

Effectiveness of a Structured Teaching Programme on Knowledge Regarding Prevention of Urinary Tract Infections in Patients with Indwelling Catheters among Staff Nurses

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Abstract:

Background: Urinary tract infections (UTIs) account for over one-third of all healthcare-associated infections (HAIs), with approximately 75% linked directly to the prolonged clinical use of indwelling urinary catheters (CAUTIs). This secondary nosocomial bacteremia increases patient morbidity, mortality, and hospitalization costs. Frontline staff nurses play a definitive role in minimizing microbial infiltration through rigid containment protocols and specialized bundle-care management.

Materials & Methods: An evaluative quantitative approach incorporating a pre-experimental single-group pre-test/post-test research design was conducted across institutional wards at SGK Hospital and Khetan Hospital, Jaipur. A cohort of 60 registered staff nurses was selected via non-probability convenience sampling. Baseline parameters were extracted on Day 1 using a validated 30-item multi-domain structured knowledge questionnaire. The structured educational framework (STP) was administered on Day 7, followed by an identical post-test validation on Day 14.

Results: Initial diagnostics demonstrated limited baseline awareness: 30% of the cohort scored within the 'Poor' knowledge tier (0–15 marks), 60% within the 'Good' tier (15–20 marks), and only 10% scored in the 'Excellent' tier. Post-test results following the educational intervention showed a substantial intellectual shift: 91.67% of participants advanced into the 'Excellent' knowledge domain, completely eliminating the 'Poor' category. The aggregate mean performance score escalated from 16.16 (SD = 2.78) to 23.06 (SD = 2.01). The empirical paired t-test value yielded 33.1465, significantly exceeding the critical tabular threshold of 1.7668 ($df = 59$, $p < 0.05$), verifying absolute pedagogical efficacy. Chi-square analysis proved that baseline variations had no statistically significant correlation with socio-demographic variables.

Conclusion: The study strongly confirms that a Structured Teaching Programme acts as an exceptional clinical mechanism to optimize nurses' technical competencies, successfully protecting hospitalized patients from invasive cross-contamination pathways.

Keywords: Catheter-Associated Urinary Tract Infection (CAUTI), Staff Nurses, Structured Teaching Programme, Efficacy, Nursing Practice.

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INTRODUCTION

Professional nursing practice is fundamentally dependent upon an active marriage of sound theoretical concepts and standard clinical skill sets. Within modern medical environments, the excretion of physiological waste and the stabilization of systemic fluid-electrolyte baselines remain essential metrics of human vitality. This complex regulation is executed by the human urinary tract—comprising the kidneys, ureters, urinary bladder, sphincter mechanisms, and the urethra. When this vital tract faces acute anatomical obstructions or when a patient suffers from temporary or neurological voiding dysfunctions, the insertion of a mechanical urinary catheter turns into a crucial clinical necessity to preserve visceral integrity.

Although the implementation of an indwelling retention catheter serves clear therapeutic and diagnostic roles, empirical data indicates that extensive clinical overuse poses severe infectious risks. A urinary tract infection (UTI) represents a destructive microbial infiltration involving any localized section of the genitourinary apparatus. According to data reported by the National Healthcare Safety Network (NHSN), UTIs constitute the most widespread class of healthcare-associated infections (HAIs) in modern clinical settings. Alarming, approximately 75% of these nosocomial infections stem directly from an invasive urinary device, creating what is epidemiologically classified as a Catheter-Associated Urinary Tract Infection (CAUTI).

Sustained placement of residential devices directly triggers a daily bacteriuria incidence rate of 3% to 8%. Within the Indian subcontinent, CAUTIs represent the second most frequent nosocomial threat, contributing significantly to prolonged lengths of hospital stays, amplified patient morbidity, secondary bacteremia, and a 10% attributable mortality rate. The primary uropathogens responsible for these infections include endogenous bowel flora and cross-contamination variants like *Escherichia coli* (21.4%), *Candida* species (21%), *Enterococcus* (14.9%), and *Pseudomonas aeruginosa* (10%). Research shows that between 17% and 69% of all documented CAUTI cases are highly preventable through the rigid execution of structured, evidence-based infection control methods. Frontline registered nurses occupy the most critical junction to manage this risk. Consequently, optimizing their baseline mastery regarding preventative bundle protocols via target-specific educational teaching curriculums is a matter of paramount clinical significance.

OBJECTIVES:

This study evaluated the clinical baseline knowledge of registered staff nurses concerning CAUTI pathomechanics and measured the formal educational efficacy of a customized Structured Teaching Programme (STP) implemented to advance catheter optimization.

MATERIALS & METHODS

To successfully isolate the educational parameters of the intervention, an evaluative quantitative methodology utilizing a pre-experimental single-group pre-test/post-test framework (O1 → X → O2) was deployed. The physical settings chosen for data collection were the active clinical units and medical-surgical wards of SGK Hospital and Khetan Hospital, located in Jaipur, Rajasthan, India. Preliminary pilot evaluations, instrument validation matrices, and consistency measures were systematically executed from October 13, 2023, to December 10, 2023, at the Dana Shivam Hospital, Jaipur, confirming the clinical feasibility of the main tracking model.

The target research population comprised practicing healthcare professionals. The definitive study sample size consisted of 60 registered staff nurses who met the inclusion criteria: current institutional registration, active assignment within high-risk wards (ICU, Urology, Medical-Surgical units), and voluntary execution of informed consent documentation. The cohort was isolated using a non-probability convenience sampling technique based on immediate clinical accessibility.

The theoretical blueprint of the study was modeled onto Ludwig von Bertalanffy's General Systems Theory (1968). The nursing system was evaluated as an adaptive operational matrix divided into specific systemic nodes:

Input Phase: Mapping the core socio-demographic backgrounds (age brackets, professional educational degrees, years of ward experience) and establishing the initial baseline awareness levels via the structured pre-test.

Throughput / Activation Process: Executing the targeted educational curriculum, which utilized lecture discussions, PowerPoint media presentations, anatomical charts, and comprehensive procedural leaflets detailing the latest meatal care and closed-system collection workflows.

Output Phase: Calculating post-test performance scores to quantify changes in technical knowledge boundaries.

Continuous Feedback Loop: Evaluating statistical values to modify ongoing in-service educational modules.

The primary data extraction instrument was a dual-tier closed-ended questionnaire developed through extensive literature review and expert validation by a panel of seven medical-nursing specialists. Section A collected socio-demographic parameters. Section B comprised a 30-item standardized multiple-choice knowledge evaluation organized into three key fields: Anatomy and Physiology (10 items), Urinary Tract Infection Pathogenesis (15 items), and Preventative Bundle Care Management (5 items). Correct responses scored exactly 1 mark while incorrect items received 0, capping the potential score at 30. Internal reliability was established via the split-half technique using the Spearman-Brown prophecy formula, resulting in a robust reliability index of 0.92.

RESULTS AND DATA ANALYSIS

Statistical evaluation was executed utilizing both descriptive (frequencies, percentages, means, standard deviations) and inferential (paired t-test, Chi-square cross-tabulations) statistics to interpret the performance shifts of the 60 participating staff nurses.

Table 1: Frequency and Percentage Distribution of Staff Nurse Socio-Demographic Variables

S.No.	Socio-Demographic Variables	Frequency (f)	Percentage (%)
1	Age: 21–25 Years	30	50.00%
	Age: 26–30 Years	18	30.00%
	Age: 31–35 Years	8	13.33%
	Age: 36–40 Years	4	6.67%
2	Education: GNM Diploma	25	41.67%
	Education: B.Sc. Nursing	20	33.33%
	Education: Post-B.Sc. Nursing	10	16.67%
	Education: M.Sc. Nursing	5	8.33%
3	Gender: Female	33	55.00%
	Gender: Male	27	45.00%
4	Experience: 1–2 Years	26	43.33%
	Experience: 3–4 Years	16	26.67%
	Experience: 5–6 Years	10	16.67%
	Experience: 7 Years & Above	8	13.33%
5	Clinical Assignment: Intensive Care Unit (ICU)	28	46.67%
	Clinical Assignment: Medical Ward	18	30.00%
	Clinical Assignment: Operating Theatre (O.T.)	7	11.67%
	Clinical Assignment: Surgical Ward	7	11.67%
6	Primary Source: Institutional Workshops	27	45.00%
	Primary Source: Seminars & CNE	23	38.33%
	Primary Source: Medical Journals	6	10.00%
	Primary Source: Research Articles	4	6.67%

Table 2: Comparative Assessment of Pre-Test and Post-Test Knowledge Levels (N=60)

Knowledge Tier	Score Limits	Pre-Test Freq (f)	Post-Test Freq (f)	Pre % vs. Post %
Poor	00 – 15 Marks	18	0	30.00% --> 0.00%
Good	15 – 20 Marks	36	5	60.00% --> 8.33%
Excellent	21 – 30 Marks	6	55	10.00% --> 91.67%
Total Cohort	Max 30 Marks	60	60	100.00% --> 100.00%

Table 3: Paired t-test Analysis Confirming Educational Score Gains Among Staff Nurses

Testing Phase	Max Score	Mean Score	Mean %	SD	Calculated t	Statistical Inference
Pre-Test Baseline	25*	16.16	26.94%	2.78	33.1465	Highly Significant (p < 0.05)
Post-Test Follow-up	28*	23.06	38.44%	2.01		Table Critical: 1.7668 (df=59)
Net Effectiveness	3*	6.90	11.50%	0.76		

*Note: Sub-domain area scores dynamically scale up to a raw questionnaire max ceiling of 30 marks.

Because the calculated empirical t-value of 33.1465 vastly exceeds the standard tabular critical parameter of 1.7668 at a 0.05 level of significance with 59 degrees of freedom, the null hypothesis (H01) was definitively rejected. The research hypothesis H1 is accepted, proving that the post-intervention knowledge advancement was a direct consequence of the structured curriculum rather than random chance.

DISCUSSION AND IMPLICATIONS

The empirical findings compiled throughout this study reveal a critical lack of initial technical awareness among bedside staff nurses regarding CAUTI micro-pathology. This baseline deficit aligns closely with historical data documented in multi-centric surveillance projects. For example, clinical studies by Kaur et al. (2017) and Jacqueline et al. (2017) highlighted that while healthcare providers recognize the general necessity of catheterization, their structured knowledge regarding strict preventative bundle practices, closed drainage management, and the exact timing of device extraction remains unsatisfactory.

The substantial post-intervention score gain ($t = 33.1465$) confirms that interactive structured educational frameworks are exceptionally effective tools for professional skill development. By converting dry theoretical guidelines into an operational, visually engaging module, the staff nurses successfully built an active mental framework to manage invasive risk factors during their daily clinical assignments.

1 Implications for Nursing Practice and Administration

From a clinical standpoint, nurse administrators should enforce the daily application of standardized, validated catheter-care checklists based on CDC guidelines. Wards must establish rigorous surveillance measures to confirm that staff execute proper hand hygiene, maintain unobstructed downslope drainage flow, avoid unnecessary meatal irrigation, and ensure the prompt emptying of collection systems. Furthermore, clinical supervisors must act as key checks against prolonged device use by actively reminding physicians to remove residential lines the moment they are no longer clinically indicated.

2 Implications for Nursing Education and Research

In terms of professional development, these results support the inclusion of intensive, hands-on preventive bundle modules directly within undergraduate university programs and onboarding orientations for newly recruited personnel. Rather than leaving device management as a brief footnote in broad medical-surgical text chapters, academic institutions should execute interactive training drills. For future scientific inquiries, this project offers a reliable empirical reference to expand long-term longitudinal studies that monitor not only immediate text-based knowledge scores but also the real-world compliance changes of clinicians over an extended 12-to-24-month period.

CONCLUSION AND RECOMMENDATIONS

This research project successfully identified and corrected a critical clinical gap among 60 registered staff nurses regarding CAUTI preventative measures. While the pre-test scores clearly highlighted an urgent need for updated training, the implementation of the Structured Teaching Programme produced a verified, highly significant improvement in technical knowledge across all evaluated domains. Ultimately, the study underscores that simple, cost-effective, and highly organized in-service educational interventions can dramatically enhance the safety and quality of patient care within institutional settings.

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