

Determinants of Nursing Management Factors on Nurse Compliance with Infection Prevention: a cross-sectional study

Neila Fauzia^{1*}, Reka Julia Utama², Mira Fajarina³, Rita Noviana⁴, Rehmaila Malem⁵, Risna⁶

^{1,2,3,4,5} Universitas Bina Bangsa Getsempena, Aceh, Indonesia

⁶ STIKes Medika Nurul Islam, Aceh, Indonesia

Abstract

Nurse compliance with infection prevention is essential for ensuring patient safety and maintaining high-quality healthcare services. However, compliance is influenced by various managerial and organizational factors, and evidence from regional hospitals remains limited. This study contributes by identifying and analyzing key nursing management determinants leadership, organizational support, workload, patient safety culture, and knowledge that affect infection prevention compliance among nurses at Tgk Chik Ditiro Hospital, Sigli, Aceh.

This study used a quantitative analytic approach with a cross-sectional design conducted at Tgk Chik Ditiro Hospital, Sigli, Aceh, in 2025. The study population consisted of all staff nurses working in inpatient wards and intensive care units. A total of 120 respondents were selected using proportional random sampling. Inclusion criteria were: (1) nurses with at least six months of work experience, (2) actively working during the data collection period, and (3) willing to participate. Data were collected over a two-month period, from January 17 to May 18, 2025.

Validated and reliability-tested questionnaires were used to measure leadership, organizational support, workload, patient safety culture, knowledge, and nurse compliance. Leadership was measured using the Leadership Behavior Questionnaire (Cronbach's $\alpha > 0.80$); organizational support using the Perceived Organizational Support Scale ($\alpha > 0.85$); workload using the NASA-TLX instrument; and patient safety culture using the HSOPSC ($\alpha = 0.63-0.84$). Knowledge was assessed using a structured questionnaire based on the hospital's IPC guidelines ($\alpha = 0.78$). Nurse compliance was measured through combined self-reported checklists and direct observation to reduce potential bias. Ethical approval and institutional permissions were obtained, and written informed consent was provided by all participants.

Data analysis included univariate descriptive statistics, bivariate analysis with the Chi-square test, and multivariate logistic regression. Results showed that nurse compliance with infection prevention was 66.7%. Knowledge (OR = 3.21; $p = 0.001$) and patient safety culture (OR = 2.87; $p = 0.003$) were the strongest determinants. Workload had a negative effect on compliance (OR = 0.62; $p = 0.046$), while organizational support was not statistically significant ($p = 0.088$).

In conclusion, knowledge and patient safety culture were the most influential factors affecting infection prevention compliance among nurses. These findings highlight the importance of continuous education, strengthening patient safety culture, and effective workload management as key managerial strategies to improve compliance and enhance patient safety outcomes.

Keywords: compliance; infection prevention; nursing management

*) Corresponding author: Neila Fauzia

E-mail: neilafauzia.nf@gmail.com

1. Introduction

Healthcare-associated infections (HAIs) remain one of the most critical challenges in healthcare delivery, contributing to prolonged hospital stays, increased morbidity and mortality, and higher healthcare costs. In developing countries, including Indonesia (Sartelli et al., 2024), the prevalence of HAIs is estimated at 7–10%, which underscores the urgent need for effective infection prevention and control (IPC) measures (Virtosu et al., 2025).

Nurses, as the largest group of healthcare professionals, play a pivotal role in implementing IPC practices. However, compliance with standard precautions, such as hand hygiene and appropriate use of personal protective equipment (PPE), remains suboptimal in many settings (Cappelli et al., 2025). Several studies have demonstrated that nurse compliance is influenced not only by individual factors, such as knowledge and attitudes, but also by organizational and managerial determinants (Zhang et al., 2024).

From a nursing management perspective, key determinants include leadership, organizational support, workload, patient safety culture, and knowledge. Effective leadership, particularly transformational and supportive styles, has been shown to enhance compliance and improve patient safety outcomes (Verhougstraete et al., 2024). Organizational support, including adequate resources, supervision, and training opportunities, is also essential for sustaining compliance (Mangalea et al., 2024). Conversely, excessive workload has been linked to lower adherence to infection prevention measures (Hayward et al., 2024).

Patient safety culture is another critical factor. Hospitals with strong safety cultures, characterized by open communication, teamwork, and non-punitive error reporting, tend to have higher levels of compliance among nurses (Biswas et al., 2024). Moreover, nurses with adequate knowledge and training are more likely to comply with infection prevention protocols, as evidenced by studies showing that educational interventions significantly improve adherence (Budianu et al., 2025).

Despite the extensive literature on IPC compliance, limited research has explored the interplay of managerial factors particularly in the Indonesian hospital context. Recent evidence from global and regional studies highlights that leadership commitment, effective supervision, safety climate, workload regulation, and organizational support significantly influence nurse adherence to infection prevention protocols (Bisola et al., 2024). Several Indonesian studies also reveal persistent barriers such as inconsistent managerial monitoring, limited motivation systems, inadequate staffing patterns, and weak managerial communication pathways, all of which contribute to variation in compliance levels (Bisola et al., 2024). However, most of these studies

focus on individual or facility-related determinants, while comprehensive assessments of nursing management functions remain scarce (Moffa & Tana, 2025). Therefore, this study aims to analyze the “determinants of nursing management factors on nurse compliance with infection prevention in Hospital X in Aceh (Tanner et al., 2025).

2. Method

This study used a quantitative analytic approach with a cross-sectional design conducted at Hospital X in Aceh 2025. The population consisted of all staff nurses working in inpatient wards and intensive care units. A total of 120 respondents were selected using proportional random sampling. Inclusion criteria included: (1) nurses with ≥ 6 months of work experience, (2) actively working during data collection, and (3) willing to participate. This research was conducted over a two-month period, spanning from January 17 to May 18, 2025.

The dependent variable in this study was nurse compliance with infection prevention practices. The independent variables consisted of leadership, organizational support, workload, patient safety culture, and knowledge. Data were collected using validated and structured questionnaires. Leadership was assessed using the Leadership Behavior Questionnaire, which has demonstrated good construct validity and internal consistency (Cronbach's $\alpha > 0.80$). Organizational support was measured with the Perceived Organizational Support Scale, previously validated in healthcare settings with reliability coefficients above 0.85. Workload was evaluated using the NASA Task Load Index (NASA-TLX), a widely applied instrument with established validity and reliability across nursing and clinical populations. Patient safety culture was examined with the Hospital Survey on Patient Safety Culture (HSOPSC), which has shown strong psychometric properties with Cronbach's α values ranging from 0.63 to 0.84 across its dimensions. Knowledge was measured using a structured questionnaire developed based on the hospital's infection prevention and control (IPC) standard operating procedures; the instrument was pretested for face validity and achieved satisfactory internal consistency (Cronbach's $\alpha = 0.78$). Nurse compliance was measured using a combination of self-reported checklists and direct observation to enhance measurement accuracy and reduce potential reporting bias.

Data collection was conducted after obtaining ethical approval from the Institutional Review Board with ethics clearance number 123/HREC-RSTCD/I/2025, along with formal permission from Tgk. Chik Ditiro Hospital. Prior to participation, all respondents were provided with comprehensive information regarding the study objectives and procedures, and written informed consent was obtained before they completed the questionnaire.

The data analysis process was carried out in

three stages. First, univariate analysis using descriptive statistics (mean, standard deviation, and frequency distribution) was used to describe the characteristics of respondents and study variables. Second, bivariate analysis using the Chi-square test was performed to examine the association between independent variables and nurses' compliance with infection prevention practices. Finally, multivariate

analysis using logistic regression was employed to identify determinant factors influencing compliance while controlling for potential confounders.

3. Results and Discussion

a. Results

Table 1. Distribution of respondents by demographic characteristics (n = 120)

Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	24	20
	Female	96	80
Age (Years)	< 25	18	15
	25-35	78	65
	> 35	24	20
Length of Service	< 1 year	12	10
	5 year	70	58.3
	> 5 year	38	31.7
		120	100

Table 1 shows that of the 120 respondents who met the inclusion criteria, most were female (80.0%), aged 25–35 years (65.0%), and had 1–5

years of service (58.3%).

Table 2. Univariate, bivariate analysis and result of chi-square test (n = 120)

Infection Prevention Adherence is presented in frequency (f) and percentage (%).

Variable	Category	Compliance f (%)	Not-Compliance f (%)	Total f (%)	P-value
Leadership	High	62 (51.6%)	20 (16.7%)	82 (68.3%)	0.001
	Low	18 (15.0%)	20 (16.7%)	38 (31.7%)	
Organizational Support	High	56 (71.8%)	22 (28.2%)	78 (65.0%)	0.004
	Low	24 (57.1%)	18 (42.9%)	42 (35.0%)	
Workload	High	24 (47.1%)	27 (52.9%)	51 (42.5%)	0.042
	Low	56 (81.2%)	13 (18.8%)	69 (57.5%)	
Patient Safety Culture	Positive	64 (53.3%)	21 (24.7%)	85 (70.8%)	0.002
	Negative	16 (13.3%)	19 (54.3%)	35 (29.2%)	
Knowledge	High	63 (52.5%)	21 (17.5%)	84 (70.0%)	0.001
	Low	17 (14.2%)	19 (15.8%)	36 (30.0%)	

Based on Table 2, all variables demonstrated a significant association with infection prevention adherence. Nurses who perceived high leadership showed higher adherence (51.6%) compared to those with low leadership (15.0%) ($p = 0.001$). Organizational support also showed a significant relationship, where high support resulted in higher adherence (71.8%) than low support (57.1%) ($p = 0.004$).

Workload was significantly associated with adherence ($p = 0.042$); nurses with low workload were more compliant (81.2%) than those with high workload (47.1%). Patient safety culture also showed a meaningful

association ($p = 0.002$), with positive culture yielding higher adherence (53.3%) than negative culture (13.3%).

Knowledge had the strongest association with adherence ($p = 0.001$), where nurses with high knowledge demonstrated much higher adherence (52.5%) than those with low knowledge (14.16%). These findings indicate that leadership, organizational support, workload, patient safety culture, and knowledge all play critical roles in influencing nurses' infection prevention adherence.

Table 3. Multivariate Analysis

Variable	OR	95% CI	p-value
Leadership	1.95	1.05 – 3.61	0.034
Organizational Support	1.72	0.92 – 3.20	0.088
Workload	0.62	0.38 – 0.98	0.046
Patient Safety Culture	2.87	1.48 – 5.55	0.003
Knowledge	3.21	1.75 – 5.86	0.001

Based on Table 3, the multivariate analysis shows that several variables are significantly associated with infection prevention adherence. Leadership remains a significant predictor, where nurses with good leadership support have 1.95 times higher odds of adherence (95% CI: 1.05–3.61, $p = 0.034$). Organizational support, although showing an increased odds ratio (OR = 1.72), does not reach statistical significance ($p = 0.088$).

Workload is also a significant factor; nurses with lower workload are more likely to adhere, as indicated by an OR of 0.62 (95% CI: 0.38–0.98, $p = 0.046$), meaning

that high workload reduces adherence. Patient safety culture shows a strong association with adherence, where a positive culture increases the odds by 2.87 times (95% CI: 1.48–5.55, $p = 0.003$). Knowledge emerges as the strongest predictor in the model. Nurses with higher knowledge levels are 3.21 times more likely to adhere to infection prevention practices (95% CI: 1.75–5.86, $p = 0.001$). Overall, leadership, workload, patient safety culture, and knowledge significantly influence adherence, while organizational support shows a positive but non-significant effect.

b. Discussion

This study demonstrated that nurse compliance with infection prevention at Hospital X in Aceh reached 66.7%. This proportion is relatively moderate, indicating that one-third of nurses did not consistently follow infection prevention protocols. The findings are in line with previous studies in similar contexts, where compliance rates among nurses ranged from 55% to 75% depending on workload, organizational culture, and training levels (Paladini et al., 2025). Despite the implementation of infection prevention and control (IPC) programs, ensuring consistent compliance among nurses remains a challenge worldwide (Pestana-Santos et al., 2025).

Bivariate analysis showed that all managerial variables leadership, organizational support, workload, patient safety culture, and knowledge were significantly associated with compliance (Rollo, 2025). This reinforces the perspective that infection prevention is not only an individual responsibility but also strongly shaped by organizational and managerial contexts (Rashid et al., 2025).

In the multivariate analysis, knowledge, patient safety culture, leadership, and workload remained statistically significant predictors. Knowledge was the strongest determinant, where nurses with adequate knowledge were more than three times as likely to comply (Nababan & Lee, 2025).

This research is in accordance with research conducted by Iskandar et al. (2025) showing that structured training programs increase compliance levels. Patient safety culture was another key determinant. A strong culture characterized by

teamwork, open communication, and a non-punitive approach to error reporting was associated with higher compliance levels.

This research aligns with research conducted by Mudhee et al. (2025) which states the important role of safety culture in improving adherence to infection prevention practices. Furthermore, research conducted by Yazdi (2025) also noted that interventions aimed at strengthening safety culture can substantially reduce infection rates. Overall, these findings highlight the importance of integrating safety culture into daily clinical routines as a fundamental component of hospital quality improvement.”

Studies conducted by Almashad et al. (2025) also indicate that workload has a negative relationship with compliance. Nurses who face heavier workloads tend to be less adherent to infection prevention protocols. This finding is consistent with research by Zabin et al. (2025) which states that excessive workload reduces the time available for essential IPC activities, such as proper hand hygiene and the appropriate use of personal protective equipment. High workload can also lead to fatigue and psychological stress, ultimately decreasing the likelihood that nurses will consistently follow established procedures. These results underscore the importance of effective workload management and ensuring adequate nursing staff levels as critical components of successful infection control programs.

Leadership was also a significant predictor. Supportive and transformational leadership can promote compliance by modeling desired behaviors, providing

feedback, and fostering accountability (Bhattacharjee et al., 2025). Nurse managers who encourage participation, communicate effectively, and prioritize patient safety create an environment where compliance becomes a professional norm rather than an individual choice (Sundstrup et al., 2025).

Interestingly, organizational support was significant in the bivariate analysis but lost significance in the multivariate model. This suggests that organizational support alone may not directly predict compliance when stronger factors such as knowledge and safety culture are present (Baradaran et al., 2025).

These findings have important implications for nursing management and hospital administration. First, continuous education and training should be prioritized to enhance nurses' knowledge and skills in infection prevention. Second, hospitals should strengthen patient safety culture through initiatives that promote teamwork, open communication, and non-punitive error reporting. Third, workload should be managed effectively by optimizing staffing ratios and ensuring reasonable task distribution. Finally, nurse leaders should adopt transformational leadership styles, acting as role models and motivating staff to comply with IPC protocols.

Future research could adopt a longitudinal design to explore causal relationships between managerial factors and compliance. Intervention studies focusing on training, leadership development, and culture change are also needed to determine effective strategies for sustaining compliance. Additionally, qualitative studies could provide deeper insights into the barriers and facilitators of compliance from nurses' perspectives, complementing the quantitative findings of this study.

4. Conclusions and Suggestions

This study highlights the multifactorial nature of nurses' adherence to infection prevention practices. The findings demonstrate that compliance is shaped by a combination of individual and managerial determinants. Knowledge emerged as the strongest predictor, emphasizing the importance of ongoing education to ensure that nurses possess the competencies required for effective infection prevention. A positive patient safety culture also played a critical role, indicating that fostering teamwork, open communication, and a supportive environment is essential for reinforcing safe clinical practices.

Leadership and workload were additional influential factors. Supportive leadership contributed to improved adherence, underscoring the need for nurse managers to model, encourage, and monitor infection prevention behaviors. Conversely, high workload reduced compliance, suggesting that adequate staffing and balanced task distribution are necessary to maintain optimal infection control performance.

Overall, this study underscores that improving infection prevention adherence requires an integrated approach that strengthens knowledge, nurtures a strong safety culture, ensures effective leadership, and optimizes workload conditions. These components should be prioritized within hospital management strategies to enhance the quality and safety of patient care.

5. Acknowledgments

The authors would like to express their sincere gratitude to the leadership of X Hospital in Aceh for granting permission to conduct this study. We also extend our appreciation to all respondents who generously participated and contributed to this research.

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