Factors Affecting Nurses' Performance toward Central Line Associated Blood Stream Infection in Critical Care Units

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Abstract

Background: Central venous catheter insertion is not a benign procedure. It is a potentially harmful one, if it is not performed correctly, it might result in life threatening complications. **Aim of study:** to assess nurses' performance toward CLABSIs and assess the factors affect their performance at the ICUs of Ain Shams University Hospitals. **Research design:** A descriptive exploratory research design was utilized. **Sample:** A convenient samples of 100 nurses were included in the current study. **Setting:** This study was carried out at the Intensive Care Units of Ain Shams University Hospitals. **Tools of data collection:** Four tools were developed by the investigator and utilized to collect data pertinent to the current study: nurses' knowledge self-administered questionnaire regarding CLABSIs, Factors assessment questionnaire and Nurses' practices observational checklist to assess their performance of Central Venous Catheter insertion and care procedure and nurses' attitude Likert scale. **Results:** Around (92%) of the studied sample had unsatisfactory knowledge level, the great majority (91%) of the studied sample had unsatisfactory practice level. There is statistically significance deference in the mean knowledge scores in relation to years of experience in the intensive care unit (p =0.009). A statistically significance in the total practice scores in relation to years of experience in the intensive care unit (p =0.048). Total of positive attitudes are about (43%), Total of negative attitudes are about (57%). And the factors were suggested by researcher affect nurses' performance toward Central Line Associated Bloodstream Infections in percentage (88%). **Conclusion:** In spite of having vital role in assessment and management of critically ill patients, critical care nurses in the current study had unsatisfactory knowledge, practice and attitude regarding CLABSIs, and there are many factors affect their performance, factors related to setting, factors related to patient and factors related to nurses. **Recommendation:** updating knowledge and practices of ICU nurses through carrying out continuing educational programs including evidence based guidelines about CLABSIs; Ongoing monitoring of staff nurses' practice while practicing CVC insertion and care and replication of this study on larger probability sample.

Key words: CLABSIs, ICU Nurses' Knowledge, Practices and attitude, factors affect performance.

Introduction

Sepsis is life threatening and can be caused by Bloodstream Infections (BSIs) associated with Central Venous Catheters (CVCs). The probability of infection with an increase in Intensive Care Unit (ICU) stay at greater cost can occur with long-term CVC use. Because of the costs of primary BSIs, it is important to continue research on the effectiveness of any viable alternative **(Shah, Schwartz, Luna& Cullen, 2016)**.

Central venous catheters (CVCs) are necessary to deliver lifesaving medications and offer a source for hemodynamic monitoring of the intensive care unit (ICU) patient. However, the longer these catheters are in use, the potential for exposure to central line–associated bloodstream infections (CLABSIs) and development of sepsis increases greatly. CLABSIs and other hospital-acquired infections (HAIs) haunt the health care system by increasing hospital and patient costs, resulting in expensive antibiotic therapy and death due to sepsis. CLABSIs

may be the second most preventable cause of hospital death **(Shah et al, 2016).**

Central venous access is indicated when peripheral veins are inaccessible, for administration of potent vasoactive drugs such as norepinephrine, when irritating or hypertonic solutions or parenteral alimentation are infused, when incompatible medications must be infused through a multilumen catheter, when acute or subacute hemodialysis or hemofiltration is needed, or for hemodynamic monitoring or transvenous cardiac pacing. Large bore central venous catheters also facilitate extremely rapid infusion of resuscitation fluid **(Taylor et al 2007)**.

The prevention of CLABSI is a topic of national importance. Because most CLABSIs occur in intensive care unit (ICU) settings, much of this discourse has focused on the critically ill, for whom significant strides have been made. With the advent of interventions that include unit-based safety approaches, a technical checklist of best practices, and enhanced measurement and feedback of infection rates, significant decreases in CLABSI rates have been realized in ICUs**(Chopra, O'Horo, 2013).**

Significance of the study

Central venous catheter insertion is not a benign procedure. It is a potentially harmful one, if it is not performed correctly, it might result in life threatening complications. Thus, nurses should remain sensitive to possible hazards and complications and take all necessary precautions to ensure patients' safety. However, the investigator noticed that, there are certain malpractices regarding central venous catheter insertion and care, where nurses didn't follow the principles of aseptic techniques during the insertion procedure; guidelines of central venous catheter care were lacking and the maintenance and drug administration through the device need meticulous nursing care.

With an increasing demand for intensive care beds more nurses in acute and high dependency wards will be expected to care competently for patients with central venous catheter. Central line is intravascular catheters that have a great role for hydration and hemodynamic monitoring. However, this has many associated risks and complications. So, it is imperative that nurses are aware of these risks and are able to practice according to current research recommendations

Aim of the study

This study aims to assess factors affecting Central line Associated Bloodstream Infection at critical care unit through the following:

1- Assess the nurses' performance regarding central line associated bloodstream infection in critical care units.

2- Assess the factors that affecting central line associated bloodstream infection in critical care units.

Research Questions

To fulfill the aims of current study the following research questions were formulated:

1. What are the nurses' levels of performance regarding central line associated bloodstream infection in critical care units?

2. What are the factors that affect nurses' performance toward central line associated bloodstream infection in critical care units?

Subjects & Method

Setting:

The current study was carried out at four different intensive care units of Ain Shams University Hospital. These units are:

- Medical Intensive Care unit 1 in the 1st floor which consisted of (17 beds).

- Medical Intensive Care unit 2 in the 1st floor which consisted of (17 beds).

- Cardiac Care Unit in the 2nd floor which consisted of (19 beds).

- Surgical Intensive Care unit in the 2nd floor which consisted of (42beds).

Subjects:

A convenient Sample of 100 nurses were included in the study, representing all those who work in the selected intensive care units (ICUs) of Ain Shams University Hospitals. Nurses had a convenient Sample of 100 nurses were included in the study, representing all those who work in the selected intensive care units (ICUs) of Ain Shams University Hospitals. Nurses had a minimum of one year working experience, and were willing to participate in the current study with the following inclusion criteria: Both sexes and different nursing educational categories.

Tools of data collection:

Four tools were utilized to collect data pertinent to the current study. They were developed by the researcher according to recent literature (**Maville et al, 2012).**

The designed tools included the following:

1. Self administered questionnaire:

It was used to assess nurses' knowledge regarding central line associated bloodstream infection at critical care unit, it was developed by researcher based on review of relevant recent literature and it was included two parts:

The first part: is concerned with demographic characteristics of nurses under the study. it included data related to gender, age, educational level, area of work, years of experience in nursing and ICU and number of attended training courses about central line associated bloodstream infection and previous related protocols and guidelines.

The second part: is concerned with assessment of nurses' knowledge regarding Central Line Associated Bloodstream Infection (**Maville et al, 2012).**

It included 15 multiple choices questions related to nurses' knowledge regarding Central Line Associated Bloodstream Infection and classified into three sections:

- The first section related to basic general knowledge about Central Venous Catheter (CVC) (from question 1-5) and contained questions related to Central Venous Catheter, the sites of CVC insertion, recommended flushing method, routine care and the complication of CVC insertion.

- The second section related to preparation for insertion and infection control measures (6-10) and contained questions related to maximal barrier precaution during CVC insertion, the risk of bloodstream infection, prevention of CLABSI, central line dressing and antibiotic use.

- The third section related to maintenance and post-insertion care (11 to 15) and contained questions related to frequency of dressing change, catheter occlusion,

best practices of care, the types of dressing and care after removal.

> **Scoring system**

The total score for the questionnaire was 15 grades; each right answer took one grade. The scoring system classified as follows;

- Scores less than 13 (< 90%) was unsatisfactory.

- Scores more than 13 (≥90%) was satisfactory.

2. Nurses practices observational checklist:

This tool was developed by researcher to assess nurses' practice regarding central line associated bloodstream infection after reviewing the recent related literature and written in English language. It consisted of 49 subtitles classified under three main parts: the first part was concerned with pre-insertion preparation (from step 1.1 to 3.4); the second part was concerned with procedure of central venous catheter

insertion (from step 4.1 to 4.15); and third partwas concerned with maintenance of asepsis and daily care (from step 5.1 to 5.17) **(Maville et al, 2012).**

> **Scoring system**

The total scores for the questionnaire was49 grades; each right answer took one grade. The scoring system classified as follows;

- Scores less than 45 (< 90%) was unsatisfactory.

- Scores equal ormore than 45 (≥90%) was satisfactory.

3. Nurses attitude Likert scale:

This tool was developed by researcher to assess nurses' attitude toward Central Venous Catheter CVC and CLABSI in critical care units and consist of 10 statements covering nurses' believes regarding CVC & CLABSI **(Mazaheri, Falahi&Rahgozar, 2009).**

> **Scoring system**

The total score for the Likert scale was 30 grades; as strongly agree point took three grades, agree point took two grades and not agree point took one grade. The scoring system classified as follows;

- Scores less than 18 (< 60%) was negative attitude.

- Scores equal or more than 18 (≥60%) was positive attitude.

4. Factors assessment questionnaire:

It was used to assess the factors that affecting nursing performance toward central line associated bloodstream infection at critical care unit and it classified to three partitions:

- The first part illustrated the setting related factors, it include 5 factors (from 1 to 5) about availability of clear instruction, equipment, infection control strategies, training courses and surveillance of infection in the unit.

- The second part include 5 patients' related factors (from 6 to 10) regarding daily assessment, signs of infection, presence of another infection source, assessing vital signs before CVC insertion and bad patient general hygiene.

- The third part contained five questions (from 11 to 15) illustrated factors related to nurses about shortage in nursing staff, their job satisfaction, their knowledge, patient' assessment and their level of education.

The results were displayed as a number and percentage to the nurses' point of view as yes " they consider it as a factor", no "they consider it is not a factor" or they cannot decide.

Tools validity:

Content validity was done to identify the degree to which the used tools measure what was supposed to be measured. Tools developed by the researcher were examined by a panel of five medical surgical nursing experts. The Jury reviewed the tools for clarity, relevance, comprehensiveness and simplicity then based on the opinion of the jury a minor modification were done and final form were developed.

Tool reliability:

Alpha Chrombach test was used to measure the consistency of the tools used under study.

Pilot study:

A pilot study was carried out on ten staff nurses working in Critical Care Medicine ICU at Ain Shams University Hospital (10% of the studied subject) to test feasibility, objectivity, and applicability of the data collection tools. Carrying out the pilot study gave the investigator experience to deal with the included subjects, and the data collection tools. And necessary modifications were done and the ten nurses who included in the Pilot study were excluded from the study.

Ethical consideration:

The ethical research consideration in the study included the following:

1. The research approval obtained from the ethical committee in faculty of nursing, Ain Shams University before starting the study.

2. Oral consents for staff' agreements to be included in the study were obtained after explanation of the nature and purpose of the study.

3. Each nurse was free to either participate or not in the current study and had the right to withdraw from the study at any time without any rational.

4. The research was assured maintaining anonymity and confidentiality of the subjects' data.

5. Nurses were informed that obtained data was collected for research purpose. Confidentiality and anonymity of each subject were assured through coding of all data.

Administrative design:

An official permission to conduct the study was obtained from Faculty of Nursing and directors of Intensive Care Unit at Ain shams university hospitals.

Statistical Design:

Upon completion of data collection, Data were analyzed using Statistical Program for Social Science (SPSS) version20.0. Quantitative data were expressed as mean± standard deviation (SD).

The following tests were done:

- Chi-square (X^2) test of significance was used in order to compare proportions between two qualitative parameters.

- Spearman's rank correlation coefficient (rs) was used to assess the degree of association between two sets of variables if one or both of them was skewed.

- Probability (P-value)

  - P-value <0.05 was considered significant.

  - P-value <0.001 was considered as highly significant.

  - P-value >0.05 was considered insignificant.

Results and data analysis

Table (1): clarifies that, 55%of the studied nurses were males. Also 72% of studied nurses had age between 18-26 years. 49% of the studied nurses had bachelor nursing degree.58% of the studied nurses had 1-5 years of experience in nursing field. While 48% of the studied nurses had less than one year of experience in ICU, and aboutcourses received in caring of patients with central venous catheter, 64% didn't receive any courses.

Table (2): shows that, 92% of the studied nurses had unsatisfactory total knowledge level about Central Line Associated Bloodstream Infection.

Table (3): clarifies that, 91% of the studied nurses had unsatisfactory total practice level regarding CLABSI.

Figure (1) shows that, 61% of the nurses' exhibit negative attitude toward CLABSI.

Figure (2) clarifies that, the studied factors affect nurses' performance toward Central Line Associated Bloodstream Infection in percentage (88%).

Table (4): shows there is highly statistically significant difference between total knowledge scores and years of experience in the intensive care unit (p =0.009), and there is no statistically significance between total knowledge scores in relation to gender, age, qualification and years of experiences in the field of nursing.

Table (5): shows there is highly statistically significant difference between total practice scores and years of experience in the intensive care unit (p =0.048), and there is no statistically significance between total practice scores in relation to gender, age, qualification and years of experiences in the field of nursing.

Table (6): reveals that there is high significant statistical positive correlation between total knowledge and total practice (P< 0.001), also there is high significant statistical positive correlation between total knowledge and total attitude (P< 0.001), the same between total practice and total attitude (P< 0.001).

Table (7): reveals that there is significant statistical positive correlation between total knowledge and the factors that related to work setting (P= 0.034) and the factors related to patient (P= 0.033), there is a positive statistical relationship between patient' related factors and total practice (0.045) and patient' related factors and total attitude (0.050). Finally, there is a positive relationship between total factors assessment and the three domain of nurses performance knowledge (0.028), practice (0.022) and attitude (0.044).

Tables (1): Percentage distribution of demographic characteristics of the study nurses (N= 100).

Socio-demographic data	No.	%
Gender		
Males	55	55
Females	45	45
Age (years)		
18-<26years	72	72
26-<36 years	26	26
36-<46 years	2	2
Qualifications		
Bachelor of Nursing	49	49
Institute of Nursing Technician	35	35
Secondary school Nursing Diploma	16	16
Years of experience in the field of nursing		
<1 years	12	12
1- <5 years	58	58
5-<10 years	25	25
10+ years	5	5
Years of experience in the intensive care unit		
<1 years	48	48
1- <5 years	37	37
5-10 years	13	13
>10 years	2	2
Received courses regarding central venous catheter care or exposed to related protocols or guidelines		
Yes	36	36
No	64	64

Tables (2): Percentage distribution for nurses under the study regarding satisfactory level knowledge about Central Line Associated Bloodstream Infection (N= 100).

Total Knowledge	No.	%
Satisfactory (>90%)	8	8
Unsatisfactory (<90%)	92	92
Total	100	100

Tables (3): Percentage distribution & satisfactory level of Total Practice about Central Line Associated Bloodstream Infection among nurses under the study (N= 100).

Satisfactory level of total practice	No.	%
Satisfactory (<90%)	9	9
Unsatisfactory (>90%)	91	91
Total	100	100

Figure (1): Percentage distribution of nurses' Total Attitude toward Central Line Associated Bloodstream Infection(N= 100).
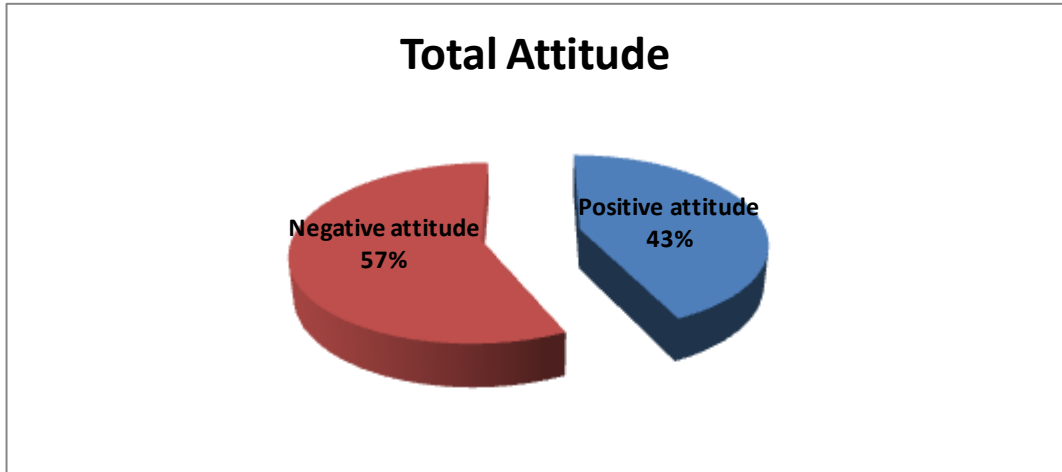

Figure (2): Percentage distributions of total of the factors affect the performance regarding Central Line Associated Bloodstream Infection (N= 100).
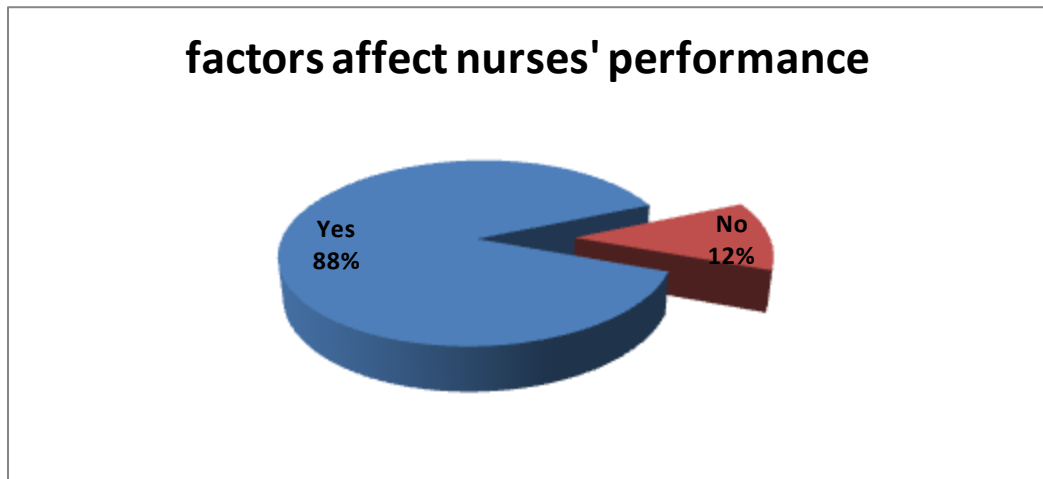
Table (4): Relation between nurses' demographic characteristics and their total knowledge (N=100).

Socio-demographic data	Total Knowledge				Chi-square test	
	Satisfactory (n=8)		Unsatisfactory (n=92)			
	No.	%	No.	%	x2	p-value
Gender						
Male	3	37.5%	52	56.5%	0.445	0.505
Female	5	62.5%	40	43.5%		
Age (years)						
18-25 years	5	62.5%	67	72.8%		
26-35 years	3	37.5%	23	25.0%	0.725	.696
36-45 years	0	0.0%	2	2.2%		
Qualification						
Bachelor of Nursing	5	62.5%	44	47.8%		
Institute of Nursing Technician	1	12.5%	34	37.0%	2.021	.364
Nursing Diploma	2	25.0%	14	15.2%		
Years of experience in the field of nursing						
<1 years	0	0.0%	12	13.0%		
1- <5 years	5	62.5%	53	57.6%	2.052	.562
5-10 years	2	25.0%	23	25.0%		
>10 years	1	12.5%	4	4.3%		
Years of experience in the intensive care unit						
<1 years	1	12.5%	47	51.1%		
1- <5 years	6	75.0%	31	33.7%	11.601	**0.009****
5-10 years	0	0.0%	13	14.1%		
>10 years	1	12.5%	1	1.1%		
Received courses in the field of critical care patients care						
Yes	4	50.0%	45	48.9%		
No	4	50.0%	47	51.1%	.003	.953

**high significant - *significant

Table (5): Relation between nurses' demographic characteristics and their total practice (N=100).

Socio-demographic data	Total Practice				Chi-square test	
	Done (n=9)		Not Done (n=91)			
	No.	%	No.	%	x2	p-value
Gender						
Male	3	33.3%	52	57.1%	1.037	0.309
Female	6	66.7%	39	42.9%		
Age (years)						
16-25 years	5	55.6%	67	73.6%		
26-35 years	4	44.4%	22	24.2%	1.863	0.394
36-45 years	0	0.0%	2	2.2%		
Qualification						
Bachelor of Nursing	6	66.7%	43	47.3%		
Institute of Nursing Technician	2	22.2%	33	36.3%	1.239	0.538
Nursing Diploma	1	11.1%	15	16.5%		
Years of experience in the field of nursing						
<1 years	2	22.2%	10	11.0%		
1- <5 years	4	44.4%	54	59.3%	1.944	0.584
5-10 years	2	22.2%	23	25.3%		
>10 years	1	11.1%	4	4.4%		
Years of experience in the intensive care unit						
<1 years	3	33.3%	45	49.5%		
1- <5 years	5	55.6%	32	35.2%	6.754	**0.048****
5-10 years	0	0.0%	13	14.3%		
>10 years	1	11.1%	1	1.1%		
Received courses in the field of critical care patients care						
Yes	6	66.7%	43	47.3%	1.235	0.266
No	3	33.3%	48	52.7%		

**high significant - *significant

Table (6): Correlation between the three dimension of nursing performance knowledge, practice and attitude(N=100).

		Total Knowledge	Total Practice	Total Attitude
Total Knowledge	r		0.304	0.336
	p		**<0.001****	**<0.001****
Total of Practice	r	0.304		0.433
	p	**<0.001****		**<0.001****
Total of Attitude	r	0.336	0.433	
	p	**<0.001****	**<0.001***	

Table (7): Correlation between factors affecting nurses' performance and total knowledge, practice and attitude.(N=100).

		Total Knowledge	Total practice	Total Attitude
Related to setting	r	0.196	0.109	0.050
	p	0.034*	0.344	0.291
Related to patient	r	0.557	0.249	0.229
	p	0.033*	0.045*	0.050*
Related to nurses	r	0.076	0.044	0.006
	p	0.498	0.713	0.996
Factors assessment questionnaire	r	0.293	0.403	0.279
	p	0.028*	0.022*	0.044*

**high significant - *significant

Discussion

As regards to the factors assessment questionnaire, the current study revealed that, there are many factors affect nursing performance toward Central Line Associated Bloodstream Infection such as shortage in nursing staff number, the nurses' job satisfaction levels and the periodically assessment of nurses knowledge these points completely in agreement with Penoyer (2010)who discuss the relationship of nurse staffing and patient outcomes in critical care populations, nurse staffing ratios have been associated with patient outcomes such as mortality, adverse events, complications, failure to rescue , quality of care, costs, length of stay, as well as nurse burnout and job dissatisfaction.

On the same line **Fridkin& Williamson(1996)** who conducted a study to assess the role of understaffing in central Venous Catheter Bloodstream Infection and revealed that Nursing staff reductions below a critical level, during a period of increased Total Parenteral Nutrition (TPN) use, may have contributed to the increase in CVC-BSI in the Surgical Intensive Care Unit (SICU) by making adequate catheter care difficult. During healthcare reforms and hospital downsizing, the effect of staffing reductions on patient outcome (i.e., nosocomial infection) needs to be critically assessed.

Also the current study revealed that there are many factors related to the patients that affect the incidence of Central Line Associated Bloodstream Infection such as patient' hygiene, presence of other source for infection, general condition and vital signs stabilization and these points in agreement with**Moro&Viganò (1994)** who studied the factors that increased the risk of Catheter Related Infections and revealed that Skin and hub colonization are the two major determinants for endemic CRIs; colonization of the hub, however, is more frequently associated with more severe infections. In

order to reduce CRIs, more efforts should be focused on understanding which factors increase the risk of colonization both of the skin and of the hub.

On the other hands there are other factors affect nursing performance toward CLABSIs related to the work setting such as the presence a clear instructions help the nurses to use central venous catheter correctly, the availability of all required equipment for caring of central venous catheter, presence of infection control strategies at the work setting, and continues training.

As regards to correlations between the variables of the study,concerning age category, the current study revealed that, a significant statistical difference in the knowledge in relation to age of the participant. Young adult nurses (less than 25 years) had higher mean knowledge score than old age nurses. This may be due to the fact that new graduate nurses could have fresh knowledge, and intact memory.

Also nurses who have experience from (One < 5 years) and (less than One year) in nursing and ICU respectively, were found to have higher mean knowledge scores than others categories. However knowledge of more experienced nurses was found to be based on opinions and tradition rather than on evidence based guidelines. Findings of the current study are inconsistency with that of **Day & Wilson-Barnett, (2002)** who found no relation between working experience and level of knowledge.

These findings are in agreement with that of **Abdullah & Ismail (2014)**, who revealed a higher tendency of bachelor nurses to have higher mean knowledge scores and those who have less than one year of experience got higher mean knowledge scores than others, with significant statistical

difference. In this regards, also **Rushdy& El Feky (2015)** revealed a significant statistical difference between mean knowledge score and the degree of nursing education.

The current study revealed that nurses' practice level didn't differ significantly in relation to nurses' gender, qualifications but there is statistically significance with ICU experience, these finding are near to **Barsuk& Cohen (2015),** who concluded that Total years in nursing had a significant negative correlation with overall baseline performance. For individual task performance, total years in nursing and total years in ICU nursing had significant, negative correlations with only medication administration.

On the other hand, **Choudhry, Fletcher, &Soumerai (2005),** conducted a systematic review to assess the relationship between clinical experience and quality of health care and showed a negative association between increasing experience and practice. In addition, **Hill (2010)** conducted a study on improving quality and patient's safety and revealed that the years of experience had a positive impact on the quality of care provided.

The current study revealed that nurses' attitude level didn't differ significantly in relation to years of experience in the intensive care unit, gender, age, qualification and years of experiences in the field of nursing. And the reasons of these in the current study may be relevant "from the researcher's point of view" that it was a required attitude from the surrounded old staff and duo to lack of training about suitable attitude during caring the patients.

The current study revealed that there is high significant statistical positive correlation between total knowledge and total practice also there is high significant statistical positive correlation between total knowledge and total attitude, the same between total practice and total attitude, from the researcher's point of view the knowledge is the great domain in the nursing

performance, duo to its positive effect on other two domains. When the total knowledge level was increased, normally the practice level and the attitude level were increased.

Regarding the work setting factors there is significant statistical positive correlation with total knowledge level that means the suggested work setting factors affect the first domain of nursing performance "knowledge". The availability of all required equipment for caring of central venous catheter and the presence of surveillance for central line associated bloodstream infection are the factors which has statistical positive correlation with total knowledge, also there are another factors such as the presence a clear instructions at the work setting and presence of infection control strategies at the work setting and infection control training.

This point of view is supported by **Hadian&Pishva (2010),** who conducted a study about the effect of education and presence of clear instruction on knowledge and performance of nursing staff working in intensive care units and concluded that; the difference between knowledge and practice before education may be related to several factors. Such as, work overload, large patient population, lack of resources and lack of motivation. Therefore continuous education and supervision could increase the level of knowledge and practice.

Regarding the patient factors there is significant statistical positive correlation with all domains of nursing performance total knowledge level, total practice level and total attitude. Assessing site of central venous line insertion daily, increasing body temperature of the patient, assessing vital signs before central line insertion and bad general patient hygiene after inserting central line are considered important factors affect nursing performance toward Central Line Associated Bloodstream Infection.

These points in agreement with **Wright et al, (2013)** who revealed that skin

hygiene affect the bloodstream infection directly through hematogenous infection, skin organisms at the insertion site, and catheter hub contamination, the hematogenous seeding of the external catheter tip can be prevented through limiting unnecessary device utilization by preventing infection at other sites leading to secondary bacteremia, this leaves skin organisms (extraluminal) and contaminated catheters hubs (intraluminal) as the two most modifiable causal pathways to preventing infection.

Regarding the nurses factors there is no significant statistical correlation with the domains of nursing performance but from the researcher's point of view these factors have high effect on nursing performance such as shortage in nursing staff number, the nurses' job satisfaction levels, periodically assessment of nurses knowledge toward central line associate bloodstream infection and levels of education of staff nurses.

Conclusion

Based on findings of the current study, it can be concluded that although nurses have vital role in assessment and management of critically ill patients, they had unsatisfactory knowledge, practice and negative attitude regarding CLABSIs. Also there are many factors affect nurses' performance regarding CLABSI, work setting related factors such as presence of clear instruction, availability of equipment, presence of infection control strategies, infection control training and presence of surveillance, patient related factors such as daily assessment of the CVC insertion site, assessment signs of CLABSI, confirmation presence of CLABSI & excluding another site, obtaining base line vital signs and patient hygiene and there are nurses related factors as presence of nurses shortage, job satisfaction, periodic assessment of nurses' knowledge, responsibility of the nurses toward assessment signs of infection and nurses' level of education. Also there is presence of a positive correlation between

three domain of nurses' performance and the factors affecting nurses' performance.

Recommendations

Based on findings of the present study, the followings are recommended:

1. Ongoing monitoring of staff nurses' practice by head and charge nurses during CVC insertion and care and provision of guidance to correct poor practices and to ensure that patient safety is being guaranteed.

2. Provision of written guidelines, booklets, policies regarding CVC insertion and care procedures.

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