

Infection Control Measures Associated with Central Venous Catheter in Pediatric: Health Care Professionals' Knowledge and Performance

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1.ABSTRACT

Introduction: Central line associated blood stream infection is responsible for increasing the mortality in pediatric intensive care units, prolonged hospitalization and increasing healthcare expenses. **Aim:** The present study aimed at studying knowledge and performance of healthcare professionals regarding infection control measures associated with central venous catheter at pediatric intensive care units. **Method:** The study is a baseline assessment survey for a larger study. Convenience sampling technique was used to recruit a total number of 10 physicians and 20 nurses, who were working at the intensive care units at pediatric hospital, Mansoura University. **Results:** The study revealed that 40% of nurses showed poor knowledge level in relation to infection control measures associated with central venous catheter and 35% of them showed incompetent performance level. **Conclusion:** Poor knowledge level and incompetent performance among health care professionals regarding infection control measures of central venous catheter at pediatric intensive care units. It is recommended to implement educational module on infection control measures of central venous catheter at pediatric care units.

Keywords: Infection Control Measures, Central Venous Catheter, Pediatric Care Unit.

2.Introduction

Healthcare system must consider preventing measures of healthcare acquired infection (HAIs) as the most important strategy HAIs are infections that develop at 48 hours or more after being admitted to the hospital or within 30 days of receiving medical care. Around 0.5 million cases of HAIs being detected annually at intensive care units (ICUs) because of the impaired immunity of ICU patients (Haque, Mainul et al., 2018 and Sikora, Anna et al., 2022). Effective infection prevention and control (IPC) measures can minimize HAIs up to 70% (Alhumaid et al., 2021 and Curren, Emily J., et al., 2022). According to the Centre for Disease Control and Prevention (CDC), about 1.7 million of hospitalized patients annually develop HAIs, and more than 98,000 of them die as a result of HAIs (Erdem, Ilknur, et al., 2022). One of Iranian main hospitals reported that the incidence rate of HAIs was 17.1 per 1000 patient-days during the year 2021. This indicates that 17.1 out of 1000 hospitalized patients daily showed a sign of HAIs (Nasiri, Naser, et al., 2023). In Egypt the record show that the incidence rate of HAI was 3.7% in New Mansoura General hospital during the year 2017(Hassan, Rania, et al., 2020).

Despite the obvious advantages of CVCs in the PICU, they are associated with considerable

risk central line associated bloodstream infection (CLABSI), which is one of fatal HAIs. CLABSI induce fatality incidence ranged from 12% to 25% (Kendirli, T et al., 2017). Therefore, CLABSI is considered as major public health issue and one of the biggest obstacles for healthcare systems (Belloni, Silvia, et al., 2022). CLABSI are a significant contributor to morbidity and death in pediatric intensive care units, which raises the cost of care for the public health system. According to estimates, CLABSI cause between 84,000 and 204,000 infections annually, with an infection incidence rate of 0.46 to 26.5 per 1000 catheter days. (Scarselli, Alessia, et al.,2023). The most frequent HAI in high-risk neonate and children is a CLABSI. They have been associated to a noticeably longer length of hospital stay. Up to 65%-70% of CLABSI may be avoidable, albeit not all HAIs are, if evidence-based infection control techniques are used during the installation and maintenance of central lines. (Hamza, Wafaa Seddik, et al.,2022).

Through ongoing education, health providers can become more knowledgeable about the most recent evidence-based practices, which is a key method for preventing and controlling the difficulties associated with CVCs. This means that vascular access care procedures, educational

approaches, and professional practices should all be reviewed on a regular basis by healthcare facilities. This means that the involvement and dedication of every member of the hospital staff is necessary for the effective implementation of both these measures and the quality improvement process as a whole. The medical treatment cost and patient morbidity associated with CVCs issues may significantly decrease with the mandatory adoption of education and training program of evidence-based guidelines for CVCs. (Abdo, Naglaa M., et al.2020).

Aim of the Study

The aim of the study is investigating knowledge and performance for health care professionals related to infection control measures associated with central venous catheter in pediatric.

3.Method

3.1Design

A cross- sectional design was utilized to accomplish this study.

3.2Setting

Children's Hospital at Mansoura University.

3.3Participants and sampling:

Convenient sampling technique was used to recruit health care professionals who are working at pediatric intensive care unit at "Pediatrics Hospital at Mansoura University". The expected number of healthcare professionals to be involved in the study is 10 physicians and 20 nurses

3.4Data Collection

The researcher designed two self-administered questionnaires to assess demographic and occupation characteristics of healthcare professionals as well as their level of knowledge regarding infection control measures associated with central venous catheter. The researcher designed performance observational checklist to assess the performances of health care professionals regarding infection control measures associated with central venous catheter before, during and after insertion of central line.

Content validity of the designed tools was tested by 5 experts in the field of infection prevention and control. Face validity of the designed tool was tested by conducting a pilot study on 10% of study sample that will be excluded from the study sample. The researcher visited the pediatric intensive care unit at "Pediatrics Hospital at Mansoura University" six times to collect data about the demographic and occupational

characteristics as well as to assess the knowledge level of healthcare professionals regarding infection control measures associated with central venous catheter. Researcher directly observed the performance of health care professionals regarding infection control measures associated with central venous catheter before, during and after insertion of central line.

3.5 Ethical considerations:

Ethical approval was obtained from the Research Ethics Committee of Faculty of Nursing, Mansoura University for conducting the study. Verbal consent was obtained from the participants after clarifying the aim of the study and ensuring confidentiality of data. Participants were informed that they have the right to withdraw at any time from the study without giving any reason.

3.6Data analysis

Statistical analyses were performed using the statistical software Stands for Statistical Product and Service Solutions (SPSS) v20. the frequency and percentage of categorical data were expressed.

4.Results

Table (1) shows that the age of the studied sample ranged from 18 to 40 years with a mean age of nurses 30.40 (3.378) and a mean age of physicians 31.60 (4.70). Most nurses (60%) were females while 80% of physician were males. Regarding their qualifications 90% of nurses have bachelor degree, 60% and 40% of physicians have master and PhD degree. Regarding years of experience, (80%) of nurses had experience ranged from less than 5 years to less than10 years while (80%) of physicians had experience less than 5 years. Only 40% of nurses and 60% of physician attended course on infection control.

Table (2) shows that total level of knowledge related to infection control measures associated with central venous catheter for 40% of nurses showed poor level of knowledge while all physicians showed good level of knowledge.

Table (3) shows that the total performance level regarding infection control measures associated with central venous catheter before, during and after insertion of central venous catheter. An improvement level was observed among 40% of nurses while 35% of them showed an incompetent level. On the other hand, 70% of physicians were competent in performing infection control measures.

Infection Control Measures Associated with. . .

Table 1 Healthcare professional's socio-demographic characteristic (N=30)

Items	Nurses (N=20)		Physicians (N=10)	
	No	%	No	%
Age group 18-30 years	12	60	5	50
31-40 years	8	40	5	50
Mean ± SD	30.40 (3.378)		31.60(4.70)	
Gender				
Male	8	40	8	80
Female	12	60	2	20
Educational level				
Bachelor	18	90	0	0
Master	2	10	6	60
PhD	0	0	4	40
Years of experience				
< 5 years	8	40	8	80
5:< 10 years	8	40	2	20
10: < 15 years	3	15	0	0
≥ 15 years	1	5	0	0
Mean ± SD	7.60 (3.705)		4.70 (2.263)	
Attending infection control courses				
No	12	60	4	40
Yes	8	40	6	60

Table 2 Healthcare professional's total knowledge levels score regarding infection control measures associated with central venous catheter

Levels	Percentage (score)	Nurses N=20		Physician N=10	
		No	%	No	%
Poor	< 60 % (<18.6)	8	40	0	0
Fair	60 :< 80 % (18.6: <24.8)	5	25	0	0
Good	≥ 80 (≥ 24.8)	7	35	10	100

Table 3Health care professionals' total performance score regarding infection control measures associated with central venous catheter before, during and after insertion .

Levels	Percentage	Nurses N=20		Physician N=10	
		No	%	No	%
Incompetent	< 60 %	7	35	2	20
Improving	60 :< 80 %	8	40	1	10
Competent	≥ 80 %	5	25	7	70

5. Discussion

The elimination of healthcare associated infections (HAIs) is a significant goal of patients' safety and delivering high-quality health care (Beville, A. S. M., et al 2021). Central line associated blood stream infection (CLABSI) is a

preventable complication of the use of central venous catheter (CVC). Healthcare professionals are the backbone in prevention of CLABSI or CVC complications by applying standardized guidelines through sustaining the aseptic field during the insertion of CVC. Competent practices are needed for the prevention of CLABSI (Abou Zed, A., et al

2020). Therefore, the study aimed to assess knowledge and performance for health care professionals related to infection control measures associated with central venous catheter in pediatric.

The current study indicates that most of the studied nursing staff had poor score level of knowledge regarding infection control measures related to central venous catheter. This result is in the same line with a study conducted by **Zeyada, F. Y. M., et al. (2021)** who found that most nurses had poor knowledge concerning knowledge about central venous catheter, central line associated blood stream infection and its management. At the same line a study conducted by **Ouda, Wafaa E., et al. (2021)** revealed that the level of knowledge regarding central venous catheter, catheter-related bloodstream infection and CVC maintenance bundle was considerably low among the nurses. The results of the current study could be due to lack of training, in which more than half of nurses did not receive training related to infection control measures.

This finding is consistent with other study carried out by **Alfar, Nadia Mohammed, et al. (2020)** reported low knowledge scores among nurses in relation to infection control measures before conducting educational interventional study to improve nurses' knowledge related preventing CLABSI. The previous study emphasized the importance of continuous educational programs for nursing staff to improve their competencies in preventing CLABSI.

Concerning total performance level of health care professionals, the present study reveals that one third of the studied health care professionals had an incompetent total performance level regarding infection control measures related to central venous catheter. From the research's point of view, the findings of the present study may be attributed to several factors, including the staff shortage, work overload in the intensive care units, and a lack of knowledge about infection control measures as a result of a lack of training programs. This result is supported by **McCauley, Lauren, Marcia Kirwan, and Anne Matthews (2021)**, who revealed that insufficient knowledge, workload and inadequate training are the major causes of noncompliance with infection control measures. Along the same line, a study conducted by **Bayoumi, (2018), Zeyada, et al. (2021), and Alfar, Nadia Mohammed, et al (2020)** who revealed that the most of studied nurse had unsatisfactory level of performance related to infection control measures related to central venous catheter. This finding is consistent with other study

was carried out by **Abou Zed, A., (2020)**, who reported unsatisfactory mean score of nurse's practices prior to attending training program on improve performance regarding preventing CLABSI.

According to the retrieved field notes, throughout the data collection of the present study shortage of the staff, work overload, inadequate infection control policies, as well as insufficient training of the health care professionals. All of these factors lead to the observed poor knowledge and incompetent performance level among the studied group.

6. Conclusion

The present study revealed poor score level of knowledge and incompetent performance among health care professionals regarding infection control measures of central venous catheter at pediatric intensive care units.

7. Recommendations

Based on the findings and conclusions drawn from the study, the following recommendations are suggested:

Provide educational and training program for health care professionals on infection control measures related to central venous catheter at pediatric intensive care units.

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