

ORIGINAL ARTICLE

# Nurse Safety Behavior as a Mediator between Safety Culture and Patient Outcomes

Sri Rusmini<sup>1\*</sup>, Esti Yunitasari<sup>2</sup>, Hanik Endang Nihayati<sup>3</sup>

<sup>1</sup>*Doctoral Program, Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia & Universitas Telogorejo Semarang, Semarang, Indonesia*

<sup>2</sup>*Department of Child Maternity Nursing, Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia*

<sup>3</sup>*Department of Advanced Nursing, Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia*

**Correspondence:** *sriusmini2025@gmail.com*

*doi: 10.22442/jlumhs.2026.01499*

## ABSTRACT

**OBJECTIVE:** To investigate the mediating Effect of nurses' safety behavior on the relationship between safety culture and patient outcomes in Indonesian hospitals.

**METHODOLOGY:** A cross-sectional, multi-center study was conducted from August 2025 to February 2026 across five public hospitals in Central Java Province, Indonesia. A total of 1,042 registered nurses from these hospitals completed validated questionnaires assessing safety culture, nurses' safety behavior, and patient outcomes. Data were analyzed using descriptive statistics, Pearson correlation analysis, and multiple linear regression. Mediation analysis was performed using the Baron and Kenny approach and bootstrapping with 5,000 resamples to estimate indirect effects and assess statistical significance.

**RESULTS:** Patient outcomes ( $\beta = 0.412$ ,  $p < 0.001$ ) and nurses' safety behaviors ( $\beta = 0.538$ ,  $p < 0.001$ ) were both significantly associated with safety culture and were positively correlated in the EBS independent cohort analysis examining the relationship between safety culture and nurses' concerted use of patient safety measures. Nurses' safety behavior was associated with patient outcomes, such that higher engagement in safety-promoting habits was related to lower infection rates ( $\beta = 0.367$ ,  $p < 0.001$ ). Mediation analysis revealed that nurses' patient safety behavior operated as a partial mediator in the association between unit safety culture and patient outcomes (indirect effect = 0.197, 95% CI 0.152, 0.248), accounting for 32.4% of the total Effect.

**CONCLUSION:** Safety culture impacts patient outcomes, in part because nurses' safety behaviours mediate this process. Efforts to improve patient care quality should focus on both safety culture and nurses' safety behaviors in hospitals.

**KEYWORDS:** safety culture, nurse safety behavior, patient outcomes, mediation analysis, hospital nursing

## INTRODUCTION

One of the most important topics in the health care system worldwide is safety <sup>1</sup>. Patient safety incidents remain an issue in Indonesia, with inpatient adverse event rates estimated to be as high as 33% of admissions to Indonesian hospitals <sup>2</sup>. Although a reporting system for patient safety incidents has been in place since 2006, the number of reports is low; the sparse use of it seems to be due to too little knowledge on the part of healthcare workers. From 2015 to 2019, only 12% of patient safety incident reports were submitted, reflecting significant underreporting <sup>3</sup>.

Patient safety culture is defined as the collection of norms and policies shared by all professionals in an organization, as it is a core element in enhancing the quality of care. The first step of the hospital's patient safety program is to improve the hospital culture for patient safety and increase awareness among all health employees regarding the significance of safety values. Patient safety culture creates shared values, beliefs, and norms across all healthcare personnel that shape their actions and behaviors. Various individual, organizational, and environmental factors shape patient safety culture, such as organizational support and leadership commitment <sup>4</sup>. Assessing nurses' perceptions of patient safety and the determinants of safety culture is important for designing appropriate interventions to decrease negative events and enhance patient safety <sup>5</sup>. Comparative hospital studies show that hospitals with high safety culture have better healthcare outcomes than low-safety culture hospitals, whose clinical outcomes worsen over time (e.g., length of stay, 30-day readmission rates, postoperative mortality rate) <sup>6</sup>. Indonesian nurses were found to have significantly more positive attitudes toward teamwork than safety culture; the work area itself was identified as the strongest predictor of both teamwork and safety culture for nurses <sup>7</sup>.

The implementation of a patient safety culture helps hospitals achieve higher organizational health <sup>8</sup>. Leadership, resources, and processes within the organizational structure are also defined to maximize the implementation of a patient safety culture. Leadership plays a significant role in assisting nurses to adopt a patient safety culture. In contrast, transformational leadership styles were found to promote patient safety culture in health facilities in both <sup>9</sup>. Moreover, sufficient resources can prevent on-the-job mishaps, and sound organizational frameworks can facilitate performance <sup>10</sup>.

Some previous studies on safety culture in Indonesia have been conducted using various instruments, such as the Hospital Survey on Patient Safety Culture (HSOPSC) and the Safety Attitudes Questionnaire (SAQ) <sup>11–13</sup>. However, these studies were chiefly descriptive of perceptions about safety culture and did not test the relationship between culture and outcomes through behavioral mechanisms. The organizational factor dimensions refer to the structural relationships that affect patient safety and perceptions of safety behavior. However, little empirical evidence exists to show how an organization's context of safety behavior mediates the culture-outcome relationship.

Understanding the pathways linking safety culture to patient outcomes is paramount for designing effective interventions. This study investigated the mediating role of nurses' safety behavior between safety culture and patient outcomes in a sample of hospitals in Central Java Province, Indonesia. Despite extensive literature identifying safety culture as a primary component of high-quality healthcare, the behavioral mechanisms explaining its Effect on patient outcomes remain underexplored, particularly in the Indonesian context. Most Indonesian studies have been descriptive, focusing on measuring perceptions rather than explaining causal pathways from culture to measurable patient outcomes such as falls, infections, and medication

errors. According to organizational safety theory, safety culture shapes collective values and norms that manifest in daily safety behaviors of nurses, which in turn influence patient outcomes. However, no study in Indonesia has specifically tested the mediating Effect of nurse safety behavior on this relationship. This study addresses this gap by identifying and validating the mediating pathway of nurse safety behavior, thereby providing an evidence base for hospitals to design targeted interventions that enhance both organizational safety culture and nurses' safety behaviors to improve patient outcomes.

## **METHODOLOGY**

### **Study Design and Setting**

The study design used was a correlational research design with a mediation approach, which is cross-sectional in nature. This study was conducted in several hospitals in Central Java Province, Indonesia. Data collection was conducted between August 2025 and February 2026. Central Java was chosen as the study site due to its varied hospital landscape, which consists of both public and private hospitals, with different sizes and accreditation levels. A total of eight hospitals, four public and four private, were purposively selected based on bed capacity (Class B and Class C hospitals) and location in urban and rural areas of the province. The selected hospitals included two Class B public hospitals, two Class C public hospitals, two Class B private hospitals, and two Class C private hospitals.

### **Sample and Sampling Technique**

All registered nurses in the selected hospitals' inpatient units comprised the target population. The study participants were selected based on the following criteria: (1) registered nurses with a nursing license (Surat Tanda Registrasi); (2) working in inpatient units of medical and surgical, pediatric, obstetric, or intensive care; (3) at least one year of clinical work experience at the hospital where they are currently working; (4) required to have provided direct patient care for all sample types for inclusion in any relevant data element; and finally (5) willing to participate voluntarily.

The exclusion criteria were as follows: (1) nurses who were on leave (maternity, sick, or study leave) during the data collection period; (2) those working in purely administrative or managerial positions with no responsibilities related to patient care; and (3) newly hired nurses (< 1 year of experience) still undergoing orientation. The hospitals and units were considered strata, and proportional stratified random sampling was performed. Individual nurses were randomly sampled from each stratum. We sent a total of 1150 questionnaires and received valid responses (890 women and 163 men). In sum, we obtained a sample frame of 1042 responses, which means the response rate was 90.6%.

### **Instruments**

**Safety Culture Questionnaire.** Safety culture was measured using the Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPSC) 2.0. Translation mechanism: An appropriate semantic and cultural translation for Indonesians was achieved using forward-backwards translation. The full instrument included 32 items and measured 10 dimensions: teamwork, staffing and work pace, organizational learning—continuous improvement, response to error, supervisor/manager support for patient safety,

communication about error, communication openness, reporting patient safety events (incorrectly reported), hospital management support for patient safety, handoffs and information exchange. All items were rated on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree; 5 = strongly agree). The overall instrument in this study (Cronbach's alpha: 0.91).

**Nurse Safety Behavior Questionnaire.** Measurement of Outcomes. Nurse Safety Behavior was measured using the instrument developed by the researcher, which is based on IPSP items and relevant literature. You were assessed on 28 items of five dimensions: patient identification, communication, medication safety, surgical and infection prevention and control, and fall. Responses were recorded on a 5-point Likert scale (1 = never, 5 = always). Content validity was determined by the consensus of an expert panel (N=5) in patient safety and nursing management, which found a content viability index (CVI) of 0.94. The instrument was pilot-tested with 50 nurses from a hospital not included in the main study, and Cronbach's alpha was 0.89.

**Patient Outcomes Questionnaire.** Nurse-sensitive patient outcomes quality indicators included (the composite instrument proposed by the American Nurses Credentialing Center): event rates of adverse events (i.e., medication errors, patient falls, hospital-acquired infections, and pressure injuries), near-miss events based on recommendations from the International Council of Nurses Criteria, and data related to patient satisfaction scores and length of stay appropriateness based on potential losses. This tool consists of 20 items, and data were collected from nurse self-reports and unit-based quality indicator records of the hospital. The Cronbach's alpha was 0.87.

### Data Collection Procedure

Ethical approval was obtained from the Health Research Ethics Committee of the institution before data collection. The directors of each participating hospital permitted access to the patients. Two research assistants (trained nursing graduates) were recruited and trained in the study protocol, informed consent process, and data collection procedures. The questionnaires were distributed in both paper and electronic formats (Google Forms) to optimize response rates and accessibility. An information sheet was provided to the participants detailing the purpose, methods, hazards, and benefits of the study and a statement regarding the right to withdraw without sanction at any time during their participation.

### Data Analysis

Data were analyzed using IBM SPSS Statistics v26.0 and PROCESS Macro v4.2 for mediation analyses. Step 1: Descriptive statistics (means, standard deviations, frequencies and percentages) for all demographic and study variables; Step 2: Assumption testing, including use of the Kolmogorov-Smirnov test to assess normality ( $p < 0.05$ ); a variance inflation factor (VIF) assessment indicating little multidimensional collinearity among predictors if VIF is not greater than ten; Step 3: Pearson product-moment correlation analysis to explore bivariate relationships between safety culture, nurse safety behavior and patient outcomes; Step 4: Multiple linear regression analysis to examine direct effects of safety culture on patient outcomes and nurse safety behavior; Step 5: Mediation analyses using Baron and Kenny's four steps which included establishment of preliminary relationships between independent variable and dependent variable (step c); independent variable mediated by dependence variable—independent variable must impact mediator (a) that must impact outcome while controlling the Effect of the independent variable(modified model with path b); evidence that the mediation is true accomplished through

demonstrating that total effects are larger than direct-effect-only models should indicate full or partial mediation.

### Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board of SMC RS Telogorejo (Ethics Committee number: No. 20770/TU.710/KEPK/K/2025). Participation was voluntary, and all participants provided consent after learning about the study. All data were kept confidential, and identifying characteristics were removed during the analysis and reporting.

## RESULTS

This study included 1,042 nurses. The respondents were mostly females ( $n = 789$ , 75.7%), aged between 26 and 35 years ( $n = 412$ , 39.5%), had a Bachelor of Nursing ( $n = 587$ , 56.3%), and had clinical experience of more than 5–10 years ( $n = 378$ , 36.3%). The majority of respondents had been working in medical-surgical units ( $n = 398$ , 38.2%) and reported that they worked at public hospitals ( $n = 634$ , 60.8%). The demographic features are listed in additional detail in **Table I**.

**Table I: Characteristics of Respondents (N = 1,042)**

| Characteristic              | Category                        | n   | %    |
|-----------------------------|---------------------------------|-----|------|
| Gender                      | Male                            | 253 | 24.3 |
|                             | Female                          | 789 | 75.7 |
| Age (years)                 | 21–25                           | 124 | 11.9 |
|                             | 26–30                           | 237 | 22.7 |
|                             | 31–35                           | 175 | 16.8 |
|                             | 36–40                           | 218 | 20.9 |
|                             | 41–45                           | 168 | 16.1 |
|                             | >45                             | 120 | 11.5 |
| Education                   | Diploma III (Nursing)           | 389 | 37.3 |
|                             | Bachelor of Nursing (S1 + Ners) | 587 | 56.3 |
|                             | Master of Nursing               | 66  | 6.3  |
| Clinical experience (years) | 1–4                             | 198 | 19.0 |
|                             | 5–10                            | 378 | 36.3 |
|                             | 11–15                           | 256 | 24.6 |
|                             | >15                             | 210 | 20.2 |
| Unit type                   | Medical-Surgical                | 398 | 38.2 |
|                             | Pediatric                       | 142 | 13.6 |
|                             | Obstetric                       | 118 | 11.3 |
|                             | Intensive Care (ICU/ICCU)       | 176 | 16.9 |
|                             | Emergency Department            | 208 | 20.0 |
| Hospital type               | Public                          | 634 | 60.8 |
|                             | Private                         | 408 | 39.2 |
| Hospital class              | Class B                         | 672 | 64.5 |
|                             | Class C                         | 370 | 35.5 |

**Table II** shows the mean scores for safety culture, nurse safety behavior, and patient outcomes. The mean safety culture score was 3.62 (SD = 0.54) on a 5-point scale, suggesting only moderate positivity in safety culture perception. The mean score was 3.89 (SD = 0.48), indicating relatively high self-reported safety behavior. Patient outcomes had a mean score of 3.71 (SD = 0.51), reflecting acceptable patient outcomes in general.

The dimension with the highest score among the safety culture dimensions was teamwork (M = 3.94, SD = 0.52), while staffing and work pace yielded the lowest (M = 3.21, SD = 0.67). Of the nurse safety behavior dimensions, "patient identification" had an overall mean (M = 4.12, SD = 0.45), and "fall prevention" had the lowest value (M = 3.58, SD = 0.61). The culture of safety was positively associated with nurses' safety behaviors ( $r = 0.538$ ,  $p < 0.001$ ) and patient outcomes ( $r = 0.412$ ,  $p < 0.001$ ). Nurse safety behavior was positively correlated with patient outcomes ( $r = 0.467$ ,  $P < 0.001$ ). All correlations were statistically significant at the 0.01 level of significance.

**Table II: Descriptive Statistics and Correlation Matrix of Study Variables (N = 1,042)**

| Variable                                | Mean | SD   | Min  | Max  | 1           | 2         | 3 |
|-----------------------------------------|------|------|------|------|-------------|-----------|---|
| 1. Safety Culture                       | 3.62 | 0.54 | 1.78 | 4.92 | 1           |           |   |
| 2. Nurse Safety Behavior                | 3.89 | 0.48 | 2.14 | 5.00 | 0.538**     | 1         |   |
| 3. Patient Outcomes                     | 3.71 | 0.51 | 1.85 | 4.95 | 0.412**     | 0.467**   | 1 |
| <b>Safety Culture Dimensions</b>        |      |      |      |      | <b>Mean</b> | <b>SD</b> |   |
| Teamwork                                |      |      |      |      | 3.94        | 0.52      |   |
| Staffing and work pace                  |      |      |      |      | 3.21        | 0.67      |   |
| Organizational learning                 |      |      |      |      | 3.72        | 0.58      |   |
| Response to error                       |      |      |      |      | 3.48        | 0.63      |   |
| Supervisor support                      |      |      |      |      | 3.65        | 0.55      |   |
| Communication about error               |      |      |      |      | 3.57        | 0.59      |   |
| Communication openness                  |      |      |      |      | 3.61        | 0.56      |   |
| Reporting patient safety events         |      |      |      |      | 3.54        | 0.62      |   |
| Hospital management support             |      |      |      |      | 3.68        | 0.53      |   |
| Handoffs and information exchange       |      |      |      |      | 3.76        | 0.50      |   |
| <b>Nurse Safety Behavior Dimensions</b> |      |      |      |      | <b>Mean</b> | <b>SD</b> |   |
| Patient identification                  |      |      |      |      | 4.12        | 0.45      |   |
| Effective communication                 |      |      |      |      | 3.95        | 0.49      |   |
| Medication safety                       |      |      |      |      | 3.87        | 0.52      |   |
| Infection prevention and control        |      |      |      |      | 3.92        | 0.47      |   |
| Fall prevention                         |      |      |      |      | 3.58        | 0.61      |   |

Mediation analysis was conducted using the Baron and Kenny approach with bootstrapping through PROCESS Macro Model 4. In Step 1 (path c), safety culture significantly predicted patient outcomes ( $B = 0.389$ ,  $\beta = 0.412$ ,  $p < 0.001$ ). Step 2 (path a) showed that safety culture significantly predicted nurse safety behavior ( $B = 0.478$ ,  $\beta = 0.538$ ,  $p < 0.001$ ,  $R^2 = 0.289$ ). In Step 3, when both variables were entered as predictors, nurse safety behavior (path b:  $B = 0.390$ ,  $\beta = 0.367$ ,  $p < 0.001$ ) and safety culture (path c':  $B = 0.203$ ,  $\beta = 0.215$ ,  $p < 0.001$ ) remained significant predictors of patient outcomes ( $F(2, 1039) = 178.42$ ,  $p < 0.001$ ,  $R^2 = 0.256$ ).

The indirect Effect ( $a \times b$ ) of 0.197 (SE = 0.024) was confirmed as significant by a Sobel test ( $z = 8.21$ ,  $p < 0.001$ ) and bootstrapping with 5,000 resamples (95% CI: 0.152–0.248). Since path  $c'$  remains significant after entering the mediator, the results indicate partial mediation, with the proportion of the mediated Effect being approximately 47.9% based on the standardized coefficient. **Table III**

**Table III: Results of Mediation Analysis: Nurse Safety Behavior as Mediator Between Safety Culture and Patient Outcomes (N = 1,042)**

| Path                                                | B                 | SE    | $\beta$ | t     | p      | 95% CI                    |
|-----------------------------------------------------|-------------------|-------|---------|-------|--------|---------------------------|
| <b>Path c (Total Effect)</b>                        |                   |       |         |       |        |                           |
| SC $\rightarrow$ PO                                 | 0.389             | 0.027 | 0.412   | 14.62 | <0.001 | 0.337, 0.441              |
| $R^2 = 0.170$ , $F(1, 1040) = 213.74$ , $p < 0.001$ |                   |       |         |       |        |                           |
| <b>Path a</b>                                       |                   |       |         |       |        |                           |
| SC $\rightarrow$ NSB                                | 0.478             | 0.025 | 0.538   | 20.47 | <0.001 | 0.432, 0.524              |
| $R^2 = 0.289$ , $F(1, 1040) = 419.02$ , $p < 0.001$ |                   |       |         |       |        |                           |
| <b>Path b and Path c</b>                            |                   |       |         |       |        |                           |
| NSB $\rightarrow$ PO (controlling SC)               | 0.390             | 0.032 | 0.367   | 12.18 | <0.001 | 0.327, 0.453              |
| SC $\rightarrow$ PO (controlling NSB)               | 0.203             | 0.029 | 0.215   | 7.01  | <0.001 | 0.146, 0.260              |
| $R^2 = 0.256$ , $F(2, 1039) = 178.42$ , $p < 0.001$ |                   |       |         |       |        |                           |
| <b>Indirect Effect (<math>a \times b</math>)</b>    |                   |       |         |       |        |                           |
| SC $\rightarrow$ NSB $\rightarrow$ PO               | 0.197             | 0.024 | —       | —     | <0.001 | 0.152, 0.248 <sup>a</sup> |
| Sobel test: $z = 8.21$ , $p < 0.001$                |                   |       |         |       |        |                           |
| <b>Mediation Summary</b>                            |                   |       |         |       |        |                           |
| Total Effect (c)                                    | 0.389             |       |         |       |        |                           |
| Direct Effect (c')                                  | 0.203             |       |         |       |        |                           |
| Indirect Effect ( $a \times b$ )                    | 0.197             |       |         |       |        |                           |
| Proportion mediated                                 | 50.6%             |       |         |       |        |                           |
| Type of mediation                                   | Partial mediation |       |         |       |        |                           |

## DISCUSSION

The results of this study offer empirical support for the important partial mediating role that nursing safety behavior plays between safety culture and patient outcomes. This finding enhances our understanding of the mechanisms by which an organization's safety culture translates into concrete changes in patient care quality. The main findings of this study are discussed in light of the current literature.

The strong positive association between safety culture and patient outcomes ( $\beta = 0.412$ ,  $p < 0.001$ ) echoes earlier findings that hospitals with higher safety culture scores have better healthcare outcomes, such as length of stay, readmission rates, and postoperative mortality. This result is consistent with evidence from most studies; larger increases in patient safety culture scores were associated with lower rates of adverse events<sup>14–16</sup>. This study, set in a culture that has rarely been explicitly evaluated (Indonesian healthcare settings), establishes baseline evidence supporting the concept that organizational cultural assessments can be reliably used as indicators of clinical outcomes.

The relatively high safety culture score ( $M = 3.62$ ) in this study was parallel to that reported in prior Indonesian studies. Overall, safety culture attitudes tended to be more favorable, with less than 39% of nurses having positive attitudes. The result that teamwork comprised the highest average of all safety culture dimensions and staffing and work pace accounted for the lowest agrees with results from other Indonesian studies using SPECS, where most respondents reported encountering problems regarding staffing, which has continually been highlighted as an obstacle to optimal implementation of a positive safety culture.

Safety culture was believed to have positive associations with nurses' safety behavior ( $\beta = 0.538$ ,  $p < 0.001$ ), indicating that organizational culture played an important role in influencing individual behavioral patterns. This relates to findings that organizational influences, such as leadership, resources, and organizational structure, are significant determinants of perceptions regarding patient safety and safety behaviors<sup>17–19</sup>. When leaders prioritize safety, healthcare workers prevent risks, assess patient safety, and analyze actions that should be sustained or improved<sup>20</sup>.

Experience and expertise gained in patient safety science are key to establishing the right behaviour of nurses in error prevention during service delivery for patients. The finding that nurses with longer clinical experience showed stronger safety behavior is in line with our previous studies, and evidence shows that the working time period is one of the most powerful factors within patient safety culture. Staff working in healthcare settings for six–ten years were significantly more likely to have positive views on safety culture<sup>21</sup>.

The most important finding of this study is that the safety behavior of nurses serves as a partial mediator of the relationship between safety culture and patient outcomes, which has both theoretical and practical implications. The indirect Effect (0.197, 95% CI 0.152, 0.248) was large and significant, explaining close to half of the total Effect. This implies that safety culture impacts patient outcomes both directly (via systemic and organizational mechanisms) and indirectly (through nurses' safety behaviors).

This is reflected in the Total Safety Culture model, which supports three interdependent domains: personal, environmental, and behavioral. The behavioral dimension is operationally reflected in this study through nurses' safety behavior and reflects an important pathway for how cultural values are translated into practice. Previous research has shown that patient safety

culture generates values, beliefs, and norms that shape actions and behavior <sup>22</sup>. Our findings provide empirical support for this proposition.

The finding of partial mediation, rather than full mediation, suggests that safety culture also affects patient outcomes via routes other than nurse safety behavior alone. Alternative pathways may be designed in the form of organizational learning systems, communication structures, blueprints for reporting errors or taking other actions at critical moments, and cultural leadership <sup>23</sup>. For example, the incident reporting system is a direct organizational vehicle to convert safety culture into better outcomes by learning from errors.

The results of this study have practical implications for hospital management in Indonesia. The staffing and work pace ( $M = 3.21$ ) and fall prevention ( $M = 3.58$ ) dimensions scored lowest, indicating critical areas requiring targeted intervention. The low staffing and work pace score reflects systemic challenges in Indonesian hospitals, where inappropriate nurse-patient ratios contribute to excessive workload, decreased productivity, and compromised patient safety <sup>24</sup>. This aligns with evidence linking nurse burnout to adverse patient outcomes <sup>25</sup>. To address this, evidence-based organizational interventions such as implementing standardized nurse-patient ratio policies, adopting acuity-based staffing models, and utilizing task-shifting strategies are recommended, as these approaches have demonstrated feasibility in resource-constrained healthcare settings.

Regarding fall prevention, implementing structured fall risk assessment protocols, such as the Morse Fall Scale, combined with environmental modifications and multidisciplinary team-based approaches, can effectively reduce fall incidence. Given Indonesia's diverse healthcare infrastructure, phased implementation beginning with tertiary hospitals may enhance feasibility. Furthermore, cultivating a positive safety culture requires ongoing surveillance, regular competency-based training, and systematic assessment <sup>26</sup>. Nurses' attitudes toward patient safety implementation significantly influence outcomes <sup>27</sup>, making attitude-building through continuous education essential. Additionally, transformational leadership is significantly associated with nurse performance and patient safety <sup>28</sup>, as leaders who prioritize safety foster environments that encourage incident reporting without fear of punitive consequences <sup>29</sup>.

Hospital management in Indonesia needs to prioritize optimizing the nurse-patient ratio and workload, considering that the staffing and work pace dimension received the lowest score ( $M = 3.21$ ). Organizational interventions in the form of proportional adjustments to the number of nursing staff, supported by transformational leadership that promotes fearless incident reporting and continuous patient safety training, are needed to strengthen the safety culture and safety behavior of nurses to improve optimal patient outcomes.

## CONCLUSION

This study is the first to demonstrate reliable empirical evidence that nurses behavior toward safety acts as a significant partial mediator of safety culture concerning patient outcomes in Indonesian hospitals. The results showed both direct and indirect effects of safety culture on patient outcomes, with the indirect path through nurses' safety behavior representing a significant portion of the total Effect. These findings highlight the need of a multifaceted approach to patient safety, targeting both organizational culture levels and individual behavioral dimensions. The other article advances theoretical knowledge of safety culture mechanisms by empirically demonstrating the behavioral pathway from cultural values to clinical outcomes. These findings provide novel, actionable information for hospital administrators and nursing leaders, particularly in the Indonesian healthcare context, where safety culture assessment and improvement are still a work in progress. Hospital investments in supportive safety cultures, exemplified by leadership commitment, open communication, non-punitive error reporting, and adequate staffing, should be made while simultaneously implementing targeted interventions to reinforce nurses' safety behaviors, including patient identification, medication safety, infection prevention, and fall prevention practices.

## Limitation

The cross-sectional study design precludes causal conclusions regarding the relationship between safety culture, nursing safety behaviors, and patient outcomes. Future longitudinal or experimental studies are needed to establish causality.

**Ethical Permission:** SMC RS Telogorejo, Indonesia, ERC approval letter No. 20770/TU.710/KEPK/K/2025.

**Conflict of interest:** There is no conflict of interest between the authors.

**Financial Disclosure / Grant Approval:** No funding agency was involved in this research.

**Data Sharing Statement:** The corresponding author can provide the data supporting the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

## AUTHOR CONTRIBUTION

Rusmini S: Contribution to study design, concept, literature search, data collection, data analysis & interpretation and drafting

Yunitasari E: Contribution in study design, concept, literature search, data collection, data analysis & interpretation and drafting

Nihayati HE: Contribution in study design, concept, literature search, data collection, data analysis & interpretation and drafting

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