowledge also increases. This is evident in this study also. But, it was found that nurses with more than 20 years of experience could bet able to perform with 62.54% marks compared to highest marks (71.43% in the age group of 16-20 years). This may be due to the reason that their ICU experience were less or more experienced nurses are having higher age with difficulties of the old age.

In relation to ICU experience, it was found that 30% staff were having more than 20 years of ICU experience. 56% staff were having experiences from 1-10 years in ICU. Considering the ICU experience only, it is found that more the years of experience in ICU the higher the marks they acquired. Highest score of 65.87% is among nurses having more than 20 years of ICU experience. It is interestingly found that 1-5 years ICU experience have scored more (61.34%) compared to 6-10 years and 11-15 years of experiences. This scoring may be due to their fresh outlook and active learning.

It was seen that around 82% of the respondents agreed that inappropriate selection during procurement procedure, inadequate mechanism for maintenance and poor maintenance were the reasons for frequent failure of equipment. Similar reasons are mentioned as the reasons for non-functional equipment in a study made in Srilanka in 42% of equipment [15]. There is a tendency among hospitals to employ nurses with inadequate experience in ICUs. This study points to the fact that such trends are not a healthy sign in healthcare.

CONCLUSION:
From the analysis, it can be concluded that most of the nurses under study have knowledge on operation, maintenance and safety of equipment used in various ICUs. A good number of nurses who gave right answers had an educational qualification of B Sc nursing or higher qualifications. Most of the respondents who belonged to middle ag group with good working experiences in the ICU are having reasonably adequate knowledge.

Periodic regular training to be conducted for Nurses as well as other staff at ICU for understanding the working principles of the equipment, which will lead to better equipment management and extend the longevity of the equipment.

The study concluded that, in order to manage ICU in relation to

biomedical equipment operation, maintenance and safety, sufficient well qualified and experienced Nurses should be employed and regular training is mandatory.

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Impacts/Highlights:

a)Intensive care unit (ICU) one of the most vital areas of any hospital. It is also a very critical area both on operational and financial aspect. The Nurses posted in critical care should be well planned according to the national and international standard and they should be well trained and experienced. ICU has lot of costly and complex biomedical equipments. Nurses should be well trained and experienced to handle the lifesaving equipments.

b)It is evident that there is scarcity of health manpower specially nurses. There is a tendency among hospitals to employ nurses with inadequate experience in ICUs. This study points to the fact that such trends are not a healthy sign in healthcare.

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