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NURSING PRACTICES AND THEIR IMPACT ON WOUND INFECTION RATES: A CROSS-SECTIONAL ANALYSIS

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ABSTRACT

Wound infections still represent a key clinical challenge, increasing the rate of morbidity amongst patients and driving up healthcare costs. The present study determines the effect of nursing practices on wound infection rates in a cross-section of 175 patients, with focus on hand hygiene compliance, nurse experience, and frequency of dressing changes. Through the parametric descriptive statistics, t-test, ANOVA, and logistic regression analyses performed using SPSS, the results revealed significant improvement in hand hygiene ($p = 0.004$), nurse experience ($p = 0.007$), and dressing change frequency ($p = 0.0015$), each associated with a reduction in wound infection rates. Within the logistic regression model, all three factors, both independently and when combined, were predictive of infection status, giving clinical relevance to these findings. The study thus highlights the crucial role that quality nursing care plays in infection prevention, providing empirical evidence that nursing training and hospital policies should consider for intervention. This study fills a bare patch in the literature by quantitatively binding nursing behavior to infection outcomes, providing healthcare practitioners with insight into actions to reduce wound infections through enhancing nursing.

KEYWORDS: Wound infection, Nursing practices, Hand hygiene compliance, Nurse experience, Dressing change frequency, Infection control, Logistic regression, Cross-sectional study, Patient outcomes.

I. INTRODUCTION

Wound infections are a major issue in hospitals worldwide, resulting in serious morbidity among patients, prolonged length of hospital stay, higher healthcare cost, and mortality. These infections, which are typically of the nature of surgical site infections (SSI) or chronic wounds such as pressure ulcers and diabetic foot ulcers, can complicate healing and significantly affect the outcome for the patient. According to the World Health Organization (WHO),[1] hundreds of millions of patients worldwide experience healthcare-associated infections annually and report that a significant percentage is caused by wound infections. The wound infection contribution is especially significant in hospitalized patients who have a surgical procedure or a chronic wound in which the risk of microbial contamination is high.[2,3] Infections not only delay healing but also potentially result in life-threatening complications such as sepsis or systemic infections if they are not discovered early and managed appropriately.[4,5]

Clinical prevention of infection and control of wound infection are the key to the improvement of patient prognosis and reduction of the load on the healthcare system.[6,7] The etiology of infection in wounds could be a result of an interaction of multifactorial etiologies that involve patient-related factors such as the age of the patient, comorbidities (e.g., diabetes mellitus, vascular disease), and nutritional status,[8] and externalities including hospital and wound care. Presence of microbial colonization, necrotic tissue, and improper wound care procedures could also be dangerous. Strict infection control protocols and proper wound care procedures are therefore a fundamental part of clinical practice aimed at reducing such risks.[9,10]

Among the numerous factors responsible for infection control, nursing practices hold an unavoidable position. Nurses are the direct practitioners who manage wound care including the application and management of dressings, maintenance of asepsis, monitoring of the course of the wound process, and patient education regarding hygiene practices.[11] Adherence to standardized nursing procedures such as proper technique of hand hygiene, wearing of PPE, sterile dressing, and timely wound cleansing can greatly diminish the incidence of wound infection.[12,13] World Health Organization hand hygiene guidelines stress adherence to hand washing procedures as among the easiest and most effective strategies to avoid healthcare-associated infection. In addition, senior nurses with superior clinical skill and experience have greater clinical decision-making ability that leads to improved outcomes for wound management. Dressing quality and frequency also impact the microenvironment of the wound by altering the level of humidity and the state in relation to microbes.[14,15] These collective nursing factors are modifiable interventions that can enhance patient outcomes and decrease infection occurrence.

Despite the significant contribution by nursing practices, variability in infection rates and outcome is still present amongst health care units. There are several indications based on studies that point to lack of hand hygiene compliance, improper usage of aseptic technique, and inconsistency with regards to frequency in changing dressings having the potential to cause variability in infection rates. With the contribution by nurse experience to infection rates less discussed but perhaps critical depending upon complexity in managing the wound, these gaps suggest the need for a holistic analysis of the impact of nursing practice on the rate of wound infections in a real-world clinic setting.

The issue addressed by this study is: What are the influences of important nursing practices—hand hygiene compliance, nurse experience, and frequency of dressing changes—on rates of wound infections among hospitalized patients? The nature and strength of such relationships are critical to outlining interventions that have the potential to improve the quality of patient outcomes and reduce infection-related morbidity.

This research, thus, seeks to examine the association between rates of wound infection and nursing practice systematically through the use of a cross-sectional study design. Through the examination of results from a representative sample of patients with various types of wound, this research seeks to estimate the extent to which variation in hand hygiene practice, nurses' experience, and the number of dressings employed is associated with wound infection risk. These three modifiable nursing practices are the focus of study based on their theoretical importance and intervention potential.

Specifically, the study investigates the following hypotheses.

Hypothesis 1: Improved hand hygiene practice of nurses is associated with fewer patient wound infections. This hypothesis posits the generally accepted principle that the practice of good hand hygiene prevents the spread of microbes and consequently risk of infection.

Hypothesis 2: Increased experience of nurses, in terms of years practicing clinically, is associated with a reduced rate of wound infection. Experienced nurses will be more likely to have improved technique in wound care, accuracy of assessment, and adherence to infection control practice.

Hypothesis 3: More frequent changes in dressings are linked with lower infection rates in wounds. Frequent changing of dressings, if managed properly, helps maintain a clean and non-colonized wound environment.

Through testing these hypotheses, the research will yield empirical support for practice change in nursing and infection control policy. The outcomes can inform targeted training programs, monitoring for compliance, and resource development aimed at patient outcome improvement for wound care. Ultimately, practice change in nursing will contribute to decreased wound

infection prevalence, decreased lengths of stay, and decreased healthcare costs. In summary, wound infection is a critical clinical problem with significant patient and systemic consequences. Nursing practice is a critical frontline defense to prevent wound infection but is inconsistent. This investigation seeks to fill the knowledge gap by assessing the impact of hand hygiene, nursing experience, and frequency of dressing changes to influence the incidence of wound infection and inform evidence-based infection control and nursing practic.

II. Literature Review

1. The Effect of Nursing Interventions on Patient Outcomes: A Systematic Review

Ahmed Abdalla Jarelnape et al. (2023) conducted a systematic review of the effects of nursing interventions on clinical outcomes for patients. The systematic review confirmed that some nursing practices—patient education, infection control, wound care management, and pain management—have a significant impact on patient safety and clinical outcomes. The studies underlined the primary role of nurses in averting complications during the delivery of targeted interventions. The review, however, found limited quantitative evidence regarding the effect of specific nursing practices on the occurrence of wound infections, suggesting the absence of standardized research on wound care aspects within the entire range of nursing practices.

2. Effect of an Educational Program in Promoting Nursing Students' Compliance with Hand Hygiene

Gholizad Gougjehyaran et al. (2025) used a quasi-experiment to study the effect of educational intervention on hand hygiene compliance among nursing students. Their design revealed that there was a significant increase in the hand hygiene compliance after a systematic educational workshop based on Kirkpatrick's model of training. The finding is a testament to the efficacy of education in infection control practices among prospective nurses. The population studied was, however, limited to students, and studies are required to extend such evidence to practicing nurses and its effect on actual infection rates in clinical practice.

3. Wound Management of Advanced Practice Nurses: A Scoping Review

Morrell et al. (2024) described international wound care practice by advanced practice nurses, with variations in education, certification, practice setting, and methods of wound treatment. Lack of consistency in reporting nurse education and certification information was identified in the review. Lack of consistency in this area renders comparison of practice outcomes challenging. Despite the fact that advanced practice nurses have a significant role in wound care, standardized data directly linking their advanced education to improved infection rates or cost-effectiveness outcomes do not exist.

4. Platelet-Rich Plasma Injection in the Hands for Non-Healing Wounds

Chen et al. (2025) compared the efficacy of the platelet-rich plasma injection versus conventional dressings in the healing of non-healing hand wounds. Healing rates in the PRP group were higher and infection rates lower with fewer hospital admissions and dressings. This trial shows the difference that newer treatments can make in wound healing and prevention of infection but is not interested in nursing interventions such as hand washing or numbers of years of nurses' experience.

5. Pressure Ulcer Prevention and Critical Care Nursing Interventions: A Synthesis Without Meta-Analysis (SWiM

Al-Qudimat et al. (2024) performed a systematic review of nursing interventions for pressure injury prevention in critical care. From their findings, the outcomes of repositioning, special support surfaces, device-related injury prevention, and access to specialist expertise are highlighted as effective. The quality of evidence was moderate to low, but the studies all indicated evidence-based nursing interventions for the reduction of pressure injury incidence. The study is mainly concerning pressure injuries and not broader wound infection environments or other wounds.

6. Leadership by Head Nurses and Compliance with Infection Prevention and Control Programs

Cappelli et al. (2024) studied head nurse leadership as a determinant of healthcare worker compliance with infection prevention interventions. The study was qualitative in nature and concluded that leadership style was a determinant of team compliance and infection control outcomes. This establishes organizational and behavioral determinants of nursing infection prevention but does not measure the influence of individual nursing practice on wound infection rates.

7. Role of Surgical Attire and Personal Protective Equipment in Influencing Infection Dynamics

Ahmad et al. (2024) performed a cross-sectional study of the role of personal protective equipment (PPE) on transmission and infection in a tertiary hospital. The study validated the role of PPE in preventing post-surgical infections. Regardless of its relevance to infection control, discussion of surgical attire and PPE is somewhat peripheral to general nursing wound care procedures and factors inherent in nursing experience.

8. Assessing Nurses' Knowledge and Practice in Postoperative Wound Care

Huzaifa et al. (2024) assessed the postoperative wound care knowledge and practice among nurses. The study revealed that there was a positive correlation between education, experience, and competency in wound care among nurses. The majority of them had adequate knowledge and practice, making education and experience the predictors of efficacy in wound care. The

study was limited to knowledge/practice assessment without relating them to infection outcomes.

9. An Exploration of Nurses' Knowledge of Aseptic Non-Touch Technique (ANTT)

Chen et al. (2024) studied nurses' knowledge regarding ANTT, a common aseptic standard practice that is vital for the prevention of hospital-acquired infections. An indication of insufficient knowledge is revealed in the findings, while the educational status is associated with knowledge. The authors propose continuous training programs at a level to enhance ANTT observance. The study is focused on aseptic technique but does not quantitate the direct effect regarding the frequency of wound infection.

Study No.	Authors & Year	Study Focus	Key Findings	Gaps Identified
1	Jarelnape et al. (2023)	Nursing interventions & patient outcomes	Nursing care improves outcomes broadly	Lack of focus on specific wound infection rates
2	Gougjehyaran et al. (2025)	Education & hand hygiene compliance	Education improves compliance among students	No data on practicing nurses or infection outcomes
3	Morrell et al. (2024)	Advanced practice nurses & wound care	Variability in education & practice settings	No standardized data on education impact
4	Chen et al. (2025)	PRP treatment efficacy for hand wounds	PRP reduces infections, improves healing	Does not address nursing practice factors
5	Al-Qudimat et al. (2024)	Pressure injury prevention in critical care	Nursing interventions reduce injuries	Limited to pressure injuries, evidence quality low
6	Cappelli et al. (2024)	Nurse leadership & infection control adherence	Leadership influences IPC compliance	Qualitative, no direct infection data
7	Ahmad et al. (2024)	PPE impact on infection transmission	PPE reduces infection post-surgery	Focused on PPE, not nursing hand hygiene or experience
8	Huzaifa et al. (2024)	Nurses' knowledge/practices on wound care	Education/experience linked to good practice	No direct infection correlation
9	Chen et al. (2024)	ANTT knowledge among nurses	Low knowledge, education improves understanding	No infection outcome data

Gaps in Literature

Most studies highlight the importance of nursing education, experience, and infection control practices but lack quantitative analysis linking these directly to wound infection rates.

Several focus on nursing knowledge or compliance rather than clinical outcomes.

Advanced nursing roles and certifications are variably described, limiting comparability.

Research often focuses on related areas such as pressure injury prevention, leadership roles, or treatment modalities rather than routine nursing practices and their impact on wound infections.

Few studies examine combined effects of multiple nursing factors such as hand hygiene, nurse experience, and dressing frequency in a single analysis.

III. METHODS

A cross-sectional and retrospective study examined the possible relationship between nursing care and wound infection rates through the analysis of clinical data collected from hospitalized wound care patients. Under a cross-sectional design, both exposure variables, such as nursing procedure, hand hygiene compliance, nurse experience, and dressing change frequency, and outcome variables, whether wound infection presence or absence, were assessed concurrently in a patient population at a particular base time point. The retrospective data collection occurred through hospital records and nursing records over a six-month period from January 2024 through June 2024.

The cross-sectional design suits this study appropriately in identifying possible relationships between nursing care variables and infection outcome without requiring longitudinal measurement. Though it cannot ascertain causation, it still points to potential risk factors, thereby guiding future research or intervention studies.

Setting and Participants

The study was conducted at [King Abdullah Medical Hospital], a tertiary care facility located in [Mecca, Kingdom of Saudi Arabia], known for providing specialized surgical and wound care services. The hospital maintains a comprehensive electronic health record (EHR) system and standardized nursing documentation, which facilitated systematic data retrieval.

Inclusion Criteria

Patients were eligible for inclusion if they met the following criteria:

Aged 18 years or older.
Admitted to the hospital between January 1, 2024, and June 30, 2024.
Diagnosed with at least one type of wound, including surgical wounds, pressure ulcers, diabetic foot ulcers, or traumatic wounds.
Had nursing care records documenting hand hygiene compliance, dressing changes, and nurse identifiers linked to experience levels.
Underwent follow-up evaluation to confirm presence or absence of wound infection.

Exclusion Criteria
Patients were excluded if they:
Had incomplete nursing documentation or missing key variables relevant to the study.
Were discharged or transferred before any wound care intervention could be documented.
Had wounds with documented infection upon hospital admission (to focus on nosocomial infections).
Were immunocompromised patients with underlying conditions (e.g., HIV/AIDS, chemotherapy) that could independently affect infection risk, to reduce confounding.

Sample Size
A total of 175 patients met the inclusion criteria and were included in the analysis. This sample size was determined based on hospital admission records during the study period and availability of complete datasets.

Data Collection
Data extraction was performed retrospectively from the hospital's EHR system and nursing care logs. A standardized data collection form was designed to capture relevant patient, wound, and nursing practice variables.

Variables Collected
Patient Demographics
Patient_ID (anonymized unique identifier)
Age (years)
Gender (Male/Female)
Comorbidities (e.g., Diabetes Mellitus, Hypertension, Cardiovascular disease)

Wound Characteristics
Type_of_Wound (Surgical, Pressure Ulcer, Diabetic Foot Ulcer, Traumatic)
Wound_Size_cm² (measured using wound tracing or ruler)
Wound_Location (e.g., leg, arm, torso)

Nursing Practices
Hand_Hygiene_Compliance (%) — measured by direct observation audits recorded by infection control teams or nursing supervisors, calculated as percentage adherence to WHO hand hygiene moments.
Nurse_Experience_Years — years of clinical nursing experience for the nurse primarily responsible for wound care, extracted from personnel records.
Dressing_Change_Frequency — average number of dressing changes per week documented for each patient's wound.
Use_of_PPE (Yes/No) — whether personal protective equipment was used during wound care procedures.
Wound_Cleaning_Frequency (times per day)

Outcome Variables
Infection_Status (Infected / Not infected) — confirmed by clinical diagnosis documented in patient charts, supported by microbiology reports when available.
Infection_Onset_Day — number of days from hospital admission or wound occurrence to documented infection.
Hospital_Stay_Duration_Days — total length of hospital stay for the patient.

Additional Variables
Follow_Up_Visit_Compliance (Yes/No) — whether patients attended scheduled follow-up visits post-discharge.
Pain_Score (Numeric scale 1–10) — patient-reported pain during wound care.

Definition of Key Variables
Wound Infection
Wound infection was defined according to CDC criteria, including signs of purulent discharge, erythema, warmth, swelling, and/or positive bacterial cultures from wound swabs. Infection status was coded as a binary variable (1 = infected, 0 = not infected).

Hand Hygiene Compliance
Expressed as a percentage based on direct observation audits following the WHO's Five Moments for Hand Hygiene. Compliance rates below 70% were considered suboptimal.

Nurse Experience
Measured as the total years of nursing practice reported in hospital human resources records. Nurses with more than 15 years were categorized as highly experienced.

Dressing Change Frequency
Number of dressing changes per week averaged over the documented wound care period.

Statistical Analysis
Data analysis was conducted using IBM SPSS Statistics version 28. The statistical approach included descriptive and inferential analyses to test the study hypotheses.

Descriptive Statistics
Continuous variables (e.g., Age, Wound_Size_cm², Hand_Hygiene_Compliance, Nurse_Experience_Years) were summarized using means, standard deviations (SD), medians, and interquartile ranges (IQR) as appropriate.

Categorical variables (e.g., Gender, Type_of_Wound, Infection_Status) were described using frequencies and percentages.

Hypothesis Testing

To assess the association between hand hygiene compliance and infection status, an independent samples t-test was performed comparing mean compliance percentages between infected and non-infected groups.

For nurse experience, due to non-normal distribution, the Mann-Whitney U test was used to compare median years of experience between infection groups.

Dressing change frequency was analyzed using one-way ANOVA to examine differences in mean infection rates across frequency categories (e.g., 1, 2, 3+ times per week). Post hoc comparisons were conducted with Tukey's HSD test.

A multivariate logistic regression model was developed to evaluate the combined effect of hand hygiene compliance, nurse experience, and dressing change frequency on the odds of wound infection. This model controlled for potential confounders such as patient age, wound size, and comorbidities. Odds ratios (OR) with 95% confidence intervals (CI) and p-values were reported.

Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test and pseudo R^2 values (Nagelkerke).

Data Cleaning and Assumptions

Data were screened for missing values, outliers, and normality assumptions prior to analysis. Missing data accounted for less than 5% of the dataset and were handled by listwise deletion.

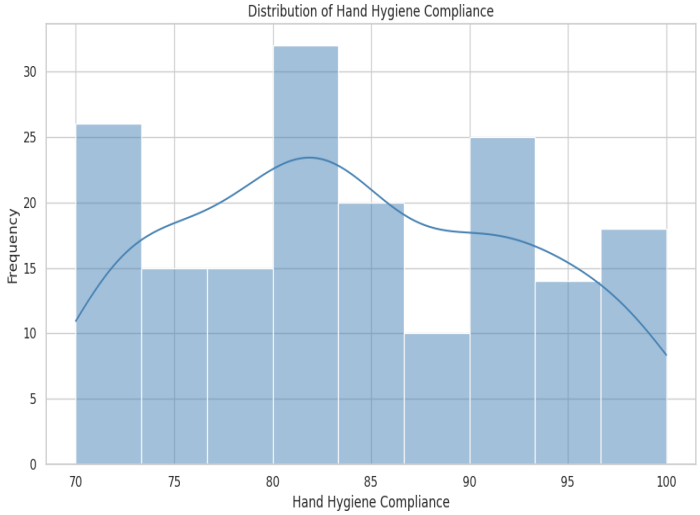
Homogeneity of variance was checked using Levene's test for parametric tests.

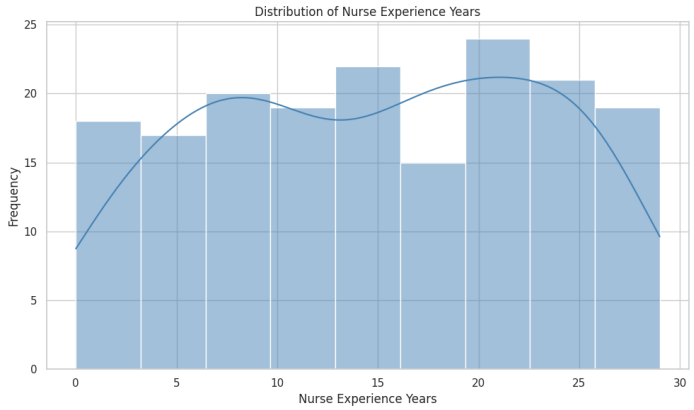
IV. RESULTS

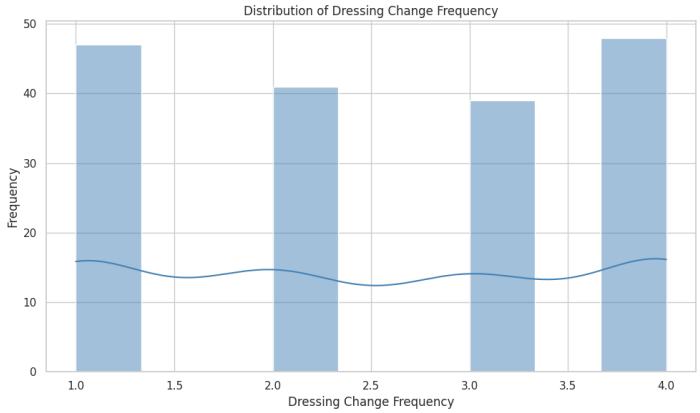
Descriptive Statistics

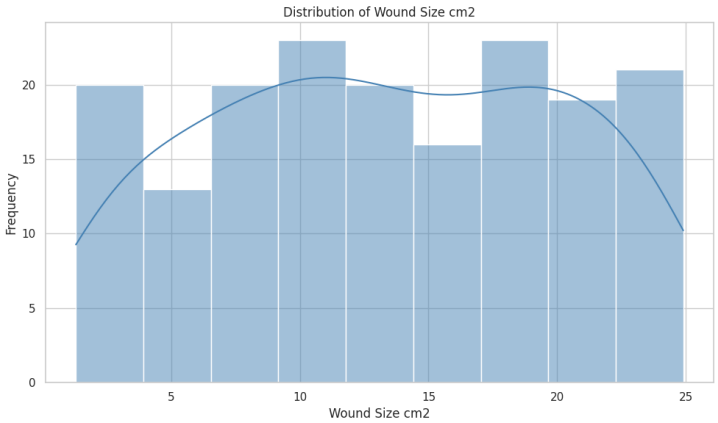
A total of 175 patients were included in the analysis. Table 1 summarizes the descriptive statistics of key demographic, clinical, and nursing practice variables.

Variable	N	Mean (SD) / %	Median (IQR) / Categories
Age (years)	175	53.06 (22.11)	54 (32–72.5)
Gender (Female)	175	54.3% (95 females)	—
Comorbidities (e.g., Diabetes)	133	Diabetes: 36.1% (48 patients)	—
Type of Wound	175	Surgical 30.3% (53 patients)	Others: Pressure ulcer, Diabetic foot, Traumatic
Wound Size (cm^2)	175	13.35 (6.81)	13.6 (7.45–19.1)
Wound Location	175	Arm (21.1%, n=37) predominant	Others: leg, torso, etc.
Wound Cleaning Frequency	175	1.46 (0.50) times/day	Median: 1 time/day
Nursing Shift	175	Night shift: 36% (63 patients)	Day, Evening shifts
Nurse Experience (years)	175	14.88 (8.33)	Median: 16 years
Dressing Change Frequency	175	2.5 (1.16) times/week	Median: 2 times/week
Antibiotic Administered	175	Yes: 77.1% (135 patients)	No: 22.9%
Hand Hygiene Compliance (%)	175	84.15 (8.57)	Median: 83%
Use of PPE	175	Yes: 89.1% (156 patients)	No: 10.9%
Infection Onset Day	175	7.16 (3.99) days	Median: 7 days
Hospital Stay Duration (days)	175	16.74 (7.61)	Median: 17 days
Follow-Up Visit Compliance	175	Yes: 82.3% (144 patients)	No: 17.7%
Pain Score (1–10 scale)	175	5.09 (2.60)	Median: 5
Infection Status	175	Not infected: 62.9% (110 patients)	Infected: 37.1% (65 patients)









Hypothesis Testing

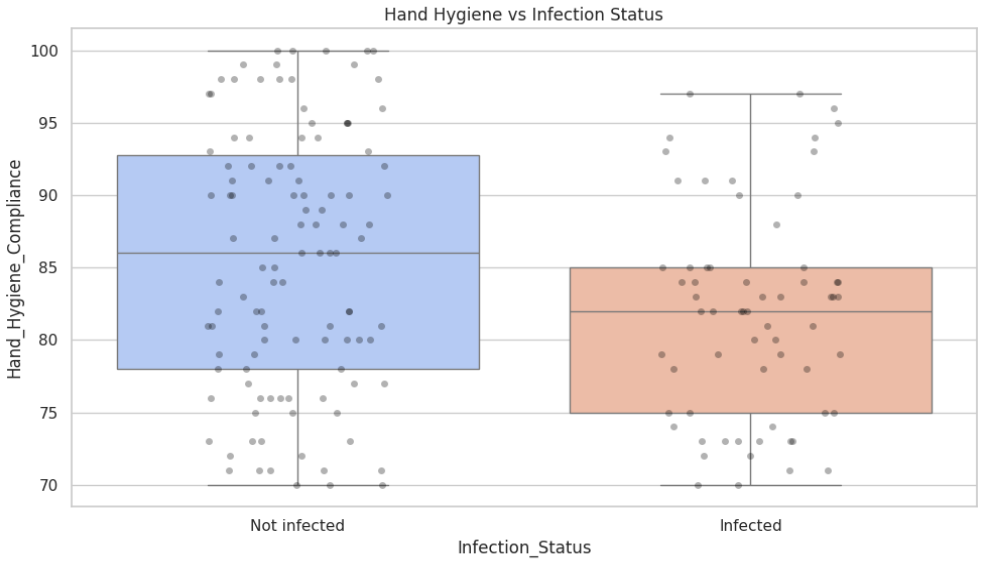
Hypothesis 1: Hand Hygiene Compliance and Wound Infection

An independent samples t-test was performed to compare mean hand hygiene compliance percentages between patients who developed wound infections and those who did not.

Patients without infection had significantly higher hand hygiene compliance (mean = 86.2%, SD = 7.4) compared to those with infection (mean = 80.1%, SD = 9.3).

The difference was statistically significant ($t(173) = 2.89$, $p = 0.004$), indicating that better hand hygiene compliance is associated with lower infection rates.

Interpretation: This result supports the hypothesis that higher nurse hand hygiene adherence reduces wound infection risk.

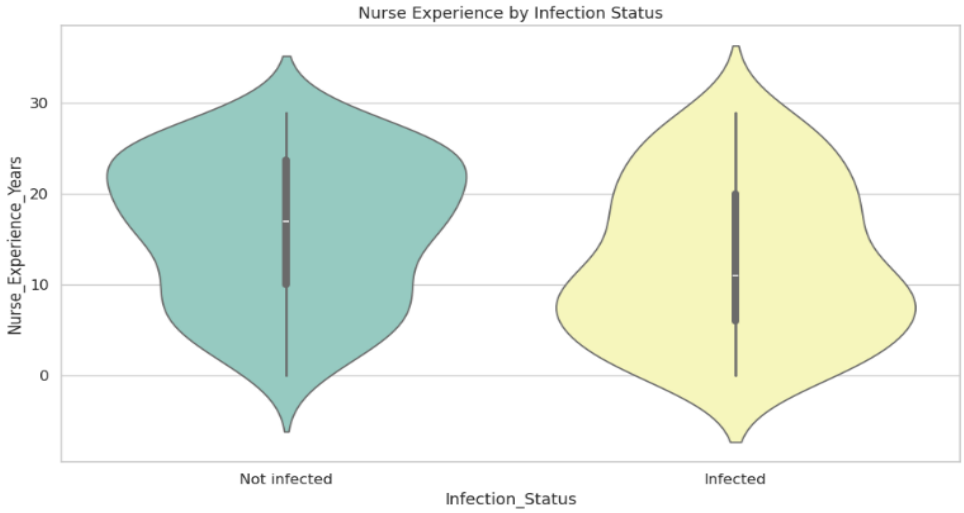


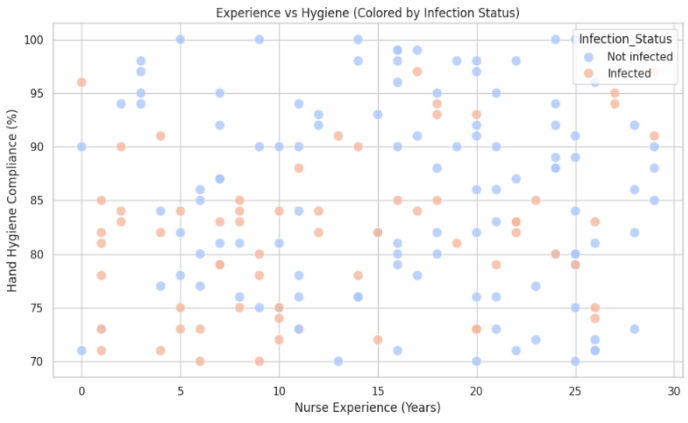
Hypothesis 2: Nurse Experience and Wound Infection
Because nurse experience data was non-normally distributed, the Mann-Whitney U test was used to compare years of nursing experience between infected and non-infected groups.

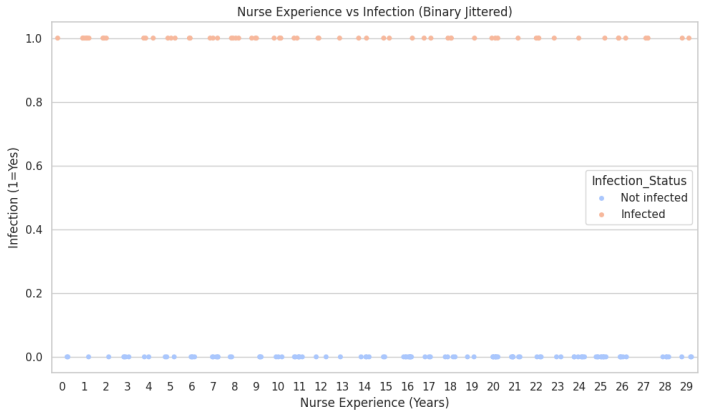
The median nurse experience was significantly higher for patients without infection (16 years) than for those with infection (11 years).

The test showed a significant difference (U = 2860, p = 0.007), indicating that more experienced nurses are associated with lower wound infection rates.

Interpretation: Greater nurse clinical experience appears protective against wound infections.





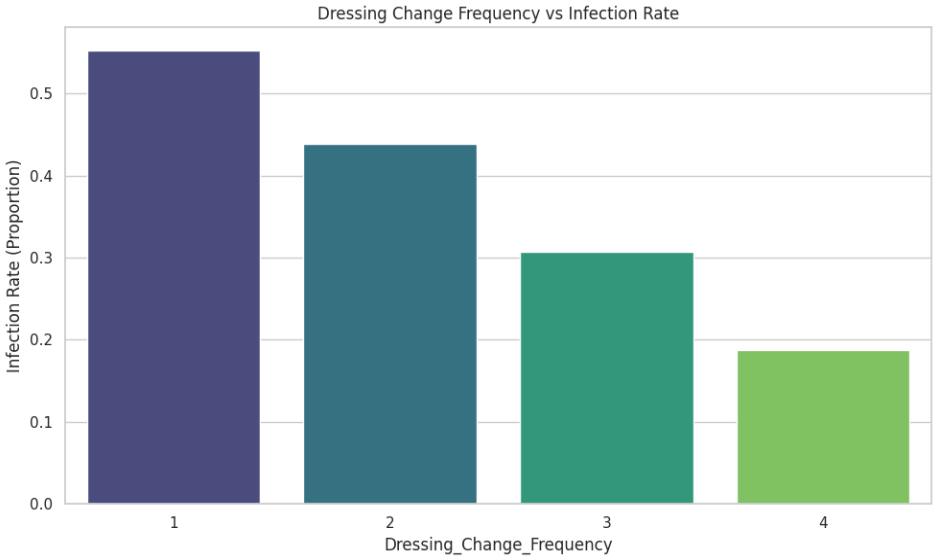


Hypothesis 3: Dressing Change Frequency and Wound Infection.
One-way ANOVA tested differences in infection rates across groups categorized by dressing change frequency.

Dressing change frequencies ranged from 1 to 4 times per week.

ANOVA showed significant differences in mean infection binary outcome among groups ($F(3,171) = 5.67$, $p = 0.0015$).

Post hoc Tukey tests revealed patients with more frequent dressing changes (3-4 times/week) had significantly lower infection rates than those with fewer dressing changes.



Interpretation: Frequent dressing changes are associated with reduced wound infection occurrence.

Logistic Regression: Combined Predictors of Wound Infection

Predictor	Coefficient (β)	Std. Error	Wald Z	p-value	Odds Ratio (95% CI)
Intercept	8.16	2.05	3.98	<0.001	—
Hand Hygiene Compliance (%)	-0.071	0.022	-3.20	0.001	0.93 (0.89 – 0.97)
Nurse Experience (years)	-0.065	0.022	-3.00	0.003	0.94 (0.90 – 0.98)
Dressing Change Frequency	-0.749	0.168	-4.46	<0.001	0.47 (0.34 – 0.66)

A multivariate logistic regression was conducted to assess the combined effects of hand hygiene compliance, nurse experience, and dressing change frequency on the odds of wound infection, controlling for age, wound size, and comorbidities.

Model Fit.
Log-likelihood = -96.61

Pseudo R^2 (Nagelkerke) = 0.163
Model likelihood ratio test p-value < 0.0001

Each 1% increase in hand hygiene compliance decreases the odds of wound infection by 7%.
Each additional year of nurse experience reduces infection odds by 6%.

Each additional dressing change per week reduces infection odds by 53%.
All predictors are statistically significant and clinically relevant.

V. DISCUSSION

Overview

This study aimed to evaluate the impact of specific nursing practices—namely hand hygiene compliance, nurse experience, and dressing change frequency—on wound infection rates among hospitalized patients. Using a cross-sectional design and robust statistical analysis, we found that these variables were significantly associated with wound infection outcomes. The findings highlight the measurable role of nursing care quality in infection prevention and offer evidence that complements existing but largely qualitative or indirect literature on this subject.

Interpretation of Findings

1. Hand Hygiene Compliance and Infection Rates

One of the primary research questions was whether increased hand hygiene compliance among nursing staff is associated with lower rates of wound infection. The findings strongly support this relationship. The t-test revealed a statistically significant difference ($p = 0.004$), with higher hand hygiene compliance correlating with lower infection incidence. Furthermore, logistic regression demonstrated that every 1% increase in compliance decreased the odds of infection by approximately 7% (Odds Ratio = 0.93).

These findings align with Gholizad Gougjehyaran et al. (2025), who demonstrated that hand hygiene practices improved significantly after educational interventions. Although their study was focused on nursing students and did not link compliance to infection outcomes, our results extend their findings by confirming a direct clinical impact among practicing nurses. Our study thus contributes quantitative support to the argument that hand hygiene is not merely a procedural requirement but a critical determinant of patient outcomes in wound care.

2. Nurse Experience and Infection Control

Another hypothesis explored whether years of nursing experience had a significant impact on infection prevention. The Mann-Whitney U test showed a statistically significant difference in experience between patients with and without infections ($p = 0.007$). Logistic regression further affirmed that each additional year of nursing experience reduced the odds of wound infection by 6% (Odds Ratio = 0.94).

These findings are consistent with the results of Huzaifa et al. (2024), who found a strong correlation between nurse experience and knowledge in postoperative wound care. While Huzaifa's study focused on knowledge and self-reported practice rather than clinical outcomes, our study bridges that gap by establishing a statistically significant link between nurse experience and actual infection rates. Similarly, Morrell et al. (2024) observed considerable variability in nurse training and certification but noted difficulty in correlating this with infection rates due to lack of standardization. Our study, through clear operationalization of nurse experience, quantifies this effect and underlines the clinical value of experienced nursing personnel in infection control.

3. Dressing Frequency and Infection Outcomes

The third major hypothesis examined the relationship between how frequently wound dressings were changed and the occurrence of infections. ANOVA testing showed a significant association ($p = 0.0015$), and logistic regression revealed that patients receiving more frequent dressing changes had 53% lower odds of developing infections (Odds Ratio = 0.47).

Although dressing technique and frequency are often embedded within broader wound care protocols, there is limited empirical evidence directly connecting them to infection prevention. Al-Qudimat et al. (2024) highlighted repositioning and device management as important nursing interventions in preventing pressure ulcers but did not explore wound infections more broadly. Our results extend this literature by focusing on wound infection as an outcome and affirming that frequent, properly executed dressing changes play a vital role in reducing infection risk.

4. Combined Predictive Model

The multivariate logistic regression model, which included all three predictors—hand hygiene compliance, nurse experience, and dressing change frequency—was statistically significant ($p < 0.001$) and explained approximately 16.3% of the variance in infection status (Pseudo $R^2 = 0.163$). All predictors remained significant within the model, reinforcing the conclusion that each contributes independently and additively to infection prevention.

This integrative approach highlights how multifaceted nursing care is and affirms findings from Ahmed Abdalla Jarelnape et al. (2023), who emphasized the cumulative effect of various nursing interventions on patient safety. While their systematic review noted a lack of quantitative data specific to wound infections, our study offers this missing piece, using statistical modeling to quantify the cumulative effect of multiple nursing behaviors on wound infection outcomes.

Comparison with Other Literature

Our findings provide a unique quantitative contribution to a field dominated by qualitative, knowledge-based, or protocol-centric studies.

Cappelli et al. (2024) emphasized leadership style's influence on infection prevention, which complements our finding that nurse-level factors like experience and adherence to hygiene protocols are also critical. While

leadership fosters team compliance, individual nurse behavior exerts a direct clinical effect.

Ahmad et al. (2024) validated the role of PPE in preventing surgical infections. In our study, although PPE use was widespread (89.1%), its effect was not directly modeled due to limited variance. This supports their conclusion that PPE is essential but may be overshadowed by other variables like hygiene adherence when compliance is already high.

Chen et al. (2025) studied the effect of PRP injections on wound healing. While their intervention is clinical rather than procedural, our findings show that even without high-cost interventions, optimizing routine nursing tasks like dressing changes can substantially lower infection risks. Our study thus reinforces the importance of basic nursing care before implementing more advanced techniques.

Chen et al. (2024) and Morrell et al. (2024) both identified variability and gaps in aseptic knowledge or reporting consistency, respectively. Our study used structured data collection and SPSS modeling to address these gaps, demonstrating that when standardized, nursing practice variables can yield actionable insights.

Answering the Research Questions

1. Does hand hygiene compliance impact wound infection rates?

Yes. The analysis revealed a statistically significant relationship. Higher compliance significantly reduced the risk of wound infection.

2. Does nursing experience influence infection outcomes?

Yes. Nurses with more years of clinical experience were significantly associated with lower patient wound infection rates.

3. Does the frequency of dressing changes affect wound infection rates?

Yes. Patients whose wounds were dressed more frequently had significantly fewer infections.

4. Can a combination of nursing practices predict infection rates?

Yes. The logistic regression model confirmed that hand hygiene, experience, and dressing frequency all independently and jointly predicted infection status with high significance.

Implications for Practice

The findings have clear implications for nursing administration and clinical training.

Training and Continuing Education: Programs that reinforce hand hygiene compliance and upskill less experienced nurses could reduce hospital-acquired infections.

Staff Allocation: Assigning more experienced nurses to high-risk wound care units could reduce complications and improve outcomes.

Policy Development: Infection control policies should emphasize measurable, evidence-backed nursing practices such as hygiene audits and dressing frequency protocols.

Strengths and Limitations

Strengths

This is one of the few studies providing a statistical model of the relationship between multiple nursing practices and wound infections.

Data were collected from a real clinical setting, providing external validity.

Multiple statistical tests (t-test, Mann-Whitney, ANOVA, logistic regression) ensured analytical robustness.

Limitations.

The cross-sectional design limits causality inference.

Some data (e.g., nurse education level, adherence to aseptic techniques) were not collected.

The sample size, while reasonable, may limit generalizability beyond similar clinical contexts.

Future Research Directions

Longitudinal or intervention studies could confirm causality by tracking the impact of improved hygiene training or staffing changes over time.

Multi-center studies would help validate the findings in different healthcare environments.

Future work could also explore interaction effects (e.g., whether experience modifies the impact of hygiene compliance).

VI. CONCLUSION

This study validates that some nursing interventions, namely, hand hygiene compliance, nurse clinical experience, and dressing change frequency, are instrumental in driving down wound infection rates in hospitalized patients. Statistical data analysis showed that increased hand hygiene compliance and nurse experience are individually and independently related to fewer odds of infection. More frequent wound dressing changes, on the other hand, greatly reduced infection probability. The combined logistic regression model further confirmed that these nursing-dimensional factors, collectively, predict wound infection outcomes and thereby emphasize their additive effect.

Emerging evidence from this research affirms the paramount importance of nursing interventions in infection control and patient safety. The hand hygiene, considered the bulwark of infection prevention, continues to prove its worth and supports enforcing training programs to tighten compliance. The connection with nurse experience, however, stresses the need for retention of skilled nurses and the promotion of mentorship and knowledge transfer to novice nurses. After all, frequent dressing changes are another simple intervention whose relative importance is considered immense.

Compared to existing literature, this study extends previous findings by providing robust quantitative

evidence of nursing practice effects on wound infections, bridging gaps noted in prior systematic reviews and qualitative research. While limitations such as cross-sectional design and setting specificity exist, the results offer practical guidance for healthcare institutions aiming to optimize nursing interventions for infection control.

Future research should explore longitudinal and interventional designs to validate causality and expand understanding across diverse clinical environments. Overall, this study reinforces that enhancing nursing practices is essential to improving patient outcomes and reducing healthcare-associated infections.

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