

# Assess the Nurses' Knowledge and Practice Regarding the Prevention of Catheter Associated Urinary Tract Infection at Rajshahi Medical College Hospital, Rajshahi, Bangladesh

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## Abstract

**Background:** Urinary Tract Infections are a serious health problem affecting millions of people each year. Catheter associated urinary tract infection is one of the most common health care acquired infections encounter in clinical practice. The most common hospital acquired infection is catheter associated urinary tract infection (CAUTI) accounting for almost 40% of all the nosocomial infections [2, 3, 5]. The most important predisposing factors of Catheter associated urinary tract infection is the insertion and prolonged use of indwelling urinary catheter, which has been performed by unsterile technique and by not taking adequate measure to maintain cleanliness of the catheter. **Objective:** The aim was to assess the level of nurses' knowledge and practice regarding the prevention of catheter associated urinary tract infection (CAUTI) at Rajshahi Medical College Hospital, Rajshahi. **Methodology:** A descriptive cross sectional study design was used and sample size 110 that was simple random sampling technique followed those who meet the inclusion criteria and to assess the nurses knowledge regarding prevention of catheter associated urinary tract infection at Rajshahi Medical College Hospital, Rajshahi. The study was conducted from July 2021 to December, 2022. The instruments for data collection were a semi-structured questionnaire which composed of three parts: Demographic variables, knowledge and practice based information on prevention of catheter associated urinary tract infection. **Results:** The findings revealed that the highest, 67% were within 31-40 years of age, and 59% were professional education with Diploma in Nursing. This study's main findings revealed the average 47% were high level of knowledge regarding the prevention of CAUTI. It's may due to their clinical experiences. **Conclusion:** Catheter associated urinary tract infections is one of the most common health care associated infections as literature said but can be prevented. According to the results of this study, some nurses have shown a good implementation of different practices towards catheter indications and CAUTI prevention. The present study concludes that a significant proportion of respondents have a high level of nurse knowledge and practice regarding the CAUTI prevention.

**Keywords:** Urinary Tract Infection, Knowledge, Practice, Prevention.

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## INTRODUCTION

Catheter associated urinary tract infection (CAUTI) is a Urinary Tract Infection (UTI) in a patient

with a catheter present or within 48 hours of catheter removal. Prolonged catheterization is a risk factor for developing a CAUTI. UTI is a common infection among health care settings. Urinary catheter insertion is

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considered the most important predisposing factor for CAUTI and almost 25% of them undergo urinary catheterization during their stay in the hospital. The most common hospital-acquired infection is CAUTI accounting for almost 40% of all nosocomial infections. Nurses are considered as the primary health care providers who are responsible for inserting and maintain urinary catheters, as well as the production of desired outcomes. Nurses are also accountable to acquire appropriate knowledge and practices of catheter care that will prevent UTI [1].

The most common hospital acquired infection is catheter associated urinary tract infection (CAUTI) accounting for almost 40% of all the nosocomial infections [2, 3]. The single most important predisposing factor for CAUTI is the insertion of urinary catheter [2]. Urinary Tract Infections are a serious health problem affecting millions of people each year. Infections of the urinary tract are the 2<sup>nd</sup> most common type of infections in the body [4]. Most urinary tract infections caused by bacteria, they are gram negative organisms like *E.coli* causes about 80%, *Klebsiella* causes about 5%, *Enterobacteria proteus* are found to be 2% of reported cases. Other organisms are *Trichomonos vaginalis* and *Neisseria Gonorrhoea* [5]. Infection occurs in all portions of urinary tract in both acute and chronic stage, may be upper or lower, hospital acquired or community acquired infections. The infection usually affects the bladder but the urethra, ureters and kidney may involves. Urinary catheter insertion considered as the most important predisposing factor for catheter associated urinary tract infection (CAUTI) [6]. The daily risk varies from 3-7% for an acquisition of bacteriuria when the urinary catheter remains in situ (Nicolle, 2014). Catheter associated urinary tract infection is one of the most common Hospital-Acquired Infections (HAIs). The global burden of HAIs is underestimated in developing countries due to lack of surveillance systems [7]. The National Healthcare Safety Network (NHSN) in 2013 reported that CAUTI pooled means were ranged from 1.2 to 4.1 per 1,000 urinary catheter days in medical-surgical and burn intensive care units (ICUs). While for Non-ICU rates ranged from 1.3 to 1.5 per 1,000 urinary catheter days in medical-surgical units. In Egypt, a national surveillance of HAIs program was conducted for ninety-one ICUs in 28 hospitals on three phases from April 2011 to February 2016, and the results show that there were 2,688 HAIs, in which about 15% of HAIs were UTIs [7]. A study in three Arabian Gulf Countries: Saudi Arabia (SA), Oman, and Bahrain for a six year surveillance from 2008 to 2013. Their study findings revealed there were 140 CAUTI events in SA, 145 CAUTI events in Bahrain, and only one CAUTI event in Oman [8]. Another study conducted in SA examining device-associated healthcare associated infection (DA-HAI) in 12 general Ministry of Health hospitals, among ICU patients between 2013-2016. Urinary tract infection cases are mostly related to the presence of urinary catheter although many catheters are used unnecessarily and for prolonged periods of time.

Extended use of urinary catheter and inappropriate management increase the risk of infections [9]. The Association for Professionals in Infection Control (2014) also indicated that CAUTI has been reported to be associated with increased morbidity, mortality, hospital cost, and length of hospital stay. Nurses play an important role in urinary catheter insertion, maintenance, and removal. The global burden of Hospital-Acquired Infection (HAI) is underestimated in developing countries due to lack of surveillance systems, The Association for Professionals in Infection Control and Epidemiology in the United States also reported that CAUTI is accounting for 25.6% of all HAIs. The National Healthcare Safety Network in 2013 reported that CAUTI pooled means were ranged from 1.2 to 4.1 per 1000 urinary catheter days in medical-surgical and burn intensive care units. While for Non-ICU rates ranged from 1.3 to 1.5 per 1000 urinary catheter days in medical-surgical units. CAUTI can lead to such complications as prostatitis, epididymitis, and orchitis in males, and cystitis, pyelonephritis, gram-negative bacteremia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis in patients. Complications associated with CAUTI cause discomfort to the patient, prolonged hospital stay, and increased cost and mortality. It has been estimated that each year, more than 13,000 deaths are associated with UTIs.

Nurses are considered as the primary healthcare providers who are responsible for inserting and maintaining of urinary catheters, as well as production of desired outcomes [10]. Nurses are also accountable to acquire appropriate knowledge and practices of catheter care that will prevent UTIs. In Saudi Arabia from 2008 to 2013, CAUTI in National Guard Hospitals in Riyadh, Jeddah, Alhasa, and Dammam rate per 1,000 catheter days were (4.1, 1.3, 1.6, 2.2) respectively [8].

The significance of this study, from a researcher it will provide baseline information on nurses' knowledge level on prevention of CAUTI. Nurses' must be skillful and competent enough with their knowledge and practice to prevent UTI among the hospitalized patient under indwelling catheter and give adequate knowledge to patients regarding the prevention of CAUTI.

Therefore, nurses should have adequate knowledge regarding infection control in the use of urethral catheters and their practice must be adhered to healthcare setting's guidelines on infection control. Catheter-associated urinary tract infection is considered as the most frequent and preventable infections, if nurses take into consideration the recommended catheter placement indications and evidenced-based practice of catheter maintenance [9]. The study aimed to assess the nurse's knowledge and practice regarding the prevention of catheter-associated urinary tract infection at Rajshahi Medical College Hospital, Rajshahi, Bangladesh.

## METHODS & MATERIALS

A Descriptive type of cross-sectional study was conducted to assess the nurses' knowledge and practice regarding the prevention of catheter-associated urinary tract infection at Rajshahi Medical College Hospital, Rajshahi, Bangladesh, from July 2021 to December 2021. The Rajshahi Medical College Hospital, Rajshahi was selected for this study. Because this is a tertiary-level hospital that provides all kinds of treatment facilities for patients, it is one of the most famous and popular public hospitals in north Bengal of Bangladesh. The study's target population was all of registered nurses those who working at Rajshahi Medical College Hospital, Rajshahi. The sample was selected from the Nephrology department, ICU, Urology department and Surgery department, and 110 nurses were selected as a sample size at Rajshahi Medical College Hospital, Rajshahi, Bangladesh.

### Inclusion Criteria

The sample was included simple random sampling technique by using the following inclusion criteria:

1. Nurses are those who work in the selected area of the hospital.
2. Nurses who are willing to participate.
3. Respondents who are available on duty during the data collection period.

### Exclusion Criteria

1. Nurses who are not willing to participate.
2. Respondents who are not available during the data collection period.
3. Nurses are those who work less than six months in the selected area of the hospital.

Collected information is compiled, analyzed, and edited using the software SPSS (version 24.0) (IBM) Chicago, Illinois. At first, the research proposal was approved by the institutional ethical committee from Bogura Nursing College, Bogura. Before conducting the study, a written permission letter was issued by the Principal of Bogura Nursing College, Bogura, to facilitate approval from the Director and Nursing superintendent of Rajshahi Medical College Hospital, Rajshahi. The objectives of the study were explained to the respondents by the investigators for their clear understanding. Then written consent was obtained before starting data collection. The respondents were assured that confidentially and anonymity was strictly maintained.

## RESULT

Data were analyzed manually following the tally marks and percentages of all variables using the scientific calculator. All tables of the variables were created manually for results and then converted into tables, bar graphs, and pie charts by using the computer. All of these were included in the result sheet of the document. The relevant tables were then prepared for the

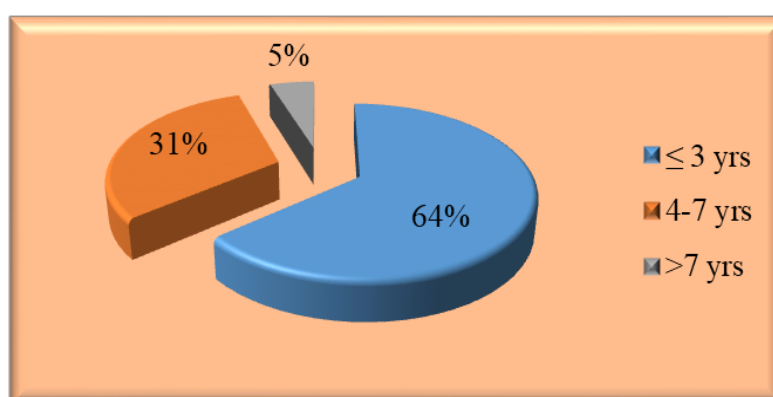
final presentation. The (Table-1) shows that 45% were within  $\leq 30$  years of age, 43% were within 30-40 years, 6% were 41-50 years and 6% were  $>50$  years of age. The mean age of respondents is 28.6 years. Table 1 shows that 30% were male and 70% were female among the respondents. The table shows that the respondents and, 94% were married, 5% were single and 1% was divorce. 95% were Muslim and, 1% were Hindu, 4% were Christian among the respondents (Table-1) shows that 31% were SSC, 64% were HSC, and 5% were Master's Degrees in the highest general education and the professional education, 74% were Diploma in nursing, 14% were BSc in nursing/PHN, and 12% were MSc/MPH among the respondents. In the current working placement, the highest 32% were surgery department and the special training 42% were answered yes, and 58% were answered no special training, 64% were within  $\leq 3$  years of working experience, 31% were within 4-7 years, and 5% were  $>7$  years of current working experience among the respondents (Table-1). Table 2 shows that the majority, 99% answered of knowledge on idea about the term of CAUTI and rest of 1% answered no; the highest the 54% were responded the option of Urethral infection, 31% were Bladder infection, 12% were Cross infection and 3% were Nosocomial infection of the concept of catheter associated urinary tract infection; 25% were responded the option of If catheterization within two weeks, 70% the option If the growth with microorganism within catheterization, 4% the option of If the urinary incontinence and 1% the option of others for the causes of catheter associated urinary tract infection; 76% were answered the option of E. coli, 19% the option of Staphylococcus, 4% the option of Streptococcus and the 1% the option of Virus about the most common organism is responsible for CAUTIs; the highest 83% were reply the option of Inappropriate aseptic technique use for cauterization, 10% the option of the urine bag is changed weekly, 1% the option of the urine bag is emptied before the patient transfer and 6% the option of not properly hand washing before and after insertion of catheterization about the risk factors CAUTIs; 31% were reacted the option of low grade raise of body temperature, 19% the option of Cloudy of urine or blood in urine, 49% the option of Pain in the lower abdomen and 1% the option of others for the clinical features of CAUTIs; 62% was answered the option of retention of urine, 26% the option of catheterization for trauma or surgery and 12% the option of Measurement of urinary output about the indication of urinary catheter insertion that you insert; 23% was responded the option of bleeding after catheterization with urine, 67% were the option of burning sensation that patient complain, 5% the option of catheter block and 5% were the option of rupture of urethra about the complication of urinary catheter insertion; 6% were answered the option of Wearing Clean gloves, 30% the option of Hand hygiene before and after catheter insertion, 13% the option of Used gown and 51% the option of Used aseptic technique, sterile catheter, aseptic solution for the precaution to prevent CAUTI; the 87% were answered

the option of Apply standard precautions, 5% the option of nursing documentation, 6% the option of Daily perform catheter care and 2% the option of Avoid contact with urine container for the prevention of CAUTI; 90% was answered the option of Correct, 6% the option of Incorrect and 4% the option of don't know for the UTI resulting from the presence of an indwelling urinary catheter for a prolonged duration of time; 71% was answered the option of Correct, 16% the option of Incorrect and 13% the option of don't know for the Placing the drainage bag above the bladder at all times increases the risk for CAUTI; 82% was answered the option of Correct, 15% the option of Incorrect and 3% the option of don't know for the Nurses should discontinue and start the procedure again using the aseptic technique if she forgets to put on sterile gloves

before inserting a urinary catheter; 84% was answered the option of Correct, 15% the option of Incorrect and 1% the option of don't know for the Use catheters only when there is a clinical indication is the best method to prevent CAUTIs; 91% was answered the option of Correct, 6% the option of Incorrect and 3% the option of don't know for the Changing indwelling catheter or drainage bags at routine, fixed, intervals is recommended for proper catheter maintenance among the respondents. The average level of knowledge regarding the prevention of CAUTIs (Table-5) revealed that the 47% were high level of knowledge, 33% were moderate level of knowledge and 20% were low level of knowledge regarding the average level of knowledge regarding the prevention of CAUTIs among the respondents.

**Table 1: Socio-demographic characteristics of participants (n=110)**

Age group (years)	Frequency	Percentage
≤ 30	50	45
31-40	47	43
41-50	7	6
>50	6	6
Total	110	100
Distribution of respondents by Gender		
Male	33	30
Female	77	70
Distribution of respondents by marital status		
Single	06	5
Married	103	94
Divorce	01	1
Distribution of respondents by religion		
Muslim	105	95
Hindu	01	1
Christian	04	4
Distribution of respondents by general education		
SSC	34	31
HSC	71	64
Master's Degree	5	5
Distribution of respondents by Professional Educational status		
Diploma in Nursing	82	74
BSc in nursing/PHN	15	14
MSc/MPH	13	12



**Fig 1: Distribution of respondents by the current working experience (n=110)**

**Table 2: Distribution of Knowledge on different variables (n=110)**

Variables	Frequency	Percentage
Have you any idea about the term of CAUTI?		
Yes	109	99
No	01	1
The concept of catheter associated urinary tract infection is-		
Urethral infection	60	54
Bladder infection	34	31
Cross infection	13	12
Nosocomial infection	03	3
The causes of catheter associated urinary tract infection is-		
If catheterization within two weeks	28	25
If the growth with microorganism within catheterization	77	70
If the urinary incontinence	04	4
Others	01	1
The most common organism is responsible for CAUTIs		
E. coli	84	76
Staphylococcus	21	19
Streptococcus	04	4
Virus	01	1
The risk factors CAUTIs is-		
Inappropriate aseptic technique use for cauterization	91	83
The urine bag is changed weekly	11	10
The urine bag is emptied before the patient transfer	01	1
Not properly hand washing before and after insertion of catheterization	07	6
The clinical features of CAUTIs is-		
Low grade raise of body temperature	34	31
Cloudy of urine or blood in urine	21	19
Pain in the lower abdomen	54	49
Others	01	1
What is the indication of urinary catheter insertion that you insert?		
Retention of urine	68	62
Catheterization for trauma or surgery	29	26
Measurement of urinary output	13	12
What is the complication of urinary catheter insertion that you faced in the clinical area?		
Bleeding after catheterization with urine	25	23
Burning sensation that patient complain	74	67
Catheter block	06	5
Rupture of urethra	05	5
Nurses should follow the precaution to prevent CAUTI that you used indwelling catheter		
Wearing Clean gloves	07	6
Hand hygiene before and after catheter insertion	33	30
Used gown	14	13
Used aseptic technique, sterile catheter, aseptic solution	56	51
Practice on prevention of catheter associated urinary tract infection is-		
Apply standard precautions	96	87
Nursing documentation	05	5
Daily perform catheter care	07	6
Avoid contact with urine container	02	2
Catheter associated urinary tract infection is a UTI resulting from the presence of an indwelling urinary catheter for a prolonged duration of time		
Correct	99	90
Incorrect	07	6
Don't know	04	4
Placing the drainage bag above the bladder at all times increases the risk for Catheter associated urinary tract infection		
Correct	78	71
Incorrect	18	16
Don't know	04	13

Variables	Frequency	Percentage
Nurses should discontinue and start the procedure again using the aseptic technique if she forgets to put on sterile gloves before inserting a urinary catheter		
Correct	90	82
Incorrect	17	15
Don't know	03	3
Use catheters only when there is a clinical indication is the best method to prevent Catheter associated urinary tract infection		
Correct	92	84
Incorrect	17	15
Don't know	01	1
Changing indwelling catheter or drainage bags at routine, fixed, intervals is recommended for proper catheter maintenance		
Correct	100	91
Incorrect	07	6
Don't know	03	3

**Table 3: Distribution of average level of knowledge regarding the prevention of CAUTIs (n=110)**

Variables	Frequency	Percentage
High level of knowledge	7	47
Moderate level of knowledge	5	33
Low level of knowledge	3	20
Total	15	100.00

## DISCUSSION

The purpose of this descriptive cross-sectional study was to assess the nurse's knowledge regarding prevention of catheter associated urinary tract infection at Rajshahi Medical College Hospital, Rajshahi. This chapter presents a summary of the study, findings in relation to those previously reported in the literature, and a discussion. In addition, the suggestions for practice and recommendations for future research will also be addressed. The present study findings revealed that the socio-demographic information was maximum respondents 45% were within  $\leq 30$  years of age and mean age of the respondents was 28.6 years. There were 70 were female, 94% were married, 95% were Muslim, 64% were HSC in general education and the professional education was 74% Diploma in nursing among the respondents. Moreover, the highest 32% were current working placement in surgery department, 58% were answered No for special training on prevention of catheter associated urinary tract infection and 64% were  $\leq 3$  years current working experience among the respondents. A similar study reported that the two thirds of nurses were female, and more than half of them was single, belonged on the age group between 20 to less than 25 years old (40.9%). Because most of the old nursing quit work and went to other hospitals because government hospitals do not have salaries in them, and this is because of the wars in our country. The majority of nurses were had diploma degree and had years' experience group between one to five years [13]. The half of nurses (51%) had training courses in CAUTI. This might be related to the fact that the majority of them hold a nursing diploma. In addition, current study finding agrees with a study found that more than two-thirds of nurses were female (68.6%) [3]. Moreover, our results

agreement with the study found that the highest percentage 52% of the study participants had a diploma [14]. A study was reported in his study that 53% had training about CAUTI [15]. Also, it agrees with the study reported that 79% had training on infection control [16]. The results this disagreement with other results reported that more than half 57% were males, furthermore more than three-fourths 77% had bachelor's degree [16-18].

The findings of the present study average level of nurses' knowledge regarding the CAUTI was 47% were high level of knowledge, 33% were moderate level of knowledge and 20% were low level of knowledge regarding the prevention of CAUTIs. These results may due to their clinical experience. A similar study found in India indicated that the majority of nurses 47% had adequate knowledge 33% had moderately adequate knowledge and 20% had inadequate knowledge regarding urinary catheter care. Another study showed that the preventive measures of the catheter-associated urinary tract infection showed that 72% of the nurses knew that antimicrobial prophylaxis offers are not greater benefit in reducing the incidence of CAUTI. This finding disagrees with the study was conducted that more than half of nurses 61% mistakenly considered that antimicrobial prophylaxis offers greater benefit in reducing the incidence of CAUTI [3]. The current study showed the knowledge level of nurses toward prevention of CAUTI was more than two-third 72% of nurses were had fair knowledge might be due to the inadequacy of in-service refreshing training' courses or because hospitals have not a clear and updated guideline protocol that nurses can access and adhere to at work. A study result conformity with the majority, 77% had fair knowledge of CAUTI19. Furthermore, the result of the study accepted

with another study that the most 59% of nurses had a moderate level of knowledge and only 16% had an adequate level of knowledge towards the prevention of CAUTI. In the line, the results of our study relative similar with the majority of nurses 81% had fair knowledge on prevention of CAUTI. In the same line, mentioned that, more than half 54% of nurses had moderate knowledge regarding prevention methods of CAUTI [20]. Moreover, this finding is disagreement with the study was conducted in India who reported that more than two third 73% of the staff nurses in the pretest were had good knowledge regarding the prevention of urinary tract infections in patients with an indwelling catheter [13]. Furthermore, our study was unaccepted with the study that was reported that the majority of ICU nurses 65% have a low level of knowledge regarding CAUTI prevention [16]. On the other hand, nurses were found to have good knowledge, a positive attitude and good perceived practice regarding CAUTI prevention. On the line, our result not compatible with more than one quarter 28% of health care professionals had moderately adequate knowledge on CAUTI. Moreover, this result unconformity with revealed that, more than half of nurses 63% had a low level of knowledge [3]. Other study findings are contradicted with those stated that the nurses were least knowledgeable about different approaches to catheterization and specimen collecting methods followed by proper urethral catheter maintenance and finally, considerations and techniques for catheter insertion [17]. Regarding considerations and techniques for catheter insertion, the majority of nurses in this study knew that Silicone is preferable than Teflon-coated and latex catheter materials in reducing the risk of encrustation for long-term catheterized patients who have a frequent obstruction. In addition, more than one-half of the nurses in this study did not know that using alcohol hand sanitizer is comparable to hand washing in preventing CAUTI incidence. This finding is consistent with 60% of nurses did not realize that using alcohol hand sanitizer is comparable to hand washing in preventing CAUTI, while the result contradicted with found that 70% of nurses know that using alcohol hand sanitizer is comparable to hand washing in preventing CAUTI [17, 21]. Another study mentioned that there was no significant difference between alcohol hand sanitizer and hand washing in reducing CAUTI incidence.

#### Limitations of the study

There was a small sample size in the study. This is a small representation of nurses at Rajshahi Medical College Hospital, Rajshahi; the study's results may be limited to one particular area. The small sample size and selection samples only from the limited population at Rajshahi Medical College Hospital, Rajshahi were the limitations of our study. Thus, the large scales studies with larger sample sizes selected a simple random sampling from all parts of society are recommended to obtain more generalized results for further study in the health care sector as well as nursing profession.

## CONCLUSION AND RECOMMENDATIONS

In conclusion, the Urinary catheter insertion considered as the most important predisposing factor for catheter-associated urinary tract infection (CAUTI). One of the most common catheter-associated infections is CAUTI. It is largely preventable if catheterization indications, catheterization care methods, and other preventative measures are carefully followed. Nurses are also accountable to acquire appropriate knowledge of catheter care that will prevent UTIs. In this study, there were knowledge deficit and poor practices some area about CAUTI prevention among nurses at Rajshahi Medical College Hospital, Rajshahi. The findings of the current study provided a baseline direction to the studies had high level of knowledge that the aimed to assess the nurses' knowledge regarding the prevention of CAUTI at Rajshahi Medical College Hospital, Rajshahi. In order to make progress that the nurses are needed special knowledge based continuing education, special training, workshop, seminar, symposium for the proper management of dengue fever patients for improving their condition promptly as well as reducing emerging complications. Although, Proper nursing practices in preventing the CAUTIs and their management contribute to promoting and creating an appropriate environment. Nurses stated they had the necessary competencies to safe patient care. There is a need to continue the better knowledge and positive practice to prevent CAUTIs. This can be achieved by providing educational and motivational activities and improving nursing services to promote health and reduce CAUTIs and its consequences. There is a need for more research studies to increase nurses' knowledge regarding the prevention of CAUTIs because there were few research studies in this field. A similar study can be undertaken on a large scale. A comparative study between urban and rural areas may be conducted to generate the findings.

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**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethical Committee.

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