
To Assess the Incidence of Catheter Associated Urinary Tract Infection and Evaluate the Effectiveness of Evidence based Practice Protocol for Prevention of Catheter-associated Urinary Tract Infections (CAUTI) in Adult Critical Care Patients

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Abstract

Background: UTIs are the most common type of healthcare-associated infection. Among UTIs acquired in the hospital, approximately 75% are associated with a urinary catheter, which is a tube inserted into the bladder through the urethra to drain urine. The most important risk factor for developing a CAUTI is prolonged use of the urinary catheter. Therefore, catheters should only be used for appropriate indications and should be removed as soon as they are no longer needed.

Aim: The aim of the study is to prevent CAUTIs in adult critical care patients, by using evidence based practice protocol.

Materials and Methods: A Quasi Experimental one group pretest posttest research design was used. 200 staff nurses were selected from hospitals by using purposive sampling technique. Biophysical measures like signs and symptoms of CAUTI and urine culture was done to assess the incidence of CAUTIs in adult critical care patients before administration of evidence based practice protocol.

Result: The overall incidence rate of CAUTI in adult critical care patients was 11.1%. A Comparison of Pre and Post test level of Knowledge of Staff Nurse's regarding CAUTIs shows that 46(23.0%) had poor knowledge before intervention and it was reduced 2(1.0%) after intervention. None of the staff nurse had excellent knowledge before intervention and was increased 12(6.0%) after intervention, 23(11.5%) had pre test good knowledge and was increased to 122(61.0%) in post test. Pre test mean knowledge of staff nurse regarding CAUTIs was 13.68 whereas post test knowledge score was 16.5 and was statistically significant with p-value <0.0001.

Conclusion: This approach shows for reduction of CAUTIs in critical care settings. The same type of protocol or education programme might be adopted for the other health care associated infections.

Key words: Adult Critical Care Patients, Catheter Associated Urinary Tract Infection, Evidence Based Practice Protocol, Incidence.

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Introduction

The urinary system is one of the main routes through which the human body excretes liquid waste.¹ Urinary tract infection (UTI) is a collective term that describes any infection involving any part of the urinary tract, namely the kidneys, ureters, bladder and urethra.²

CAUTI is defined by CDC as a UTI in a patient who was catheterized for more than 2 days with at least one of the following signs or symptoms: fever ($>38^{\circ}\text{C}$); urgency; frequency; dysuria; suprapubic tenderness; costovertebral angle pain or tenderness and a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms. If an indwelling urinary catheter was in place for > 2 calendar days and then removed, the UTI criteria must be fully met on the day of discontinuation or the next day.³

Urinary tract infection (UTI) is one of the most common infections in humans, accounting for more than 150 million cases worldwide. In addition to being the most common bacterial infection, UTIs also account for 36% of all healthcare-associated infections. Of these 36% infections, 80% of them are estimated to be catheter associated. Beyond the initial urinary infection, catheter-associated UTIs (CAUTIs) can lead to complications including bacteremia, endocarditis, osteomyelitis, septic arthritis, and meningitis. These pathologies collectively result in prolonged hospital stays and increased morbidity and mortality.⁴

The risk of developing a CAUTI is directly related to catheter dwell time. For catheterized patients, the rate of development of catheter-associated bacteriuria is approximately 3% to 7% per day and is more common in the elderly and females. The two most important factors that lead to the development of CAUTIs and have been the main focus of quality improvement areas are unnecessary urinary catheter placement and inappropriate delay in removing a catheter when it is no longer needed. Unfortunately, 38% of attending physicians are unaware that their patients have a urinary catheter in place. Furthermore, in 20% to 50% of cases, there is no clear indication for catheter placement.⁵

Diagnostic testing for CAUTI includes urinalysis and urine culture.⁶ Prevention strategies for CAUTI include; hand hygiene steps to be followed before

and after handling or manipulation of the catheter or urinary drainage bag, while maintaining a continuous sterile closed drainage system. Keeping the catheter and the peri-catheter area clean with regular use of antiseptic solutions, along with the incontinence care.⁷

Nurses have to be aware of CDC guidelines in carrying out procedures like urinary catheter insertion, collection of urine specimens and maintenance of indwelling catheter. Adherence of staff nurses is important in reduction of occurrence of hospital based infections.⁸

Catheter restriction protocols have been a common component of successful multi-modal interventions to decrease catheter use and CAUTI rates, including hospital-wide interventions such as the emergency department, inpatient units (including general medical, surgical wards and ICU), and in the peri-procedural setting.⁹

Undertaken study was conducted to prevent catheter associated urinary tract infections (CAUTIs) in adult critical care patients, through enhancing the knowledge and improving the quality care practice of staff nurses by using evidence based practice protocol.

Materials and Methods

An evaluative approach was used for the present study. The design adopted for the study was quasi experimental one group pretest posttest research design. The study was conducted in medical ward, surgical ward, POW, Intensive care unit and emergency ward of BLDE (Deemed to be University) Shri B M Patil MCH & RC. Total 200 staff nurses were selected by using Non Probability Purposive Sampling Technique. The study includes adults both the males and female staff nurses who fulfilled the inclusion criteria and available at the time of data collection. The data were collected on selected wards to assess the incidence of catheter associated urinary tract infection in adult critical care patients by urine culture. The next part of data collection involved the staff nurses by assessing the pretest using structured knowledge questionnaire which also includes sociodemographic profile and self reported practice questionnaire. After the pretest evidence

based practice protocol (EBPP) was inducted. Seven days after administration of EBPP the posttest was obtained. Data were analyzed by using descriptive and inferential statistics. Continuous data were expressed in terms of mean and standard deviation (SD). Comparison of mean pre test and post test knowledge scores using paired t test.

Results

A total of 200 staff nurses completed the questionnaire. The sociodemographic data represented in Table 1 that frequency and percentage distribution of adults according to socio-demographic profile such as age, gender, educational qualification, years of experiences and exposure to

CNE programme. Majority of staff nurses were 36-45 years of age, 70% of participants were female, and 39% of participants completed their BSc (N) degree and most of the participants 28% from medical ward. The results reveal that majority of the staff nurses have ≥ 10 Years work experience and very few 25.5% only had attended CNE programme on CAUTIs. Table No 2, 3 and 4 shows comparison of pre and post test level of knowledge of staff nurses and paired difference between pre test and post test knowledge score of staff nurse regarding knowledge on CAUTIs. Table No 5, 6 and 7 shows comparison of pre and post test level of practice of staff nurses and paired difference between pre test and post test practice score of staff nurse regarding prevention of CAUTIs.

Table 1: Frequency and percentage distribution of adults according to Socio- demographic Profile

SI. No	Sociodemographic Profile	Frequency	Percentage
Age			
1	22-35	60	30.0
	36-45	67	33.5
	46-55	54	27.0
	55 & Above	19	9.5
Total		200	100.0
Gender			
2	Male	59	29.5
	Female	141	70.5
Total		200	100.0
Educational Qualification			
3	GNM	62	31.0
	B.Sc(N)	79	39.5
	PB.BSc(N)	44	22.0
	MSc(N)	15	7.5
Total		200	100.0
Specialty Area			
4	Medical Ward	56	28.0
	Surgical Ward	54	27.0
	Intensive care Unit	49	24.5
	Post-Operative Ward	28	14.0
	Emergency Ward	13	6.5
Total		200	100.0
Work Experience			
5	0-3 Years	60	30.0
	7-9 Years	67	33.5
	≥ 10 Years	73	36.5

Total		200	100.0
Study Participants Based on Exposure to CNE Program on CAUTIs			
6	Yes	51	25.5
	No	149	74.5
Total		200	100.0

Table 1 shows that majority 67(33.5%) of the staff nurse were in the age group 36-45, 60(30.0%) were in the age group 22-35, 54(27.0%) were in the age group 46-55 and 19(9.5%). It was clear that majority 141(70.5%) of the staff nurse were females and remaining 59(29.5%) were males. It is revealed that 79(39.5%) of the staff nurse were BSc (N) graduates, 62(31.0%) were studied GNM, 44(22.0%) studied PBBSc (N), and remaining 15(7.5%) were studied MSc (N). Regarding speciality area of 56(28%) were

selected from medical ward, 54(27%) were surgical ward, 49 (24.5%) from Intensive care unit, 28(14%) were from post operative ward and very few 13 (6.5%) were from Emergency ward. Majority of the staff nurses had 73 (36.5%) had more than 10 years of work experience, 67(33.5%) had 7-9 years of experience and 60(30%) had 0-3 years of experiences. Most of the 149(74.5%) had previous knowledge or exposure to CNE Program on CAUTIs 51(25.5%) had no exposure to any kind of CNE program on CAUTI.

Table 2: Comparison of pre and post test level of knowledge and practice of staff nurses regarding CAUTIs

SI. No	Level of Knowledge	Pre-test		Post-Test		Level of Practice	Pre-test		Post-test	
		F	P (%)	F	P (%)		F	P (%)	F	P (%)
1	Poor Knowledge	46	23.0	02	1.00	Good	198	99.0	150	75.0
2	Medium Knowledge	131	65.5	64	32.0					
3	Good Knowledge	23	11.5	122	61.0	Excellent	02	1.0	50	25.0
4	Excellent Knowledge	00	00	12	6.00					
Total		200	100.0	200	100.0	Total	200	100.0	200	100.0

Table 2 showed that, 46(23.0%) staff nurses had poor knowledge before intervention and it was reduced 2(1.0%) after intervention. None of the staff nurse had excellent knowledge before intervention and was increased 12(6.0%) after intervention, 23(11.5%) had pre test good knowledge and was increased to 122(61.0%) in post test.

The pre test mean knowledge of staff nurse regarding CAUTIs was 13.68 whereas post test knowledge score was 16.5 and was statistically significant with p-value <0.0001.

And 198(99.0%) of the staff nurse had good practice before intervention and it was reduced 150(75.0%) after intervention. Only 2(1.0%) staff nurse had excellent practice regarding CAUTIs before intervention and as increased to 50(25.0%) after intervention.

The mean pre-test practice of staff nurse regarding CAUTIs was 72.17 whereas post test mean practice score was 83.04 and was statistically significant with p-value < 0.000.

Table 3: Comparison of Incidence of among the patients before and after evidence based Practice protocol (EBPP)

SI. No	Ward	Before EBPP		After EBPP	
		N	CAUTI	N	CAUTI
1	Medical Ward	45	06	40	03
2	Surgical Ward	60	05	50	02
3	Intensive care Unit	15	02	05	00
4	Post-Operative Ward	20	03	10	00
5	Emergency Ward	40	04	30	02
Total		180	20(11.1%)	135	07(5.3%)

Table 3 revealed that out of 60 patients in surgical ward, 5 had CAUTI before protocol and it was reduced to 2 patients out of 50 after EBPP, in medical ward, out of 45 patients 6 had CAUTI before EBPP which was fall down to 3 patients out of 40. Regarding Intensive care unit and Post operative ward before EBPP 2 patient had CAUTI out of 15 in ICU and 3 had CAUTI out 20 in Postoperative ward, after Protocol administration out of 5 patients in ICU and 10 patients in postoperative ward none of the patient had CAUTI. Regarding emergency ward out of 40 patients 4 had CAUTI before EBPP and it was reduced to 2 patients out of 30 after EBPP. It reveals that out of 180 patients, 20 patients had catheter associated urinary tract infection (CAUTI) before administration of EBPP. The overall incidence rate of CAUTI was 20(11.1%). After EBPP out of 135 patients incidence rate of CAUTI was 07(5.3%).

From the above Table 4, it was clear that pre test knowledge of the staff nurse regarding CAUTIs was not associated with socio demographic variables such as age, gender, work experience and CNE program but it was highly associated with educational qualification and area of specialty. And pre test practice of the staff nurse’s regarding CAUTIs was not associated with any of the socio demographic variables.

Discussion

CAUTI is a very challenging risk factor among hospital acquired infection. Enhancing knowledge and level of practice among health professionals would helps to prevent this problem. This quasi experimental one group pretest posttest study was conducted to prevent catheter associated urinary tract

infections (CAUTIs) in adult critical care patients, by using evidence based practice protocol. Total 200 staff nurses were included for this study. The study findings reveals that the overall incidence rate of CAUTI in adult critical care patients was 11.1% before administration of evidence based practice protocol. The results of the study shows that in pretest, 46(23%) had poor, 131(65.5%) had moderate level, 23(11.5%) had good knowledge and 198(99%) shown good level and only 02(1%) excellent level of practice. The present study was supported by another study conducted by Anns M. Benny, Anju S. Indiculla, and Annamary Kanjumon to assess the nurses’ knowledge on prevention of Catheter Associated Urinary Tract Infection in a selected hospital of Mangaluru. Total 235 staff nurses working in medical college hospital with National Accreditation Board of Hospitals were involved. Structured knowledge questionnaire was used to assess nurses’ knowledge on CAUTI. The result of this study shows that majority of nurses (80.85%) had average knowledge and few (7.23%) nurses had high knowledge regarding CAUTI. Study concludes that the knowledge of Nurses on prevention of CAUTI and indicated that nurses had an average knowledge.¹⁰ In the post test of present study, 2(1%) had poor, 64(32%) had moderate level, 122(61%) had good knowledge, 12(6%) had Excellent knowledge and 150(75%) shown good level and only 50(25%) excellent level of practice. Pre test mean knowledge of staff nurse regarding CAUTIs was 13.68, whereas post test knowledge score was 16.5 and was statistically significant with p-value <0.0001. The findings of post test confirmed that the effectiveness of evidence based practice protocol in terms of significantly improve the knowledge and practice of staff nurses and also reduce the incidence of CAUTI

Table 4: Association between level of knowledge and practice of study participants regarding CAUTIs with their Socio-demographic Profile

Variables	Pre-Test Knowledge Level			Chi-square	df	P-value	Variables	Pre-test Practice Level		Chi-square	df	P-value
	Good	Medium	Poor					Good	Excellent			
Age							Age	Good	Excellent			
22-35	18	36	06				22-35	59	01	1.17	3	0.76
36-45	17	41	09				36-45	66	01			
46-55	08	42	04	7.79	6	0.253	46-55	54	00			
55 & above	03	12	04			(NS)	55 & above	19	00			(NS)
Gender	Good	Medium	Poor				Gender	Good	Excellent			0.35
Male				3.412	2	0.18	Male	00	59		1	(NS)
Female	31	90	20			(NS)	Female	02	139	0.84		
Educational Qualification	Good	Medium	Poor				Educational Qualification	Good	Excellent			
GNM	10	44	08				GNM	60	02		3	
B.Sc(N)	17	52	10				B.Sc(N)	79	00			
PB.BSc(N)	10	29	05	13.97	6	0.03	PB.BSc(N)	44	00	4.49		0.21
MSc(N)	09	06	00			(S*)	MSc(N)	15	00			(NS)
Specialty Area	Good	Medium	Poor				Specialty Area	Good	Excellent			
Medical Ward	06	40	10				Medical Ward	56	00			
Surgical Ward	18	32	04				Surgical Ward	53	01			
Intensive care Unit	11	34	04	16.25	8	0.03	Intensive care Unit	49	00			
Post-Operative Ward	05	18	05			(S*)	Post-Operative Ward	27	01			
Emergency Ward	06	07	00				Emergency Ward	13	00	3.45	4	0.48
Work Experience							Work Experience	Good	Excellent			
0-3	18	36	06			0.28	0-3	59	01			0.55
7-9	17	41	09			(NS)	7-9	66	01	1.17	2	(NS)
≥ 10	11	54	08	5.05	4		≥ 10	73	00			
CNE Program							CNE Program	Good	Excellent			
Yes	14	33	04	1.39	2	0.49	Yes	51	00			0.40
No	32	98	19			(NS)	No	147	02	0.69	1	(NS)

among critical care patients. Mariam Sabry Shaheb conducted a quasi-experimental study to evaluate the impact of protocol of care of catheterization on nurses. 50 staff nurses working with patients undergoing for urinary catheterization were assessed for knowledge. The results shows that the knowledge of staff nurses was (28%) in pre test, (100%) immediately after the administration of protocol and (98%) 3 months after and (96%) 6 months after the protocol intervention. The study suggest that providing ongoing in-service education for nurses to update knowledge related to care of catheterized patients.¹¹

Recommendations

- Several experts and organizations have published guidelines or recommendations on the identification, management and prevention of catheter associated urinary tract infections (CAUTIs).
- A similar study can be conducted on a large sample may help to draw more definite conclusions and make generalization.
- Our study highlighted the importance of the use of the urethral catheters only for appropriate indications, sterile techniques for insertion and necessary for continuous assessment, and maintenance of a sterile, continuously closed drainage system that allows unobstructed urine flow.

Conclusion

Prevention is the main step against CAUTI. Priorities with proven value are the appropriate use and early removal of catheters, aseptic insertion, and the maintenance of a closed urinary drainage system. Infection control programs must develop, implement, and monitor policies and practice to minimize infections associated with use of these devices. A major focus of these programs should be to limit the use of indwelling urethral catheters, and to remove catheters promptly when no longer required.

Conflict of Interest: We declare that there is no conflict of interest

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