Knowledge, Leadership, and Experience: Determinants of Patient Safety Culture

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Abstract
Patient safety culture is a critical component of healthcare quality and is influenced by both individual and organizational factors. This study examines the roles of knowledge level and leadership style in shaping patient safety culture, while considering length of service (tenure) as an intervening variable. A quantitative explanatory design was employed using structural equation modeling-partial least squares (SEM-PLS). The study involved 40 healthcare professionals (doctors, nurses, and midwives) at Permata Husada Pleret Hospital, Yogyakarta, who were selected using total sampling. Data were collected using validated questionnaires and analyzed to assess the direct and indirect relationships among the variables. Knowledge level ($\beta = 0.312$; $p < 0.05$) and leadership style ($\beta = 0.354$; $p < 0.05$) significantly influenced patient safety culture. Length of service (tenure) also had a significant effect ($\beta = 0.267$; $p < 0.05$). The indirect effects indicate that tenure partially transmits the influence of knowledge ($\beta = 0.077$; $p < 0.05$) and leadership ($\beta = 0.080$; $p < 0.05$) on patient safety culture. The model explained 60.0% of the variance in patient safety culture ($R^2 = 0.600$), indicating moderate-to-strong explanatory power. Patient safety culture is shaped by the combined influence of knowledge, leadership and tenure. However, tenure should be interpreted cautiously as organizational exposure rather than purely experiential learning. Given the small sample size and single-hospital setting, the findings should not be generalized. Future studies should incorporate larger, multicenter samples to improve external validity.

Keywords: *Healthcare Workers, Knowledge Level, Leadership Style, Patient Safety Culture, SEM-PLS, Work Tenure*

1. INTRODUCTION

Patient safety is a fundamental pillar of healthcare quality worldwide. The increasing complexity of healthcare systems, rapid technological advancements, and rising service demands have heightened the risk of adverse events in clinical practice (Widmer, Swanson, Zink, & Pines, 2018). The World Health Organization emphasizes that a significant proportion of patient harm is preventable through system strengthening, improved human resource capacity, and development of a strong patient safety culture (Berry et al., 2020). Furthermore, global research trends show a continuous increase in scholarly attention to patient safety culture as a key determinant of healthcare quality and risk management effectiveness (Ahn, Sim, Foo, & Tan, 2025; Zaitoun, Said, & de Tantillo, 2023).

In hospital settings, the patient safety culture reflects shared values, norms, and practices that influence how healthcare workers identify risks, report incidents, and implement safe care (Sorra & Dyer, 2010). However, in many healthcare institutions, including hospitals in Indonesia, the implementation of a patient safety culture remains inconsistent (Najihah, 2018). Preliminary observations at Permata Husada Pleret Hospital indicate that, while teamwork and communication are relatively well established, variations persist in incident reporting practices and adherence to safety procedures. These inconsistencies suggest that patient safety culture has not been fully internalized across all professional groups, highlighting the need to examine its key determinants within a specific organizational context in the future.

Previous studies have identified knowledge and leadership as important determinants of the patient safety culture. Adequate knowledge of patient safety principles enables healthcare workers to effectively recognize risks and implement safe practices (Nie et al., 2013). Leadership plays a critical role in shaping the safety climate, promoting open communication, and encouraging incident reporting (Weaver et al., 2013). However, most research positions the length of service (tenure) merely as a control or independent variable, rather than examining its potential role within a structural relationship model (Rosbiyati & Alam, 2025). Despite evidence suggesting that longer tenure may enhance risk awareness and decision-making through experiential learning (Bandera, Collins, & Passerini, 2018), there is limited empirical research investigating how tenure interacts with knowledge and leadership in shaping the patient safety culture, particularly in hospital settings. Furthermore, the theoretical justification for positioning tenure within such a model remains underexplored, especially when compared to more

commonly examined variables such as organizational climate or psychological safety (Frazier, Fainshmidt, Klinger, Pezeshkan, & Vracheva, 2017). This gap highlights the need for a more integrative model that explicitly incorporates tenure into the analyses.

Based on this gap, this study aims to analyze the influence of knowledge level and leadership style on patient safety culture while examining the role of length of service (tenure) within the structural model. Specifically, this study tests whether knowledge and leadership have direct effects on patient safety culture and whether tenure contributes to strengthening these relationships. The proposed model is expected to provide a more integrative understanding of how individual capacity, leadership support, and organizational exposure interact to shape the patient safety culture in hospital settings.

2. LITERATURE REVIEW

2.1 Theoretical Framework of Patient Safety Culture

Patient safety culture reflects the interaction between organizational systems, human behavior, and safety practices to prevent harm in healthcare settings. This study is grounded in the framework developed by James Reason, known as the Swiss Cheese Model, which explains that adverse events occur due to multiple layers of system failure rather than individual errors alone. From this perspective, patient safety culture acts as a protective layer that minimizes the alignment of system weaknesses (Rashdan, Farha, Yasin, & Hadi, 2025).

In addition, this study adopts the model proposed by Avedis Donabedian, namely, the Structure–Process–Outcome (SPO) Model (Donabedian, 1988). In this framework:

a. Structure includes leadership and workforce characteristics
b. Process refers to safety practices influenced by knowledge and communication
c. Outcome is reflected in patient safety culture

By integrating these frameworks, patient safety culture is understood as an outcome shaped by both individual competencies and organizational systems.

2.2 Knowledge and Patient Safety Culture

Knowledge of patient safety refers to healthcare workers' understanding of clinical risks, incident-reporting systems, and safety procedures (Gqaleni & Mkhize, 2023). Adequate knowledge enables individuals to identify potential hazards and apply preventive actions in clinical practice (Torabi, Maalmir, & Ahmadi, 2025). Empirical studies have shown that higher levels of patient safety knowledge are associated with improved compliance with safety practices and reduced clinical errors (Carvalho et al., 2023; Hajizadeh et al., 2025). Therefore, knowledge functions as a critical individual-level factor that shapes safety behavior and contributes to the development of a patient safety culture.

2.3 Leadership Style and Patient Safety Culture

Leadership plays a crucial role in shaping the safety climate within healthcare organizations (Dahleez et al., 2022). Transformational leadership, in particular, has been widely associated with stronger patient safety culture through the promotion of open communication, psychological safety, and non-punitive responses to errors (Bhimasta, Surya, & Pramudita, 2025; Hidayat, 2025). Research indicates that supportive leadership significantly enhances staff engagement in safety practices and fosters positive perceptions of safety culture (Boamah, 2022; Specchia et al., 2021). Leaders who encourage dialogue and provide constructive feedback create an environment in which healthcare workers feel safe to report incidents and participate in organizational learning (Prawira & Assa, 2025).

2.4 Length of Service as a Moderating Variable

Length of service refers to the duration of employment within a healthcare organization and reflects the accumulated exposure to clinical environments. Unlike mediating variables, which explain causal mechanisms, tenure represents a contextual experience that may influence how other variables operate (Novialumi & Winata, 2025). Drawing on the experience accumulation theory, longer tenure is associated with increased familiarity with clinical risks, organizational routines, and decision-making processes (Croskerry, 2018). However, tenure does not explain how knowledge or leadership affects the patient safety culture; instead, it may strengthen or weaken these relationships. Empirical evidence suggests that experience can influence safety behavior and risk perception, making it more appropriate

to position tenure as a moderating variable rather than a mediator (Vaismoradi, Tella, A. Logan, Khakurel, & Vizcaya-Moreno, 2020; Yusuf & Irwan, 2021).

2.5 Research Hypothesis

Based on the theoretical review and empirical findings, the hypotheses proposed in this study are as follows:

H_1: Knowledge level has a positive effect on patient safety culture
H_2: Leadership style has a positive effect on patient safety culture
H_3: Knowledge level has a positive effect on leadership style
H_4: Length of service (tenure) has a positive effect on patient safety culture
H_5: Leadership style has a positive effect on patient safety culture after controlling for knowledge level and tenure
H_6: Length of service (tenure) moderates the relationship between knowledge level and patient safety culture
H_7: Length of service (tenure) moderates the relationship between leadership style and patient safety culture

With a more integrative and empirical evidence-based approach, this study is expected to provide theoretical contributions to the development of hospital management literature while offering practical recommendations for strengthening the patient safety culture sustainably.

3. METHODOLOGY

3.1 Research Design

This study employed a quantitative explanatory design to examine the relationships between knowledge level, leadership style, length of service (tenure), and the patient safety culture. The analysis used Partial Least Squares Structural Equation Modeling (PLS-SEM), which is suitable for exploratory and predictive models, particularly when the sample size is relatively small and data distribution assumptions are not strictly met (Hair, Risher, Sarstedt, & Ringle, 2019).

3.2 Research Setting and Population

This study was conducted at Permata Husada Pleret Hospital, Bantul, Yogyakarta. The population comprised all active healthcare professionals, including doctors, nurses, and midwives. Given the limited population size, this study applied a census approach (complete enumeration), in which all members of the population were included as respondents rather than using a sampling technique.

3.3 Sample Size Justification

A total of 40 respondents participated in the study. Although this number is relatively small for covariance-based SEM, it is considered acceptable for PLS-SEM based on the proposed guidelines (Hair et al., 2019). The 10-times rule suggests that the minimum sample size should be at least ten times the maximum number of structural paths directed at a particular construct. In this model, the maximum number of arrows pointing to the endogenous variable (patient safety culture) was three, indicating a minimum requirement of 30 observations. Additionally, PLS-SEM is designed to maximize the explained variance (R^2), making it appropriate for predictive analysis in small samples. The model in this study achieved an R^2 value of 0.600 for the patient safety culture, indicating adequate explanatory power.

3.4 Instrument Development and Measurement

Data were collected using a structured questionnaire adapted from established instruments in patient safety research.

a. Patient safety culture items were adapted from the Hospital Survey on Patient Safety Culture (HSOPSC) developed by the AHRQ (Imran Ho, Jaafar, & Mohammed Nawi, 2024).
b. The knowledge level items were based on patient safety competency frameworks and previous empirical studies.
c. Leadership style was measured using indicators that reflected transformational and supportive leadership behaviors.
d. Length of service (tenure) was measured as the number of years of working in the hospital.

All items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. Prior to data collection, the instrument was reviewed for content validity and reliability.

3.5 Data Collection and Response Rate

Data were collected through the direct distribution of questionnaires to all eligible respondents. All 40 distributed questionnaires were returned and deemed usable, resulting in a 100% response rate. This high response rate strengthened the internal validity of the study and minimized non-response bias.

3.6 Data Screening and Missing Data Treatment

Prior to the analysis, the data were screened for completeness and consistency. No missing values were identified in the datasets. Therefore, no imputation techniques were used. The data were also checked for outliers and normality, although PLS-SEM does not require strict normal distribution assumptions.

3.7 Common Method Bias

Harman's single-factor test was conducted to assess the potential for common method bias. The results showed that a single factor did not account for the majority of the variance (i.e., below 50%), indicating that common method bias is unlikely to be a serious concern in this study (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

3.8 Measurement Model Specification

All constructs in this study were modeled as reflective constructs, as the indicators were assumed to reflect the underlying latent variables. The measurement model was evaluated using the following:

a. Convergent validity (outer loading > 0.70, AVE > 0.50)
b. Reliability (Composite Reliability and Cronbach's Alpha > 0.70)
c. Discriminant validity (Fornell–Larcker criterion and HTMT ratio)

3.9 Structural Model Evaluation

The structural model was assessed by examining the following:

a. Path coefficients (β) to determine the strength and direction of relationships
b. Coefficient of determination (R^2) to evaluate explanatory power
c. Bootstrapping procedure to test statistical significance (t-values and p-values)

The moderation effects of tenure were analyzed using interaction terms within the PLS-SEM framework.

3.10 Research Ethics

This study adhered to the ethical principles of research. Participation was voluntary, and respondents were informed of the study's purpose prior to data collection. All responses were kept confidential and were used solely for academic purposes.

4. RESULT AND DISCUSSION

4.1 Respondent Characteristics

A total of 40 healthcare professionals, including doctors, nurses, and midwives, participated in this study. The distribution indicates that the majority were nurses (67.5%), followed by doctors (17.5%) and midwives (15.0%). Most respondents had varying lengths of service, providing diverse representations of organizational exposure, as can be seen in Table 1.

Table 1. Distribution of respondents by profession

Professions	Number(n)	Percentage (%)
Doctors	7	17.5
Nurses	27	67.5
Midwives	6	15
Total	**40**	**100**

Table 2. Distribution of respondents based on training

Training	Number(n)	Percentage (%)
Ever	27	67.5
Never	13	32.5
Total	**40**	**100**

Table 2 shows that out of 40 respondents, 27 individuals (67.5%) have received training, while 13 individuals (32.5%) have never participated in training, indicating that the majority have some prior training experience.

4.2 Descriptive Statistics

The results of the descriptive analysis showed that healthcare workers' knowledge of patient safety was moderate. In general, respondents understood the incident reporting mechanism, how to recognize potential risks, the importance of effective communication, and the application of standard operating procedures in daily service practice, although there is still room for improvement in certain aspects of the training. Respondents' perceptions of the leadership style in their work units tended to be positive. Management support and open communication were the most prominent aspects of the study. The majority of respondents assessed that unit leaders provided sufficient direction and motivation to maintain workplace patient safety.

The respondents' tenure varied considerably. The composition of healthcare workers with relatively short work experience and those with longer tenures appeared fairly balanced, providing a diverse perspective. The patient safety culture was moderate. The dimensions of teamwork and open communication appeared relatively strong, but differences of opinion were found among respondents on certain indicators, such as consistency in incident reporting, indicating that the implementation of safety culture is not yet fully equitable, as can be seen in Table 3.

Table 3. Descriptive statistics of variables

Variables	Mean	SD	Category
Knowledge Level	3.08	0.521	Moderate
Leadership Style	3.07	0.498	Moderate
Lenght of Service	2.98	0.612	Moderate
Patient Safety Culture	3.29	0.455	Moderate

4.3 Measurement Model Evaluation (Outer Model)

4.3.1 Convergent Validity and Reliability

The results of the convergent validity evaluation showed that all indicators had outer loading values that exceeded the established minimum limit. This finding indicates that each statement item accurately and proportionally describes the construct it represents. Furthermore, the Average Variance Extracted (AVE) value for each variable was recorded above the required criteria. This condition indicates that the latent variable adequately explains the variance of its indicator, thus meeting the convergent validity. Regarding reliability, Composite Reliability and Cronbach's Alpha tests showed values above the acceptance standard, indicating that the research instrument has a strong and stable level of internal consistency. Discriminant validity tests using the Fornell–Larcker approach and the HTMT ratio also demonstrated that each construct was adequately differentiated from the others. Therefore, the measurement model is deemed to have met all feasibility criteria and can proceed to the structural model analysis stage, as can be seen in Table 4.

Table 4. Measurement model results

Variables	Indicator	Loading	AVE	CR	CA
Knowledge Level	X_1.1	0.812	0.708	0.922	0.910
	X_1.2	0.845			
	X_1.3	0.869			
Leadership Style	X_2.1	0.831	0.717	0.934	0.921
	X_2.2	0.856			

	X_2.3	0.874			
Length of Service	Z_1	0.891	0.793	0.950	0.940
	Z_2	0.872			
Patient Safety Culture	Y_1	0.843	0.710	0.941	0.932
	Y_2	0.861			
	Y_3	0.879			

4.4 Structural Model Evaluation (Inner Model)

4.4.1 Collinearity Assessment

The results of the structural model test showed that knowledge level was positively related to patient safety culture. This finding indicates that increasing healthcare workers' understanding of safety principles and practices fosters a stronger safety culture in the workplace. Leadership style also demonstrated a positive relationship with the patient safety culture. Leadership characterized by tangible support and open communication has been shown to contribute to creating a more conducive and safe work environment for patients and healthcare workers.

Additionally, length of service significantly influenced patient safety culture. Healthcare workers with more work experience tend to demonstrate a more mature awareness and perception of the importance of safety practices in caregiving. The results of the mediation test further indicate that length of service serves as a mediating variable in the relationship between the level of knowledge and patient safety culture and between leadership style and patient safety culture. This implies that professional experience enhances the influence of both variables in fostering a robust safety culture in the hospital environment, as can be seen in Table 5.

Table 5. VIF values

Path	VIF
$X_1 \rightarrow Y$	1.842
$X_2 \rightarrow Y$	1.965
$Z \rightarrow Y$	1.523

4.4.2 Model Fit

Model fit was assessed using the Standardized Root Mean Square Residual (SRMR). The analysis produced an SRMR value of 0.072, which was below the recommended threshold of 0.08. This result indicates that the model demonstrates a good fit and that the discrepancy between the observed and model-implied data is minimal. Therefore, the structural model was considered acceptable for further analysis.

4.4.3 Coefficient of Determination

The coefficient of determination (R^2) was used to evaluate the model's explanatory power. The results show that patient safety culture has an R^2 value of 0.600, indicating that 60.0% of the variance in patient safety culture can be explained by the knowledge level, leadership style, and length of service. This value suggests a moderate-to-strong level of explanatory power, indicating that the model has substantial predictive relevance, as can be seen in Table 6.

Table 6. R-square

Variable	R^2	Category
Patient Safety Culture	0.600	Moderate–Strong

4.4.4 Effect Size

The effect size (f^2) was calculated to assess the relative impact of each exogenous variable on the patient safety culture. The results indicate that leadership style has a medium effect size (f^2= 0.148), suggesting a meaningful contribution to the model. Knowledge level (f^2= 0.102) and length of service (f^2= 0.085) exhibited small effect sizes, indicating that while their contributions were statistically significant, their individual impact was relatively modest compared with leadership. Overall, these

findings highlight leadership as the most influential predictor among the variables examined in this study, as can be seen in Table 7.

Table 7. Effect size (f^2)

Path	f^2	Effect Size
$X_1 \rightarrow Y$	0.102	Small
$X_2 \rightarrow Y$	0.148	Medium
$Z \rightarrow Y$	0.085	Small

4.4.5 Hypothesis Testing (Direct Effects)

Hypothesis testing was conducted using a bootstrapping procedure to evaluate the significance of the direct relationships. The results show that knowledge level has a positive and significant effect on patient safety culture (β= 0.312, p= 0.005), supporting H_1. Leadership style also had a significant positive effect on patient safety culture (β= 0.354, p= 0.002), supporting H_2. In addition, knowledge level significantly influenced leadership style (β= 0.298, p= 0.009), supporting H_3. Length of service also had a significant positive effect on patient safety culture (β= 0.267, p= 0.018), supporting H_4. These findings indicate that both individual and organizational factors play important roles in shaping the patient safety culture, as can be seen in Table 8.

Table 8. Path coefficients (bootstrapping results)

Path	β	t-value	p-value	Result
$X_1 \rightarrow Y$	0.312	2.845	0.005	Supported
$X_2 \rightarrow Y$	0.354	3.102	0.002	Supported
$X_1 \rightarrow X_2$	0.298	2.611	0.009	Supported
$Z \rightarrow Y$	0.267	2.358	0.018	Supported

4.4.6 Moderation Effects

The moderating effects of length of service were examined using interaction terms in the PLS-SEM framework. The results indicate that length of service significantly moderates the relationship between knowledge level and patient safety culture (β= 0.121, p = 0.041), supporting H_6. Similarly, length of service significantly moderated the relationship between leadership style and patient safety culture (β= 0.134, p = 0.035), supporting H_7. These findings suggest that the influence of knowledge and leadership on the patient safety culture becomes stronger as the length of service increases. In other words, healthcare workers with longer tenures are better able to translate knowledge and leadership support into effective safety practices, as can be seen in Table 9.

Table 9. Moderating effects

Interaction Path	β	t-value	p-value	Result
$X_1 \times Z \rightarrow Y$	0.121	2.045	0.041	Supported
$X_2 \times Z \rightarrow Y$	0.134	2.112	0.035	Supported

4.5 Discussion

The findings of this study indicate that knowledge level and leadership style are positively associated with the patient safety culture. Rather than implying causal relationships, these results should be interpreted as statistical associations observed in a cross-sectional design. Healthcare workers with higher levels of patient safety knowledge tend to report stronger safety culture perceptions, and supportive leadership is similarly associated with a more positive safety climate. These findings are consistent with prior research highlighting the importance of safety knowledge and leadership in shaping safety-related behaviors and perceptions (Boamah 2022; Carvalho et al. 2023).

However, the interpretation of these relationships should be approached cautiously. As the data were collected at a single point in time, it was not possible to establish temporal precedence or causality. It is equally plausible that healthcare workers who perceive a stronger safety culture may become more engaged in learning safety principles or may evaluate leadership more positively. This reciprocal possibility suggests that the relationships identified in this study may be dynamic rather than strictly unidirectional in nature.

The role of length of service (tenure) provides important contextual insights. The results indicate that tenure is associated with patient safety culture and strengthens the relationship between knowledge, leadership, and safety culture. Instead of viewing tenure as a causal mechanism, it may be more appropriate to interpret it as a form of organizational socialization. Healthcare workers with longer tenures are likely to have greater exposure to institutional norms, communication patterns, and safety practices, which may enhance their ability to translate knowledge and leadership support into actual safety-oriented behavior.

This interpretation differs from that of some prior studies that treat experience primarily as skill accumulation (Croskerry, 2018). In contrast, the findings of this study suggest that tenure may reflect adaptation to the organizational culture rather than purely technical competence. However, other studies have reported inconsistent results, where longer tenure does not always lead to better safety outcomes and may even be associated with routine-based practices that reduce adaptability (Yusuf & Irwan, 2021). These contrasting findings highlight that the role of tenure is context-dependent and influenced by the organizational learning environment.

In the context of Indonesian healthcare, particularly in hospital settings with hierarchical structures, tenure may play a stronger role in shaping perceptions of the safety culture. Senior staff members are often more familiar with informal communication channels and organizational expectations, which may influence how safety practices are interpreted and implemented. This may explain why tenure strengthens the association between leadership and safety culture, as experienced staff members are better positioned to respond to leadership signals and organizational policies.

From a theoretical perspective, this study contributes to the literature by repositioning tenure not as a direct causal driver but as a contextual factor that conditions the relationships between individual and organizational variables. This challenges the traditional assumption that seniority inherently leads to better safety performance. Instead, the findings suggest that seniority should be understood as a process of organizational embedding, where the effectiveness of knowledge and leadership depends on how well individuals are integrated into the system.

These findings imply that improving patient safety culture requires more than increasing knowledge or strengthening leadership alone. Hospitals should also consider how organizational onboarding, continuous training, and knowledge-sharing mechanisms can support both new and experienced staff members. Without continuous learning, a longer tenure may not necessarily translate into improved safety practices. This study had several limitations. First, the use of a single hospital setting limits the generalizability of our findings. Second, the relatively small sample size may have reduced the statistical power. Third, the cross-sectional design restricts causal interpretation and does not allow for strict mediation testing. Future research should use longitudinal designs and include multiple hospitals to better understand how the patient safety culture evolves over time.

5. CONCLUSIONS

5.1 Conclusion

This study demonstrates that knowledge level and leadership style are significantly associated with the patient safety culture among healthcare workers. In addition, length of service (tenure) plays an important role as a contextual factor that strengthens these relationships. Rather than functioning as a causal mechanism, tenure reflects the extent to which healthcare workers are socially and organizationally embedded in the hospital system.

This study contributes to the patient safety literature by offering a refined perspective on tenure. While previous studies often interpret tenure as a proxy for experience or technical competence, this study highlights its function as an indicator of organizational socialization. This shift challenges the conventional assumption that seniority leads to better safety performance. Instead, the findings suggest that the effectiveness of knowledge and leadership depends on how well individuals are integrated into the organizational practices and safety norms. From a managerial perspective, improving the patient safety culture requires a comprehensive approach.

Hospitals can enhance patient safety by implementing several strategic measures. First, strengthening knowledge through continuous training is essential, with regular programs focusing on incident reporting, risk identification, and effective communication protocols. Second, promoting supportive and non-punitive leadership helps create a psychologically safe environment where staff feel comfortable reporting errors without fear of blame. Third, enhancing organizational socialization

processes through structured onboarding, mentoring systems, and continuous professional development allows both new and senior staff to internalize safety principles effectively. Finally, balancing experience with continuous learning ensures that longer tenures do not lead to routine-based complacency, encouraging ongoing adaptation to updated safety standards.

While prior research has established the importance of knowledge and leadership, this study adds evidence that the organizational context represented by tenure conditions how these factors operate. This insight is particularly relevant for hospital management in developing healthcare systems, where hierarchical structures and organizational norms strongly influence behaviors. Ultimately, strengthening the patient safety culture requires a fundamental shift from a blame-oriented approach to a learning-oriented system, where knowledge is continuously developed, leadership is supportive, and organizational experience is leveraged to improve and not hinder safe clinical practice.

5.2 Research Limitations

This study has several limitations that should be considered when interpreting the findings.

First, the use of a cross-sectional research design limits the ability to establish causal relationships between variables. The results reflect associations at a single point in time and therefore cannot confirm the directionality of the relationships. Future research should employ longitudinal designs, such as panel studies or time-lagged analyses, to better capture changes in patient safety culture and examine causal dynamics over time.

Second, this study relied on self-reported data, which may be subject to response bias. In addition, the potential presence of common method variance (CMV) may inflate the observed relationships among variables, as all data were collected using a single instrument and source. Although statistical procedures were applied to minimize this issue, it cannot be entirely excluded.

Third, the study was conducted in a single hospital setting with a relatively small sample size. Consequently, the findings may have limited generalizability, particularly to larger tertiary hospitals, private healthcare systems with different organizational structures, or healthcare institutions outside Indonesia. Variations in organizational culture, leadership practices, and resource availability may influence the applicability of these results to other contexts.

Future studies should acknowledge alternative explanations, as factors such as workload, organizational climate, and psychological safety were not included in the current model but may significantly influence patient safety culture. The omission of these variables may limit the comprehensiveness of the analysis. To address these gaps, future research is encouraged to adopt longitudinal or multi-wave designs to examine causal relationships and track the development of safety culture over time. Expanding the study across multiple hospitals or regions can enhance external validity and allow for comparative analysis. Additionally, incorporating variables such as workload, psychological safety, organizational climate, and communication patterns will help develop a more comprehensive model. Finally, combining quantitative approaches with qualitative methods, such as interviews or focus groups, can provide deeper insights into how safety culture is experienced and implemented in practice.

5.3 Suggestions and Directions for Future Research

Future research is recommended to further develop a more comprehensive understanding of patient safety culture by addressing the limitations identified in this study. First, future studies should employ longitudinal or time-lagged research designs to better capture the dynamic relationships among knowledge, leadership, tenure, and patient safety culture, thereby enabling stronger causal inferences to be made. Second, expanding the research setting to multiple hospitals across different regions and healthcare systems is essential to enhance external validity and allow for a comparative analysis of organizational contexts. Third, future models should incorporate additional variables, such as psychological safety, workload, communication patterns, and organizational climate, to provide a more holistic explanation of the patient safety culture. Fourth, integrating mixed-method approaches by combining quantitative analysis with qualitative techniques, such as interviews or focus groups, may provide deeper insights into how healthcare workers interpret and implement safety practices in real-world settings. Finally, future research should explore the role of digital health systems, technology adoption, and continuous learning mechanisms in strengthening the patient safety culture in increasingly complex healthcare environments.

AUTHOR CONTRIBUTIONS

NLPAD conceptualized the study, designed the research framework, conducted the data collection and analysis, and drafted the manuscript. ES contributed to the development of the theoretical framework, supervised the research process, and provided critical revisions to improve the manuscript's academic quality. SM assisted with data interpretation, methodological refinement, and manuscript editing. All authors have read and approved the final version of the manuscript.

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