
CRITICAL CARE NURSES' KNOWLEDGE AND PRACTICES REGARDING CENTRAL VENOUS LINE CARE BUNDLE AT EMERGENCY HOSPITAL, MANSOURA UNIVERSITY

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Abstract

Background: Central venous catheter (CVC) represents one of the intravascular access devices that are necessary for critically ill patients. However, it is associated with several risks, of these are central line associated bloodstream infections (CLABSIs) which are serious but often preventable when evidence-based guidelines such as central line bundle are followed. **Aim of the study:** To assess nurses' knowledge, and practices about central line care bundle at an Emergency Hospital, Mansoura University. **Research design:** A design was descriptive exploratory. **Sample:** A convenience sample consisting of 64 nurses was included. **Tools of data collection:** Data were collected through two tools: critical care nurses' knowledge assessment questionnaire and nurses' practice observational checklist. **Results:** The great majority of nurses had unsatisfactory knowledge and practices regarding central line care bundle in percentages of 85% & 89.7% respectively. Unsatisfactory knowledge was found in relation to central line associated blood stream infection and central line bundle in percentages of 87.9% & 74.1% respectively. Unsatisfactory practice was found regarding utilization of insertion and maintenance bundle in percentages of 91.4% & 89.7% respectively. **Conclusion:** nurses had unsatisfactory knowledge and practice. **Recommendations:** Enhancement of nurses' knowledge and practices regarding central line care bundle through carrying out training programs and ~~ntitepeper~~ of this study on a larger sample.

Key Words: Critical care, nurses' knowledge, practices, central line care bundle

Introduction:

Central venous catheter (CVC) represents one of the intravascular access devices that are vital for the care of hospitalized critically ill patients. They provide reliable venous access for clinical activities such as infusion of medications, nutritional support, and hemodynamic monitoring ^[1]. However, CVC is one of the leading causes of healthcare-associated infections (HAIs) and are frequently implicated in life threatening problems ^[2].

Central line associated bloodstream infection (CLABSI) is one type of HAIs. It develops within 48-hour in a patients with

central lines in place before the onset of blood stream infection ^[3]. The most important advances in prevention of CLABSI is identification of associated individual risk factors such as: increased length of hospitalization before venous catheterization; prolonged duration of catheterization; heavy microbial colonization at the insertion site; and heavy microbial colonization at the catheter hub ^[4, 5].

CLABSIs are serious but often preventable when evidence-based guidelines are utilized by critical care

nurses who are in constant contact with patients and can utilize infection control techniques, help health facilities to develop and enforce standards of care that have been proven effective against infection. Among these standards are central line care bundles which can be followed during insertion and maintenance of central lines [6].

Central line care bundle is concerned with insertion and maintenance of the central line. Concerning the insertion bundle, it includes hand hygiene; maximal barrier precautions; chlorhexidine skin antiseptics; optimal catheter type and site in adults; and preferring subclavian insertion to minimize infection risk. However, central line maintenance bundle includes daily review of line necessity with prompt removal of unnecessary lines; aseptic lumen access, catheter site, and tubing [7].

Significance of the study

Critical care nurses have important roles in preventing CLABSI, so, they must have the ability to know how to prevent complication associated with central line insertion and provide high quality patient care. Using bundles is expected to facilitate care of central line, reduce rates of infection, improve health and decrease length of hospitalization and therefore, decrease the health care cost. However, little is known and carried out regarding nursing care of patients with CVCs and there is no accurate statistics about incidence of CLABSI in Egypt. This in addition to scares researches about central line care bundle

Therefore, the present study will be carried out in attempt to establish a base line data about nurses' knowledge and practices regarding this important aspect of patients' care. Such data can be incorporated in the future plan of care, upgrade nurses as one of the health team members and might generate an attention

and motivation for further researches in this area .

Aim of study:

To assess critical care nurses' knowledge and practices regarding central line care bundle at an Emergency Hospital, Mansoura University.

Research Questions:

Q1: What is the level of critical care nurses' knowledge about central line care bundle at intensive care units, of an Emergency Hospital, Mansoura University?

Q2: What is the level of critical care nurses' practice regarding central line care bundle at intensive care units, of an Emergency Hospital, Mansoura University?

Subjects & Method

Research design:

A descriptive research design was utilized in the current study.

Setting:

This study was conducted in three Intensive Care Units affiliated to an Emergency Hospital, Mansoura University. The first ICU consists of 10 beds, the second ICU consists of 8 beds, and the third ICU consists of 4 beds. The nurse patient ratio was approximately 1:2.

Subjects:

A convenience sample consisting of 64 nurses who agreed to share in the study was included.

Tools of Data Collection:

Data were gathered using two tools that were developed by the researcher as follows:

Tool I: Critical Care Nurses' knowledge Assessment Questionnaire.

This tool was developed by the investigator after reviewing the related recent literatures and in the light of the **Canadian Patient Safety Institute (2013), The Joint Commission for Preventing CLABSIs (2013) & US Centers for Disease Control and Prevention (2012)** to assess critical care

nurses' knowledge about central line care bundle. This tool was composed of two main parts:

Part (A): "Critical care nurses' personal and background data. It includes data such as nurses' age, educational background, years of experience in ICU, and attending training programs about central line care bundle.

Part (B): Critical care nurses' knowledge assessment questionnaire about central line care bundle.

This part consists of 22 multiple choices questions and 10 true/false questions classified into four main domains as follows: Central line catheter, CLABSI, central line bundle and role of the nurse toward care of patients with CVC.

Scoring system: One score was allocated for each true answer take and zero score for each false and unknown answer. **The total scores are 32** classified into two categories: unsatisfactory knowledge level (<24) and satisfactory knowledge level ($\geq 24 / \geq 75\%$).

Tool II: Nurses' Practice Observational checklist about central line care bundle.

It was developed by the investigator to assess critical care nurses' practices regarding central line care bundle. It consists of 12 questions classified into two main domains: central line insertion bundle and central line maintenance bundle

Scoring system: One score was allocated for each correct practice and zero score was allocated for each incorrect or not performed. **The total scores are 35** classified into two categories: unsatisfactory practice level (<26) and satisfactory practice level ($\geq 26 / \geq 75\%$).

Validity and reliability:

Developed tools were tested for content validity by a panel of 5 experts: two professors from Anesthesia and Intensive Care Department, Faculty of Medicine, Mansoura university and three

professors from Critical Care and Emergency Nursing Department, Faculty of Nursing, Cairo and Mansoura University who reviewed the English and Arabic tool for clarity, relevance, and the applicability. Modifications were done according to their suggestions.

Internal consistency & reliability of the data collection tools were assessed via Cronbach's Alpha and were found to be: $r = 0.81$ for knowledge assessment questionnaire and $r = 0.84$ for practice observational checklist.

Pilot study:

Six nurses were carried out the pilot study (they were excluded from main study) to examine the feasibility of the data collection tools, and to estimate the time needed to fill out the data collection tools and modifications were done. Some items have been rephrased to be clear and understood.

Human Rights Protection

Acceptance ee carryout the study was given from Faculty of Nursing, Mansoura University Research Ethical Committee and hospital administrative authority after explaining the aim and nature of the study.

Participation in this study was voluntary. Informed consents were obtained from each subject, and each subject has the right to euot eae from the study at any time. Subjects were reported that obtained data will be used only for the purpose of research.

Procedure

The current study started from December 2015 with preparation of different data collection tools after reviewing the related literatures, web sites and seeking experts' advices. Tools were developed in Arabic and tested for content validity & reliability. Then official agreements to carry out the study were obtained from directors of the Emergency Hospital and ICUs.

The actual data collection started from March to July 2016. Once permissions

were granted. Informed consents were obtained and nurses were asked to fill out the knowledge assessment questionnaire. Data were collected three times per week during the morning, and afternoon shifts, according to involved nurses' time schedule. The investigator was available during nurses' completion of the questionnaire. Each nurse required from 15-20 minute to answer questions.

Concerning nurses' practices, they were assessed using tool (II). Nurses were observed by the investigator at three different times during their care of ICU patients. Each assessment time required approximately 3 hours. The mean of the three observations was calculated.

Statistical analysis data

The Statistical Package for Social Sciences version 20 (SPSS) were used to analyzed and tabulated the data. The cut off value for statistical significance level was $p \leq 0.05$. Descriptive statistics were used such as numbers and percentage for qualitative data, and median, mean, standard deviation for quantitative data. The normality of data was first tested with one-sample Kolmogorov-Smirnov test. Cronbach's Alpha that is model of internal consistency, based on the average inter-item correlation was also used.

Limitation of the Study

The current study was carried out only in one hospital, so findings may not be representative of the general population of intensive care unit nurses in Egypt.

Unavailability of chlorhexidine (an antiseptic solution used in central line care bundle) in the hospital and it is not listed in the protocol of disinfection.

Results

Table (1) shows that, 81.1% of the nurses was in the age group ranged between 25 - 39 years, with a mean age of 32.0 ± 5.69 . They had secondary school diploma, 5 - 15 years of experience with a mean of 2.52 ± 1.2 and attended training programs in percentages of 70.7%, 55.2%, and 50% respectively.

Figure (1) illustrated that most (85%) of the nurses had unsatisfactory knowledge level ($<75\%$) about central line care bundle.

Figure (2) shows that most (89.7%) of nurses had unsatisfactory practice level ($<75\%$) about central line care bundle.

Table (2) reflects positive significant correlations between: age and years of experience in nursing and in the ICU; and total knowledge and total practice scores (r/p : 0.953/0.001, 0.615/0.001; and 0.277/0.035 respectively). However, negative correlations were presented between total knowledge scores age, years of experience in nursing and in the ICU (r/p : -0.274/0.037, -0.299/0.023, and -0.389/0.003 respectively).

Table (3) The mean knowledge scores regarding to age group, education level and attended workshops shows no significant difference. However, it differed significantly in relation to years of experience in ICU ($F=2.99$ at $P \leq 0.027$).

Table (4) The mean practice scores regarding to age groups, years of experience in ICU, education level and attended workshop shows no significant difference.

Table (1): Distribution in percentage of Sample as regards to Demographic Characteristics (N = 58)

Variables	Frequency	N = 58	
		N.	%
<u>Age group (years)</u>			
18- 25		3	5.2
25- 32		24	41.4
32-39		23	39.7
≥39		8	13.8
	Mean ±SD 32.0±5.69	Median 32.0	
<u>Educational level</u>			
BSc Nurses		15	25.9
Technical Diploma Nurses		2	3.4
Secondary School Diploma Nurses		41	70.7
<u>Work experience in ICU by year</u>			
<5		14	24.1
5- 10		16	27.6
10- 15		16	27.6
15-20		8	13.8
≥20		4	6.9
	Mean ±SD 2.52 ± 1.2	Median (2.0)	

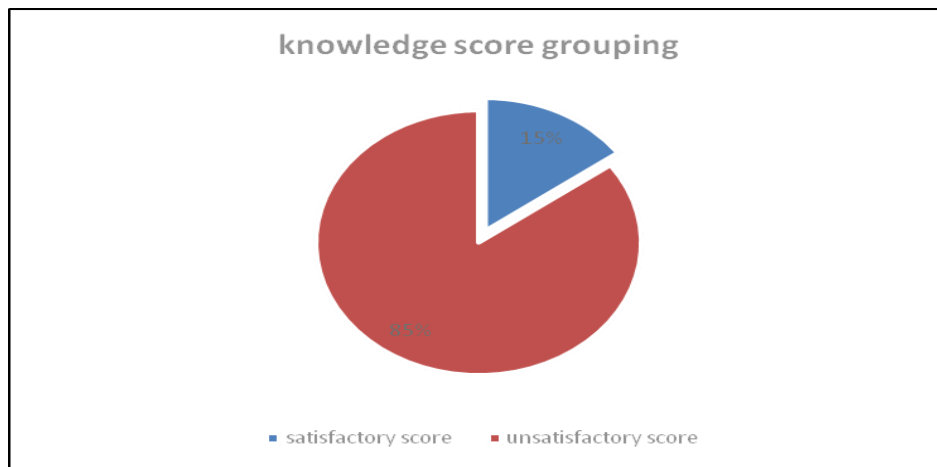


Figure (1) Distribution in percentage of Sample as regards to Knowledge level about Central Line Care Bundle (N = 58).



Figure (2) Distribution in percentage of Sample as regards to Practice Level about Central Line Care Bundle (N = 58)

Table (2):Correlation between Demographic Characteristics, Total Knowledge and Total Practice Scores of the Sample (N = 58).

Variables	Correlation & P value	Total practice Scores	Total Knowledge Scores	Age	Experience in nursing
Total Knowledge	r	0.277			
	P	0.035*			
Age (Years)	r	- 0.021	- 0.274		
	p	0.877 NS	0.037*		
Experience in nursing (Years)	r	- 0.059	-0.299	0.953	
	p	0.66 NS	0.023*	<0.001* *	
Experience in ICU (Years)	r	- 0.176	-0.389	0.615	0.697
	p	0.187 NS	0.003*	<0.001* *	<0.001**

NS: Not significant, * : Significant at $p \leq 0.05$ **: Significant at $p \leq 0.001$

Table (3): Comparison of Demographic Characteristics of the Sample in relation to Mean Knowledge Scores (N = 58).

Variables	Mean ± SD	Test of significance
Age groups		
18-25	21.0 ± 3.6	F=1.458 P≤0.236 NS
25-32	20.67 ± 3.74	
32-39	18.96 ± 2.87	
≥39	18.63 ± 3.42	
Years of experience in ICU		
<5	22.0 ± 3.01	F=2.99 P≤0.027*
5- 10	19.38±4.4 ^A	
10- 15	19.38±2.55 ^B	
15- 20	18.63±1.85 ^C	
≥20	16.75±1.5 ^D	
Education		
BSc Nurses	21.07±3.92	F=1.59 P≤0.12 NS
Technical Diploma Nurses	19.0±1.41	
Secondary school Diploma Nurses	19.27±3.2	
Attended Workshop		
Yes	19.83±3.21	t=0.23 P≤0.82 NS
No	19.62±3.63	

NS: Not significant

*: Significant at p≤ 0.05

Table (4): Comparison of Demographic Characteristics of the Sample in relation to Mean Practice Scores (N = 58).

Variables	Mean ± SD	Mean practice score	Test of significance
Age groups			
18-25		18.67±0.58	F=0.29 P=0.832 NS
25-32		17.79±2.15	
32-39		18.1±1.63	
≥39		17.88±1.36	
Years of experience in ICU			
<5		18.21±1.67	F=0.553 P=0.698 NS
5-10		18.38±1.67	
10-15		17.75±2.14	
15-20		17.62±1.69	
≥20		17.25±1.71	
Education			
BSc Nurses		18.33±1.7	F=1.003 P=0.37 NS
Technical Diploma Nurses		16.5±2.12	
Secondary school Diploma Nurses		17.93±1.8	
Attended workshop			
Yes		17.96±1.88	t=0.073 p=0.94 NS
No		18.0±1.71	

NS: Not significant

Discussion

The present study showed that the majority of studied sample had diploma nursing education. This finding is consistent with that of Kadium^[10] who carried out study about improving nurses' knowledge to reduce catheter-related bloodstream infection in a hemodialysis unit and demonstrated that the most of studied sample had basic nursing diploma.

Most of the studied nurses in the current study were young adults (in the age group ranged between 25 to less than 39 years). Young adulthood stage was described by Cramm & Nieboer^[11] to be the stage of young adulthood. Therefore these nurses have the ability to learn and to practice what they learn.

Concerning years of experience, more than two-thirds of the studied sample had experience ranged between 5 - 15 years and half of them attend workshops about infection control. The finding is not agree with Akinwale^[11] who carried out a study about central line-associated bloodstream infection (CLABSI) and revealed that the sample studied had no more than five years of experience.

What is the level of critical care nurses' knowledge about central line care bundle at intensive care units, of an Emergency Hospital, Mansoura University? The current study revealed that nurses had unsatisfactory knowledge level about central line care bundle. This finding is in concordance with that of Shrestha^[12] who studied the impact of educational intervention about care of patients with central venous line on nurses' knowledge and reported unsatisfactory mean knowledge scores. Unexpectedly, in spite of having unsatisfactory knowledge level among majority of the studied sample, they provided correct answers in relation to central venous catheter.

The mean knowledge scores were in relation to age group, education level and

attended workshop. The scores differed significantly in relation to years of experience in the ICU. The research finding is compatible with that of Ullman, Long & Rickard^[13] who carried out a survey study about pediatric ICU nurses' evidence - based knowledge and practice regarding CLABSI prevention and revealed no significant variation between ICU nurses highest education level and main work activity in relation to their knowledge.

Also negative significant statistical correlations were found between total knowledge scores and age, years of experience in the ICU. The finding is not in agreement with the postulation of the learning theory of Kolb^[14] which revealed that the person learns more by practicing, the more years of experience the more the knowledge level.

What is the level of critical care nurses' practice regarding central line care bundle at intensive care units, of an Emergency Hospital, Mansoura University? The present study revealed that more than three quarters of the studied nurses had unsatisfactory practice level regarding central line care bundle. This could be due to disproportion between number of patients to nurses as there was staff shortage, work overload, unavailability of hospital protocols of care specially about central line care, scarce educational programs and workshops, and lack of cooperation between the multidisciplinary team members.

Moreover, critical care nurses in the current study didn't utilize CVC insertion bundle in general due to their belief that it is not their responsibility. This finding is in the same line with that of Alkubati et al^[15] who illustrated that more than half of their studied nurses were not compliant with the recommended practice guidelines during CVC insertion. However, near half of the studied nurses followed certain

maximal barrier precautions/guidelines such as hand hygiene, putting on sterile gloves and draping only around the site of insertion. This finding contradicts the recommendation of the American Association of Critical-Care Nurses to use large sterile drapes during CVC insertion, and cover the whole patient's body except for the insertion site to keep an aseptic environment and prevent infection [12].

Regarding central line maintenance bundle of care, nurses in the current study didn't do the following: replace the central line when patients are hemodynamically unstable and a central line associated blood stream infections are suspected; perform hand hygiene before contact with all catheter entries; wear sterile gloves; cover open lumens (catheter hubs or stopcocks); disinfect access ports with alcohol chlorhexidine /alcohol or povidone-iodine; change needle every 7 day and change caps at 72 hours.

However, nurses in the current study assessed the insertion site daily for redness or swelling; changed gauze dressings every 2 days; replaced the administration sets every 96 hours; and replaced tubing which used to administer (blood, blood products, or lipids) every 24 hours and flushed the catheter with normal saline before and after administration of medications, blood product and nutrients

Conclusion

Critical care nurses in the present study have insufficient knowledge with insufficient practice about central line care bundle. These finding could negatively affect patients' health and safety as the nurse is the first member of the health care team to be responsible about patients' care. However, having unsatisfactory knowledge and practice level, nurses had certain knowledge about central venous catheter such as definition, uses and routine care also they have some good practice as assess insertion site daily and change dressing dressings every 2 days .

Thus, training and improvement of knowledge and skills about central line care bundle become an urgent need to prevent CLABSI. Thus, training and enhancement of knowledge and skills about central line care bundle becomes an important need to prevent central line associated blood stream infection.

Recommendations

According to findings of the present study, these are recommended:

- Increase sample size
- Strict observation to nurses' regarding utilization of infection control standards.
- Availability of log book to follow-up nurses' commitment to application of central line care bundle.
- Availability of written guidelines and posters about central line care bundle
- Replicate at different geographical area

Conflict of interest:

The authors declare that they have no conflict of interests.

Acknowledgments:

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