Advances in Life Science and Technology
ISSN 2224-7181 (Paper) ISSN 2225-062X (Online)
Vol.19, 2014

Effect of Implementing Central line Bundle on Minimizing Rate of Central Line-Associated Blood Stream Infection (CLA-BSI) among Intensive Care Patients

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Abstract
Central line-associated blood stream infection (CLA-BSI) are one of the most common hospital acquired infections . **This study aims** assessment the effect of implementing central line bundle on minimizing rate of central line associated blood stream infection among intensive care patients**. A quasi - experimental design** were used in this study. **The present study was conducted** in Intensive Care Unit (ICU) at Zagazig University Hospitals. **The study subjects** includes two groups **Group I**, consisted of all nurses provided direct nursing care for patient during insertion, caring and removal of central lines and group two, patients, 40 patients received routine nursing care for caring central line (control group **)Group II**, includes 40 patients received central line bundle based on guideline of center for disease control and prevention(study group). **Tools of the study** consist of three tools, the first tool was patient devolvement assessment form:- for assessment of central line associated blood stream infection devolvement, the second tool was a structured observational checklist while ,third tool was central line bundle. The study findings **concluded,** Implementation of central line bundle minimize rate of CLA-BSI compared to routine care of central line. **The study recommended**, empowering nursing to enforce use of a central line bundle to be sure all processes related to central line placement are executed for each line placement .
Keywords: Central line bundle - Intensive care unit – patients

1. Introductin

Acentral venous catheter is also called a central venous line. Sometimes, the "venous" is omitted and it is called a central catheter or central line. The central venous catheters may be inserted for the short term or long term. There are two types of long term central catheters: a cuffed or tunnelled line and the reservoir long line that ends in a rubber bulb or reservoir (Warren, 2003).

Mermel, (2000), stated that ,central venous catheters (CVCs) are being used increasingly in the inpatient and outpatient setting to provide long-term venous access. CVCs disrupt the integrity of the skin, making infection with bacteria and/or fungi possible. Infection may spread to the bloodstream and hemodynamic changes and organ dysfunction (severe sepsis) may ensue, possibly leading to death

Approximately 90% of the catheter-related bloodstream infections (CR-BSIs) occur with CVCs. The attributable mortality for such central line infections is approximately 18%. Thus, probably about 14,000 deaths occur annually due to central line infections (Berenholtz et al., 2004).

Stoll et al., (2002) mentioned that, Central lines -associated bloodstream infections (CLABSIs) in hospitals are a worldwide serious persistent problem. Although often preventable, they are a source of morbidity, mortality, prolonged hospital stay, and rising costs.

O'Grady et al, (2002) & Institute for Healthcare Improvement (2010) added that, central line associated bloodstream infection (CLABSI) contributes to increased hospital stay, cost, and risk of mortality. The risk of developing a CLA-BSI depends on a variety of factors such as the duration of catheterization, location of catheter, and type of ICU to which a patientis admitted (Coopersmith CM, et al.,2002).

Mermel, (2000)and Berenholtz, et al (2004), found that the central line bundle is a group of evidence-based interventions for patients with intravascular central catheters that, when implemented together, result in better outcomes than when implemented individually as well as application of the central line bundle has demonstrated striking reductions in the rate of central line infections in many hospitals. In the same line . Marwick & Davey, (2009) and Institute for Healthcare Improvement (2010) reported that, five evidence-based interventions constitute the central line bundle. These include hand hygiene, maximal barrier precautions, use of chlorhexidine as a skin antiseptic, optimal catheter site selection (i.e., avoidance of the femoral vein for central venous access), and daily assessment of line necessity with prompt removal of central lines when indicated.

Pronovost et al (2006) stated that, nurses assisting with CVC placement were empowered to ensure physician adherence to all five interventions in the bundle. In addition, The teams also evaluated each CLABSI that did occur, to determine whether it could have been prevented.

1.1 Subjects and methods

Aims of the study

The aim of this study was to assess the effect of implementing central line bundle on minimizing rate of central line associated blood stream infection.

Primary outcomes

To reduce the rate of CLA-BSI regardless patient illness severity.

Secondary outcomes

To evaluate the effectiveness of central line bundle as nursing intervention.

Research hypotheses:

It was hypothesized that central line bundle will minimize rate of central line associated blood stream infection.

Subjects and Methods

Research design:

A quasi-experimental design was used for this study to assess the effect of implementing central line bundle on minimizing rate of associated blood stream infection. The study was conducted during 6 months from April 2013 - September 2013.

Study setting

The study was conducted in Intensive Care Unit at General Surgery Hospital, at Zagazig University hospital.

Sample size

The sample size was calculated through EPI info (Epidemiological information system) soft ware version 6 according to the following collected data, the confidence level 95% and a power of study 80%. The estimated sample size was calculated to be 80 patients who received routine nursing care during insertion, caring and removal of central lines

Study subjects

Group I –Nurses:-

All nurses provided direct nursing care for patient during insertion, caring and removal of central lines during ordinary care and during applied central line bundle they were 30 nurses.

Group II- Patients:-

The study divided to two groups, control group who included 40 patients received routine nursing care during insertion, caring and removal of central lines, and Intervention group who included of 40 patients received central line bundle to minimize rate of central line associated blood stream infection. The patients were determined according to the following criteria:-

Inclusion criteria

1. All patients admitted to ICU aged were18 years and above
2. cases required insertion central lines
3. free from any signs of blood stream infection during admission

Excluded criteria

Patients excluded from the study who were complaining from:-

1. Patients possessing signs of infection at body site other than the catheter.
2. patients with have dermatitis or burn over the insertion site

Data collection tools

Three tools were developed by the researchers for the collection of the required data based on review of relevant literature.

Tool (1): patient devolvement assessment form:- for assessment of central line associated blood stream infection devolvement .This form was developed by the researcher based on criteria for diagnosis of blood stream infection to assess the patient's status regarding diagnosis of blood stream infection. It was consisted of two parts

First part: Included information about demographic characteristics and medical condition, e.g. gender, age, clinical diagnosis, purpose of insertion, length of central line insertion.

Second part: Assessment of symptoms of blood stream infection based on criteria for diagnosis of blood stream infection which included following criteria:

(1) Temperature >38.5 0C or <36.5 0C

(2) Leukocyte count > 12.000 cells/uL or < 3,000 the cells/uL

(3) A positive blood culture.

(4)Positive culture for catheter tip.

Tool (2): A Structured observational checklist

It is performed two times once at the routine insertion of central line and once during applied central line bundle. The scoring system for the observational checklist consisted of given two points for the done step, while zero for

the step not done. The higher scores indicated a higher level of practices. Those score classified as:

Unsatisfactory	(< 60 %)
Satisfactory	(60 %)
Good	(≥75 %)

Tool (3): Central line bundle

Central line bundle are groupings of best practices with respect to a disease process that individually improve care, but when applied together result in substantially greater improvement. as well as compliance with the central line bundle can be measured by simple assessment of the completion of each item. The approach has been most successful when all elements are executed together, an "all or none" strategy. It includes the following items:-

1-Hand Hygiene

This item enhance the appropriate hand hygiene which should occur during care of central line as the following :

• Before and after palpation of the catheter insertion site,
• Before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter,
• When hands are obviously dirty or when contamination of the hands is suspected,
• Before and after invasive procedures,
• Between patients,
• Before donning and after removing gloves,
• And after using the bathroom

2- Chlorhexidine Skin Antisepsis

This technique for ensuring proper disinfection is as follows :-

• Prepare the skin at the insertion site with chlorhexidine 2% in 70% isopropyl alcohol.
• When an ampule is included, pinch the wings on the chlorhexidine applicator to break open the ampule and then hold the applicator down to allow saturation of the pad with the solution.
• Press the saturated sponge against the skin and scrub back and forth for at least 30 seconds. Do not wipe or blot with the sponge.
• Allow the solution to dry completely at the insertion site. This should take approximately 2 minutes.

3. Maximal Barrier Precautions at insertion

-For the patient receiving a central line, maximal barrier precautions means covering the patient head to toe with a sterile drape with just a small opening allowed for inserting the catheter at the site.
- For the healthcare provider placing the central line, maximal barrier precautions means strict hand hygiene and the appropriate use of caps covering the hair, masks covering the nose and mouth tightly, sterile gowns, and sterile gloves.

4-Daily Review of Line Necessity will prevent unnecessary delays in removing lines that are no longer clearly needed for the care of the patient. Many times, central lines remain in place simply because they provide reliable access and because personnel have not considered removing them. However, it is clear that the risk of infection increases over time as the line remains in place and that the risk of infection decreases if the line is removed. and optimal central line removal for determination central line associated blood stream infection according to central line bundle required catheter replacement at scheduled time intervals as a method to reduce CR-BSI has not lowered rates of infection." Additionally, routine replacement is "not necessary for catheters that are functioning and have no evidence of causing local or systemic complications (Institute for Healthcare Improvement, 2012).

Method of data collection

1. An official permission for conducting the study was obtained from administrative and responsible personnel after explaining the aim and nature of the study and submission of a formal letter from the Faculty of Nursing.
2. Development of tool I & II after reviewing recent relevant literatures.
3. Validity of tools were established for content validity by a panel of five expertise
in this field who revised for clarity, relevance, applicability, comprehensiveness, and ease for implementation and according to their opinions, minor modifications were done accordingly.
4. Meeting and discussion were held between the researcher and the nursing administrative personnel to explain the objectives and the nature of the study to gain their cooperation during the implementation phase of the study.
5. Formal consents were obtained from conscious patients, whereas the consents of unconsciousness patients were obtained from their significant, then, patients were recruited based on the above mentioned criteria.
6. Patients were randomly assigned to control group or study group, 40 in control group and 40 in intervention group. The control group received routine nursing care during central line insertion, where as the intervention group received the central line bundle based on CDC 2012
7. Lines in the ICU were placed by resident physicians with assessing nursing team.

8. Central line bundle was applied to 5 patients before starting data collection to evaluate the tentative effect on decreasing central line blood stream infection.
9. Patients in the intervention group received the central line bundle by residents and nursing staff under supervision of researcher for cases needed central line in the morning shift and continue for 48 hours or more. While nursing staff provides routine care for cases in afternoon and evening shift.
10. Nursing staff was instructed to use the checklist at the time of line insertion. All providers in the room were required to wear sterile cap, mask, and gloves. Nurses were empowered to stop procedures if sterile technique was not correctly employed.
11. Patients in the control group received routine central line care using cotton swabs with normal saline 0.9% to clean the site of insertion in the afternoon and evening shift shift by ICU nurses.
12. A base line central venous line assessment for detection signs of infection was done for all patients in control and study groups on admission after insertion.
13. Axillary's body temperature,' WBCs, blood culture was recorded for all patients in control and study groups after 48 hours of line insertions.
14. All blood cultures obtained from patients admitted to the ICU were reviewed by the General History lab at Zagazig University and all suspected CLA-BSI.
15. All data collected from the medical records were used only for research study only.
16. The anonymity, privacy and confidentiality of patients, voluntary participation and right to withdraw from the study at any time were emphasized.

Statistical analysis

Up on completion of data collection each sheet was manually scored. The back ground data sheet was coded and listed into numbers for calculation. Data were checked, entered and analyzed by using SPSS (version 14) soft ware computer packed (special package for social science). Data were express as number and percentage for categorical variables, range and mean ± stander deviation for continuous variables. Student t- test, Chi square (X2), Mann-Whitney test, Fisher test are used for comparison between quantitative and qualitative variables at P-value= <0.05 was considered statistically significant.

1.1.1Results.

Table1. Demographic and Clinical Characteristics among Intervention and Control group (n=80)

Items	Intervention Group (n=40)		Control Group (n=40)		X2	P-Value
	No	%	No	%		
Age (years):						
40 <	**16**	**40**	**14**	**35**	**0.05**	**0.82**
40+	**24**	**60**	**26**	**65**	**t=0.38**	**0.61**
Rang	**18.0-79.0**		**18.0-80.0**			
Mean ±SD	**45.9 ±18.3**		**44.5±18.2**			
Sex :						
Male	**26**	**65**	**28**	**70**	**0.26**	**0.63**
Female	**14**	**35**	**12**	**30**		
Diagnosis:						
Trauma	**20**	**50.0**	**17**	**42.5**		
Post–operative	**10**	**25.0**	**15**	**37.5**	**2.11**	**0.35**
Stroke	**10**	**25.0**	**8**	**20.0**		
Purpose of central line insertion						
TPN	**3**	**7.5**	**2**	**60**	**2.19**	**0.33**
Hemodynamic monitoring	**31**	**77.5**	**24**	**5.0**	**Fisher**	**1.00**
Routine intravenous therapy	**6**	**15**	**8**	**20**	**2.11**	**0.35**
Duration of central lines insertion/days						
8 <	**18**	**45.0**	**14**	**35.0**	**0.83**	**0.36**
8>	**22**	**55.0**	**26**	**65.0**		
Range	**5.0-18.0**		**5.0-15.0**		**U=3.18**	**0.37**
Mean± SD	**7.2±2.6**		**8.6±3.3**			

(*) statistically significant<0.05 U) Mann-Whitney test
TPN (Total parental nutrition)

> More than < less than

Table .1 illustrated that the intervention included 80 patients, 40 in the intervention and 40 in the control group, 60 % of intervention and 65% of control group were more than 40 years old. More than half of the sample (65%) were males in intervention group and (70%) in control group. The differences were not proved to be statistically significant . shows that, regarding patient medical diagnosis, multi injury trauma account for 50% and42.5% in the intervention group control group. Patients with postoperative accounts for 25% and 37.5% in intervention and control group consequently. While cerebral stoke account (25%) in intervention group and (20%) in control group. Concerning purpose of insertion central line in intervention group it was found that (77.5%) of patients Inserted central line for them due to hemodynamic monitoring followed by(15%) for routine intravenous therapy while (7.5%) for Total parental nutrition. The purpose of insertion central line among control group was(60%) of patients Inserted central line for them due to hemodynamic monitoring followed by(20%) for routine intravenous therapy while (5%) for Total parental nutrition respectively.. The difference between intervention and control groups as regards to, diagnosis, purpose of insertion central line , and duration of central lines insertion/days were statistically non significant .

Table 2 . Nurse's Practice regarding appropriate times for hand hygiene among control and intervention group.

Items	Control Group (n=40)		Intervention Group (n=40)		2X	P value
	No	%	No	%		
-Before and after inserting	0	0.0	10	33.33	12.0	0.001**
- Before and replacing.	10	33.3	20	667	6.67	0.009*
Before and after accessing,	5	16.7	20	66.7	15.4	0.001**
- Before and after repairing,	0	0.0	5	16.7	5.36	0.02*
- Before and after dressing on the site of insertion.	17	56.7	28	93.4	10.76	0.001**
- When hands are obviously soiled or if contamination is suspected	15	50.0	26	86.7	0.07	0.79
- Before and after invasive procedures	0	0.0	25	83.4	42.86	0.001**
- Between patients	5	16.7	10	33.3	2.22	0.13
-Before donning and after removing gloves	0	0.0	5	16.7	5.36	0.02*
Total Mean ± SD (range)	3.5±1.3 2-6		6.4±0.8 6-8		paired t 11.0	< 0.001**

P < 0.05 significant (S) *
P < 0.01 highly significant (H.S) **

Table 2. Shows nurse's practice about regarding (appropriate times for hand hygiene during insertion of central line) among control and intervention group . it was observed that there was significance difference among studied group regarding nurses` practice related to hand hygiene before and after central line insertion, replacing, accessing , repairing, and dressing on the site of insertion . the table illustrated that and it was found that, the total mean practice score regarding hand washing was 3.5±1.3 among control group compared to 6.4±0.8 among patients in intervention group. It was found statistically significant difference among control and intervention group.

Table (3) :Nurse's Practice regarding applying maximal barrier precautions during preparation for line insertion)among control and intervention group.

Items	Control Group (n=40)		Intervention Group (n=40)		^2X	P value
	No	%	No	%		
1- For patient : -covering the patient from head to toe with a sterile drape.	10	33.3	15	50.0	1.71	0.19
2- For nurses **a- Gloves** - wearing sterile gloves while Performing vein puncture	18	60.0	20	66.7	0.29	0.59
- Handling specimen	0	0.0	10	33.3	12.0	0.001*
- Remove and discard gloves after each individual task before leaving bed	0	0.0	5	16.7	5.36	0.02*
b- Gown - Sterile gown always worn by the inserter/s	18	60	18	60.0	0.0	1.0
c- Mask and cap -Mask and cap worn by all persons in the room at time of insertion.	10	33.3	20	66.7	6.67	0.009*
Total Mean ± SD (range)	3.7±2.4 0-8		5.2±1.3 2-8		Paired-t 3.4	0.01*
3 - Handling of soiled linen: - Put on gloves and wear a plastic apron during bed making	0	0.0	10	33.3	12.0	0.001**
- Linens are kept away from body to avoid contamination	10	33.3	20	66.7	6.67	0.009*
- Placing linens on chair, tables or on the floor are avoided	0	0.0	5	16.7	5.36	0.02*
- Soiled linens are kept in leak proof bags	0	0.0	5	16.7	5.36	0.02*
- Shake or toss linens are avoided	10	33.3	20	66.47	6.67	0.009*
Total Mean ± SD (range)	1.3±0.9 0-2		6.3±0.7 6-8		paired t 21.7	< 0.001**

Table (3) Illustrated that, the total means score practice regarding using protective clothes for patients and nurses in control group was 3.7±2.4 compared to 5.2±1.3 in intervention group. It was found that, there was statistically significant difference among studied nurses. P= 0.01. It was found also that, the total mean practice score related to handling of soiled linen was 1.3 ± 0.9 in control group and increased to 6.3 ± 0.7 in intervention group. there was a statistical significance difference among studied nurses in intervention group and control group. (P< 0.001).

Table .4 Nurse's Practice regarding preparation of the skin antisepsis (chlorhexidine)before central line insertion among intervention and control group.

Items	Control group (n =40)		Intervention group (n=40)		^2X	P value
	No	%	No	%		
-Prepare skin with antiseptic/detergent chlorhexidine 2% in 70% isopropyl alcohol.	2	6.7	5	16.7	0.65	0.42
-Pinch wings on the chlorhexidine applicator to break open the ampule.	12	40.0	20	66.7	4.29	0.03*
-Hold the applicator down to allow the solution to saturate the pad	0	0.0	20	66.7	0.0	1.0
3-Press sponge against skin	20	66.7	25	83.7	2.22	0.13
-Apply chlorhexidine solution - using a back-and forth.	10	33.3	15	50.0	1.71	0.19
-Friction scrub for at least 30 seconds	20	66.7	26	86.7	3.35	0.06
-Do not wipe or blot.	20	66.7	23	76.7	0.74	0.39
-Allow antiseptic solution time to dry completely before puncturing the site (~ 2 minutes).	0	0.0	0	0.0	0.0	1.0
- Optimal catheter site selection	30	100	30	100.0	0.0	1.0
-Daily review of line necessity,	12	40.0	20	66.7	4.29	0.03*
-Assess signs of infection	4	13.4	9	30.0	2.45	0.11
-prompt removal of unnecessary lines	10	33.3	17	16.7	3.3	0.069
Total Mean ± SD (range)	6.0±1.8 4-8		9.3±3.0 6-14		paired t 10.7	< 0.001**

P < 0.05 significant (S) *
P < 0.01 highly significant (H.S) **

Table . 4 Portrays nurse's practice regarding preparation of the skin antisepsis before central line insertion)among intervention and control group . It was found that the total mean practice score was 6.0±1.8 among (control group) and increased to 9.3±3.0 among intervention group. A statistically significant difference was found among studied nurses throughout the use of guidelines protocol. P< 0.001.

Table (5)Nurse's Practice regarding daily review of central line aseptic and Prompt removal and determination signs of central line associated blood stream infection among intervention and control group.

Items	Control Group (n=40)		Intervention Group (n=40)		^{2}X	P value
	No	%	No	%		
- **Chose appropriate site for insertion and avoiding femoral**	30	100.0	30	100.0	0.0	1.0
- **Record time and date of line placement**	20	66.7	27	90.0	4.81	0.02*
Aseptic Technique at Line Access and Dressing Changes						
▪ Change dressing every day	0	0.0	0	0.0	0.0	1.0
▪ Use aseptic technique during changing deesing	10	33.3	26	86.7	17.78	0.001**
▪ Report any abnormalities	0	0.0	0	0.0	0.0	1.0
- **Daily Review of Line Necessity .**	5	16.7	20	66.7	7.94	0.004*
- **Monitor Signs of infection , including**:-						
▪ Fever	30	100.0	30	100.0	0.0	1.0
▪ Hypotension	30	100.0	30	100.0	0.0	1.0
▪ pus discharge	30	100.0	30	100.0	0.0	1.0
- **Removal dislodge line .**	5	16.7	20	66.7	7.94	0.004*
- **Assessment signs of infection in other body site**	30	100.0	30	100.0	0.0	1.0
- **aspirate blood sample for blood culture**	30	100.0	30	100.0	0.0	1.0
- **Assessment for removal of central lines as part of your daily goal sheets.**	6	20.0	9	30.0	0.8	0.37
Total Mean ± SD (range)	18.5±2.1 14-24		20.0±2.4 18-24		**paired t** 3.16	0.003*

Table .5 Shows that, the total mean nurse's practice score regarding daily review of central line aseptic and Prompt removal and determination signs of central line associated bloodstream infection was 18.5 ± 2.1 among control group and improved to reach 20.0 ± 2.4 in among intervention group . The same table portrays that there is statistical significance among studied nurses. P< 0.001

Table .6 Total means scores of nurses' practice throughout the program.

Total score	Intervention Group (n=40)	Control Group (n=40)	Paired t-test	p-value
Total practice	**Mean ±SD range**		**12.5**	**<0.001****
	41.7±14.1 30-52	**51.6±3.9 44-60**		

P < 0.01 highly significant (H.S) **

The total mean scores of nurses practice among intervention and control group illustrated in **Table (6)** It was found that, the total mean score was 41.7 ± 14.1 in control group compared to 51.6±3.9 in intervention group. It was found that, there was statistically significant difference. P< 0.001 .

Table .7 White Blood Cells (WBCs) Count throughout 5 Days of Following central line insertion among Patients in the Intervention and Control Group.

(WBC) Count	Control Group (n=40)		Intervention Group (n=40)		X^2 Test	p-value
	No.	%	No.	%		
First day of central line insertion :						
<10	30	75.0	23	57.5		
10>	10	25.0	17	42.5	2.37	0.10
Range	5.0-19.0		3.0-21.0			
Mean ±SD	9.6±3.0		10.0±4.8		U=1.95	0.19
2nd day :						
<10	28	70	22	55.0		
10>	12	30	18	45.0	1.92	0.42
Range	6.0-19.0		2.0-24.0			
Mean ±SD	10.7±3.0		11.2±5.9		U=0.56	0.26
3rd day:						
<10	26	65.0	19	47.5		
10>	14	35.0	21	52.5	0.08	0.72
Range	6.0-19.0		2.0-24.0			
Mean ±SD	11.4±3.0		12.2±5.9		U=0.89	0.34
4th day:						
<10	18	45.0	10	25.0		
10>	22	55.0	30	75.0	2.65	0.08
Range	4.0-26.0		1.0-33.0			
Mean ±SD	12.5±5.0		14.3±5.2		U=1.76	54
5th day:						
<10	16	40.0	8	20.0		
10>	24	60.0	32	80.0	2.05	0.12
Range	4.0-32.0		1.0-41.0			
Mean ±SD	12.8±5		15.7±5.5		U=2.67	0.16

Table .7 shows that, there was no significant difference in (WBCs) count on 1st, 2nd, 3rd, 4th and 5th day after central line insertion among intervention and control groups. It can also noted that, on 1st day the mean (WBCs) count was 9.6±3.0, 2nd was 10.7±3.0, 3rd day was 11.4±3.0, 4th day was 12.5±5.0 and on 5th day was 12.8±5 compared to control group on 1st day was 10.0±4.8, 2nd was 11.2±5.9, 3rd day was 12.2±5.9, 4th day was 14.3±5.2 and on 5th day was 15.7±5.5. There was no significant difference in the mean (WBCs) count in 1st, 2nd, 3rd, 4th and 5th day among intervention and control group.

Table .8 Percentage Distribution of Isolated Organisms from blood Culture among Study and Control group.

	Control Group (n=40)		Intervention Group (n=40)		X2 Test	p-value
	No	%	No	%		
Gram-positives						
- Staphylococcus aureus, (Methicillin-sensitive)	7	17.5	14	35	4.71	0.03*
- Staphylococcus aureus, (Methicillin resistance)	3	7.5	6	15.0	2.68	0.047
- Enterococcus faecalis	4	10.0	9	22.5	3.21	0.07
Gram-negatives	0	0.0	1	2.5	0.001	1.00
- Eschericia coli	1	2.5	1	2.5	0.001	1.00
- Pseudomonas aerigunosa						
- Candida species	4	10.0	5	12.5	0.001	1.00
Total positive:						
Yes	19	47.5	36	90.0	14.54	0.001*
No (no growth	21	52.5	4	10.0		

Table.8 Shows blood cultures microbial growth , was gram positive Staphylococcus aureus (Methicillin-sensitive) account (17.5%) followed by gram positive Candida species and Enterococcus faecalis account (20%)and (7.5%) for gram positive Staphylococcus aureus (Methicillin resistance) and only (2.5%) had gram negatives (Pseudomonas aerigunosa) ,Gram-negatives Eschericia coli ,completely disappeared in the study group. As compared with control group it was found that gram positive -Staphylococcus aureus (Methicillin-sensitive) account (35 %) followed by Enterococcus faecalis Methicillin resistance, account (15%) followed by Candida species (12.5%) while both Eschericia coli and Pseudomonas aerigunosa account (5 %). Also noted that (52.5%) were negative from any bacterial species in study group compared to (10%) in control group.

Figure .1 Mean of Body Temperature Follow-up after central line insertion among Patients in the Intervention and Control Group

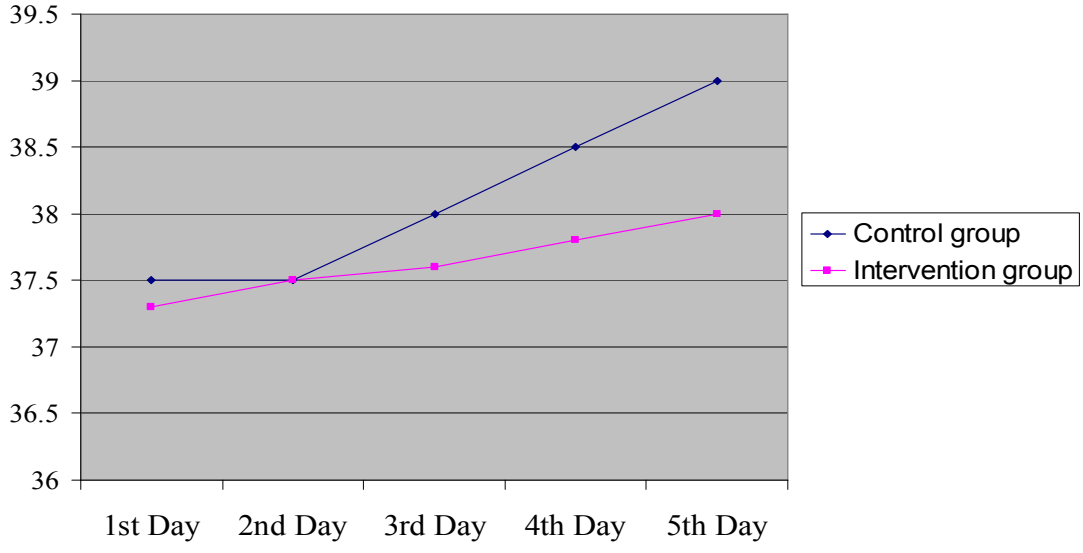

Figure.1 Illustrated that, there was no significant difference regarding to body temperature after central line insertion on 1st, 2nd, 3rd, 4th and 5th day among intervention and control group. It can also noted that, on 1st day the mean of body temperature was 37.3±0.5, 2nd was 37.5±0.2, 3rd day was 37.6±0.5, 4th day was 37.8±0.2, 5th day was 38.0±0.5 in intervention group compared to control group on 1st day was 37.5±0.6, 2nd was 37.5±0.8, 3rd day was 38 ±0.3, 4th day was 38.5±0.5, 5th day was 39.0±0.8. There was no significant difference in the mean of body temperature on 1st, 2nd, 3rd, 4th and 5th day among intervention and control group.

IV-Discussion

The use of central venous catheters (CVCs) is an integral part of modern health care throughout the world, allowing for the administration of intravenous fluids, blood surface of the device. Therefore health care personnel who insert or maintain CVCs must clearly understand their indications for use and the potential for complications. Many studies ,demonstrated that educational programs and intensified training reduce the risk of infection associated with CVC uses (Zingg etal., 2009).

As well as the nurses constitute the highest number of personnel working in hospital, hence any defect in their role will affect on the quality of care given to the patient, and therefore they require continuous training programs as well as follow up their care provided to the patient. Several researchers have recognized that even experienced staff may not be knowledgeable about risk factors for CLABSIs and best practices to prevent them (Barsuk et al., 2010 and Yilmaz et al., 2007).

In the present study, it was found that on admission there aren't any significant difference between the intervention and control groups as regards to, age, gender, admission diagnosis , purpose of central line insertion as the common purpose was hemodynamic monitoring, flowed by routine intravenous therapy and TPN in both groups, in relation to duration of central line insertion there no significance deference detected among control and intervention group .Despite the duration of central line discussed by several study (Comer et al., 2011 and Guerra et al., 2010) and who reported that the CVC duration, with the risk increasing with CVC dwell time considered one of the Potentially modifiable risk factors of CLBSIs (Warren, 2003)

Nurses have the most direct, ongoing role in the care of patients and the interventions or procedures that put patients at risk of central line infection (Rosenthal and Maki , 2004).In the present study, it was found that nurses `s practice related to implementation of the central line components among intervention group ,it was observed that it achieved excellent results in minimizing rate of CLBSIs . this agreement with Health Department and Human Services (2011) reported that the implementation of the first item of central line bundle which presented the appropriate times for hand hygiene among control and intervention group, the practice of intervention group was significantly difference. Several researchers have evaluated the impact of hand hygiene on the risk of CLABSIs.

This finding agree with O'Grady et al (2002), who stated that, One way to decrease the likelihood of central line infections is to use proper hand hygiene. Washing hands or using an alcohol-based waterless hand cleaner helps prevent contamination of central line sites and resultant bloodstream infections. This is in agreement with Infusion Nurses Society, (2011) who mentioned that ,hand hygiene is a key component of any effective patient safety and infection prevention program. Hand hygiene is generally accepted as the single most important measure in preventing the spread of infection.

In relation to nurses' practice of the second items of central line bundle (applying maximal barrier precautions during preparation for line insertion) ,it was observed that there was significant difference among control and intervention group .These results were supported by Pratt RJ(2007) who said that, aseptic technique requires the use of various barriers, such as sterile gloves, sterile gowns, sterile drapes, and masks, to prevent the transfer of microorganisms from health care personnel and the environment to the patient during a procedure.

The current study revealed that the Implementation of the third items of central line bundle which explain the measures related to preparation of the skin antisepsis (Chlorhexidine)before central insertion resulted in excellent compliance of sterile technique during central line insertion , this finding agree with Casey etal., (2007) who shows that disinfection of the device surface with chlorhexidine/alcohol solutions appears to be most effective in reducing colonization. added that ,the addition of 70% alcohol to chlorhexidine increases both the kill rate and the drying time of the agent, while the chlorhexidine has residual activity and is effective in the presence of serum. As well as . Marschall et al., (2008), emphasized that ,appropriate disinfectants must be used to prevent transmission of microbes. While 70% alcohol is the most frequently used agent, chlorhexidine is recommended in several guidelines. Timsit et al., (2009)added that ,Chlorhexidine-impregnated dressings have been used to reduce the risk of CLABSI.

According to findings of the current study the that there is no significance difference detected among control and intervention group related to chosen the appropriate site for insertion and avoiding femoral. These findings in accordance with Chittick P and Sherertz RJ, (2010) who reported that, some data derived from several observational studies of CVC insertions suggest that the greatest risk of infection in adults is associated with use of the femoral vein as the insertion site, and the lowest risk is associated with subclavian site insertions, with an intermediate level of risk associated with internal jugular vein insertions for non tunneled CVCs.

In relation to nurses' practice related to recording time and date of line placement and daily review of line necessity, there was significant difference among control and intervention group, this finding agree with Pronovost et al., (2007) who recognized that , the risk of CLABSI increases with the duration of time the catheter is left in place, so daily evaluation of the continued need for a catheter is an important aspect of CLABSI prevention; catheters that are no longer needed should be promptly removed.

According to findings of the current study the aseptic technique is a method used to prevent contamination with

microorganisms. This finding agree with Infusion Nurses Society, (2011) who mentioned that the result of the present study as well as using aseptic technique during dressing by studied nurses was significantly difference among control and interventions group.

The study reported that criteria for suspected central line associated blood stream infection followed the central line bundle includes the following criteria : (i) fever of >38.3°C (ii) leukocytosis of >12 × 10^9/ml, and/or (iii) A positive blood culture. As regarding to body temperature there was no significant difference observed between patients in intervention and control groups on the first, second, third, fourth and fifth day after central line insertion this finding in the line with Raad, etal., (1993) stated that, the classic presentation of CLABSI is the development of fever and chills immediately after accessing a catheter that has been locked for some time. However, the range of clinical presentations is broad, and the catheter may not always be immediately considered as the source of fever.3

Regarding to leucocytosis, there was no significant difference between patients in study and control groups on the first, second, third, fourth and fifth day. Presence of leucocytosis in patients that were not having pneumonia might be related to another body infection. This agreement with Zaidi et al., (2004) who reported that the CLABSIs are serious but often preventable infections when evidence-based guidelines are followed for the insertion and maintenance of central lines. As regards to the types of bacterial species isolated by blood sample aspirated from both intervention and control groups, it can be noted that, A laboratory-confirmed bloodstream infection colonization was detected among both group and the most frequent isolated microorganisms gram positive Staphylococcus aureus (Methicillin-sensitive) followed by gram negative Candida species , among studied patients compared to control group. This finding agree with Wisplinghoff et al., (2004) who found that Gram-positive skin organisms often comprise the most commonly reported causative microorganisms of bloodstream infections. as well as Health Department and Human Services (2011) reported that the data from a nationwide surveillance study in the United States found that coagulase-negative staphylococci and Staphylococcus aureus account for 31% and 20%, respectively, of all health care–associated bloodstream infections. Enterococcus and Candida species ranked third and fourth, at 9% each.

Conclusions

Hand hygiene is a key component of any effective infection prevention program. Aseptic technique, a method used to prevent contamination with microorganisms, is recommended by the central line bundle for insertion and care of CVCs. When preparing to insert a CVC, health care personnel should be attentive to maximal sterile barrier precautions, skin preparation, catheter selection, and use of catheter kits or carts. Despite the development of preventive measures to reduce risks of infection related to CVC insertion and maintenance, CLABSI continues to be a significant burden in studied populations.

Recommendation

- Empower nursing to enforce use of a central line bundle to be sure all processes related to central line placement are executed for each line placement.
- Using an insertion checklist can improve adherence to best practices and reduce error.
- Health care personnel must ensure that a patient's CVC is removed or replaced at the appropriate time and in asafe manner. Such considerations include daily review of Line necessity.
- Correct use of central venous bundle ; use of chlorhexidine-impregnated dressings; early catheter removal; and adoption of continued education programs for the healthcare team.
- Development of records and multidisciplinary guidelines of care for central venous catheter insertion and maintenance.
- Implantation of the bundle must be carried over from shift to shift to eliminate gaps in teaching and utilization.
- Health care personnel should understand the appropriate care and maintenance needed to prevent infection after the CVC is inserted, as proper care of the CVC post insertion is critical to preventing CLABSIs.
- Nurses' practice related to care of central lines needs to be supported by the policies, procedures and practices of their own ICU.

Acknowledgments

The author thanks members of the nursing and medical staff of intensive care unit at the University of Zagazig Hospitals, who have been involved in research and prof Dr. Ahmed Gab Allah, Professor of Clinical Pathology ,at Department of Clinical Pathology at Zagazig Uinvirsty Hostpials who devoted much of his time, effort generous advice for the completion of this work.

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