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Intensive care nurses' knowledge and attitudes towards catheter-related bloodstream infections and evidence-based nursing: results from a descriptive and cross-sectional survey conducted in a hospital in Türkiye

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Abstract

Background Intensive care units pose a risk for catheter-related infections because they are the setting of frequent catheter use. This study aimed to determine intensive care nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections and their attitudes towards evidence-based practices.

Methods This descriptive and cross-sectional survey was conducted between June and October 2021 among 148 nurses working in the adult intensive care units of a hospital in Istanbul. Data were collected using a descriptive characteristics form, the Peripheral and Central Venous Catheter-Related Bloodstream Infection Prevention Knowledge and Attitude Scale, and the Attitude Towards Evidence-Based Nursing. Data were analysed with Pearson correlation test, linear regression analysis, t-test and ANOVA test.

Results A significant (148/162) portion of the intensive care nurses participated in the survey, with a response rate of 91%. Among the participants, 83.8% had received training on preventing catheter-related bloodstream infections. The nurses had good knowledge and attitudes towards preventing catheter-related bloodstream infections (62.80 ± 4.78) and moderate attitudes towards evidence-based nursing (48.30 ± 4.40). A weak positive correlation was found between knowledge and attitude towards preventing catheter-related infections total score and attitudes towards evidence-based nursing total score ($r = 0.334$, $p < 0.001$). The change in total knowledge and attitudes towards preventing catheter-related infections score explained 10.6% of the variation in total attitude towards evidence-based nursing score ($R^2 = 0.106$).

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Conclusion The increase in nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections was associated with better attitudes towards evidence-based nursing. It is recommended that continuing education be provided to nurses on evidence-based practices, including catheter-related infection precautions.

Clinical trial number Not applicable.

Keywords Bloodstream infection, Critical care nursing, Evidence-based nursing, Nursing care, Vascular catheter

Introduction

Healthcare-associated infections are one of the most important indicators of the quality of care in healthcare institutions [1–3] and are a critical indicator of mortality and morbidity all over the world [2, 3]. Healthcare-associated infections are reported to occur in 3.2% of hospitalized patients [4]. However, the rate of these infections in intensive care units (ICUs) is significantly higher, reaching 30% [5], making healthcare-associated infections 5–10 times more common in ICUs compared to general hospital settings [6]. Among the various types of infections, catheter-related bloodstream infections are particularly prevalent in ICUs, often associated with the excessive use of catheters [7, 8]. In the United States, an estimated 80,000 central catheter-related infections occur annually in ICUs [6]. The European Centre for Disease Prevention and Control (ECDC) reported a total of 5,298 ICU-acquired bloodstream infections in Europe in 2017 [9]. Similarly, in Türkiye, the National Health Care-Associated Infections Surveillance Network reported 5,676 cases of ICU-acquired bloodstream infections in 2016 [10].

Catheter-associated bloodstream infections cause prolonged hospital stays and increase costs and mortality risk [1]. It is possible to reduce or even stop catheter-related bloodstream infections by taking control measures for risk factors [3, 11]. Evidence-based practices are among the most important preventive practices [12, 13]. Effective prevention practices and their continued use seem to result in a significant decrease in the rate of catheter-related bloodstream infections [6]. Catheter care and interventions are mostly undertaken by nurses, and they are therefore the healthcare professionals who will be the first to detect catheter issues and complications [12, 14, 15]. Previous studies have largely focused on the knowledge and attitudes of intensive care nurses towards preventing catheter-associated bloodstream infections and have shown that nurses have inadequate knowledge [16–18].

Particularly in the healthcare environment in Türkiye, infection rates in ICUs and the management of these infections lead to serious health and economic consequences. The number of beds, patient density, staff levels, and variability in healthcare infrastructure in ICUs in Türkiye make infection management and the role of nurses in this process crucial [19]. Specifically, evaluating nurses' knowledge and attitudes regarding catheter-related bloodstream infections is a critical step in developing local health policies and educational strategies. Considering the infection rates in ICUs in Türkiye, it is believed that this research will provide valuable data to enhance the quality of local healthcare services. Therefore, this study aimed to determine nurses' knowledge and attitudes towards who worked in the adult intensive care units of one hospital in Türkiye towards preventing catheter-related bloodstream infections and attitudes towards evidenced based nursing.

Methods

Study design

This descriptive and cross-sectional study collected and analysed survey data from ICU nurses in Istanbul, Türkiye. The Strengthening the Reporting Observational Studies in Epidemiology (STROBE) cross-sectional checklist was used [20].

Setting and participants

This study was conducted in adult intensive care units (cardiovascular surgery, coronary, and anaesthesia) of a training and research hospital in Istanbul, Türkiye between June and October 2021. No formal sample size calculation was performed for this study. The aim was to include the entire population of nurses working in the adult ICUs during the study period, without specific sample selection. A total of 162 ICU nurses met the inclusion criteria, and 148 ICU nurses voluntarily agreed to participate in the study. Inclusion criteria for the study were: (1) being a nurse, (2) working in an adult intensive care unit, and (3) agreeing to participate in the study. The exclusion criterion of the study was not filling out the questionnaires completely.

Data collection

Before starting the research, ethical approval was obtained from the relevant university's ethics committee (dated 21.05.2021 and numbered 17/17), and permission was obtained from the institution (dated 27.05.2021 and meeting number 59). Participants were verbally informed about the study face-to-face and then asked to independently complete the questionnaires. The questionnaires took an average of 10–15 min to complete. The researcher who collected the data was the infection

control nurse of the hospital where the study was conducted. At the beginning of the study, the infection control nurse only introduced the study and hung posters to encourage participation in the study. The participation of the nurses was completely voluntary and the participants were informed face to face about the purpose of the study. When collecting the data from the participants, anonymity and voluntariness were emphasized to each of them and no financial or other rewards were requested from them. The infection control nurse only played an informative role during the participation process and did not provide any guidance or intervention during the collection of data.

Instruments

A descriptive characteristics form, the Peripheral and Central Venous Catheter-Related Bloodstream Infection Prevention Knowledge and Attitude Scale, and the Attitude Towards Evidence-Based Nursing Scale were used as data collection tools. The outcomes of the study were to determine the knowledge and attitudes of ICU nurses towards preventing catheter-related bloodstream infections and their attitudes towards evidence-based nursing practices and to examine the relationship between these two variables.

Descriptive characteristics form This form was prepared by the researchers in line with the literature and includes nine questions on participants' sociodemographic characteristics (age, gender, education, working time, working time in the ICU, working shifts) and whether they received evidence-based nursing training to prevent catheter-related bloodstream infections previously and whether they followed current guidelines [14]. The current guidelines implemented in the ICUs of the hospital for preventing catheter-related bloodstream infections were the 2011 CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections (2017 update) and the 2019 Turkish Society of Hospital Infections and Control National Vascular Access Management guide [3, 6].

Peripheral and central venous catheter-related bloodstream infection prevention knowledge and attitude scale This scale was developed by Bakan and Arli in 2021 [11] to evaluate nurses' knowledge and attitudes towards preventing peripheral and central venous catheter-related bloodstream infection. The scale has 14 items and two subscales, general precautions (score range: 7–35 points) and catheter care (score range: 7–35 points). The total score from this five-point Likert-type scale is obtained by summing the item scores and ranges from 14 to 70. Higher scores indicate better knowledge and attitudes [11].

Attitude towards evidence-based nursing questionnaire This scale was developed by Ruzafa-Martínez et al. in 2011 [21] and adapted into Turkish by Ayhan et al. in 2015 [22]. The scale includes 15 items and three subscales, namely beliefs and expectations (score range: 7–35 points), intention of conduct (score range: 4–20 points), and feeling towards evidence-based nursing (score range: 4–20 points). Scores between 15 and 75 points can be obtained from this five-point Likert-type scale. A high score indicates a strong belief in evidence-based nursing and good level of feelings and intention to practice [22].

Data analysis

The study data obtained were analysed using the SPSS 22.0 statistical program. Frequency and percentage analyses were used to determine the descriptive characteristics of the nurses participating in the study. Mean and standard deviation were used to summarise scale scores. Normal distribution of the data was ascertained using kurtosis and skewness values, and parametric tests were used in the analysis. Relationships between the nurses' scale scores and potentially related factors were examined through Pearson correlation and linear regression analyses. T-test and one-way analysis of variance (ANOVA) were used to analyse the differences in scale total and subscale scores according to nurses' descriptive characteristics. Statistical significance was set at $p < 0.05$.

Results

A total of 148 ICU nurses were enrolled with a response rate of 91%. More than half (60.1%) of the ICU nurses in the study were 30 years of age or younger, and 69.6% were women. Most of the participants (91.2%) had a bachelor's degree or higher, 54.7% had been working for 0–5 years, and 58.1% had the mean working experience in the ICU for 1–5 years. The majority of the nurses (83.8%) had received training on preventing catheter-related bloodstream infections and 63.5% had received training on evidence-based nursing practices. Over half of the nurses (58.8%) reported following the current guidelines (Table 1).

The nurses' total mean score for Knowledge and Attitudes Towards Preventing Catheter-Related Bloodstream Infections was 62.80 ± 4.78 (min-max: 14–70), and their mean scores in the general precautions and catheter care subscales were 32.62 ± 2.52 (min-max: 7–35), and 30.19 ± 3.57 (min-max: 7–35), respectively. The total mean score for Attitudes Towards Evidence-Based Nursing was 48.30 ± 4.40 (min-max: 15–75). Their mean subscale scores for beliefs and expectations, intention of conduct, and feeling towards evidence-based nursing were 31.02 ± 3.68 (min-max: 7–35), 10.73 ± 2.22 (min-max: 4–20), and 6.55 ± 2.56 (min-max: 4–20), respectively.

Table 1 Distribution of nurses' descriptive characteristics ($n = 148$)

Characteristics	Frequency (*n*)	Percentage (%)
Age (years)		
≤ 30	89	60.1
31–35	38	25.7
> 35	21	14.2
Gender		
Female	103	69.6
Male	45	30.4
Education		
Associate's degree	13	8.8
Bachelor's degree	120	81.1
Master's degree	15	10.1
Working experience (years)		
≤ 5	81	54.7
> 5	67	45.3
Working experience in intensive care unit (years)		
0–1	22	14.9
1–5	86	58.1
> 5	40	27.0
Working shifts		
24-hour shift	8	5.4
12-hour shift	140	94.6
Received training on preventing catheter-related bloodstream infections		
Yes	124	83.8
No	24	16.2
Received training on evidence-based nursing		
Yes	94	63.5
No	54	36.5
Follows current guidelines		
Yes	87	58.8
No	61	41.2

Table 2 Correlation between nurses' knowledge and attitudes towards preventing catheter-related infections and their attitudes towards evidence-based nursing ($n = 148$)

Measurements		Knowledge and attitude total	General measures	Catheter care
Attitudes towards evidence-based nursing total	r	0.334**	0.311**	0.235**
	P-value	< 0.001	< 0.001	0.004
Beliefs and expectations	r	0.433**	0.437**	0.282**
	P-value	< 0.001	< 0.001	0.001
Intention of conduct	r	0.054	-0.005	0.073
	P-value	0.515	0.953	0.380
Feeling towards evidence-based nursing	r	-0.093	-0.088	-0.064
	P-value	0.260	0.285	0.437

r: Pearson correlation test, *$P < 0.05$ **$P < 0.01$

A weak positive correlation was found between knowledge and attitudes towards preventing catheter-related bloodstream infections total score and attitudes towards evidence-based nursing total score ($r = 0.334$, $p < 0.001$) (Table 2).

In the regression analysis to determine the relationship between the total scores for nurses' knowledge and attitude towards preventing catheter-related infections and attitude toward evidence-based nursing, the model was found to be significant ($F = 18.370$; $p < 0.001$). The change in total knowledge and attitudes towards preventing catheter-related infections score explained 10.6% of the variation in total attitude towards evidence-based nursing score ($R^2 = 0.106$). A higher knowledge and attitudes towards preventing catheter-related infections score was associated with more positive attitude toward evidence-based nursing ($ß=0.307$). The regression model of the relationship between the general measures and catheter care subscale scores and total evidence-based nursing attitude scores was also significant ($F = 10.527$; $p < 0.0001$). Change in general precautions and catheter care scores explained 11.5% of the variation in attitude towards evidence-based nursing ($R^2 = 0.115$). General measures ($ß=0.514$) and catheter care ($ß=0.211$) were both positively associated with attitude towards evidence-based nursing (Table 3).

Nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections did not differ significantly according to working time, working time in the ICU, working shifts, or whether they had received training on preventing catheter-related bloodstream infections and evidence-based nursing ($p > 0.05$). Nurses who reported following current guidelines had significantly higher knowledge and attitudes towards preventing catheter-related bloodstream infections total scores compared to those who did not ($t = 3.675$, $p = 0.001$) (Table 4).

There were no significant differences in the nurses' total scores for attitudes towards evidence-based nursing according to working time, working time in the ICU, working shifts, whether they had received training on preventing catheter-related bloodstream infections and evidence-based nursing, or whether they followed current guidelines ($p > 0.05$). However, beliefs and expectations subscale scores were significantly higher among nurses who received training in evidence-based nursing ($t = 2.023$; $p = 0.045$) and followed current guidelines ($t = 3.399$; $p = 0.002$) (Table 5).

Discussion

In this study, ICU nurses' knowledge and attitudes toward preventing catheter-related bloodstream infections and their attitudes toward evidence-based nursing were positive. Furthermore, an increase in ICU nurses' knowledge and attitudes toward preventing catheter-related

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Table 3 Results of regression analysis of the relationship between nurses' knowledge and attitudes towards preventing catheter-related infections and attitudes towards evidence-based nursing (n = 148)

Dependent variable	Independent variable	ß	t	P-value	F	Model (P-value)	R^2
Attitudes Towards Evidence-Based Nursing Total	Constant	28.999	6.420	< 0.001*	18.370	< 0.001*	0.106
	Knowledge and Attitude Total	0.307	4.286	< 0.001*			
Attitudes Towards Evidence-Based Nursing Total	Constant	26.663	5.636	< 0.001*	10.527	< 0.001*	0.115
	General Measures	0.514	3.450	0.001*			
	Catheter Care	0.211	2.238	0.027*			

Linear Regression Analysis, *P < 0.05

Table 4 Comparison of nurses' knowledge and attitude scores for preventing catheter-related bloodstream infections according to descriptive characteristics (n = 148)

Characteristics		Knowledge and attitude total	General measures	Catheter care
	n	Mean ± SD	Mean ± SD	Mean ± SD
Working experience (years)				
≤ 5	81	62.96 ± 4.44	32.78 ± 2.11	30.18 ± 3.52
> 5	67	62.61 ± 5.19	32.42 ± 2.61	30.19 ± 3.95
t		0.443	0.824	0.052
P-value		0.658	0.421	0.959
Working experience in intensive care unit (years)				
0–1	22	62.82 ± 4.32	32.96 ± 1.62	29.86 ± 4.16
1–5	86	62.81 ± 4.83	32.53 ± 2.38	30.28 ± 3.58
> 5	40	62.77 ± 5.04	32.60 ± 2.63	30.18 ± 3.82
F		0.001	0.106	0.045
P-value		0.999	0.900	0.956
Working shift				
24-hour shift	8	60.25 ± 5.75	26.62 ± 3.66	33.62 ± 4.17
12-hour shift	140	62.95 ± 4.70	27.82 ± 2.25	35.13 ± 3.68
t		-1.560	-1.409	-1.116
P-value		0.121	0.390	0.266
Received training on preventing catheter-related bloodstream infections				
Yes	124	62.70 ± 4.85	32.56 ± 2.55	30.14 ± 3.70
No	24	63.33 ± 4.50	32.88 ± 2.42	30.46 ± 2.84
t		-0.591	-0.550	-0.402
P-value		0.555	0.583	0.688
Received training on evidence-based nursing				
Yes	94	63.25 ± 4.37	32.89 ± 2.27	30.36 ± 3.53
No	54	62.02 ± 5.38	32.13 ± 2.87	29.89 ± 3.65
t		1.521	1.785	0.775
P-value		0.130	0.097	0.440
Follows current guidelines				
Yes	87	63.97 ± 3.92	33.16 ± 1.98	30.80 ± 3.31
No	61	61.15 ± 5.41	31.84 ± 2.99	29.31 ± 3.77
t		3.675	3.242	2.552
P-value		0.001*	0.003*	0.012*

F: ANOVA Test; t: Independent groups t test, *P-value < 0.05

bloodstream infections was associated with better attitudes toward evidence-based nursing. The study period (June–October 2021) overlaps with the COVID-19 pandemic, which could act as a confounding variable.

Many studies in the literature emphasise the importance of measuring nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections [16–18, 23–25]. Nurses' good knowledge and attitudes are effective in preventing these infections [26]. In the present study, ICU nurses' mean score for knowledge and attitude towards preventing catheter-related bloodstream infections was 62.80 ± 4.78. Considering that the highest score that can be obtained from the scale is 70, this score was found to be high. This high score may have been indirectly influenced by the infection control nurse, who may have provided ongoing education, support, or reminders about infection prevention protocols, thus reinforcing the importance of evidence-based practices among nurses. In other similar studies, it was also found that nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections varied (low, medium or high) [14, 16, 18, 25]. These differences may be related to the inclusion of nurses working in different regions and units.

Determining nurses' attitudes towards evidence-based practices provides guidance in the efforts to develop strategies for using evidence-based practices [23]. In the study, the ICU nurses' total mean scores from attitudes towards evidence-based nursing were found to be 48.30 ± 4.40. Considering that the highest score that can be obtained from the scale is 75, this score was found to be medium. Similarly, other studies also indicate that the attitudes of nurses towards evidence-based practice were moderate [27, 28].

According to the literature, nurses' knowledge and attitudes are effective in the implementation of evidence-based practices [24, 29]. In the present study, a positive and significant relationship was found between the total score for knowledge and attitude towards preventing catheter-related bloodstream infections and the total score for attitude towards evidence-based nursing. Nurses' attitudes towards evidence-based nursing improved as their knowledge and attitudes towards preventing catheter-related bloodstream infections increased. This suggests that nurses believe more in evidence-based practices as they improve their knowledge on this topic and practise based on this knowledge.

Table 5 Comparison of nurses' attitude scores towards evidence-based nursing according to descriptive characteristics ($n = 148$)

Characteristics	n	Attitudes towards evidence-based nursing total	Beliefs and expectations	Intention of conduct	Feeling towards evidence-based nursing
		Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Working experience (years)					
≤ 5	81	47.951 ± 4.003	30.580 ± 3.817	10.864 ± 2.172	6.506 ± 2.341
> 5	67	48.731 ± 4.829	31.552 ± 3.448	10.567 ± 2.278	6.612 ± 2.823
t		-1.076	-1.610	0.810	-0.249
P-value		0.284	0.109	0.419	0.804
Working experience in intensive care unit (years)					
0–1	22	49.000 ± 4.629	30.182 ± 3.724	11.091 ± 2.091	7.727 ± 2.729
1–5	86	47.616 ± 3.792	30.826 ± 3.823	10.500 ± 1.969	6.291 ± 2.300
> 5	40	49.400 ± 5.242	31.900 ± 3.209	11.025 ± 2.731	6.475 ± 2.873
F		2.626	1.861	1.109	2.851
P-value		0.076	0.159	0.333	0.061
Working shifts					
24-hour shift	8	46.625 ± 2.615	31.875 ± 4.086	9.125 ± 1.553	5.625 ± 1.923
12-hour shift	140	48.400 ± 4.465	30.971 ± 3.660	10.821 ± 2.219	6.607 ± 2.589
t		-1.111	0.675	-2.129	-1.055
P-value		0.268	0.501	0.035[*]	0.293
Received training on preventing catheter-related bloodstream infections					
Yes	124	48.532 ± 4.291	31.105 ± 3.499	10.790 ± 2.176	6.637 ± 2.621
No	24	47.125 ± 4.839	30.583 ± 4.539	10.417 ± 2.448	6.125 ± 2.232
t		1.440	0.635	0.754	0.896
P-value		0.152	0.598	0.452	0.372
Received training on evidence-based nursing					
Yes	94	48.479 ± 4.571	31.479 ± 3.429	10.713 ± 2.284	6.287 ± 2.746
No	54	48.000 ± 4.102	30.222 ± 3.975	10.759 ± 2.119	7.019 ± 2.150
t		0.636	2.023	-0.122	-1.682
P-value		0.526	0.045[*]	0.903	0.095
Follows Current Guidelines					
Yes	87	48.563 ± 4.422	31.851 ± 3.142	10.379 ± 2.179	6.333 ± 2.831
No	61	47.934 ± 4.374	29.836 ± 4.063	11.230 ± 2.194	6.869 ± 2.101
t		0.855	3.399	-2.330	-1.254
P-value		0.394	0.002[*]	0.021[*]	0.212

F: ANOVA Test, t: Independent groups t test, [*]*P*-value < 0.05

Evidence-based practices are of great importance in obtaining effective results in nursing practices. Many studies have mentioned that knowledge and attitudes towards preventing catheter-related bloodstream infections are effective in the implementation of evidence-based nursing [17, 23–25]. According to the present study, the results of regression analysis showed that ICU nurses' knowledge and attitude towards preventing catheter-related bloodstream infections total score was positively associated with attitude towards evidence-based nursing total score, with the former explaining 10.6% of the variance in the latter. A randomised controlled study by Cardoso et al. demonstrated the efficacy of their evidence-based practices intervention on knowledge and skill levels [30]. It is thought that the high level of knowledge and attitude of ICU nurses towards preventing catheter-related bloodstream infections contributes to their high awareness and sensitivity regarding evidence-based practices.

Following current guidelines also impacts nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections [11]. In the current study, nurses who followed current guidelines were found to have significantly higher knowledge and attitude towards preventing catheter-related bloodstream infections total scores than the nurses who did not. A study in Jordan indicated that nurses and doctors working in ICUs had a low level of knowledge about preventing catheter-related bloodstream infections and insufficiently followed and implemented the current guidelines [17].

In this study, factors such as working years, length of work experience in the ICU, and receiving training

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on the prevention catheter-related bloodstream infections did not cause a significant difference in the knowledge and attitudes towards preventing catheter-related bloodstream infections. Similarly, in another study, no significant difference was found between nurses' years of experience and ICU-specific work experience and their knowledge levels regarding central venous catheter care and follow-up. Surprisingly, the knowledge scores of nurses who had received training on central venous catheters were lower than those who had not [16]. A study conducted in Yemen found that ICU nurses who had received prevention training and had over 10 years of work experience demonstrated significantly higher average knowledge scores [26]. A study from Türkiye showed that as both overall work experience and ICU-specific experience increased, ICU nurses' knowledge of preventing central venous catheter-related infections also improved. However, no significant difference was found between the knowledge scores of nurses who had received training on this topic and those who had not [23]. A study conducted in Iran found that as work experience increased, ICU head nurses demonstrated higher levels of knowledge regarding infection control [31]. When all these findings are considered together, it is understood that the effect of variables such as length of work experience and receiving training on knowledge levels regarding infection prevention is inconsistent, and this effect may vary depending on many factors such as in-house training policies, individual motivation, content and quality of training. Therefore, it is important to consider not only variables such as length of experience or receiving training, but also how these processes are structured and implemented, in order to improve infection prevention knowledge.

Developing a positive attitude towards evidence-based nursing also increases the quality of nursing practices [32]. Studies have shown that evidence-based practice training given to nurses increases their knowledge and attitudes on this subject [26, 29, 30]. In this study, the beliefs and expectations subscale scores of the nurses who received training on evidence-based nursing and followed current guidelines were found to be significantly higher than the scores of the nurses who did not. Another study reported that the total score for evidence-based nursing differed significantly based on whether they followed professional publications [27]. According to these studies, it is thought that training in evidence-based practices has a positive effect on nurses' attitudes.

Limitations
There are several factors that limit this study. The first is that the data were obtained from a single centre. Thus, it cannot be generalised to intensive care nurses, but instead provides general insight. Second limiting factor was that the data were based on nurses' statements. Whether the nurses had received training in the prevention of catheter-related infections and evidence-based nursing was evaluated based on their responses to the questionnaire. Thirdly, the study period overlaps with the COVID-19 pandemic, which could act as a confounding variable by increasing nurses' focus on infection control practices, possibly enhancing their knowledge and attitudes beyond what might be observed under normal circumstances. Fourthly, the regression analysis shows that knowledge and attitudes toward catheter-related bloodstream infection prevention explained only 10.6% of the variation in attitudes toward evidence-based nursing, suggesting other factors not captured in this study play a significant role. Finally, nurses' scores for knowledge and attitudes may have been indirectly influenced by the infection control nurse (the researcher) who provided ongoing education, support, or reminders about infection prevention protocols, thus reinforcing the importance of evidence-based practices among nurses.

Conclusion
Based on the results of our study, nurses had fairly good knowledge and attitudes towards preventing catheter-related bloodstream infections and moderate attitudes towards evidence-based nursing. The increase in nurses' knowledge and attitudes towards preventing catheter-related bloodstream infections was associated with better attitudes towards evidence-based nursing. It is recommended that further studies be conducted on this subject, adopting a longitudinal design, with multiple centers, and using more advanced statistical methods to control confounding factors.

Data availability
The data supporting this study's findings are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study was approved by the University of Health Sciences Hamidiye Scientific Research Ethics Committee in Istanbul, Türkiye (date: 21.05.2021, number: 17/17). The research conforms to the provisions of the Declaration of Helsinki in Brazil 2013.

Consent for publication
Not applicable.

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