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Clinical Competence of Nurses and Its Association with Patient Safety Indicators

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Abstract

Background: Clinical competence is a key factor in the determination of nursing quality and patient safety, but its differential effect on patient safety indicators (PSIs) is not fully understood.

Objective: This research study investigated the association between clinical competence of nurses and significant PSIs through correlation analysis, regression analysis, and subgroup analysis.

Methods: Spearman correlation was used to measure the relationships between the Clinical Competence Score and five PSIs, including hospital-acquired infections (HAI), medication errors, patient falls with injury, pressure ulcers, and hand hygiene compliance. Independent effects were assessed using multivariable regression models (OLS and Poisson) using the adjustment of demographic and workplace confounders. Subgroup results were made based on results in the various departments and the various levels of experience.

Results: The clinical competence showed statistically significant negative relation with HAI ($\rho = -0.145$, $p = 0.012$) and statistically significant positive relation with hand hygiene compliance ($\rho = 0.279$, $p < 0.001$). These findings were validated by regression analysis, which indicated that greater competence independently predicted better hand hygiene compliance ($\beta = 4.209$, $p < 0.001$) and low HAI rates ($\beta = -0.243$, $p = 0.0085$). Results indicated that there were marginal associations with medication errors, although there was no significant relationship between patient falls or pressure ulcers. Subgroup analysis showed that there are no significant differences in competence or PSI rates between departments or experience levels.

Conclusion: The impact of clinical competence on the infection-related safety outcomes is the primary reason to highlight its significance in infection control practices compared to more general physical safety events.

Keywords: Clinical competence; Patient safety indicators; Hand hygiene; Hospital-acquired infections; Nursing quality; Regression analysis

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Introduction

Patient safety is one of the pillars of quality healthcare provision, and international health care systems endeavour to reduce avoidable injuries and improve clinical outcomes. In this context, nurses, who represent the most significant proportion of the healthcare workforce, are vital in the provision of safe, effective, and compassionate care (Adu & Zuma, 2024). Their everyday contact with patients, their ability to carry out complicated clinical procedures, and follow the evidence-based guidelines make them key frontline security guards of patient safety (Xu et al., 2025). As a result, the notion of clinical competence, which is understood as the combination of knowledge, skills, attitudes, and judgment required to complete the nursing tasks in a practical way, has become one of the critical factors that define the outcome of the individual performance and the overall outcome of the system safety (Almarwani & Alzahrani, 2023). The connection between clinical competence of nurses and quantifiable PSIs is thus a key area of concern to guarantee the maximization of workforce development and enhancement of care quality, as well as minimization of adverse events in hospital settings (Hall et al., 2020).

PSIs are standard measures that are utilized to monitor potentially preventable complications, including hospital-acquired infections, medication errors, patient falls, and pressure ulcers. Such indicators are not only essential to indicate the quality of care provided but also used as referents to institutional accountability and accreditation (Alshammari et al., 2023). Although many factors contribute to the PSI rates, such as the staffing, workload, organizational culture, and availability of resources, the competence of an individual nurse is becoming known as a modifiable and influential variable (Atalla et al., 2025). Indeed, competent nurses will be more inclined to identify the onset of patient deterioration, follow infection control guidelines, administer medicine correctly, and provide fall prevention methods- all of which directly influence PSI incidence (Zaitoun et al., 2022). Although this theoretical association exists, the empirical evidence that quantifies the strength and direction of the relationship between clinical competence and specific PSIs has not been thoroughly researched, especially in varied clinical settings and various nursing specialties (Atalla et al., 2025).

According to the existing literature, increased nursing competence is associated with better patient outcomes, such as lower mortality, reduced hospital stays, and fewer complications. Nevertheless, most of the literature uses self-reported competence or aggregate techniques that do not necessarily reflect the complexity and situational specificity of clinical performance (Smith et al., 2024). Furthermore, minimal studies have explored various PSIs simultaneously considering possible confounding factors, including years of experience, education level, nurse-to-patient ratio, type of shift, and the department setting (Tai et al., 2024). This is a considerable gap since the variables are able to influence the results of competence and safety independently. An example of this is when a nurse in an intensive care unit (ICU) experiences greater acuity and complexity than a nurse in pediatrics, which could affect both the demonstration of competence and PSI rates - but these differences need to be controlled to determine the actual impact of competence itself.

The given research fills this gap by analyzing a dataset of 300 registered nurses working on five major departments, known as Medical, Surgical, Pediatrics, ICU, and Emergency, to test

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the correlation between a provable Clinical Competence Score and five major PSIs: Hospital-Acquired Infections, Medication errors, patient falls with injury, pressure ulcers, and hand hygiene compliance percent (Hafezi et al., 2022). This study will use powerful statistical techniques, such as Spearman rank correlation and multivariate regression models (Ordinary Least Squares with continuous and Poisson regression with count data), and subgroup analysis of the department and experience level in order to obtain a complex, empirically based view of the relationships between nurse competence and actual safety outcomes.

Methodology

1. Study Design

The study design used was a quantitative, cross-sectional, analytical study that aimed at exploring the relationship between PSIs and clinical competence of nurses. This design allowed determining the level of competence and safety results of a specified population simultaneously and then conducting correlational and multivariate inferential statistics at the same time.

2. Study Setting and Population

The research took place in the tertiary care hospitals of India in the months of January-June 2025. The target population consisted of the registered nurses working in direct inpatient care in various clinical departments, such as Medical, Surgical, Pediatrics, Emergency, and Intensive Care Units (ICUs). Nurses who had less than six months of clinical experience, those who were working in an administrative position only, or had been on an extended leave during the study period, were eliminated to make sure that competence measures were based on active clinical practice.

3. Sample Size and Sampling Technique

The sample size of about 300 nurses was established to yield sufficient statistical power to carry out a correlation and regression study, concerning a medium effect, a level of significance of 0.05, and a power of 0.80. A slightly larger sample was aimed at to consider the possible non-response or incomplete data. Proportional representation was also achieved through the stratified random sampling technique by ensuring that every hospital department and work shift (morning, evening, and night) was represented. The method increased the sample representativeness and reduced selection bias.

4. Study Variables and Measurement

4.1 Independent Variable: Clinical Competence

A validated nursing competence assessment tool was used to measure clinical competence and provide a continuous Clinical Competence Score. The tool evaluated several areas, such as clinical judgment, technical skills, communication, critical thinking, and professional responsibility. The answers were noted in a Likert-type scale, whereby a higher score represented a higher clinical competence.

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4.2 Dependent Variables: Patient Safety Indicators (PSIs)

Five major PSIs of both adverse events and preventive clinical care were included as the dependent variables in this study. These were hospital acquired infections (HAI), medication errors, patient falls with injury, pressure ulcers and hand hygiene adherence. Count-based outcomes were operationalized as hospital-acquired infections, medication errors, patient falls, and pressure ulcers, which are the frequency of the events that took place during the study period. Hand hygiene compliance, on the other hand, was also a continuous percentage variable, calculated through a regular hospital audit of data, which showed compliance with the set protocols of infection control. This difference informed the choice of the right statistical models to be used later.

4.3 Covariates

The multivariate regression models were used to adjust the covariates, which were a few demographic, professional, and organizational variables, to account for any possible confounding effects. These covariates included nurses age, years of clinical experience and highest educational level, and those can affect not only clinical competence but also patient safety outcomes. Further, workload and contextual variables, that is, nurse-to-patient ratio, shift type (morning, evening, or night), and department of posting, were added to the model to minimize differences in the intensity of staffing, work patterns, and clinical environment. The inclusion of these covariates enabled the more precise estimation of the independent effect that clinical competence has on the indicators of patient safety.

5. Data Collection Procedure

Data collection was done after receiving ethical approval from the Institutional Ethics Committee of [Institution Name]. All the participants secured written informed consent.

The administration of clinical competence questionnaires was done at non-duty time by trained research personnel to ensure that patient care was not disturbed. The data on patient safety were collected in hospital quality assurance and incident reporting systems, aggregated on a unit or nurse level, and anonymized before the analysis. There was no discernible nurse-level attribution of adverse events carried out.

6. Statistical Analysis

The statistical software was used to analyze the data (Python and R Studio). Nurse characteristics, competence scores, and PSI distributions were summarized using descriptive statistics, such as means, standard deviations, frequencies, and percentages.

6.1 Correlation Analysis

Bi-variable associations between Clinical Competence Score and either of the PSI were examined using Spearman rank-order correlation coefficient (r). The approach of Spearman was chosen because PSI data was not normally distributed and competence scores were ordinal to continuous. The visualization of the results was conducted with the Spearman correlation heatmap and complemented with scatter plots with trend lines fit.

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6.2 Regression Analysis

A multivariate regression analysis was done to determine the independent impact of clinical competence on patient safety outcomes with the adjustment of the pertinent confounding variables. Hand Hygiene Compliance (%) was used in Ordinary Least Squares (OLS) and was regression because the result was measured on a continuous scale. Meanwhile, Hospital-Acquired Infections, Medication Errors, Patient Falls with Injury, and Pressure Ulcers were analyzed using Poisson regression models since all of the mentioned indicators were count-based outcomes. The findings of the regression were in the form of coefficients with the p-values and the levels of statistical significance. Results were presented in table format and further explained with bar charts and forest plots, which introduced a clear understanding of the magnitude, direction, and accuracy of the estimated effects of clinical competence on the patient safety indicators.

6.3 Subgroup Analyses

To investigate the differences in clinical competence and patient safety outcomes in various clinical and professional settings, subgroup analyses were conducted. The differences in clinical competence between the departments were investigated with the help of the one-way Analysis of Variance (ANOVA), whereas the differences in the rates of patient safety indicators in the departments have been evaluated with the help of the Kruskal-Wallis test, as the PSI data were not normally distributed. Further, the comparison in terms of the level of experience was done by grouping the nurses into two categories: Junior (≤ 5 years of experience) and Senior (> 5 years of experience). The difference between these groups in terms of clinical competence scores and the number of PSI events was assessed with the help of the Mann-Whitney U test. The significance level was set at $p < 0.05$ and where possible marginal associations were identified.

7. Ethical Considerations

The principles of the Declaration of Helsinki were followed in the study. The participation was voluntary and all data were anonymized before analysis and all data were confidential. The findings were presented in an aggregate form to avoid any identification of nurses or units, which reduced professional or ethical harm to the participants.

Results

1. Correlation Analysis

Spearman Correlation Heatmap

The rank correlation calculated by Spearman was used to determine the relationship between Clinical Competence Score and individual PSI in Figure 1. The Clinical Competence Score had a statistically significant negative correlation with the Hospital-Acquired Infections ($\rho = -0.145$, $p = 0.012$), meaning that the higher the score of Clinical Competence, the lower the hospital-acquired infections. Conversely, a clinically significant correlation between Clinical Competence Score and Medication Errors exhibited a weak and negative correlation ($\rho = -0.078$, $p = 0.179$), though it was not substantial enough to indicate the reliability of the

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association in this sample. Equally, there was insignificant yet slightly negative correlation between Patient Falls with Injury ($\rho = -0.054$, $p = 0.352$), whose values were not significant to support any definite conclusion about the relationship. The correlation to Pressure Ulcers was not statistically significant ($\rho = -0.034$, $p = 0.557$) and was of the nature of no significance, which did not support the relationship between competence and the occurrence of pressure ulcers in Table 1. On the contrary, the HH Compliance % showed a statistically strong positive correlation with Clinical Competence Score ($\rho = 0.279$, $p < 0.001$), i.e. the strongest and most persistent relationship observed, which proved that nurses with better clinical competence showed significantly better hand hygiene compliance.

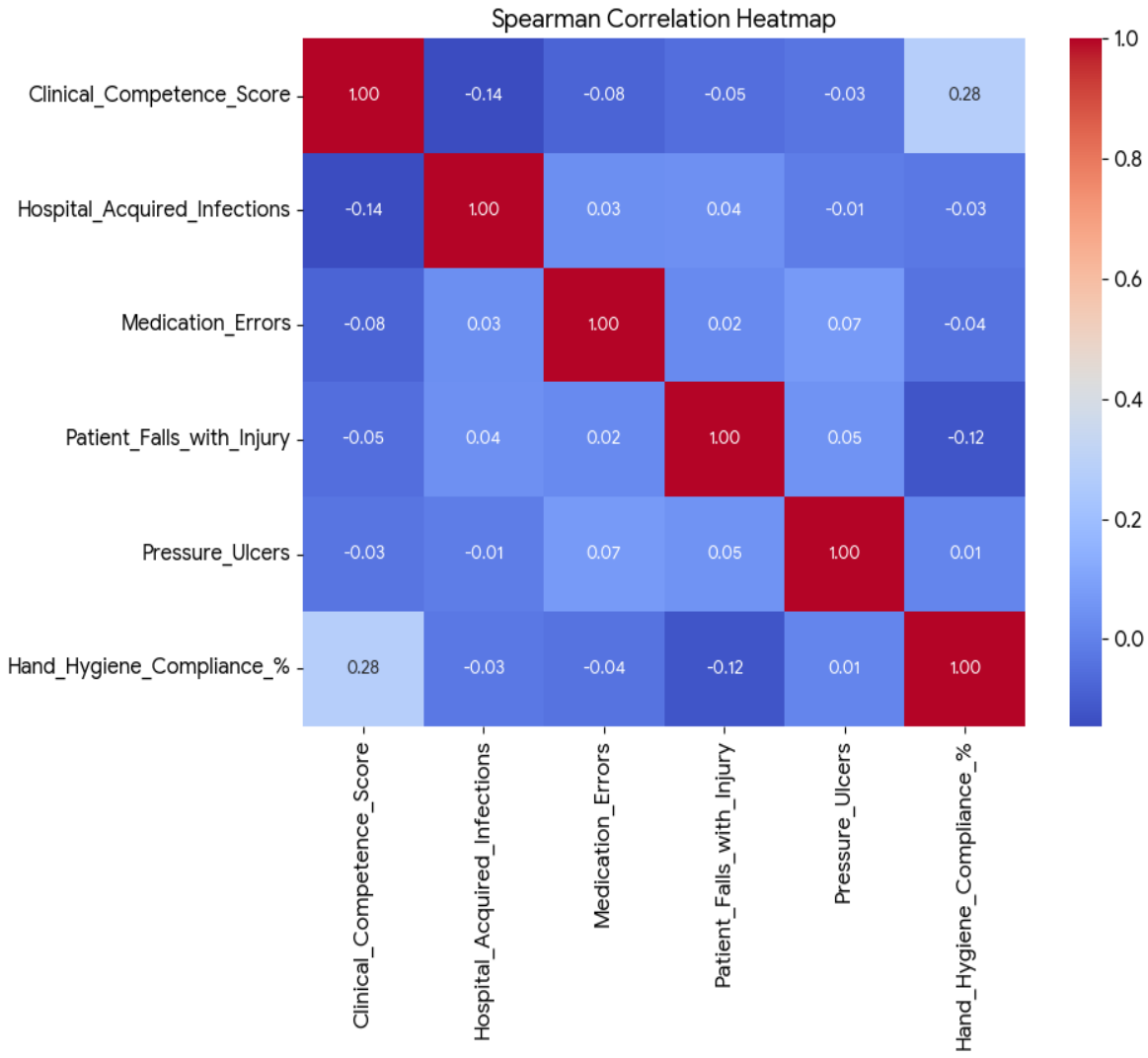

Figure 1. Spearman correlation heatmap

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Table 1. Correlation between Clinical Competence and PSIs

PSI Variable	Spearman Correlation (ρ)	p-value	Significant ($p < 0.05$)
Hospital-Acquired Infections	−0.145	0.0121	Yes
Medication Errors	−0.078	0.1794	No
Patient Falls with Injury	−0.054	0.3520	No
Pressure Ulcers	−0.034	0.5566	No
Hand Hygiene Compliance (%)	0.279	< 0.0001	Yes

Scatter Plots

Scatter plots were created to visually analyze the relationship between Clinical Competence Score and each PSI, and in each scatter plot, a red trend line was put to show which way and how strong the association is mentioned in Figure 2.

In the case of Hospital-Acquired Infection, the scatter plot image showed a negative red-colored trend line, which was a visual confirmation of the statistically significant negative correlation. The data points revealed that there was a moderate one to one scatter around the line, which was in line with a weak and significant inverse relationship, higher competence scores tended to be correlated with a lower number of infections.

The trend line, in the instance of the Medication Errors, was slightly decreasing, which corresponds with the weak negative correlation which existed; though, the plot was widely spread, showing a high variability and low predictability of competence on medication error rates. This pattern in visualization was an indication of the non-significant statistical outcome.

The Patient Falls with Injury plot exhibited a virtually flat trend line and the downward slope was very little which means that there is a negligible linear association between clinical competence and fall-related injuries. The fact that the points were randomly distributed contributed to the fact that there was no statistically significant association.

The same was the case with the scatter plot of Pressure Ulcers which had a near horizontal trend line and insignificant negative slant. The fact that the data points did not form a definite pattern visually proved the lack of any significant correlation between nurse competence and the occurrence of pressure ulcers.

The opposite is true since in the scatter plot of Hand Hygiene Compliance %, the red trend line was found to be of a significantly upward nature which effectively indicates strong visual evidence of a positive relationship. Hand hygiene compliance tended to improve as Clinical Competence Score improved and the spread was less and the correlation is more

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homogeneous over the range of scores- which is in line with the statistically significant and relatively more substantial correlation observed in the analysis.

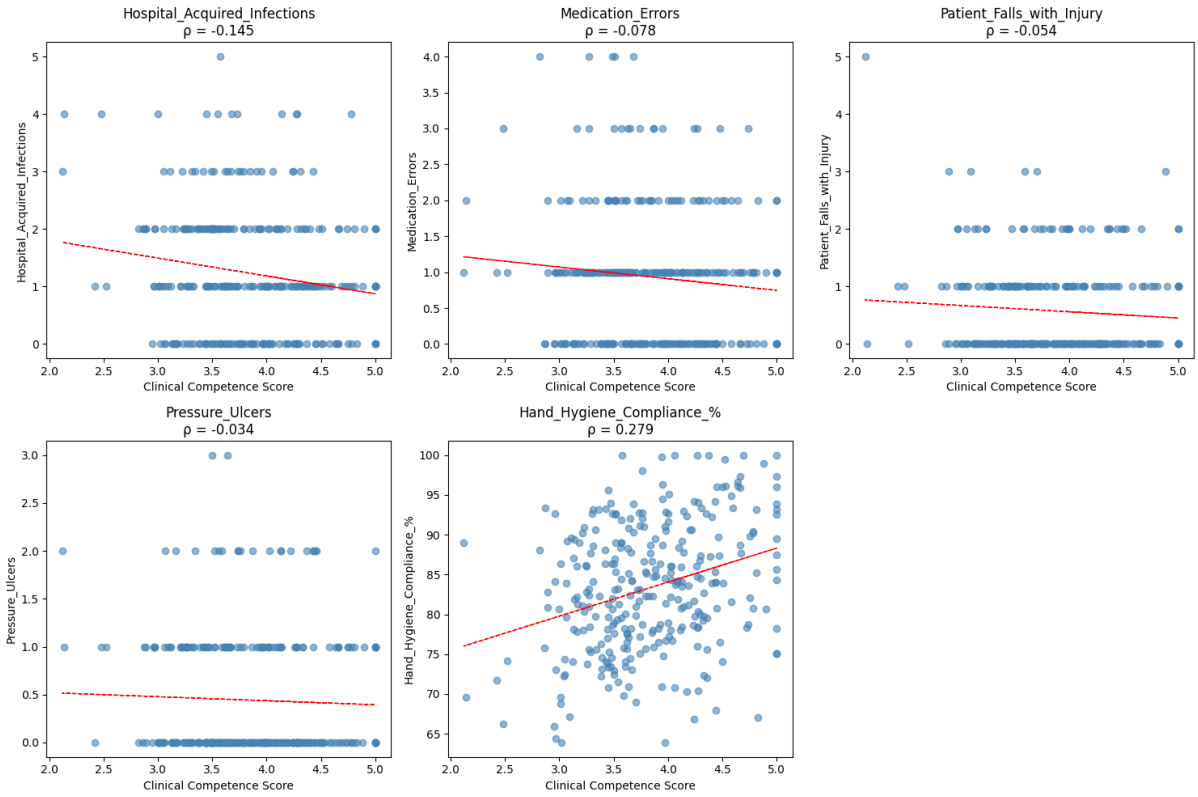

Figure 2. Association Between Clinical Competence Score and Patient Safety Indicators: Scatter Plots Revealing Weak to Moderate Correlations Across Five Key Outcomes

Regression Analysis

In Table 2, the regression analysis investigated the independent impact of Clinical Competence Score on five fundamental PSIs and controlled the confounding variables including Age, Years of Experience, Education Level, Nurse-to-Patient Ratio, Shift, and Department. The findings demonstrated that clinical competence had a statistically significant impact on two variables: Hand Hygiene Compliance and Hospital-Acquired Infections (HAI).

In the case of Hand Hygiene Compliance, Ordinary Least Squares (OLS) regression model has been used that gave a significant value according to the coefficient of 4.209 ($p < 0.001$). This meant that a one-unit rise of Clinical Competence Score would result in an increase of 4.21 percentage points in hand hygiene compliance - the most significant effect in any PSIs. This result highlighted the importance of clinical competence in enhancing compliance with fundamental infection control measures.

Contrarily, Poisson regression was applied in developing the Hospital-Acquired Infections, and a negative coefficient of –0.243 ($p = 0.0085$) was found to be significant. This implied a

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positive correlation between increased clinical competence and a lower infection rate- in line with the assumption that more competent nurses would be able to apply preventive care in a better way despite the fact that that ratio, experience, and departmental variation had been enabled.

In the case of Medication Errors, Poisson model yielded a negative coefficient of –0.183 ($p = 0.0865$) that was slightly less than the standard level of statistical significance ($p < 0.05$). Although this peripheral relationship gave a suggestion of the possible protective influence of competence on medication safety, the data was not quite enough to make concrete conclusions in this sample.

Patient Falls with Injury ($\beta = –0.146$, $p = 0.2739$) and Pressure Ulcers ($\beta = –0.086$, $p = 0.5795$) did not exhibit any statistically significant association with clinical competence. The coefficients were negligible and not substantial indicating that these bad events might not be due to individual nurse competency but in this data set, they are due to systems or environmental conditions.

These results were supported graphically by the relevant bar chart in Figure 2, which was called Clinical Competence Score Impact on Patient Safety Indicators (Coefficients from Regression Models). The size and the direction of each regression coefficient were indicated in the chart, and the Hand Hygiene was the tallest of all the bars, indicating its significant positive impact. The HAI bar was not very long, but it was slightly under zero as it is supposed to have a moderate adverse effect. The Medication Errors, Falls, and Ulcers bars were close to zero, and Medication errors had a small negative number, which is in proportion to its marginal significance. The visual presentation did show that only Hand Hygiene and HAI showed significant connections with clinical competence, and other PSIs have insignificant or nonsignificant effects.

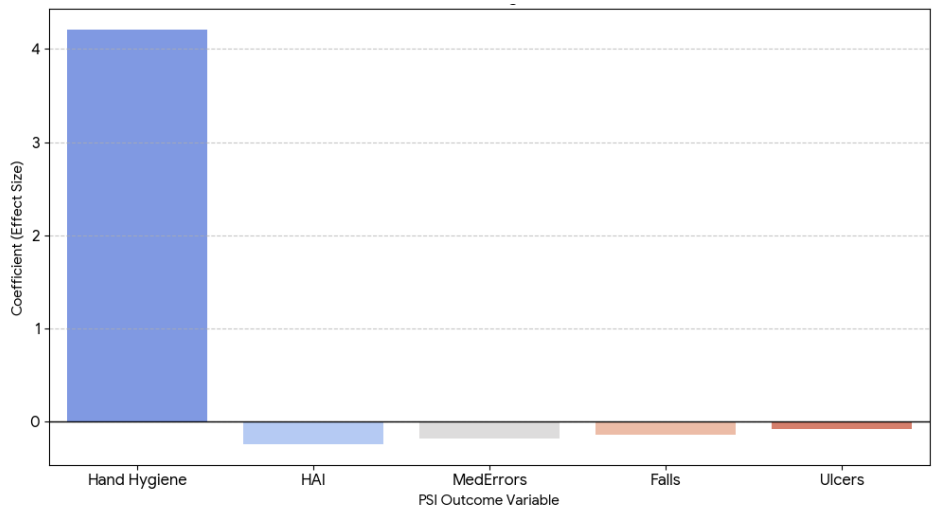

Figure 3. Clinical competence score impact on patient safety indicators using coefficient regression model

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Table 2. Regression Analysis of Clinical Competence on Patient Safety Outcomes

Outcome Variable	Model Type	Coefficient (Effect)	p-value	Statistical Significance
Hand Hygiene Compliance	OLS	4.209	< 0.001	*** (High)
Hospital-Acquired Infections (HAI)	Poisson	−0.243	0.0085	** (Medium)
Medication Errors	Poisson	−0.183	0.0865	· (Marginal)
Patient Falls with Injury	Poisson	−0.146	0.2739	Not Significant
Pressure Ulcers	Poisson	−0.086	0.5795	Not Significant

Note: OLS = Ordinary Least Squares regression. Poisson regression was used for count-based patient safety outcomes. Significance levels: *** $p < 0.001$; ** $p < 0.01$; · $p < 0.10$.

Forest plot

The strongest and most accurate association was observed between Hand Hygiene Compliance: the point estimate was far to the right of zero (it was approximately 4.2) and the confidence interval did not cross zero, which validated a very strong significant positive association - higher clinical competence was strongly correlated with better hand hygiene practices.

Hospital-Acquired Infections (HAI) had a statistically significant negative coefficient (it was approximately –0.24), and the confidence interval was on the left side of the zero line, which was a visual confirmation of the arguments that competence was higher and it was associated with fewer infections on its own.

The point estimate of the Medication Errors was slightly less than zero (–0.18), and the confidence interval was just below the zero which is a reflection of its marginal significance ($p = 0.0865$). This indicated a potential protective role of competence, but not sufficient evidence was found to prove a definite relationship in this sample.

On the contrary, both Patient Falls with Injury and Pressure Ulcers had point estimates that were very close to zero (–0.15 and –0.09, respectively), and the confidence intervals entirely contained zero - which gives an explicit visual confirmation that there was no statistically meaningful relationship between clinical competence and these outcomes.

Taken together, the forest plot demonstrated that the effect of clinical competence was a quantifiable, independent effect on infection-related safety measures, mostly hand hygiene and hospital-acquired infections, and had a small to no impact on falls or pressure ulcers. This trend highlighted the possibility that competence can have the most significant effects in areas that involve a high level of procedural compliance and infection control practices, as opposed to wider physical safety outcomes, at least in the study of this dataset.

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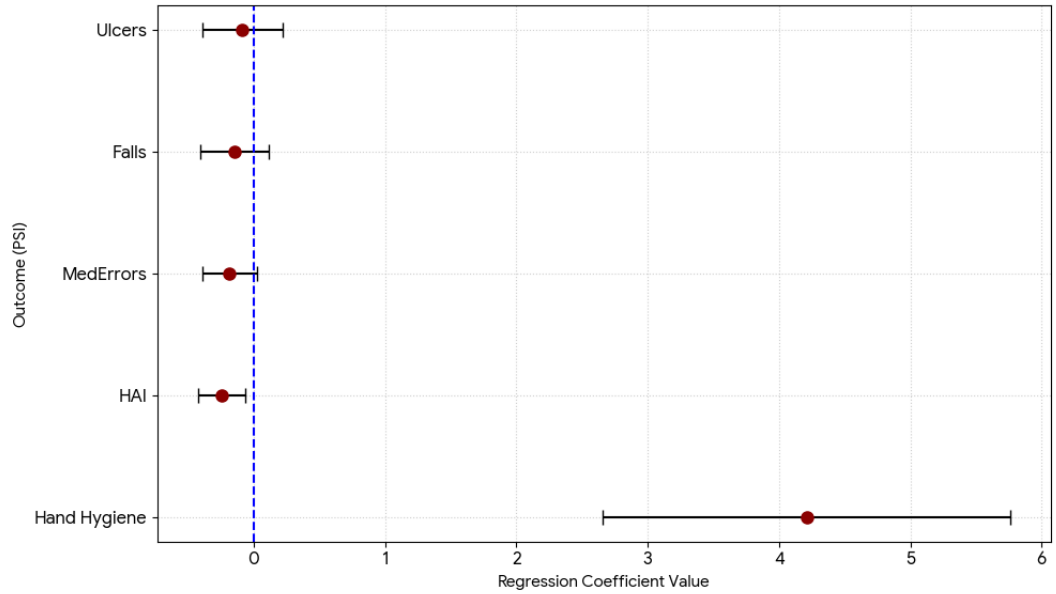

Figure 4. Clinical competence score using forest plot of regression coefficients (95% CI)

3. Subgroup Analysis

1. Subgroup Analysis: Departmental Comparison

Figure 5, comparative analysis of the clinical competence and patient safety incidences in the individual departments was summarized in the left side of the figure with the title, Clinical Competence Score by Department with the boxplots of all the five departments, Pediatrics, Medical, Surgical, Emergency, and ICU. Table 3 that comes with this analysis gave the competence means that narrowed between 3.81 (Surgical) and 3.96 (ICU) with a sample size of 42 (Pediatrics) to 75 (Surgical). A One-way ANOVA statistically established no significant differences among the competence in the departments ($F = 1.33$, $p = 0.256$), and visual evidence was provided by the boxplots, where all five departmental distributions were widely spread, medians in the range of 3.7 to 4.0, and interquartile ranges spread similarly. There was no statistically significant difference in competence between departments, which supported the statistical finding that there was no significant difference in clinical competence across departments.

Equally, there was little difference in the frequency of PSI events per nurse (average) among the departments ranging between 2.15 (ICU) and 2.53 (Emergency), and no significant difference was identified through Kruskal-Wallis test ($H = 4.35$, $p = 0.361$). The ICU may have had the lowest mean PSI rate and the Emergency the highest, but the difference was not so significant to be called significant due to a variance in each group, as well as the size of the samples.

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Table 3. Department-wise Mean Competence Scores and PSI Events

Department	Mean Competence Score	Mean PSI Events	Sample Size (N)
Emergency	3.86	2.53	55
ICU	3.96	2.15	55
Medical	3.84	2.45	73
Pediatrics	3.86	2.50	42
Surgical	3.81	2.37	75

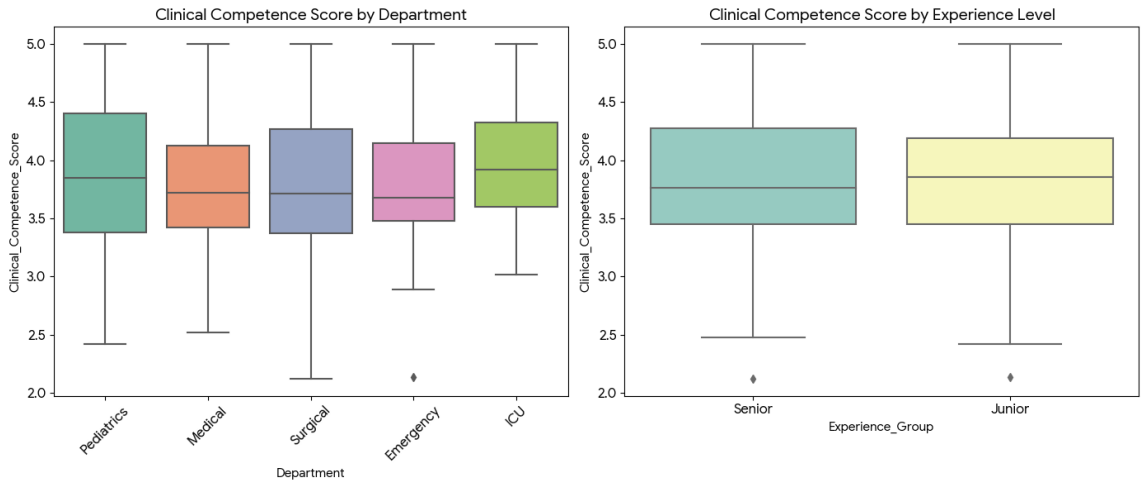

Figure 5. Clinical Competence Scores by Subgroups (The left plot - the distribution of scores across departments; right plot - compares Junior vs. Senior nurses).

2. Subgroup Analysis: Experience Level Comparison

The figure is visually divided into the right panel, titled Total PSI Events by Experience Level, which comparatively displays the distribution of total PSI events between two groups of nurses, one being the Junior (≤5 years of experience) and the other one being the Senior (>5 years of experience) nurses. The boxplots show that although the median PSI event count of Junior nurses seems to be a little higher than of Senior nurses with a wider interquartile range and additional outliers, the differences in the overall distribution are still significant. The mean PSI rate of the TPNs (2.80 events per nurse) is higher among Junior nurses (2.33) than among Senior nurses (2.33). The Mann-Whitney U did not however, show any statistically significant difference between the two at the standard $\alpha = 0.05$ level ($p = 0.074$), level, implying that the difference may have been as a result of chance.

Table 4, states that Clinical Competence Score of Junior nurses (3.89) was slightly higher than that of Senior nurses (3.85), but the Mann-Whitney U test of competence also did not find significant difference in the levels of competence between the two experience groups (p

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= 0.767). This observation fits into the overall picture of nursing practice, in which formal competency evaluations might not necessarily translate into practice or patient safety outcomes - and indicates that other elements outside tenure, including workload, teamwork, or unit culture, might have a greater impact on patient safety.

Table 4. Comparison of Clinical Competence and Patient Safety Indicators by Experience Level

Experience Group	Mean Competence Score	Mean PSI Events	Sample Size (N)
Junior (≤ 5 years)	3.89	2.80	44
Senior (> 5 years)	3.85	2.33	256

Note: Values represent group means. Experience was categorized based on years of professional practice.

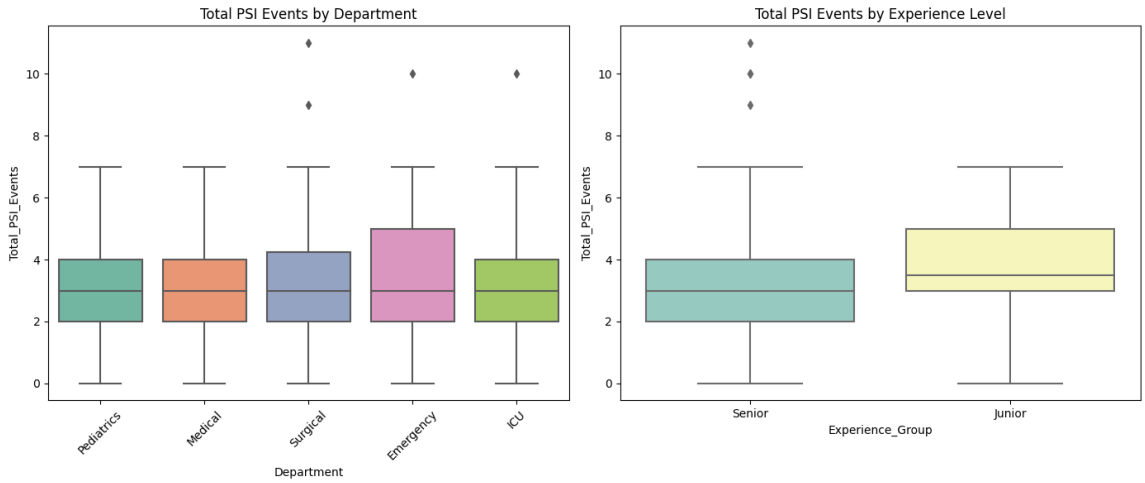

Figure 6. Distribution of PSI Events Across Clinical Departments and Nurse Experience Levels

Discussion

The main aim of the research was to investigate the dependence between clinical competence of nurses and the main PSIs with the help of correlation, regression, and subgroup analysis to find out the associative and independent effect and to consider the significance of the related confounders. The results show that clinical competence has selective links with patient safety outcomes but not consistent impacts on all indicators. In particular improved hand hygiene compliance and fewer hospital-acquired infections (HAIs) were significantly related to higher clinical competence, but statistically significant and meaningful relationships were not found between medication errors, patient falls with injury, and pressure ulcers. Further subgroup analyses showed no significant difference in the level of clinical competence or the level of PSI between the two departments or years of experience. Together, these findings indicate that clinical competence has the most significant effect on infection prevention practices and

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outcomes, and other safety occurrences might be better initiative by systemic, environmental, or organizational influences.

The close and stable correlation between clinical competence and hand hygiene compliance is consistent and congruent with the current literature of competence as a foregone conclusion of compliance with the infection control practice. Hand hygiene is a thinking-based, protocol-focused behavior that involves knowledge, vigilance and professional accountability - pillars of clinical competence (Sands et al., 2020). Past research has shown that more competent or competent nurses, in terms of clinical judgment, show more compliance with the standard precautions and infection prevention measures (Elseesy et al., 2023). This study contributes to the idea that competence increases the capacity of nurses to transform knowledge into regular practice with a strong positive effect in both correlation and regression analyses. Notably, the size of the regression coefficient indicates that it is not only statistically significant but also practically, which indicates competence as a changeable variable that can significantly enhance essential but straightforward safety behavior.

On the same note, the negative association between clinical competence and hospital-acquired infections is well-grounded in the previous studies of the relationship between the quality of nursing and infection outcomes. HAIs are multifactorial yet specific to front line nursing care that encompass aseptic technique, surveillance, early identification and timely intervention (Alnadawy et al., 2024). Research has found that reduced catheter-associated infection and ventilator-associated pneumonia rates are linked to increased nurse competence, education, and clinical expertise (Teixeira et al., 2025). The current evidence builds upon this result by showing that clinical competence is a predictive of reduced rates of infection despite including nurse-to-patient ratios, experience, shift patterns, and department. This indicates that competence has a unique contribution to infection prevention in addition to staffing and structural variables, which contributes to the core position of competence in the patient safety framework.

Conversely, the lack of meaningful interrelations between clinical competence and medication errors, falls on patients with injuries, and pressure ulcers also aligns with the emerging literature on the complexity of these outcomes (Kakemam et al., 2024). Although medication errors are affected by personal vigilance, system-level factors, including electronic prescribing systems, workload, interruptions, and organizational safety culture, have significant influence on medication errors (Guntschnig et al., 2025). The marginal association in this study implies a potential protective pattern but demonstrates the possibility of not being able to control systemic vulnerabilities by competence only. Likewise, the environment, patient acuity, mobility aids, staffing sufficiency, and multidisciplinary coordination effect patient falls and pressure ulcers. Such outcomes have been noted by the previous research to be more responsive to the bundled interventions, unit-level protocols, and institutional policies than individual competency (Neill & Martin, 2024). Meaningless coefficients and non-significant results in this work contribute to another understanding that these PSIs are not as sensitive to personal competence of nurses alone.

These findings are also further contextualized through the subgroup analyses that revealed that there was no significant difference in clinical competence amongst the departments or

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levels of experience. This implies the reasonable homogeneity of competence in the workforce, which may well represent standard training, credentialing and continuing learning standards in the organization. It is also interesting to note that there are no significant differences between junior and senior nurses as such because it refutes the assumptions that the measured competence and the number of safety incidents are bound by the number of years of experience. The same results were also noted in earlier studies, indicating that experience in itself does not lead to better safety outcomes without some complementary environments, reasonable workloads, and group cooperation (Ajmi & Aase, 2021). These findings stress the significance of organizational context and confirm that competence has to be actively maintained on a systems level and not passively built up with experience.

This study has a number of limitations which must be considered in the interpretation of this study although it has strength. To start with, the cross-sectional design prevents causal inference; although the relationships are evident, it is impossible to conclude the direction of the relationships. Second, a composite score was used to measure clinical competence, which, despite being standardized, might not be significantly faithful to subtle variables of clinical performance in real-life situations. Third, there may be underreporting/reporting bias of PSI data, especially in medication errors and falls. Fourth, the research was done in one institution, which may not be generalized to other healthcare facilities with other staffing models and other patient groups and safety cultures. Lastly, even though critical confounders were managed, uncontrolled variables which could have contributed to the observed patterns were leadership quality, safety climate, and interprofessional collaboration.

Conclusion

This research offers strong support to the fact that clinical competence in nurses is not consistently related to the patient safety outcomes but to the selective nature of its relationship with these outcomes. In a variety of analytical models, the concept of clinical competence showed a significant and separate correlation with the indicators of infection, especially the hand hygiene adherence and hospital-acquired infections. The positive correlation that is significant with hand hygiene demonstrates competence as the primary factor underlying compliance with necessary preventive measures, and the negative correlation with HAI proves its applied value in decreasing the burden of infection in the medical practice.

On the contrary, the lack of statistically significant relationships between clinical competence and medication errors, patient falls, or pressure ulcers indicates that the outcomes could be more significantly influenced by organizational, environmental, or system-level influences, including staffing, workflow organization, and resource availability. Subgroup comparisons also indicated that there were no significant difference in competence and PSI rates based on department, or the years of experience, which suggests that formal competence tests might reflect standardized skills, and not experiential or situational factors affecting safety.

On the whole, these results also indicate that specific interventions to enhance clinical competence can have the most significant patient safety improvement in areas where procedural adherence is needed, especially in infection prevention. System level variables

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should be included in future studies to enhance the explanation of intricate safety outcomes in relation to more than just individual competence.

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