



## ORIGINAL ARTICLE

## Knowledge, Attitude and Practices of ICU Nurses on Catheter Related Bloodstream Infection (CRBSI)

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### Abstract

**Background:** Bloodstream infections (BSIs) are associated with insertion and maintenance of central venous catheters (CVC). Catheter Related Bloodstream Infection (CRBSI) is the most frequent causes of healthcare-associated infections in intensive care units (ICUs) and is a major challenge for health care providers working in intensive care units. It gives the higher risk to the mortality rate of ICU patients and also increased length of ICU stay and additional healthcare costs for them. Most international institutions published the clinical practice for the prevention of (CRBSIs) and update annually that will guide specific actions to be implemented by health care personnel who insert and handle a CVC including nurses in ICU settings who also have the direct exposure and continuous perform CVC procedures. Therefore, they should be knowledgeable and compliant in the insertion assistance, care, and maintenance of central lines. To improve the appropriate use of CVCs, in-depth knowledge, attitude and practice of ICU nurses is essential to adherence the appropriate preventive measures for Catheter Related Bloodstream Infection (CRBSI) and reducing the CRBSIs rate among the patients.

**Aim:** The objective of this study was to assess the level of knowledge, attitude and practice of ICU nurses regarding on catheter related bloodstream infection (CRBSI). Moreover, this study was also done to investigate the association between knowledge and attitude of ICU nurses on catheter related bloodstream infection (CRBSI) and the association between knowledge and practices of ICU nurses regarding CRBSI.

**Methods/materials:** A cross-sectional study conducted on 86 ICU nurses in two ICUs in Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang, Malaysia. A purposive sampling method was used. The tool for data collection was a questionnaire consists of 4 parts such as sociodemographic

data of participants, level of knowledge, attitude and practices of ICU nurses regarding CRBSI. The data were analyzed by using descriptive statistics and inferential statistics (Chi-square test) of IBM Statistical Package Social Science (SPSS) version 25.

**Result:** 100% response rate was achieved and 94.2% of ICU nurses have a good level of knowledge, and 94.2% have a good attitude in handling patients with CVC at ICU. Moreover, 88.4% of participants had good practices based on evidence-based practice guidelines of CVC care. There was a significant association between knowledge and attitude of ICU nurses regarding CRBSIs ( $p = 0.000$ ) and also there was a significant association between knowledge and practices of ICU nurses regarding CRBSIs ( $p = 0.001$ ).

**Conclusion:** In conclusion, the results of this study clearly indicated that the majority of ICU nurses had good knowledge, attitude and practice regarding CRBSIs in patients with CVC at Kuantan, Malaysia. However, this study was conducted in only one hospital due to time constraint using self administered questionnaires. Hence, the researcher suggested that direct observation checklists should be applied in accessing their practice for future study to reduce the bias.

### Keywords

Knowledge, Attitude, Practices, ICU nurses, Catheter related bloodstream infection (CRBSI)

### Introduction

Catheter-related bloodstream infection (CRBSI) give a higher risk to mortality rate among ICU patients in many countries [1]. CRBSI is the leading health association infection followed by urinary tract infections, surgical site infections and ventilator-associated pneumonia [2]. In addition, CRBSI has been shown to increase both ICU

number of patient and hospital length of stay [3]. The incidence rate of central-line associated bloodstream infection among adult ICUs patients were 1.6 to 44.6 cases per 1,000 central line days, while neonatal ICUs patients ranged from 2.6 to 60.0 cases per 1,000 central line days, in addition to the mortality rate ranging from 2.8 to 9.5 [4]. Patients in intensive care units (ICUs) are at an increased risk for CRBSIs because 48% of ICU patients have indwelling central venous catheters (CVC), accounting for 15 million central catheter days per year in United States ICUs [5]. The nurse who has a thorough understanding of the benefits and risk of central venous access devices should be able to minimize and accurately recognize catheter-related problem ensuring safer and improved outcomes for the patient [5].

In the Malaysia Registry of Intensive Care (2015), the incidence of CRBSI was 0.4 per 1000 catheters day compared to 0.7 in 2014 and 0.8 in 2013 respectively. The incidence rate was decreased every year, but the study of this topic still important to be done to know the current status of knowledge, attitude and practice on CRBSI and its relationship. In addition, several studies conducted in West countries proposed that rate of zero CRBSI can be achieved by the implementation of preventive measures. However, in developing countries only a few studies where the target of zero CRBSI reached [6]. Knowledge of healthcare providers about CRBSI has not been fully assessed, and little known about the association between knowledge and attitude and knowledge and practices among ICU nurses. To increase awareness of the prevention of CRBSI, in-depth knowledge of these issues among ICU nurses is essential. Therefore, this study was conducted to determine the knowledge level, and attitude, to explore the practices of ICU nurses, to determine the association between knowledge and practices and lastly to determine the association between knowledge and attitude of ICU nurses regarding CRBSI.

## Materials and Methods

A cross-sectional survey design was conducted among 86 ICU nurses at Intensive Care Unit (ICU) 1 and ICU 2 in Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang, Malaysia. Purposive sampling was used in this study and a self-administered questionnaire written in English was distributed among participants and data collection period was from April to May 2018. Nurses' sociodemographic data, knowledge, attitude on CRBSI and its prevention guidelines and practices on CVC care were collected. The researcher was obtained ethical approval from National Medical Research Register (NMRR), Medical Research Ethics Committee (MREC) and Kulliyah Nursing Post Graduate Research Committee (KNPGRC). Moreover, approval from relevant authority such as hospital director, matron and sister in ICU department. The purpose of the study was

explained and got voluntary participation with informed consent from the respondents. Then, questionnaires were distributed and collected back. All answered questionnaire was put in a sealed envelope, and all information was kept anonymous. Statistical analysis program, SPSS version 21 was used and data were analyzed using descriptive analysis which is frequency and percentage and inferential analysis which is the Chi-Square test. P-value < 0.05 was set as statistically significant.

## Results

### Sociodemographic data

All the participants in this study were female ICU nurses (n = 86). The frequency of age group  $\leq$  35 years was 50 (58.1%), age 36-40 was 27 (31.4%), age 41-45 was 6 (7.0%), age 46-50 was 1 (1.2%) and the age above and equal to 51 years was 2 (2.3%). In addition, there were 20 nurses (23.3%) with 1-5 years in practices as ICU nurses. Most of them were working in ICU between 6-10 years which were 31 nurses (36.0%). 28 nurses (32.6%) and 4 nurses (4.7%) works between 11-15 years and 16-20 years respectively. Only 3 nurses (3.5%) had experience working for more than 20 years as ICU nurses. Most of the participants had a diploma in nursing with a percentage of 96.5% (n = 83) compared to a degree in nursing with 1.2% (n = 1) and nurses who had any speciality with 2.3% (n = 2). However, none of them had PhD and Master degree in nursing. Furthermore, the majority of participants were working as a staff nurse (96.5%) and only 3 (3.5%) had a head-nurses/nurses coordinator. All data was shown in [Table 1](#).

### The level of knowledge of ICU nurses on CRBSI

As seen in [Table 2](#), most of the ICU nurses which were 81 (94.2%) got 5-8 marks to answer the knowledge assessment questions correctly indicated that the nurses had good knowledge regarding CRBSI. Meanwhile, 5 (5.8%) of them was categorized as a poor level of knowledge with 0-5 marks only achieved the correct answer.

### The attitude of ICU nurses on CRBSI

As shown in [Table 3](#), ICU nurses showed a good attitude with 94.2% (n = 81) with the score between 16 to 18 marks and 5.8% (n = 5) nurses needed to improve their attitude with 1-9 marks while caring the patient with CVC to prevent CRBSI.

As shown in [Table 4](#), the participants had got the sources of information about CRBSI mostly from the guidelines were (89.5%), followed by from colleagues (36%), workshops (34.9%), internet (9.3%), a scientific journal (8.1%) and professional organization (7.0%). (91.9%) felt the need to improve their information regarding CRBSI whereas 7 of them (8.1%) felt enough and no need to improve.

**Table 1:** Sociodemographic data among ICU nurses in HTAA.

Variables	Frequency (n)	Percentage (%)
Gender		
Male	0	0
Female	86	100
Age group (years)		
≤ 35	50	58.1
36-40	27	31.4
41-45	6	7.0
46-50	1	1.2
≥ 51	2	2.3
Number of years in practices		
1-5	20	23.3
6-10	31	36.0
11-15	28	32.6
16-20	4	4.7
≥ 21	3	3.5
Educational level in Nursing		
Diploma in Nursing	83	96.5
Degree in Nursing	1	1.2
PhD	0	0
Master	0	0
Any speciality	2	2.3
ProfessionalRole		
Ordinary nurse	83	96.5
Head-nurse/Nurses Coordinator	3	3.5

**Table 2:** The knowledge level of ICU nurses regarding CRBSI.

Range of knowledge	Frequency (n)	Percentage (%)
5-8 marks (good)	81	94.2
0-4 marks (poor)	5	5.8

**Table 3:** The attitude of ICU nurses regarding CRBSI.

Range of attitude	Frequency (n)	Percentage (%)
10- 18 marks (good attitude)	81	94.2
1-9 marks (need to improve)	5	5.8

### The practices of ICU nurses on CRBSI

The percentage of ICU nurses who did the good practice with the mark between 33 to 48 marks was 88.4% (n = 76). However, 11.6% (n = 10) of them only perform moderate practices with the range mark between 17 to 32 marks. Luckily, none of the ICU nurses performs a bad practice. All data are shown in [Table 5](#).

### The association between knowledge and attitude of ICU nurses on CRBSI

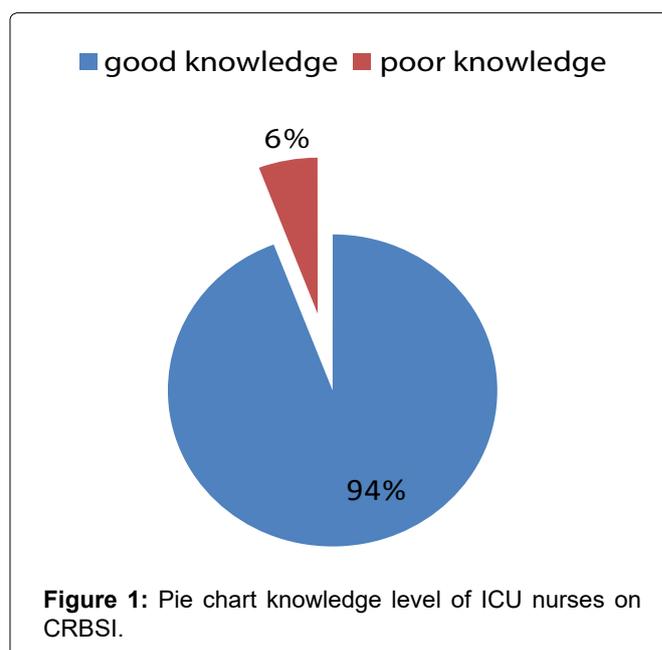
As shown in [Table 6](#), there was a significant association

**Table 4:** Sources of information regarding CRBSI and attitude of nurses.

Variables	Frequency (n)	Percentage (%)
Sources of information		
None	0	0
Guidelines	77	89.5
Workshops	30	34.9
Colleagues	31	36.0
Scientific journal	7	8.1
Internet	8	9.3
Professional organization	6	7.0
Feeling need for further information		
Yes	79	91.9
No	7	8.1

**Table 5:** The practices of ICU nurses regarding CRBSI

Range of practices	Frequency (n)	Percentage (%)
33-48 marks (good)	76	88.4
17-32 marks (moderate/fair)	10	11.6
0-16 marks (poor)	0	0

**Figure 1:** Pie chart knowledge level of ICU nurses on CRBSI.

between knowledge and attitude of ICU nurses regarding CRBSI with  $\chi^2 (1, n = 86) = 28.464, p = 0.000$ .

### The association between knowledge and practices of ICU nurses on CRBSI

There was also a significant association between knowledge and practices of ICU nurses regarding CRBSI with  $\chi^2 (1, n = 86) = 12.088, p = 0.001$  as shown in [Table 7](#).

### Discussion

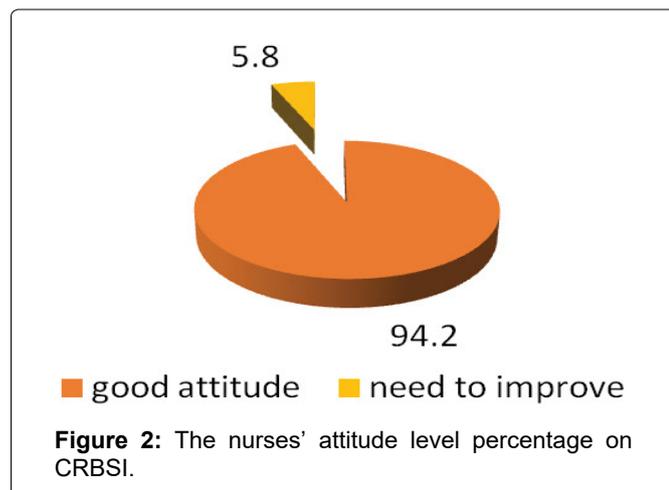
Regarding the knowledge level, the present study showed that ICU nurses have a good level

**Table 6:** The association between knowledge and attitude of ICU nurses regarding CRBSI.

Attitude of ICU nurses			$\chi^2$ (df)	p value
Knowledge of ICU nurses	Good (10-18 marks)	Need to improve (1-9 marks)		
Good (5-8 marks)	79	2	28.464 (1)	0.000
Poor ( $\leq$ 4 marks)	2	3		

**Table 7:** The association between knowledge and practices of ICU nurses regarding CRBSI.

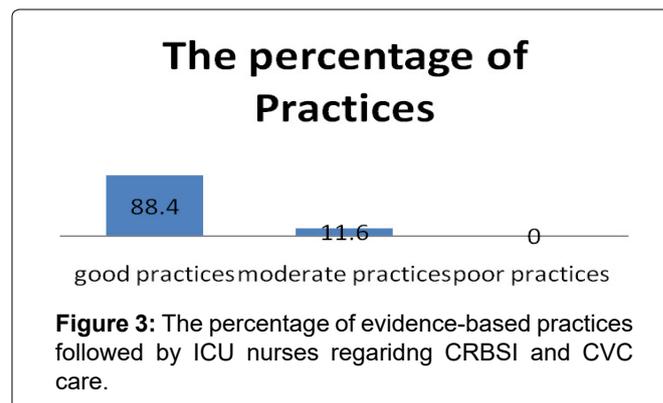
Practices of ICU nurses				$\chi^2$ (df)	p value
Knowledge of ICU nurses	Good (33-48 marks)	Moderate (17- 32 marks)	Poor (0-16 marks)		
Good (5-8 marks)	74	7	0	12.088 (1)	0.001
Poor ( $\leq$ 4 marks)	2	3	0		



of knowledge concerning evidence-based practice for preventing CRBSI. These findings of the present study were in agreement with a previous study conducted in Southern Italy by Esposito, et al. (2017), which demonstrated that Italian nurses had an adequate level of knowledge concerning evidence-based recommendations for preventing CRBSI [4]. However, this study findings contrasted with the study conducted in the ICUs of Alexandria Main University Hospital which mentioned the knowledge of health care workers about the guidelines for the prevention of catheter infection were low [7] and also ICU nurses in China had limited knowledge and there were nurses who know nothing about the practice guidelines to prevent CRBSI [8].

Concerning the attitude level of ICU nurses, the majority of respondents from this study had a good attitude in caring patients with CVC in prevention CRBSI. This finding of the present study was in agreement with the study in Italy about an investigation of nurses' knowledge, attitudes, and practices regarding Disinfection Procedures [9].

Regarding practice, ICU nurses in this study had good practice following evidence-based guidelines to reduce CRBSI. Sodhi, et al. (2013) supported these findings when 55% of the nurses correctly answered questions on hand hygiene and only 11% answered incorrectly [10]. This finding may be attributed to the hospital-



wide campaign and the poster on hand hygiene. Thus, the involvement of top-level management to improve the organizational culture regarding hand hygiene was significant [10].

In addition, in this study, there was an association between knowledge and attitude of ICU nurses on CRBSI. This finding supported by Kaushal, et al. (2015) claimed that there was a significant impact on knowledge and attitude score on practice [11]. Sessa, et al. (2011) supported that the positive attitude of nurses was independent of working position and of the knowledge level [9]. Moreover, there was also a significant association between knowledge and practices of ICU nurses on CRBSI. This finding supported by Kamunge (2013) indicated a significant, but positive correlation between registered nurses' knowledge and practice is weak [12].

## Conclusion

The survey found that the level of knowledge, attitude and practice of Malaysian ICU nurses were good. In addition, it is great when all health care providers included nurses involved and are trained well about the infection to prevent CRBSI. Well-organized educational programs can improve the level of CVC care for ICU patients. Furthermore, healthcare facilities must not only adopt policy guidelines of catheter care bundles, but also must ensure that this guidelines are transferred into patient' care practically for a better outcome.

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## Conflict of Interest

The authors declare no conflicts of interest.

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