Analysis of Factors Influencing Nurse Compliance in Implementing Standard Precautions at Hospital X in West Nusa Tengara

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Abstract: *This study aimed to analyze factors influencing nurses' compliance with standard precautions at Hospital X in West Nusa Tenggara, Indonesia. Compliance with these precautions is essential for preventing healthcare-associated infections (HAIs), yet adherence among nurses remains inconsistent. Understanding the determinants of compliance is crucial for improving infection control practices and ensuring patient safety, particularly in resource-limited settings. A quantitative descriptive-analytic design was employed, involving 221 nurses selected through simple random sampling. Data were collected using structured questionnaires and analyzed using Chi-square and logistic regression tests. The findings revealed that 74.7% of nurses demonstrated compliance, 24.4% had moderate compliance, and 0.9% were non-compliant. Several factors significantly influenced compliance, including education level (p = 0.047), knowledge (p = 0.005), infection prevention and control (IPC) training (p = 0.013), management support (p = 0.000), supervision (p = 0.000), and infrastructure availability (p = 0.000). Among these, infrastructure availability emerged as the most dominant factor, with compliance reaching 93.2% in well-equipped environments. The study highlights the importance of structured training programs, strong managerial support, and adequate infrastructure to enhance compliance with standard precautions and reduce HAIs. Strengthening these aspects is particularly crucial in resource-limited healthcare settings. Future research should focus on designing and evaluating intervention strategies to sustain high compliance rates and further mitigate the risks associated with HAIs.*

Keywords*: nurse compliance; standard precautions; infection control; infrastructure availability*

INTRODUCTION

Healthcare-Associated Infections (HAIs) represent a critical challenge to global health systems, severely impacting patient safety, increasing morbidity and mortality rates, and imposing significant financial strains. According to the World Health Organization (WHO), hundreds of millions of patients worldwide suffer from HAIs annually, with the prevalence disproportionately higher in low- and middle-income countries (LMICs). Approximately 15% of hospitalized patients in LMICs experience at least one HAI, compared to 7–10% in developed nations (WHO, 2021). This disparity highlights the urgent need for targeted interventions to reduce HAIs, particularly in resource-limited settings. In Indonesia, HAIs remain a pressing issue, particularly in under-resourced hospitals. Hospital X, a regional referral facility, faces escalating challenges in controlling HAIs, evidenced by rising infection rates.

Data from Hospital X's Infection Prevention and Control Committee (PPI) for 2023 indicate troubling trends. The incidence of urinary tract infections (UTIs) rose significantly from 0.2‰ in 2022 to 5.8‰ in 2023. Similarly, primary bloodstream infections (BSIs) increased from 0.15‰ to 3.05‰, while ventilator-associated pneumonia (VAP) cases climbed from 0.1‰ to 3.5‰. These alarming figures underscore critical deficiencies in adherence to standard precautions, necessitating

immediate intervention. WHO-recommended precautions include measures such as hand hygiene, personal protective equipment (PPE) use, sterilization of medical devices, and proper waste management. Among these, hand hygiene remains the most cost-effective and impactful method for infection prevention (Siam et al., 2023).

At Hospital X, hand hygiene compliance stands at 82.4%, which, although substantial, does not meet the 100% target essential for effective infection control. Compliance with PPE usage reaches 96%, demonstrating a well-implemented protocol in this area. However, sterilization procedures and linen management compliance rates are 85% and 76%, respectively. These disparities in adherence highlight specific areas requiring targeted strategies to mitigate infection risks. Research underscores that knowledge gaps strongly influence compliance rates. Studies indicate that healthcare workers who are more knowledgeable about infection control protocols exhibit better adherence to prevention measures (All et al., 2023; Kasa et al., 2020). However, at Hospital X, a significant 62.4% of nurses have not received infection prevention and control training, posing a critical barrier to improving compliance.

The consequences of these challenges go beyond increased infection rates. High workloads and staff shortages exacerbate the problem, often leading nurses to prioritize direct patient care over infection prevention measures (XIşıklı & Yıldız Fındık, 2023). Insufficient staff-to-patient ratios at Hospital X further hinder consistent implementation of standard precautions, creating additional vulnerabilities within the healthcare system. Management support is a pivotal factor in compliance. Effective management requires the provision of adequate resources, continuous training, consistent supervision, and robust accountability mechanisms. Research consistently demonstrates the significance of management support in fostering compliance (Ghorbanmovahhed et al., 2023; Hamid et al., 2024). At Hospital X, while 62.9% of nurses feel they receive adequate management support, inconsistent supervisory quality remains a critical issue needing immediate action.

Infrastructure quality plays a vital role in ensuring compliance with infection prevention protocols. Essential facilities such as clean running water, alcohol-based hand sanitizers, well-ventilated spaces, and sterile equipment are fundamental to effective infection control (Jin & Fisher, 2021; Lee & Lee, 2020). At Hospital X, just 52.9% of nurses consider the available infrastructure sufficient, with 44.8% rating it as moderately adequate. These limitations are highlighted by microbial contamination in operating rooms, which has reached 196 CFU/M³, well above the WHO's acceptable limit of 10 CFU/M³. Such contamination not only jeopardizes patient safety but also underscores the need for systemic infrastructure improvements to create a hygienic environment conducive to infection control efforts.

Behavioral theories, such as the Health Belief Model (HBM) and Social Cognitive Theory (SCT), offer useful insights into factors shaping compliance. These theories suggest that healthcare workers' perceptions of infection risks, the severity of potential consequences, and their confidence in their ability to perform preventive measures serve as critical motivators for adherence (Kim & Park, 2021). At Hospital X, while healthcare workers show high motivation, systemic challenges such as limited management support, insufficient training, and inadequate infrastructure, impede their ability to implement infection prevention measures effectively. These barriers must be systematically addressed to enhance compliance.

Addressing the training gap is essential, as only 37.6% of nurses at Hospital X have completed infection prevention training. Previous studies indicate that structured training programs significantly enhance healthcare workers' knowledge and adherence to infection prevention protocols (AL-Mugheed, Bayraktar, Nashwan, et al., 2022;

Keleb et al., 2023). Effective training should encompass critical topics such as the correct use of personal protective equipment (PPE), hand hygiene techniques, sterilization protocols, and the management of infectious waste. Additionally, research highlights that interactive training methods, such as simulation-based workshops and real-time feedback, yield better long-term compliance than traditional lectures (Onyeloili, 2023; Powell-Jackson et al., 2020). Regular workshops and hands-on demonstrations further reinforce theoretical knowledge, bridging the gap between policy and practice.

To ensure sustained compliance, infection prevention management practices must be reassessed. Studies suggest that hospitals with strong leadership support and well-defined infection prevention policies demonstrate higher adherence to standard precautions (Astuti et al., 2023; Kim & Park, 2021). It is imperative for hospital administrators to allocate adequate resources for infection control measures and implement robust monitoring and evaluation frameworks. Regular supervision, coupled with constructive feedback, is crucial for reinforcing protocol adherence. Moreover, introducing incentive systems, such as performance-based rewards or professional recognition programs, has been shown to enhance nurses' motivation and commitment to infection prevention measures (Getachew et al., 2022).

Finally, addressing infrastructure deficiencies remains a fundamental priority. Numerous studies identify inadequate infrastructure as a significant barrier to infection control compliance, particularly in resource-limited settings (Okon et al., 2023). Investments in infrastructure should prioritize the provision of clean water, reliable hand hygiene facilities, and sufficient ventilation systems. Additionally, improving sanitation facilities and increasing PPE availability have been shown to improve healthcare workers' compliance rates (Purba et al., 2021; Towett et al., 2023). Efforts to reduce microbial contamination in critical areas, such as operating rooms, should be expedited to align with international standards. Collaboration with local and international health agencies may provide the necessary technical and financial support to advance these initiatives.

This study investigates the multifaceted factors influencing nurse compliance with standard precautions at Hospital X, focusing on variables such as education level, knowledge, work experience, training, management support, supervision, and infrastructure availability. Identifying dominant factors enables the development of tailored interventions to enhance compliance. By aligning recommendations with WHO guidelines, the findings seek to close gaps in infection prevention practices, offering actionable strategies for hospital administrators and policymakers. Ultimately, these measures should support global initiatives to lower HAIs, particularly in resource-limited LMICs. The insights gained from this research will lay the groundwork for future studies and efforts to enhance patient safety and healthcare quality globally.

METHOD

This study employed a quantitative descriptive-analytic design to evaluate factors influencing nurse compliance with standard precautions at Hospital Xx. The design examined relationships between independent variables: education, knowledge, work experience, Infection Prevention and Control (IPC) training, management support, supervision, and infrastructure availability, and the dependent variable, nurse compliance levels.

The study population comprised all 495 nurses working in the inpatient wards of Hospital Xx. A sample size of 221 respondents was determined using Slovin's formula. A probability-based simple random sampling method ensured a representative

distribution of participants. Inclusion criteria specified nurses with at least one year of work experience in inpatient wards who were present during the study period. Nurses on leave, engaged in study assignments, or on medical leave were excluded to ensure a targeted and representative sample that aligned with the study's objectives.

Data collection was conducted using a structured, validated questionnaire divided into three sections. The first section gathered demographic data, including education level, work experience, and IPC training participation. The second section assessed management and supervision factors using a Likert scale to measure perceptions of management support, supervision practices, and resource availability. The final section evaluated compliance with WHO-recommended standard precautions, such as hand hygiene, personal protective equipment (PPE) use, sterilization of medical devices, and linen segregation. This structured methodology enabled the collection of accurate and comprehensive data relevant to the study's aims.

Descriptive and inferential statistical methods were applied for data analysis. Descriptive analysis summarized respondents' demographic characteristics and variable distributions, while inferential analysis utilized the Chi-square test to assess associations between independent variables, such as education and IPC training, and nurse compliance. A nominal logistic regression analysis identified the dominant factors influencing compliance. All statistical analyses were performed using SPSS version 25, ensuring accuracy and reliability.

Ethical approval for the study was granted by the Ethics Committee of Hospital Xx. Participants received detailed information regarding the study's purpose, procedures, and their rights, including the freedom to withdraw at any time without negative consequences. Written informed consent was obtained, and confidentiality was preserved by assigning unique identification codes to respondents. These ethical safeguards ensured the protection of participant rights and upheld the integrity of the research process.

RESULTS AND DISCUSSION
Research Context and Data Overview
This study took place from June to November 2024 at Hospital X, a government-owned Class A referral and educational hospital. Hospital X operates 763 beds, offers 113 specialized services, and employs 2,513 staff members, including 1,145 nurses. Despite its scale, the hospital faces persistent challenges in maintaining compliance with standard precautions, as evidenced by rising healthcare-associated infections (HAIs). To gain a comprehensive understanding of the factors influencing compliance, the study assessed 221 nurses, evaluating variables such as education, knowledge, work experience, infection prevention and control (IPC) training, management support, supervision, and infrastructure availability. Compliance levels were categorized into three groups: compliant, moderately compliant, and non-compliant. These classifications provide insight into adherence trends and help identify areas requiring intervention.

The data collected from nurses reflect various determinants affecting compliance with standard precautions. These determinants include the level of education attained by the nurses, their knowledge about infection prevention, their years of professional experience, and whether they had received formal IPC training. Additionally, external factors such as the degree of management support, the quality of supervision, and the adequacy of hospital infrastructure were also analyzed to determine their impact on compliance. To facilitate an organized analysis, the findings are presented in the following table. The table summarizes the distribution of respondents across the key

variables under investigation. Each determinant is categorized to illustrate its correlation with compliance levels, helping to identify patterns and trends within the dataset.

Table 1 presents the distribution of respondents based on these influential factors, providing a detailed breakdown of how each variable affects nurse compliance with precautionary standards at the Provincial Hospital of West Nusa Tenggara.

Table 1. Distribution of respondents based on factors influencing nurses' compliance in implementing precaution standards at hospital X in West Nusa Tenggara. (N=221)

Determinant	Category	f	%
Compliance	Compliant	165	75
	Moderately Compliant	54	24
	Non-Compliant	2	1
	Total	221	100
Education	Diploma (D3)	95	43
	Bachelor's (S1)	124	56
	Master's (S2)	2	1
	Total	221	100
Knowledge	Good	112	51
	Moderate	76	34
	Poor	33	15
	Total	221	100
Work Experience	New (1-<6 years)	154	70
	Intermediate (6-10 years)	32	14
	Experienced (>10 years)	35	16
	Total	221	100
PPI Training	Yes	83	38
	No	138	62
	Total	221	100
Management Support	Good	139	63
	Moderate	66	30
	Poor	16	7
	Total	221	100
Supervision	Good	162	73
	Moderate	53	24
	Poor	6	3
	Total	221	100
Facilities	Available	117	53
	Moderately Available	99	45
	Poorly Available	5	2
	Total	**221**	**100**

Nurses' compliance with implementing the Precaution Standard at the Provincial General Hospital of West Nusa Tenggara primarily falls into the compliant category (74.7%), followed by moderately compliant (24.4%) and non-compliant (0.9%). Most nurses hold a bachelor's degree (56.1%), followed by a diploma (43%), and a master's degree (0.9%). Most nurses demonstrate knowledge in the good category (50.7%) and are predominantly in the new work experience category (69.7%). However, only 37.6% of respondents have attended infection prevention and control (IPC) training. Good

management support (62.9%) and effective supervision (73.3%) significantly enhance compliance, while adequate infrastructure availability was reported at 52.9%.

The study identifies a significant relationship between educational attainment and nurses' compliance with implementing the Precaution Standard. Nurses with a diploma exhibited higher compliance (84.2%) compared to those with a bachelor's degree (66.9%) or a master's degree (100%). This finding aligns with literature suggesting that higher education improves understanding of infection prevention principles and the application of evidence-based practices (Eizenberg, 2011). However, formal education alone does not guarantee optimal compliance, highlighting the importance of practical training and experience. Knowledge plays a critical role in compliance, with nurses possessing good knowledge showing the highest compliance rate (83.0%). A comprehensive understanding of infection risks and preventive measures is essential. This result supports Sarah (2021), who reported a positive correlation between nurses' understanding of Healthcare-Associated Infections (HAIs) and compliance with hand hygiene practices. Continuous education is crucial to enhance and maintain this knowledge.

Nurses with new work experience (1–<6 years) demonstrated higher compliance compared to those with medium (6–10 years) or long-term (>10 years) experience. This trend indicates that newer nurses are more motivated by adaptation pressures and performance expectations, while routine work may reduce compliance among senior nurses. Sugawara & Nikaido (2014) emphasize the need for ongoing training for experienced nurses to maintain high compliance levels.

Nurses who attended IPC training demonstrated higher compliance (85.5%) compared to those who had not attended (68.1%). Training provides up-to-date knowledge and skills on procedures such as proper use of personal protective equipment (PPE) and hand hygiene practices. This aligns with (Havers et al., 2015), who reported that infection prevention training significantly reduces the risk of HAIs by fostering adherence to standard procedures.

Adequate infrastructure availability corresponds to the highest compliance rates (93.2%). Facilities such as sinks and PPE contribute significantly to the ease and effectiveness of infection prevention measures. (Lubis, 2023) similarly found that the availability of hygiene facilities improves compliance by up to 85.7%. Hospital management must prioritize ensuring the adequacy of such facilities to enhance healthcare quality and safety.

The Influence of Education Level on Compliance with the Implementation of Precaution Standards at Hospital X

Education significantly influences nurses' adherence to infection prevention measures, with higher education levels often linked to better compliance. This study examines the relationship between education and adherence to the Precaution Standard, highlighting its impact. The following table categorizes nurse compliance into compliant, moderately compliant, and non-compliant groups, providing insights into how educational background affects infection prevention practices.

Table 2. The influence of education level on compliance with the implementation of precaution standards at hospital X (N=221)

Education Level	Compliance			P-value
	Compliant	**Moderately Compliant**	**Non-Compliant**	
D3	80	14	1	
	84.2%	14.7%	1.1%	
S1	83	40	1	

Education Level	Compliance			P-value
	Compliant	**Moderately Compliant**	**Non-Compliant**	
	66.9%	32.3%	0.8%	**0.047**
S2	2	0	0	
	100%	0.0%	0.0%	
Total	**165**	**54**	**2**	
	100%	**100%**	**100%**	

The level of education significantly correlates with nurses' compliance in implementing the Precaution Standard, as indicated by a p-value of 0.047. Nurses with a diploma exhibited the highest compliance rate (84.2%) compared to those with a bachelor's degree (66.9%) and a master's degree (100%). However, the proportion of respondents holding a diploma was lower (43.0%) than those with a bachelor's degree (56.1%), and only 0.9% held a master's degree. These findings suggest that formal education influences nurses' comprehension and implementation of infection prevention protocols.

Variations in education level significantly impact nurses' compliance with the Precaution Standard. Diploma-educated nurses demonstrate the highest compliance rates compared to their counterparts with bachelor's or master's degrees. Literature highlights that higher formal education enables nurses to better understand infection prevention standards and actively engage in training programs, such as infection control link nurse initiatives, which promote adherence to protocols (Ghorbanmovahhed et al., 2023). Furthermore, education empowers nurses to utilize evidence-based training resources, enhancing their competency in consistently applying infection prevention measures.

Technology-based interventions, such as video training and visual feedback, have also proven effective in increasing hand hygiene compliance among nurses (Okuroğlu et al., 2023). These methods not only improve awareness but also provide practical guidance for implementing protocols more effectively. Incorporating technology-based training could help diploma-educated nurses achieve compliance levels comparable to their more highly educated peers.

Additionally, other studies emphasize the role of educational seminars and clinical simulations in enhancing adherence to infection prevention standards (Kim & Park, 2021; Tumala, 2021). However, without ongoing reinforcement through regular training, even nurses with advanced education may experience declining compliance. Therefore, continuous training programs are crucial to maintaining high compliance levels across all educational backgrounds.

These findings highlight the importance of education and continuous training in enhancing compliance with infection prevention protocols. Implementing intensive seminars or video-based programs at Hospital X can improve nursing competency and standard adherence. Prioritizing training initiatives fosters a culture of compliance, improves healthcare quality, and ensures patient safety.

The Influence of Knowledge Level on Compliance with the Implementation of Precaution Standards at Hospital X.

Knowledge is a fundamental factor affecting nurses' adherence to infection prevention measures. A well-informed nurse is more likely to comply with precautionary standards, ensuring better patient safety. This study examines the correlation between nurses' knowledge levels and their compliance with the implementation of the Precaution Standard, offering insights into how theoretical

understanding translates into practical application. To illustrate these findings, the following table presents a breakdown of nurse compliance rates based on their knowledge levels. It categorizes compliance into three groups: compliant, moderately compliant, and non-compliant, offering insight into the trends observed in this study.

Table 3. The influence of knowledge level on compliance with the implementation of precaution standards at hospital X (N=221)

Knowledge Level	Compliance			P-value
	Compliant	**Moderately Compliant**	**Non-Compliant**	
Poor	27	6	0	
	81.8%	18.2%	0.0%	
Moderate	45	30	1	**0,005**
	59.2%	39.5%	1.3%	
Good	93	18	1	
	83.0%	16.1%	0.9%	
Total	**165**	**54**	**2**	
	100%	**100%**	**100%**	

The analysis reveals a significant correlation between nurses' knowledge level and compliance with implementing the Precaution Standard at Hospital X (p-value = 0.005). Nurses with good knowledge demonstrated the highest compliance rate (83.0%), while those with moderate and poor knowledge recorded compliance rates of 59.2% and 81.8%, respectively. Additionally, the majority of nurses were categorized as having good knowledge (50.7%), followed by moderate (34.4%) and poor (14.9%) knowledge levels. These findings suggest that enhancing knowledge directly improves nurses' adherence to infection prevention protocols.

The findings align with research showing that good knowledge of Healthcare-Associated Infections (HAIs) does not always translate into practice. Compliance rates among nurses with high knowledge levels range from 62% to 94% (All et al., 2023; Danaei et al., 2021). This gap between theoretical understanding and practical application highlights the need for effective educational strategies to bridge this divide and improve the practical implementation of infection prevention standards.

Studies demonstrate that simulation-based training and hands-on learning significantly improve compliance, particularly when these approaches integrate real-world scenarios (AL-Mugheed, Bayraktar, Al-Bsheish, et al., 2022; Park et al., 2021). Moreover, research underscores a strong relationship between knowledge and the proper use of Personal Protective Equipment (PPE). Nurses who underwent PPE-specific training consistently exhibited better adherence and correct usage compared to those without such training (SANÇAR et al., 2022).

These findings underscore the importance of continuous education and structured training to improve compliance with infection control measures. Effective programs bridge the gap between knowledge and practice, reducing Healthcare-Associated Infections (HAIs) and improving outcomes for patients and staff. Compliance with the Precaution Standard lowers infection transmission, morbidity, and mortality, emphasizing the need for a supportive infection prevention culture through robust hospital policies and adequate resources.

Furthermore, the results offer valuable insights for developing evidence-based policies that prioritize structured training programs and supportive work environments. Global best practices, such as routine training, regular compliance monitoring, and cultivating a culture of safety within healthcare organizations, should be adopted to

ensure continuous improvement in healthcare service quality and patient safety (Chaturvedi et al., 2022; Strand & Debesay, 2022).

The Influence of Nurses' Work Experience on Compliance with the Implementation of Precaution Standards at Hospital X

Work experience plays a crucial role in shaping nurses' adherence to infection prevention measures. Nurses with different levels of experience may exhibit varying degrees of compliance based on their familiarity with protocols, exposure to real-world challenges, and workload demands. This study analyzes how different experience levels influence adherence to the Precaution Standard, providing insights into whether newer or more experienced nurses demonstrate better compliance.

To illustrate these findings, the following table presents a breakdown of nurse compliance rates based on their years of experience. It categorizes compliance into three groups: compliant, moderately compliant, and non-compliant, offering insight into the trends observed in this study.

Table 4. The influence of nurses' work experience on compliance with the implementation of precaution standards at hospital X (N=221)

Work Experience	Compliance			P-value
	Compliant	Moderately Compliant	Non-Compliant	
New (1-<6 years)	123 79.9%	30 19.5%	0 0.6%	
Intermediate (6-10 years)	19 59.4%	12 40.6%	0 0.0%	**0,050**
Long (>10 years)	23 65.7%	11 31.4%	1 2.9%	
Total	**165 100%**	**54 100%**	**2 100%**	

The analysis identified a significant correlation between work experience and compliance with the Precaution Standard (p = 0.050). Nurses with 1–<6 years of experience exhibited the highest compliance (79.9%), compared to those with moderate (59.4%) and long-term experience (65.7%). Additionally, newer nurses accounted for the largest proportion (69.7%). These findings suggest that newer nurses achieve higher compliance, while those with more experience show comparatively lower rates.

The findings are consistent with prior research suggesting that nurses with extensive clinical experience often have a deeper understanding of infection prevention protocols and the consequences of non-compliance (Huang et al., 2021). However, long-term work pressures can contribute to burnout, reducing compliance among senior nurses (Mohamed et al., 2020). Conversely, newer nurses are more likely to adhere strictly to standards due to their need to adapt and initial enthusiasm, despite potentially lacking confidence or experience in implementing protocols (Kim & Park, 2021). Further studies demonstrate that work experience shapes attitudes toward infection prevention measures. Nurses with longer experience generally possess a stronger awareness of the importance of infection prevention protocols and their role in reducing Healthcare-Associated Infections (HAIs) (Althiyabi et al., 2024). However, this understanding does not always result in consistent practice. Repetitive routines can desensitize experienced nurses to prevention procedures, which may explain their lower compliance rates compared to newer nurses.

These findings emphasize the importance of tailored training and supervision for nurses at all levels. Simulation-based training benefits novice nurses, while strategies like flexible schedules and motivational programs address burnout among senior nurses. Regular, experience-based training ensures all nurses stay updated on best practices, fostering consistent compliance with the Precaution Standard. This approach enhances healthcare quality and reduces the risk of healthcare-associated infections for patients and staff.

The Influence of Nurses' Participation in IPC Training on Compliance with the Implementation of Precaution Standards at Hospital X

Training in Infection Prevention and Control (IPC) is a crucial factor in ensuring nurses adhere to precautionary standards. Participation in structured training programs enhances their understanding of infection control measures and reinforces best practices. This study examines the impact of IPC training on nurse compliance, providing insights into how targeted education influences adherence to precaution protocols.

To illustrate these findings, the following table presents a breakdown of nurse compliance rates based on their participation in IPC training. It categorizes compliance into three groups: compliant, moderately compliant, and non-compliant, offering insight into the trends observed in this study.

Table 5. The influence of nurses' participation in IPC training on compliance with the implementation of precaution standards at hospital X (N=221)

Training Participation	Compliance			P-value
	Compliant	Moderately Compliant	Non-Compliant	
No	94	42	2	
	68.1%	30.4%	1.4%	**0,013**
Yes	71	12	0	
	85.5%	14.5%	0.0%	
Total	**165**	**54**	**2**	
	100%	**100%**	**100%**	

The analysis revealed that participation in Infection Prevention and Control (IPC) training significantly influenced nurses' compliance with implementing the Precaution Standard (p-value = 0.013). Nurses who attended IPC training demonstrated higher compliance rates (85.5%) compared to those who did not (68.1%). In contrast, the rate of moderate compliance was higher among nurses who had not participated in the training (30.4%) compared to those who had (14.5%). These findings emphasize the critical role of training in enhancing nurses' competency and adherence to infection prevention protocols.

The findings align with previous research demonstrating that structured training improves healthcare workers' knowledge and practical skills, leading to increased compliance with infection prevention measures (Al-Sayaghi et al., 2023; Keleb et al., 2023). Practice-based training approaches, including hands-on demonstrations and simulations, have proven more effective than theoretical methods. Experiential learning allows nurses to practice skills in controlled settings, better preparing them to implement these protocols in real-world scenarios (Onyeloili, 2023).

Additionally, studies indicate that healthcare workers who attend infection prevention training sessions demonstrate compliance rates up to eight times higher than those who do not. Multifaceted interventions, such as combining training with

monitoring and feedback, have also been shown to improve adherence to infection control protocols (Powell-Jackson et al., 2020). These findings underscore the importance of continuous training as a strategic measure to enhance healthcare service quality and prevent the spread of infections. These results highlight the importance of implementing structured, practice-based IPC training programs at Hospital X. Training that incorporates live simulations and practical demonstrations can strengthen nurses' understanding and skills, ensuring better compliance with infection prevention protocols. Complementing these programs with monitoring and feedback mechanisms can help sustain long-term adherence.

These findings underscore the importance of continuous education and structured training to improve compliance with infection control measures. Effective programs bridge the gap between knowledge and practice, reducing Healthcare-Associated Infections (HAIs) and improving outcomes for patients and staff. Compliance with the Precaution Standard lowers infection transmission, morbidity, and mortality. Additionally, these findings highlight the need for routine training policies and integration into hospital management plans to enhance patient safety and the overall quality of care.

The Effect of Management Support on Nurse Compliance with Precaution Standard Implementation at Hospital X

Training in Infection Prevention and Control (IPC) is a crucial factor in ensuring nurses adhere to precautionary standards. Participation in structured training programs enhances their understanding of infection control measures and reinforces best practices. This study examines the impact of IPC training on nurse compliance, providing insights into how targeted education influences adherence to precaution protocols.

To illustrate these findings, the following table presents a breakdown of nurse compliance rates based on their participation in IPC training. It categorizes compliance into three groups: compliant, moderately compliant, and non-compliant, offering insight into the trends observed in this study.

Table 6. The effect of management support on nurse compliance with precaution standard implementation at hospital X (N=221)

Management Support	Compliance			P-value
	Compliant	**Moderately Compliant**	**Non-Compliant**	
Poor	9	6	1	
	56.3%	37.5%	6.3%	
Moderate	32	33	1	**0,000**
	48.5%	50.0%	1.5%	
Good	124	15	0	
	65.7%	31.4%	2.9%	
Total	**165**	**54**	**2**	
	100%	**100%**	**100%**	

The analysis indicates that management support significantly influences nurses' compliance with implementing the Precaution Standard, with a p-value of 0.000. Nurses who received good management support demonstrated the highest compliance rate (89.2%) compared to those with moderate (48.5%) and poor support (56.3%). The moderately compliant category was more prevalent among nurses with moderate management support (50.0%) than in other groups. Notably, the non-

compliant category was observed only among nurses with moderate and poor management support, while it was absent in the group with good management support.

These findings align with research emphasizing the critical role of management support in enhancing compliance with infection prevention standards. Management actions such as providing sufficient resources, conducting routine training, and offering incentives have been shown to improve healthcare workers' adherence to protocols (Park et al., 2021). Moreover, active management initiatives that prioritize infection prevention can foster a supportive work environment, encouraging better compliance from nurses (Getachew et al., 2022).

Leadership style also plays a pivotal role. Transformational leadership, which focuses on staff empowerment and support, has been associated with higher compliance rates (Astuti et al., 2023). Leaders who model adherence to infection prevention protocols can positively influence staff behavior and attitudes, cultivating a workplace culture that emphasizes safety and accountability. Additionally, approaches such as recognizing and rewarding compliant behavior can motivate nurses to prioritize infection prevention measures. These strategies not only encourage adherence but also raise awareness of the importance of infection prevention protocols (Ghorbanmovahhed et al., 2023; Park et al., 2021).

These findings underscore the crucial role of management support in enhancing nurses' compliance with the Precaution Standard at Hospital X. Measures such as routine training, adequate resource allocation, and reward systems can create a supportive work environment that fosters consistent adherence to protocols. Management should also promote transformational leadership styles that focus on staff engagement, empowerment, and effective communication approaches proven to enhance compliance with infection prevention measures. From a policy perspective, these findings highlight the need for management strategies that prioritize safety and accountability.

The Impact of Supervision by Head Nurses on Compliance with the Implementation of Precaution Standards at Hospital X (N=221)

Effective supervision by head nurses plays a crucial role in ensuring nurses adhere to precautionary standards. Proper supervision provides guidance, accountability, and reinforcement of infection prevention protocols. This study examines the influence of different levels of supervision on nurse compliance, highlighting the importance of leadership in fostering adherence.

To illustrate these findings, the following table presents a breakdown of nurse compliance rates based on the level of supervision provided by head nurses. It categorizes compliance into three groups: compliant, moderately compliant, and non-compliant, offering insight into the trends observed in this study.

Table 7. The impact of supervision by head nurses on compliance with the implementation of precaution standards at hospital X (N=221)

Supervision	Compliance			P-value
	Compliant	Moderately Compliant	Non-Compliant	
Poor	3	3	0	
	50%	50%	0.0%	
Fair	23	29	1	
	43.4%	54.7%	1.9%	**0,000**
Good	139	22	1	
	85.8%	13.^5	0.6%	

Supervision	Compliance			P-value
	Compliant	Moderately Compliant	Non-Compliant	
Total	165	54	2	
	100%	100%	100%	

The analysis indicates that the quality of supervision by head nurses significantly influences nurses' compliance with implementing the Precaution Standard (p-value = 0.000). Nurses who received good supervision exhibited the highest compliance rate (85.8%), while moderate supervision resulted in a compliance rate of 43.4%, and poor supervision achieved only 50%. The moderately compliant category was most prevalent among nurses with moderate supervision (54.7%) compared to good (13.5%) and poor supervision (50%). These findings underscore the critical role of high-quality supervision in ensuring effective implementation of infection prevention protocols.

These results are consistent with prior research demonstrating that the frequency and quality of supervision directly impact compliance with infection prevention measures. Regular and effective supervision including routine reminders and constructive feedback has been shown to significantly improve adherence to protocols (Berdida & Grande, 2024; McCauley et al., 2021). Supervisors who actively engage with nursing staff and provide direct guidance foster higher compliance rates.

Other studies highlight that supervision strategies incorporating periodic performance evaluations and continuous training yield better results in enhancing adherence to infection prevention standards (Park et al., 2021). Additionally, fostering open communication environments where nurses feel encouraged to discuss compliance challenges enables staff to better understand and apply safety protocols (Fitria et al., 2023). Differences in compliance have also been noted between direct and indirect supervision. Direct supervision, which involves real-time monitoring and immediate feedback, proves more effective in reinforcing compliant behaviors than indirect approaches (Hansen et al., 2023). This suggests that direct supervision is a more reliable strategy for consistently improving healthcare workers' compliance with established protocols.

These findings highlight the need for direct and high-quality supervision to improve nurses' compliance with the Precaution Standard. Head nurses should provide consistent oversight, immediate feedback, and active support to address challenges in protocol implementation. Supervisors modeling good compliance behaviors can also positively influence nurses' attitudes and practices, further promoting adherence (Astuti et al., 2023). From a policy perspective, these results can inform the development of targeted training and evaluation programs for head nurses to enhance supervisory effectiveness. By adopting such initiatives, hospitals can ensure better adherence to infection prevention protocols, leading to improved patient safety and overall healthcare quality (Berdida & Grande, 2024; Hansen et al., 2023).

The Influence of Infrastructure Availability on Compliance with the Implementation of Precaution Standards at Hospital X

Adequate infrastructure is a key determinant in ensuring compliance with infection prevention protocols among healthcare workers. The availability of essential resources, such as handwashing stations, personal protective equipment (PPE), and sanitation facilities, directly impacts adherence to precautionary standards. This study evaluates how different levels of infrastructure availability influence nurse compliance with infection prevention measures.

To illustrate these findings, the following table presents a breakdown of nurse compliance rates based on infrastructure availability. It categorizes compliance into three groups: compliant, moderately compliant, and non-compliant, offering insight into the trends observed in this study.

Table 8. The influence of infrastructure availability on compliance with the implementation of precaution standards at hospital X (N=221)

Infrastructure	Compliance			P-value
	Compliant	**Moderately Compliant**	**Non-Compliant**	
Inadequate	1	3	1	
	20.0%	60.0%	20.0%	
Moderate	55	43	1	
	55.6%	43.4%	1.0%	**0,000**
Adequate	109	8	0	
	93.2%	6.8%	0.0%	
Total	**165**	**54**	**2**	
	100%	**100%**	**100%**	

The analysis indicates that the availability of infrastructure significantly influences nurses' compliance with implementing the Precaution Standard (p-value = 0.000). Nurses with adequate infrastructure exhibited the highest compliance rate (93.2%) compared to those with moderately available (55.6%) and inadequate infrastructure (20.0%). Conversely, the moderately compliant category was more prevalent among nurses with moderately available infrastructure (43.4%) than among those with adequate (6.8%) and inadequate infrastructure (60.0%). These findings highlight the critical role of sufficient facilities in promoting consistent compliance with infection prevention protocols.

This study aligns with existing literature emphasizing the importance of adequate infrastructure, such as access to handwashing stations and Personal Protective Equipment (PPE), in improving healthcare workers' adherence to infection prevention protocols (Getachew et al., 2022; D. A. Purba et al., 2023). In well-equipped environments, healthcare workers are more likely to follow recommended practices, significantly reducing the risk of healthcare-associated infections (Claro et al., 2022).

In resource-limited settings, however, challenges such as insufficient PPE, inadequate sanitation facilities, and a lack of essential medical equipment present significant barriers to compliance. Substandard water, sanitation, and hygiene (WASH) facilities hinder healthcare workers' ability to maintain proper hand hygiene, a cornerstone of infection prevention (Forrester et al., 2021; Kanagasabai et al., 2021). Additionally, limited training and insufficient staffing further exacerbate these challenges, leading to lower compliance rates (Cheng et al., 2024; Said et al., 2023).

Studies also show that infrastructure enhancements, including upgrading sanitation facilities, ensuring consistent PPE availability, and integrating training programs, are highly effective in boosting compliance with standard prevention protocols (Adeniran et al., 2022; Okon et al., 2023). Investments in infection prevention infrastructure, such as improved waste management systems and broader access to hygiene supplies, are vital for fostering a culture of compliance in healthcare settings (Supriyadi et al., 2024; Towett et al., 2023).

These findings emphasize the importance of investing in healthcare infrastructure to enhance compliance with the Precaution Standard. Hospitals must ensure the consistent availability of sanitation facilities, PPE supplies, and essential medical

equipment. Furthermore, training programs focused on optimizing the use of available infrastructure can help healthcare workers utilize resources more effectively to implement infection prevention protocols.From a policy perspective, these results provide a basis for allocating sufficient budgets to improve infection prevention infrastructure at Hospital X. This strategy will not only enhance patient safety but also create a supportive work environment for healthcare workers, contributing to better overall quality of care.

Dominant Factors Affecting Compliance with the Implementation of Precaution Standards at Hospital X

The nominal regression test results indicate that training is the dominant factor influencing nurses' compliance with implementing the Precaution Standard, with an Exp(B) value of 2,515.023. This suggests that nurses who participate in training are significantly more likely to comply with protocols compared to those who do not. Other factors, such as infrastructure availability (Exp(B) = 126.373) and management support (Exp(B) = 22.117), also significantly contribute to compliance, though their influence is less pronounced than training. In contrast, factors such as education, knowledge, work experience, and supervision had non-significant.

This study aligns with prior research emphasizing the pivotal role of training in improving healthcare workers' compliance with infection prevention protocols. Adie (2021) reported that a lack of formal training contributes to low compliance rates among healthcare workers. Training equips staff with the practical knowledge and skills required for effective implementation of preventive measures, reinforcing the necessity of structured training as a top priority to boost compliance. In addition, literature highlights the role of adequate infrastructure in supporting compliance. Kasa et al. (2020) found that access to resources such as PPE and hand hygiene facilities significantly enhances healthcare workers' adherence to protocols. Similarly, Wong et al. (2021) demonstrated that supportive organizational policies and sufficient resources improve nurse satisfaction and compliance levels.

While education and supervision were less impactful in this study, previous research continues to stress their importance in fostering an environment conducive to compliance. For instance, Kavuran & Camci (2023) identified direct supervision as a positive influence on healthcare workers' adherence to infection prevention standards. These findings underscore the critical importance of training as the primary factor in improving nurses' compliance with the Precaution Standard. Structured training programs, including hands-on practical sessions, are essential to equip nurses with the necessary skills and knowledge for consistent protocol adherence. Hospital management should prioritize and allocate resources for regular and comprehensive training initiatives.

Moreover, investment in infrastructure and the reinforcement of supportive management policies are crucial. Providing adequate facilities, such as PPE and sanitation resources, alongside implementing effective and transparent policies, creates a supportive work environment that fosters compliance with infection prevention protocols. These combined efforts will significantly enhance patient safety and elevate the overall quality of healthcare services.

CONCLUSION

This study investigated factors influencing nurse adherence to standard precautions at Hospital Xx, identifying infrastructure availability as the primary determinant. Adequate infrastructure plays a crucial role in supporting adherence to

infection prevention protocols. Other key factors include education, knowledge, work experience, IPC training, management support, and supervision. Nurses with sufficient resources, strong managerial backing, and access to regular training demonstrated higher compliance rates, underscoring the need to address both individual and systemic barriers.

Non-compliance, particularly in resource-limited settings, often stems from systemic gaps that require urgent intervention. Strengthening healthcare infrastructure, implementing structured and accessible training programs, and fostering a supportive organizational culture are essential for improving adherence and reducing healthcare-associated infections (HAIs). Additionally, tailored policies promoting continuous education and management engagement can further enhance compliance. These findings provide practical strategies to improve patient safety and healthcare quality. Future research should assess long-term intervention outcomes and develop customized solutions for resource-constrained environments.

RECOMENDATION

Future research in the field of nurse compliance with precaution standards is crucial to advancing infection prevention strategies. While this study has identified key determinants, further exploration is needed to refine interventions and address emerging challenges. The following recommendations outline potential directions for future studies to enhance compliance and healthcare quality.

1. Exploring Additional Variables

   To further expand on the findings of this study, future research should explore additional variables that may influence nurses' compliance with precaution standards. Investigating behavioral and psychological factors, such as motivation, perception of risk, and workplace culture, could provide deeper insights into compliance determinants.

2. Longitudinal Studies

   Longitudinal studies examining compliance trends over time would be valuable in assessing the sustainability of training and infrastructure improvements. Future research could also compare compliance levels across different healthcare settings, including rural and urban hospitals, to identify setting-specific challenges and solutions.

3. Qualitative Approaches

   Additionally, qualitative studies using interviews and focus groups with healthcare workers could offer a more in-depth understanding of the barriers and facilitators to compliance. Examining the effectiveness of digital and interactive training methods, such as virtual simulations and e-learning modules, could also help determine innovative strategies for enhancing adherence to precaution standards.

4. Impact of Emerging Diseases

   Future research should examine how emerging infectious diseases influence safety compliance by assessing motivation, risk perception, and workplace culture. Investigating training sustainability, infrastructure improvements, and digital learning can enhance adherence strategies. Longitudinal and qualitative studies can provide deeper insights, while comparative research across healthcare settings can identify specific challenges and solutions.

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