KNOWLEDGE AND IMPLEMENTATION OF CAUTI-BUNDLES IN PATIENTS' CARE AMONG NURSES IN A NIGERIAN TERTIARY HEALTH FACILITY

Authors:

Odikpo Linda C;[1] Ezike Okwudili Calistus;[2] Onyia Evert O[2]; Amadi Osinachi Chidinma;[2] Egbuniwe Michel Chiedu[3]; Ada C. Nwaneri[4]; Makata Ngozi .E[1]; Noreen E. Agbapuonwu[1]; Ihudiebube-Splendor Chikaodilli[4]; Ojong Idang Neji[5]; Okedo Henriietta[6];

Author Affiliations:

[1]Departement Of Nursing Science, Nnamdi Azikiwe University, Awka,Nigeria

[2]Federal Medical Centre Asaba, Delta State, Nigeria

[3]Department Of Nursing Services, Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State, Nigeria.

[4]Department Of Nursing Sciences, University Of Nigeria, Enugu Campus, Enugu, Nigeria

[5]Department Of Nursing Science, University Of Calabar, Nigeria

[6]Department Of Nursing Science,Tansian University,Anambra State, Nigeria

Corresponding Author:

Dr Odikpo Linda C

lc.odikpo@unizik.edu.ng

+2348135705878

ABSTRACT

Background: Between 15-25% of hospitalized patients receive urinary catheters during their hospital stay, predisposing majority to catheter-associated urinary tract infection (CAUTI). Owing to the high prevalence of CAUTI globally, CAUTI-Bundle was introduced and adopted as a gold standard of care which should be utilized by nurses while providing care to admitted patients on catheter.

Aim: This study assessed the knowledge and implementation of CAUTI-Bundles in patients care among nurses in a Nigerian Tertiary Hospital.

Materials and methods: A cross-sectional descriptive survey was carried out among 466 registered nurses purposively recruited from Federal Medical Centre Asaba. Data were collected using a pretested researchers' developed questionnaire. The data obtained were analyzed using frequencies, percentages and Chi-square at value less than 0.05 level of significance.

Results: More than half of the nurses 251(66.4%) had adequate knowledge about the use of CAUTI bundles in patients' care while only 175(46.2%) implemented and sparingly adhered to the CAUTI-Bundle protocol while caring for the patients on catheter. There was a significant association between years of experience, cadre ($p < 0.05$) and knowledge of CAUTI-Bundle.

Conclusion: Although more than half of the participants had adequate knowledge about CAUTI-Bundles, its implementation was suboptimal. As CAUTI continues to pose a challenge to hospital safety and quality healthcare of the patients, nurses who are the keystones to CAUTI bundle implementation, need to have better understanding of which, and in what context implementation strategies should be best utilized to ensure reductions in CAUTIs and catheter days of their patients.

Keywords: *CAUTI-Bundle, Knowledge, Implementation, Patients care, Nurses*

INTRODUCTION

Catheter-associated urinary tract infection (CAUTI) is the most common healthcare associated infection worldwide,[1] which has led to increased costs, prolonged hospital stays, and substantial morbidity for patients on indwelling catheter admitted in the hospitals. Seventy-five (75%) percent of urinary tract infections (UTIs) are acquired in the hospital when the patients are catheterized with incidence directly proportional to the length of catheter days.[2,3,4,5]

There are several strategies with varying levels of evidence which can help to prevent CAUTI before and after placement of urinary catheters in the healthcare institutions,[6] as majority of cases of CAUTI are avoidable with the appropriate implementation of infection prevention bundles of care which it's elements include; appropriate use, aseptic insertion and maintenance, early removal, and hand hygiene, which are together referred to as Care Bundle.[7] CAUTI BUNDLE package was developed by Centre for Disease Control and Prevention (CDC) and the Association for Professionals in Infection Control and Epidemiology (APIC) and it's evidenced based result contributes to infection prevention, reduction in unnecessary antibiotic prescribing, and also significant decline in the development of antibiotic resistance in health care facilities.[8]

Similar studies conducted in this regard among nurses showed low level of knowledge and poor practice of CAUTI Bundle. Report of study by Algarni et al[9] on nurses' knowledge and practices towards prevention of catheter-associated urinary tract infection at King Abdulaziz University Hospital Jeddah, Saudi Arabia showed that more than half of nurses (62.77%) had a low level of knowledge while 83.94% of nurses had a poor level of practice.

Another similar study in India also revealed that only 57% of the respondents could identify all the measures for prevention of CAUTI and the knowledge regarding the indication for catheterization though not up to the expected recommended standard was significantly better amongst the doctors as compared to nurses.[10] Also a study on utilization of CAUTI Bundle among Critical Care Nurses at Kenyatta National Hospital showed weak correlation between the observed and reported low bundle utilization[11].

In Nigeria however, there is paucity of information with regards to the knowledge and implementation of CAUTI BUNDLES among nurses. A reviewed study available was zeroed down to perceived causes and prevention of catheter-associated urinary tract infections,[12] thus, the need for a study of this kind on CAUTI Bundles cannot be overemphasized as nurses' role is key to reducing inappropriate catheter use and preventing CAUTI among patients. This study therefore assessed the knowledge and implementation of CAUTI Bundles among Nurses in a Nigerian Tertiary Health facility. Specifically, the study ascertained knowledge of nurses with regards to CAUTI Bundles in the care of patients; their level of Implementation/application; and also tested the association between sociodemographic profile of the nurses and their knowledge of CAUTI-Bundle.

MATERIALS AND METHODS

Study design: A cross sectional descriptive design was adopted for the study. This was used to assess knowledge and implementation of CAUTI BUNDLES among nurses in Federal Medical Centre (FMC) Asaba, Delta State.

Study Setting: The study was conducted at Federal Medical Centre (FMC), Asaba which is a tertiary health institution located in Oshimili -South Local Government Area, Delta State, Nigeria.

The FMC Asaba is one of the two tertiary health institutions located in Delta state, which is situated in the South-South geo-political zone of Nigeria.

Population for the study: The target population consisted of all registered nurses practicing at Federal Medical Centre Asaba. The total number of registered nurses in FMC Asaba was 466 (Nurses' Annual Report, 2019). The study involved the total population; thus there was no sampling carried out. All the 466 registered nurses in FMC Asaba were consecutively recruited for the study.

Instrument for Data Collection: Data was collected using participants' self-administered questionnaire designed by the researchers in accordance with the set objectives of the study on knowledge and application of CAUTI BUNDLES among nurses in Federal Medical Centre (FMC) Asaba, Delta State. The questionnaire has four parts containing fort- six (46) items. Section A has seven (7) items which elicited information on participants' demographic characteristics. Section B contains twenty-five (25) questions which elicited information on knowledge of CAUTI Bundle, while section C contain fifteen (15) questions which elicited information on implementation of CAUTI BUNDLE among nurses**.** Face and content validation of the instrument was carried out by experts in the field of Nursing, urology, public health and infection prevention. Their inputs were utilized in modifying the tool before actual field use. The reliability of the instrument was ensured by collecting pilot data at Okwe General Hospital in Asaba, which has similar characteristics with the study population. The internal consistency of the items was established using Cronbach's Alpha method. The four-point rating scale used in collecting data on implementation of CAUTI Bundles was given values as follows; Always(A)-4, most times (MO)-3, occasionally(O)-2, not at all (NA)-1.

Data Collection: Data was collected with the aid of a pretested questionnaire during all shifts for period of two (2) weeks.

Ethical Consideration: Ethical approval was obtained from the FMC Health Research Ethics Committee. Informed oral consent was obtained from the respondents before administering the instrument and confidentiality of the data collected was ensured.

Data analysis: Data obtained from the study were summarized using descriptive statistics of frequency, percentages, mean and standard deviations and Chi-square. The results were presented in tables. Level of significance, was set at less than 0.05.

Results

Result on socio-demographic data of the client showed that most of the participants 345(91.3%) were within the age range ≤30-39years; predominantly females 357(94.4%); with majority 271(71.7%) having 1-10 years of professional experience; majority are within Nursing officer 11/1 cadre 175(46.3%) and have their unit mainly to be medical ward 75(19.8%). Table 1 showed the participants' knowledge about catheter associated urinary tract infection (CAUTI). Majority 286(75.7%) of the participants had heard about CAUTI; most of the participants 357(94.4)% have no written policy or guidelines on how to prevent CAUTI. 342(90.5%) agreed that this is the first time they heard of CAUTI Bundle. Knowledge summary showed that more than half (66.4%) of the participants had adequate knowledge about CAUTI-Bundle as many were able to correctly answer 18-24 items on knowledge section.

Table 2 shows 85(22.5%) occasionally Pass catheter when bladder is full (preferably) for wash-out effect, none 0(0.0) use ultrasound guidance while passing catheter, majority 214 (56.6) Keep peri-urethral area clean and dry , 303 (80.2) did not agree to securing of catheter to the patients thigh, 19(5%) of respondents always wash hands before emptying urine from the urine bag while 76(20%) always use separate disinfected jug to collect urine from each bag. 60% always obtain urine sample from port using aseptic technique and not by disconnecting closed drainage bag. 38(10%) prevent contact of the drainage spigot with the non-sterile collecting jug container.

Table 3 shows association between some socio-demographic factors and adequate knowledge of catheter associated urinary tract infections (CAUTI) bundle. Sex, years of experience, level of education of the respondents are statistically non-significant determinants of adequate knowledge of CAUTI-Bundle.

The P-values of above 5% on the sex showed that knowledge of CAUTI-Bundle is independent of the sex. Also, the P-values on the years of experience showed that knowledge of CAUTI-Bundle is not dependent on the years of experience with exception of those with 11-20years of experience who are more likely to have 2 times more knowledge compared to other respondents (p=0.004, AOR=2.0). Similarly, those in children's unit showed 4 times more knowledge compared to other respondents in other units (p=0.001, AOR=4.0).

Table 1: Knowledge about catheter associated urinary tract infections (CAUTI) bundle

S/N	VARIABLES	Yes	NO
1	Have you heard of catheter associated urinary tract infections (CAUTI)?	286 (75.7)	92 (24.3)
2	Do you have a written policy or guidelines on how to prevent CAUTI?	21 (5.6)	357 (94.4)
3	Are you aware of the CAUTI bundle?	36 (9.5)	342 (90.5)
4	Is this the first time you hear about this bundle?	342 (90.5)	36 (9.5)
5	Do you know the components of CAUTI Bundle?	18 (4.8)	360 (95.2)
5	Have you received any training on CAUTI Bundle?	0 (0.0)	378(100.0)
6	Insertion of urethral catheter poses a great risk for CAUTI	375 (99.2)	3 (0.8)
7	CAUTI Bundle is considered a good infection control measure	375 (99.2)	3 (0.8)
8	CAUTI Bundle can reduce prevalence of CAUTI to <2%	314 (83.1)	64 (16.9)
9	Healthcare workers should avoid unnecessary catheterization of patients	369 (97.6)	9 (2.4)
10	Catheter is passed preferably when bladder is full	168 (44.4)	210 (55.6)
11	For CAUTI insertion Bundle, sterile items/equipment must be used	375 (99.2)	3 (0.8)
12	Are you aware that closed (not open) drainage system must be applied?	243 (64.3)	135 (35.7)
13	For maintenance Bundle, you must review the need for the catheter daily	174 (46.0)	204 (54.0)
14	Aseptic technique must be used for daily catheter care	378 (100.0)	0 (0.0)
15	Hand hygiene is required before emptying urine from uri-bag	211 (98.4)	167 (1.6)
16	Periurethral area must be always clean and dry	378 (100.0)	0 (0.0)
17	Perineum must be cleaned as soon as possible after fecal incontinence	378 (100.0)	0 (0.0)
18	Drainage bag tubing must be free from kinks to allow free flow of urine	378 (100.0)	0 (0.0)
19	Break in the close drainage system must be avoided unless absolutely necessary	377 (99.7)	1 (0.3)
20	Drainage should never be raised above bladder level	200 (52.9)	178 (47.1)
21	The drainage tubing should be secured on the patient's thigh	133 (35.2)	245(64.8)
22	The drainage bag must never touch the floor	317 (83.9)	61 (16.1)
23	Drainage bag should be emptied every 8 hours or when 2/3rd full	214 (56.6)	164 (43.4)
24	Separate disinfected jug should be used to collect urine from each bag	218 (57.7)	160 (42.3)
	Knowledge Summary	**Frequency**	**Percentage**
	Adequate (18 – 24)	251	66.4
	Inadequate (< 18)	127	33.6

Table 2: Implementation of catheter associated urinary tract infections (CAUTI) bundle

S/N	ITEMS	Always	Most times	Occasionally	Not at all
1	Pass catheter when bladder is full (preferably) for wash-out effect	92 (24.3)	93 (24.6)	85 (22.5)	108 (28.6)
2	Use bladder ultrasound when catheterizing	0 (0.0)	0 (0.0)	2 (0.5)	376 (99.5)
3	Keep peri-urethral area clean and dry	214 (56.6)	154 (40.7)	10 (2.6)	0 (0.0)
4	Secure catheter appropriately (on patient's thigh) to prevent movement in urethra	2 (0.5)	7 (1.9)	66 (17.4)	303 (80.2)
5	Clean patient's perineum after fecal incontinence	313 (82.8)	38 (10.0)	18 (4.8)	9 (2.4)
6	Check catheter, bag and tubing often for kinks and obstructions	4 (1.1)	109 (28.8)	265 (70.1)	0 (0.0)
7	Avoid break in close drainage system unless absolutely necessary	255 (67.5)	97 (25.7)	7 (1.9)	0 (0.0)
8	Ensure the drainage bag is never raised above the height of the bladder	5 (1.3)	66 (17.5)	112 (29.6)	195 (51.6)
9	Do not hold the bag upside down when emptying	4 (1.1)	77 (20.4)	293 (77.5)	4 (1.1)
10	Make sure drainage bag does not touch the ground	297 (78.5)	77 (20.4)	1 (0.3)	3 (0.8)
11	Empties the bag every 8hours or when 2/3rd full	14 (3.7)	90 (23.8)	236 (62.4)	38 (10.1)
12	Wash hands before emptying urine from the urine bag	19 (5.0)	47 (12.4)	227 (60.1)	85 (22.5)
13	Obtain urine sample from port using aseptic technique and not by disconnecting closed drainage bag	227 (60.1)	63 (16.7)	25 (6.6)	63 (16.7)
14	Use separate disinfected jug to collect urine from each bag;	76 (20.1)	28 (7.4)	66 (17.5)	208 (55.0)
15	Prevent contact of the drainage spigot with the non-sterile collecting jug/container	38 (10.0)	76 (20.1)	236 (62.4)	28 (7.4)

Table 3: Association between some socio-demographic factors and adequate knowledge of CAUT bundle

Variable	Adequate knowledge of CAUTI Bundle (n=251)		AOR	Confidence interval	*p*- value
Sex					
Male	10 (4.0)		-	-	-
Female	241 (96.0)		0.4	0.181 – 1.060	0.067
Years of experience					
1 – 10	191 (76.1)		-	-	-
11 – 20	54 (21.5)		2.0	1.239 – 3.196	0.004*
21 – 30	5 (2.0)		0.5	0.055 – 4.152	0.477
31 and above	1 (0.4)		0.1	0.010 – 0.538	0.072
Qualification / level of education					
RN	1 (0.4)		-	-	-
RN/RM/HND	98 (39.0)		1.0	0.059 – 15.557	0.977
B.SCN	150 (59.8)		0.2	0.013 – 3.394	0.270
MSN/PhD Nursing	2 (0.8)		0.5	0.013 – 19.562	0.711
Facility/Unit					
A&E	50 (19.2)		-	-	-
FMC Maternity complex	41(16.3)		1.9	0.865 – 4.041	0.111
Theatre	29 (11.6)		1.1	0.457 – 2.889	0.767
Medical ward	48 (19.1)		1.9	0.890 – 3.950	0.098
Surgical ward	33 (13.2)		1.2	0.504 – 2.914	0.667
Children's ward	21 (8.3)		4.0	1.751 – 8.994	0.001*
Other	29 (11.6)		1.7	0.737 – 4.031	0.209
Cadre					
NOII/NOI	79 (31.5)		-	-	-
SNO/PHO	138 (55.0)		0.2	0.105 – 0.285	<0.001*
ACNO/CNO	21 (8.4)		0.04	0.005 – 0.298	0.002*
Directorate	13 (5.2)		0.06	0.008 – 0.494	0.009

Discussion

On the knowledge of the participants about CAUTI-Bundles in the care of patients, the result from the findings showed that more than half of the participants (66.4%) had adequate knowledge about CAUTI bundle in the care of their patients. Although, none have undertaken any form training or retraining on CAUTI-Bundle. This result supported the findings of Kose et al[14] which stated there was high level of knowledge among the nurses especially those with associate degree. High level of knowledge among nurses with regards to CAUT-Bundle was also reported by Mong et al[15] which may be as a result of similarity in professional characteristic knowledge. This result contradicts a report from a similar study,[16] which stated that there still existed a significant gap in knowledge regarding nursing practices of infection control and also another similar report which stated that the nurses were the least knowledgeable about different approaches to catheterization and specimen collecting method in patients care.[17]

On the implementation of CAUTI-Bundle, the participants had suboptimal application of CAUTI bundle in the care of their patients although some CAUTI-Bundle elements were better applied more than others. Those that were highly applied by more than 70% of the participants were to pass catheter when bladder is full (preferably) for wash-out effect, cleaning patient's perineum after faecal incontinence, ensuring that drainage bag does not touch the ground and being overfilled. The other elements were implemented by less than 50% of the participants. These were washing hands before emptying urine from the Uri- bag; empties the bag every 8hours or when 2/3rd full; prevent contact of the drainage spigot with the non-sterile collecting jug/container; check catheter, bag and tubing often for kinks and obstructions.

CAUTI Bundle care protocol should always be practised while taking care of any patient on urinary catheter. Nurses should ensure that urine drainage bags are not touching the floor and overfilled. The over 70% utilized components of the Bundle elements among the participants was also reported in a similar study by Thompson et al[18] where 88% of the participants ensured that the drainage bags were not touching the floor.

It is important to reiterate that drainage bags should be emptied regularly since when they are overfilled, they may cause traction to the urethral meatus predisposing patients to inflammation and eventually CAUTIs. Another report on implementation of CAUTI-Bundle elements among nurses from a similar study showed nurses have sufficient information on how to insert a urinary catheter which depicts knowledge, but not enough information on catheter care, use of urine bags and the intidactions of urinary catheterization which can be likened to implementation not been at the best possible standard level by implication.[14,19] This results contradicts other reports from similar studies where nurses were rated overall good in perceived practice regarding CAUTI prevention,[15] and also report of 100% utilization of the bundle by the participants in patients care.[13]

Report of the hypothesis showed that most of the socio demographic characteristics did not influence the knowledge of CAUTI-Bundle to the care of patience among the nurses. There was no significant relation between level of education and Knowledge of CAUTI Bundle. However, Cadre showed more significant influence on the knowledge of CAUTI-Bundle. Although, one would expect level of education to be a determinant of knowledge and implementation to CAUTI bundles, but this study showed the opposite. This contradicts the findings in a similar study which reported education to be positive in relation to compliance with CAUTI Bundle implementation.[20,21] This finding is also in agreement with Kose etal[14] who found a significant positive relationship between nurse's knowledge and years of nursing experience. It is therefore important to improve knowledge as one gain experience through years of practice for effective implementation of standard preventive and health promotive protocols like the CAUTI-Bundle. This can be through constant awareness creation, sending of reminders, training cum continuous education provision for nurses, staff education, monitoring, care techniques, setting CAUTI among the high priority list in various health institution amongst other measures.[22,23]

Conclusion

CAUTI is one of the major healthcare associated infections and the need to ensure it is prevented cannot be overemphasized. It is largely preventable if the CAUTI-Bundle is dutifully followed. In this study, there were knowledge gaps and suboptimal implementation of CAUTI-Bundle among Nurses in the health institution. The study showed that level of education does not have a signification relation to infection control among nurses but cadre showed significant relation with the Knowledge CAUTI-Bundle among nurses.

Acknowledgment: We acknowledge nurses in the tertiary health institution used for the study for consenting to participate in this study and also the hospital principal officers for their kind approval.

References

1. World Health Organization (2011). Report on the burden of endemic health care-associated infection worldwide: a systematic review of the literature. Available at . Retrieved 07/06/2020.

Dwayne E. B

2. , Staci E, Cecilia R, Cori K, Valsa K. and Implementing Cauti Prevention Bundle in the PACU. Journal of Perianathesia Nursing, 31(4), 13 DOI:https://doi.org/10.1016/j.jopan.2016.04.031
3. Lewis SS, Knelson LP, Moehring RW, Chen LF, Sexton DJ, Anderson DJ. (2013) Comparison of non-intensive care unit (ICU) versus ICU rates of catheter-associated urinary tract infection in community hospitals. Infect Control Hosp Epidemiol. 2013;34:744–7.
4. Jacqueline M. Knowledge, attitude and practice of nurses towards the prevention of catheter associated urinary tract infection in selected referral hospitals in Rwanda. Master's Thesis at University of Rwanda/College of Medicine and Health Sciences. 2017. http://dr.ur.ac.rw/bitstream/handle/123456789/324/MUKAKAMANZI%20Jacqueline.pdf. Accessed September 27, 2021.
5. Krein SL, Kowalski CP, Harrod M, Forman J, Saint S. Barriers to reducing urinary catheter use: a qualitative assessment of a statewide initiative. Journal of American Medical Association Internal Medicine. 2013;173(10):881-886.
6. Umscheid C.A., Mitchel M.D., Doshi J.A., Agarwal R., Williams K., Brennan P.J. (2011). Estimating the proportion of healthcare associated infections that are reasonably preventable and the related mortality and costs. Infection control and hospital epidemiology. 2011;32(2):101-114.
7. Vera LF, Fillipa AV. Prevention of catheter-associated urinary tract infection: implementation strategies of international guidelines. Revista Latino-Americana de Enfermagem. 2016. doi: 24: e2678. 10.1590/1518-8345.0963.2678
8. Agency for Health Research and Quality (2015) Toolkit for Reducing Catheter-Associated Urinary Tract Infections in Hospital Units: Implementation Guide available at https://www.ahrq.gov/hai/cauti-tools/guides/implguide-pt3.html (accessed 15th May 2020)
9. Algarni S., Sofar S. and Wazqar D. (2019) Nurses' knowledge and practices toward prevention of catheter-associated urinary tract infection at King Abdulaziz University Hospital. Journal of Health, Medcine and nursing, 4(4), 39- 62,
10. Manisha J, Vinita D, Bibhabati M, Archana T, Poonam SL. Knowledge and attitude of doctors and nurses regarding indication for catheterization and prevention of catheter-associated urinary tract infection in a tertiary care hospital. Indian Journal Critical Care Medicine.2015; 19 (2): 76–81. doi: 10.4103/0972-5229.151014
11. Assanga PA, Omondi AL, Inyama HK. Evaluation on the Utilization of Catheter Associated Urinary Tract Infection Bundle Among Critical Care Nurses - Kenyatta National Hospital. American Journal of Nursing Science.2016; 5(5): 201-212
12. Malomo AO, Aminu K, Adeolu AA, Adeleye AO, Balogun JA et al. Perceived causes and prevention of catheter-associated urinary tract infections among spinal cord injured patients. Journal of Clinical Nephrology. 2019; 3: 175-180.
13. Nurses' Annual Report. Federal Medical Center Asaba. 2019
14. Kose Yildiz, Yeliz Leblebici, Selma Sen Akdere, Hatice Cakmakci, Serap Otunctemur, Memet Taskin Egici, Guven Bektemur. Level of knowledge of the nurses work in a public hospital about the prevention of catheter associated urinary tract infections. Anatolian Journal of Nursing and Health Sciences . **2016; 50(1): 70-9.** 10.5350/SEMB.20151216103044

15. Mong I, Ramoo V, Ponnampalavanar S, Chong MC, Wan Nawawi WNF. Knowledge, attitude and practice in relation to catheter-associated urinary tract infection (CAUTI) prevention: A cross-sectional study. J Clin Nurs. 2022 Jan;31(1-2):209-219. doi: 10.1111/jocn.15899. Epub 2021 Jun 8. PMID: 34105196.

16. Prasanna, K., & Radhika, M. (2015). Knowledge regarding catheter care among staff nurses. International Journal of Applied Research, 1(8), 182–186.

17. Opina MLF, Oducado RMF. Infection control in the use of urethral catheters: Knowledge and practices of nurses in a private hospital in Iloilo city. Asia Pacific Journal of Education. 2014;1(5):93-100

18. Thompson D, Chairez D, Nimmo V & Scott K, "Point Prevalence Surveillance of foley catheter maintenance and utilization." Foley Catheter Observation Survey. 2016; 2 (3): 12-18.

Ezike Okwudili Calistus

19. , Linda C. Odikpo , Onyia Evert, Amadi Osinachi Chidinma , Egbuniwe Michel Chiedu , Ada C. Nwaneri, Ngozi E. Makata, Ihudiebube-Splendor Chikaodilli (2023). Barriers to CAUTI-bundle application in patients' care among nurses in a Nigerian tertiary health facility. Internation Journal of Urology Nursing. Wiley Online Library. https://doi.org/10.1111/ijun.12360..Print ISSN: 1749-7701

20. Mohammed H, AKassar RAH. Effectiveness of Educational program on nurses' knowledge toward preventing female catheter-associated urinary tract infections. Indian Journal of Forensic Medicine & Toxicology. 2019; 13(1):230. http://dx.doi.org/10.5958/0973-9130.2019.00047.1.

21. Rife F. Strategies used by hospitals in a Southeastern State to reduce catheter associated urinary tract infections: comparing the outcomes by hospital structure and processes East Tennessee State University, in 55th interactive workshop on nurses' practice and perception. New York Science Journal. 2012;8(5): 117–126. http://www.sciencepub.net/newyork

22. Willson et al (2009)Nursing interventions to reduce the risk of catheter-associated urinary tract infection:J Wound Ostomy Continence Nurs, 36(2):137-54. doi: 10.1097/01.WON.0000347655.56851.04

23. Clarke K, Tong D, Pan Y, Easley K.A, Norrick B, Ko C, Wang A. et al, (2013). "Reduction in Catheter-Associated Urinary Tract Infections by bundling interventions". Int J Qual Health Care; 25 (1): 43-49.