

# Barriers to Implementation of a Urinary Catheter Care Bundle for Critically Ill Patients with Cerebrovascular Stroke

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## Abstract

**Background:** Catheter-associated urinary tract infections (CAUTIs) are the most prevalent healthcare-associated infection in the ICU. Patients with indwelling urinary catheters are more prone to CAUTIs due to the increased risk of post-stroke infections brought on by stroke-induced immunosuppression. Therefore, it is imperative to focus on the barriers related to knowledge deficit, health care organization and nursing practice to overcome bad consequences of developing CAUTIs. **Objective:** to identify barriers to implementation of a urinary catheter care bundle for critically ill patients with cerebrovascular stroke. **Setting:** the study was carried out in five ICUs of Health Affairs Directorate hospitals in Alexandria governorate. **Subjects:** A convenient samples of 130 nurses of both genders who are assigned in the direct care of the newly admitted patients with cerebrovascular stroke in the previously mentioned units. **Tools:** two tools were used. Tool one: "Urinary catheter care bundle barriers questionnaire tool ". Tool two: "Nurses' knowledge about urinary catheter care bundle for critically ill patients with cerebrovascular stroke questionnaire". **Results:** The study showed that there was a significant relationship between socio-demographic data and mean score of UCCB implementation overall barriers regarding gender, age, education level and years of experience ( $P=0.011$ ,  $P=0.001$ ,  $P=0.001$  and  $P=0.001$  respectively). Furthermore, the study groups exhibited significant relationship between socio-demographic data and percent score of knowledge level about UCCB of studied CCNs regarding gender, age, education level and years of experience ( $P=0.114$ ,  $P=0.004$ ,  $P=0.001$  and  $P=0.002$  consequently). **Conclusion:** the implementation of urinary catheter care bundle was highly effective as it reduced CAUTI rate for critically ill patients with cerebrovascular stroke. **Recommendations:** critical care nurses should implement a UCCB approach that is tailored to the critically ill patients with cerebrovascular stroke. Hospital administration should establish educational program and workshops about the UCCB approach for critically ill patients with cerebrovascular stroke to critical care nurses.

**Key words:** Urinary catheter, Urinary tract infection, cerebrovascular stroke patients, Intensive care units.

## Introduction

The intensive care unit (ICU) is a potentially hostile environment to the vulnerable critically ill patient. In addition to the physical stress of illness, pain, sedation, interventions, and mechanical ventilation, there are physiological and psychosocial stressors perceived by these patients. One of the pathological disorders in the ICU environment which affects the brain's blood vessels is referred to as cerebral vascular disease. The cerebrovascular disease can be caused by several factors as emboli, thrombosis, or hemorrhages. Each of these etiologies has a unique procedure, yet they all lead to damage to a particular area of the brain (Morton & Fontaine, 2018).

Although the causes of the wide variation in reported incidence of stroke-associated urinary tract infection (UTI) are unknown, it's probable that variables such as follow-up time, single- or multicenter studies, diagnostic standards, duration of stay, and use of antibiotics may play a part. The likelihood of developing UTI is reportedly enhanced by the severity of a stroke, a history of stroke, diabetes, and an increase in post-void residual volume (Ndakotsu et al., 2021).

Catheter-associated urinary tract infections (CAUTIs) are the most prevalent healthcare-associated infection in the ICU. The prevention recommendations for CAUTIs recommend a combination of measures, including the correct administration of an indwelling urinary catheter. The insertion of a catheter is frequently required in stroke patients because of immobility, a decline in consciousness, or bladder issues. In a recent research, between 12% and 31% of acute stroke patients received indwelling urinary catheter implantation while they were hospitalized (Duszynska et al., 2020).

Patients with indwelling urinary catheters are more prone to CAUTIs due to the increased risk of post-stroke infections brought on by stroke-induced immunosuppression. In addition, having an indwelling urinary catheter is associated with worse outcomes for stroke patients who also have a urinary tract infection. Furthermore, according to Centers for Disease Control and Prevention (CDC) 2020 urinary tract infections made up between 30% and 40% of hospital-related infections. (Henry, 2018; John et al., 2018& CDC, 2020).

Additionally, morbidity, mortality, medical expenses, and length of hospital stay all rises as a result. The most common risk factor for UTIs occurrence is urinary tract catheterization. In addition, over one-fourth of all hospitalized patients in the medical field during a hospital stay, centers use urinary catheters at least once. The two main factors that make intensive care unit (ICU) patients more likely to develop urinary tract infections are frequent urine catheterization and prolonged catheter use (Karp, Kobernik, Kamdar, Fore & Morgan, 2018 & Soundaram et al., 2020).

## Aim of the study

This study aims to identify barriers to implementation of a urinary catheter care bundle for critically ill patients with cerebrovascular stroke.

## Materials and method

### Materials

**Design:** A descriptive research design was used to conduct this study.

**Settings:** This study was conducted in five ICUs of Health Affairs Directorate hospitals in Alexandria governorate.

**Subjects:** A convenient sample of 130 nurses of both genders who are assigned in

the direct care of the newly admitted patients with cerebrovascular stroke in the previously mentioned units was included in this study. Power analysis using Epi Info program v 7 was used to find sample size by applying the following parameters: population size 191 nurses, expected frequency of error 50%, Accepted error 5%, confidence coefficient 95% and expected sample size 130 nurse. Head nurse and assistants of the previous units were excluded from the study.

**Tools:** In order to collect the necessary data for the study two tools were used:

**Tool one: Urinary catheter care bundle barriers questionnaire:**

This tool was adapted from health protection Scotland HPS organization (Health Protection Scotland [HPS], 2018) after reviewing literatures. (Chuang & Tambyah, 2021; Soundaram et al., 2020; Rahiman, Chikte & Hughes, 2018; Gaikwad et al., 2018; King, 2020). It is a self-reported questionnaire that will be used to identify barriers to implementation of a urinary catheter care bundle. This tool consists of four parts.

**Part I: Critical care nurses' socio-Demographic data:** It was used to collect data about the studied nurses' age, gender, marital status and educational level.

**Part II: Critical care nurses' related barriers:** This part includes barriers related to nursing such as presence of nursing supervision during inserting urinary catheter, years of experience in ICU, have knowledge about signs and symptoms of infection, using aseptic technique during insertion and maintenance, attending workshop about CAUTI prevention, awareness of the nurse about protocol and policy of CAUTI in the unit, attending training program about UCCBs and having

brochure and poster about inserting urinary catheter.

**Part III: Organization related barriers:**

This part includes barriers related to the organization such as presence of policy about maintaining UCCBs, presence of infection control team and link nurse in the unit all over 24 hours, presence of a checklist for inserting and maintaining UCCBs, presence of time plan for inserting and removing of the urinary catheter.

**Part IV: Environment related barriers:**

This part includes barriers related to the environment such as adequate number of sinks according to the beds in the unit, availability of antiseptic solutions for hand hygiene, tissue paper and water, presence of urine bag holder in bed, availability of sterile equipment for each patient, necessary material for urinary catheter care such as bladder scanner and close drainage system, availability of urethral catheter kites and Presence of clean basin for each patient for urethral meatus.

**Tool two: Nurses' knowledge about urinary catheter care bundle for critically ill patients with cerebrovascular stroke questionnaire:**

It is a multiple-choice question that was developed by the researcher based on review related literatures. (Ndakotsu et al., 2021; John et al., 2018; Chuang & Tambyah, 2021; Soundaram et al., 2020). It uses to assess nurses' knowledge about UCCBs for critically ill patients with cerebrovascular stroke. It contains one correct answer, two wrong answer and one don't know answer. It was included three parts.

**Part I** assesses nurses' knowledge with cerebrovascular stroke disease, it includes 5 questions, **part II** assesses nurses' knowledge about CAUTIs, it includes 5 questions, **part III** assesses nurses' specific

knowledge about UCCBs component, it includes 10 questions.

## Method

Approval from Ethical Research Committee, Faculty of Nursing and Alexandria University was obtained. An official letter from the Faculty of Nursing was sent to the administrative authorities in Alexandria Health Affairs Directorate. Permission to conduct the study was obtained from the administrative authorities of the previously mentioned settings after explanation of the aim of the study. Tools were prepared and tested. Tools were submitted to jury of five experts in the field of the study to assess validity of the tools. Reliability of the tools was tested using Cronbach's Alpha test. A pilot study was carried out on 10 % of the sample size (13 nurses) to assess the clarity and applicability of the research tools and necessary modifications were done. These nurses were excluded from the study. Data was collected by the researcher during the period from September 2022 to January 2023.

Data collected from CCNs assigned to admit patients with cerebrovascular stroke in the selected units. The researcher obtained socio-demographic data from the CCNs. The researcher distributed the questionnaires to CCNs at morning, evening and night shifts during break time. The researcher determined CCNs' knowledge level about cerebrovascular stroke disease and UCCBs. The researcher identified the barriers to implement the urinary catheter care bundle when CCNs report the expected barriers by answering the questionnaire of tool one. The researcher was stayed nearby CCNs for any clarification. The collected data analyzed by using appropriate statistical test to explore barriers to implementation of a urinary catheter care bundle for critically ill patients with CVS.

## Ethical considerations:

Informed written consent was obtained from critical care nurses after explains aim of the study. Critical care nurses were allowed the right to refuse to participate in the study at any time. Confidentiality of the data was maintained during execution of the study.

## Statistical Analysis

The collected data was fed to the computer and analyzed by using SPSS software version 25. Descriptive statistical methods were used to the summarized data. Data were summarized as frequencies (n) and percentages (%) for categorical variables. Different tests were used as ANOVA or analysis of variance was used to allow mean comparison of more than two groups at the same time to determine whether a relationship exists between them. Pearson's correlation was used for investigating the correlation between two quantitative continuous variables.

## Results

**Table 1** shows the Socio-demographic characteristics of studied critical care nurses. It shows that 56.2% of the nurses studied were between the ages of 20 and 30, and 79.2% were females. In terms of their educational level, 54.6% of them obtained a technical degree. Most of them (59.2%) had less than ten years of experience. Although (76.9%) of them implement UCCB, the others (23.1%) do not.

**Table 2** represents frequency of studied critical care nurses' related barriers regarding UCCB implementation. It depict that the most encountered barriers regarding CCNs are not attending a CAUTI prevention workshop, not having a brochure and poster regarding inserting a urinary catheter and lack of routine assessment and evaluation of

urinary catheter care and need (100%, 100% and 93.8%) consequently. On the other hand, it shows that the least encountered barriers are not using of securing devices to prevent the movement of the catheter after its insertion, not position the urinary drainage bag below the level of the bladder on a stand that prevents the contact with the floor and not using the sampling port and the aseptic technique to obtain a catheter sample of urine (25.4%, 18.5% and 7.7%) respectively.

**Table 3** represents frequency of studied critical care nurses' organizational related barriers regarding UCCB implementation. It depicts that the most encountered barriers regarding CCNs related to organization are not having a policy about replacing a system if there is a break in asepsis, not having a time plan for inserting and removing the urinary catheter, and not having a checklist for inserting and maintaining UCCBs (96.9%, 91.5% and 90.8%) consequently. On the other hand, it shows that the least encountered barriers are not presence of policy about collecting CAUTI-related data (urinary catheter prevalence, appropriateness and infection rates) in the unit, not presence of policy about maintaining UCCBs and not presence of form for date of insertion, expected duration and date of removal (81.5%, 8.5% and 4.6%) respectively.

**Table 4** represents frequency of studied critical care nurses' environmental related barriers regarding UCCB implementation. It depicts that the most encountered barriers regarding CCNs related to environment are the absence of necessary urinary catheter care materials such as a bladder scanner and a close drainage system, the absence of a clean basin for each patient for urethral meatus, and the absence of sterile lubricant (gel) during urinary catheter insertion (97.7%, 94.6% and 72.3%) consequently. On the other hand, it shows that the least

encountered barriers are lack of tissue paper and water, presence of urine bag holder in bed, lack of sterile equipment for each patient and not presence of antiseptic cleaning of meatus before insertion of urinary catheter (16.2%, 10.0% and 4.6%) respectively.

**Table 5** denotes the relationship between socio-demographic data and means score of UCCB implementation overall barriers. It can be noted that there was a statistical significant relationship between gender of CCNs and overall barriers ( $P=0.011^*$ ). As regard age, there was a statistical significant relationship between age of CCNs and overall barriers ( $P=0.001^*$ ). As regard education level, there was a statistical significant relationship between education level of CCNs and overall barriers ( $P=0.001^*$ ). As regard years of experiences, there was a statistical significant relationship between years of experiences of CCNs and overall barriers ( $P=0.001^*$ ).

## Discussion

The most frequent healthcare-associated infection in ICU is catheter-associated urinary tract infections (CAUTIs). CAUTIs prevention guidelines advocate a combination of interventions, including the proper use of an indwelling urinary catheter. The catheter placement is common in stroke patients due to immobility, decreased consciousness, or bladder problems. In early study, indwelling urinary catheter placement was given to between 12% and 31% of acute stroke patients while they were in the hospital (Duszynska et al., 2020).

As a result of the increased risk of post-stroke infections caused by stroke-induced immunosuppression, stroke patients with indwelling urinary catheter are more susceptible to CAUTI. Furthermore, both

urinary tract infection and indwelling urinary catheter use are linked to poorer outcomes in stroke patients (Henry, 2018; John et al., 2018).

The main findings of the current study are barriers of implementing urinary catheter care bundle. Barriers related to nurses such as absence of brochure and poster regarding inserting a urinary catheter and lack of routine assessment and evaluation of urinary catheter care and need. Furthermore, organizational barriers such as not having a policy on replacing a system if there is a break in asepsis, not having a time plan for inserting and removing the urinary catheter, not having a checklist for inserting and maintaining UCCBs. Moreover, environmental barriers such as the absence of a clean basin for each patient for urethral meatus and the absence of sterile lubricant (gel) during urinary catheter insertion. These outcomes may be related to lack of training and attending workshops about UCCB, shortage of nursing staff and absence of a checklist for inserting and maintaining UCCBs.

It was agreed with Parker (2020) who stated that the insertion urinary catheter care bundle includes a list of indications based on expert opinion that are intended to aid health care practitioners in determining whether or not a urinary catheter is essential and appropriate. Additionally, it was in agreement with El-Sayed (2020), who discovered that the most common barriers included a lack of supervision, a lack of a single container for each patient, touching the opening of the urinary bag with a contaminated container, which could spread infection, ignorance of the significance of drainage bag emptying, and more than two thirds of healthcare professionals who didn't perform catheter hygiene as frequently as required by local policy. These outcomes could be caused by the lack of a link nurse

available 24 hours a day, nursing supervision, not using aseptic technique during insertion and maintenance of urinary catheter and lack of resources.

Also, it was supported by Withanagamage (2020) and Alqarni (2021) who discovered that critical care nurses had a low score regarding daily catheter care, cleaning the meatus, which may possibly be related to overload on nurses and staff who are involved in patient care. These outcomes could be attributed by not using aseptic technique during insertion and maintenance of urinary catheter, absence of antiseptic cleaning of meatus before insertion of urinary catheter and absence of necessary materials for urinary catheter such as urinary collecting bag and urine bag holders in bed.

Regarding relationship between socio-demographic data and UCCB implementation overall barriers, it was noted that the mean barriers percent scores was significantly different between studied groups as regards the education level and years of experience in ICU and that was in agreement with El-Sayed (2020) who reported that work overload for nurses, lack of nurses, experience (most of them had experience less than one years ), vague policies and procedures regarding care for the patient with indwelling urinary catheter ,transfer of the studied patients between different units made regularity and superiority of care very difficult.

Regarding relationship between socio-demographic data and knowledge level about UCCB of studied CCNs, in regards to education level and years of experience in the ICU, it was found that the mean knowledge score was statistically insignificant between the examined groups. This difference may be attributed to the small number of years of experience and fluctuating educational levels. This outcome

was consistent with Geetanjali's (2020) findings, which showed a statistically insignificant difference between the mean knowledge scores for education level and years of ICU experience.

**Conclusion**

Based on the finding of the current study it can be concluded that urinary catheter care bundle was highly effective as it reduced CAUTI rate for critically ill patients with cerebrovascular stroke. The studied critical care nurses according to their questionnaire about UCCB reported barriers that were divided into nursing, organizational and environmental related barriers.

**Recommendations**

Based on the findings of the current study, the following recommendations are suggested:

- Educate critical care nurses about care of urinary catheters using bundle approach with continuous development workshops to update their knowledge regarding new evidence-based practice.
- Hospital administration should implement quality improvement strategies to enhance appropriate use of indwelling catheters and reduce the risk of CAUTI based on a facility risk assessment.
- Applying this study on a large popularity sample to validate the results.

**Table (1): The distribution of socio-demographic characteristics of studied critical care nurses (n = 130)**

Socio-demographic characteristics of studied critical care nurses	No.	%
<b>Gender</b>		
Male	27	20.8
Female	103	79.2
<b>Age (years)</b>		
20-30	73	56.2
>30-40	39	30.0
>40	18	13.8
Mean ± SD.	31.75 ± 9.69	
<b>Education level</b>		
Bachelor	43	33.1
Technical	71	54.6
Diploma	16	12.3
<b>Years of experiences in ICU</b>		
<10	77	59.2
10-<20	33	25.4
20-<30	7	5.4
≥30	13	10.0
<b>Do you implement UCCB bundle?</b>		
Yes	30	23.1
No	100	76.9
Mean ± SD.	11.26 ± 11.21	

**Table (2): Frequency of studied critical care nurses' related barriers regarding UCCB implementation (n = 130)**

	Critical care nurses barriers	Not barriers		Barriers	
		No.	%	No.	%
1	Attending workshop about CAUTI prevention.	0	0.0	130	100.0
2	Having brochure and poster about inserting urinary catheter.	0	0.0	130	100.0
3	Presence of routine assessment and evaluation of urinary catheter care and need.	8	6.2	122	93.8
4	Avoid contact between the urinary drainage tap and the container when emptying the drainage bag.	25	19.2	105	80.8
5	Presence of meatal care with soap and water before insertion of urinary catheter.	26	20.0	104	80.0
6	Keeping the drainage bag below the bladder while in bed, chair, transport or ambulation.	31	23.8	99	76.2
7	Teach the patient about urinary catheter care and how they can minimize complications.	33	25.4	97	74.6
8	Awareness of protocol and policy of CAUTI in the unit.	38	29.2	92	70.8
9	Presence of nursing supervision during inserting urinary catheter.	40	30.8	90	69.2
10	Adequate nurse to patient ratio.	41	31.5	89	68.5
11	Using aseptic technique during insertion and maintenance of urinary catheter.	48	36.9	82	63.1
12	Knowledge about signs and symptoms of urinary tract infection.	89	68.5	41	31.5
13	Attending training program about UCCBs.	92	70.8	38	29.2
14	Using of securing devices to prevent the movement of the catheter after its insertion.	97	74.6	33	25.4
15	Position the urinary drainage bag below the level of the bladder on a stand that prevents the contact with the floor.	106	81.5	24	18.5
16	Using the sampling port and the aseptic technique to obtain a catheter sample of urine.	120	92.3	10	7.7



**Table (3): Frequency of studied critical care nurses' organizational related barriers regarding UCCB implementation (n = 130)**

Q	Organizational barriers	Not barriers		Barriers	
		No.	%	No.	%
1	Presence of policy about replacement system if break in asepsis happen.	4	3.1	126	96.9
2	Presence of time plan for inserting and removing of the urinary catheter.	11	8.5	119	91.5
3	Presence of a checklist for inserting and maintaining UCCBs.	12	9.2	118	90.8
4	Presence of infection control team and link nurse in the unit all over 24 hours.	18	13.8	112	86.2
5	Presence of policy about collecting CAUTI-related data (urinary catheter prevalence, appropriateness and infection rates) in the unit.	24	18.5	106	81.5
6	Presence of policy about maintaining UCCBs.	119	91.5	11	8.5
7	Presence of form for date of insertion, expected duration and date of removal.	124	95.4	6	4.6

**Table (4): Frequency of studied critical care nurses' environmental related barriers regarding UCCB implementation (n = 130)**

Q	Environmental barriers	Not barriers		Barriers	
		No.	%	No.	%
1	Presence of necessary material for urinary catheter care such as bladder scanner and close drainage system.	3	2.3	127	97.7
2	Presence of clean basin for each patient for urethral meatus.	7	5.4	123	94.6
3	Presence of sterile lubricant (gel) during insertion of urinary catheter.	36	27.7	94	72.3
4	Availability of urethral catheter kites.	53	40.8	77	59.2
5	Presence and wearing of sterile gown during insertion of urinary catheter.	53	40.8	77	59.2
6	Adequate number of sinks according to the beds in the unit.	76	58.5	54	41.5
7	Availability of antiseptic solutions for hand hygiene.	104	80.0	26	20.0
8	Availability of tissue paper and water, presence of urine bag holder in bed.	109	83.8	21	16.2
9	Availability of sterile equipment for each patient.	117	90.0	13	10.0
10	Presence of antiseptic cleaning of meatus before insertion of urinary catheter.	124	95.4	6	4.6

**Table (5): Relationship between socio-demographic data and mean score of UCCB implementation overall barriers (n = 130)**

Socio-demographic data	No.	overall barriers:	Test of Sig. (P)
		Mean ± SD.	
<b>Gender</b>			
Male	27	54.10 ± 8.43	U=950.50 P <0.011*
Female	103	59.43 ± 10.05	
<b>Age (years)</b>			
20-30	73	55.04 ± 9.56	H=26.184* P <<0.001*
31-40	39	59.83 ± 8.39	
>40	18	68.35 ± 6.99	
<b>Education level</b>			
Bachelor	43	69.13 ± 6.47	H=30.799* P <0.001*
Technical	71	58.98 ± 8.85	
Diploma	16	53.21 ± 9.29	
<b>Years of experiences in ICU</b>			
<10	77	54.55 ± 9.55	H=27.238* P <0.001*
10-<20	33	60.42 ± 7.98	
20-<30	7	65.80 ± 8.15	
≥30	13	68.76 ± 6.93	

SD: Standard deviation

U: Mann Whitney test

H: H for Kruskal Wallis test

p: p value for Relationship between socio-demographic data and mean score of UCCB implementation overall barriers

\*: Statistically significant at  $p \leq 0.05$

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