

The Application Effect Analysis of Nurse's Equipment Management Standardized in ICU Equipment Management

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Abstract: Objective: To assess the application effect analysis of nurse's equipment management standardized in ICU equipment management. Method: This study included 56 related medical staffs who are working in ICU department and they used the medical equipment in their working. the data of 2018 was defined as control group, that the medical equipment was receive common management methods in 2018. In intervention group, we collected related data in 2019, that the medical equipment was receive nurse's equipment management standardized in this year, the intervention contrasts Standardize management, set up instrument management team, formulate instrument management system, instrument maintenance and repair system, instrument training system, and regularly organize study and training for all staff in the ward. We evaluated the differences between the two groups in terms of instrument repair rate, instrument maintenance cost, nursing staff's mastery of instrument and equipment skills, instrument maintenance quality, instrument and equipment maintenance rate, and instrument management mode satisfaction. Result: In terms of the frequency and cost of instrument and equipment maintenance, the frequency and cost of maintenance are both higher than the standard management, and the results are statistically significant. In the survey results of instrument and equipment standard management, except maintenance efficiency, the other data are statistically significant. The p value of nursing staff's satisfaction with instrument and equipment skills, instrument maintenance quality, instrument and equipment maintenance, the p-value instrument management mode was all less than 0.005, the difference was statistically significant. Conclusion: Standardized management of ICU equipment can reduce equipment failure rate and maintenance cost.

Keywords: Equipment Management, ICU, Standardized Management

1. Introduction

The part of medical services depends on a steady increase in the evolution of medical technology. Most hospital departments were affected by the impact of electronic, mechanical, hydraulic equipment in daily routine [1]. Tong thinks that the rational use of medical equipment has positive significance for improving the efficiency of clinical diagnosis and treatment and promoting the rehabilitation of patients. As an important part of hospital work, effective management means for medical equipment can improve the management efficiency of hospital equipment and optimize the management quality of hospital equipment, which is of great clinical significance [2, 3]. Scheduled maintenance

(SM) and corrective maintenance (CM) require maintenance for medical equipment in all hospitals. Base on the manufacturer's instructions, the work of maintenance personnel contains the operations performed at scheduled times to reduce deterioration from use or the occurrence of functional failures in scheduled maintenance process. In addition, the work of corrective maintenance includes repairing equipment function and replacement which repair is not feasible due to costs or obsolescence [4-6].

Medical equipment is one of the important components of medical services, which is closely related to the clinical medical quality of patients. The types of equipment in ICU mostly include important life support equipment such as ventilators, monitors, defibrillators, etc. The management of first-aid equipment requires

100% intact standby state. The quality of medical equipment will affect the clinical medical work, thus affecting the medical quality of patients, and even lead to medical accidents [7, 8]. The nurse's equipment management standardized is a training in part of medical equipment maintenance, that the nurses were trained by professional skills in the use of medical equipment. Furthermore, nurse's equipment management standardized made the medical staffs learn more related knowledge of medical equipment maintenance and improve their practical ability of medical equipment maintenance [9, 18, 19]. The aim of this study is to assess effect of nurse's equipment management standardized in ICU equipment management.

2. Methods

2.1. Participants Enrollment and Survey Methods

This study included 56 related medical staffs who are working in ICU department of The First Affiliated Hospital of Jinan University and they used the medical equipment in their working. The time of collecting data of the study from January 2018 to December 2019 by our researchers. In addition, the data of 2018 was defined as control group, that the medical equipment were receive common management methods in 2018. In intervention group, we collected related data in 2019, that the medical equipment was receive nurse's equipment management standardized in this year. We recorded maintenance charge of medical equipment and maintenance times in every season of this two years. Another data was collected in the last month of the year by questionnaires. In our research result, the result of an analysis includes maintenance times, maintenance cost, medical staff satisfaction and maintenance quality evaluation.

2.2. Control Group

Participants in control group received a common equipment management model in 2018.

2.3. Intervention Group

In addition, the participants of intervention group received nurse's equipment management standardized. We provide professional training to medical equipment preparers, that medical equipment preparers have better maintenance skill and they are scheduled for maintenance. Additionally, we use China national standard to determine maintenance results, that it ensure all maintenance results is qualified.

2.4. Instrument and Equipment Standard Management Mode

(1) We establish a medical device Management Committee.

Its composition structure includes: section director, head nurse, one medical device management group leader, two medical device management deputy leaders, members include all the director members of the instrument group. (2) We make instrument management standard. It includes: guidelines for the use of various instruments, routine maintenance plans, maintenance methods, quality control, procedures for troubleshooting, instrument maintenance files, and rules for instrument lending. We regularly train nursing staff in general practice to standardize the operation behavior of using instruments among nurses. (3) Set the instrument placement point and position placement. We place equipment in a classified location. Equipment should be placed in a place that is not wet and dry. Regularly organize the quality control and maintenance of the use safety of medical devices, and monitor and evaluate the use environment of the equipment. (4) We regularly invite relevant engineers to analyze and evaluate the risk of preventive maintenance, testing, calibration and clinical use guidance of medical equipment in use. (5) We regularly repair and maintain the instruments to keep them clean. The instrument management team leader arranges staff to clean and maintain all the instruments and equipment every two weeks. Each patient will be end-disinfected when he/she turns out. (6) Improve equipment borrowing and returning procedures and analyze quality control and maintenance data.

2.5. Inclusion and Exclusion Criteria

Inclusion criteria: (1) All the enrolled nurses in the undergraduate department; (2) All participants were aware of this study and agreed to participate in it. Exclusion criteria: (1) Interns; (2) Training personnel.

2.6. Statistical Analysis

Our data analyzer performed the statistical analysis by SPSS 20.0. The P value, t-test and chi-square test were associated with collection result were analyzed. Besides, the mean standard deviation for statistical description.

3. Result

We collected the basic information of participant by a homemade questionnaire (Table 1). In detail, most participants are female nurses. The most of their educational background are undergraduate and junior college, only a few participants had graduate and doctoral degrees. In addition, their length of service is between 1 to 5 years, that they have enough experience to assess the equipment management model.

Table 1. Basic Information of Participant.

| Projects | Number of participants | n (%) & Mean±SD |
|---|------------------------|-----------------|
| Gender (Female) | 56 | 41 (73.21%) |
| educational background (Undergraduate course) | 56 | 29 (51.79%) |
| Job responsibilities (Nursing) | 56 | 48 (85.71%) |
| Age (year) | 56 | 27.14±17.34 |
| Length of service (year) | 56 | 3.16±2.75 |

Table 2. Maintenance times and Maintenance Cost.

| Projects | Maintenance times | Maintenance Cost |
|--------------------|-------------------|-------------------|
| Control group | 15.75±6.42 | 44106.75±13058.47 |
| Intervention group | 6±1.22 | 11417±6852.44 |
| X ² | 4.65 | 8343.81 |
| P value | 0.199 | < 0.005 |

In Table 2, it shows maintenance times and maintenance cost of two group. The control group has more maintenance times and higher maintenance cost than that of intervention group, but only maintenance cost is statistical significance in research result

Table 3. Participants' satisfaction with the management model.

| Projects | Equipment operation training | Maintenance quality | Maintenance efficiency | Arrangement and placement of equipment | Cleaning and disinfection | Management Model |
|-----------------------------|------------------------------|---------------------|------------------------|--|---------------------------|------------------|
| Control group (n = 56) | 31.59±11.44 | 29.86±12.16 | 30.27±9.19 | 29.00±13.00 | 32.27±14.42 | 30.34±12.12 |
| Intervention group (n = 56) | 68.41±10.86 | 70.14±12.88 | 69.73±10.07 | 71.00±12.00 | 67.73±13.77 | 69.66±14.12 |
| P value | < 0.005 | < 0.005 | 0.241 | 0.031 | < 0.005 | 0.029 |

4. Discussion

In ICU department, the medical equipment is not only used in the treatment and diagnosis of many diseases, but also can reduce the harm to patients and improve the efficiency of disease diagnosis [10, 11, 19]. However, the equipment will fail or make mistakes in sometime so that it affects the clinical treatment effect and the diagnosis of patients' diseases. The reasons are aging of medical equipment and high frequency of use of medical equipment [12-15, 20]. Thus, most organization build a medical equipment management model to help the department to ensure the quality of maintenance [16].

According to the above survey results, the nurse's equipment management standardized can reduce maintenance cost and improve equipment operation training, maintenance quality, arrangement and placement of equipment, cleaning and disinfection, management model satisfaction. Base on the research of maintenance times and maintenance cost, the result which collect from maintenance times and maintenance cost of control group and intervention group indicates maintenance cost are not statistical significance and maintenance cost are statistical significance, that the nurse's equipment management standardized only affect maintenance cost, not maintenance times. In research of participants' satisfaction with the management model, except of maintenance efficiency, the nurse's equipment management standardized improve most of medical equipment maintenance, that include equipment operation training, maintenance quality, arrangement and placement of equipment, cleaning and disinfection, management model satisfaction. In detail, the management model strongly improves equipment operation training, maintenance quality, cleaning and disinfection as the result shows their p values are less than 0.005. But the result is different to the Hezhang's report, that his result of arrangement and placement of equipment was not affected by medical equipment management standardized [17].

(44106.75±13058.47 vs 11417±6852.44, $p = < 0.005$).

The Table 3 indicated participants' satisfaction of two groups in different aspects, that include equipment operation training, maintenance quality, maintenance efficiency, arrangement and placement of equipment, cleaning and disinfection and management model. All the data except maintenance efficiency were statistically significant, that equipment operation training, maintenance quality, cleaning and disinfection have significant difference as their p values are less than 0.005.

The biggest differences between the control group and the intervention group were that the intervention group had a regular maintenance plan, associated personnel training, and a standardized quality control system. Regular maintenance plans ensure that medical equipment is less likely to malfunction at work, improving the quality of care in the ICU, and reducing medical risks.

5. Conclusion

In conclusion, the standardized management of equipment in ICU can reduce the failure rate and maintenance cost of equipment. In addition, it improves the satisfaction of most aspects of instrument and equipment maintenance, including instrument operation skill training, maintenance quality, instrument positioning and placement, instrument surface cleaning and disinfection, and management mode satisfaction. The standardized management of ICU equipment helps to ensure the nursing safety of patients, and ICU nursing staff plays an important role in the standardized management of equipment.

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