



Planned Teaching Intervention and Its Effect on Catheter-Associated UTI Prevention: Evidence from Nursing Officers in Sambalpur

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Abstract

Background of the Study: Catheter-associated urinary tract infections (CAUTIs) constitute a significant portion of healthcare-associated infections, impacting morbidity, hospital stay, and mortality. Adherence to infection prevention guidelines can mitigate CAUTIs. This study investigated the "Effect of planned teaching program on prevention of urinary tract infection in patients with indwelling urinary catheter among nursing officers at selected hospital, Sambalpur."

Objectives: To assess the impact of a planned teaching program on urinary tract infection prevention among nursing officers at selected Sambalpur hospitals with indwelling catheters. To examine the relationship between nursing officers' post-test knowledge scores and demographic characteristics.

Methodology: The study employed a pre-experimental design, a quantitative approach, and a self-structured questionnaire to evaluate Nursing Officers' knowledge of UTI prevention in patients with indwelling catheters. Participants were selected through purposive sampling. Subject: 60 nurses from the ICU, Medicine Ward, and Surgery Ward participated. A Self-Structured Questionnaire was used to collect data. Section A includes 8 socio-demographic items. Section B comprises 30 Self-Structured Questionnaire items related to catheter-associated UTI.

Data analysis: Most nursing officers in this study were aged 31-40 years, including both men and women, mainly Hindu and literate. The majority (78.3%) held GNM qualifications, with 20% having P.B.B.Sc. and 1.7% M.Sc. Nursing degrees. Most had prior knowledge of catheter-associated urinary tract infections (CAUTI), and 60% were married. Post-test knowledge on risk factors and prevention of CAUTI improved to 20.31% from a pre-test score of 15.95%, showing that systematic education was effective. The paired t-test ($t = 6.94$, $P < 0.05$) confirmed significant knowledge gain after the teaching program. Post-test knowledge was significantly associated with the Working Department ($\chi^2 = 11.43$) and Marital Status ($\chi^2 = 8.43$), while age, gender, religion, educational qualifications, previous CAUTI knowledge, and source of knowledge showed no significant association. This suggests that the department and marital status influenced knowledge improvement after the program.

Conclusion: Nursing officers should be educated on preventing catheter-associated urinary tract infections in patients with indwelling catheters. Enhanced monitoring and accountability through feedback and audits can improve hand hygiene and cleaning practices, thereby creating a safer workplace and reducing the risks of catheter-associated urinary tract infections. Indwelling catheters, catheter-associated urinary tract infection, infection control, and aseptic methods.

Keywords: Catheter-Associated Urinary Tract Infection, Indwelling Urinary Catheter, Planned Teaching Programme, Nursing Officers, Infection Prevention

Introduction

Indwelling urinary catheterisation is a routine clinical practice that nurses undertake in both hospitals and the community. Approximately 12%-16% of patients require this procedure during their hospital stay, with a higher prevalence among those admitted to specialised intensive care units.⁽¹⁾ Catheter-associated urinary tract infections (CAUTI), obstructions, urine leakage, dislodgement, haematuria, and urethral trauma are common. These complications related to catheter use can lead to visits to the emergency department, extended hospital stays, greater antibiotic consumption, and add to the strain on patients and the healthcare system..^(2,3)

Nurses, the largest health workforce, oversee the health system and are well-suited to coordinate and deliver quality patient-centered care, including catheter self-management. Indwelling catheter (IDC) management knowledge and skills vary among nurses..^(1,4) Indwelling urinary catheters are frequently associated with catheter-associated urinary tract infections (CAUTIs). Catheter management is a critical aspect of the responsibility of nurses in the prevention of CAUTI. This study evaluates the knowledge of nurses and the factors that influence

their adherence to best practices. 21 high-quality studies were selected from 397 articles in a systematic review that adhered to the PRISMA guidelines. The results indicate that nurses have a sufficient level of knowledge and skills, despite the fact that their educational backgrounds are highly diverse. In-service training and self-learning facilitate prevention, while barriers include age, gender, experience, resources, and work environment. It is imperative to enhance the knowledge of nurses and implement evidence-based interventions in order to decrease the incidence of CAUTI and improve patient outcomes.⁽⁵⁾

CAUTI is still a big problem in medicine around the world. In China, where CAUTI is still a major and hard to control clinical illness, especially in high-risk groups like ICU and postoperative patients, the situation is very worrying. Even though there are many ways to keep CAUTI from happening, the rate of it happening in Chinese ICUs is still too high. This shows that we need better models for how to help right away. It has been proven that CAUTI is a multi-factor infection because it is marked by positive cultures of urinary tract infections that last more than 48 hours. Repeated catheterisation, long-term use of antibiotics, bad medical advice for extubation, and inflammatory cascades are all things that can cause CAUTI. Out of these causes, pathogenic microorganisms getting into the bladder through the urethra is thought to be the first step in the development of CAUTI. In terms of microbiology, the pathogens linked to CAUTI are gram-negative bacilli (like *Escherichia coli* and *Klebsiella* spp.) and gram-positive cocci (like *Enterococcus* spp.). These bacteria tend to grow quickly in catheters' urinary drainage systems, which can cause infections. Notably, if you don't treat CAUTI right away, it can lead to serious problems that can kill you, like sepsis, which makes the chance of a bad outcome for the patient much higher.⁽⁶⁻⁹⁾ Urinary tract infections are among the most common healthcare-associated infections and account for a significant share of hospital infections in the United States. The main hospital risk factor is temporary use of an indwelling urinary catheter. Catheter-associated urinary tract infections (CAUTI) are the most frequent urinary tract infection in the country and cause thousands of deaths each year. Intensive care unit patients face higher CAUTI risk because indwelling urinary catheters are used more often than in general wards. Healthcare-associated infections cause substantial morbidity and mortality for patients, and direct and indirect costs that strain limited healthcare resources. Indiscriminate, inappropriate antibiotic use selects antimicrobial-resistant organisms. Movement of resistant bacteria between hospitals and communities makes it difficult to distinguish community-acquired multidrug-resistant pathogens from those acquired in healthcare settings. The most effective response is a comprehensive program including antimicrobial resistance surveillance, rational antimicrobial use, and robust infection control measures.⁽¹⁰⁾

Previous research on CAUTI prevention through educational interventions has been primarily conducted in metropolitan cities, large corporate hospitals, or Western countries, with little emphasis on smaller cities or government hospitals in eastern India, such as Odisha. Many research measured knowledge but lacked pre-experimental designs and post-intervention evaluations, or they failed to investigate relationships with demographic characteristics such as marital status and working department. There is also a lack of region-specific evidence on the efficacy of planned instruction programs adapted to local nursing cadres (e.g., largely GNM-qualified staff) and resource-limited contexts. Few research have focused on long-term knowledge retention or the integration of audit and feedback mechanisms in Indian public healthcare. This study addresses these gaps by giving localised evidence from Sambalpur.

Objectives of the Study

1. To evaluate the impact of the planned teaching program on the prevention of urinary tract infections in patients with indwelling urinary catheters among nursing officers at selected hospitals in Sambalpur.
2. To determine the correlation between the post-test knowledge score of nursing officers and the demographic variables they have chosen.

Methodology

Present study was quantitative study with pre-experimental one group pre-test and post-test design to assess the effect of teaching program on prevention of catheter associated urinary tract infection (CAUTI) among nursing officers in Intensive Care Unit, Medicine and Surgery wards of VIMSAR, Burla, Sambalpur. Purposive sampling was used to select 60 nursing officers who agreed to participate and were actively working in the specified departments. Data was collected using self-structured questionnaire in two parts: Part I consisted of socio-demographic data such as age, gender, religion, marital status, education, department, and previous knowledge of CAUTI. Part II consisted of 30 multiple-choice questions on the prevention of CAUTI in patients with urinary catheters. One mark was awarded for each correct answer with scores classified as poor (0-10), average (11-20) and good (21-30). The teaching program was developed systematically. It involved setting objectives, preparing content from literature and expert advice, designing instructional methods using lectures and discussions and using audio-visual aids like charts, posters, pamphlets and demonstrations. Content validity was established through expert review, and reliability was determined using Cronbach's alpha ($\alpha=0.83$), indicating high internal consistency. The Institutional Research Committee approved the study and informed consent was obtained from the participants with the confidentiality assured. A pilot study was conducted to test the feasibility, refine tools, and validate procedures for the main study, involving six nursing officers. Data collection took place over four weeks with pre-tests, teaching intervention and post-tests after seven days. Statistical analysis Descriptive statistics were used for demographic variables, paired t-test for knowledge improvement and chi-square test for association between post-test scores and demographic factors with P value < 0.05. This approach provided rigour, reliability and ethical integrity in the evaluation of the effectiveness of the teaching program.

Results

This chapter provides an analysis and interpretation of data collected from 60 nursing officers to assess the efficacy of a structured education program on the prevention of urinary tract infections in patients with indwelling urinary catheters at selected hospitals in VIMSAR, Burla, Sambalpur. The collected data were carefully organised, tabulated, analysed, and interpreted using both descriptive and inferential statistical techniques, in alignment with the study's aims and hypotheses. The main objectives were to evaluate the impact of the proposed training program on the knowledge levels of nursing officers and to investigate the correlation between their post-test knowledge scores and specific demographic characteristics. The results are organised into four sections: demographic features, pre- and post-test knowledge levels, comparative score analysis, and connections with demographic factors, thus offering empirical insights to guide evidence-based nursing practice.

Table 1: Distribution of samples based on the selected Demographic variables (n=60)

Demographic Variable		f	%
1. Age	a.21-30years	19	31.6
	b.31-40years	27	45
	c.41-50years	7	11.7
	d.51-60years	7	11.7
2. Gender	a. Male	10	16.7
	b. Female	50	83.3
	c. Transgender	0	0.0
3. Religion	a. Hindu	45	75
	b. Muslim	3	5
	c. Christian	12	20
4. Marital Status	a. Married	36	60
	b. Unmarried	23	38.3
	c. Widow	1	1.7
5. Educational Qualification	a. G.N.M	47	78.3
	b. P.B.B.Sc. or Basic B.Sc. Nursing	12	20
	c. M.Sc Nursing	1	1.7
6. Working Department	a. ICU	18	30
	b. Medicine Ward	22	36.7
	c. Surgery Ward	20	33.3
7. Previous Knowledge about CAUTI	a. Yes	54	90
	b. No	6	10
8. If yes then the source of knowledge from	a. Printed media	6	11.1
	b. Electronic media	5	9.2
	c. clinical or peer group experiences	43	79.7

Table – I: illustrates the demographic profile of the study sample comprising 60 nursing officers. The majority of participants were in the 31-40 years age group (45%, n=27), followed by 21-30 years (31.6%, n=19). The sample was predominantly female (83.3%, n=50), with males constituting 16.7% (n=10). In terms of religion, most respondents were Hindu (75%, n=45), followed by Christian (20%, n=12) and Muslim (5%, n=3). Regarding marital status, 60% (n=36) were married, while 38.3% (n=23) were unmarried. Educationally, the majority held a G.N.M qualification (78.3%, n=47), with 20% (n=12) possessing P.B.B.Sc. or Basic B.Sc. Nursing degrees. Participants were distributed across clinical departments, with the highest representation from the Medicine Ward (36.7%, n=22), followed by Surgery Ward (33.3%, n=20) and ICU (30%, n=18). Notably, 90% (n=54) reported having previous knowledge about Catheter-Associated Urinary Tract Infection (CAUTI), primarily derived from clinical or peer group experiences (79.7%, n=43).

Table 2: Comparison of Nursing Officers' Knowledge on Preventing UTIs in Patients with Indwelling Catheters Before and After Planned Teaching Program (n=60)

Knowledge Levels	Pre-test f	Pre-test %	Post-test f	Post-test %
Poor	7	11.7	0	0.0
Average	46	76.6	29	48.4
Good	7	11.7	31	51.6

Table 2 Comparison of level of knowledge regarding prevention of urinary tract infection in patients with indwelling urinary catheter among Nursing Officers before and after Planned Teaching Programme Pre-test results showed that the majority of the participants, 46 (76.6%) had an average level of knowledge, while 7 (11.7%) had low knowledge, and 7 (11.7%) had strong knowledge.

The result of post-test showed a significant improvement in the knowledge of the participants after the Planned Teaching Programme. 31 (51.6%) Nursing Officers had good level of knowledge, 29 (48.4%) had average level of knowledge, and none (0%) were in the bad knowledge category.

The comparison of pre-test and post-test data indicates a favourable movement in the knowledge level. The percentage of participants with high knowledge was significantly enhanced from 11.7% to 51.6% while the percentage of participants with low knowledge was decreased from 11.7% to 0%. The Planned Teaching Programme helped Nursing Officers reduce urinary tract infections in indwelling catheter patients.

Table – III: Comparison of Pre-test and Post-test Knowledge Scores on Prevention of Urinary Tract Infection among Nursing Officers (n = 60)

Assessment	Mean $\pm$ SD	Mean Difference	t-value	df	p-value
Pre-test	15.95 $\pm$ 3.72	4.36	6.94	59	<0.001*
Post-test	20.31 $\pm$ 3.32				

Table III illustrates the comparison of pre-test and post-test knowledge scores on the prevention of urinary tract infections among nursing officers. The mean pre-test knowledge score for the nursing officers was 15.95 $\pm$ 3.72, which increased to 20.31 $\pm$ 3.32 following the implementation of the planned teaching program. The mean difference in knowledge scores was 4.36. The statistical significance of this improvement was confirmed by a paired t-test (t = 6.94, df = 59, p < 0.001). These results indicate that the educational program effectively enhanced the knowledge of nursing officers regarding the prevention of urinary tract infections in patients with indwelling urinary catheters.

Table 7. Association Between Post-test Knowledge Levels and Selected Demographic Variables Among Nursing Officers on Prevention of Urinary Tract Infection (n = 60)

Demographic Variable	χ^2 Value	df	p-value	Significance
Age	1.20	3	0.75	Not Significant
Gender	0.58	1	0.44	Not Significant
Religion	2.15	2	0.34	Not Significant
Marital Status	8.43	2	0.01	Significant*
Educational Qualification	0.93	2	0.62	Not Significant
Working Department	11.43	2	<0.01	Significant*
Previous Knowledge about CAUTI	3.27	1	0.07	Not Significant
Source of Previous Knowledge†	2.32	2	0.31	Not Significant

Using the Chi-square test, Table 7 shows the relationship between Nursing Officers' post-test knowledge levels about how to avoid getting a urinary tract infection and the demographic factors they chose. The study found that marital status ($\chi^2 = 8.43$, df = 2, p = 0.01) and working department ($\chi^2 = 11.43$, df = 2, p < 0.01) were strongly connected with knowledge levels after the test (p < 0.05).

All of the p-values for the post-test knowledge levels were greater than 0.05, so there was no statistically significant link between them and age ($\chi^2 = 1.20$, df = 3, p = 0.75), gender ($\chi^2 = 0.58$, df = 1, p = 0.44), religion ($\chi^2 = 2.15$, df = 2, p = 0.34), educational level ($\chi^2 = 0.93$, df = 2, p = 0.62), previous knowledge about CAUTI ($\chi^2 = 3.27$, df = 1, p = 0.07), or where the previous knowledge came from ($\chi^2 = 2.32$, df = 2, p = 0.31).

Finally, these results show that only marital status and working department were significantly linked to the post-test knowledge levels of Nursing Officers about how to keep patients with indwelling urinary catheters from getting urinary tract infections. Basically, the results show that the planned teaching program worked the same way for most groups of people. The only things that changed were the Nursing Officers' marital status and the department where they worked.

Discussion

The results of the present study clearly indicate that the systematic training intervention increased the knowledge of the nursing officers regarding catheter-associated urinary tract infections (CAUTI). The mean knowledge score was 15.95 in pre-test and 20.31 in post-test with very significant p-value, indicating that systematic instruction is a successful method to develop awareness and practice. This is consistent with other studies that have showed the usefulness of educational interventions in reducing infection risks. For instance, a study published in the American Journal of Infection Control reported that multimodal teaching programs combined with audit and feedback interventions led to significant reductions in the incidence of CAUTIs, supporting the present study's conclusion that structured education can improve infection control outcomes.⁽¹¹⁾ Similarly, a comprehensive evaluation published in BMC Nursing revealed that nurses with higher knowledge and practice scores had lower incidence of CAUTI, necessitating continued training.⁽¹²⁾ Another similar study conducted in intensive care units in China

showed that focused nurse education significantly boosted adherence to aseptic techniques, therefore reducing infection rates,⁽¹³⁾ which is consistent with the advantages seen in Sambalpur.

However, not all research has been successful with its educational interventions. Werneburg (2022) argued that CAUTI continues to be a persistent burden despite improvements in training and standards, due to systemic challenges such as prolonged catheterisation, antibiotic resistance and budget restrictions.⁽¹⁴⁾ This means that education alone may not be enough unless accompanied by wider institutional improvements. Similarly, Chenoweth and Saint (2013) observed that interventions at the national level in the United States, such as reimbursement policies and dissemination of guidelines, had a limited measurable impact on CAUTI rates, demonstrating that improvement of knowledge does not always translate into long-term practice change.⁽¹⁵⁾ The discordant findings highlight the complexity of CAUTI prevention and emphasise the necessity for multimodal strategies including education, policy enforcement, resource allocation and ongoing surveillance.

The present study also discovered considerable relationship between post-test knowledge development and demographic factors including marital status and job department although no significant influence was identified for age, gender, religion and educational qualifications. This suggests that contextual factors, like as workload and exposure to catheterised patients, may have an impact on the effectiveness of training programs. These results are in agreement with the prior studies that highlight the importance of the work environment and personal motivation for the performance of instructional programs.

The results from Sambalpur overall contribute to the growing body of evidence that planned teaching programmes are effective in increasing nurses' awareness on CAUTI prevention, particularly in resource-limited settings. The contradictory findings show the significance of incorporating education into a broader system of infection control policies, audit mechanisms and systemic support to achieve sustained reductions in CAUTI prevalence. Future work should focus on long-term retention of knowledge, adherence to practice, and integration of feedback systems into educational interventions to ensure that improvements in patient outcomes result.

Conclusion

The study concluded that the planned teaching program was effective in improving the knowledge of nursing officers regarding the prevention of urinary tract infection in patients with indwelling urinary catheter. The mean knowledge score after the test was higher than the pre-test score indicating a significant increase in knowledge after the intervention. Most of the participants were female, married, and had GNM qualification. Many were working in medicine wards and had previous exposure to CAUTI information. Only working department was significantly associated with post-test knowledge among the selected demographic variables and age, gender, religion, marital status, educational qualification, previous knowledge and source of knowledge were not significantly associated. Overall, the results suggest that structured teaching improves nurses' knowledge and promotes safer catheter care practices. Therefore, routine educational programs and multidisciplinary efforts are required to decrease the risk of CAUTI and improve patient outcomes in hospital settings.

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