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## Staff Education for Catheter-Related Urinary Tract Infection Prevention in Intensive Care

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# Walden University

College of Nursing

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Ascar Boinett

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Executive Summary: Staff Education Project

Staff Education for Catheter-Related Urinary Tract Infection Prevention in Intensive Care

by

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## Summary

This doctor of nursing practice (DNP) staff education project was conducted to address inconsistent adherence to catheter-associated urinary tract infection (CAUTI) prevention bundles in an adult intensive care unit (ICU). CAUTIs remain a leading cause of morbidity, extended hospital stays, and increased healthcare costs. The project aimed to improve nurses' knowledge and attitudes regarding CAUTI prevention through structured education and the integration of daily catheter reassessment checklists into practice. A quantitative pretest–posttest design was used to measure changes in participants' knowledge and attitudes following two 45-minute educational sessions. Forty-two ICU nurses participated in the intervention. Data were analyzed using descriptive and inferential statistics, including paired *t* tests and effect size calculations. Results showed statistically significant improvements. Knowledge scores increased from a mean of 6.38 (*SD* = 1.27) to 9.05 (*SD* = 0.62) in a statistically significant way,  $t(41) = -12.584, p < .001$ . Attitude scores improved from 36.33 (*SD* = 1.82) to 46.36 (*SD* = 1.51),  $t(41) = -28.913, p < .001$ . All individual attitude items also demonstrated statistically significant gains, indicating enhanced perceptions of teamwork, confidence, and accountability in CAUTI prevention,  $p < .001$ . Sustaining the improvement will require ongoing education, competency validation, and regular audit feedback. Overall, the project demonstrates that nurse-driven education can produce measurable improvements in clinical practice and contribute to positive social change by reducing infection rates, improving patient outcomes, and promoting a culture of safety and professional accountability within critical care nursing.

## **Background**

CAUTI remains one of the most common healthcare-associated infections in adult critical care units, contributing to increased morbidity, prolonged hospital stays, and higher healthcare costs. Despite the availability of evidence-based CAUTI prevention bundles, inconsistent adherence to established protocols continues to challenge patient safety and quality outcomes. A recent internal review at the project site revealed variability in catheter maintenance practices and limited daily reassessment of catheter necessity. These findings indicate a gap in staff knowledge and compliance with CAUTI prevention guidelines.

The purpose of this DNP staff education project was to improve nursing compliance with prevention protocols through structured staff education, implementation of a multimodal CAUTI prevention bundle, and integration of daily catheter checklists into workflow and the electronic medical record (EMR) system, ultimately improving CAUTI rates. The project question guiding this initiative was: In hospitalized adult patients with indwelling urinary catheters, how effective is structured staff education of nurses in adult critical care units on CAUTI prevention bundles to improve staff knowledge, skills, and attitudes?

The background evidence strongly supports the role of education and nurse-driven protocols in reducing CAUTI incidence. Tyson et al. (2020) demonstrated that nurse-driven removal protocols decrease catheter use and infection rates in surgical ICUs. Similarly, Su (2025) conducted a meta-analysis confirming significant reductions in catheter utilization with nurse empowerment interventions. Rosenthal et al. (2024) found that a nine-component CAUTI bundle was effective in lowering infection rates across 32

countries. Additional studies by Whitaker et al. (2023) and Gray et al. (2023) showed that combining education with checklist auditing and continuous feedback sustains adherence and reduces infection rates. The strength of evidence is high, based on multiple meta-analyses, randomized controlled trials, and large-scale quality improvement studies, validating the need for structured staff education and monitoring interventions to achieve sustained CAUTI reduction.

### **Staff Education Project Development**

The staff education project was developed in collaboration with key stakeholders, including the quality improvement team, nurse managers, clinical educators, and bedside nurses in the adult critical care unit. Leadership support and strong organizational readiness facilitated the planning and implementation phases. The project targeted all ICU nurses responsible for catheter insertion, maintenance, and documentation.

Two live, in-person education sessions were conducted in October 2025, each lasting approximately 45 minutes to accommodate different nursing shifts. The sessions included didactic instruction, practical demonstrations of aseptic catheter insertion and maintenance, and the use of the daily catheter checklist. A pretest–posttest design was used to assess changes in participants’ knowledge and attitudes regarding CAUTI prevention. Participants also completed a competency checklist during training to validate procedural skills.

Data collection included pre- and post-intervention surveys and competency evaluations. Quantitative data were analyzed descriptively and inferentially to determine mean changes in knowledge and attitude scores using SPSS V.31. Qualitative feedback

from participants was also reviewed to identify perceived barriers and facilitators to bundle adherence.

The evaluation of the project was guided by a Likert-type scale to assess attitudes toward training effectiveness, learning outcomes, behavioral changes, and early organizational impact (see Appendix). The expected outcomes included improved staff knowledge and skills, increased compliance with daily catheter reassessment, and a subsequent reduction in CAUTI incidence rates in the critical care unit. The collaborative, evidence-informed approach ensured alignment with institutional infection prevention goals and national patient safety standards.

### **Results**

Pre- and posttest data were analyzed using descriptive and inferential statistics to evaluate changes in nurses' knowledge and attitudes toward CAUTI prevention. Knowledge was assessed with a 10-item instrument administered as a pretest and a posttest identical to the pretest; each correct response contributed 1 point to the total knowledge score (possible range = 0–10). Attitudes toward CAUTI prevention were measured using a 10-item Likert scale (1 = *strongly disagree* to 5 = *strongly agree*) and summed to form a total attitude score (range = 10–50). A competency skills checklist was used during training to confirm procedural ability, but it is not included in the quantitative analyses reported here.

The descriptive statistics show marked improvements in both knowledge and attitudes from pretest to posttest. Knowledge scores increased from a mean of 6.38 ( $SD = 1.27$ ) to 9.05 ( $SD = 0.62$ ). Attitude scores improved from 36.33 ( $SD = 1.82$ ) to 46.36 ( $SD = 1.51$ ).

Paired-samples  $t$  tests demonstrated statistically significant increases in both domains: knowledge ( $t(41) = -12.584, p < .001$ ) and attitudes ( $t(41) = -28.913, p < .001$ ). Each of the 10 individual attitude statements also showed significant improvement ( $p < .001$ ), suggesting broad enhancement in perceptions of responsibility, teamwork, and confidence regarding CAUTI prevention practices.

Descriptive statistics were computed for total knowledge and total attitude scores ( $N = 42$ ). Knowledge scores increased from a pretest mean of 6.38 ( $SD = 1.27$ ) to a posttest mean of 9.05 ( $SD = 0.62$ ). Attitude totals increased from a pretest mean of 36.33 ( $SD = 1.82$ ) to a posttest mean of 46.36 ( $SD = 1.51$ ).

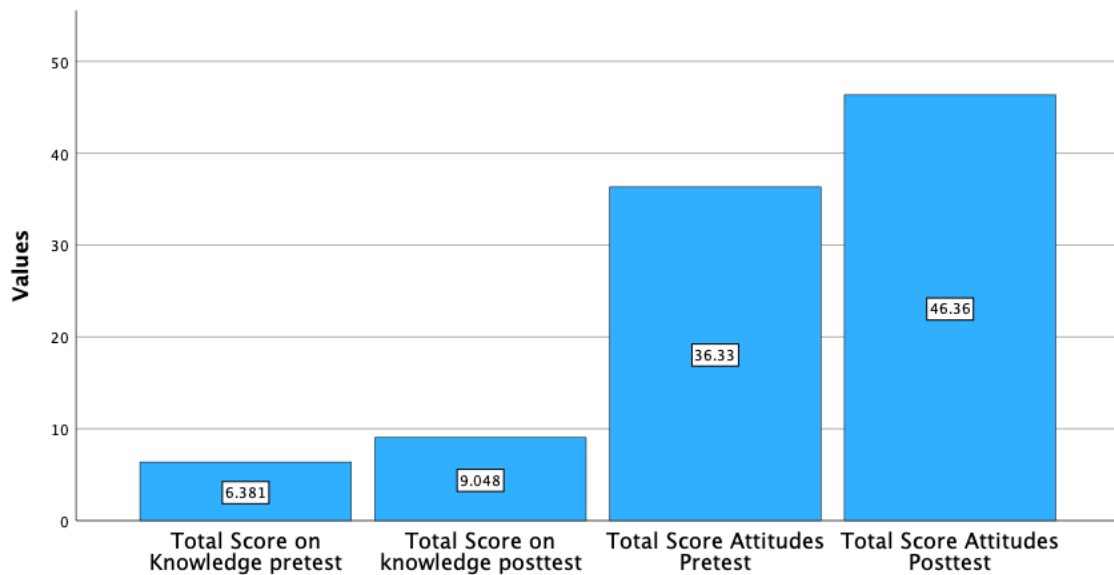
Paired-samples  $t$  tests were used to evaluate pre–post change because the same participants were measured before and after the educational intervention and the data were approximately normally distributed. Inferential results indicated statistically significant and practically meaningful improvements. For knowledge, the mean difference (pre–post) was  $-2.667$  (95% CI [ $-3.095, -2.239$ ]),  $t(41) = -12.584, p < .001$ , Cohen's  $d = 1.37$ , indicating a large effect size. For attitudes, the mean difference (pre–post) was  $-10.024$  (95% CI [ $-10.724, -9.324$ ]),  $t(41) = -28.913, p < .001$ , Cohen's  $d = 2.25$ , indicating a larger effect size when compared to the change in knowledge. In addition, each of the 10 individual attitude items showed significant pre–post improvement (all  $p < .001$ ), reflecting broad gains in confidence, perceived resources, shared responsibility, and commitment to routine catheter reassessment.

The results indicate that structured staff education, reinforced through checklists and feedback sessions, is highly effective in improving both cognitive and affective

learning outcomes among ICU nurses. Figure 1 displays the pre/post changes in total knowledge and attitude scores, visually highlighting the magnitude of improvement.

**Figure 1**

*Descriptive Statistics Knowledge and Attitude Pre to Post*



The impact on the organization has been positive, as evidenced by the sample of 42 participating nurses and by strong support from nursing leadership and infection control. The competency checklists used in the project identified only a few opportunities for improvement, and the staff's comments were largely positive. Finally, a limitation was noted: Close to 60 nurses were working in the ICU, and although education was provided to more than half, there are clear indications for continued educational efforts, as well as auditing, to ensure that both process and outcome indicators are positively affected.

## **Conclusions**

Implementation of the structured CAUTI prevention education led to substantial improvement in nursing knowledge and attitudes. The initiative enhanced nurses' awareness, confidence, and shared accountability in preventing CAUTIs.

Organizationally, this project strengthened infection control culture, improved interdisciplinary collaboration, and aligned with institutional goals for zero preventable infections.

Continued reinforcement through quarterly education, ongoing audits, and integration of the daily catheter checklist into the EMR system is recommended to sustain gains. These findings contribute to nursing practice by validating education-based quality improvement interventions as effective mechanisms for improving patient safety outcomes and reducing healthcare-associated infections. On a broader level, this project promotes positive social change by improving patient outcomes, reducing infection-related morbidity and costs, and fostering a culture of safety, inclusivity, and professional accountability among nursing staff.

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### Appendix: Staff Education Planning Grid Project Materials

In-person staff education sessions will be held in the hospital conference room. Two separate sessions will be held to accommodate approximately 20–25 nursing staff members per session, representing a significant proportion of the ICU nursing team. Each session will last 45 minutes and will include both didactic and practical demonstration components.

<p><b>Learning Outcome(s):</b>  <b>Nursing Professional Development</b>  Nurses will demonstrate improved knowledge and positive attitudes toward CAUTI prevention bundles, accurate documentation, and adherence to daily catheter necessity assessments.</p> <p><b>Patient Outcome</b>  Reduction in CAUTI incidence per 60 catheter-days by 20% within four months post-implementation.</p> <p><b>Organizational Outcome</b>  Increased compliance with CAUTI prevention policies and sustained improvements in infection control metrics.</p>			
<b>Topical Content Outline</b>	<b>Time frame</b>	<b>References</b>	<b>Teaching method/learner engagement and Evaluation method</b>
Introduction and Pretest: Overview of project purpose, objectives, and baseline assessment of knowledge and attitudes using a 5-point Likert scale (from strongly disagree to agree strongly)	5 min	CDC Guidelines (2024); ANA Infection Prevention Standards	Facilitator-led discussion; pretest administered manually to gauge baseline skill and attitude
Review of CAUTI bundle components: Aseptic insertion, maintenance, daily assessment, and early removal	15 min	Lo et al., 2017; Saint et al., 2020	Interactive PowerPoint; small group discussion; real-case scenarios
Demonstration: Daily catheter checklist and EMR documentation	10 min	Facility CAUTI checklist; CDC NHSN definitions	Demonstration with role play; Q&A

Reinforcement: Roles of champions and unit accountability	5 min	Johns Hopkins EBP Model; Project protocol	Group reflection; share success stories; commitment pledge
Posttest and feedback collection: Measure knowledge and attitude changes using the same Likert tool; open feedback discussion	10 min	Internal QI evaluation tool; pre/post survey instrument; Likert's scale	Manual posttest identical to pretest; open feedback discussion. Comparison of pre- and post-scores to determine knowledge gain and attitude change.

**Evaluation Method: Pre and Posttest (manual data collection before and after the training).**

### **Pre- and Post-Intervention Survey Tool**

**Knowledge Questions (Select the Correct Answer — Circle One)**

*(Each question scored Correct / Incorrect)*

1. A urinary catheter should be inserted only when **clinically indicated** and not for staff convenience.  
 True     False
2. The **most common source** of CAUTI is contamination of the drainage system.  
 True     False
3. It is acceptable to insert a Foley catheter without sterile gloves if sterile technique cannot be maintained.  
 True     False
4. The drainage bag should be positioned **below bladder level** to prevent backflow.  
 True     False
5. Daily assessment of the necessity of the catheter should be documented in the **electronic medical record (EMR)**.  
 True     False

6. The recommended interval for routine catheter change in the ICU is **every 72 hours**.  
 True     False
7. **Hand hygiene** before and after catheter manipulation is an essential CAUTI prevention measure.  
 True     False
8. In a sedated, ventilated patient with adequate urine output, catheter removal should be considered within **48–72 hours** of insertion.  
 True     False
9. The nurse should notify the provider when a patient with a catheter develops **cloudy urine, fever, or suprapubic tenderness**.  
 True     False
10. The CDC recommends using a **catheter insertion checklist** to ensure aseptic technique.  
 True     False

### Attitude Questions (Circle One Response)

(1 = Strongly Disagree, 2= Disagree, 3=Neutral, 4= Agree, 5 = Strongly Agree)

#	Statement	1	2	3	4	5
1	It is possible to prevent most CAUTIs with proper technique and vigilance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Preventing CAUTI is a shared responsibility among all members of the care team.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	I feel confident in my ability to perform CAUTI prevention procedures correctly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Our ICU provides adequate resources (supplies, time, support) for CAUTI prevention.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	The necessity of the catheter should be reassessed every shift to ensure early removal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Staffing shortages are a significant barrier to CAUTI prevention in our unit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Adhering to the CAUTI prevention bundle improves patient outcomes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#	Statement	1	2	3	4	5
8	I believe feedback from audits and infection data motivates staff to follow CAUTI protocols.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Ongoing education and competency checks are essential for sustained CAUTI prevention.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Preventing CAUTI is part of my professional responsibility as a nurse.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>