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REVIEW

An Updated Scoping Review of Factors Associated with Length of Stay in Emergency Department

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Background: The Emergency Department (ED) is important to the hospital healthcare system. However, increasing patient visits to the ED have increased the length of stay (LOS), which contributes to overcrowding, resource constraints, and decreased quality of care. Factors affecting LOS are complex and involve patient characteristics, hospital operations, and health system policies.

Purpose: This review aimed to explore the factors influencing ED LOS.

Methods: This study employed a scoping review with the PRISMA-ScR approach, analyzing articles from PubMed, Scopus, Taylor & Francis, and EBSCOhost databases published between 2022 and 2025. The keywords used were Emergency department patients OR ED patients OR Hospital admissions OR Emergency visits AND Length of stay OR hospital stay AND Predictor OR Factor. The quality appraisal of the articles was assessed using the Joanna Briggs Institute critical evaluation tool. Data were analyzed using descriptive qualitative and thematic analysis.

Results: Factors influencing LOS in the ED were categorized into five main categories: (1) Patient characteristics (advanced age, male gender, comorbidities, and specific clinical conditions such as sepsis and blood diseases); (2) Time and environmental factors (nighttime, weekend, and winter visits); (3) Hospital and health system factors (hospital type, bed capacity, insurance status, and triage severity); (4) Diagnostic and treatment processes (waiting times for radiology and laboratory examinations, delays in specialist consultations, and limited inpatient beds); and (5) Patient arrival mode (arriving by ambulance or referred from another hospital).

Conclusion: Longer LOS in the ED is influenced by various multidimensional factors that interact with each other. To reduce patient stays in the ED, efforts to optimize triage, improve diagnostic efficiency, and strengthen coordination between hospital units are needed. Evidence-based strategies such as digitizing medical records and predictive analytics can help improve service efficiency and reduce ED congestion.

Keywords: emergency department, length of stay, overcrowding, predictors, service efficiency

Introduction

The Emergency Department (ED) is vital to the hospital service system.[1,2] Not only does it provide emergency medical intervention and 24-hour accessibility to primary healthcare, but it also serves as the primary regulator in directing patients towards further care.[1] However, the increasing number of patient visits to the ED has posed significant challenges, especially related to length of stay (LOS).[3] LOS in the ED is defined as the duration of time a patient spends from their arrival until their discharge, either for inpatient care or after receiving treatment and being sent home.[4–7] The Joint Commission does not specify a fixed length of stay in an ED.[8] However, they do identify ED boarding (holding admitted patients in the ED while awaiting an inpatient bed) as a patient safety risk and recommend that it should not exceed 4 hours. Previous studies reported that the accepted duration of a patient's stay in the ED, also known as emergency department length of stay (EDLOS), is generally considered to be 6 hours.[9] Prolonged LOS in the ED can

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lead to overcrowding, resource constraints, decreased quality of care, and increased risk of poor clinical outcomes, making it an important indicator in assessing the efficiency and effectiveness of health services.[1,10]

Various complex and multidimensional factors, including patient characteristics (age and gender), clinical aspects, operational factors, and health system policies influence LOS in the ED.[11] In addition, comorbidities and severity of the disease play a role in determining the duration of service required.[2,12–16] Previous studies have reported that overcrowding in the ED is often correlated with longer waiting times for evaluation, medical intervention, and final patient decisions, whether to be discharged or treated further.[17–19]

Identifying factors that influence LOS in the ED has high urgency because it directly impacts the efficiency of the health care system, the quality of patient care, and the sustainability of hospital operations.[12,14,15] Excessive LOS causes overcrowding and increases the risk of delays in handling critical patients, resulting in poor clinical outcomes, health worker workload, and higher service costs.[3,12,14,15,17,20] Therefore, understanding the main determinants of LOS is a fundamental step in designing evidence-based ED service improvement strategies.

Several strategies have been developed to address the problem of prolonged LOS in the ED, including optimizing the triage system, increasing the efficiency of the diagnostic process, and strengthening coordination between the ED and other care units.[21] Also, allocating and managing resources, including medical equipment and staff, is critical to reducing waiting times and improving patient outcomes.[22] The implementation of information technology in patient management, such as electronic medical records (EMR) and data-based predictive systems, is also starting to speed up medical decision-making and reduce unnecessary waiting times.[23]

Despite various efforts, the problem of LOS in the ED remains a global challenge that requires evidence-based solutions.[24] Previous reviews have explored various factors contributing to LOS in the ED,[11] There were 34 studies analyzed in the publication year range of 2000–2020. The previous review examined several studies published in 2019–2020 during the COVID-19 pandemic.[11] Therefore, there is a significant gap in the existing literature, especially regarding the impact of the COVID-19 pandemic on the emergency care system.[25]

The COVID-19 pandemic in 2019–2021 has caused significant disruption to health services, including the ED, with impacts that include a surge in the number of patients, changes in disease patterns, increased case severity, and extreme pressure on hospital capacity and health workers.[26] This condition causes fundamental changes in LOS patterns due to increasing case complexity, resource limitations, and changes in policy in patient management in the ED.[27,28] Therefore, findings from pre-pandemic studies may not fully represent the current reality in emergency services.

Materials and Methods

Design

The design used in this study is a scoping review. Scoping reviews are a flexible methodological approach designed to explore and map rapidly developing topics.[29] This design offers broader conceptual coverage and systematically explains relevant research findings. The framework in the scoping review consists of five main stages: formulating research questions, identifying and selecting relevant literature, determining study feasibility, extracting and mapping data structurally, and synthesizing, summarizing, and presenting results comprehensively.[29]

Eligibility Criteria

The PRISMA Extension for Scoping Reviews (PRISMA-ScR) was used in this literature review to find the predictors of LOS in the emergency room (see Figure 1).[30] Research questions and eligibility criteria for research articles using the PCC approach (Population, Concept, and Context).

P (Population): Patients admitted to the Emergency Room

C (Concept): Length of stay

C (Context): Predictor or determinant

In this review, articles without full-text access, articles not written in English, and articles that were secondary research were excluded from the analysis. Inclusion criteria include accessible full-text articles written in English and

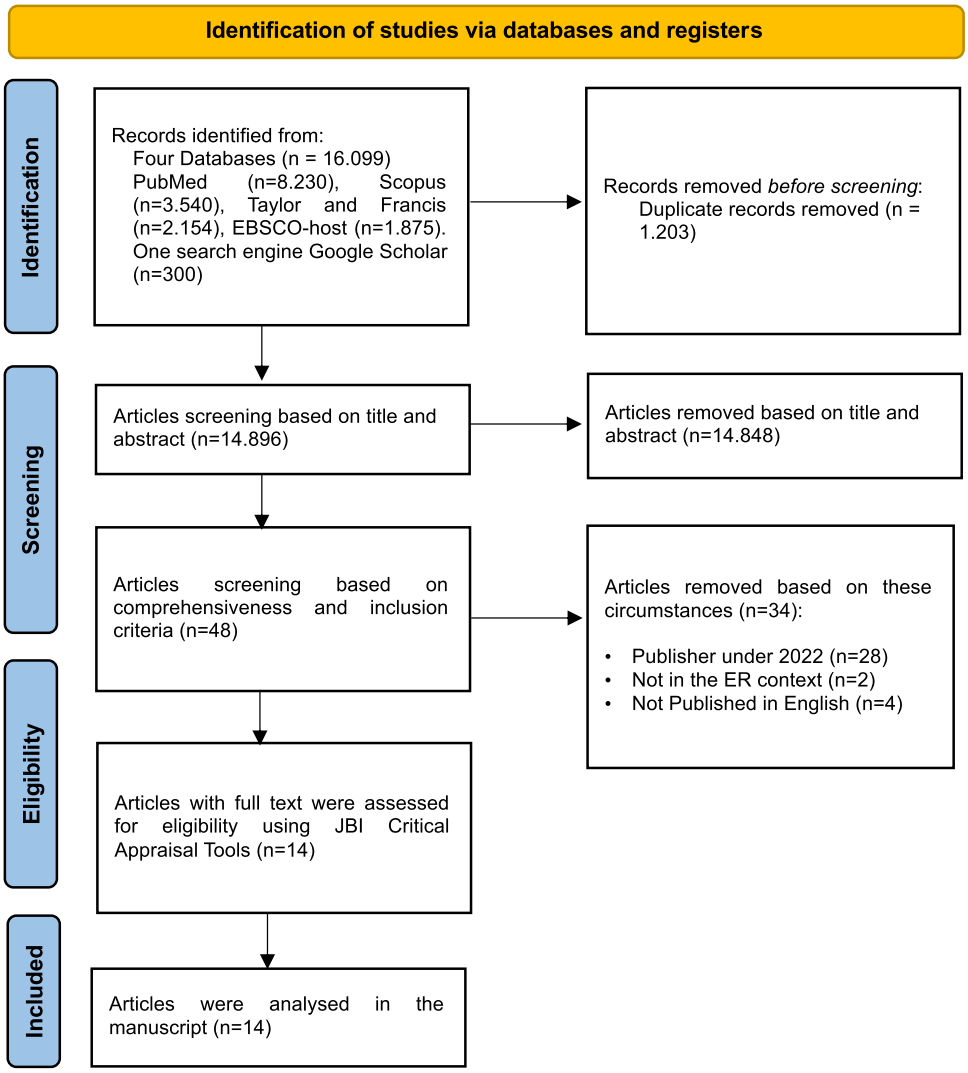

Figure 1 PRISMA Flow Diagram. Adapted from Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71[30].

primary research that discusses predictors of LOS in the ED. In addition, this review was limited to articles published between 2022 and 2025 to ensure that the studies reviewed reflected the current and latest healthcare system conditions.

The phenomenon of interest in this review focuses on predictors of length of stay in the ED. Length of stay is the time a patient spends from admission to discharge from the ER, either through direct discharge, further care in an inpatient unit or referral to another facility.[8,9] Predictors include clinical variables such as older age, male gender, comorbidities (eg, Charlson comorbidity index), specific diagnoses (eg, sepsis, blood diseases, tumors), trauma, and pain duration ≥12 hours, healthcare systems, and hospital policies that may affect the efficiency of ED services.

Data Collection and Analysis

Search Strategy

Systematically, literature searches are carried out through four central databases: EBSCOhost, PubMed, Scopus, Taylor and Francis, and one search engine, Google Scholar. The keywords used were "Emergency department patients OR ED patients OR Hospital admissions OR Emergency visits AND Length of stay OR hospital stay AND Predictor OR Factor". Each keyword is verified using MeSH (Medical Subject Headings), and synonyms are applied to capture all relevant

articles. In addition, the author uses Boolean operators such as "AND" and "OR" to filter or expand search results based on various word variations.

The literature search was conducted independently by two authors (KK and EE), each performing the initial search across the selected databases. The search results were then compared and merged to eliminate duplicates and ensure consistency. Subsequently, the article selection process based on title and abstract screening, followed by full-text review—was also carried out independently by the same two authors (KK and EE). The final author (YT) verified the selected articles, clarified any uncertain findings, and made the final decision regarding which articles would be included in the analysis.

Study Selection and Quality Appraisal

The article selection process follows the PRISMA-ScR series, which starts by checking the article's title, abstract and full text to see its relevance to the research topic according to the inclusion and exclusion criteria. Articles are selected by the authors (KK and EE) and reviewed by the another (YT). After assessing the article as relevant, the author checked each text completely using the Joanna Briggs Institute (JBI) critical assessment checklist.[31] Each question has the following answer options: yes, no, and cannot tell. Each statement has the following answer options: Yes, No, Not Applicable, and Unclear. The answer "Yes" is given a score of 1, and the other answers are given a score of 0. All articles with a total score of at least 70% are classified as having a substantial methodology. If there is any discrepancy in the election results, the author makes the final decision. All authors agree on the feasibility of this study without any differences of opinion.

To enhance the methodological clarity, we have expanded on the process used to resolve disagreements in article selection. While the final decision was made by the author, any conflicts were addressed through discussions within the research team, where differing opinions were carefully considered. This approach helped ensure a transparent and robust article selection process. In cases where discrepancies occurred during the screening and selection process, the authors held online meetings via virtual meeting to discuss and resolve the disagreements. Final decisions on article inclusion were reached through mutual consensus among all involved authors, ensuring objectivity and consistency throughout the selection process.

Data Extraction and Analysis

The first author extracted the data in the form of an extraction table. In this review, data extraction from the studies is analyzed using a table describing all the results related to the topic discussed. The information presented in the extraction table is related to the characteristics of the study: Authors/Year, Design, Country, Mean Age, Sample, Average LOS, Category of LOS, Predictors of LOS, and JBI.

The data analysis process begins with the identification and presentation of data obtained in the form of tables based on the reviewed articles. After obtaining the data, all authors analyze and explain each finding based on the extraction results. Finally, the authors recheck the included studies to ensure and minimize errors during extraction.

Results

Study Selection

Figure 1 shows a PRISMA flowchart depicting the study selection process in a systematic review. The process began with the identification stage, where a total of 16.099 records were obtained from four major databases, namely PubMed, Scopus, Taylor and Francis, and EBSCO-host, and one Google Scholar search engine. Before screening, a total of 1.203 duplicate records were removed. Next, in the screening stage, 14.896 articles were evaluated based on title and abstract, and 14.848 articles that did not meet the criteria were removed.

The next stage was the eligibility assessment, where 48 articles were further screened based on completeness and inclusion criteria. Of these, 34 articles were eliminated for several reasons, namely that they were published before 2022 (28 articles), not in the context of the emergency department (2 articles), and not published in English (4 articles). Finally, the remaining 14 articles were assessed using the JBI Critical Appraisal Tools, and all of these articles were included in the analysis.

Study Characteristics

Table 1 characteristics of the studies analyzed include various studies from various countries with different research designs, including retrospective studies,[32–38] cross-sectional,[16,39–43] cross-sectional perspective,[41] and observational

Table 1 Characteristics of Study

Authors/ Year	Design	Country	Mean Age	Sample	Average LOS	Category of LOS	Predictors of LOS	JBI
Badheeb et al 2024[32]	Retrospective study	Saudi Arabia	52.3 ± 13.5 years	122 adult patients	6.1 ± 1.8 hours	>6 hours (delayed)	• Multiple consultations (OR: 2.82; 95% CI: 1.32–6.26, p=0.013) • Conflict between teams (OR: 2.50; 95% CI: 1.17–5.54, p=0.031) • ED visiting at holiday time (OR: 0.14; 95% CI: 0.04–0.40, p <0.001) • CTAS 4 and 5 (OR: 2.22; 95% CI: 0.95–5.30, p = 0.003) • Late arrival of the specialist (OR: 0.43; 95% CI: 0.20–0.91, p = 0.042)	9/11
Alharbi et al 2023[33]	Retrospective National Database Analysis	Saudi Arabia	Not specified	1,572,296 ED visits	Median 61 minutes	Not categorized	Severity level, shift time, hospital type, and admission status (p<0.001)	8/11
Alnahari et al 2024[40]	Cross-sectional study	Saudi Arabia	> 30 years old (65%)	53.874 patients ED patients in a government hospital	30% stayed ≥4 hours	>4 hours (prolonged)	• Male gender (OR = 1.20; 95% CI: 1.04–1.38) • Age <60 years (OR = 0.58; 95% CI: 0.39–0.84) • Night shift (OR = 0.67; 95% CI: 0.56–0.81) • CTAS Level III (OR = 0.28; 95% CI; 0.88–0.023)	7/8
Zeleke et al 2024[41]	Prospective cross-sectional study	Ethiopia	3 years (median, pediatric)	268 pediatric patients	67.2% >24 hours	>24 hours (prolonged)	• Residency (AOR = 2.04, CI: 1.03, 4.025) • Triage category (AOR = 3.25, CI: 1.08, 5.974), • Waiting for imaging (AOR = 4.230, CI: 1.638, 10.93)	9/11
Negasi et al 2022[16]	Cross-sectional study	Ethiopia	≤1 years	408 pediatric patients	79.7% prolonged >24 hours	>24 hours (prolonged)	• Nighttime arrival (AOR = 3.19, 95% CI: 1.14, 8.98) • Weekend arrival (AOR = 4.25, 95% CI: 1.49, 5.35) • Not receiving ordered medication in the hospital (AOR = 2.05, 95% CI:1.04, 4.03) • Orange triage category (AOR = 4.01, 95% CI: 1.60, 10.05)) • Duration of pain 13–24 h (AOR = 0.29, 95% CI: 0.89,0.98)	7/8
Lee et al 2022[34]	Retrospective cohort study	South Korea	Age ≥ 65 years (58,8%)	657,622 ICU patients from ED	Median 3.3 hours	>6 hours (prolonged)	• Nighttime ED presentation (AOR: 1.49; 95% CI: 1.46–1.51) • Lower triage acuity (KTAS 4) (AOR: 1.48; 95% CI: 1.44–1.53) • Charlson Comorbidity Index (CCI) ≥ 3 (AOR: 1.46; 95% CI: 1.43–1.49) • Hospitals with 800–999 beds (AOR: 0.69; 95% CI: 0.68–0.70) • ED Level 2 (vs Level 1) (AOR: 0.93; 95% CI: 0.91–0.94) • Provincial area hospitals (vs Metropolitan) (AOR: 0.94; 95% CI: 0.93–0.95)	9/11
Uzun et al 2024[36]	Retrospective single-center	Türkiye	Median: 56 (37%)	5568 adult ED patients	Median 4.4 hours	>8 hours (prolonged)	• Older age (p=0.009) • Refugee status (p=0.004) • Non-urgent triage category (p<0.001) • Diagnostic tests and imaging (p<0.01) • Internal ward admission and night shift arrival (p<0.01).	9/11

(*Continued*)

Table 1 (Continued).

Authors/ Year	Design	Country	Mean Age	Sample	Average LOS	Category of LOS	Predictors of LOS	JBI
Belayneh et al 2023[39]	Cross-sectional study	Ethiopia	18–44years (59,6%)	495 adult ED patients	46.5% >24 hours	>24 hours (prolonged)	• Lack of insurance (AOR: 2.11; 95% CI: 1.22, 3.65) • Delayed consultation (AOR: 9.5; 95% CI: 5.00, 18.03) • Non-communicative presentation (AOR: 1.98; 95% CI: 1.07, 3.68) • Overcrowding (AOR: 4.98; 95% CI: 2.13, 11.68) • Shift change experience (AOR: 3.67; 95% CI: 1.30, 10.37)	7/8
Kim et al 2024[35]	Retrospective National Database Analysis	South Korea	Adult (20–64 years) (49.2%)	25,578,263 ED visits	Median 2.1 hours	>6 hours (prolonged)	• Elderly patients (≥ 65 years) (AOR: 1.415; 95% CI: 1.411–1.419) • Transferred from other hospitals (AOR: 1.469; 95% CI: 1.463–1.474) • Arrival by 119 ambulances (AOR: 1.093; 95% CI: 1.077–1.108) • Pediatric patients (protective factor) (AOR: 0.682; 95% CI: 0.678–0.686) • Sepsis (AOR: 1.324; 95% CI: 1.311–1.340) • COVID-19 infection (AOR: 1.413; 95% CI: 1.399–1.427)	9/11
Payne et al 2023[44]	Time-motion observational study	Australia	41.2 years old ± 23.4	381 ED patients	N/I	Not categorized	CT imaging specialist reviews as main delay factors	9/11
Fekadu et al 2022[43]	Cross-sectional study	Ethiopia	38 years (range 18–80)	400 adult ED patients	42.25% >24 hours	>24 hours (prolonged)	• Triage type (AOR = 0.26; 95% CI: 0.13–53) • Laboratory request (AOR: 3.05; 95% CI: 1.49–6.23) • Radiological requests (AOR: 1.80; 95% CI: 1.05–3.07) • Medical diagnosis (AOR: 2.27; 95% CI: 1.21–4.26)	7/8
Ba-Aoum et al 2023[38]	Retrospective observational study	United States	21–65 years (51.95%)	42,462 ED visits	Mean 4.06 hours	Not categorized	Older patients, middle triage, hospitalization, complexity of care, ward transfer, high patient-to-doctor ratio ($p < 0.001$)	9/11
Melkamu et al 2025[42]	Cross-sectional study	Ethiopia	2 years (median)	761 pediatric patients	Median 48 hours	>24 hours (prolonged)	• Rural residence (AOR: 1.65, 95% CI: 1.10–2.48) • Duration of pain ≥ 12 hours (AOR: 1.92, 95% CI: 1.13–3.25) • Waiting time ≥ 5 minutes (AOR: 2.24, 95% CI: 1.1–4.24) • Comorbid illness (AOR: 1.92, 95% CI: 1.13–3.25) • High acuity level, absence of medication in the hospital (AOR = 2.26, 95% CI: 1.02–2.46)	7/8
Alanazi et al 2023[37]	Retrospective cohort study	Saudi Arabia	58.5 years	18,526 critically ill ED patients	Mean 2.5 hours	>4 hours (prolonged)	• Age >60 years (OR: 2.12, 95% CI: 1.53–3.18) • Admission in winter (OR: 1.50, 95% CI: 0.95–1.95) • Respiratory, blood, and tumour diseases (OR: significant) • Nervous system diseases (protective factor, OR: 0.31, 95% CI: 0.24–0.49) • Trauma (protective factor, OR: 0.24, 95% CI: 0.15–0.44)	9/11

Abbreviations: AOR, Adjusted Odds Ratio; CCI, Charlson Comorbidity Index; CTAS, Canadian Triage and Acuity Scale; ED, Emergency Department; ICU, Intensive Care Unit; KTAS, Korean Triage and Acuity Scale; LOS, Length of Stay; OR, Odds Ratio.

studies.[44] The countries involved in this study include Saudi Arabia,[32,33,37,40] Ethiopia,[16,39,41–43] South Korea,[34,35] Turkey,[36] United States of America,[38] and Australia.[44] Sample populations range from pediatric to adult patients, with sample sizes ranging from hundreds to millions of ED visits.

Quality Appraisal Results

The analysis results found that all studies were of good quality (>70%) (see Table 1). The JBI analysis results showed that most of the studies analyzed used cross-sectional and cohort methods (prospective and retrospective). Most studies with this method have weaknesses in identifying confounding factors, and strategies to overcome them often need to be included. In addition, in the cohort studies analyzed, several studies still need to include and explain follow-up care strategies.

Length of Stay in Emergency Department

The length of patient stay in the ED was the main focus of this study, with some studies categorizing the length of stay as more than 4 hours,[37,40] 6 hours,[32,34,35] and 24 hours,[16,39,41–43] as a significant extension of waiting time (see Table 1). Patients' average length of stay in the ED (Average LOS) varies widely across studies. Studies with national databases show shorter median durations, such as in South Korea (Kim et al, 2024; Median 2.1 hours)[35] and Saudi Arabia (Alharbi et al, 2024; Median 61 minutes).[33] However, studies in certain facilities have shown longer durations of stay, such as Badheeb et al[32] in Saudi Arabia with an average of 6.1 ± 1.8 hours or Lee et al[34] in South Korea with a median of 3.3 hours. Furthermore, studies examining pediatric populations have shown more extended hospital stays, such as in Ethiopia (Zeleke et al, 2024; 67.2% of pediatric patients stayed >24 hours and Negasi et al, 2022; 79.7% of patients stayed >24 hours).[16,41] Meanwhile, a study by Uzun et al in Türkiye showed a median LOS of 4.4 hours in the adult population.[36]

Factor Associated with Length of Stay in Emergency Department

Table 2 categorizes the factors influencing the LOS in the ED into five main categories: patient characteristics, time and environmental factors, hospital and healthcare system factors, diagnostic and treatment processes, and patient arrival mode. Patient-related factors include older age, male gender, refugee status, comorbidities (measured using the Charlson

Table 2 Factors Associated with LOS in the Emergency Department

Category	Subcategory	References
Patient Characteristics	Older age	[34–38,40]
	Male gender	[40,45]
	Refugee status	[36]
	Comorbidities (Charlson Comorbidity Index)	[35,42]
	Specific diagnoses (sepsis, blood diseases, tumours)	[35,37]
	Trauma (protective factor)	[37]
	Pain duration ≥12 hours	[16,36,42]
	Residency	[41]
	Living in a rural residence	[42]
	Mental health and pediatric patients	[44]
Time & Environmental Factors	Night shift	[16,34,36,40]
	Weekend arrival	[16,36]
	Winter season	[37]
	Holiday arrival	[32]
	ED overcrowding	[39]
	Shift time, season, severity level	[33]

(*Continued*)

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Table 2 (Continued).

Category	Subcategory	References
Hospital & Healthcare System Factors	Hospital type and level	[33,34]
	Hospital size	[34]
	Hospital location (metropolitan vs provincial)	[34]
	Insurance status	[39]
	High patient-to-doctor ratio	[38]
	Low triage severity level	[34,36,38]
	Delayed consultation	[39]
	Multiple consultations	[32]
	Medical staff shift change	[39]
	The conflict between medical teams	[32]
	Complexity of care	[38]
	Ratios: patients per nurse	[38]
Diagnostic & Treatment Processes	Radiology/laboratory examinations	[36,43]
	Waiting time for imaging	[36,41,44]
	Waiting time for laboratory results	[43]
	Not receiving prescribed medication	[16,42]
	Number of investigations	[32,41]
	Required a CT	[44]
	Specialist review and/or inpatient bed	[44]
	Registrars and nurse practitioners	[44]
	Diagnosed with a medical condition	[43]
	Higher acuity level and absence of medication	[42]
	Adult patients admitted to ICU from ED	[34]
	Orange triage category	[43]
	Non-urgent triage category	[32,36]
	Internal ward admission	[36]
	Waiting time ≥ 5 minutes	[42]
Patient Arrival Mode	Arrival by ambulance	[35]
	Transfer from another hospital	[35]

Abbreviations: CCI, Charlson Comorbidity Index; CT, Computed Tomography; CTAS, Canadian Triage and Acuity Scale; ED, Emergency Department; ICU, Intensive Care Unit; KTAS, Korean Triage and Acuity Scale; LOS, Length of Stay.

Comorbidity Index), and specific diagnoses such as sepsis, blood diseases, and tumours. In contrast, trauma cases tend to have shorter LOS. Other patient-related determinants include pain duration exceeding 12 hours, residency status, living in rural areas, and mental health or pediatric conditions.

Time and environmental factors contributing to prolonged LOS include night shift and weekend arrivals, winter seasons, holiday admissions, and ED overcrowding—variations in shift time, seasonality, and patient severity levels further influence patient flow efficiency. Hospital and healthcare system-related factors encompass hospital type, level, size, location (metropolitan vs provincial settings), insurance status, high patient-to-doctor ratios, and triage severity levels. Additional systemic barriers include delayed consultations, multiple consultations, medical staff shift changes, conflicts between medical teams, and overall complexity of care. The availability of nursing staff (measured by patient-to-nurse ratios) also plays a role in LOS variation.

Diagnostic and treatment processes significantly impact LOS, with prolonged radiology and laboratory examination times, delays in imaging and laboratory results, and unavailability of prescribed medications being major contributors. The number of required investigations, the necessity of CT scans, specialist consultations, and inpatient bed availability further affect patient throughput. Additionally, the involvement of registrars and nurse practitioners, medical diagnosis complexity, triage category (eg, high-acuity "orange" or non-urgent cases), and internal ward admission delays contribute to prolonged ED stays. Lastly, patient arrival mode plays a crucial role, as those arriving via ambulance or being transferred from another hospital often experience longer LOS due to the severity of their conditions and the need for more extensive medical evaluation.

Discussion

Length of stay in the ED is an important indicator of the efficiency of emergency services. It has significant implications for the quality of care and the overall capacity of the health system. This review aims to explore the factors that contribute to patient's length of stay in the ED. Based on the analysis results in this review, several studies define prolonged LOS in the ED as a hospital stay of more than 4 hours,[37,40] 6 hours,[32,34,35] and 24 hours.[16,39,41–43] The differences in these definitions reflect variations in hospital policies and health systems across countries. Prolonged LOS is caused by several factors divided into five categories: patient characteristics, time and environmental factors, hospital and healthcare system factors, diagnostic and treatment processes, and patient arrival mode.

Various characteristics of patients in the ED play a crucial role in determining the length of stay in the ED. Older patients and males tend to stay longer due to increased medical needs, disease complexity, and possible comorbidities.[34,35] Elderly patients admitted to the ED have more complex and multiple symptoms than younger patients, requiring additional diagnostic tests, procedures, and consultative services.[46] High comorbidity, as measured by the Charlson Comorbidity Index, contributes to prolonged length of stay due to the need for further evaluation and more complex medical interventions.[34,42] In addition, several specific conditions such as sepsis, blood diseases, and tumours are also associated with increased duration of stay in the ED, consistent with the need for closer monitoring and more in-depth interventions.[35,37] In contrast, patients with traumatic injuries, nervous system diseases, and psychiatric disorders tend to have shorter lengths of stay, perhaps due to more structured care pathways and higher priority in treatment.[37] Multidisciplinary consultation and care are readily adopted for patients with stroke, acute heart failure, acute coronary syndrome, and trauma.[37] This is in contrast to previous studies, which reported that patients with mental health conditions and children also tended to have longer lengths of stay, which may be linked to the need for a multidisciplinary approach as well as limited specialist facilities for these patient groups.[44]

Time and environmental factors have also been shown to influence patients' length of stay in the ED. Nighttime, weekends, and winter months are often associated with increased waiting times and longer stays.[16,34,36,40] This can be attributed to more limited staff availability, increased caseloads and logistical challenges hospitals face during this period.[47] Holiday arrivals also contributed to increased length of stay, most likely due to limited specialist services and slower referral systems, leading to increased ED congestion and worsening the situation and care process.[32,38]

In addition, health system and hospital-related factors play a significant role in determining the duration of ED stay. The type, level, size, and location of the hospital contribute to patient length of stay variations.[33,34] Metropolitan hospitals with larger capacities may face challenges in patient management due to high visits. In contrast, hospitals in rural areas may experience constraints in the availability of specialist services and diagnostic infrastructure.[34] A patient's insurance status also impacts access and duration of care, with uninsured patients more likely to experience delays in obtaining further services.[39] In addition, factors such as high patient-to-doctor ratios, delays in consultations, changes in

medical staff shifts, and conflicts between medical teams can extend patient waiting times, thus impacting the operational efficiency of the ED.[38,39]

Based on the analysis of diagnostic factors and treatment processes that affect patients' length of stay in the ED, it was found that delays in radiology and laboratory examinations were among the leading causes of increased patient waiting times. Previous studies have reported that waiting times for medical imaging, such as CT scans and laboratory tests, are often obstacles in accelerating the patient's diagnostic process.[36,43] Zeleke et al and Payne et al also highlighted that these delays contribute to increased patient stays in the ED because delayed diagnosis hinders clinical decisions needed to determine further care plans.[41,44] Triage factors also play a role in determining patients' length of stay in the ED. The "orange" triage category, which indicates a higher level of urgency, is associated with a more extended stay.[43] In contrast, patients with the "non-urgent" triage category also experienced extended length of stay.[32,36]

Another problem is the failure to receive the prescribed medication by the patient promptly. Negasi et al and Melkamu et al revealed that delays in administering therapy can cause worsening of the patient's condition, especially for those with high levels of disease severity.[16,42] This becomes more complex when combined with the high number of diagnostic investigations that need to be performed on patients.[32,41] The more tests that need to be done, the longer the patient has to wait for the results to determine the next treatment step. Then, the presence of a specialist doctor and the availability of inpatient beds also contribute to the length of stay of patients in the ED. Payne et al noted that patients requiring further specialist review or intensive care beds are likelier to experience extended ED stays due to limited hospital capacity and long consultation times.[44] In addition, the involvement of registrars and advanced practice nurses also plays an important role in the effectiveness of the care pathway, especially in managing patients who require further evaluation or more intensive medical supervision.[44]

The mode of patient arrival to the ED also contributes to variation in length of stay. Patients arriving by ambulance or referred from other hospitals often have a higher severity of illness, which implies a need for more intensive and prolonged care.[35] Other factors such as triage category,[16,38] number of investigations required,[41] and need for specialist consultation[32] are also variables that directly influence the length of time a patient stays in the ED.

Essentially, LOS the ED before and after the pandemic has always varied, as have the factors contributing to it. However, the pandemic has exacerbated the healthcare situation.[27] The COVID-19 pandemic led to a surge in the number of patients requiring intensive care, with many cases of COVID-19 infection necessitating isolation and specialized treatment.[48] Furthermore, the limited availability of medical personnel, as well as the shortage of facilities and medical equipment, resulted in longer patient care in the ED.[48] On the other hand, the increase in patients with more complex comorbidities, such as hypertension, diabetes, and heart disease, prolonged the length of stay in the ED due to the need for more in-depth evaluation and medical interventions.[48,49]

During the COVID-19 pandemic, there was a significant change in factors influencing LOS of patients in the ED compared to the post-pandemic period especially in terms of patient characteristics. The COVID-19 pandemic caused a surge in the number of patients presenting to the ED with symptoms of COVID-19 infection.[27] Patients with critical conditions and various comorbidities such as diabetes, hypertension, and heart disease require longer intensive care. This situation is further exacerbated by co-infections from COVID-19.[48] This causes the LOS to be longer compared to the previous period.

The COVID-19 pandemic has had a profound impact on the length of stay in the ED, with a significant increase in patient complexity and resource constraints. The surge in critical patients, particularly those with comorbidities and co-infections, has exacerbated the challenges faced by EDs worldwide. As we transition to the post-pandemic period, it is essential to apply the lessons learned during the crisis to optimize ED workflows, improve resource allocation, and enhance patient care. By leveraging a comprehensive, data-driven approach and focusing on improving coordination and efficiency, healthcare systems can better manage future surges and enhance the overall quality of emergency care.

Strengths and Limitations

This review provides a comprehensive and updated analysis of factors influencing the LOS in the ED, particularly in the post-pandemic era. By including studies published between 2022 and 2025, this review captures the most recent trends and challenges EDs face worldwide. Using a scoping review methodology ensures a broad exploration of determinants

affecting LOS, allowing for the identification of various patient, system, and process-related factors. Additionally, including studies from multiple countries enhances the generalizability of the findings and provides insights into how different healthcare systems manage LOS in ED settings.

However, this study has several limitations. First, the variation in study designs, definitions of prolonged LOS, and healthcare settings may introduce heterogeneity in the findings, making direct comparisons challenging. Second, most included studies relied on retrospective or cross-sectional data, limiting the ability to establish causal relationships between factors and LOS. Third, while this review aimed to capture post-pandemic trends, the long-term effects of COVID-19 on ED operations remain underexplored, requiring further investigation. Lastly, studies conducted in low-resource settings were relatively limited, which may affect the applicability of findings to healthcare systems with significant resource constraints. Future research should focus on longitudinal studies that assess the impact of targeted interventions on reducing LOS and improving ED efficiency. Additionally, exploring the role of digital health solutions and predictive analytics in optimizing patient flow may provide valuable strategies for addressing prolonged LOS in various healthcare settings.

Conclusions

Factors influencing the LOS in EDs are categorized into five domains: patient characteristics, time and environmental factors, hospital and healthcare system factors, diagnostic and treatment processes, and patient arrival mode. While the variability in these factors existed before the pandemic, the COVID-19 crisis significantly intensified many of these challenges. The surge in critical cases, particularly those involving comorbidities and co-infections, as well as the strain on healthcare resources, led to prolonged ED stays during the pandemic. These trends have had lasting effects on the efficiency of ED services and the quality of patient care.

As healthcare systems emerge from the pandemic, it is crucial to recognize the shifting dynamics of patient characteristics and system responses. The post-pandemic era requires healthcare providers to adapt to new patterns of care, optimize triage systems, and utilize digital solutions to enhance diagnostic efficiency and patient management. By addressing the lessons learned during the pandemic, such as the need for improved resource allocation and better coordination between hospital units, healthcare systems can better manage future surges and mitigate the risks of prolonged ED stays. Further research focusing on post-pandemic trends and innovative interventions will be essential to refine hospital policies and enhance emergency care management, ensuring that EDs can meet the evolving needs of diverse patient populations in a more efficient and effective manner.

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