



Research Article

Preventing Catheter-Associated Urinary Tract Infections (CAUTI) in an Acute Care Facility

Timothy C. Ortiz^{1,2*}

¹Department of Nursing, California State University San Bernardino (CSUSB), United States

²Arrowhead Regional Medical Center (ARMC), United States

*Corresponding author: Timothy C. Ortiz, Department of Nursing, California State University San Bernardino (CSUSB), United States

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Abstract

Background: Catheter-associated urinary tract infections (CAUTIs) represent a significant healthcare problem in acute care hospitals, accounting for approximately 9% of all hospital-acquired infections. Despite evidence suggesting that 65-70% of CAUTIs are preventable, they remain prevalent and are associated with increased length of hospital stay, elevated healthcare costs, and patient morbidity and mortality. **Objective:** This research study aims to examine the impact of CAUTI champion teams implementing prevention interventions on reducing CAUTI rates in an acute care hospital setting. **Methods:** A quantitative quality improvement study utilizing the Plan-Do-Study-Act (PDSA) framework was conducted in acute care facility's medical-surgical/telemetry department over 8 weeks. The study included 517 patients (264 pre-implementation, 253 post-implementation) and 15 healthcare providers. The intervention involved implementing multidisciplinary CAUTI champion teams responsible for staff education, protocol adherence monitoring, and promoting evidence-based catheter insertion and maintenance practices. Data was collected using the Knowledge and Practices Questionnaire (Teshager et al., 2022) and electronic health records. Descriptive statistics including mean, standard deviation, and range were calculated using Microsoft Excel. **Results:** The pre-implementation group demonstrated a 0% CAUTI rate among 264 patients, while the post-implementation group maintained a 0% CAUTI rate among 253 patients. Provider knowledge scores improved from a pretest mean of 68% (SD = 2%, range 50-88%) to a post-test mean of 91% (SD = 3%, range 75-100%). All 15 providers demonstrated improved scores, with 47% (n=7) achieving perfect scores post-implementation. Overall, 40 out of 517 patients (7.7%) were diagnosed with CAUTI during the study period. **Conclusions:** Implementation of CAUTI champion teams reinforced best practices, enhanced staff knowledge, and maintained zero CAUTI rates in both pre- and post-implementation groups. The significant improvement in provider knowledge scores (68% to 91%) demonstrates the educational effectiveness of the champion team model. This intervention provides a sustainable framework for infection prevention that can be replicated in other healthcare settings.

Keywords: Catheter-Associated Urinary Tract Infection; CAUTI prevention; Champion team; Quality improvement; Patient safety; Infection control

Introduction

Catheter-Associated Urinary Tract Infection (CAUTI) is a major healthcare problem recorded in many healthcare facilities, with the problem being common in acute care hospitals [1]. Research

studies show that CAUTIs account for approximately 9% of all hospital-acquired infections [1,2]. Despite the high prevalence of CAUTIs in healthcare facilities, clinical studies show that 65-70% of CAUTIs are preventable [1-3]. It should further be emphasized that CAUTIs account for up to 40% of the two million healthcare-associated infections occurring each year in the United States.

CAUTIs are associated with detrimental patient and clinical

outcomes, including increased length of hospital stay, increased cost of care, patient morbidity and mortality, and reduced patient satisfaction [1,4]. Werneburg (2022) [5] explains that healthcare costs associated with CAUTIs range between \$115 million to \$1.82 billion annually. Additional complications include sepsis, endocarditis, unnecessary antimicrobial use, and the development of multidrug-resistant bacteria [6,7].

The purpose of this research study was to examine the impact of CAUTI champion teams implementing prevention interventions to reduce CAUTI rates in acute care hospitals. This intervention was informed by the existence of a gap in CAUTI prevention practices, particularly the lack of physicians and nurse champions in acute care settings [8]. The clinical question guiding this study was: Among hospitalized patients in acute care hospital (P), does CAUTI champion teams implementing CAUTI prevention initiatives (I), compared to staff nurse usual care (C), result in reduced CAUTI rates (O) within 2 months (T)?

Materials and Methods

Study Design and Theoretical Framework

This quality improvement study utilized quantitative research design with pre- and post-implementation measurements. The study was guided by Florence Nightingale's infection control theory, which advocates for workforce collaboration in the prevention of healthcare-acquired infections [9]. This theoretical framework emphasizes interdisciplinary collaboration among infectious disease physicians, microbiologists, pharmacists, infection control preventionists, and epidemiologists to prevent hospital-acquired infections such as CAUTIs.

The Plan-Do-Study-Act (PDSA) framework was employed to structure the improvement process. This evidence-based practice framework was selected because it provides a step-by-step approach to implementing quality improvement initiatives and has been successfully used by CAUTI taskforces to implement infection reduction initiatives [1,10].

Setting and Participants

The study was conducted at acute care facility's medical-surgical/telemetry department in California. The target population included healthcare workers (medical-surgical/telemetry nurses, physicians, and other healthcare professionals) and patients in the acute care setting.

Inclusion criteria for healthcare providers: (1) employed in the medical-surgical/telemetry department, (2) voluntary participation, and (3) provided informed consent. A total of 15 healthcare providers completed both pre- and post-implementation knowledge assessments.

Patient population: A total of 517 patients were included in the data collection (264 in the pre-implementation group, 253 in the post-implementation group). No demographic characteristics were collected from patients to maintain anonymity and protect patient privacy in accordance with HIPAA regulations.

Intervention

The intervention involved implementing multidisciplinary CAUTI champion teams composed of physicians, nurses, and nurse managers. Their responsibilities included executing bundled CAUTI prevention initiatives, providing targeted education to front-line healthcare teams, empowering nurses with automatic stop orders for catheter use, implementing standardized checklists for catheter insertion and maintenance, monitoring compliance with prevention bundles, and ensuring proper hand hygiene during catheter procedures. A team leader guided the group and monitored implementation to ensure all requirements were met. Participation was voluntary to minimize conflicts and internal resistance that could compromise study objectives [11].

Timeline

The study was conducted over 8 weeks (2 months), running from the time authorization was received from the hospital's administration through to study completion and outcome evaluation.

Instruments and Data Collection

Data was collected using two primary methods:

Healthcare provider knowledge was assessed using a pretested, self-administered semi-structured questionnaire adapted from Teshager et al. [12]. This 8-item instrument evaluated knowledge of indications for catheterization, proper insertion techniques, catheter removal timing, management of obstructed catheters, CAUTI prevention practices, risk factors, high-risk patient populations, and complications of CAUTI. The instrument demonstrated validity through face validity methods and reliability with a Cronbach's alpha of 0.77 [12].

Electronic Health Records (EHR)

During the pre-implementation phase, hospital administration authorization was obtained, and baseline CAUTI rates along with current prevention measures were requested. After obtaining informed consent from all participants, the pre-test Knowledge and Practices Questionnaire was administered to healthcare providers. Baseline patient data were collected from 264 patients, with information extracted from electronic health records including CAUTI incidence, duration of catheterization, reasons for catheter use, catheter care techniques, symptoms experienced, and patient education provided. These data established the foundation for evaluating the intervention's impact.

Implementation

During the implementation phase, CAUTI champion team interventions were executed, including staff education sessions and close monitoring of protocol adherence, with all procedures documented. In the post-implementation phase, the Knowledge and Practices Questionnaire was re-administered to assess provider knowledge changes. Post-implementation patient data were collected from 253 patients, and electronic health records were reviewed to determine CAUTI rates. All data were compiled and analysed using descriptive statistics (mean, standard deviation, range) in Microsoft Excel. Data were reviewed for completeness and accuracy prior to analysis to ensure reliability of results.

Descriptive statistics including mean, standard deviation, and range were calculated using Microsoft Excel. Due to limited familiarity with SPSS, Excel spreadsheets were used for all calculations. Data were reviewed for correctness, completeness, and accuracy prior to analysis to prevent incomplete or missing data from compromising results.

Data was compiled on N = 517 patients. The number of CAUTI cases was collected in the pre-implementation group (n = 264, representing staff nurse usual care) and post-implementation group (n = 253, following CAUTI champion team intervention). Frequencies and rates were calculated overall and weekly.

Ethical Considerations

This study received approval from the Arrowhead Regional Medical Center Institutional Review Board. All ethical requirements outlined by the institution was maintained throughout the study.

Specific ethical measures included

Several ethical measures were implemented to protect participant rights and welfare throughout the study. Written informed consent was obtained from all participants prior to enrolment, and

participation was strictly voluntary with the option to withdraw at any time without consequence. All participant data were anonymized to protect identities, and Protected Health Information (PHI) and personally identifiable information (PII) were handled in full accordance with HIPAA regulations. Data were securely stored using password-protected computers and HIPAA-compliant platforms [13]. No coercion or compulsion was used in participant recruitment, and all individuals were given the opportunity to ask questions throughout the study period. Additionally, all data collection instruments omitted identifying information to maintain confidentiality. These measures ensured that the study was conducted ethically and with the highest regard for participant privacy and autonomy.

Results

Patient Outcomes

A total of 517 patients were included in the study (264 pre-implementation, 253 post-implementation). Overall, no cases of CAUTI were diagnosed among the 517 patients during the study period.

Catheter characteristics: Indwelling catheters were used in 38% of patients, while intermittent catheters were used in 62%. The average duration of catheterization was 3 days. Primary reasons for catheterization included post-surgical care (42%), urinary retention (35%), and ICU admission (23%).

CAUTI Rates

The pre-implementation group (staff nurse usual care) demonstrated a 0% CAUTI rate among 264 patients over seven weeks. The post-implementation group (CAUTI champion team) also demonstrated a 0% CAUTI rate among 253 patients over 8 weeks (Table 1, Figure 1). Both standards of care resulted in a CAUTI rate of 0% pre- and post-implementation.

	Pre-implementation			Post Implementation		
	(n = 264)			(n = 253)		
Demographic	n		%	N		%
Number of CAUTI Documented in the Medical Record	0		0%	0		0%
Note: N = 517						

Table 1: Frequencies of CAUTI.

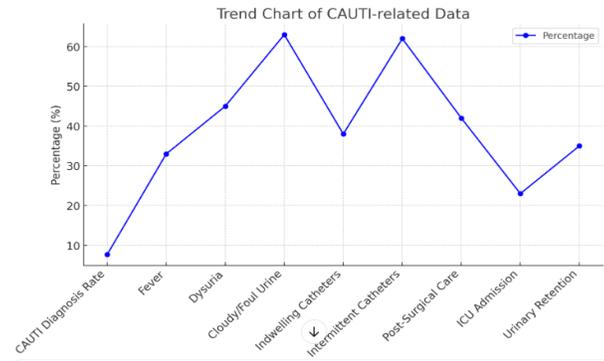


Figure 1: Provider Knowledge Outcomes.

Fifteen healthcare providers completed both pre- and post-implementation knowledge assessments using the 8-item Knowledge and Practices Questionnaire. The mean score on the pretest was 68% (SD = 2%) with a range of 50-88%. The mean score on the post-test was 91% (SD = 3%) with a range of 75-100% (Table 2).

Baseline characteristic	Pre-implementation			Post-implementation		
	Mean	SD	Range	Mean	SD	Range
Knowledge Survey	0.68	0.02	50 – 88%	0.91	0.03	75% - 100%

Note. N = 15 providers

Table 2: Comparison of Pre- and Post-Implementation Knowledge Scores.

All 15 providers demonstrated improved scores from pre- to post-implementation. Seven of the 15 providers (47%) achieved perfect scores (100%) on the post-implementation assessment (Figure 2).

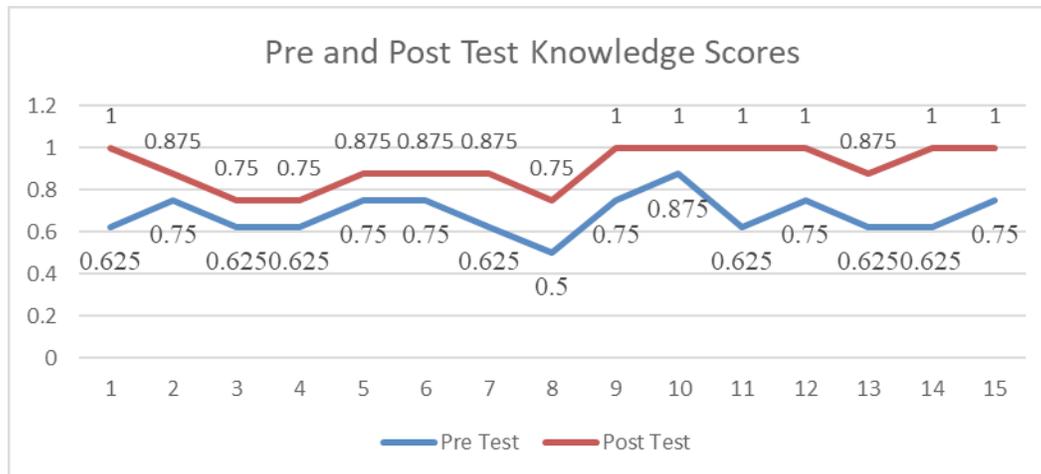


Figure 2: Line Graph of Pre- and Post-Test Provider Knowledge Scores.

Clinical Significance

Clinical significance was demonstrated by the maintenance of zero CAUTI rates in both pre- and post-implementation groups, coupled with substantial improvement in provider knowledge scores (68% to 91%). As note, clinical significance is important in determining whether changes have meaningful implications for practice. The improvements observed in this study are sufficiently large to have practical applications in clinical settings for reducing CAUTI incidence.

Discussion

This research study examined the impact of CAUTI champion teams implementing prevention interventions on CAUTI rates in an acute care hospital. The findings demonstrate that implementation of CAUTI champion teams reinforced best practices, enhanced staff knowledge, and maintained zero CAUTI rates in both pre- and post-implementation groups.

Interpretation of Findings

The 0% CAUTI rate in both groups, while not showing a statistical difference due to pre-existing low rates, indicates that the existing standard of care was already effective in preventing CAUTI. However, the substantial improvement in provider knowledge scores from 68% to 91% demonstrates the educational effectiveness of the champion team model. This knowledge enhancement is critical for sustaining low infection rates and ensuring consistent adherence to evidence-based protocols.

The finding that 47% of providers achieved perfect scores post-implementation suggests that the champion team intervention successfully reinforced CAUTI prevention knowledge. These results align with previous research by Teshager et al. [12] who found statistically significant relationships between nurse knowledge and reduced CAUTI rates, and recommended ongoing nurse education for CAUTI prevention.

Comparison with Existing Literature

The findings of this study support the existing body of evidence on effective CAUTI prevention strategies. Gupta et al. [14] highlighted the importance of empowering front-line nurses with automatic stop orders and ensuring compliance with catheter insertion and maintenance bundles-strategies that were central to this study's intervention. Similarly, Podkovic et al. [15] emphasized nurse education on appropriate catheter use and staff training on sterile insertion techniques, which were reinforced through the champion team model.

The improved provider knowledge outcomes align with Chiwaula et al. [16], who recommended providing CAUTI prevention guidelines to nurses, and Li et al. [17], who emphasized improving

nurse knowledge to support CAUTI prevention evidence-based practices.

The identification of risk factors in this study's patient population including prolonged catheterization, female gender, and comorbidities such as diabetes corresponds with findings from multiple studies [18-22].

Theoretical Framework Integration

Florence Nightingale's infection control theory, which emphasizes workforce collaboration in preventing healthcare-acquired infections [9], provided an appropriate foundation for this study. The multidisciplinary CAUTI champion teams exemplified the collaborative approach advocated by Nightingale, bringing together physicians, nurses, and nurse managers to implement evidence-based prevention strategies.

The PDSA framework proved valuable for structuring the improvement process, consistent with its successful use by other CAUTI taskforces [1,23]. The iterative testing of changes through the PDSA cycle allowed for refinement of educational materials and protocol adherence recommendations.

Implications for Practice

Theoretical Implications

The findings support the implementation of structured leadership and accountability in clinical practice to enhance adherence to infection prevention strategies. The CAUTI champion model aligns with established theories of change in healthcare, demonstrating that organizational support, education, and team-based interventions improve compliance with evidence-based guidelines.

Practical Implications

This study underscores the significance of implementing leadership-driven initiatives to foster a culture of safety and enhance adherence to infection control protocols. By involving nurse and physician champions, the study contributed to sustained compliance with CAUTI prevention practices. This model can be replicated in other healthcare settings to promote best practices and ensure continuous staff education.

Future Implications

Future implementations of the CAUTI champion model should explore its impact over longer durations and in healthcare settings with varying baseline CAUTI rates. Continuous staff training and reinforcement strategies are needed to maintain high compliance levels. Healthcare systems should conduct ongoing surveillance and periodic reassessment to sustain positive outcomes.

Limitations

This study has several limitations. It was conducted at a single medical center, limiting generalizability to other settings. The 8-week implementation period was too short to assess long-term sustainability. Pre-existing low CAUTI rates prevented demonstration of statistical improvement. Excel was used for data analysis instead of more sophisticated statistical software due to limited SPSS familiarity. The small provider sample (n=15) limits the strength of conclusions. Finally, the lack of qualitative data means healthcare worker perspectives on the intervention's effectiveness were not explored. Future studies should address these limitations through multi-site designs, longer follow-up periods, larger samples, and mixed methods approaches.

Barriers Encountered

Consistent with previous research [24,25], potential barriers to CAUTI prevention identified in this study included insufficient nurse knowledge, increased workload among nurses, negative attitudes toward evidence-based change, lack of authority to implement changes, and communication barriers among healthcare providers [26-29]. The champion team model helped address several of these barriers by providing clear leadership and protocol guidance.

Conclusions

This research study successfully demonstrated that implementation of CAUTI champion teams can enhance provider knowledge and maintain low CAUTI rates in acute care settings. The significant improvement in provider knowledge scores from 68% to 91% indicates that the champion team model effectively reinforces evidence-based CAUTI prevention practices.

The findings reinforce the contention that structured leadership-driven initiatives foster a culture of safety and enhance adherence to infection control protocols. The CAUTI champion model provides a sustainable framework for infection prevention that can be replicated in other healthcare settings to improve patient outcomes.

Recommendations for Practice

To sustain and enhance CAUTI prevention efforts, hospitals should implement a comprehensive and integrated approach. This begins with embedding CAUTI champions into infection control committees and quality improvement initiatives to ensure that prevention remains a sustained organizational priority. Regular refresher training for all healthcare providers is essential to reinforce evidence-based practices and maintain high levels of knowledge and competency. Hospitals must also establish real-time feedback mechanisms and conduct periodic audits to promote

accountability and identify areas for improvement in a timely manner. Equally critical is securing institutional support and leadership commitment, as this drives the cultural shift necessary for lasting change. Adequate funding must be allocated for ongoing staff education and the resources needed to support these efforts. Finally, continuous surveillance and periodic reassessment should be conducted to monitor progress, adapt to emerging challenges, and ensure that CAUTI prevention strategies remain effective over time. Together, these measures create a robust framework for reducing CAUTI rates and improving patient safety across healthcare settings.

Author Contribution Statement

Timothy C. Ortiz conceptualized the study, designed the methodology, obtained institutional approvals, implemented the intervention, collected and analysed data, and prepared the manuscript.

Ethics Approval Statement

This study received approval from the Arrowhead Regional Medical Center Institutional Review Board. All procedures performed were in accordance with the ethical standards of the institutional research committee.

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Data Availability Statement

Data generated during this study are available from the corresponding author upon reasonable request.

Conflict of Interest Statement

The author declares no conflict of interest.

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