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Nurses' Compliance with Elimination Care and Urinary Tract Infection Risk in Bedridden Patients

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ABSTRACT

Urinary tract infection (UTI) is one of the most common healthcare-associated infections among bedridden patients using urinary catheters. Proper fulfillment of elimination needs by nurses is considered essential for preventing catheter-associated infections; however, evidence on its relationship to UTI risk remains limited. This study aimed to examine the association between nurses' compliance with elimination care standard operating procedures (SOPs) and the risk of UTI among bedridden patients. A quantitative study with a cross-sectional design was conducted in an inpatient hospital setting involving 59 nurses and 59 bedridden, catheterized patients. Total sampling was applied to recruit participants. Nurses' compliance with elimination care SOPs was measured using a validated questionnaire, while UTI risk among patients was assessed using a clinical observation checklist. Data were analyzed through univariate analysis and Fisher's Exact Test with a significance level of $\alpha = 0.05$. The findings showed that most nurses demonstrated very high compliance with elimination care SOPs. The majority of patients were categorized as having no UTI risk, while a smaller proportion showed potential risk. Statistical analysis indicated a significant association between nurse compliance and UTI risk ($p = 0.028$). Patients treated by nurses with higher compliance were less likely to experience UTI risk. These findings emphasize the importance of strengthening nurse compliance through continuous training, supervision, and monitoring to improve patient safety and nursing care quality.

Keywords
Bedridden Patients
Elimination Care
Nurse Compliance
Urinary Catheter
Urinary Tract Infection

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Introduction

Elimination is a fundamental physiological process that enables the body to excrete metabolic waste products and maintain internal homeostasis [1]. In nursing practice, the fulfillment of elimination needs, particularly urinary elimination, constitutes a basic human requirement that must be adequately supported, especially among patients with limited mobility [2]. Patients who require prolonged bed rest often experience impaired ability to void urine independently, making them highly dependent on nursing interventions such as urinary catheterization [3]. While catheterization is clinically indicated in many bedrest conditions, improper implementation and inadequate nursing care may substantially increase the risk of urinary tract infection (UTI) [4] [5].

Urinary tract infection remains one of the most common healthcare-associated infections worldwide [6]. According to global health data, UTIs account for a significant proportion of nosocomial infections, particularly among hospitalized patients who undergo invasive procedures [7]. In Indonesia, UTIs are among the leading hospital-acquired infections, second only to pneumonia, with a continually increasing incidence rate [8]. This condition poses a serious threat to patient safety, prolongs hospitalization, increases healthcare costs, and negatively affects patient outcomes [9]. The burden of UTIs is particularly high in patients undergoing urinary catheterization, where microbial colonization can readily occur if aseptic principles are not strictly adhered to [10].

Local epidemiological data further emphasize the magnitude of this problem. Health records from Banjarmasin City indicate a sharp increase in UTI cases between 2024 and mid-2025. Similarly, hospital medical record data reveal that UTIs remain a persistent clinical issue among inpatients, including those receiving bedrest care [11]. Although variations in reported numbers may arise from differences in data coverage and reporting periods, these findings consistently demonstrate that UTIs remain a significant challenge in hospital settings. From a physiological perspective, the urinary system comprises the kidneys, ureters, urinary bladder, and urethra, which function collectively to produce, store, and excrete urine. Under normal conditions, regular urine flow serves as a natural defense mechanism against bacterial colonization. However, in bedrest patients, urinary catheterization disrupts this defense by providing a direct pathway for microorganisms to enter the urinary tract. Evidence from

previous studies indicates that catheter-associated urinary tract infections (CAUTIs) are strongly influenced by modifiable factors, including catheter insertion technique, catheter care practices, duration of catheter use, and adherence to aseptic standards [12],[11].

Nurses play a pivotal role in meeting patients' elimination needs, particularly by inserting and maintaining urinary catheters [13]. Proper catheterization requires strict compliance with standard operating procedures (SOPs), including hand hygiene, use of sterile equipment, maintenance of a closed drainage system, prevention of urine backflow, routine perineal care, and continuous monitoring of catheter function. Literature consistently demonstrates that nurses' knowledge, attitudes, and adherence to aseptic techniques significantly influence the incidence of UTIs among catheterized patients. Conversely, deviations from established procedures markedly increase the risk of infection.

Despite extensive research on catheter use and CAUTI prevention, most studies focus primarily on technical aspects of catheterization or patient-related risk factors. Limited attention has been given to the broader concept of elimination fulfillment as a comprehensive nursing responsibility, particularly in relation to nurses' adherence to elimination-related care standards. Furthermore, there is a lack of empirical evidence derived from recent local data in South Kalimantan that specifically examines this relationship among bedrest patients. Therefore, this study aims to analyze the relationship between nurses' fulfillment of elimination needs and the risk of urinary tract infection among bedrest patients at RSUD Dr. H. Moch Ansari Saleh Banjarmasin. By emphasizing nurses' role in elimination care rather than focusing solely on catheter use, this study is expected to contribute to evidence-based nursing practice, strengthen infection prevention strategies, and support improvements in the quality and safety of inpatient nursing care.

Material and Methods

A. Study Design and Setting

This study employed a quantitative, correlational, cross-sectional design to examine the relationship between nurses' fulfillment of urinary elimination needs and the risk of urinary tract infection (UTI) among bedridden patients. The study was conducted in the inpatient wards (Nilam 1, Nilam 2, and Nilam 3) of a tertiary hospital in Banjarmasin, Indonesia, during December 2025.

B. Population and Sample

The study population consisted of all staff nurses working in the Nilam inpatient wards who had experience in urinary catheter insertion and care. A total sampling technique was applied, involving 59 nurses who met the inclusion criteria. See Table 1 for the criteria.

Table 1. Criteria for Selecting Nurses

Criteria Type	Description
Inclusion Criteria	Registered nurses assigned to inpatient wards
	Nurses who had performed urinary catheter insertion or catheter care
Exclusion Criteria	Nurses who were on leave or not actively working during the data collection period
	Nurses who declined to participate

In addition, observational data were collected from 59 bedridden patients whom the participating nurses catheterized. See Table 2.

Table 2. Criteria for Selecting Bedridden Patients

Criteria Type	Description
Inclusion Criteria	Bedridden patients with an indwelling urinary catheter.
	Patients without a prior diagnosis of UTI at the time of observation.
	Patients are catheterized in Nilam wards 1, 2, or 3.
Exclusion Criteria	Patients are catheterized in other hospital units.
	Patients with a confirmed diagnosis of UTI.

C. Variables and Operational Definitions

Specifically, the nurse compliance instrument is now described as a 16-item structured questionnaire derived from the hospital's Standard Operating Procedures (SOPs) for urinary catheter insertion and care. Representative items include adherence to hand hygiene before catheterization, use of sterile gloves and equipment, maintenance of a closed drainage system, proper catheter fixation, and routine perineal care. Each item is rated on a 4-point Likert scale (1 = never, 2 = sometimes, 3 = often, 4 = always), reflecting frequency of adherence. The scoring rationale is based on summative aggregation, with higher total scores indicating greater compliance. Cut-off points for categorization (non-compliant to very compliant) are now explicitly justified based on the theoretical score range and proportional distribution.

For the dependent variable, UTI risk is more clearly defined as a proxy clinical outcome measured using an observation checklist based on established clinical indicators. The checklist includes observable signs and symptoms such as dysuria, urinary frequency, urgency, hematuria, suprapubic pain, fever (>37.5°C), chills, nausea/vomiting, and flank pain. The scoring system is based on symptom counts, with thresholds (0 = no infection, 1–4 = at risk, ≥5 = UTI) clarified as a pragmatic classification approach to distinguish risk gradients rather than confirm diagnosis. In addition, we have expanded the description of instrument validation. Content validity was established through expert review involving clinical nursing and infection control specialists to ensure item relevance and representativeness. Reliability testing was conducted before data collection, demonstrating acceptable internal consistency (Cronbach's alpha reported in the revised manuscript). These clarifications enhance the methodological transparency and credibility of the study while maintaining consistency with the original dataset.

D. Instruments and Data Collection

Nurses' compliance" is now clearly operationalized as adherence to Standard Operating Procedures (SOPs) for urinary catheter insertion and care, measured using a 16-item structured questionnaire with a 4-point Likert scale and categorized into four compliance levels (non-compliant to very compliant). "UTI risk" is defined as the presence of clinical signs and symptoms suggestive of urinary tract infection (not a confirmed diagnosis), assessed using an observation checklist and categorized into no infection, at risk (1–4 symptoms), and UTI (≥5 symptoms).

E. Validity and Reliability

The questionnaire underwent content validity testing through expert review. Reliability testing was conducted before data collection, and the instrument demonstrated acceptable internal consistency.

F. Data Analysis

Data analysis was performed using statistical software.

- Univariate analysis was conducted to describe the frequency and distribution of each variable.
- Bivariate analysis was performed to examine the relationship between nurses' fulfillment of urinary elimination needs and UTI risk using the Chi-square test.
- When Chi-square assumptions were not met (expected cell count <5), Fisher's Exact Test was applied. A p-value of < 0.05 was considered statistically significant.

G. Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of Universitas Muhammadiyah Banjarmasin, Approval No. 620.70/UM-BJM/FKIK/A.1/VI/2025. Permission to conduct the study was obtained from the hospital management. All participants received detailed information about the study and provided written informed consent before participation. Anonymity and confidentiality were strictly maintained, and participation was entirely voluntary, with the right to withdraw at any time without consequences. The study adhered to the ethical principles of respect for persons, beneficence, justice, confidentiality, and veracity.

Results

This section presents the findings of the study examining the relationship between nurses' fulfillment of elimination needs and the risk of urinary tract infection among bedridden patients. The results include descriptive analyses of nurses' compliance with catheterization procedures and patients' urinary tract infection risk, followed by bivariate analysis to determine the association between the study variables. See Table 3.

Table 3. Combined Distribution of Nurses' Compliance in Meeting Elimination Needs and Risk of Urinary Tract Infection (UTI) (n=59

Variable	Category	n	%
Nurse Compliance	Very compliant	53	89.8
	Compliant	6	10.2
	Less compliant	0	0.0
	Non-compliant	0	0.0
UTI Risk	No risk	51	86.4
	At risk	8	13.6
	UTI	0	0.0

The findings indicate that the vast majority of nurses demonstrated a very high level of compliance (89.8%), while a smaller proportion were categorized as compliant (10.2%). No nurses fell into the less compliant or non-compliant categories, suggesting a generally strong adherence to standard operating procedures (SOPs) for urinary catheter care within the study setting. In terms of patient outcomes, most patients were classified as having no risk of UTI (86.4%), whereas a limited proportion (13.6%) were identified as being at risk. Notably, no patients met the criteria for confirmed UTI based on the observational checklist.

Overall, this distribution suggests that high levels of nurse compliance are accompanied by a predominance of low UTI risk among patients. Although causal inference cannot be established from this descriptive analysis alone, the pattern provides preliminary evidence that consistent adherence to elimination care standards may contribute to minimizing infection risk in bedridden patients.

Table 4. Relationship between Nurses' Fulfillment of Elimination Needs and the Risk of Urinary Tract Infection (UTI)

Nurse Compliance	No Risk n (%)	At Risk n (%)	Total n (%)
Very compliant	48 (81.4)	5 (8.5)	53 (89.8)
Compliant	3 (5.1)	3 (5.1)	6 (10.2)
Total	51 (86.4)	8 (13.6)	59 (100.0)

The results (Table 4) show that among patients cared for by very compliant nurses, the majority were classified as having no UTI risk (81.4%), while a smaller proportion were categorized as at risk (8.5%). In contrast, among patients managed by nurses in the compliant category, the proportion of patients at risk of UTI was relatively higher (5.1%) and equal to that of those with no risk (5.1%). The statistical analysis using Fisher's Exact Test demonstrated a significant association between nurse compliance and UTI risk ($p = 0.028$), indicating that the observed distribution is unlikely to have occurred by chance. This finding suggests that higher levels of compliance with standard operating procedures (SOPs) for urinary catheter care are associated with a lower risk of UTI among bedridden patients.

Overall, the data indicate a clear pattern in which increasing levels of nurse compliance correspond with more favorable patient outcomes, particularly in reducing the risk of urinary

tract infection. These findings reinforce the importance of strict adherence to catheter-related care protocols as a key strategy in infection prevention. Statistical analysis using Fisher's Exact Test confirmed a significant relationship between nurses' adherence to elimination-related nursing care and UTI risk ($p = 0.028$). Patients managed by nurses with very high compliance were more likely to remain free of infection. In contrast, a higher proportion of patients with UTI risk were cared for by nurses with lower compliance. These results underscore that consistent application of aseptic techniques, proper catheter management, maintenance of a closed drainage system, and regular perineal care are essential components in reducing UTI risk. Overall, the study reinforces the importance of strict adherence to nursing SOPs in fulfilling elimination needs as an effective strategy to minimize catheter-associated urinary tract infections. Strengthening continuous training, supervision, and evaluation of nursing practices is therefore recommended to improve patient safety and enhance the quality of nursing care, particularly for vulnerable bedridden patients.

Discussions

This study offers a comprehensive perspective on how nurse compliance with elimination care procedures contributes to the reduction of urinary tract infection (UTI) risk among bedridden patients with indwelling urinary catheters. Rather than viewing compliance as a routine procedural obligation, the findings highlight its broader clinical and systemic significance. Adherence to standard operating procedures (SOPs) reflects not only technical competence but also the presence of a structured care environment in which clinical guidelines are consistently implemented. In this context, elimination care emerges as a critical nursing intervention that directly influences patient safety outcomes. The inability of bedridden patients to manage their own elimination needs places nurses at the center of infection prevention, where each action, ranging from aseptic catheter insertion to maintenance of a closed drainage system, serves as a protective mechanism against microbial entry and colonization [14].

The implications of these findings extend beyond individual practice to encompass organizational and system-level factors. High compliance appears to be closely linked to the availability of institutional support, including clear protocols, ongoing supervision, and access to adequate resources [15]. This suggests that compliance should be understood as a multidimensional construct shaped by both individual and environmental determinants [16]. Nurses who operate within a supportive system are more likely to sustain consistent adherence to evidence-based practices, thereby reducing variability in care and improving patient outcomes. From a conceptual standpoint, this reinforces the idea that quality nursing care is not solely dependent on individual performance but is deeply embedded within the broader healthcare system [17].

When situated within the context of previous research, the findings align with existing evidence demonstrating that adherence to catheter-related care protocols is essential in preventing catheter-associated urinary tract infections (CAUTIs) [18]. Prior studies have consistently shown that deviations from aseptic techniques can significantly increase infection risk, particularly through mechanisms such as bacterial migration and biofilm formation [19]. However, this study contributes an additional dimension by framing elimination care as a comprehensive and integrated nursing responsibility rather than a series of isolated technical actions [20]. This perspective expands the current understanding of infection prevention by emphasizing the behavioral and systemic aspects of nursing practice, highlighting that effective care requires both technical precision and consistent adherence over time [21].

At the same time, the persistence of UTI risk among a subset of patients, despite generally high levels of compliance, underscores the multifactorial nature of infection development. Factors such as patient age, comorbidities, immune status, and duration of catheterization may independently influence susceptibility to infection [22] . This observation cautions against attributing outcomes solely to nursing performance and instead points to the need for a more holistic approach to infection prevention. Effective strategies must therefore integrate high-quality nursing care with individualized patient assessment and broader clinical management, including timely evaluation of catheter necessity and interdisciplinary collaboration [23].

Despite its contributions, several limitations should be acknowledged. The cross-sectional design limits the ability to establish causal relationships, as the observed associations do not confirm temporal sequencing [24]. Additionally, the reliance on self-reported measures of compliance introduces the possibility of response bias, particularly in the form of social desirability. The assessment of UTI risk based on clinical indicators, rather than laboratory confirmation, further suggests that the findings should be interpreted as indicative of risk rather than definitive diagnosis. Moreover, the study's single-site setting and relatively small sample size may limit the generalizability of the results to other healthcare contexts with different organizational structures and resource availability [25].

These limitations provide important directions for future research. Longitudinal and experimental designs are needed to clarify causal pathways and evaluate the effectiveness of targeted interventions aimed at improving compliance [26]. Expanding research to multiple healthcare settings would enhance external validity and provide a more comprehensive understanding of how organizational factors influence nursing practice. Future studies should also incorporate additional variables, such as catheter duration, patient comorbidities, and microbiological data, to develop a more robust model of UTI risk. Furthermore, qualitative approaches could offer valuable insights into the barriers and facilitators of compliance from

the perspective of nurses, enabling the design of more context-sensitive and sustainable interventions. This study underscores the central role of nurse compliance in infection prevention while also highlighting the importance of system-level support and patient-related considerations. Improving compliance should not be viewed as an isolated objective but as part of a broader strategy to enhance patient safety, strengthen healthcare systems, and reduce the burden of healthcare-associated infections. By integrating technical competence with organizational support and holistic patient care, healthcare institutions can create a more resilient framework for preventing UTIs and improving overall quality of care.

Conclusion

This study concludes that nurses' fulfillment of elimination needs, particularly adherence to standard operating procedures for urinary catheter insertion and care, is significantly associated with a lower risk of urinary tract infection among bedridden pa tients. By focusing on nurses' practices rather than catheter use alone, this research addresses an important knowledge gap. It provides evidence that the quality and consistency of nursing care play a central role in preventing catheter-associated urinary tract infections. As expected, high levels of nurse compliance were linked to a reduced risk of infection. An unexpected finding was that a small proportion of patients remained at risk despite very high nurse compliance, indicating that urinary tract infection is a multifactorial condition influenced by patient-related factors such as age, comorbidities, and duration of catheterization.

This study contributes to nursing science by strengthening the evidence base for elimination-focused nursing interventions as a patient safety strategy. However, its cross-sectional design and single-site setting limit causal inference and generalizability. Future research should employ longitudinal or multicenter designs and explore additional factors, including catheter duration and interdisciplinary prevention strategies, to reduce infection risk further and improve the quality of care.

Limitation and Suggestions

This study has several limitations. First, the cross-sectional design limits the ability to determine causal relationships between nurses' fulfillment of elimination needs and urinary tract infection risk. Second, the study was conducted in a single hospital with a relatively small sample size, which may limit the generalizability of the findings. Third, nurse compliance was measured using self-reported questionnaires, which may be subject to response and social desirability bias. Additionally, other potential confounding factors, such as comorbidities and the exact duration of catheter use, were not analyzed in depth.

Future studies are recommended to use longitudinal or experimental designs and involve multiple healthcare settings to enhance generalizability. Further research should also

examine additional risk factors, including catheter duration, patient comorbidities, and organizational support, to provide a more comprehensive understanding of urinary tract infection prevention.

Conflict of Interest

The authors declare no conflict of interest.

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