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Prolonged emergency department length of stay and fall-risk: A hospital-based observational study

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ABSTRACT

Emergency Department Length of Stay (EDLOS) is an important indicator of emergency care efficiency and may be associated with patient safety outcomes, including fall risk. This study aimed to determine the association between EDLOS and fall-risk classification among patients in the Emergency Department (ED) of Hospital X, Tegal, Indonesia. This quantitative analytical observational study used a cross-sectional approach with prospective data collection from 29 April to 3 May 2025. A total of 100 patients were recruited using accidental (convenience) sampling. EDLOS was measured from ED arrival until discharge, inpatient admission, or transfer to another hospital unit and summarized using median and interquartile range (IQR). For bivariate analysis, EDLOS was categorized using the hospital's operational 4-hour threshold. Fall risk was assessed using the Morse Fall Scale (MFS). Of the participants, 67.0% had normal EDLOS (<4 hours), with a median of 2 hours 30 minutes (IQR: 1 hour 58 minutes–3 hours 58 minutes), while 33.0% had prolonged EDLOS (≥4 hours), with a median of 6 hours 03 minutes (IQR: 4 hours 22 minutes–9 hours 15 minutes). Overall, 66.0% had low fall risk, 19.0% high risk, and 15.0% no risk. EDLOS category was significantly associated with fall-risk classification (Pearson's χ^2 = 200.000, df = 2, $p < 0.001$; Cramer's V = 0.787, 95% CI: 0.65–0.86). However, this observational finding does not establish causality or an independent effect of EDLOS. Integrating patient-flow management with systematic fall-risk assessment may support patient safety.

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1. Introduction

Patient safety is a fundamental component of healthcare quality and aims to prevent avoidable harm during healthcare delivery. The World Health Organization recognizes patient safety as a global priority because adverse events continue to occur across healthcare settings, with patient harm arising from interactions among patient-related, healthcare-professional, organizational, and system-level factors (World Health Organization, 2023; Habibah & Dhamanti, 2021; Habibi et al., 2023). Patient falls are among the important adverse events in healthcare and may result from multiple interacting factors, including impaired mobility, balance disorders, cognitive impairment, medication effects, and environmental hazards (Fulbrook et al., 2025). In Indonesia, patient safety incidents remain a concern. The Ministry of Health reported 4,397 incidents in 2021 and 4,918 in 2022, although the low reporting rate indicates that substantial underreporting may remain (Nurislami et al., 2023). Patient falls have also been identified as

an important patient-safety issue in Indonesian hospitals, emphasizing the need for systematic risk identification and prevention (Saprudin et al., 2021).

The Emergency Department (ED) is a particularly challenging environment for patient safety because of rapid patient turnover, clinical uncertainty, frequent interruptions, multidisciplinary decision-making, and fluctuating workload (Muhammad Nur Hidayah et al., 2020; Wessman et al., 2022). These characteristics may be intensified by ED crowding, which is a multifactorial phenomenon involving patient demand, staffing, treatment capacity, patient throughput, and access to inpatient beds (Eidstø et al., 2025). An overview of systematic reviews identified patient, staff, and system-level factors as important contributors to ED crowding and highlighted boarding as a major system-level contributor (Pearce et al., 2023). Crowding may also compromise the continuity of patient monitoring and safety practices. Recent evidence supports the relevance of this relationship: Schacht et al. (2025) found that greater ED patient volume at the time of arrival was associated with documented falls, although boarding was not independently associated with falls after adjustment for patient characteristics. These findings suggest that ED operational conditions may be related to falls, but that the relationship is complex and cannot be attributed to a single operational factor.

Emergency Department Length of Stay (EDLOS), defined as the interval between ED arrival and discharge, inpatient admission, or transfer to another hospital unit, is an important indicator of emergency-care performance and patient flow. EDLOS is influenced by diagnostic investigations, specialist consultations, treatment requirements, clinical decision-making, inpatient bed availability, boarding, and interdepartmental coordination (Harahap, 2022; Nhdi et al., 2021; Purawijaya et al., 2023). Indonesian studies have similarly identified diagnostic processes, consultation time, inpatient bed availability, and delayed patient transfer as important contributors to prolonged EDLOS (Dwisari et al., 2024; Novita et al., 2023; Yulianingsih et al., 2022). However, EDLOS should not be interpreted as an independent cause of adverse outcomes. A large systematic review and meta-analysis involving 1,718,518 ED patients found that the association between EDLOS and in-hospital mortality varied according to EDLOS thresholds and patient populations, with no consistent association across all cut-offs (Lauque et al., 2023). This finding reinforces the importance of considering EDLOS within the broader context of clinical complexity and healthcare-system processes.

A potential relationship between EDLOS and fall risk can be conceptualized through both patient-level and system-level pathways. Patients who remain longer in the ED may have greater clinical complexity, require additional diagnostic or therapeutic interventions, and experience greater functional dependence. Prolonged stays may also coincide with reduced mobility, repeated transfers, fatigue, medication exposure, intravenous lines or monitoring equipment, and increased dependence on nursing assistance. At the system level, prolonged EDLOS may occur alongside crowding and competing demands for healthcare professionals, potentially making continuous safety monitoring more challenging. Nevertheless, the same factors—including advanced age, neurological impairment, disease severity, mobility limitation, cognitive status, and medication exposure—may influence both EDLOS and fall-risk status. Thus, these characteristics may act as potential confounders rather than demonstrating that prolonged EDLOS itself causes increased fall risk. This distinction is particularly important because fall risk among ED patients is multifactorial and may arise from the interaction of patient vulnerability and the care environment (Ghosh et al., 2022; Mutrika & Hutahaean, 2022; Waszczeniuk, Courtney, 2024).

Despite growing evidence concerning EDLOS, ED crowding, and patient safety, an important knowledge gap remains. Previous research has predominantly examined EDLOS in relation to mortality, treatment delays, waiting time, patient satisfaction, and general measures of ED performance (Dunne et al., 2024; Harahap, 2022; Lauque et al., 2023; Purawijaya et al., 2023). Conversely, research concerning falls in emergency settings has increasingly examined actual fall events and patient-level risk factors. For example, Schacht et al. (2025) demonstrated an association between ED volume and actual falls, but their study did not examine EDLOS in relation to standardized fall-risk classification. Similarly, existing fall-risk research has largely focused on individual clinical characteristics and inpatient populations rather than the relationship between ED patient-flow duration and standardized fall-risk assessment.

Therefore, it remains insufficiently understood whether patients experiencing normal versus prolonged EDLOS differ in their fall-risk classification during the same episode of emergency care. This gap is particularly relevant in Indonesia, where differences in hospital capacity, staffing, referral pathways, and inpatient bed availability may shape EDLOS and patient-safety practices differently from those reported in other healthcare systems.

The present study addresses this gap by examining the association between EDLOS category and fall-risk classification based on the Morse Fall Scale (MFS) among patients receiving emergency care at Hospital X, Tegal, Indonesia. Unlike studies that use actual falls as the primary outcome, this study evaluates standardized fall-risk classification during the ED episode, representing an earlier stage of patient-safety surveillance and potentially allowing vulnerable patients to be identified before an adverse event occurs. The study also integrates an operational indicator of emergency-care performance (EDLOS) with a nursing-based patient-safety assessment (MFS), thereby connecting hospital patient-flow processes with individualized fall-risk assessment. This approach provides context-specific evidence from an Indonesian ED and extends existing literature that has largely examined EDLOS, crowding, and falls as separate issues. Preliminary observations at Hospital X further supported the relevance of this question: although the hospital applies a four-hour operational EDLOS threshold, prolonged stays were frequently observed, with the longest stay reaching 15 hours and 20 minutes, while patients exceeding four hours appeared to have a higher proportion of fall-risk classifications. The four-hour threshold was therefore used as a hospital operational criterion rather than as a universal biological threshold for fall risk.

Accordingly, this study aimed to determine the association between Emergency Department Length of Stay and fall-risk classification based on the Morse Fall Scale among patients in the Emergency Department of Hospital X, Tegal, Indonesia. Given the observational cross-sectional design, the study was designed to identify a statistical association rather than establish a causal relationship or demonstrate that prolonged EDLOS independently predicts fall risk. By examining EDLOS and standardized fall-risk classification within the same emergency-care episode, this study seeks to contribute evidence that may inform both emergency nursing practice and hospital patient-flow management, particularly in healthcare settings where prolonged EDLOS and resource constraints remain important patient-safety challenges.

2. Methods

Statistical analyses were performed according to a prespecified analytical sequence comprising EDLOS measurement, descriptive analysis, bivariate analysis, assessment of potential confounding, and interpretation of the observed associations. EDLOS was initially recorded as a continuous variable and calculated as the interval between ED arrival and the time of discharge, inpatient admission, or transfer to another hospital unit. Continuous EDLOS was summarized using the median and interquartile range (IQR) because of its non-normal distribution. For the primary categorical analysis, EDLOS was subsequently dichotomized as normal (<4 hours) or prolonged (≥4 hours), based on the operational EDLOS standard applied by the study hospital. The 4-hour threshold was treated as an operational service-performance criterion and not as a biological threshold for fall risk. Participant characteristics and study variables were summarized descriptively. Categorical variables were reported as frequencies and percentages. Continuous variables were summarized as means and standard deviations (SDs) when normally distributed and as medians and IQRs when non-normally distributed.

The primary bivariate analysis examined the association between EDLOS category and fall-risk category according to the Morse Fall Scale (MFS). Because both variables were categorical, Pearson's chi-square test was used. Expected cell frequencies were examined to assess the validity of the chi-square approximation; when the assumptions were not satisfied, an exact test was considered. Statistical tests were two-sided, with $p < 0.05$ considered statistically significant. The magnitude of the association was quantified using Cramer's V as an effect-size measure for the contingency table. Effect size was interpreted alongside the corresponding p-value rather than relying on statistical significance alone.

Potential confounding was considered a priori based on clinical plausibility and established determinants of fall risk, including age, sex, clinical diagnosis, disease severity, and mobility status. However, multivariable regression modelling was not performed because the present analysis was limited to the available bivariate data. Consequently, the reported association between EDLOS and fall risk was not adjusted for potential confounding factors. This limitation was taken into account when interpreting the findings. Given the observational nature of the study, the analyses were intended to assess statistical association rather than causation. Accordingly, the findings were interpreted as unadjusted associations, and no causal inference was made regarding the relationship between EDLOS and fall risk.

3. Results and Discussion

During the study period from 29 April to 3 May 2025, a total of 100 patients presenting to the Emergency Department of Hospital X, Tegal, were included in the study and completed the observation process, resulting in a 100% response rate. All participants met the eligibility criteria and provided written informed consent prior to data collection. The collected data included patient demographic characteristics, Emergency Department Length of Stay (EDLOS), and fall risk assessment using the Morse Fall Scale (MFS). The baseline characteristics of the participants and the distribution of study variables are presented in the following tables.

Table 1.
Characteristics of respondent (n=100)

Characteristics	Frequency (n)	Precentage (%)
Sex		
Male	40	40,0
Female	60	60,0
Age IQR mean±SD (Years)	42.8 ± 20.2	
Patient Status		
Inpatient	83	83,0
Outpatient	17	17,0
Total	100	100,0

Table 1. illustrated the majority of participants were female (60%), while male participants accounted for 40% of the sample. The mean age of the participants was 42.8 ± 20.2 years. Based on patient disposition, the majority of patients were admitted for inpatient care (83%), whereas 17% of patients were discharged or managed as outpatients.

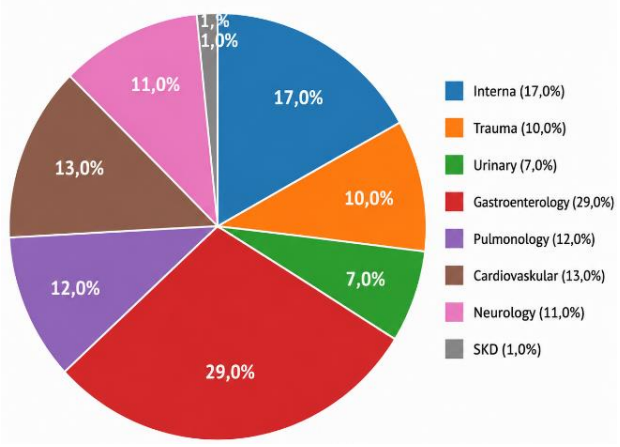


Figure 1. Case Distribution in Emergency Department Hospital X (n=100)

Figure 1 illustrated the distribution of patient cases showed that gastroenterology cases represented the largest proportion (29%), followed by internal medicine cases (17%), cardiovascular cases (13%), pulmonology cases (12%), neurology cases (11%), trauma cases (10%), urinary cases (7%), and SKD cases (1%). These findings indicate that gastrointestinal-related conditions were the most frequent clinical presentation among patients included in the study.

Table 2.
Distribution of Emergency Department Length of Stay (n=100)

LOS Category	n	Median (Q1–Q3)
Normal (<4 h)	67	2 h 30 min (1 h 58 min–3 h 58 min)
Prolonged (≥4 h)	33	6 h 03 min (4 h 22 min–9 h 15 min)
Total	100	

Table 2 presents the distribution of Emergency Department Length of Stay (ED LOS). Of the total patients, 67 (67.0%) had a normal ED LOS (<4 hours), with a median length of stay of 2 hours 30 minutes (IQR: 1 hour 58 minutes–3 hours 58 minutes). The remaining 33 (33.0%) experienced a prolonged ED LOS (≥4 hours), with a median length of stay of 6 hours 03 minutes (IQR: 4 hours 22 minutes–9 hours 15 minutes).

Table 3.
Distribution Fall of Risk in Emergency Department (n=100)

Fall Risk Category	n	Median (Q1–Q3)
No Risk	19	20 (0–20)
Low Risk	66	35 (35–40)
High Risk	15	60 (60–70)
Total	100	

Table 3 presents the distribution of fall risk categories based on the Morse Fall Scale (MFS). Among the 100 patients included in the study, 19 patients (19.0%) were classified as having no fall risk, with a median MFS score of 20 (Q1–Q3: 0–20). The majority of patients were categorized as having low fall risk (66 patients, 66.0%), with a median MFS score of 35 (Q1–Q3: 35–40). Meanwhile, 15 patients (15.0%) were classified as having high fall risk, with a median MFS score of 60 (Q1–Q3: 60–70).

Table 4.
Correlation between Emergency Department Length of Stay (EDLOS) and Fall Risk based on Morse Fall Scale (MFS) (n=100)

Length of Stay	Morse Fall Scale (MFS)				Pearson Chi-Square (χ^2)	df	p-value	Cremer's V
	High Risk (%)	Low Risk (%)	No Risk (%)	Total (%)				
Normal	12	42	13	67				
Prolonged	7	24	2	33	61.9369	2	<0.001	0.787
Total (%)	19,0	66,0	15,0	100,0				

Note: Chi-square test showed a statistically significant association between Emergency Department Length of Stay and fall risk based on the Morse Fall Scale (χ^2 = 61.9369, df = 2, p < 0.001).

Table 4 presents the association between Emergency Department Length of Stay (EDLOS) and fall-risk classification based on the Morse Fall Scale (MFS). Among patients with a normal EDLOS (<4 hours), 12 (17.9%) were classified as having high fall risk, 42 (62.7%) as low fall risk, and 13 (19.4%) as having no fall risk. Among patients with a prolonged EDLOS (≥4 hours), 7 (21.2%) were classified as having high fall risk, 24 (72.7%) as low fall risk, and 2 (6.1%) as having no fall risk. The Pearson's chi-square test indicated a statistically significant association between EDLOS category and MFS-based fall-risk classification (χ^2 = 61.9369, df = 2, p < 0.001). The magnitude of the association was substantial, as

indicated by a Cramer's V of 0.787, suggesting a strong association between EDLOS category and fall-risk classification. Given the observational design and the absence of multivariable adjustment, this finding should be interpreted as an unadjusted association rather than evidence of an independent or causal effect of prolonged EDLOS on fall risk.

Discussion

This study examined the association between Emergency Department Length of Stay (EDLOS) and fall-risk classification among patients presenting to the Emergency Department (ED) of Hospital X, Tegal. The findings showed that 67.0% of patients had a normal EDLOS (<4 hours), whereas 33.0% experienced a prolonged EDLOS (≥4 hours). Most participants were classified as having low fall risk (66.0%), followed by high fall risk (19.0%) and no fall risk (15.0%) based on the Morse Fall Scale (MFS). The bivariate analysis demonstrated a statistically significant association between EDLOS category and fall-risk classification (Pearson's $\chi^2 = 200.000$, df = 2, $p < 0.001$), with a strong effect size (Cramer's V = 0.787, 95% CI: 0.65–0.86). However, because this study used an observational design and did not perform multivariable adjustment, this association should not be interpreted as evidence that prolonged EDLOS causes an increase in fall risk.

The predominance of patients with a normal EDLOS suggests that most patients in this study were managed within the hospital's operational timeframe. Nevertheless, the finding that approximately one-third of patients experienced prolonged EDLOS indicates that delays in ED patient flow remained relevant. EDLOS is a multidimensional indicator influenced by both patient-level and system-level factors. Diagnostic investigations, specialist consultations, treatment requirements, clinical decision-making, inpatient bed availability, boarding, and interdepartmental coordination may all contribute to variation in EDLOS. Previous studies have identified diagnostic examinations and physician consultation time as important determinants of EDLOS (Harahap, 2022; Nhdi et al., 2021; Purawijaya et al., 2023). Therefore, prolonged EDLOS should be understood within the broader context of hospital patient-flow processes rather than being attributed solely to patient clinical complexity.

Inpatient bed availability may be an important system-level contributor to prolonged EDLOS. When an admission decision has been made but an inpatient bed is unavailable, patients may remain in the ED while awaiting transfer. This boarding process may reduce available treatment capacity and contribute to congestion and delays in the movement of other patients. Previous studies have identified limited inpatient bed availability and delayed patient transfer as important contributors to prolonged EDLOS (Dwisari et al., 2024; Novita et al., 2023; Yulianingsih et al., 2022). These findings indicate that strategies to reduce prolonged EDLOS should extend beyond the ED itself and involve hospital-wide patient-flow management. Proactive bed management, timely inpatient transfer, efficient diagnostic pathways, and improved interdepartmental communication may contribute to more efficient patient flow.

The distribution of fall risk in this study is clinically relevant because 15.0% of participants were classified as having high fall risk. Patients presenting to the ED may experience acute changes in physical and functional status related to illness, pain, weakness, dizziness, impaired balance, medication exposure, intravenous therapy, or unfamiliar surroundings. These conditions may affect mobility and patient safety during emergency care. Medication-related effects, including dizziness, drowsiness, weakness, and impaired coordination, may further increase susceptibility to falls (Muliyadi et al., 2021; Muslim, 2025). Consequently, fall-risk assessment should be integrated into routine nursing assessment for ED patients and should not be limited to patients with prolonged EDLOS.

The significant bivariate association between EDLOS and fall-risk classification indicates that EDLOS category and fall-risk status were statistically related in this study population. The relatively large effect size (Cramer's V = 0.787, 95% CI: 0.65–0.86) suggests that the observed association was substantial in magnitude. Nevertheless, statistical association does not establish causality. One possible explanation is that patients requiring longer ED care may have greater clinical complexity, require additional diagnostic or therapeutic interventions, or experience greater functional dependence. These characteristics may be associated with both prolonged EDLOS and higher MFS scores. Thus, the

observed relationship may reflect the combined influence of patient characteristics, clinical condition, and healthcare-process factors rather than an independent effect of EDLOS.

The ED environment may also provide a plausible context for the observed association. Patients who remain in the ED for extended periods may experience repeated transfers, prolonged use of intravenous lines or monitoring equipment, interruptions in rest, changes in healthcare personnel, and increased dependence on assistance for mobility. These circumstances may be particularly relevant among patients with impaired balance, weakness, cognitive impairment, or mobility limitations. However, these mechanisms were not directly measured in the present study and should therefore be considered plausible explanations rather than established causal pathways (Devia Jaramillo et al., 2025; Eidstø et al., 2024, 2025; Farimani et al., 2024).

Importantly, EDLOS should not be regarded as the sole factor associated with fall risk. Individual characteristics such as age, previous history of falls, neurological impairment, mobility limitation, cognitive status, use of assistive devices, medication exposure, diagnosis, and disease severity may substantially influence MFS classification (Burgess et al., 2022; Fulbrook et al., 2025; Schacht et al., 2025). Some of these factors may also influence EDLOS and therefore act as potential confounders. For example, patients with neurological or musculoskeletal conditions may have elevated fall risk regardless of whether their EDLOS is normal or prolonged. Conversely, patients may experience prolonged EDLOS because of bed availability or administrative delays while remaining clinically stable and independently mobile. These considerations support the interpretation that the relationship between EDLOS and fall risk is multifactorial.

The strength of the observed association provides an important contribution to interpretation. Cramer's V of 0.787 (95% CI: 0.65–0.86) indicates a strong association between EDLOS category and MFS-based fall-risk classification. The confidence interval also suggests relatively high precision around the estimated effect size. However, the effect estimate should be interpreted as an unadjusted measure because potential confounding variables were not controlled simultaneously. Therefore, the strong bivariate association should not be interpreted as evidence that EDLOS independently predicts fall risk. Future studies should determine whether this association persists after adjustment for patient characteristics and clinical factors.

Potential confounding is particularly relevant because age, sex, diagnosis, disease severity, mobility status, cognitive status, and medication exposure may influence both EDLOS and fall risk. The present study did not perform multivariable logistic regression or another multivariable modelling approach. Consequently, the observed association represents a bivariate association and may partly reflect differences in the underlying characteristics of patients with normal and prolonged EDLOS. Future research involving larger samples and more comprehensive clinical data should use multivariable regression to estimate adjusted effect measures and 95% confidence intervals and to determine whether EDLOS remains independently associated with high fall risk after accounting for clinically relevant confounders.

The findings have important implications for nursing practice. Nurses play a central role in identifying, documenting, and reassessing fall risk throughout ED care. A prolonged EDLOS should not automatically be interpreted as indicating high fall risk; instead, nursing assessment should consider mobility, cognition, balance, medication effects, previous falls, and changes in clinical condition. Patients identified as having high fall risk may require individualized preventive measures, including assisted ambulation and toileting, appropriate environmental safety measures, communication of fall risk during handovers, and reassessment following clinical deterioration or changes in treatment. These interventions are particularly relevant when patients remain in the ED for extended periods or undergo repeated transitions between treatment and diagnostic areas.

The findings also have implications for ED management and patient safety. Although the present study identified a strong association between EDLOS and fall-risk classification, reducing prolonged EDLOS alone should not be regarded as a sufficient fall-prevention strategy. Instead, patient-flow management should be integrated with systematic fall-risk assessment and preventive nursing interventions. Hospital managers should address operational contributors to prolonged EDLOS,

including inpatient bed availability, boarding, diagnostic delays, and interdepartmental coordination, while maintaining appropriate safety monitoring for patients who remain in the ED. An integrated approach may support both operational efficiency and the continuity of patient-safety practices.

The scientific contribution of this study lies in examining the association between EDLOS and MFS-based fall-risk classification in an Indonesian ED setting. Evidence regarding the relationship between ED patient-flow duration and fall-risk classification remains less developed than evidence from inpatient settings, particularly in the Indonesian context. By prospectively assessing EDLOS and fall risk during the same episode of emergency care, this study provides context-specific evidence regarding the potential relationship between patient flow and patient safety. The findings suggest that EDLOS may be relevant to fall-risk surveillance, while emphasizing that EDLOS should not replace individualized assessment of fall risk.

Several limitations should be acknowledged. First, the study included 100 patients from a single hospital and was conducted over five consecutive days, which may limit the generalizability of the findings to other institutions, time periods, and patient populations. Second, convenience sampling may have introduced selection bias because the participants may not fully represent the broader ED population. Third, potential confounding variables, including age, diagnosis, disease severity, mobility, cognitive status, and medication exposure, were not simultaneously controlled through multivariable analysis. Fourth, the 4-hour EDLOS threshold was based on the hospital's operational standard and should therefore be interpreted as a service-performance threshold rather than a biological threshold for fall risk. Finally, the outcome examined was MFS-based fall-risk classification rather than prospectively confirmed fall events. Therefore, the findings should not be interpreted as demonstrating that prolonged EDLOS causes falls.

Despite these limitations, this study provides useful evidence supporting the integration of ED patient-flow management with patient-safety practices. The strong observed association between EDLOS and MFS-based fall-risk classification suggests that patients across different EDLOS categories require appropriate and continuous fall-risk assessment. However, EDLOS should be interpreted alongside individual clinical and functional characteristics rather than used as a standalone predictor of fall risk. Future multicentre prospective studies with larger samples should incorporate objective fall-event outcomes, comprehensive measurement of potential confounders, and multivariable regression modelling. Such research would help determine whether the observed association persists after adjustment for clinically relevant factors and provide more precise estimates of the independent relationship between EDLOS and fall risk.

4. Conclusion

This study identified a statistically significant and strong association between Emergency Department Length of Stay (EDLOS) and fall-risk classification among patients in the Emergency Department of Hospital X, Tegal. The findings indicate that patients with different EDLOS categories differed significantly in their distribution of fall-risk classification based on the Morse Fall Scale (MFS) (Pearson's $\chi^2 = 200.000$, $df = 2$, $p < 0.001$; Cramer's $V = 0.787$, 95% CI: 0.65–0.86). However, given the observational design and the absence of multivariable adjustment, the observed association should not be interpreted as evidence of a causal relationship or as an independent effect of prolonged EDLOS on fall risk.

These findings highlight the importance of integrating ED patient-flow management with systematic fall-risk assessment and preventive nursing practices. EDLOS may serve as a useful indicator for identifying patients who require continued attention to patient safety, although fall-risk assessment should remain individualized and based on patients' clinical and functional characteristics rather than EDLOS alone. Strategies to improve patient flow, reduce avoidable delays, strengthen interdepartmental coordination, and maintain continuous fall-prevention practices may support safer and more efficient emergency care.

Future multicentre prospective studies with larger sample sizes, objective fall-event outcomes, and comprehensive assessment of potential confounders are recommended. Multivariable regression

analysis should also be considered to determine whether the association between EDLOS and fall risk persists after adjustment for relevant patient and clinical characteristics.

References

Burgess, L., Ray-Barruel, G., & Kynoch, K. (2022). Association between emergency department length of stay and patient outcomes: A systematic review. *Research in Nursing & Health*, *45*(1), 59–93. https://doi.org/10.1002/nur.22201

Devia Jaramillo, G., Esmeral Zuluaga, N., & Velandia Avellaneda, V. A. (2025). Effective strategies for reducing patient length of stay in the emergency department: a systematic review and meta-analysis. *BMC Emergency Medicine*, *25*(1). https://doi.org/10.1186/s12873-024-01163-y

Dunne, T. J., Gaboury, I., & Ashe, M. C. (2024). Falls in hospital increase length of stay regardless of degree of harm. *Journal of Evaluation in Clinical Practice*, *20*(4), 396–400. https://doi.org/10.1111/jep.12144

Dwisari, G. A., Sari, K., Pelayanan, M., Di, K., & Sakit, R. (2024). *Jurnal ARSI : Administrasi Rumah Sakit Indonesia Length Of Stay Di Instalasi Gawat Darurat Sebagai Indikator Mutu Pelayanan Kesehatan Di Rumah Sakit X Tahun 2024*. *10*(3). https://doi.org/10.7454/arsi.v10i3.1186

Eidstø, A., Tuominen, J., Ylä-Mattila, J., Huhtala, H., Palomäki, A., & Koivistoinen, T. (2025). Is a Prolonged Emergency Department Stay a Risk for Patient Safety? *JACEP Open*, *6*(4), 1–8. https://doi.org/10.1016/j.acepjo.2025.100170

Eidstø, A., Ylä-Mattila, J., Tuominen, J., Huhtala, H., Palomäki, A., & Koivistoinen, T. (2024). Emergency department crowding increases 10-day mortality for non-critical patients: a retrospective observational study. *Internal and Emergency Medicine*, *19*(1), 175–181. https://doi.org/10.1007/s11739-023-03392-8

Farimani, R. M., Karim, H., Atashi, A., Tohidinezhad, F., Bahaadini, K., Abu-Hanna, A., & Eslami, S. (2024). Models to predict length of stay in the emergency department: a systematic literature review and appraisal. *BMC Emergency Medicine*, *24*(1), 1–39. https://doi.org/10.1186/s12873-024-00965-4

Fulbrook, P., Miles, S. J., Jordan, F., Hazelwood, S., & Lee, H. Y. (Debbie). (2025). Screening and assessment of falls risk in the emergency department. *Australasian Emergency Care*, *28*(3), 179–185. https://doi.org/10.1016/j.auec.2025.03.003

Ghosh, M., O'Connell, B., Afrifa-Yamoah, E., Kitchen, S., & Coventry, L. (2022). A retrospective cohort study of factors associated with severity of falls in hospital patients. *Scientific Reports*, *12*(1), 1–9. https://doi.org/10.1038/s41598-022-16403-z

Habibah, T., & Dhamanti, I. (2021). Faktor yang Menghambat Pelaporan Insiden Keselamatan Pasien di Rumah Sakit: Literature Review. *Jurnal Kesehatan Andalas*, *9*(4), 449. https://doi.org/10.25077/jka.v9i4.1460

Habibi, M., Juando, J., & Novalinda Ginting, C. (2023). Hubungan Waktu Tunggu Dan Length Of Stay (LOS) Dengan Kepuasan Pasien. *JINTAN: Jurnal Ilmu Keperawatan*, *3*(02), 144–151. https://doi.org/10.51771/jintan.v3i02.505

Harahap. (2022). Analisa Faktor yang Berhubungan dengan Length of Stay Di IGD Rumah Sakit Medan. *Keperawatan Universitass Muhammadiyah Jakarta*, 1–13.

Lauque, D., Khalemsky, A., Boudi, Z., Östlundh, L., Xu, C., Alsabri, M., Onyeji, C., Cellini, J., Intas, G., Soni, K. D., Junhasavasdikul, D., Cabello, J. J. T., Rathlev, N. K., Liu, S. W., Camargo, C. A., Slagman, A., Christ, M., Singer, A. J., Houze-Cerfon, C. H., … Bellou, A. (2023). Length-of-Stay in the Emergency Department and In-Hospital Mortality: A Systematic Review and Meta-Analysis. *Journal of Clinical Medicine*, *12*(1). https://doi.org/10.3390/jcm12010032

Muhammad Nur Hidayah, Yanny Trisyani W, & Aan Nuraeni. (2020). Overcrowding Factors in an Emergency Department: A Literature Review. *Jurnal Teknologi Kesehatan Borneo*, *1*(2), 62–69. https://doi.org/10.30602/jtkb.v1i2.18

Muliyadi, M., Azwaldi, A., & Purbasar, P. (2021). Pemenuhan Kebutuhan Rasa Aman Pada Pasien Risiko Jatuh Melalui Asuhan Keperawatan di Pelayanan Rumah Sakit. *JKM : Jurnal Keperawatan Merdeka*, *1*(2), 293–301. https://doi.org/10.36086/jkm.v1i2.1012

Muslim, F. J. (2025). *Factors Influencing Patients at Risk of Falling in the Emergency Department : A Systematic Literature Review*. *1*(3), 298–309.

Mutrika, R., & Hutahaean, S. (2022). Penerapan Edukasi Pencegahan Risiko Jatuh Terhadap Peningkatan Pengetahuan Dan Persepsi Pasien Dalam Mencegah Jatuh Di Ruang Rawat Inap Rumah Sakit X. *Jurnal Keperawatan Muhammadiyah*, *7*(4), 107–111. https://doi.org/10.30651/jkm.v7i4.14536

Nhdi, N. Al, Asmari, H. Al, & Thobaity, A. Al. (2021). Investigating indicators of waiting time and length of stay in emergency departments. *Open Access Emergency Medicine*, *13*, 311–318. https://doi.org/10.2147/OAEM.S316366

Novita, N., Ika, I. M., & VIA, S. H. (2023). Analisis Faktor-Faktor yang Mempengaruhi Waktu Tunggu Pasien di Instalasi Gawat Darurat (IGD) Rumah Sakit Umum dr. Zainoel Abidin Banda Aceh. *Journal of Medical Science*, *4*(2), 71–81. https://doi.org/10.55572/jms.v4i2.100

Nurislami, S., Pramesona, B. A., Wintoko, R., & Oktarlina, R. Z. (2023). Faktor-faktor yang Memengaruhi Pelaporan Insiden Keselamatan Pasien: Literature Review. *Jurnal Penelitian Perawat Profesional*, *5*(2), 551–558. https://doi.org/10.37287/jppp.v5i2.1436

Pearce, S., Marchand, T., Shannon, T., Ganshorn, H., & Lang, E. (2023). Emergency department crowding: an overview of reviews describing measures causes, and harms. *Internal and Emergency Medicine*, *18*(4), 1137–1158. https://doi.org/10.1007/s11739-023-03239-2

Purawijaya, H., Satar, Y. P., Andarusito, N., Hadimuljono, E., & Ruahedi, R. (2023). Analisis Faktor-Faktor Yang Mempengaruhi Length Of Stay (LOS) di Instalasi Gawat Darurat Rumah Sakit Hermina Ciputat. *Jurnal Manajemen Dan Administrasi Rumah Sakit Indonesia (MARSI)*, *7*(4), 356–368. https://doi.org/10.52643/marsi.v7i4.3565

Saprudin, N., Nengsih, N. A., & Asyiyani, L. N. (2021). Analisis Faktor Yang Berhubungan Dengan Upaya Pencegahan Risiko Jatuh Pada Pasien Di Kabupaten Kuningan. *Jurnal Kampus STIKES YPIB Majalengka*, *9*(2), 180–193. https://doi.org/10.51997/jk.v9i2.138

Schacht, J. A., Mulqueen, S., Mangino, A., Antkowiak, P. S., Burke, R. C., Stenson, B. A., & Chiu, D. T. (2025). Emergency department volume metrics and the association with falls. *JACEP Open*, *6*(2), 100074. https://doi.org/10.1016/j.acepjo.2025.100074

Waszczeniuk, Courtney, W. (2024). *Developing a Multifaceted Fall Prevention Strategy in the Emergency Department*. *4*(1), 1–23.

Wessman, T., Ärnlöv, J., Carlsson, A. C., Ekelund, U., Wändell, P., Melander, O., & Ruge, T. (2022). The association between length of stay in the emergency department and short-term mortality. *Internal and Emergency Medicine*, *17*(1), 233–240. https://doi.org/10.1007/s11739-021-02783-z

Yulianingsih, H., Firman, F., & Meliala, A. (2022). Implementasi Manajemen Lean di Instalasi Gawat Darurat Rumah Sakit Akademik Universitas Gadjah Mada. *The Journal of Hospital Accreditation*, *4*(02), 83–90.