



Original Article

Practices of Medical Device Usage Among Nurses Working in The Critical Care

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ABSTRACT

Ventilator is widely used medical device in the critical care to deal with multiple life emergencies. So, nurses must be trained regarding usage of ventilator to provide excellent care without any complication. **Objective:** To analyze the effect of educational training program on nurses' practices regarding the usage of medical devices (Ventilator). **Methods:** Quasi experimental research design with pre- and post-was used followed by educational intervention. Research was conducted in Critical Care Unit (CCU) of public tertiary care Hospital. Total 36 nurses were selected. Nurses who have attended any training session regarding ventilator care were excluded from the study **Results:** Paired sample t-test showed a significant difference in the pre and post scores of nurse's practices regarding the usage of the ventilator, with paired sample t test, $t(34) = -20.4$, $p < .05$ was significant. Pre-test mean scores ($M=10.00$, $SD= 0.00$) compared with post -test scores ($M=17.42$, $SD=2.14$) which showed highest differences in mean. The value of *Cohen's d* was 0.12 showing a lower effect size. **Conclusions:** Educational interventional program has a positive effect on nurse's practices regarding the usage of ventilator. During Pre-program evaluation of ventilator nurse's practices were unsatisfactory which improved to 95% after the educational intervention.

INTRODUCTION

Medical Devices (MD) are considered as one of most important essential facility in critical care units. Critical care is not possible without medical device like ventilator [1]. It is evident by research that 80% of total patients in critical care unit need ventilator support to restore their life. Which shows that nurses have a dire need to be expert in providing the ventilator associated care. Nursing care of ventilated patients is very important and nurses must be trained before entering in the critical care unit about all basic practices and techniques of medical devices. Specially, ventilator [2]. Moreover, every critical care nurse should encounter the best possible nursing care to the patients. In Pakistan according to recent statistic. Approximately, 28% to 35% patients develop irreversible complication due to unsatisfactory nursing care practices. Because more than 90% critical care unit are managed in Pakistan by the untrained critical care nurses. That's why, In

Pakistan, mortality rate of mechanically ventilated is more than 60%. This mortality can be control by improving the nursing care practices with the help of regular teaching and learning sessions and giving the proper training to the novice nurses before coming in direct contact of ventilated patients [3]. Moreover, nurses don't have proper practices about the medical devices and do not report any adverse event to the higher authorities as even professional deficiencies can be corrected by reporting the hurdle which nurses are facing during the usage of ventilator [4]. As novice nurses don't practice the standard pre-cautions usually, due lacking of proper training, education and experience. Globally, ventilators are extensively used in the critical care units for multiple life threatening emergencies. As nurses play an abundant role throughout mechanical ventilation process from intubating to extubating. So, nurses must be trained to have satisfactory practices

about operating the ventilator like adjustment settings according to physician and anesthetic orders [5]. Training session can improve the nursing care and practices to satisfactory level [6]. Only experienced and qualified nurses can handle quickly all ventilator associated problem. Professional requirements of nursing profession nurses must have teaching sessions in real setting with patients and clinical teaching sessions are revolutionary steps for the enhancement critical care nurses' practices [7]. It is prime responsibility of the nurses to identify the any complication throughout the ventilator support and suitable management in order to provide the best quality care and life saving assistance to the patients [8]. Critical care unit (CCU) is always equipped with multiple Medical devices. Nurses are the first line user of these medical devices and in critical care unit patients are totally depended on the nurses. As nurses plays an essential role in CCU that's why nurses should have professional expertise to handle the medical devices while taking care of critically ill patients. Nurses have knowledge of these device but their practices are not up to the mark. Specially, novice nurses use the medical devices for the first time. Nurses face multiple issues regarding the usage of the medical devices [9]. Another study was carried out in Ireland by Sowan et al., (2017), results showed that 61% nurses don't know the reasons of ventilator alarm and appropriate practices according the alarm. Due unsatisfactory practices, medical errors occur which lead to the death untimely. Alarms in the medical devices act like a safeguard because every alarm is the indication of specific urgent need to be fulfilled by the nurses e.g. blocked endotracheal (EET) can be assess by the alarm but if blockage of the EET is ignored this may cause sudden death of the ventilator depended patient [10]. A research study was conducted in Pakistan at Islamabad in which 62% nurses express that there is no proper training regarding the nursing practices of ventilator that's why nurses face multiple issues in using the ventilator which leads to professional deficiencies. Organizations and clinical faculty of nursing colleges should focus on clinical practices regarding the use ventilator. There should be proper clinical and education training sessions for novice nurses to make them expert in using the ventilator [5]. Dipaanjali et al., observed in their research study that nurses don't have satisfactory practices regarding the care of mechanically ventilated patient. Unsatisfactory Practices score was 76% regarding the patients' position, proper suctioning techniques and endotracheal tube care. Education training session proved improvement in the unsatisfactory score of practices [11]. Educational training session is most powerful strategy to improve the nurse's practices and their performance regarding the usage of

ventilator. likewise, a research study concluded that post training session has a positive effect on the nurse's practices regarding the usage of the ventilator [12]. The purpose of current study is to explore practices of the critical care nurses regarding the usage of the medical devices.

METHODS

The quasi experimental design was used with pre -post design. 36 nurses were selected as research participant from critical care unit. Duration of the study was 9 months after inter research review board approval. Ethical approval was also obtained from ethical committee of The University of Lahore. Nurses who had attended any training session before or who were on leave were excluded from the study. Demographic tool and observational check list containing 42 items were the 2 adopted tools used in this study. Observational check list had 5 domains: ventilator setting, EET care, emergency equipment and safety check, infection control practices, suction care practices. Response was measured by research as Done and Not done pre and post-test mean, Standard deviation, sample t test and Pearson product moment co- relation analysis was done. Intervention: PHASE 1 Self- introduction was given to the participants and written consent was obtained. Pre-test was conducted by researcher after filling out the observational check list by observing the nurse's practices regarding the ventilator without interrupting the participant. PHASE 2 the educational program was implemented for 16 weeks which included lecture, discussion, and teaching on spot and practical exercises. Teaching materials in form of hand out, data base, power point presentation, pictures, laptop, videos, and booklets. Each study session was given in 30 to 45 minutes which induces discussion for extra 10 minutes. PHASE 3 After 4 months, post test was conducted data was collected by the same observational check list. Statistical analysis as performed by using SPSS 21.

RESULTS

Results showed that there were 21(60.0%) females and 14(40.0%) males. 27(71.1%) participants belonged from 25-30 years of age group which showed that majority were novice nurses in young age. Education of nurses was measured through a diploma in Nursing, 4 years BS genetics, and 2 years BS nursing. Statistics showed that 17(48.6%) of nurses were those who acquired nursing diplomas. According to their work experience, 28(80.0%) participants had less than six month of work experience in ICU and CCU. Results of the paired sample t-test concluded in the table blow which showed a significant difference in pre and post scores of nurse's practices regarding the usage of the ventilator. Values of paired sample t test and p

value, $t(34) = -20.4$, $p < .05$ were found significant Findings showed that pre-test mean scores compared with post-test educational intervention for Ventilator ($M=10.00$, $SD=0.00$) ($M=17.42$, $SD=2.14$) and for showing the highest differences in mean. Thus, the hypothesis of difference has been approved. The value of Cohen's d was 0.12 showing a lower effect size (Table 1).

Variables	Pre-scores (n=35)		Post-scores (n=35)		99% CI				Cohen's d
	M	SD	M	SD	t	p	LL	UL	
Ventilator	10.00	0.00	17.42	2.14	-20.4	.000	-8.16	-6.69	0.1

Table 1: Pre and Post scores of nurse's practices regarding the usage of the ventilator

Note. M= Mean, SD= Standard Deviation, p= Significant value, LL= Lower Limit, UL= Upper Limit, CI= Confidence Interval, Cohen's d = Effect Size

Variables	n	M	SD	1	2	3	4	5	6	7	8	9
1. Gender	35	1.11		-	-1*	-1	-9*	.03*	.231	.04*	.10*	.6*
2. Age	35	3.10		-	-	.71	.32	.131	.2	.216	.251	.35
3. Education	35	3.23		-	-	-	.39	.118	.254	.242	.323	.41
4. Experience	35	4.11		-	-	-	-	.497	.332	.785	.927	.92
5. NPOC	35	3.98		-	-	-	-	-	.45	.644	.460	.46
6. VC	35	4.05		-	-	-	-	-	-	.33	.28	.33
7. ETC	35	4.11		-	-	-	-	-	-	-	.72**	.73**
8. ICRC	35	4.13		-	-	-	-	-	-	-	-	-

Table 2: Analysis of correlation between demographic characteristics, and practices of ventilator medical devices (n=35)

Note. m= mean, SD= standard deviation, *correlation is significant at the 0.05 level (2-tailed). **correlation is significant at the 0.1 level (2-tailed) and ***correlation is significant at the 0.01 level (2-tailed), gender (male=1, female=2), experience (less than 6 months=1, more than month=2), (npoc= nurses practice observational checklist), vc= ventilator care, etc= endotracheal tube care, eesc= emergency equipment and safety check, icrc= infection control related care, icrc= infection control related care, scp= suction care practices

DISCUSSION

Descriptive were calculated in two main steps. Individual personal characteristics i.e., age, gender, education and experience of work in critical care unit was estimated in first step while descriptive of nurse's practice and observational checklist was calculated in second step. Analysis of the demographic characteristics showed that different age group, experience level and educational background effects the nurse's practices and their professional capabilities. Similar, findings were also supported by another research study [13]. The results suggest that there is a significant relationship between the level of age, years of experience and education. Nurses who have more work experience in critical care unit and

higher educational degree like BSN. Specially, young nurses have the great potential of learning advance skill. Similar findings were also supported by the Kramer that year experience in critical care unit make nurses practices perfect [14]. Meanwhile, current research study showed that 80% nurses have less than six moth experience that's why nurse's practices are not satisfactory. Because perfection always come with time. Similar results were agreed by another research study that more experienced nurses can perform nursing care with perfection [15]. Ventilator is considered as life-saving therapy in critical care unit but ventilator usage needs expert practices to functional well. Nurses are consider as back bone of the ventilator care. Research finding suggest that nurses have unsatisfactory practices regarding the usage of ventilator as pre - test score showed that 81% have unsatisfactory practices, as have less than 6 month experience in the critical care unit and regarding the usage of medical devices specially ventilator similar finding were also indicated in a study published in 2021 which observed that 70% nurses have unsatisfactory practices regarding the usage of ventilator [16,2]. Research finding showed that educational taring session is most powerful strategy to improve the nurse's practices and their performance regarding the usage of ventilator Likewise, a research study concluded that post training session has a positive effect on the nurse's practices regarding the usage of the ventilator [12]. Research findings showed that Ventilator depended patients' needs round the clock strict monitoring of all physical needs and ventilator parameters and only nurses are responsible for whole task with doctor. Moreover, suddenly specific decisions and actions are needed to handle life threatening emergencies like air leakage, unexpected shutdown, low oxygen saturation, blockage or displacement of endotracheal tube (EET). There is significant positive effect of educational training session on nurse's practices regarding the endotrachial care of ventilated patients as post-test results confirmed that 95% nurse's practices were found satisfactory. Likewise, another research was agreed with the similar findings that training session is helpful in improvement of nurse's practices [17,18]. Research findings indicated that educational training sessions has a positive effect on the nurse's practices. Pre and post test results were found significant statistically and results of the paired sample t-test showed a significant difference in pre and post scores for nurse's practices regarding ventilator. It was found significant differences with paired sample test $t(34) = -20.4$, $p < .05$. Findings showed pre and post mean scores compared with post -educational session for Ventilator ($M=10.00$, $SD=0.00$) ($M=17.42$, $SD=2.14$). and for showing the highest differences in mean. Thus, the hypothesis of

difference has been approved. The value of Cohen's d was 0.12 showing a lower effect size. Similar research results were agreed with another research study [19,20].

CONCLUSION

Most of the nurses have unsatisfactory practices regarding the usage of medical devices. Specifically, ventilator practices were not up to the mark in the pre- test implementation. Meanwhile, in post-test it was found that educational intervention has significant positive effect on nurse's practices.

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