

Workload, Stress, and Patient Safety in Emergency Nursing Units: An Analytic Cross-Sectional Study

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ABSTRACT

Introduction: Emergency departments represent high-risk clinical environments where workforce strain may compromise patient safety. The World Health Organization reports a global shortage of health workers exceeding 10 million, disproportionately affecting acute care settings. According to the Global Burden of Disease study, non-communicable diseases and injury-related conditions continue to drive emergency service utilization worldwide. In many middle-income countries, increasing patient volume and limited staffing contribute to excessive nurse workload and occupational stress, which are recognized determinants of adverse events and reduced safety compliance. To examine the association between workload, occupational stress, and patient safety practices among nurses working in emergency units.

Research Methodology: An analytic cross-sectional study was conducted among 80 emergency nurses in a tertiary hospital. Total sampling was applied. Data were collected using validated self-administered questionnaires measuring workload, occupational stress, and patient safety practices. Bivariate analysis was performed using Chi-square tests, followed by multivariate logistic regression to estimate adjusted odds ratios (AOR) with 95% confidence intervals (CI). Statistical significance was set at $\alpha = 0.05$.

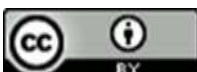
Results: High workload was significantly associated with inadequate patient safety practice (AOR = 3.05; 95% CI: 1.14–8.15; $p = 0.026$). High occupational stress also independently predicted inadequate safety practice (AOR = 2.47; 95% CI: 1.01–6.05; $p = 0.048$). The final model explained 31% of the variance in patient safety outcomes.

Conclusion: Excessive workload and occupational stress are significant determinants of patient safety performance in emergency nursing units. Workforce regulation, staffing optimization, and stress mitigation strategies should be integrated into hospital quality improvement and public health workforce policies.

Keywords: Emergency Nursing; Occupational Stress; Patient Safety; Workload; Workforce Health.



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INTRODUCTION

Emergency departments (EDs) are all allied, complex, and high in the health system. All health systems worldwide. Globally, increasing population aging, the growing burden of non-communicable diseases, and recurrent public health emergencies have significantly escalated emergency service utilization (AbuAlRub et al., 2025). The World Health Organization has emphasized that health workforce shortages and maldistribution remain critical barriers to safe and effective care delivery, particularly in acute and emergency settings (Babaii et al., 2025). In many countries, emergency nursing units face chronic overcrowding, high patient turnover, and unpredictable clinical acuity, which collectively intensify workload and psychological strain among nurses. These conditions are closely associated with compromised patient safety, including medication errors, delayed interventions, communication breakdowns, and adverse events (Badaruddin et al., 2025).

At the national level, health systems in middle-income countries continue to struggle with nurse-to-patient ratios that fall short of recommended standards. Rapid urbanization and increased referral flows to tertiary hospitals have exacerbated congestion in emergency units (Bayadsi et al., 2025). In Indonesia, for example, the expansion of universal health coverage has improved access to services but has also amplified patient volumes in hospital emergency departments. Consequently, nurses frequently manage excessive caseloads while performing complex clinical decision-making under time pressure (Baymon et al., 2024). Locally, hospital-based reports and internal audits often indicate incidents related to documentation errors, delayed triage, and workflow interruptions, which are frequently linked to workload intensity and occupational stress (Benjamin, 2025).

The existing literature consistently demonstrates significant associations among workload, nurse stress, and patient safety outcomes (Erdoğan & Ayaz-Alkaya, 2025). Quantitative studies have identified correlations between high nurse-to-patient ratios and increased adverse events, including falls, medication errors, and hospital-acquired infections (Hsu et al., 2025). Burnout, emotional exhaustion, and moral distress have also been widely documented among emergency nurses. However, much of the current evidence relies on cross-sectional survey designs and standardized measurement scales. While these approaches provide statistical associations, they often fail to capture the lived experiences, contextual dynamics, and coping mechanisms of nurses working in emergency units (Jing et al., 2026).

Moreover, inconsistencies remain in how the workload is conceptualized. Some studies measure workload primarily in numerical terms (e.g., patient ratios), whereas others incorporate task complexity, documentation demands, and non-clinical responsibilities (Kang & Jin, 2024). Similarly, stress has been operationalized through psychological scales, with insufficient exploration of organizational culture, leadership dynamics, and interprofessional collaboration. As a result, the relational pathways linking workload, stress, and patient safety remain underexplored from a qualitative and contextual perspective (Kim et al., 2025).

The explicit research gap lies in the limited qualitative inquiry that holistically examines how emergency nurses perceive and interpret the interplay between workload pressures, psychological stress, and patient safety practices within their specific institutional contexts (Labrague, 2024). Few studies provide in-depth narratives that illuminate how nurses negotiate

competing priorities, maintain vigilance under fatigue, or adapt safety strategies during peak demand periods. Without such contextual understanding, policy interventions may oversimplify the problem and fail to address structural determinants embedded in daily practice (Kwak et al., 2025).

This study offers novelty by employing a qualitative design to explore the experiential dimensions of workload and stress in emergency nursing units and their perceived implications for patient safety. By foregrounding nurses' voices, this research contributes nuanced insights into organizational processes, adaptive strategies, and safety culture in high-acuity settings. The study aims to generate context-sensitive evidence that can inform workforce planning, leadership interventions, and patient safety improvement frameworks. Therefore, the objective of this study is to explore and interpret emergency nurses' experiences of workload and occupational stress and to analyze how these experiences influence patient safety practices within emergency nursing units.

RESEARCH METHODOLOGY

Study Design

This study employed an analytic cross-sectional design to examine the association between workload, occupational stress, and patient safety practices among nurses working in emergency nursing units. A cross-sectional approach was selected because it enables simultaneous measurement of exposure variables (workload and stress) and outcome variables (patient safety practices) within a defined population at a specific time point. This design is appropriate for estimating prevalence and identifying statistically significant associations between variables in occupational health and patient safety research.

Setting and Participants

The study was conducted in the Emergency Department of a tertiary-level referral hospital in Indonesia from January to March 2025. The target population consisted of all registered nurses assigned to the emergency nursing unit during the study period. Inclusion Criteria: Registered nurses providing direct patient care in the emergency unit. Minimum length of employment. Willingness to participate and provide informed consent. Exclusion Criteria: Nurses on extended leave during data collection. Administrative nurses without direct clinical responsibilities. Incomplete questionnaire responses.

Sampling Technique and Sample Size

A total sampling approach was used due to the relatively small and accessible population. The final set of eligibility criteria is size eligibility criteria. Sample size adequacy was assessed using the formula for an analytic cross-sectional study comparing proportions with 95% confidence level ($\alpha = 0.05$) and 80% statistical power. Based on an anticipated moderate effect size and estimated prevalence of high workload at 50%, the minimum required sample size was calculated to be 73 respondents. To account for potential non-response, the sample was increased to 80 participants.

Variables and Measurement

Workload: Operationally defined as the perceived level of physical, cognitive, and time-related demands experienced by nurses during their shift. Measured using a validated workload scale consisting of Likert-type items. Scores were categorized into low and high workload based on a stress cut-off. Occupational Stress: Defined as psychological strain arising from work-related demands exceeding coping capacity. Measured using a standardized stress assessment instrument.

Scores were categorized into low, moderate, and high stress levels according to established scoring guidelines. Dependent Variable. Patient Safety Practice: Defined as adherence to safety protocols, including medication administration accuracy, patient identification procedures, infection prevention, and documentation completeness. Measured using a validated patient safety questionnaire and categorized into adequate and inadequate practice.

Validity and Reliability

Content validity was assessed by three experts in emergency nursing and health services research. Construct validity was evaluated using exploratory factor analysis (EFA). Internal consistency reliability was determined using Cronbach's alpha coefficient, with acceptable reliability defined as $\alpha \geq 0.70$. Primary data were collected directly from participants through structured self-administered questionnaires.

Data Collection Procedures

Data collection was conducted after obtaining institutional permission and ethical clearance. Eligible participants were approached during the shift briefings. After explanation of the study objectives, written informed consent was obtained. Questionnaires were distributed and completed anonymously during non-clinical hours to minimize workflow disruption. Data collectors received standardized training to ensure uniform procedures. Completed questionnaires were checked for completeness on the same day. Double data entry was performed to reduce transcription errors. Data cleaning procedures included range and consistency checks.

Data Analysis

Univariate analysis was performed to describe respondent characteristics and variable distributions using means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Bivariate Analysis. The association between workload, occupational stress, and patient safety practice was assessed using Chi-square tests for categorical variables and independent t-tests where appropriate. Crude odds ratios (OR) with 95% confidence intervals (CI) were calculated. Multivariate Analysis. Variables with $p < 0.25$ in the bivariate analysis were included in multivariate logistic regression to identify independent predictors of inadequate patient safety practices. Adjusted odds ratios (AOR) with 95% CI were reported. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test. The level of statistical significance was set at $\alpha = 0.05$.

Ethical Approval

This study received ethical clearance from the Health Research Ethics Committee of the Faculty of Medicine, Institut Kesehatan dan Bisnis Surabaya, East Java, Indonesia. Ethical approval number: 012/KEPK-FK/2025. All participants provided written informed consent before enrollment. Confidentiality was maintained by anonymizing responses and restricting data access to the research team only.

RESULT

A total of 80 emergency nurses participated in this study, yielding a response rate. Data were complete and eligible for analysis after quality control procedures. The results are presented sequentially, beginning with descriptive statistics on respondent characteristics and the distributions of the main study variables (workload, occupational stress, and patient safety practices). This is followed by bivariate analyses examining the associations between independent and dependent variables. Finally, a multivariate logistic regression analysis was conducted to

identify independent predictors of inadequate patient safety practice. Statistical significance was determined at a 95% confidence level ($\alpha = 0.05$).

Table 1. Characteristics of Respondents (n = 80)

Variable	Category	n	%
Age	<30 years	32	40.0
	≥30 years	48	60.0
Sex	Male	28	35.0
	Female	52	65.0
Education Level	Diploma (D3)	34	42.5
	Bachelor (S1/Ners)	46	57.5
Years of Experience	<5 years	30	37.5
	≥5 years	50	62.5
Workload	Low	33	41.3
	High	47	58.7
Occupational Stress	Low–Moderate	35	43.8
	High	45	56.2
Patient Safety Practice	Adequate	49	61.3
	Inadequate	31	38.7

The *majority* of respondents were aged ≥30 years (60.0%), female (65.0%), and held a bachelor-level nursing degree (57.5%). More than half (62.5%) had ≥5 years of clinical experience. 58.7% of nurses reported a high workload, and 56.2% experienced high occupational stress. Inadequate patient safety practice was observed in 38.7% of respondents.

Table 2. Analysis of Factors Associated with Inadequate Patient Safety Practice

Variable	Inadequate n (%)	Adequate n (%)	OR (95% CI)	p-value
High Workload	24 (51.1)	23 (48.9)	3.42 (1.32–8.84)	0.011
High Stress	22 (48.9)	23 (51.1)	2.89 (1.13–7.36)	0.026
<5 Years Experience	15 (50.0)	15 (50.0)	2.14 (0.82–5.56)	0.118
Age ≥30 years	17 (35.4)	31 (64.6)	0.68 (0.26–1.76)	0.427

Analysis demonstrated that nurses with high workload had 3.42 times the odds of inadequate patient safety compared to those with low workload (OR = 3.42; 95% CI: 1.32–8.84; $p = 0.011$). Similarly, high occupational stress was significantly associated with inadequate safety practice (OR = 2.89; 95% CI: 1.13–7.36; $p = 0.026$). Years of experience and age were not statistically significant at $\alpha = 0.05$.

Table 3. Logistic Regression Analysis of Predictors of Inadequate Patient Safety Practice

Variable	Adjusted OR (AOR)	95% CI	p-value
High Workload	3.05	1.14–8.15	0.026
High Stress	2.47	1.01–6.05	0.048
<5 Years Experience	1.89	0.68–5.28	0.221

Model Fit: Hosmer–Lemeshow test $p = 0.72$

Nagelkerke $R^2 = 0.31$

After adjustment for potential confounders, high workload remained an independent predictor of inadequate patient safety practice (AOR = 3.05; 95% CI: 1.14–8.15; $p = 0.026$). Nurses experiencing high occupational stress had 2.47 times greater odds of inadequate safety practice (AOR = 2.47; 95% CI: 1.01–6.05; $p = 0.048$). Years of experience were not statistically significant in the final model. The model demonstrated good fit (Hosmer–Lemeshow $p = 0.72$) and explained 31% of the variance in patient safety practice.

The findings of this study demonstrate a statistically significant association between workload, occupational stress, and patient safety practices among nurses working in emergency units. More than half of the respondents reported high workload and high stress, indicating

substantial occupational demands in the emergency care environment. Bivariate analysis revealed that nurses with high workload had over 3 times the odds of demonstrating inadequate patient safety practices. Similarly, high occupational stress was significantly associated with compromised safety performance. Multivariate logistic regression confirmed that both workload and stress remained independent predictors after controlling for years of experience. The adjusted odds ratios indicate that a high workload increased the likelihood of inadequate safety practices by approximately 3-fold, while high stress nearly doubled the risk. These findings suggest that psychological strain and task intensity operate as critical determinants of safety-related behavior in high-acuity settings. The model explained 31% of the variance in patient safety practice, indicating that while workload and stress are significant contributors, other organizational and contextual factors may also influence safety outcomes. Overall, the results underscore the importance of workload management and stress-mitigation strategies to enhance patient safety performance in emergency nursing units.

DISCUSSION

This study examined the association between workload, occupational stress, and patient safety practices among nurses working in emergency units. The findings demonstrate that high workload and high occupational stress were significantly associated with inadequate patient safety practice. Nurses experiencing high workload had approximately threefold increased odds of suboptimal safety performance, while those reporting high stress had more than double the likelihood of inadequate safety practices. Importantly, both factors remained statistically significant in the multivariate logistic regression model after controlling for years of experience, indicating that workload and stress function as independent predictors (Martins et al., 2025). The final model explained 31% of the variance in patient safety practice, suggesting a meaningful but partial contribution of these occupational determinants (McMahon et al., 2025). These findings highlight the critical role of work intensity and psychological strain in shaping safety-related behaviors in high-acuity environments such as emergency departments. The relatively high prevalence of reported workload and stress underscores the structural pressures inherent in emergency nursing practice (Parizad et al., 2026).

The findings can be interpreted through the Job Demand–Resources (JD–R) Model, which posits that excessive job demands such as time pressure, high patient turnover, and cognitive overload deplete individual resources and increase the risk of strain and performance impairment (Park et al., 2024). In emergency nursing units, workload represents a primary job demand, while stress reflects the psychological response to sustained imbalance between demands and coping resources. When job demands exceed available resources, cognitive fatigue and reduced attentional capacity may compromise adherence to safety protocols (Pawlak et al., 2025). Additionally, the Cognitive Load Theory provides further explanatory insight. Emergency settings require rapid clinical decision-making under uncertainty. High workload increases intrinsic and extraneous cognitive load, thereby limiting working memory capacity (Penciner et al., 2025). Under such conditions, procedural lapses, documentation errors, and communication breakdowns become more probable. The significant association between high stress and inadequate safety practice suggests that psychological strain may mediate the relationship between workload and safety outcomes (Rababa et al., 2026).

From a patient safety systems perspective, the findings also align with Reason's Swiss Cheese Model, which conceptualizes adverse events as the result of layered failures across

systems. High workload and stress may create latent conditions that weaken defensive barriers, increasing vulnerability to active errors at the frontline level (Rahn et al., 2025).

The present findings are consistent with international evidence demonstrating that nurse workload is strongly associated with adverse patient outcomes (Roitenberg, 2025). Studies conducted in North America and Europe have reported that higher nurse-to-patient ratios correlate with increased medication errors, patient falls, and hospital-acquired infections (Smith et al., 2026). Similarly, research in Asian healthcare systems has identified occupational stress as a significant predictor of burnout and decreased safety compliance. In Southeast Asian contexts, emergency departments frequently experience overcrowding and resource constraints, which amplify workload pressures. Regional studies have found that prolonged shifts, insufficient staffing, and administrative burden contribute to psychological distress among nurses (Suriyani et al., 2023). The magnitude of association observed in this study (AOR > 2.0 for both workload and stress) is comparable to effect sizes reported in prior cross-sectional analyses examining safety climate and burnout. However, some international studies have identified years of clinical experience as a protective factor for patient safety performance. In contrast, the present study did not find a statistically significant association between experience and safety practice after adjustment. This divergence may reflect contextual differences in institutional support systems, training quality, or workload distribution across seniority levels (Urban & Winters, 2025).

The convergence of findings with global literature reinforces the robustness of the observed association between occupational strain and patient safety outcomes. Emergency departments share common structural characteristics across countries, including unpredictability, high acuity, and time-sensitive interventions (Wolf, 2025). These universal features likely explain the consistent link between workload and safety performance. The divergence regarding years of experience may be attributable to several contextual factors. First, a high workload may homogenize experience levels, diminishing the protective effect of seniority. Second, experienced nurses may be assigned more complex cases or supervisory roles, thereby increasing their cognitive burden. Third, organizational culture and teamwork dynamics may play a stronger role than individual tenure in determining safety adherence (Zhang et al., 2025). Moreover, the cross-sectional nature of this study limits causal inference. It is plausible that inadequate safety practices contribute to perceived stress, suggesting a bidirectional relationship. Longitudinal research would be necessary to disentangle temporal sequencing.

Strengths and Limitations

This study has several strengths. First, it employs an analytic approach with multivariate modeling, enabling estimation of adjusted effect sizes and control of potential confounders. Second, validated instruments were used to measure workload, stress, and patient safety practice, enhancing measurement reliability. Third, including all eligible nurses in the emergency unit minimized selection bias and increased internal validity. Nevertheless, several limitations must be acknowledged. The cross-sectional design precludes causal inference and limits the ability to assess temporal relationships between exposure and outcome. Self-reported data may introduce information bias, including social desirability bias or recall bias. The study was conducted in a single tertiary hospital, which may limit external validity and generalizability to other institutional settings. Additionally, the regression model explained 31% of the variance in safety practices, indicating that other determinants, such as leadership style, staffing ratios, safety culture, and organizational support, were not captured in this analysis.

Future research should employ longitudinal or mixed-method designs to explore mediating and moderating pathways between workload, stress, and patient safety. Incorporating objective

safety indicators, such as incident reports or medication error rates, would strengthen outcome measurement. Interventional studies evaluating workload redistribution strategies, stress management programs, and leadership interventions are warranted to translate these findings into policy and practice. Overall, the study provides empirical evidence that excessive workload and occupational stress are significant determinants of patient safety performance in emergency nursing units, underscoring the urgent need for organizational-level strategies to optimize workforce conditions and enhance safety outcomes.

CONCLUSION

This study demonstrates that high workload and occupational stress are significant and independent predictors of inadequate patient safety practices among nurses in emergency units. Nurses exposed to elevated task demands and psychological strain were substantially more likely to exhibit suboptimal adherence to safety protocols. These findings confirm that workforce conditions are not merely operational concerns but constitute core determinants of patient safety performance in high-acuity environments.

From a policy perspective, hospital administrators and health system planners must prioritize workload regulation, adequate staffing ratios, and structured stress management interventions. Implementation of evidence-based workforce planning models, shift optimization strategies, and supportive leadership practices may reduce occupational strain and strengthen safety culture. Additionally, integrating routine monitoring of nurse workload and stress indicators into quality assurance systems could serve as an early warning mechanism for potential safety risks. Longitudinal and interventional designs are needed to evaluate causal pathways and test organizational strategies aimed at improving both staff well-being and patient safety outcomes. Strengthening emergency nursing systems is essential to ensuring resilient and high-quality acute care research.

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Conflict of Interest

The author declares no conflict of interest related to this study.

Authors' Contributions

Rasi Rahagia contributed to the conceptualization and design of the study, data collection, data analysis and interpretation, manuscript drafting, and critical revision of the final version. The author approved the final manuscript and agrees to be accountable for all aspects of the work.

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