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EFFECTIVENESS OF AN EDUCATION PROGRAM ON INVASIVE DEVICE CARE FOR CARDIAC NURSES

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ABSTRACT

In the cardiac care setting, it is always a challenge to meet the educational needs of nurses because of the life-threatening nature of critical illness. Inefficient nursing care of invasive device may associated with life-threatening complications. Nurses have an important role in the delivery and management of critically ill patients with invasive devices. ***Objective:*** This study was conducted to evaluate the effect of an education program regarding invasive device care for cardiac nurses. ***Method:*** Quasi experimental study was applied to 61 nurse conducted at the cardiac surgical ward and intensive care unit in the Sudan cardiac center and Ahmed Qasim hospital at Khartoum State-Sudan. An education program was implemented to nurse. A pretest was conducted, followed by the intervention. This process was followed by 2 and 5-months post-test evaluations to assess outcomes. ***Results:*** More than half of nurses 58.1% aged between 26-30 years, most of them female 69.4%, had Bachelor's degree 91.9%, and 88.7% had less than five years' experience. After implementation of an education program the nurse knowledge and practice of endotracheal tube, chest tube, central venous catheter, and arterial catheter were improved significantly were all $P<0.05$. Furthermore, after intervention the nurses gained adequate knowledge (58.1% in post I and 72.6% in post II) and adequate practice (21.0% in post I and 25.8% in post II) regarding invasive device care. ***Conclusion:*** An education program was significantly improved the knowledge and practice of nurses regarding invasive device care.

KEYWORDS: Education program, invasive device, knowledge, practice.

1. INTRODUCTION

Cardiac surgical patients often require multiple invasive devices and therapies to manage their illness and these increase the potential risk for infection to the patient. While using therapeutic medical devices is often vital to the management of the patient, they are not without risk. Ventilator associated pneumonia, catheter associated urinary tract infections and central line associated bacteraemia are all aligned with invasive device use and form a significant source of healthcare acquired infections. Cardiac surgical care staff themselves need to protect against contracting infections while providing care for their patients.[1]

Patient safety, quality of care, and efficiency of healthcare procedures are international phenomena. A substantial amount of injury to patients occurs due to healthcare management and that many injuries result from substandard care processes.[2]

As educators, nurses are on the front line of the healthcare delivery process and are responsible for catalyzing change, whether in the clinical or academic setting. For that reason, the nursing profession holds a great responsibility for improving patient safety and standards of patient care. Those changes can improve patient outcomes and satisfaction, and healthcare costs.[3] Infection prevention is dependent on the education, training, and skill of the practitioner and the integrity of the device.[4]

One of the possible complications in the immediate postoperative period is the development of infections associated to invasive devices (tracheal tube, ventilator, urethral catheter, vascular catheters) used during surgery and in the subsequent days. The presence of these infections has been related to an increase in morbidity and mortality.[5]

The longer the invasive dev ice remains in place, the greater the risk for infection. The device days (the number of days a de*vice* is in place) of an ICU is one measure of the unit invasive practices that constitutes an extrinsic risk factor for healthcare associated infection.[6] Infect rate related to invasive device in healthcare facilities is one of the important quality indicators.[7]

2. METHOD

Study Design

A Quasi-experimental research design was used for this

study. The present study was conducted between April 2016 and January 2017.

Research objectives
This study was designed to fulfil the following aims: (1) to determine basic invasive device care knowledge and practice among nurses; (2) to evaluate the effect of education program on nurses knowledge and practice.

Setting and sample
The study was conducted in the cardiac center at the Sudan Heart Center and Ahmed Qasim Hospital-Khartoum Sate-Sudan. Nurses who were currently working in these sitting and rendering direct patient care and who had at least one year of experience were eligible for participation. The sampling method used was the purposive sampling technique. Sixty-two nurses were eligible in these study.

Study instruments
Data were collected through structure questionnaire to assess the nurses knowledge and an observation checklist to assess their practice.

Using a structured and self-administered questionnaire and an observation checklist of invasive device care practices. The instruments were developed by the investigators based on an extensive review of the literature, standard recommendations, and protocols. A 45-items *self-administered questionnaire* covered two domains: demographic data and knowledge-based questions. *Demographic data* included four items as age, sex, educational level, and experience years. *Knowledge-based items* consisted of 36 questions to assess the level of nurses knowledge towards invasive device care. This section consisted of five parts: part 1: a questions related to endotracheal care (7 items), part 2: arterial catheter care (6 items), part 3: chest drain care (8 items) and part 4: central venous catheter care (9 items), and part 5: Foleys catheter care (6 items). An *observation checklist* also included 51 items regarding invasive device care. Each correct answer scored one point and each incorrect answer scored a zero. The total knowledge score was computed out of (144 grade). For practice was done correctly scored two point, if need correction scored one point and if not done scored zero. A high score indicated a great nursing practice (102 grade).

Scoring system; A score less than 50% labeled as an inadequate knowledge and inadequate practice, score ranged between 50% and 75% labeled as a moderate knowledge and moderate practice, finally, score more than 75% labeled as adequate knowledge and adequate practice.

Data collection
Data collection was undertaken between April 2016 and January 2017. After ethical permission, the researcher informed potential participants verbally about the need, aim, method and value of the study. Knowledge questionnaire were administered to the nurses in the same place and at the same time in order to avoid interaction between them. It took approximately 15 minutes to fill questionnaire in the presence of the researcher. A direct observation was conducted by researcher to appraise nurses practice during two shifts. The specific time for interviewed and observed was between 9 am to 2pm and 5pm to 8pm.

An education program was developed by a multidisciplinary task force to highlight correct practices for care of the patients with invasive device to prevention of catheter-associated bloodstream infection.

Assessment of nurses knowledge and practice were done three time, before education program, after two months of education program, and after five months of education program. The evaluation visit was made to evaluate the effect of educational intervention on nurses knowledge and practice.

Ethical considerations
An official written permission to conduct the study were obtained by the researcher from all responsible authorities.

3. RESULTS
The results of this study will be presented in the following parts; demographic data, nurses knowledge regarding invasive device care, and nurses practice.

Demographic data of the nurses ware summarized in **table (1)** the table reveals that the most of nurses 58.1% aged between 26 and 30 years with mean age 26.98±2.47. Female nurses were 69.4% more prevalent than male nurses 30.6%. Bachelors nurses were the most 91.9% were high nurses degree as master degree was less 8.1%. The majority of nurses 88.7% had less than five years experience, while a high level experience more than five years was less 11.3%.

Table (1): Distribution of nurses according demographic data.

Items		n=62	
		n	%
Age Group	20-25	19	30.6%
	26-30	36	58.1%
	31-35	7	11.3%
	Mean±SD	26.98±2.47	
Sex	Male	19	30.6%
	Female	34	69.4%
Educational Level	Bachelor's degree	57	91.9%
	Master degree	5	8.1%
Experience Years	1-<5 years	55	88.7%
	5-<10 years	6	9.7%
	10-15 years	1	1.6%

As a comparison between nurses knowledge pre, post, and after five months of education program regarding invasive device care, the **table (2)** shows that all mean score knowledge of endotracheal tube, chest tube, central venous catheter, and arterial catheter were improved significantly after implementation of an educational program were all P<0.05, (between pre and post I). Moreover, all mean score of nurses knowledge between pre and post II had significantly improved were all P<0.05. While there were insignificant different after education program (between post I and Post II) were all P>0.05.

Figure (1) shows the distribution of nurses according to their knowledge grades. The figure noticed that the nurses 32.3% had adequate knowledge before educational program, while post two months of educational program the nurses knowledge grades improved to 58.1% and, after five months 72.6% were adequate. In addition, inadequate knowledge among nurses were decreased from 22.6% before educational program to 8.1% in post I, and 9.7% in post II.

Table (3) shows the comparison between nurses practice pre, post, and after five months of education program regarding invasive device care, the table illustrated that all mean practice score of endotracheal tube, chest tube, central venous catheter, and arterial catheter were improved significantly after implementation of educational program were all P<0.05, (between Pre and Post I) and (between pre and Post II).

While educational program insignificant effect in Foleys catheters were p>0.05 before and after intervention. Moreover, there were insignificant different after education program (between post I and Post II) were all P>0.05.

Figure (2) shows the distribution of nurses according to their practice grade. The figure demonstrated that the most of nurses 66.1% had a moderate adequate practice before educational program, 72.6% in post I, and 69.4%. While adequate practice of nurses was improved after educational program to 21.0% and 25.8% compared to 8.1% before. Meanwhile, inadequate practice was decreased from 25.8% to 6.5% and 4.8% after educational program.

4. DISCUSSION

Invasive medical devices are an essential aspect of patient care. The presence of an indwelling invasive device is a recognized risk factor for healthcare associated infection.[8] ICU nurses and physicians must be especially familiar with their hospitals' guidelines for the management of invasive devices, particularly intravascular catheters of all types, urinary catheters, endotracheal tubes, and tracheostomies.[9]

Current study pointed that more than half 58.1% of nurses aged between 26-30 years, most of them female 69.4%, had Bachelor's degree 91.9%, and 88.7% had less than five years experience in their current work. Similar to our study some studies found that the majority 53.3% of nurses were aged between 20-21years and majority of them 60% were females, 46.7% studied BSc degree and all of them had less than 3 year of experience.[10] Xavier pointed out that the highest percentage 69.38% of nurses were in the age group of 21-25 years, 82.6% of staff nurses were female, 69.38% had 3-4 years of experience. Maras et al found that a 58.3% aged between 21-30years and the mean age of the nurses was 30.87±6.18 years, 75% were female and 65.3% had a Bachelor's degree, and 63.9% had less than four years experience.[11] Bedier et al, demonstrated that 63.3% of nurses aged between 20 to <25 years.[12] Shrestha, reported that the most of nurses 72.5% were less than 25 years old and 85.5% had 0-5 year of experience.[13]

Table 2: Comparison between nurses knowledge before and after education program.

Items		***Pre***	***Post I***	***Post II***	T_1	T_2	T_3
Endotracheal Tube	Mean	24.51	24.91	25.09	2.421	2.281	0.651
	±SD	1.95	1.85	1.96	0.0018*	0.026*	0.518
Chest drain	Mean	24.89	25.27	25.17	2.769	2.098	0.644
	±SD	3.29	3.21	3.23	0.007*	0.040*	0.522
Central venous catheter	Mean	30.92	31.47	31.55	2.144	2.516	0.279
	±SD	1.95	3.29	2.92	0.036*	0.015*	0.781
Arterial Catheter	Mean	18.29	18.69	18.54	3.785	2.513	1.494
	±SD	1.67	1.98	1.92	0.000*	0.015*	0.140
Foleys catheter	Mean	22.29	22.50	22.88	2.032	2.317	1.715
	±SD	1.55	1.37	1.29	0.047*	0.024*	0.091
Total Knowledge	Mean	120.80	122.85	123.85	5.191	5.793	0.806
	±SD	6.27	7.15	6.13	0.000*	0.000*	0.423

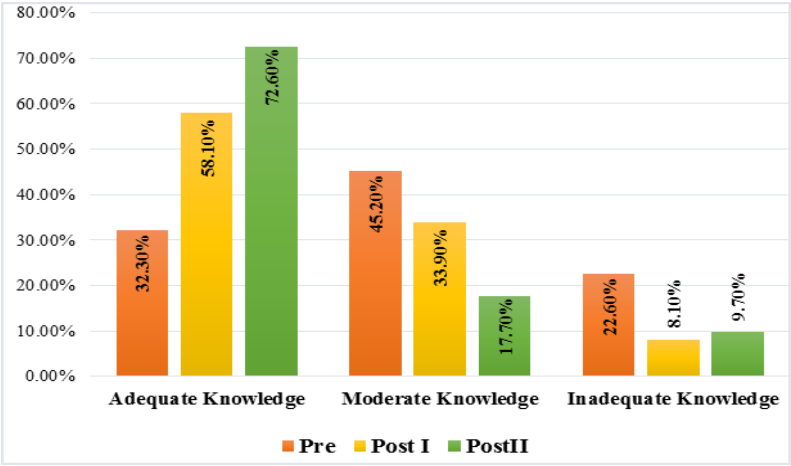

Figure 1: Distribution of nurses according to knowledge grade.

Table 3: Comparison between nurses practice before and after education program.

Items		*Pre*	*Post I*	*Post II*	T_1	T_2	T_3
Endotracheal Tube	Mean	20.13	20.59	20.62	t=2.610	t=2.498	t=0.153
	±SD	2.30	2.23	2.30	P 0.011*	P 0.015*	P 0.879
Chest Drain	Mean	12.87	14.21	13.50	t=2.872	t=2.078	t=1.466
	±SD	2.30	2.96	2.44	P 0.006*	P 0.042*	P 0.148
Central Venous Catheter	Mean	13.79	15.56	15.13	t=3.100	t=2.583	t=0.618
	±SD	3.61	3.36	3.61	P 0.003*	P 0.012*	P 0.539
Arterial Catheter	Mean	17.09	17.58	18.20	t=2.342	t=2.866	t=1.655
	±SD	2.62	2.82	3.19	P 0.022*	P 0.006*	P 0.103
Foleys Catheter	Mean	10.61	10.30	10.58	t=1.363	t=0.207	t=1.088
	±SD	1.41	1.52	1.47	P 0.178	P 0.837	P 0.281
Total Practice	Mean	74.50	78.26	78.05	t=3.932	t=4.030	t=0.192
	±SD	7.88	7.12	7.41	P 0.000*	P 0.000*	P 0.848

T_1= Compare between preintervention and Post I.
T_2= Compare between preintervention and Post II.
T_3= Compare between Post I and Post II.
*= Significant differences at P<0.05.

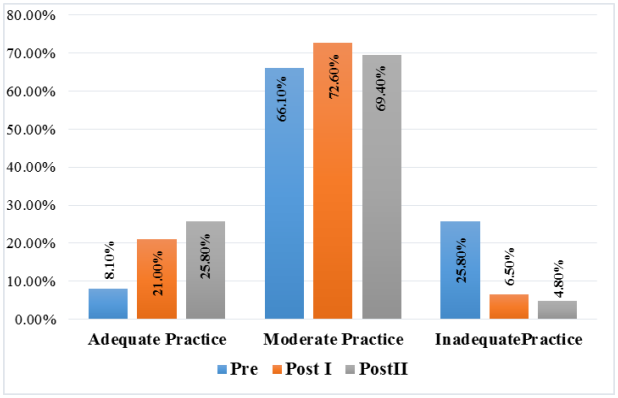

Figure 2: Distribution of nurses according to practice grade.

In our study, total mean score of nurses knowledge and practice regarding invasive device care such as an endotracheal tube, chest tube, central venous catheter, and arterial catheter were improved significantly after educational program. Furthermore, after educational program the nurses had gained adequate knowledge (58.1% in post I and 72.6% in post II) and practice (21.0% in post I and 25.8% in post II) about invasive device care. This finding is consistent with the findings of earlier studies which showed there was significant difference between the pre-intervention and post-intervention knowledge score (P0.039). The most of nurses 87.5% had moderate and 15.5% had inadequate knowledge on preintervention. Whereas after educational intervention regarding central venous catheter 45% had gained adequate knowledge, 35% had gained moderate and 20% had gained inadequate knowledge.[13] Deshmukh and Shinde stated that a 43.33 % of nurses scored poor knowledge and 75 % scored average practice before structured education. Whereas 65 % had a good knowledge and 48.33 % had a good practice regarding venous access device care after structured education.[14]

This result also supported by Ibrahim et al, who stated that the mean posttest knowledge scores of nurses regarding chest tube had significantly higher than their mean pretest knowledge scores as test P<0.05. Total performance level was unsatisfactory less than 60% in before educational intervention, while immediate post-intervention 40% and after one month 42.5% of nurses had satisfactory performance.[12] There were significant different between pretest and posttest knowledge were P0.01.[15] Abolwafa et al, were developed educational

program for nurses' related to infection control of invasive procedures showed a significant progress in nurses knowledge and practices in posttest.[16]

Before implementing the educational 62.5% of the studied nurses had low knowledge level, and 70% of them had moderate practice level, while after education 65.0% of them had moderate knowledge level and 90% had high practice level.[17] Gordon, who study the effects of nursing education on decreasing catheter associated urinary tract infection rates, found that an improved in nurses practice indicated by a statistically significant decreased catheter-associated urinary tract infections were $P< 0.05$.[18]

In conclusion, the present study revealed that there was a statistically significant improvement of nurses knowledge and practice regarding care of patients with invasive device care throughout the program phases. Therefore, it can be concluded that an educational program plays an important role in increasing level of nursing knowledge and practice regarding invasive device care.

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