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Impact of Scenario – Based Educational Intervention about Central Venous Catheter Care on Nurses' Knowledge and Practice

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Abstract

Scenario based education (SBE) is a methodology, which aims to promote learning by involving participants in realistic situations. It can improve critical care nurses' (CCN) knowledge and skills in management of nursing procedures especially central venous catheter (CVC) which is widely used and consider lifesaving. Aim of the study: to examine the impact of SBE on the nurses' knowledge and practices about care of CVC. Research design: A quasi-experimental design "one group, pre – posttest" was utilized in this study. Research hypotheses: 1) CCN "baccalaureate degree" who will receive SBE about care of CVC will have higher mean knowledge score as compared to their pre- implementation mean knowledge score. 2) CCN "diploma degree" who will receive SBE about care of CVC will have higher mean knowledge score as compared to their pre-implementation mean knowledge score. 3) CCN "baccalaureate degree" who will receive SBE about care of CVC will have higher mean practice score as compared to their pre- implementation mean practice score. 4) CCN "baccalaureate degree" who will receive SBE about care of CVC will have higher mean practice score as compared to their pre- implementation mean practice score.Setting: Adult intensive care unit (ICU) at Damietta chest disease hospital.Sample: A convenient samples "All nurses" working in the adult ICU Tools of data collection: Two tools was utilized 1) Pre/ post- test interview questionnaire schedule.2) CCNs observational checklist. Results: There was statistically significant difference in total knowledge score pre SBE, immediately after and two months later of both bachelor nurses (F= 53.206, P =.000) and diploma nurses (F= 58.613, P =.000). Also, there was statistically significant difference in total practice score pre SBE, immediately after and two months later of both bachelor nurses (F = 691.310, P =.000) and diploma nurses (F = 42.34, P =.000). Conclusion: Utilizing innovative educational methods such as SBE can have a significant influence on enhancing the nurses' knowledge and skills. Recommendations: Continuous training sessions for nurses by innovative educational methods and further studies needed to be carried out to examine the effect of SBE on a larger probability sample,
Keywords: Scenario based education, Central venous catheter, Intensive care unit

1. Introduction

Central venous catheter (CVC) is a common procedure performed in almost critical It is a time-honored technique to assess quickly the major venous system. It has a lot of benefits over peripheral access include greater longevity, avoidance of phlebitis, larger lumens, multiple lumens for rapid administration of drugs combinations, nutritional support, fluid administration, and central venous pressure (CVP) monitoring. Although they are widely used and can be life saving they are associated with multitude of complications associated with placement, maintenance and care. Central line associated blood stream infections (CLBSIs) are one of the serious complications which worsen the patients' health, prolong hospital stay ,increase the cost of care and mortality(Gerolemou, 2014). A study done at Escort Heart Centre,India showed that mortality due to CLBSI was 22.9%. (Deeptiet al.,2013).

As indicated byShrestha,(2013)education about catheter care can reduce infection rates by 41 to 66% in adult ICU and the nurse who has a thorough understanding of the benefits and risk of CVC should be able to minimize and accurately recognize catheter related problem ensuring safety and improved outcome for the patient.

Consequently, instructors often use a modified SBL presentation where small student groups are provided with a case and specific relevant questions to that case in an attempt to stimulate clinical decision making. The modified SBL process fosters students' collaboration, open discussion, and critical thinking within a structured problem- solving format and is frequently used in medicine, nursing and pharmacy curricula.

A key challenge is to link performance in the controlled simulation environment to the quality of the patient care delivered. Studies have evaluated clinical performance after simulator training with encouraging results, and suggested more researches in this scope.(Balasooriya, 2011).Therefore this study is conducted to appraise the effect of scenario based educational intervention on critical care nurses' knowledge and practice about CVC care.

1.1 Significance of the Study

It is estimated that infection associated with CVCs, is the most common complication, about 41,000 of catheter related blood stream infections (CRBSIs) occur in the united states (U.S) as reported by the Centers for Disease Control and Prevention (CDC). They are fatal in 16–35% of cases and costly.[1] As revealed by the medical records at the critical care department 2014 - 2015, Damietta chest disease hospital there are no available statistical data about CVC infection to this health problem. It has been observed through empirical observation over a period of 5 years at ICU of Damietta chest disease hospital the critical care nurses (CCNs) are facing major problems related to management of CVC and early detection of its complications. That is why there is interest to conduct such type of research, which might safeguard this category of patients to overcome these complications. Also, it is expected to help in provision of cost effective health care, generate an attention and motivation for further researches into this area.

2.Materials and Methods

The current study aims at examining the impact of a scenario- based educational intervention on the nurses' knowledge and practices about care of central venous catheter device in adult intensive care unit among critically ill patients.To achieve the aim of this study, four hypotheses were formulated:

H1 Critical care nurse “baccalaureate degree” who will receive scenario based learning about care of central venous catheter will have higher mean knowledge score as compared to their pre- implementation mean knowledge score. H2 Critical care nurse “diploma degree” who will receive scenario based learning about care of central venous catheter will have higher mean knowledge score as compared to their pre- implementation mean knowledge score. H3 Critical care nurse “baccalaureate degree” who will receive scenario based learning about care of central venous catheter will have higher mean practice score as compared to their pre-implementation mean practice score. H4 Critical care nurse “baccalaureate degree” who will receive scenario based learning about care of central venous catheter will have higher mean practice score as compared to their pre- implementation mean practice score.

2.1. Design

A quasi-experimental design “one group, pre – post test” was utilized in this study.

2.2. Setting

This study will be carried out at the adult ICU at Damietta chest disease hospital.

2.3. Sample

Convenient sample of 50 nurses work in the ICU, rotating on three shifts (morning – evening and night shift), 20 of them are diploma nurses & 30 of them are baccalaureates degree who were working at the adult ICU at Damietta chest disease hospital, who directly handle with central venous catheter.

2.4. Data collection tools:

Two tools were utilized for data collection; those tools were constructed by the investigator, reviewed by panel of five experts in critical care medicine and nursing specialty. The study tools consisted of:

1. Pre/ post- test interview questionnaire schedule (TOOL 1): which include:

a) Personal characteristics data of the study sample “age, educational level, years of experience and work hours per week”

b) Critical Care Nurses (CCNs) knowledge assessment questionnaire which include (1) Definition& common sites of insertion. (2) Anatomy & physiology review. (3) Types of CVC, indications & contraindications. (4)Catheter related infection risk factors. (5) Infection prevention & control. (6) Complications. 2. Critical Care Nurses (CCNs) observational checklist on care of CVC (TOOL 2):

It covered data such as: (1) pre/post insertion (2) CVC dressing (3) Blood sampling (4) Catheter removal.

2.5. Pilot study

Pilot Study

A pilot study was conducted on 5 nurses (10% of the sample) to ensure the feasibility& the time required for filling the tools, applicability of the study, test the adequacy and internal consistency of the study tool. Nurses involved in the pilot study were included in the actual study sample. This phase culminates in a clear implementation plan with tasks and timeline to facilitate putting the nursing education guideline into practice.

2.6. Ethical considerations

An official permission to conduct the proposed study was obtained from the ethical committee and hospital directors. Participation in this study was voluntary; each potential subject was informed about the purpose, procedure, benefits, and nature of the study and that he/she had the right to withdraw from the study at any time without any rationale, then written consent obtained from them. Subjects were informed that obtained data will not be included in any further researches without second consent. Confidentiality and anonymity of each subject were assured through coding of all data and all information has taken was protected and didn't affect their annual appraisal.

2.7. Procedure for data collection:

The study was conducted through the following phases:

• Preparatory Phase:

During this phase, the study tools (1, 2) were formulated and translated into Arabic by the investigator, the developed tools were revised by a panel of three experts in critical care medicine and nursing specialty for content validity. Initial assessment of baseline nurse‟s knowledge and practices were carried out before the scenario – based educational intervention. Accordingly the educational intervention were formulated and revised by the panel of the previously mentioned five experts.

• Implementation Phase:

For theoretical contents: pretest was done to all nurses. Then CCNs nurse was exposed to 10 sessions; each teaching session about 30 – 45 minutes each on daily bases for both groups to cover all theoretical content. Group discussions were encouraged with continuous feedback to ensure understanding and to achieve the teaching objectives.

For practical contents: pretest was carried out for all nurses; subjects were divided into small groups 5 nurses in each, both groups were exposed to a data show presentation. In addition to demonstrations and return demonstrations were performed until subjects mastered the CVC care correctly. Each 5 nurses were given different patients' scenarios.

During the scenarios, the investigator considered the mannequin as a real patient, and communicated with „him‟ each scenario contained written clinically based patients information related CVC care with some incomplete, uncertain or insufficient information to better reflecting the reality of clinical practice. Each practice session lasted from 45-60 minutes. Then the immediate post practice test was carried out. An open channel of communication was established

between the investigator and nurses to verify any misconception, reinforce correct actions, information, increase the efficiency of their skills and to answer any question or re- demonstration any of skills taught if needed

• Evaluation Phase:

Post-test “knowledge questionnaire” was done immediately and two months later. It focused on; (1) Definition & common sites of insertion. (2) Anatomy & physiology review. (3) Types of CVC, indications & contraindications. (4) Catheter related infection risk factors. (5) Infection prevention & control (6) Complications. As will as post-test “observational checklist” was carried out immediately and after two months, about CVC‟s principles of maintenance & care through (1) pre/post insertion. (2) CVC dressing. (3) Blood sampling. (4) Catheter removal by using the same study tools. Evaluation was carried out two times, within one week after the end of SBE intervention and extends for five weeks and two months later.

Statistical Design

Upon completion of data, data were analyzed by using the statistical package for the social science (SPSS) and personal computer; data analysis included descriptive statistics to describe the study sample via mean, median, range frequency and standard deviation as well as inferential statistics such as Pearson‟s coefficient correlations, t-test were used to examine the relationships between variables. A P- value of equal to or less than .05 considered statistically significant.

3. Results

Table (1) Shows that the highest percentage of studied subjects (60%) had BSc degree, their age were ranged between 25 and 30 years old with a mean age Mean±SD 29.9±3.7 .Half of them (25%) had less than 5 years of experience. Finally (74%) of the studied sample worked (full time) ranged from (36 to 54) hours per week.

Table (1) Personal characteristic data of studied nurses, (N=50)

Personal characteristic data.	**Number (No.)**	**%**
Age – **20-<25** – **25-<30** – **>30**	 **14** **27** **9**	 **28** **54** **18**
Mean±SD 29.9±3.7		
Experience – **Less than >5 years** – **5-<10** – **>10**	 **25** **17** **9**	 **50** **34** **18**
Mean±SD 6.6±4.12		
Work hours per week – **12 -18 hr. (Part time)** – **36 – 54 hr. (Full time)**	 **13** **37**	 **26** **74**
Mean±SD46.4±18.6		
Educational level – **Technical nursing institute** – **BSc degree**	 **20** **30**	 **40** **60**

Table (2) frequency distribution of bachelor nurses as regards to total knowledge scores pre and post receiving SBE.

Total knowledge score of BSc nurses	**Before**		**Immediately after**		**Two months later**		**F**	**P**
	No.	**%**	**No.**	**%**	**No.**	**%**		
Satisfactory ≥ 80%	12	40	26	86.6	24	80	53.206	.000*
Unsatisfactory < 80%	18	60	4	13.3	6	20		

*significant ≤ .005

As it is shown from table (2), the studied sample of BSc nurses had a decreased satisfactory level of total knowledge (40%) before receiving the SBE, while this percentage was improved to have an increased satisfactory level after receiving the SBL for knowledge part more than 85% satisfactory level in post-test 1 and 80 % satisfactory level in post-test 2

Table (3) frequency distribution of diploma nurses as regards to total knowledge scores pre and post receiving SBE.

Total knowledge score of diploma nurses	**Before**		**Immediately after**		**Two months later**		**F**	**P**
	No.	**%**	**No.**	**%**	**No.**	**%**		
Total knowledge score							58.613	.000*
Satisfactory ≥ 80%	5	25	18	90	17	85		
Unsatisfactory> 80%	15	75	2	10	4	20		

*significant ≤ .005

As it is shown from table (3), the studied sample of diploma nurses had a decreased satisfactory level of total knowledge (25%) before receiving the SBE, while this percentage was improved to have an increased satisfactory level after receiving the SBL for knowledge part 90% satisfactory level in post-test 1 and 85 % satisfactory level in post-test 2

Table (4) frequency distribution of bachelor nurses as regards to total practice scores pre and post receiving SBE.

Total practice score of BSc nurses	Before		Immediately after		Two months later		F	P
	No.	%	No.	%	No.	%		
Satisfactory ≥ 80%	15	50	27	90	26	86.6	691.310	.000*
Unsatisfactory < 80%	15	50	3	10	4	13.3		

*significant ≤ .005

As it is shown from table (4), the studied sample of bachelor nurses had a decreased satisfactory level of total practice (50%) before receiving the SBE, while this percentage was improved to have an increased satisfactory level after receiving the SBL for knowledge part 90% satisfactory level in post-test 1 and more than 85 % satisfactory level in post-test2

Table (5) frequency distribution of diploma nurses as regards to total practice scores pre and post receiving SBE.
*significant ≤ .005

Total practice score of Diploma nurses	Before		Immediately after		Two months later		F	P
	No.	%	No.	%	No.	%		
Satisfactory ≥ 80%	4	20	17	85	16	80	42.34	.000*
Unsatisfactory ≥ 80%	16	80	3	15	4	20		

As it is shown from table (5), the studied sample of bachelor nurses had a decreased satisfactory level of total practice (20%) before receiving the SBE, while this percentage was improved to have an increased satisfactory level after receiving the SBE for practice part 85% satisfactory level in post-test 1 and 80 % satisfactory level in post-test 2

4. Discussion

The present study delineated the dominance of baccalaureate degree over diploma nurses. This finding is merely agreement with that of Xavier B. 2013who conducted "A study to assess the effectiveness of video assisted teaching module regarding central venous catheter related blood stream infections and it prevention on knowledge of staff nurses working in ICU" which showed a significant difference between before and after the educational intervention", published in Asian journal of nursing education and research and stated that 80% of study sample had BSc degree and 20% had diploma degree.

All of studied sample was female in the age group reflecting middle age and this agree with Arslan M., et al.2014 who conducted a published study titled as "Turkish Nurses‟ Knowledge About Application, Care, and Complications of Peripheral and Central Venous Catheters and Port Catheters".

Most of study sample had less than 5 years of work experience also in the age group of less than 30 years old so these age groups need to be properly trained and oriented on CVC care. This finding is consistent with Shrestha R. 2013 who conducted a study titled as " Impact of educational intervention on nurses‟ knowledge regarding care of patient with central venous line" which showed young nurses with less experience, working in ICU should be accepted as risk group and targeted for training program.

From the in investigator‟s point of view there is a managerial trend in the hospital to make the most of ICU nursing staff from young bachelor degree, although they are less experienced, but may be they are more willing to tolerate stressful work schedules, learn easily and enthusiast for continuous education in order to improve the provided nursing care which will impact on the patient outcome.

The ssecond section is concerned with interpretation of data related to answering the first and second research hypothesis which states:

• CCN "baccalaureate degree" who will receive SBL about care of CVC will have higher mean knowledge score as compared to their pre- implementation mean knowledge score.

• CCN "diploma degree" who will receive SBE about care of CVC will have higher mean knowledge score as compared to their pre- implementation mean knowledge score.

The current study revealed that all participants of CCNs had poor knowledge regarding care of CVC in their pre-test which improved after SBL intervention as compared to their pre- implementation knowledge score this finding is consistent with

Alinie G., 2013 who conducted a study titled as "Effectiveness of the Use of Simulation Training in Healthcare Education". The results show that simulation scenario education is an effective learning method as nurses from the experimental group, who were given the opportunity to observe and take part in simulation scenario-based education followed by debriefing, made significantly higher improvements between their pre and post tests than nurses from the control group.

The finding of current study is also consistent with El Nemr W., 2013 who published a study titled as "An interventional study to decrease central venous catheter related blood stream infection in intensive care units at Zagazig university hospital" in which more than half of nurses of studied sample had diploma degree and 15 % had BSc degree both of them had an improvement of their mean knowledge score after providing an intervention including a real-life scenarios through multimedia for CVC care education and this could make participants more motivated to learn hence leading to improve CVC nursing management.

Also, this finding is in agreement of Xavier B. 2013 who conducted "A study to assess the effectiveness of video assisted teaching module regarding central venous catheter related blood stream infections and it prevention on knowledge of staff nurses working in ICU"

which showed a significant difference between before and after the educational intervention", which use a video as a type of scenario-based educational method to rise nurses‟ awareness regarding CVC care.

The third section is concerned with interpretation of data related to answering the third and forth research hypothesis which states:

• CCN "baccalaureate degree" who will receive SBL about care of CVC will have higher mean practice score as compared to their pre- implementation mean practice score.

• CCN "diploma degree" who will receive SBL about care of CVC will have higher mean practice score as compared to their pre- implementation mean practice score.

The current study revealed that overall mean practice score of all nurses of studied sample is found to be significant between before and after implementation of SBL. This finding is in agreement with Hsu LL, Huang YH and Hsieh SI, 2014 who conducted a study titled as "The effects of scenario-based communication training on nurses' communication competence, self- efficacy and myocardial infarction knowledge". The study shows a significant improvement in competence, self-efficacy in communication and knowledge of myocardial infarction from pre-

test to the second post tests and recommends SBE to be fully incorporated into in - service education for nurses.

From the investigator‟s point of view the use of scenario-based approach in this study provided a potentially more effective educational method in which to assist all CCNs to connect what they are learning to the knowledge and skills required in real-life situations regarding CVC care and maintenance. This exactly is consistent with Aebersold, M., Tschannen, D., 2013 who conducted a study on" Simulation in nursing practice: the impact on patient care" Which supported using an innovative educational intervention for nurses as it has a positive effect to enhance their knowledge and skills, facilitate collaboration, encourage work group and improve patient care provided.

In the same line revealed the study which conducted by Uysal N.,2016 and titled as "Improvement of nursing students' learning outcomes through scenario-based skills training" on a nurse students that the scenario-based skills training reduced students' common mistakes in examinations and enhanced their performance on exams.

5. CONCLUSION

Based on the findings of the current study. It can be concluded that, scenario based education has a positive influence on nurses‟ mentality and clinical performance, helps them to apply their knowledge in caring the patients, identify the new learning demands and move towards independence and self guidance. Considering the great importance of the nurses‟ caring behaviors in the critical care unit and keeping in mind the fact that the nurses in this units face critical conditions, complicated situations and sensitive patients whose life is in danger, enhancement of the performance and mastering the knowledge of caring is a necessity for all of them. In other words scenario based education develop their and gain the necessary skills without having any fear or anxiety of causing harm to the patient. Thus utilizing this modern and creative educational is safe and results in favorable impact on nursing profession.

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