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

Eman Thear Alqahtani[1], Jumah Salem Alqissy[2], Afia Salem Alqissy[3], Shabab Mohd Said Alzahrani[4], Ahmed Mohammed AlHarbi[5], Sultan Mohammed AlHarbi[6], Ohood Nsaaer hadi[7], Rashed Ahmed Alzahrani[8], Alaa abdulaziz alshreef[9], Samira Saleh Abdullah Alshabaan[10], Hanaa Mostafa Felemban[11], Khaled Omran Eid Al-Bishri[12]

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 ICUs of Makkah hospitals. 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

[1] Specialist Nursing, Al-Quwayiyah Hospital, Saudi Arabia.
[2] Specialist Nursing, Al-Quwayiyah Hospital, Saudi Arabia.
[3] Specialist Nursing, Al-Quwayiyah Hospital, Saudi Arabia.
[4] Specialist Nursing, Alyamamah Hospital- Riyadh Second Health Cluster, Saudi Arabia.
[5] Nursing technician, Riyad Al Khabra Hospital, Saudi Arabia.
[6] Nursing technician, Al-Nabhaniya Hospital, Al-Lughafiya Health Center, Saudi Arabia.
[7] Staff Nurse, Gazan general hospital, Saudi Arabia.
[8] Nursing technician, Al-Husseiniya Primary Health Care Center, Saudi Arabia.
[9] Nursing technician, Ain shams primary health care, Saudi Arabia.
[10] Nursing technician, Children hospital, Taif Health Cluster - Children's Hospital, Saudi Arabia.
[11] Midwife, Maternity and Children hospital, Saudi Arabia.
[12] Deploma of Nursing, Nursing department-Abu shoieb PHC-Makkah health cluster- Saudi Arabia

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.

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

Introduction

The intensive care unit (ICU) is apotentially hostile environment to thevulnerable critically ill patient. In addition tothe 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 vasculardisease. The cerebrovascular disease can be caused by several factors as emboli, thrombosis, or hemorrhages. Each of these etiologies has a unique procedure, yet they alllead 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 asfollow-up time, single- or multicenter studies,diagnostic standards, duration of stay, and useof antibiotics may play a part. The likelihoodof developing UTI is reportedly enhanced bythe severity of a stroke, a history of stroke, diabetes, and an increase in post-void residualvolume (Ndakotsu et al., 2021).

Catheter-associated urinary tract infections (CAUTIs) are the most prevalent healthcare-associated infection in the ICU. The prevention recommendations for CAUTIsrecommend a combination of measures,including the correct administration of anindwelling urinary catheter. The insertion of acatheter 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-inducedimmunosuppression. In addition, having an indwelling urinary catheter is associated withworse 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% ofhospital-related infections. (Henry, 2018; Johnet al., 2018& CDC, 2020).

Additionally, morbidity, mortality,medical expenses, and length of hospital stayall rises as a result. The most common risk factor for UTIs occurrence is urinary tract catheterization. In addition, over one-fourth ofall 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 infectionsare frequent urine catheterization andprolonged catheter use (Karp, Kobernik, Kamdar, Fore & Morgan, 2018 & Soundaramet al., 2020).

Aim of the study

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

Materials and method

Design: A descriptive research design wasused to conduct this study.

Settings: This study was conducted in five ICUs of Makkah hospitals, Saudi Arabia

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 setting was included in this study. Power analysis using Epi Infoprogram 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 protectionScotland HPS organization (HealthProtection 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 unite 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, necessarymaterial for urinary catheter care such asbladder 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 criticallyill patients with cerebrovascular stroke questionnaire: It is a multiple-choice question that was developed by theresearcher based on review relatedliteratures. (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 containes 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, itincludes 10 questions.

Method

Approval from Ethical Research Committee, was obtained. 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 wascarried out on 10 % of the sample size (13 nurses) to assess the clarity and applicabilityof the research tools and necessary modifications were done. These nurses wereexcluded from the study. Data was collected by the researcher during the period from February 2022 to June 2022.

Data collected from CCNs assigned to admit patients with cerebrovascular stroke inthe 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 SPSSsoftware 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 toallow mean comparison of more than two groups at the same time to determinewhether a relationship exists between them. Pearson's correlation was used forinvestigating 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.

Socio-demographic characteristics of studied critical care nurses	No.	%
Gender		
Male	27	20.8
Female	103	79.2
Age (years)		
20-30	73	56.2

>30-40	39	30.0
>40	18	13.8
Mean ± SD.	31.75 ± 9.69	
Education level		
Bachelor	43	33.1
Technical	71	54.6
Diploma	16	12.3
Years of experiences in ICU		
<10	77	59.2
10-<20	33	25.4
20-<30	7	5.4
≥30	13	10.0
Do you implement UCCB bundle?	30	23.1
YesNo	100	76.9
Mean ± SD.	11.26 ± 11.21	

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 preventionworkshop, not having a brochure and poster regarding inserting a urinary catheter andlack 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 afterits 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 theaseptic technique to obtain a catheter sampleof urine (25.4%, 18.5% and 7.7%) respectively.

		Not barriers		Barriers	
	Critical care nurses 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 howthey 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 andmaintenance 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 ofthe 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 toobtain a catheter sample of urine.	120	92.3	10	7.7

Table 3 represents frequency of studied critical care nurses' organizational relatedbarriers regarding UCCB implementation. It depicts that the most encountered barriersregarding CCNs related to organization are not having a policy about replacing a systemif 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.

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 represents frequency of studied critical care nurses' environmental relatedbarriers regarding UCCB implementation. It depicts that the most encountered barriersregarding 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.

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 inbed.	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 urinarycatheter.	124	95.4	6	4.6

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

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

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 indwellingurinary 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 patientswith indwelling urinary catheter are moresusceptible to CAUTI. Furthermore, both urinary tract infection and indwellingurinary 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 absenceof a clean basin for each patient for urethral meatus and the absence of sterile lubricant (gel) during urinary catheter insertion. Theseoutcomes 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 cathetercare 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 ofdrainage bag emptying, and more than two thirds of healthcare professionals who didn't perform catheter hygiene as frequently asrequired 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 techniqueduring 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 hada 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 outcomescould 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 necessarymaterials for urinary catheter such as urinarycollecting bag and urine bag holders in bed.

Regarding relationship between socio-demographic data and UCCB implementation overall barriers, it was notedthat the mean barriers percent scores wassignificantly different between studied groups as regards the education level andyears 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 andsuperiority 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 statisticallyinsignificant between the examined groups. This difference may be attributed to the small number of years of experience andfluctuating 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 andyears of ICU experience.

Conclusion

Based on the finding of the current study it can be concluded that urinarycatheter care bundle was highly effective as it reduced CAUTI rate for critically ill patients with cerebrovascular stroke. The studied critical care nurses according to theirquestionnaire about UCCB reported

barriers that were divided into nursing, organizational and environmental relatedbarriers.

Recommendations

Based on the findings of the current study, the following recommendations aresuggested:

- Educate critical care nurses about care ofurinary catheters using bundle approach with continuous development workshopsto update their knowledge regarding newevidence-based practice.
- Hospital administration shouldimplement quality improvementstrategies 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 popularitysample to validate the results.

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