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REVIEW

Emergency Department Crowding as Contributing Factor Related to Patient-Initiated Violence Against Nurses—A Literature Review

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ABSTRACT

Aim: To synthesise how ED crowding contributes to patient-initiated violence against emergency nurses.

Design: Framework synthesis.

Data Sources: A systematic literature search was conducted in the PubMed, PsycINFO, CINAHL and Scopus databases, covering articles up to 21 March 2024.

Review Methods: A total of 25 articles were reviewed, evaluating study quality using the Crowe Critical Appraisal Tool and employing a framework synthesis approach to chart and synthesise data.

Results: The review identifies key factors linking emergency department crowding to patient-initiated violence, focusing on crowding conditions, vulnerable populations and adverse outcomes. It emphasises the importance of multidimensional assessments, including input, throughput, output stages and staffing characteristics. Special attention is needed for patients with severe symptoms who are triaged into lower priority categories, as their perceptions of injustice and dissatisfaction may increase the risk of aggressive behaviour. However, limited information is available regarding the perspectives of patients' family members.

Conclusion: Accurate assessments of emergency department crowding and a thorough understanding of cognitive and emotional changes in high-risk patients are essential to develop strategies to manage patient-initiated violence effectively.

Impact: This review improves emergency nurses' understanding of the dynamics of patient-initiated violence in crowded emergency departments, equipping them with knowledge to better anticipate and respond to such incidents. It also offers insights that are crucial for enhancing nursing practices and ensuring workplace safety, thereby supporting the development of future emergency safety strategies.

No Patient or Public Contribution: As this is a systematic review and framework synthesis, there was no direct patient or public involvement.

Summary

- What does this paper contribute to the wider global clinical community?
  - This paper enhances the understanding of patient-initiated violence against nurses due to emergency department crowding.
  - It highlights concerns about the increased risk of violence among vulnerable populations in crowded emergency departments.
  - It suggests that incorporating patients' and visitors' perspectives in future research could further advance knowledge in this area.

1 | Introduction

In recent years, the frequency of patient-initiated violence against emergency medical personnel has surged, posing serious challenges to the delivery of emergency medical services (International Council of Nurses et al. 2022). Emergency nurses, serving as the primary point of contact, are particularly susceptible to violent behaviours from patients and their families, with verbal abuse and threats being the most common forms (Alsharari et al. 2022). Continuous exposure to such a hostile work environment places a considerable psychological burden on these nurses, resulting in high levels of stress, burnout and an increased turnover rate (Kiymaz and Koç 2023). Crowding in emergency departments (EDs) has been identified as a key factor contributing to violence against nurses (Timmins et al. 2023). However, the specific mechanisms through which crowding leads to aggressive behaviours remain inadequately understood. Further research is, therefore, crucial to elucidate these mechanisms, offering a theoretical foundation for enhancing the working conditions of emergency nurses.

2 | Background

Interactions within EDs between nurses and patients or their families often result in patient-initiated workplace violence (WPV), including both physical and nonphysical aggression (Hou, Corbally, and Timmins 2022; National Institute for Occupational Safety and Health 2024). Between 2000 and 2022, such violence against nurses in the U.S. increased by 13%, particularly in EDs (McLaughlin and Khemthong 2024). However, these figures may underestimate the actual prevalence, as WPV incidents are often underreported (Ramacciati et al. 2021). The Institute of Medicine identified ED crowding as a critical issue, defined as the demand for care exceeding available resources (Asplin et al. 2003; Institute of Medicine 2006). This problem has worsened due to rising demand and rapid advancements in emergency medicine (Mahmoodi et al. 2023). Recent California data show a 7.4% rise in ED visits from 2012 to 2022, including a 34.8% increase in critically ill patients and a 75.8% surge in severely ill cases (Hsia et al. 2023). Understanding the factors driving frequent attacks on emergency nurses in crowded EDs remains a critical research focus.

2.1 | Patient-Initiated Violence Against Emergency Nurses

Recent research identifies three primary levels of risk factors influencing patient-initiated violence against emergency nurses: aggressor characteristics, interaction dynamics and systemic crowding (Hou, Corbally, and Timmins 2024).

Aggressor characteristics play a crucial role in understanding the risk of violent behaviour. Factors such as substance abuse, mental health disorders, cognitive impairments and alcohol dependency in patients or their families significantly heighten this risk (Timmins et al. 2023; Thomas et al. 2024). Recognising these risks aids emergency nurses in anticipating and mitigating potential violence (Rehan et al. 2023; Ilarda et al. 2024). Additionally, aggression is influenced not only by health-related factors but also by social, psychological and environmental elements (Spelten et al. 2020).

Understanding the dynamics between emergency nurses and patients or their families is also essential. Unmet needs can lead to dissatisfaction and negative perceptions among nurses (Landau et al. 2018; Pagnucci et al. 2022; Hedqvist et al. 2024). The triage area, where initial interactions occur, has the highest incidence of violence, highlighting nurses' vulnerability in these situations (Alsharari et al. 2022; Janerka, Leslie, and Gill 2024).

Extended waiting times represent a unique risk factor in EDs compared to other clinical settings (Salmon, Coventon, and Read 2021; Hsia et al. 2023). Research suggests that individuals have a psychological threshold for how long they expect to wait. When these expectations are not met, and actual waiting times exceed perceived acceptable limits, a sense of frustration and anger can develop, potentially leading to violent behaviour (Watkins et al. 2011; Efrat-Treister et al. 2019). Extended waiting times, as an indicator of ED crowding, are key predictors of violent incidents, supporting further exploration of the relationship between crowding and violence (Lee et al. 2023; Timmins et al. 2023).

2.2 | Causes of ED Crowding

Crowding in EDs is perceived as primarily associated with excessive patient wait times and extended lengths of stay. However, it is a complex systemic problem with diverse root causes influenced by factors such as ED size, operational model differences and resource availability (Pearce et al. 2023). Based on its conceptual model, the issue can be divided into three links: input, throughput and output (Asplin et al. 2003).

At the 'input' stage, 24/7 EDs often face simultaneous admissions of patients with diverse medical needs, leading to resource strain (Pagnucci et al. 2022). This challenge is further compounded by many community hospitals' inability to adequately provide primary healthcare services, resulting in more patients seeking care in EDs instead (Hsia et al. 2023). For instance, emergency visits in China surged from 51.9 million in 2007 to 166.5 million in 2017 (Pan et al. 2021), reflecting increased reliance on emergency services.

During the 'throughput' stage, the rising number of critically ill patients strains medical staff and requires more resources for urgent care (Ruxin et al. 2023). Moreover, the rapid ageing of the population adds complexity, as elderly patients often present with chronic diseases and multiple comorbidities, which require higher levels of care and longer treatment times (Janerka, Leslie, and Gill 2024; Hedqvist et al. 2024). General EDs, as vital links between community healthcare and hospitals, are particularly impacted by these trends (Hsia et al. 2023). Additionally, healthcare personnel shortages extend response times and negatively impact patient experiences (Stafford et al. 2022; Berlyand et al. 2022).

Finally, at the 'output' stage, external factors exacerbate crowding in EDs. Bed shortages prevent patient transfers to inpatient wards, causing delays in new admissions and sometimes forcing treatment in hallways (Altun et al. 2024). These constraints increase the workload for ED staff, complicating patient flow management and potentially compromising outcomes (Pines, Garson, et al. 2007; Javidan 2021).

2.3 | Impacts of ED Crowding

The impacts of ED crowding on both patient and family experiences, as well as safety, have garnered significant attention. Research indicates that crowded environments increase the risk of serious medical errors, such as misdiagnosis and missed treatments, potentially leading to higher patient mortality rates (Mahmoodi et al. 2023). Consequently, patients face longer wait times and treatment delays, hindering timely care and elevating readmission rates and overall healthcare costs (Cremonesi et al. 2015; Schouten et al. 2023). Prolonged waits exacerbate anxiety for both patients and their families, leading some to leave without receiving necessary medical attention, which further diminishes satisfaction and undermines trust in the healthcare system (Wang et al. 2020; Almass et al. 2023).

In addition to affecting patients and their families, ED crowding increases the physical and emotional burden on nurses, resulting in burnout, anxiety and depression (Medley et al. 2012). This stress heightens the risk of work-related errors, diminishes job satisfaction and increases turnover rates. Alarmingly, crowding is also associated with an increase in WPV, posing a serious threat to the quality and safety of care in emergency settings (Aljohani et al. 2021; Pagnucci et al. 2022). Taking the COVID-19 pandemic as an example, EDs faced unprecedented patient influxes, with up to 60% of institutions reporting increased WPV incidents (Savioli et al. 2021; International Council of Nurses et al. 2022).

These findings strongly suggest a close association between ED crowding and patient-initiated violence; however, merely understanding this correlation is insufficient for effective improvement. A deeper exploration of the complex causal relationships and contextual factors is essential to provide constructive pathways for addressing this challenge.

2.4 | Patient-Initiated Violence and ED Crowding

Drawing from current research, clarifying the complex relationship between ED crowding and patient-initiated violence against nurses is an urgent issue (Javidan 2021; Medley et al. 2012). To effectively address the violence risks linked to ED crowding, this study integrates clinical needs with a conceptual model of violence (Hou, Corbally, and Timmins 2024), examining three dimensions: the context of ED crowding, attacker characteristics and interaction outcomes.

Assessing the impact of ED crowding on violent incidents requires understanding the crowding levels that trigger such behaviour. Peter Drucker's assertion, 'what gets measured gets improved', emphasises the need to quantify crowding levels (Lucas et al. 2009). However, variations in ED size, measurement tools and assessment standards complicate this understanding (Rasouli, Aliakbar Esfahani, and Abbasi Farajzadeh 2019; Li, Zhou, and He 2022).

In the complex dynamics of ED crowding, accurately identifying high-risk patients and potential sources of aggression is essential for violence prevention (Ilarda et al. 2024). However, individual responses to crowding differ; for example, patients undergoing percutaneous coronary intervention for myocardial infarction often experience less stress from crowding (Pines et al. 2006; Wang et al. 2017). Current research lacks a comprehensive summary of characteristics of individuals prone to aggression in crowded settings, hindering emergency nurses' ability to predict and manage violent behaviour effectively (Spelten et al. 2020).

Finally, while it is important to identify direct evidence linking ED crowding to violence, recognising potential factors that contribute to violent tendencies is equally critical (Pearce et al. 2023). Relative deprivation theory suggests that violent incidents may arise from perceptions of unfair resource distribution and associated negative emotions (Smith et al. 2012; Park et al. 2021). However, current research has not systematically examined the cognitive, emotional and behavioural consequences of ED crowding on patients or their families, limiting our understanding of how resource disparities lead to aggression.

3 | The Review

3.1 | Aim

To synthesise how ED crowding contributes to patient-initiated violence against emergency nurses.

3.2 | Design

This review employs a framework synthesis approach to examine the relationship between ED crowding and patient-initiated violence against emergency nurses, focusing on three aspects: conditions that trigger violence, characteristics of vulnerable populations and adverse outcomes during ED visits. Developed by Ritchie and Spencer, this method utilises a preconstructed theoretical framework for systematic integration and analysis of diverse data sources (Ritchie and Spencer 1994). Unlike quantitative methods, it interprets findings through themes or categories, allowing for a deeper understanding of the phenomenon.

Additionally, it accommodates dynamic adjustments to the analytical framework based on new insights, facilitating an iterative process. Key steps include familiarisation, identifying themes, indexing, charting and interpretation (Brunton, Oliver, and Thomas 2020).

3.3 | Search Strategy and Selection Criteria

A comprehensive literature search was performed using PubMed, PsycINFO, CINAHL and Scopus databases, employing both subject headings and keywords, up to the cutoff date of 21 March 2024 (Appendix 1).

This review includes only peer-reviewed journal articles published in English. It excludes duplicate publications, articles without full text and studies focused solely on specific scenarios such as public health emergencies, natural disasters, weapons of mass destruction or large gatherings. Additionally, studies limited to small community hospitals, specialty hospitals or children's hospitals, as well as those that did not specify ED size, were excluded. This research specifically addresses patient-initiated violence related to ED crowding, omitting studies that pertain only to nonemergency visit periods or target staff rather than patients.

3.4 | Screening and Quality Appraisal

All identified studies were imported into EndNote 20, and duplicates were systematically removed. The researchers (R.X. and M.Z.) independently screened the titles and abstracts and reviewed the full texts of potentially eligible articles. The quality of the studies was assessed using the Crowe Critical Appraisal Tool (CCAT), which enhances objectivity by providing structured criteria; studies scoring below 70 were deemed low quality and excluded from the review (Hou, Corbally, and Timmins 2024). In cases where significant disagreements arose during the screening or assessment process, a third reviewer (J.Z.) was involved to resolve discrepancies and reach a consensus. Notably, this systematic review did not require ethical approval due to its reliance on publicly available data.

3.5 | Data Extraction and Framework Synthesis

The data extraction process began with a thorough literature review by researchers RT and MT, who used a standardised template to collect relevant information, including details on study nationality, design, objectives, characteristics of emergency settings, crowding indicators, evaluation criteria, patient demographics and key findings. The second phase involved constructing a predefined thematic framework aligned with the research objectives, which allowed for the synthesis of data across three main themes: crowding conditions that may trigger violence, characteristics of populations most vulnerable to its effects and adverse outcomes associated with patient-initiated violence. In the subsequent steps, the researchers employed Excel for data coding and analysis to develop a comprehensive directory and charts. The final phase, mapping and interpretation, linked the occurrence of patient-initiated violence to the specific crowding conditions experienced in EDs.

4 | Results

4.1 | Study Characteristics and Critical Appraisal of Literature Findings

The literature search identified 4927 articles. After removing duplicates, 2772 articles remained. A subsequent screening of titles and abstracts narrowed the selection to 74 articles for full-text review, ultimately resulting in the inclusion of 25 articles. This selection process is illustrated in the PRISMA flow diagram (Figure 1). In the studies reviewed, while some used the term 'overcrowding', the term 'crowding' is more prevalent in emergency medicine literature (Teng 2012). Thus, this review adopts the term 'crowding'.

The 25 included studies (Table 1) span from 2006 to 2022, primarily consisting of observational research based on electronic data records. This includes 17 retrospective analyses, three cross-sectional studies and a growing number of prospective studies ($n = 5$), with four specifically examining the relationship between ED crowding and cognitive or emotional outcomes. This trend indicates a shift from initial observational studies towards a deeper exploration of the mechanisms underlying the association between ED crowding and adverse patient outcomes. All studies focused on large, comprehensive EDs, with annual patient visits ranging from 22,000 to 118,000 and multiple treatment areas, where bed counts varied from 10 to 109. Six studies examined staffing levels, all of which reported inadequate staffing but with significant variations in the physician-to-nurse ratio, reflecting differences in workforce allocation strategies across various countries and regions.

4.2 | The Conditions of ED Crowding

This review analyses the conditions contributing to ED crowding by evaluating measurement tools, assessment metrics and evaluation standards. Among the 25 studies, 23 explicitly reported their data sources as electronic hospital systems, while the remaining two studies, though not directly stated, inferred electronic data usage based on their measurement tool requirements (Wang et al. 2020; Liyanage-Don et al. 2022). The studies demonstrated variability in selecting assessment metrics tailored to different research purposes, even among the same authors (Pines et al. 2006; Pines, Garson, et al. 2007; Pines, Localio, et al. 2007; Pines, Prabhu, et al. 2010; Pines, Shofer, et al. 2010). Overall, most studies utilised multidimensional assessment metrics or scoring tools to measure ED crowding. Wang et al. (2017) noted that while some scoring tools exhibit consistency and accuracy, there is a stronger correlation between patients' subjective perceptions of crowding and their overall satisfaction with care, highlighting the critical role of patient perceptions in shaping their emergency care experiences.

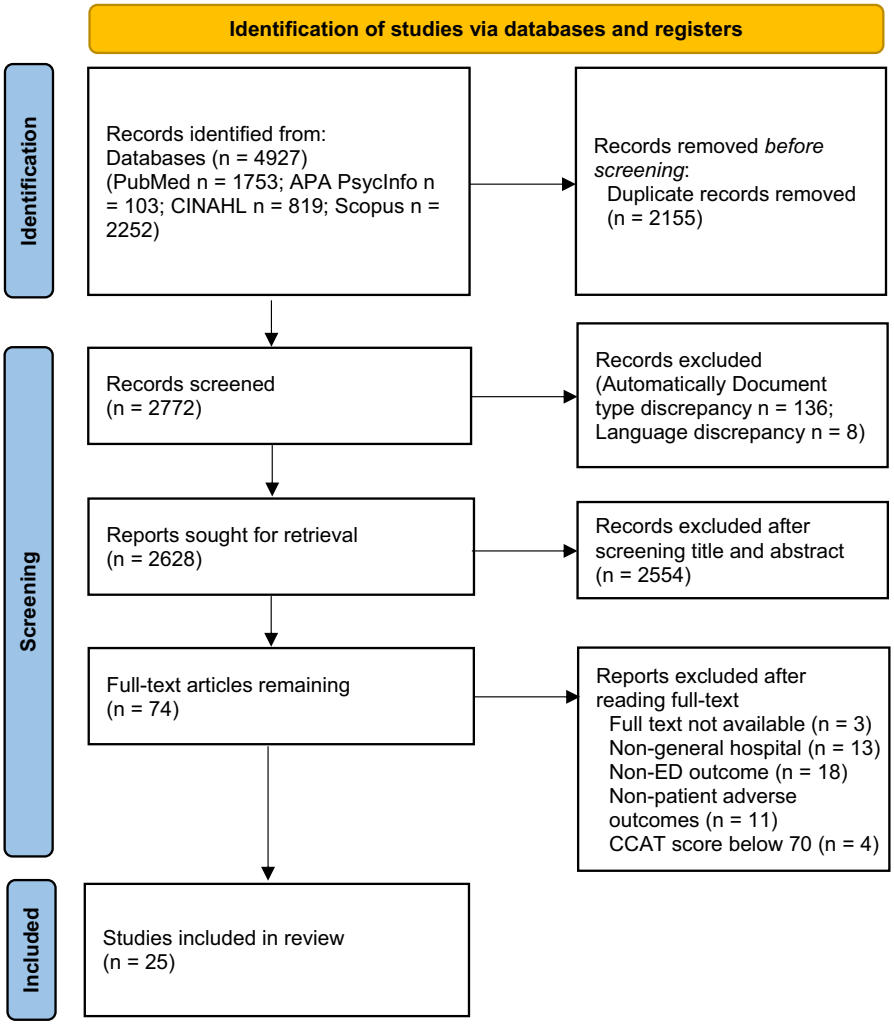

FIGURE 1 | The PRISMA flow diagram.

The assessment metrics and evaluation standards can be categorised into three segments: input, throughput and output (Table 2). In the input segment, common indicators include patient arrivals and the total patient census. Hwang et al. define an ED as crowded when the patient census exceeds 120% or the total volume surpasses 50%, while Hong considers a daily total above 93% indicative of crowding (Hwang et al. 2006, 2008; Hong et al. 2013). In the throughput segment, the primary indicator is the emergency occupancy rate, followed by the length of stay and waiting time. This segment also emphasises nurse staffing ratios, underscoring the importance of adequate nursing resources during crowding. Wu et al. (2015) used the emergency occupancy rate to evaluate different levels of crowding. In the output segment, the number of patients awaiting admission is the most frequently used indicator, with Hwang et al. (2008) suggesting that figures exceeding 50% signify crowding. However, beyond the use of scoring tools with standardised reporting, the number of studies explicitly defining ED crowding standards is limited and varies considerably, reducing their overall reference value. Our review found that outcome differences between low and high crowding conditions are typically analysed using median or interquartile range comparisons.

4.3 | The Characteristics of Vulnerable Populations

This review specifically examines the characteristics of patients or their family members who are most vulnerable to the effects of ED crowding (Table 3). Among the 25 studies, 16 reported on patient disease characteristics, with six focusing on patients whose primary symptoms involve pain, such as elderly hip fractures, abdominal pain and back pain (Hwang et al. 2006, 2008; Pines, Localio, et al. 2007; Pines, Shofer, et al. 2010; Mills et al. 2009; Hoot et al. 2020). These studies demonstrate that such patient groups are variably affected by ED crowding. Seven studies examined the impact of crowding on patients requiring immediate medication for conditions like pneumonia, asthma, stroke and severe sepsis (Pines et al. 2006; Pines, Localio, et al. 2007; Pines, Shofer, et al. 2010; Tsai et al. 2016; Gaieski et al. 2017; Peltan et al. 2019; Huang et al. 2022), while three studies explored its effects on patients needing urgent interventions for coronary syndrome, haemorrhagic shock and resuscitation (Hong et al. 2013; Wu et al. 2015; Liyanage-Don et al. 2022).

Beyond disease characteristics, eight studies analysed patient characteristics related to their ED visit processes. Notably,

TABLE 1 | Literature review summary.

No.	Author(s), year, country	Research design	ED settings and visits per year	Bed setting	Staffing for ED	Study aim	CCAT	References
1	Hwang et al. (2006), The US	A Retrospective Cohort Study	An urban academic medical centre ED/70,000	—	13 physicians and 7 nurses daily	To evaluate the impact of ED crowding on pain assessment and treatment in older adults with hip fractures	87.5	Hwang et al. (2006)
2	Pines et al. (2006), The US	A Multicentre Cross-sectional Study	The University Health Consortium/31,739–81,621	23–59 treatment spaces	Registered nurse Percentage 48.7%–73.0%	To assess the link between ED crowding and antibiotic timing in pneumonia or time to PCI in acute myocardial infarction	80	Pines et al. (2006)
3	Asaro, Lewis, and Boxerman (2007), The US	A Retrospective Cohort Study	An urban academic medical centre ED/78,000	—	—	To quantify how input and output factors affect the ED renege rate	70	Asaro, Lewis, and Boxerman (2007)
4	Pines, Garson, et al. (2007), The US	A Cross-sectional Study	An urban academic medical centre ED/57,000	59 treatment spaces	Patient/nurse ratio 3.6:1–4.7:1	To investigate if patient and provider perceptions of ED crowding compromise care and correlate with objective crowding measures	72.5	Pines, Garson, et al. (2007)
5	Pines, Localio, et al. (2007), The US	A Retrospective Cohort Study	An urban tertiary medical centre ED/ more than 55,000	40 treatment spaces	—	To determine how ED crowding affects delays in antibiotic administration for community-acquired pneumonia patients	70	Pines, Localio, et al. (2007)
6	Hwang et al. (2008), The US	A Retrospective Cohort Study	An urban academic medical centre ED/9149 visits in a span of 2 months	41 treatment spaces	EM physicians 66, Non-EM physicians 34	To evaluate how ED crowding factors relate to pain care quality	70	Hwang et al. (2008)

(Continues)

TABLE 1 | (Continued)

No.	Author(s), year, country	Research design	ED settings and visits per year	Bed setting	Staffing for ED	Study aim	CCAT	References
7	Mills et al. (2009), The US	A Prospective Cohort Study	An urban tertiary medical centre ED/55,000	51 treatment spaces	—	To assess the effect of ED crowding on nontreatment and delays in analgesia for acute abdominal pain patients	70	Mills et al. (2009)
8	Pines, Prabhu, et al. (2010), The US	A Retrospective Cohort Study	Site A is an urban medical centre ED/57,000 Site B is a community-academic site ED/35,000	Site A has 51 treatment spaces Site B has 29 treatment spaces	—	To determine if ED crowding is linked to longer length of stay and medication ordering times for treated patients	75	Pines, Prabhu, et al. (2010)
9	Pines, Shofer, et al. (2010), The US	A Retrospective Cohort Study	Site A is an urban medical centre ED/57,000 Site B is a community-academic site ED/35,000	Site A has 51 treatment spaces Site B has 29 treatment spaces	—	To examine the relationship between ED crowding and analgesia treatment delays in back pain patients	70	Pines, Shofer, et al. (2010)
10	Medley et al. (2012), The US	A Retrospective Cohort Study	An academic tertiary medical centre ED/70,000	44 treatment spaces	—	To determine if ED occupancy rates are linked to violence against staff	77.5	Medley et al. (2012)
11	de Araujo, Khraiche, and Tukan (2013), The US	A Cross-sectional Study	An urban trauma medical centre ED/79,000	—	—	To examine how ED crowding affects wait times and patient outcomes	70	de Araujo, Khraiche, and Tukan (2013)
12	Hong et al. (2013), South Korea	A Retrospective Cohort Study	A suburban academic medical centre ED/85,000	36 treatment spaces	—	To evaluate if ED crowding is linked to delayed resuscitation and increased hospital mortality	80	Hong et al. (2013)
13	Tekwani et al. (2013), The US	A Retrospective Cohort Study	A suburban academic medical centre ED/85,000	—	—	To evaluate how ED crowding affects patient satisfaction for those discharged	70	Tekwani et al. (2013)

(Continues)

TABLE 1 | (Continued)

No.	Author(s), year, country	Research design	ED settings and visits per year	Bed setting	Staffing for ED	Study aim	CCAT	References
14	Cremonesi et al. (2015), Italy	A Retrospective Cohort Study	An urban medical centre ED/54,254	—	—	To investigate how crowding affects waiting times for urgent patients and evaluate additional costs from inappropriate ED usage	90	Cremonesi et al. (2015)
15	Wu et al. (2015), China	A Retrospective Cohort Study	An urban trauma centre ED/80,000	—	Day shift: 6 physicians, and 10–15 nurses Night shift: 2–3 physicians, and 10–15 nurses	To investigate if ED crowding is linked to poor DCR strategy performance in treating haemorrhagic shock	80	Wu et al. (2015)
16	Tsai et al. (2016), Taiwan, China	A Retrospective Cohort Study	An academic tertiary medical centre ED/60,000	—	1–9 physicians, and 4–7 nurses per shift	To investigate how ED crowding and staff numbers affect care efficiency for acute stroke patients	75	Tsai et al. (2016)
17	Gaieski et al. (2017), The US	A Retrospective Cohort Study	An urban, academic trauma centre ED	—	—	To assess how ED crowding affects the timing of IV fluids, antibiotics, care for severe sepsis or septic shock and mortality	70	Gaieski et al. (2017)
18	Wang et al. (2017), The US	A Prospective Cohort Study	An academic medical centre ED/118,000	—	—	To assess the relationship between patient satisfaction and ED crowding, based on patient perception and a crowding estimation tool in a high-volume ED	80	Wang et al. (2017)

(Continues)

TABLE 1 | (Continued)

No.	Author(s), year, country	Research design	ED settings and visits per year	Bed setting	Staffing for ED	Study aim	CCAT	References
19	Peltan et al. (2019), The US	A Retrospective Cohort Study	There are 4 EDs with visits ranging from 22,000 to 89,000	10–57 treatment spaces	—	To investigate the link between ED crowding and door-to-antibiotic time in sepsis	85	Peltan et al. (2019)
20	Efrat-Treister et al. (2019), Israel	A Prospective Cohort Study	An academic medical centre ED/95,000	—	—	To examine if clients' perceptions of operational factors relate to violence against service staff	80	Efrat-Treister et al. (2019)
21	Wang et al. (2020), China	A Prospective Cohort Study	Two tertiary medical centre ED/a total of 332,200	Total of 109 treatment spaces	—	To investigate the correlation between ED crowding and anxiety in patients and nurses	70	Wang et al. (2020)
22	Hoot et al. (2020), The US	A Retrospective Cohort Study	Site A is an urban trauma medical centre ED/60,000 Site B is a county medical centre ED/85,000	Site A has 32 treatment spaces Site B has 45 treatment spaces	—	To determine if crowding affects treatment times and disposition decisions for ED patients	75	Hoot et al. (2020)
23	Huang et al. (2022), Canada	A Retrospective Cohort Study	18 highest-volume EDs/a total of 852,805	—	—	To examine the link between ED crowding metrics and outcomes in adults with asthma	85	Huang et al. (2022)
24	Liyanage-Don et al. (2022), The US	A Prospective Cohort Study	An urban academic medical centre ED	—	—	To examine if ED crowding affects perceptions of interpersonal care in patients with acute coronary syndrome	75	Liyanage-Don et al. (2022)
25	Berlyand et al. (2022), The US	A Retrospective Cohort Study	An academic medical centre ED/110,000	Total of 8 treatment units	—	To study how patient-reported experience is affected by ED crowding	85	Berlyand et al. (2022)

TABLE 2 | Indicators and evaluation criteria for ED crowding.

Themes	Indicators	Count	Evaluation Criteria	Reference
Input	ED Census	4	Census >120%, >50%, >93%	Hwang et al. (2006), Hwang et al. (2008), Hong et al. (2013), Berlyand et al. (2022)
	ED Arrivals	4	—	Asaro, Lewis, and Boxerman (2007), Pines, Localio, et al. (2007), Hong et al. (2013), Peltan et al. (2019)
	Diversion Hours	1	—	Pines et al. (2006)
Throughput	ED Length of Stay	6	—	Hwang et al. (2006), Pines et al. (2006), Asaro, Lewis, and Boxerman (2007), Pines, Localio, et al. (2007), Medley et al. (2012), Huang et al. (2022)
	ED Volume	1	—	Pines et al. (2006)
	Bed Turnover Rates	1	—	Pines et al. (2006)
	Times for Laboratory and Radiograph	1	—	Pines et al. (2006)
	Total Patient Care Hours	6	—	Pines, Garson, et al. (2007), Pines, Localio, et al. (2007), Mills et al. (2009), Pines, Prabhu, et al. (2010), Pines, Shofer, et al. (2010), Gaieski et al. (2017)
	Number of Patients In the ED	5	—	Pines, Garson, et al. (2007), Hong et al. (2013), Cremonesi et al. (2015), Tsai et al. (2016), Efrat-Treister et al. (2019)
	Patients In the Waiting Room	6	—	Pines, Garson, et al. (2007), Pines, Localio, et al. (2007), Mills et al. (2009), Pines, Prabhu, et al. (2010), Pines, Shofer, et al. (2010), Hoot et al. (2021)
	ED Occupancy Rate	8	Crowding occurs at low, medium, and high levels of ED occupancy rates: <90%, 90% to 100%, and >100%, respectively.	Mills et al. (2009), Pines, Prabhu, et al. (2010), Pines, Shofer, et al. (2010), Medley et al. (2012), Tekwani et al. (2013), Wu et al. (2015), Gaieski et al. (2017), Peltan et al. (2019)
	Wait Times	4	—	De Araujo, Khraiche, and Tukan (2013), Cremonesi et al. (2015), Huang et al. (2022), Efrat-Treister et al. (2019)
	Treatment Count	1	—	Hoot et al. (2021)
Output	Intensive Care Unit Admission Rates	1	—	Pines et al. (2006)
	Admit Percentage For the 24-hour Period	2	—	Asaro, Lewis, and Boxerman (2007)

(Continues)

TABLE 2 | (Continued)

Themes	Indicators	Count	Evaluation Criteria	Reference
	Boarded ED Admits	11	>50%	Asaro, Lewis, and Boxerman (2007), Pines, Garson, et al. (2007), Pines, Localio, et al. (2007), Hwang et al. (2008), Mills et al. (2009), Pines, Prabhu, et al. (2010), Pines, Shofer, et al. (2010), Gaieski et al. (2017), Peltan et al. (2019), Hoot et al. (2021), Berlyand et al. (2022)
	Inpatient Bed Utilization	1	—	Asaro, Lewis, and Boxerman (2007)
	Boarding Burden	2	—	Pines, Localio, et al. (2007), Hwang et al. (2008)
	Number of Discharged Patients	1	—	Pines, Localio, et al. (2007)
	Number of Patients Who Left Without Being Seen	2	—	Medley et al. (2012), Gaieski et al. (2017)
	Hospital Diversion Status	1	—	Tekwani et al. (2013)
Staffing	Staffing Levels	6	—	Pines et al. (2006), Asaro, Lewis, and Boxerman (2007), Pines, Garson, et al. (2007), Medley et al. (2012), Tsai et al. (2016), Peltan et al. (2019)
Scoring Tools	EDWIN Score	3	—	Tekwani et al. (2013), Peltan et al. (2019), Liyanage-Don et al. (2022)
	NEDOCS	3	—	Wang et al. (2017), Wang et al. (2020), Hoot et al. (2021)
	SONET	1	—	Wang et al. (2017)
	Patient Perception of Crowding	1	—	Wang et al. (2017)

TABLE 3 | Characteristics of vulnerable populations and adverse outcomes of ED crowding.

Themes	Count	Characteristics	Reference
Characteristics of Patients or Visitors Vulnerable to ED Crowding			
Pain-related	6	The chief complaints are pain, fracture pain, abdominal pain, and back pain.	Hwang et al. (2006), Pines, Garson, et al. (2007), Hwang et al. (2008), Mills et al. (2009), Pines, Prabhu, et al. (2010), Hoot et al. (2021)
Disease-related			
Immediate Drug Treatment	7	Pneumonia, Asthma, Stroke, and Severe sepsis.	Pines et al. (2006), Pines, Garson, et al. (2007), Pines, Shofer, et al. (2010), Tsai et al. (2016), Gaieski et al. (2017), Peltan et al. (2019), Huang et al. (2022)
Immediate Rescue Interventions	3	Acute Coronary Syndrome, Hemorrhagic Shock, and Resuscitation.	Hong et al. (2013), Wu et al. (2015), Liyanage-Don et al. (2022)
Process-related	8	Lower triage levels, presence in corridors and non-emergency department areas, direct discharge from the ED, and absence of insurance or reliance on medical assistance.	Asaro, Lewis, and Boxerman (2007), Pines, Garson, et al. (2007), De Araujo, Khraiche, and Tukan (2013), Tekwani et al. (2013), Cremonesi et al. (2015), Wang et al. (2017), Efrat-Treister et al. (2019), Berlyand et al. (2022)
Individual-related	2	Anxiety, and white race, male gender, and aged between 25 and 34.	Medley et al. (2012), Wang et al. (2020)
Outcomes of ED Crowding			
Perception of Unfairness			
Medical-related	15	Assessment delay, medication delay, test delay, treatment delay, increased hospital stay, and increased waiting time.	Hwang et al. (2006), Pines et al. (2006), Pines, Localio, et al. (2007), Hwang et al. (2008), Mills et al. (2009), Pines, Prabhu, et al. (2010), Pines, Shofer, et al. (2010), Hong et al. (2013), Cremonesi et al. (2015), Wu et al. (2015), Tsai et al. (2016), Gaieski et al. (2017), Peltan et al. (2019), Hoot et al. (2021), Huang et al. (2022)
Cost-related	1	Increase in Cost.	Cremonesi et al. (2015)
Other Departments-related	4	Leaving the ED or being transferred to other departments are on the rise.	Asaro, Lewis, and Boxerman (2007), De Araujo, Khraiche, and Tukan (2013), Hoot et al. (2021), Huang et al. (2022)
Dissatisfaction	6	Impaired nursing perception, poor interpersonal care quality, decreased patient satisfaction, increased state anxiety scores, and negative patient experiences.	Pines, Localio, et al. (2007), Tekwani et al. (2013), Wang et al. (2017), Wang et al. (2020), Liyanage-Don et al. (2022), Berlyand et al. (2022)
Violent Behavior	2	Increase in violent incidents	Medley et al. (2012), Efrat-Treister et al. (2019)

individuals triaged at lower urgency levels were more significantly impacted by crowding. In one survey, Cremonesi et al. (2015) found that triage priority systems effectively provide timely assistance to severe cases during crowding, resulting in increased waiting times primarily for nonurgent patients. Additionally, patients located in hallways (Pines, Garson, et al. 2007) or nonemergency areas (Asaro, Lewis, and Boxerman 2007; Cremonesi et al. 2015; Wang et al. 2017; Berlyand et al. 2022; Efrat-Treister et al. 2019), those discharged directly from the ED (Tekwani et al. 2013) and individuals seeking care due to lack of insurance or reliance on Medicaid (de Araujo, Khraiche, and Tukan 2013) were also found to be adversely affected by crowding. Compared to identifying disease characteristics, understanding patient characteristics related to their visit processes is more practical for optimising ED management and developing strategies to mitigate risks of WPV.

Moreover, two individual characteristics were identified as vulnerable to the effects of crowding. Wang et al. (2020) observed a significant correlation between patient anxiety scores

and crowding, while Medley et al. (2012) found that in high-crowding conditions, aggressive behaviours were predominantly exhibited by white males aged 25–34. Unfortunately, few studies investigated the impact of crowding on visitors, with Efrat-Treister et al. (2019) finding no significant differences between patients and their visitors.

4.4 | The Adverse Outcomes Associated With Violence

The adverse outcomes of ED crowding on patients were synthesised across cognitive, emotional and behavioural dimensions (Table 3). Cognitively, 17 studies reported adverse effects leading to patients perceiving a sense of injustice, primarily reflected in extended waiting times for treatment. During crowding, vulnerable patients face substantial delays in assessment (Hwang et al. 2006, 2008; Mills et al. 2009), treatment (Hong et al. 2013; Wu et al. 2015; Gaieski et al. 2017), examinations (Tekwani et al. 2013) and medication administration (Pines et al. 2006; Pines, Localio, et al. 2007; Pines, Prabhu, et al. 2010; Pines, Shofer, et al. 2010; Hwang et al. 2008; Mills et al. 2009; Gaieski et al. 2017; Peltan et al. 2019), which results in prolonged waiting (Cremonesi et al. 2015) and extended hospitalisation times (Pines, Prabhu, et al. 2010; Wu et al. 2015; Hoot et al. 2020). Additionally, financial comparisons and scenarios where patients leave or are referred due to a lack of timely treatment further impact patient experiences (Asaro, Lewis, and Boxerman 2007; de Araujo, Khraiche, and Tukan 2013; Hoot et al. 2020; Huang, Zhang, and Liu 2020).

Emotionally, six studies highlighted patients' dissatisfaction, including perceptions of diminished nursing quality, poor interpersonal care, decreased satisfaction, increased anxiety and negative experiences (Pines, Garson, et al. 2007; Wang et al. 2017, 2020; Liyanage-Don et al. 2022; Berlyand et al. 2022). Pines et al. noted that patients are more concerned with situations directly affecting them rather than overall ED crowding, with those receiving care in hallways experiencing a more severe impact on their perception of care (Pines, Garson, et al. 2007). This sentiment was more pronounced among nurses than physicians, reflecting the greater emotional burden borne by emergency nurses during crowding. Liyanage-Don et al. (2022) found that patients with suspected acute coronary syndrome had poorer perceptions of care quality when admitted during high crowding. Wang et al. reported a significant increase in anxiety scores among patients facing long waits in crowded EDs (Wang et al. 2020). Three studies specifically reported declines in patient satisfaction related to crowding, with Berlyand et al. showing that crowding led to negative feedback from patients upon discharge (Berlyand et al. 2022; Tekwani et al. 2013; Wang et al. 2017).

Behaviourally, two studies examined the connection between crowding and violent behaviour. Efrat-Treister et al. found that lower expected waiting times and higher perceived burdens could mitigate the impact of crowding on violent behaviour (Efrat-Treister et al. 2019). Medley et al. analysed data from multiple hospital databases and identified crowding as the most common cause of physical violence, with all perpetrators being patients (Medley et al. 2012). However, none of the included studies specifically focused on WPV directed at emergency nurses by patients.

In summary, the analysis of the three predefined themes indicates that evaluating crowding conditions that may lead to violent incidents necessitates consideration of factors such as input, throughput and output. Populations particularly vulnerable to the effects of crowding include individuals with severe symptoms, critically ill patients and those with lower acuity. In crowded environments, cognitive and emotional responses can manifest as perceptions of injustice, dissatisfaction and potential violence. These insights establish a comprehensive framework for understanding the relationship between crowding and violence, as illustrated in Figure 2.

5 | Discussion

This study highlights the need for a comprehensive assessment of crowding in EDs to address violence triggered by crowding. Paying particular attention to vulnerable populations—especially their perceptions of injustice and feelings of

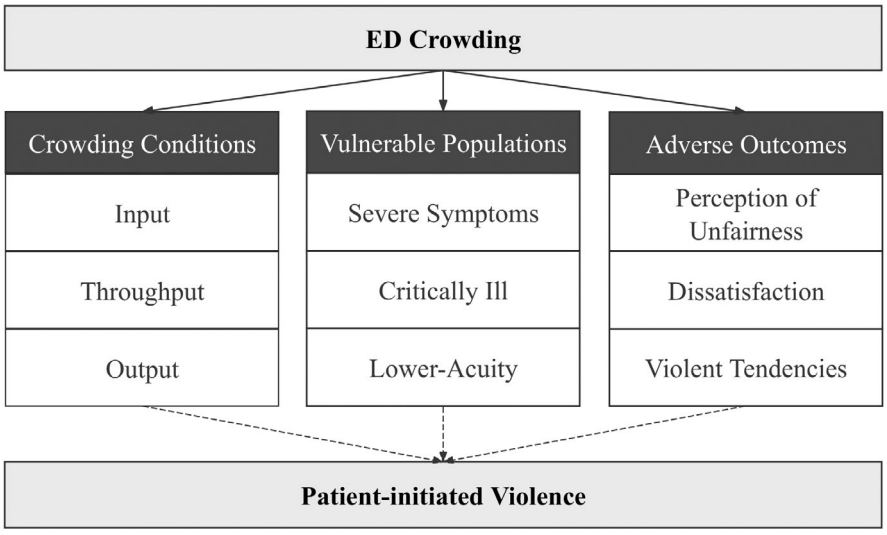

FIGURE 2 | The framework of ED crowding leads to patient-initiated violence.

dissatisfaction—can enhance responses and prevention strategies against patient-initiated violence. A deeper understanding of the relationships among these factors can lead to a more nuanced grasp of the issue's complexity and provide a solid foundation for targeted intervention measures.

5.1 | Identification of the Conditions of ED Crowding

This review reveals that assessing the impact of ED crowding on violent incidents requires a multidimensional approach. Effective evaluation should include indicators that comprehensively address the input, throughput and output stages, while also considering the staffing characteristics unique to each hospital. The adverse outcomes of ED crowding are not attributable to a single factor but result from the complex interplay of multiple elements (Teng 2012). Previous studies have highlighted that while data collection for a single indicator might be convenient, it can introduce biases by only capturing specific aspects of the problem (Javidan 2021). For instance, although the length of stay is widely regarded as a clinically important metric, its effectiveness relies heavily on precise time measurement methods (Vermeulen et al. 2016).

This study also finds that variations in nursing staff allocation considerably influence the assessment of violence related to ED crowding. Griffiths (2021) suggests that measuring patient demand per shift and optimising nurse scheduling can enhance efficiency and reduce costs. Despite the broad adoption of electronic systems in EDs, clear metrics for assessing crowding-related violence remain lacking. Accurate data collection and evaluation of ED crowding continue to pose major challenges (Rasouli, Aliakbar Esfahani, and Abbasi Farajzadeh 2019). The American College of Emergency Physicians (ACEP) is actively working to develop reliable clinical emergency data, which could support automated data collection and real-time evaluation, helping to clarify the triggers of violence related to ED crowding (Javidan 2021; Lin et al. 2024).

5.2 | Identification of the Characteristics of Vulnerable Populations

This review identifies that within the context of ED crowding, particular attention should be paid to patients presenting with severe symptoms and those triaged at lower urgency levels. These patients not only place considerable demands on emergency care resources but also have heightened expectations for prompt service (Hoot et al. 2020). Research by Shoqirat et al. (2019) suggests that effective pain management is closely linked to a reduction in violent behaviour exhibited by patients or their families, which can be influenced by the crowded environment of the ED.

Furthermore, crowding negatively affects patients who have high expectations for the quality of urgent care. Although no direct evidence currently links these patients to violent incidents, reports suggest that families of critically ill patients have sometimes resorted to damaging medical facilities or obstructing medical procedures due to delays in emergency treatment (Thomas et al. 2019; He, Holroyd, and Koziol-McLain 2023). While providing timely care is a fundamental responsibility of emergency staff, crowding should not be used as a justification for service failures. Javidan et al. (2021) argue that this factor should be systematically incorporated into the assessment frameworks for EDs.

The review also shows that patients in lower acuity often endure longer waiting times, which becomes a notable source of dissatisfaction. Research by Weerasinghe and Krämer confirms that patients with low acuity levels typically face longer waits (Krämer and Schreyögg 2019; Weerasinghe and Campbell 2023). Liao et al. (2022) report that patients spend only 19.7% of their total waiting time with a physician, with the remainder spent waiting, leading to increased anxiety and frustration. Fuseini et al. (2022) also notes that prolonged waiting times can diminish patients' sense of dignity, while Milcent (2018) suggests that reducing the influx of low-acuity patients could help mitigate the occurrence of violent incidents.

It is also noteworthy that this study finds a considerable proportion of violent behaviours involve white patients; however, given the complexities of race, culture and social contexts, this observation warrants further investigation (Agarwal et al. 2024).

5.3 | The Adverse Outcomes Associated With Violence

While this review did not find direct evidence of violence specifically targeted at emergency nurses, it does reveal that ED crowding generally triggers violent tendencies among patients. These tendencies often stem from perceptions of unfair treatment and resultant feelings of dissatisfaction. We observed that vulnerable patients frequently experience negative outcomes related to time delays during crowded emergency care. According to relative deprivation theory, these adverse outcomes amplify patients' perceptions of inequity, both personally and in comparison to others (Park et al. 2021).

Additionally, the review found that patients generally perceive a decline in the quality of care and reduced interpersonal compassion in crowded EDs, which aligns with the findings of Fogh Kasum et al. (2024), who noted that patients often feel neglected, lack decision-making power and do not receive adequate attention. This perceived injustice markedly exacerbates feelings of dissatisfaction. Research by Landau et al. (2018) confirmed that patients exhibit higher levels of dissatisfaction when they perceive negative treatment.

Moreover, when patients have high expectations regarding waiting times but fail to recognise the high workload in the ED, they may resort to violent behaviour. Research by Amit-Aharon emphasises the importance of patient perceptions during care; when patients perceive order, clarity and control in the care process, their understanding improves, which reduces the likelihood of violence (Amit-Aharon, Warshawski, and Itzhaki 2023). Zhang et al. also support this view through relative deprivation theory, suggesting that when individuals feel relatively deprived, they often relax moral constraints, engage in extreme behaviours and seek justifications for their actions (Zhang et al. 2024).

This review observed that ED crowding primarily leads to physical violence, contradicting prior research suggesting that non-physical violence is more common against emergency nurses (Hou, Corbally, and Timmins 2024). This discrepancy may stem from the reliance on internal hospital records, which inadequately reflect nurses' experiences. Thus, promoting high-quality reporting methods, such as those developed by Ramacciati et al. (2021), is crucial for encouraging nurses to report violence in overcrowded settings. Moreover, a deeper challenge lies in changing the cultural perception of violence as an inevitable aspect of emergency care. This requires sustained efforts from individuals and collectives, fostering ideological change through multidimensional collaboration involving education, leadership support and policy implementation, ultimately leading to a safer and more humanistic nursing environment.

In conclusion, this study demonstrates that ED crowding during emergency visits contributes to perceptions of injustice, dissatisfaction and increased violent tendencies among patients, particularly those presenting with severe symptoms or lower triage categories. The findings highlight the importance of accurately assessing ED crowding, identifying vulnerable populations and implementing targeted interventions to mitigate factors that may lead to violence. These insights provide valuable evidence for improving the management of emergency environments and ensuring the safety of healthcare personnel while offering a critical framework for further understanding the mechanisms through which ED crowding can incite patient-initiated violence against emergency nurses.

6 | Limitation

This review acknowledges several important limitations. The emphasis on specific research objectives and the intention to include only high-quality articles may have introduced potential bias in the inclusion and exclusion criteria, thereby limiting the comprehensiveness of the findings. Consequently, this study did not adequately capture the characteristics and perspectives of patients' families, nor did it provide direct evidence regarding violence directed at emergency nurses. This limitation highlights the importance of future research expanding the scope of samples and data sources to facilitate a more in-depth exploration and understanding of the multifaceted nature of this complex issue.

7 | Conclusion

This review provides a systematic analysis of the importance of accurately assessing ED crowding and identifying cognitive and emotional responses in vulnerable populations. It highlights the need for future research to adopt a more comprehensive approach, particularly from the perspective of patients' families, to fully understand the dynamics of patient-initiated violence in crowded emergency settings. The findings from this review enhance the structured understanding of emergency nurses regarding patient-initiated violence in overcrowded situations and strengthen their capacity to respond effectively. These insights are crucial for improving nursing practices and ensuring a safer work environment, establishing a foundation for developing more robust strategies to enhance emergency nursing safety in the future.

Author Contributions

R.X., Y.H., M.Z., J.Z., F.T.: Made substantial contributions to conception and design, or acquisition of data or analysis and interpretation of data; R.X., Y.H., F.T.: Involved in drafting the manuscript or revising it critically for important intellectual content; R.X., Y.H., M.Z., J.Z., F.T.: Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; R.X., Y.H., M.Z., J.Z., F.T.: Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Peer Review

The peer review history for this article is available at https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/jan.16708.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Appendix 1

Search Strategy

Search	Syntax (PubMed)	Included
1	"emergency service, hospital"[MeSH Terms]	101,987
2	"emergency department"[Title/Abstract] OR "emergency ward"[Title/Abstract] OR ("Accident"[Title/Abstract] AND "Emergency"[Title/Abstract]) OR "ED"[Title/Abstract] OR "acute care setting"[Title/Abstract] OR "emergency room"[Title/Abstract] OR "emergency unit"[Title/Abstract] OR "emergency medical service"[Title/Abstract]	200,737
3	1 or 2	239,568
4	"crowding"[MeSH Terms]	3970
5	"overcrowding"[Title/Abstract] OR "congestion"[Title/Abstract] OR "retention time"[Title/Abstract]	45,431
6	4 or 5	48,746
7	"result*"[Title/Abstract] OR "outcome*"[Title/Abstract] OR "consequence*"[Title/Abstract] OR "harm"[Title/Abstract] OR "negative impact"[Title/Abstract] OR "disturbing effect*"[Title/Abstract]	13,874,020
8	3 and 6 and 7	1753

Search	Syntax (APA PsycInfo)	Included
1	MA “Emergency Service, Hospital”	3912
2	AB Emergency Department OR AB Emergency Ward OR AB (Accident and Emergency) OR AB ed. OR AB Acute Care Setting OR AB Emergency Room OR AB Emergency Unit OR AB Emergency Medical Service	41,802
3	1 or 2	42,324
4	MA "Crowding"	473
5	AB “overcrowding” OR AB "congestion" OR AB "retention time"	1933
6	4 or 5	2373
7	AB "result*" OR AB "outcome*" OR AB "consequence*" OR AB "harm" OR AB "negative impact" OR AB "disturbing effect*"	2,407,302
8	3 and 6 and 7	103

Search	Syntax (CINAHL Plus)	Included
1	AB “Emergency Service, Hospital” OR AB "Emergency Department" OR AB "Emergency Ward" OR AB ("Accident and Emergency") OR AB "ed" OR AB "Acute Care Setting" OR AB "Emergency Room" OR AB "Emergency Unit" OR AB "Emergency Medical Service"	73,290
2	MH "Crowding"	2268
3	AB “overcrowding” OR AB “congestion” OR AB "retention time"	4675
4	2 or 3	6621
5	AB "result*" OR AB "outcome*" OR AB "consequence*" OR AB "harm" OR AB "negative impact" OR AB "disturbing effect*"	2,233,449
6	1 and 4 and 5	819

Search	Syntax (Scopus)	Included
1	(ABS ("emergency service, hospital") OR ABS ("emergency department") OR ABS ("emergency ward") OR ABS ("accident and emergency") OR ABS ("ed") OR ABS ("acute care setting") OR ABS ("emergency room") OR ABS ("emergency unit") OR ABS ("emergency medical service"))	265,968
2	(ABS ("crowding") OR ABS ("overcrowding") OR ABS ("congestion") OR ABS ("retention time"))	207,644
3	(ABS ("result*") OR ABS ("outcome*") OR ABS ("consequence*") OR ABS ("harm") OR ABS ("negative impact") OR ABS ("disturbing effect*"))	32,823,907
4	1 and 2 and 3	2252
Total		4927