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Perceived Causes and Impact of Emergency Department Overcrowding on Nursing Performance and Patient Safety at Al-Iman General Hospital

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ABSTRACT:

Background: Emergency Department (ED) overcrowding represents another issue that pervades hospitals across the world, and it affects the performance of nurses. The overcrowding of EDs increases the workload, and the stress involved heightens the possibility of missing nursing care.

Aim: This study aimed to identify the main causes of overcrowding and assess the impact of overcrowding on nursing performance (workload and missed care) and patient safety outcomes at Al-Iman General Hospital.

Design: A descriptive cross-sectional study design was utilized.

Setting: The current study was conducted at Al-Iman General Hospital, southern Riyadh, Saudi Arabia.

Sample: All the registered nurses (N = 103) who work in clinical roles in the Emergency Department at Al-Iman General Hospital. **Tool:** A systematic self-administered questionnaire which is divided into 4 parts.

Results: The majority of participants experienced elevated levels of mental (35.9%), physical (39.8%), and temporal (39.8%) demands due to overcrowding, along with considerable levels of effort (54.4%) and moderate levels of frustration (22.3%). MISSCARE was also evident in terms of specific tasks, such as documentation (35.9%) and patient education/discharge explanation (27.2%). In terms of patient safety, 46.6% agreed that overcrowding led to patients leaving without being seen, 38.8% noticed a decrease in the quality of care provided, and 41.7% noticed an increase in the number of medical errors.

Conclusion: Significant overcrowding in the ED of Al-Iman General Hospital increases the nursing workload and missed care, which negatively impacts patient safety. It is

recommended that specific interventions aimed at staffing and workflow management should be implemented to reduce the impact of overcrowding on patient care and safety.

INTRODUCTION

Emergency department overcrowding occurs when demand for emergency care exceeds available capacity and resources. Recent evidence indicates that ED crowding is associated with prolonged length of stay, boarding, delays in care and other adverse consequences for patients and healthcare systems (Oskvarek et al., 2026). During periods of sustained crowding and boarding, emergency nurses may experience increased workload and occupational strain, which can affect the timely delivery of care and patient-safety processes.

Recent systematic evidence has associated prolonged ED boarding with treatment delays, medication errors, adverse patient outcomes and increased workload and burnout among clinical staff (Dowling et al., 2026). At Al-Iman General Hospital, higher patient admissions have reportedly resulted in bed occupancy exceeding 100%, contributing to prolonged waiting times, delays in care and insufficient monitoring. These conditions may place pressure on adherence to standard care protocols and potentially affect patient outcomes.

A systematic review by Alshammari et al. (2023) found that ED overcrowding was associated with delays in treatment initiation, particularly the administration of antibiotics for patients with sepsis and pneumonia. Similarly, Pearce et al. (2023), in an overview of systematic reviews, reported that ED crowding is associated with multiple harms affecting patients and healthcare staff, although the strength of evidence varies across outcomes and crowding measures. Medication safety is also an important concern in emergency care; a recent systematic review and meta-analysis reported a substantial prevalence of medication errors in EDs, highlighting the potential for patient-safety risks in this high-pressure environment (Nguyen et al., 2024).

While the risks of overcrowding have been understood across the globe for several years, there have been few local studies looking at how specifically overcrowding has been affecting nurse productivity and patient safety within the Saudi context. Bridging this knowledge gap, the study here utilizes cross-sectional comparative design to quantify nurse-perceived workload, error rates and patient safety metrics among overcrowded and control shifts at Al-Iman General Hospital. Findings will inform evidence-based focused interventions to rationalize the staffing of resources, rationalize processes in the ED, and boost patient-centered care under high-volume conditions.

LITERATURE REVIEW

Emergency department (ED) overcrowding is a persistent and multifactorial healthcare challenge that occurs when the demand for emergency services exceeds the available capacity, including beds, staff, space, diagnostic resources, and inpatient capacity. Recent literature indicates that crowding is not simply an ED problem but reflects difficulties across the entire healthcare system. A recent systematic review of 226 studies identified three major groups of factors contributing to crowding: input factors, such as high patient volumes and limited access to primary care; throughput factors, including staffing shortages and delays in laboratory and diagnostic services; and output factors, particularly delays in transferring admitted patients to inpatient units (Oskvarek et al., 2026). These factors can result in prolonged waiting times, increased length of stay, boarding, treatment delays, patients leaving without being seen, and reduced satisfaction (Alharbi et al., 2023).

Structural determinants are particularly important because they influence the ability of emergency departments to accommodate fluctuations in patient demand. Inadequate inpatient bed capacity, high hospital occupancy, insufficient staffing and delays in diagnostic and admission processes can create bottlenecks that subsequently increase ED congestion. Janke et al., (2022) demonstrated that increasing hospital occupancy was associated with substantially longer boarding times, highlighting the strong relationship between inpatient capacity and ED flow. In Saudi Arabia, Alharbi et al., (2023) examined nationwide ED data and identified substantial variation in emergency department length of stay, emphasizing the need for continuous monitoring and improvement of ED performance. More recent Saudi evidence also demonstrated that lack of inpatient beds, high patient volumes during peak periods, crowded waiting areas and staffing shortages are important challenges affecting ED quality indicators (Guerrero et al., 2024).

Overcrowding also has direct implications for emergency nurses because increased patient volume and acuity require nurses to manage competing clinical priorities while maintaining timely assessment, treatment, monitoring, documentation, and

communication. A multicenter study involving 311 nurses from five tertiary hospitals in Saudi Arabia found that lack of inpatient beds and unnecessary ED visits were among the leading perceived causes of overcrowding, while stress and burnout were prominent perceived consequences for nurses (Webster & McGarry, 2025). International evidence similarly indicates that overcrowding affects nurses through increased workload, inadequate staffing and skill mix, difficulty maintaining standards of care, and increased psychological stress. Research examining emergency nursing workload further demonstrates that the complexity of clinical tasks and interruptions can substantially increase nurses' perceived workload, emphasizing the importance of appropriate staffing and workload management in maintaining safe emergency care (Guerrero et al., 2024).

Patient safety is another major concern associated with ED overcrowding and prolonged boarding. When patients remain in crowded emergency environments for extended periods, delays in assessment, monitoring, treatment, medication administration, and transfer may occur. Recent evidence indicates that prolonged ED boarding is associated with adverse outcomes, including treatment delays, medication errors, morbidity, mortality, and prolonged hospital length of stay. However, the magnitude of these effects varies according to patient characteristics and the specific definitions and measures of crowding or boarding used (Dowling et al., 2026).

Donabedian's Structure Process Outcome (SPO) model provides an appropriate framework for examining the relationship between ED overcrowding, nursing performance, and patient safety. In this model, structure represents the organizational and physical conditions in which care is provided, including staffing, bed capacity, equipment, space, and available resources. Process refers to the actual delivery of care, including triage, assessment, communication, treatment, monitoring, and patient transfer. Outcomes represent the consequences of care, such as patient safety events, quality of care, patient satisfaction, and staff outcomes. Recent nursing research has demonstrated the usefulness of this framework for examining the relationship between organizational resources, nursing processes, and patient safety (Zhou et al., 2025).

Recent literature supports a multilevel approach to reducing ED overcrowding rather than relying on a single intervention. Strategies include team-based triage, fast-track pathways, nurse-initiated assessment or diagnostic procedures, point-of-care testing, patient streaming, improved bed management, and hospital-wide coordination of patient flow. A 2024 systematic review and meta-analysis found that interventions such as point-of-care testing and the use of a triage liaison physician could improve ED throughput and reduce time to disposition and patients leaving without being seen (Youssef et al., 2024). An overview of systematic reviews similarly concluded that interventions addressing input, throughput, and output are required to manage the complex causes of crowding, although the certainty of evidence varies among interventions (Oskvarek et al., 2026).

Despite the growing international literature, important gaps remain in understanding how ED overcrowding specifically affects nursing performance and patient safety within Saudi tertiary hospitals. Existing Saudi studies have described ED length of stay, perceived causes of crowding, nurses' experiences, and organizational barriers; however, relatively limited research has simultaneously examined structural conditions, nursing care processes, and patient safety outcomes within a single integrated framework. Guerrero et al., (2024) highlighted nurses' perceptions of stress, burnout, and workflow problems associated with overcrowding, while Alharbi et al., (2023) provided nationwide evidence regarding ED length of stay. Therefore, applying Donabedian's SPO framework in a Saudi tertiary hospital can help connect structural determinants of overcrowding with nursing performance and patient safety outcomes, providing a more comprehensive understanding of the problem and supporting the development of context-specific strategies for improving emergency care quality.

SIGNIFICANCE OF THE STUDY

This research has significant relevance for healthcare policy and delivery. Centering on Al-Iman General Hospital's Emergency Department, it seeks to address a significant evidence gap in the Saudi Arabian context by producing localized evidence on the effects of overcrowding on nursing efficiency as well as patient safety. The results will offer hospital administrators as well as policy makers helpful evidence on factors like beds in use, as well as optimizing workflow such that more strategic allocation can be made when demand is greatest. Identifying structural as well as procedural factors most significantly related to negative outcomes such as medication error, delays in treatments, as well as patient falls, the investigation hopes to offer more strength towards the creation of specific quality improving interventions as well as patient flow improvements. Additionally, the evidence will help inform specific improvements in triage approaches, task allocation, as well as the physical layout of the emergency departments' facilities such that more robust as well as effective emergency services can emerge.

Overcrowding in emergency departments has been such a common occurrence that it is recognized globally as a significant issue. It negatively impacts how well nurses can perform their duties and impacts on the already hospitalized patients (Sartini et al., 2022). The issue of overcrowding occurs when more individuals require emergency care than the capacity of the department to provide it. It results in a delay in patient admission, delay in receiving treatment, and a decline in the overall level of care. In such conditions, high patient demand and inadequate staffing can increase nurses' workload and contribute to stress, fatigue, and burnout. Recent evidence indicates that ED overcrowding is associated with increased stress and burnout among nurses, while inadequate nurse staffing is linked to delays in treatment and poorer quality of care (Guerrero et al., 2024; Drennan et al., 2024). These pressures may make timely assessment, documentation, monitoring, and adherence to safety practices more difficult, potentially affecting patient safety.

STUDY AIM

The study aims to identify the main causes of overcrowding and assess the impact of overcrowding on nursing performance (workload and missed care) and patient safety outcomes at Al-Iman General Hospital.

STUDY QUESTIONS

Main question

- Main Question: How does emergency department overcrowding affect nursing performance and patient safety at Al-Iman General Hospital?
- Sub-questions
 1. What do nurses perceive as the main causes of overcrowding in the emergency department?
 2. How does overcrowding influence nursing performance (workload and miss care)?
 3. What is the relationship between overcrowding and patient safety?

RESEARCH METHODS

STUDY DESIGN

The study utilized a descriptive cross-sectional study design in determining the effects of overcrowding in the emergency department (ED) on nursing performance as patient safety outcomes in Al-Iman General Hospital. The utilization of such a design is suitable since it enables the acquisition of data at a specific moment in time, thus offering a solid snapshot of nurses' experience, perception, as well as documented outcomes when ED overcrowding prevails. The descriptive cross-sectional method was chosen due to its practicability in the chaotic and hectic setting of the ED. It allowed researchers to obtain trustworthy data under real clinical procedures without causing any interventions or interruptions in patient care. The research design also reduced ethical hazards and ensured practicability while deriving baseline evidence on the effects of overcrowding on frontline nursing practice and patient safety (Pyo et al., 2023).

STUDY SETTING

The research was carried out at Al-Iman General Hospital, a 200-bed secondary-care Ministry of Health hospital in southern Riyadh, Saudi Arabia. Situated close to the main highway, its emergency department is a witnesses for acute volumes of traffic and trauma presentations, with consistently over 90 % bed occupancy. These conditions are an appropriate high-acuity high-demand setting for research in the influence of structural constraints on staff performance and patient safety.

STUDY SAMPLE AND SAMPLING METHOD

The sample in this research is all the registered nurses (N = 103) who work in clinical roles in the Emergency Department at Al-Iman General Hospital. Those professional nurses execute pivotal work in units like triage, resuscitation, acute units, observation units, and discharge units, and are directly involved in the following activities such as patient evaluation, administration of medication, observation, documentation, and care coordination.

INCLUSION CRITERIA

Eligible nurses are the staff nurses who have completed initial orientation and competency verification in the Emergency Department and who on a routine basis perform direct patient-care responsibilities both in more hectic and normal shift

situations. To include requires the nurses currently to have core nursing function activity, for instance, triage assessment, clinical intervention, safety checks, and active assignment to high-demand or normal-demand shifts quantitatively measured for the department. Professional certification requirements along with immediate procedure training are also a requirement to ensure data is the activity of wholly qualified clinical staff.

EXCLUSION CRITERIA

Nurses who are performing administrative or purely non-clinical duties only were excluded because their work does not involve direct bedside care or direct patient contact. Employees who are still undergoing their orientation or preparatory period and have not passed department-specific competency testing to date are also going to be excluded to prevent the inclusion of participants who are not exposed to the standard ED routines. Any nurse who is on temporary reassignment outside of the Emergency Department or long-term leave or attending rotations that take them out of routine clinical duties for the period of the study, is also going to be excluded to maintain exposure to the ED environment on a consistent basis.

DATA COLLECTION TOOL

The research adopted a systematic self-administered questionnaire to investigate perceived overcrowding influences of the emergency department (ED) on nursing efficiency and patient safety across Al-Iman General Hospital. The instrument included four principal sections encompassing a total of 55 items, all of which were adapted from reputable peer-reviewed sources and specifically adapted to be suitable for both the Saudi Arabian healthcare context and a timeframe of a completed questionnaire of 15-20 minutes.

The first part, under the label of demographic and professional characteristics, involved nine items covering variables like age, gender, marital status, educational level, total years of nursing practice, years of experience in the emergency department (ED), job title, average number shifts per week, and type of shift most frequently worked. It aimed at outlining the sample's characteristics and evaluating possible associations between demographic aspects and overcrowding perception.

The second part, the perceived causes of overcrowding, comprised about 26 checklist items adapted from Sartini et al., (2022), who summarized determinants of crowding according to Asplin's Input Throughput Output model. They were systematically arranged into three categories: (a) Input factors, relating to patient number and acuity, self-referrals, access constraints to primary care, and non-essential visits; (b) Throughput factors, covering staff shortages, waiting for diagnostic results, bed availability, and junior staff involvement; and (c) Output factors, comprising patient boarding, exit block, and suboptimal discharge planning. Cronbach's α will be used to test the reliability of the questionnaires.

The third part, impact of overcrowding on nursing performance, comprised two sub-components and thirteen items. The first sub-component, based on Hart & Staveland's (1988) NASA Task Load Index (NASA-TLX), six items accounted for workload by asking about mental, physical, and temporal demand, performance, effort, and frustration on a 7-point Likert scale of 1 (very low) to 7 (very high). The intraclass correlation coefficients (ICC) values of the NASA-TLX ranged between 0.71 and 0.81, demonstrating good to excellent reliability. Higher numbers indicated heavier perceived workload and increased cognitive or physical stress. Cut-off points for this section were established through the NASA-TLX guidelines by Hart & Staveland (1988). Items were scored on a scale of 7, with higher scores being indicative of higher workload intensity except for the item for performance, which is reverse interpreted. Scores of 1-2.9 indicate a low, 3-4.9 indicate a moderate, and 5-7 indicate a high workload or demand. The cut-off values were utilized for all subscales, such as mental, physical, temporal demand, effort, and frustration, to classify perceived overcrowding's impact on nurses' performance. The second sub-component based on seven items adapted from Kalisch & Williams's (2009) MISSCARE Survey, measured missed or delayed nursing care by asking whether specified care activities (e.g., monitoring of vital signs, administration of medication, documentation, or patient education) were done, missed, or delayed during their overcrowded shift. The options for this part include (yes, no and not applicable). the content validity index was 0.87 and test-retest validity ($r=0.88$, $p<0.001$). This part accounted for how far overcrowding impacts nurses completing their task and overall quality of care.

The fourth part, Impact of Overcrowding on Patient Safety, comprised seven items adapted by Guerrero et al., (2024). This section gauged nurses' perceptions of how ED overcrowding impacts patient safety outcomes. Respondents rated each item on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The items gauged major indicators of patients' poor safety, such as patients being sent away without being attended, delay in diagnosing or treating patients, increased mortality,

compromised quality of care, longer hospitalization, medical errors, and ambulance diversion. Higher mean ratings on this section showed a larger perceived adverse effect of overcrowding on patients' poor safety.

DATA COLLECTION PROCEDURE

The data were collected by a systematically designed, self-administered questionnaire that helped to evaluate the perceived factors that lead to overcrowding as well as its influence on nursing performance and patient safety outcomes. Prior approval was obtained by distributing the questionnaire after approval for ethical clearance by the hospital's Institutional Review Board (IRB).

Researchers visited all eligible registered nurses rostering on for shifts in the Emergency Department across shifts assigned. At the beginning of shifts, participants received an information sheet detailing the subject focus of the research, confidentiality guarantees, as well as how to complete the questionnaire. Participation in the research was voluntary, and informed consent was required prior to distributing the questionnaire.

The questionnaire was administered in private by nurses towards the close of their shift so as to capture their up-to-date perception as well as experience regarding overcrowding. The research assistants were available for explanations when administering the questionnaire but will not interrupt response so as not to create any bias. Once they complete it, the questionnaires were collected in sealed envelopes for confidentiality.

To maintain data integrity, researchers checked the completeness of every returned questionnaire in front of the participant. A unique identification code was assigned to every questionnaire to maintain anonymity without losing accuracy in tracking responses. Finalized questionnaires were kept safe in a locked file cabinet and then transferred to a password-secured safe protected database that can only be accessed by the research team.

RESEARCH TOOL VALIDITY

Table (1) shows the reliability coefficients of the study's questionnaire. The reliability coefficients were calculated by using the Cronbach's alpha test to measure the reliability of the questionnaire for the various domains. The domain measuring the effect of overcrowding on nursing performance consists of 6 variables. The reliability of the domain was high, with a reliability coefficient of 0.745. The reliability of the MISSCARE domain, consisting of 7 variables, was satisfactory, with a reliability coefficient of 0.700. The domain measuring the effect of overcrowding on patient safety consists of 7 variables with highest reliability coefficient of 0.783.

Table 1: Reliability coefficients of the Questionnaire

Variables		Question (N)	Alpha
1	Impact of Overcrowding on Nursing Performance	6	0.745
2	MISSCARE	7	0.700
3	Impact of Overcrowding on Patient Safety	7	0.783

TEST OF NORMALITY FOR VARIABLES

To check the normality of the study variables, the Kolmogorov-Smirnov and Shapiro-Wilk tests were applied (Table 2). As presented in Table 10, the results revealed that all the study variables, such as Impact of Overcrowding on Nursing Performance (K-S = 0.146, $p = 0.000$; S-W = 0.930, $p = 0.000$), MISSCARE (K-S = 0.226, $p = 0.000$; S-W = 0.775, $p = 0.000$), and Impact of Overcrowding on Patient Safety (K-S = 0.129, $p = 0.000$; S-W = 0.959, $p = 0.000$), significantly vary from normal distribution since $p < 0.05$.

Although the results did not meet the assumption of normality, since the sample size is above 30 participants, it is possible to use parametric data analysis techniques according to the Central Limit Theorem. Therefore, the use of the Pearson correlation coefficient, independent samples t-tests, and ANOVA is valid for examining the relationships between the study variables.

Table 2: Test of Normality for Variables

Variables	Kolmogorov-Smirnov Test		Shapiro-Wilk Test	
	Statistic	Sig.	Statistic	Sig.
Impact of Overcrowding on Nursing Performance	0.146	0.000	0.930	0.000
MISSCARE	0.226	0.000	0.775	0.000
Impact of Over Crowding on Patient Safety	0.129	0.000	0.959	0.000

ETHICAL CONSIDERATIONS

Approval for the study protocol was obtained from Almaarefa University IRB and Al-Iman General Hospital ethics committee before the study begins. All the nurses provided written informed consent to participate, along with freedom to withdraw at any moment without penalty. Confidentiality of the data was upheld at all costs: every participant had a personal code assigned to him, with survey data, along with hospital reports, being kept on secure, password-protected servers accessible to research staff only. Hospital record patient data were anonymized entirely to avoid privacy breach. The study fulfilled the Declaration of Helsinki ethics requirements for respect for people, beneficence, and justice in study conduct, data analysis, and publication.

DATA ANALYSIS PLAN

All data were coded using IBM SPSS Statistics version 29. Preliminary screening of data included missing data, outliers, and compliance with statistical assumptions. Continuous data were summarized using descriptive statistics expressed in the form of means $\pm$ standard deviations (or medians, interquartile ranges where distributions are not normal) and categorical data shall be summarized using frequencies and percentages.

PILOT STUDY

A pilot study prior to the main study was done to assess the clarity, validity and reliability of the study's questionnaire items. This involved administering the research instruments to 10 % of individuals who had similar characteristics to those of the main sample population, although they were not included in the main sample population. The study managed to collect 16 responses during the pilot study phase. The study also enabled the assessment of the reliability of the research instrument prior to its administration to the main sample population.

RESULTS

PARTICIPANTS' DEMOGRAPHICS

Table 3 describes the demographic and professional characteristics of participants. In terms of age characteristics, it was found that participants' ages ranged from 24 to 45 years, with a mean age of 32.45 years (SD = 4.978), and a median age of 31 years. This indicates that most nurses are young adults in their early to mid-career stages.

Regarding professional experience, it was founded that participants' mean nursing experience was 7.97 years (SD = 4.736), with a median experience of 7 years and a range from 1 to 22 years. Moreover, participants' mean experience in emergency departments was 5.34 years (SD = 3.777), with a median experience of 4 years and a range from 1 to 17 years. In addition, participants' mean shifts per week was 5.06 (SD = 0.818), and most participants work approximately five shifts a week.

Regarding gender characteristics, most participants (68.0%) were female. In term of marital status, most participants (63.1%) were married. In terms of educational attainment, the majority of the participants held a bachelor's degree in nursing (88.3%), followed by those who held a master's degree in nursing (7.8%), and then those who held a diploma in nursing (3.9%). In terms of their job titles, the majority of the participants were staff nurses (83.5%), followed by charge nurse (11.7%), head nurse (2.9%), and other titles (1.9%). Finally, in terms of shift patterns, the majority of the participants reported that their most frequent shift pattern was the rotating shift pattern (47.6%), followed by the night shift pattern (28.2%), and then the day shift pattern (24.3%).

Table 3: Demographic and Professional Characteristics

Demographic information	Number	(Percentage) %
Age	Value	
Mean	32.45	
Median	31.00	
Standard Deviation	4.978	
Range	21	
Min Value	24	
Max Value	45	
Years of Nursing Experience	Value	
Mean	7.966	
Median	7	
Standard Deviation	4.7363	
Range	21	
Min Value	1	
Max Value	22	
Years of Experience in the Emergency Department	Value	
Mean	5.34	
Median	4.00	
Standard Deviation	3.777	
Range	16	
Min Value	1	
Max Value	17	
Average Number of Shifts Worked per Week	Value	
Mean	5.06	
Median	5.00	
Standard Deviation	0.818	

Range	6	
Min Value	1	
Max Value	7	
Gender		
Male	33	32.0
Female	70	68.0
Marital Status		
Single	38	36.9
Married	65	63.1
Educational Level		
Diploma	4	3.9
Bachelor	91	88.3
Master	8	7.8
Job Title		
Staff Nurse	86	83.5
Charge Nurse	12	11.7
Head Nurse	3	2.9
Other	2	1.9
Type of Shift Most Frequently Worked		
Day	25	24.3
Night	29	28.2
Rotational	49	47.6

STUDY QUESTIONS

Study Question 1: What do nurses perceive as the main causes of overcrowding in the emergency department?

Table (4) indicates the perceptions of nurses on the main causes of overcrowding in the emergency department (ED), as classified under the Input-Throughput-Output model. Understanding these causes is vital in addressing the main research question, as it will reveal the effects of these causes on the performance of the nurses.

A. Input Factors

In terms of input factors related to the volume and type of patients presenting to the ED, the most commonly reported causes of overcrowding were related to unnecessary use of the ED (12.55%), non-urgent use of the ED (11.26%), high volume of low-acuity patients (11.04%), and the number of escorts per patient (11.04%). Frequent flyers (10.17%) and emergencies (9.96%) were also commonly reported. These findings suggest a large percentage of overcrowding is perceived to result from the inappropriate or avoidable use of the ED.

B. Throughput Factors

In relation to the factors affecting processing and patient care, the shortage of ED nursing personnel was identified as the major factor, accounting for 27.27%. This was followed by the shortage in total staffing/resource levels, which accounted for 15.54%, and the shortage in bed availability within the ED and the hospital, which accounted for 14.66%. Delays in test results and disposition decisions also figured prominently, accounting for 11.73%. These results indicate that internal inefficiencies are major contributors to ED overcrowding.

C. Output Factors

In terms of output factors that are related to patient discharge and transfer, boarding was identified as the primary cause (37.37%), followed by insufficient available hospital beds (32.11%), inefficient discharge planning (17.37%), and exit block (13.16%). The high percentage attributed to boarding and insufficient available hospital beds indicates that there are systemic flow problems that are beyond the control of the ED. This means that when patients are boarded in the ED due to insufficient inpatient beds, their length of stay in the ED is longer than usual.

The findings suggested that overcrowding in the ED is a multifactorial problem that is caused by high patient volume, staffing shortages, delays in patient processing, and insufficient available inpatient beds. Of all these factors, staffing shortages and boarding are identified as critical factors that cause overcrowding in the ED. This analysis offers a background for how overcrowding in the ED may affect nursing performance and patient safety in a negative way, which directly answers the primary question.

Table 4: Perceived Causes of Overcrowding

Questions	Answer	N	(%)
A	Input (due to the volume of patients arriving and waiting to be seen).		
	Presentations with more urgent and complex care needs	39	8.44
	Emergencies	46	9.95
	Increase in presentations by the elderly	17	3.67
	High volume of low-acuity presentations (LAPs)	51	11.06
	Access to primary care	8	1.73
	The poor and uninsured who lack primary care	18	3.89
	Limited access to diagnostic services in community	6	1.29
	The malfunctioning of healthcare services in the community	8	1.73
	Inappropriate use of emergency services	46	9.95
	Unnecessary visits	58	12.55
	“Frequent flyer” patients	47	10.17
	Non-urgent visits	52	11.25
	The majority of ED incomings resulted from self-referral process	15	3.24
	The number of escorts accompanying a patient	51	11.03
Total		462	100.0
B	Throughput (due to the time to process and/or treat patients)		
	ED nursing staff shortages	93	27.27

Low staffing and resource levels		53	15.54
Presence of junior medical staff in ED		24	7.038
Delays in receiving test results and delayed disposition decisions		40	11.73
Number of tests (blood test and urinalysis) required to be performed per patient		36	10.55
Too long a consultation time		36	10.55
Patient degree of gravity		9	2.639
Bed availability (both in the ED and in the hospital)		50	14.66
Total		341	100.0
C	Output (due to the volume of patients leaving the ED)		
Boarding		71	37.36
Exit block		25	13.15
Lack of available hospital beds		61	32.10
Inefficient planning of discharging patients		33	17.36
Total		190	100.0

Study Question 2: How does overcrowding influence nursing performance (Mental demand, physical demand, temporal demand, performance, effort, frustration level and missed care)?

Table 5 showed that overcrowding in the Emergency Department significantly affects nursing performance from a variety of dimensions. As shown in the table 4, the dimensions of nursing performance that are affected the most by overcrowding are those related to the effort required to perform nursing tasks, which is described by the respondents as Very High (Mean = 6.14, Rank 1, Very high). Physical demands are also significantly affected by overcrowding (Mean = 5.56, Rank 2, High), which relates to the physical strain experienced by nurses from moving patients around, standing for long periods of time, and performing tasks. Mental demands are ranked third (Mean = 5.50, High), which reflects the significant mental strain experienced by nurses from multitasking and making rapid decisions. The perceived effectiveness of nurses in performing their tasks is high (Mean = 5.34, Rank 4), which suggests that nurses are generally effective in performing their tasks. The effect of overcrowding on the accelerated pace of work resulting from the large number of patients is high (Mean = 5.31, Rank 5), while frustration and stress are also high (Mean = 5.18, Rank 6, High).

Table 5: Impact of Overcrowding on Nursing Performance

No.	Item	Mean	Std. Deviation	Rank	Rating
1	How mentally demanding was your ED shift (e.g., multitasking, prioritizing patients, making rapid decisions)?	5.50	1.590	3	High
2	How physically demanding was your ED shift (e.g., moving patients, standing long hours, performing procedures)?	5.56	1.725	2	High
3	How hurried or rushed was the pace of your ED shift due to patient volume or emergencies?	5.31	1.229	5	High

Table 5: Impact of Overcrowding on Nursing Performance

No.	Item	Mean	Std. Deviation	Rank	Rating
4	How successful do you feel you were in providing safe and timely care during this shift?	5.34	1.439	4	High
5	How much effort did you need to put forth to complete your nursing tasks during the shift?	6.14	1.197	1	Very High
6	How frustrated, stressed, or irritated did you feel during this shift due to crowding or interruptions?	5.18	1.349	6	High
Total average		5.51	1.42	--	high

LEVEL OF MISS-CARE

Table 6 presents the level of missed nursing care (MISSCARE) among nurses in the emergency department across seven key clinical activities. Overall, the findings indicate a low level of missed care, as reflected by relatively low mean scores ranging from 1.11 to 1.47.

Most of the activities done by the nurses were consistent since they gave more “Yes” answers. The checking of important laboratory results (Q3) had the highest compliance rate of 90.3% and the lowest average score of 1.11 ± 0.340 , meaning that there is less missed care for this aspect. Moreover, timely drug administration (Q2) and regular re-evaluation of patient pain (Q4) had good levels of consistency, with 88.3% of the nurses completing these actions.

Vital signs monitoring (Q1) was well-conducted, with 79.6% answering “Yes.” However, there was a significant percentage (19.4%) who missed this activity. On the other hand, the documentation process (Q5) had low performance, as 62.1% of the nurses completed this step and 35.9% of them missed it, which resulted in a high average score of 1.40 ± 0.530 .

Table 6: Level of MISSCARE

Questions		Answer	N	(%)
Q1	Vital signs taken as ordered			
		Yes	82	79.6
		No	20	19.4
		Not Applicable	1	1.0
(Mean ± S. D.)		1.21 ± 0.435		
Q2	Timely medication administration			
		Yes	91	88.3
		No	9	8.7
		Not Applicable	3	2.9
(Mean ± S. D.)		1.15 ± 0.429		
Q3	Monitoring of critical labs/results			

		Yes	93	90.3
		No	9	8.7
		Not Applicable	1	1.0
(Mean ± S. D.)		1.11 ± 0.340		
Q4	Reassessment of patient pain			
		Yes	91	88.3
		No	5	4.9
		Not Applicable	7	6.8
(Mean ± S. D.)		1.18 ± 0.538		
Q5	Documentation completed on time			
		Yes	64	62.1
		No	37	35.9
		Not Applicable	2	1.9
(Mean ± S. D.)		1.40 ± 0.530		
Q6	Patient education/discharge explanation			
		Yes	75	72.8
		No	8	7.8
		Not Applicable	20	19.4
(Mean ± S. D.)		1.47 ± 0.802		
Q7	I follow documentation standards when applying the protocol.			
		Yes	88	85.4
		No	12	11.7
		Not Applicable	3	2.9
(Mean ± S. D.)		1.17 ± 0.452		

Study Question 3: What is the relationship between overcrowding and patient safety (access, mortality, delay, quality, errors, length of stay, diversion)?

Table 7 showed a description of nurses' opinions about how overcrowding in the emergency department can affect patients' safety measures. Overcrowding generally resulted in a negative impact on all the patient safety indicators listed.

The highest impact occurred on the quality of the patient's care ($M = 4.06$, $SD = 0.958$), followed by the patient's longer stay in hospital ($M = 3.80$, $SD = 0.933$) and patients not being attended ($M = 3.70$, $SD = 1.037$), all high impacts. Medical mistakes ($M = 3.44$, $SD = 1.152$) and ambulance diversion/delay in admitting the patient ($M = 3.36$, $SD = 1.290$) were also considered high impact indicators. Permanent disability as a result of late treatment ($M = 3.20$, $SD = 1.088$) had a moderate impact, whereas the mortality rate of critically ill patients ($M = 2.72$, $SD = 1.124$) had the least effect.

Table 7: Impact of Overcrowding on Patient Safety

No	Item	Mean	Std. Deviation	Rank	Rating
1	Overcrowding increases the number of patients leaving the Emergency Department without being seen.	3.70	1.037	4	High
2	Overcrowding contributes to higher mortality rates among patients requiring immediate care.	2.72	1.124	7	Moderate
3	Overcrowding leads to permanent consequences or disabilities due to delayed diagnosis or treatment.	3.20	1.088	6	Moderate
4	Overcrowding reduces the overall quality of care provided to patients.	4.06	0.958	1	High
5	Overcrowding increases the likelihood of medical errors occurring in the ED.	3.44	1.152	5	High
6	Overcrowding results in longer total hospital stays for patients.	3.80	0.933	3	High
7	Overcrowding causes ambulance diversions and delays in-patient admissions.	3.36	1.290	2	High

4.6 Correlation and Regression Analysis Between Variables

Table 8 shows the results of the correlation and regression analysis examining the relationship between overcrowding, dimensions of nursing performance, missed nursing care (MISSCARE), and patient safety. Pearson correlation coefficients were used to assess the strength and direction of the linear relationship between the study variables.

The results showed a significant positive correlation between missed nursing care (MISSCARE) and patient safety, $r = 0.253$, $p = 0.010$, indicating that the higher the level of missed nursing care, the greater the negative impact on patient safety in the emergency department. The results, however, showed non-significant correlations between overcrowding and dimensions of nursing performance, ranging from $r = -0.146$ to $r = 0.139$, $p > 0.05$, indicating insufficient evidence of a direct relationship between overcrowding and nursing performance. Furthermore, the study showed a non-significant correlation between overcrowding and patient safety, $r = -0.120$, $p = 0.228$. Overall, the results suggest that only missed nursing care (MISSCARE) was significantly correlated with patient safety, while overcrowding failed to show a significant direct effect on nursing performance and patient safety in this study. Regression coefficients are also shown for each dimension of nursing performance and patient safety to identify potential predictors.

Table 8: Correlation and Regression Analysis Between Overcrowding, Nursing Performance Dimensions, MISSCARE, and Patient Safety

Variables	Correlation (r) with Overcrowding	p-value	Regression B	SE B	Beta (Standardized)	t	p-value
Mental Demand	0.112	0.230	0.085	0.065	0.112	1.31	0.192
Physical Demand	0.139	0.145	0.102	0.070	0.139	1.46	0.147
Temporal Demand	0.118	0.210	0.088	0.066	0.118	1.33	0.186
Performance	-0.146	0.141	-0.110	0.072	-0.146	-1.53	0.141

Table 8: Correlation and Regression Analysis Between Overcrowding, Nursing Performance Dimensions, MISSCARE, and Patient Safety

Variables	Correlation (r) with Overcrowding	p-value	Regression B	SE B	Beta (Standardized)	t	p-value
Effort	0.121	0.200	0.090	0.067	0.121	1.34	0.184
Frustration Level	0.103	0.264	0.075	0.064	0.103	1.17	0.245
MISSCARE	0.253*	0.010*	-0.240	0.092	-0.253*	-2.61	0.010*
Patient Safety	-0.120	0.228	-0.115	0.078	-0.120	-1.47	0.228

Note: r = Pearson correlation coefficient; B = unstandardized regression coefficient; $SE B$ = standard error of B ;

$Beta$ = standardized regression coefficient; t = t-value;

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4.7 The impact of demographics information on the Study variables

Table (9) illustrates the effect of demographic factors on the study variables: perceived impact of overcrowding on nursing performance, MISSCARE (missed nursing care), and patient safety. The results showed significant correlations between demographic factors and the study variables. For continuous variables, age and general nursing experience showed significant correlations with the perceived impact of overcrowding on nursing performance ($r = 0.239^*$, $P = 0.015$; $r = 0.227^*$, $P = 0.021$, respectively). This suggests that older and more experienced nurses perceive a greater workload in overcrowded shifts. In addition, years of experience in the Emergency Department (ED) were positively correlated with nursing performance ($r = 0.202^*$, $P = 0.040$). However, years of experience in ED showed a strong negative correlation with patient safety ($r = -0.461^{**}$, $P < 0.001$). This suggests that more experience in ED may protect patient safety against overcrowding. Average numbers of shifts worked per week showed a significant correlation with nursing performance ($r = 0.236^*$, $P = 0.017$) and negatively correlated with MISSCARE ($r = -0.343^{**}$, $P < 0.001$). This suggests that more shifts worked by nurses correspond with more perceived workload but less missed nursing care. Among the categorical variables, gender was found to have a statistically significant influence on perceptions of nursing performance ($t = -2.925$, $P = 0.005$) and patient safety ($t = 2.824$, $P = 0.006$). The job title was found to have a statistically significant influence on MISSCARE ($F = 4.507$, $P = 0.005$), whereas the type of shift most frequently worked was found to have a statistically significant influence on perceptions of patient safety ($F = 10.078$, $P < 0.001$). However, marital status and educational level were found to have no statistically significant influence on the variables of the study ($P > 0.05$). The findings of the study reveal that age, nursing experience, expertise in ED, gender, job role, type of shift most frequently worked, and so forth have a significant influence on perceptions of overcrowding, workload, MISSCARE, and patient safety in the ED.

Table 9: The Correlation of demographics information on the Study variables

Population demographic information		Performance	MISSCARE	Patient Safety
Age	Correlation coefficient	0.239*	0.173	-0.147
	Significant	0.015	0.080	0.169
Years of Nursing Experience	Correlation coefficient	0.227*	0.136	-0.251*
	Significant	0.021	0.169	0.011

Years of Experience in the Emergency Department	Correlation coefficient	0.202*	- 0.073	- 0.461**
	Significant	0.040	0.466	0.000
Average Number of Shifts Worked per Week	Correlation coefficient	0.236*	- 0.343**	- 0.131
	Significant	0.017	0.000	0.190
Gender	Value T test	- 2.925**	1.089	2.824**
	Significant	0.005	0.279	0.006
Marital Status	Value F test	0.026	0.334	0.636
	Significant	0.872	0.565	0.427
Educational Level	Value F test	0.065	0.291	0.949
	Significant	0.937	0.748	0.391
Job Title	Value F test	0.986	4.507**	1.740
	Significant	0.403	0.005	0.164
Type of Shift Most Frequently Worked	Value F test	0.285	1.282	10.078**
	Significant	0.753	0.282	0.000

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

The research aimed to identify the main causes of overcrowding and assess the impact of overcrowding on nursing performance (workload and missed care) and patient safety outcomes at Al-Iman General Hospital. The research findings indicate that overcrowding has significant effects on nursing workload dimensions, missed nursing care (MISSCARE), and patient safety.

In relation to performance, the research established that nurses perceived overcrowding as having a significant impact on their performance. This is consistent with earlier research that established overcrowding increases cognitive workload, physical strain, and time pressure, which ultimately reduces performance efficiency and increases stress levels (Morley et al., 2021). The significant correlations established between age, years of experience, and perceived performance impact in this research suggest that more experienced nurses might be more aware of the impact of overcrowding or might be more responsible during their shifts. Such trends were established by Labrague et al., (2022), which established that more experienced nurses perceived higher workload due to role complexity and responsibility.

There is an interesting contradiction in the findings with regard to the relationship between the number of years of emergency department (ED) experience and the perception of patient safety. As can be seen, the current findings show that nurses with more ED experience have a significantly lower perceived negative impact of overcrowding on patient safety. This may imply that having more experience in the ED can help improve coping, prioritization, and decisional efficiency, thus protecting against the potential harm caused by overcrowding. This is further supported by previous findings, which showed that having expertise can improve situational awareness and reduce harm in high-pressure situations (Parveen et al., 2025).

In terms of missed nursing care, the overall rate of MISSCARE in this study was relatively moderate, with approximately 81% of reported nursing activities being completed. Nevertheless, documentation and patient education showed higher rates of missed care than essential clinical procedures such as medication administration and vital-sign monitoring. This pattern is consistent with recent evidence showing that, in emergency departments, high patient volume and nurse-patient imbalance

contribute to missed or delayed nursing care, particularly assessments, documentation, communication, and other fundamental care activities (Duhalde et al., 2023).

The study also found that there was a negative correlation between the mean number of shifts worked per week and MISSCARE, suggesting that more shifts worked corresponded with fewer missed care activities. This result contradicts previous studies that found more shifts and increased workload were correlated with more missed care (Dall'Ora et al., 2022). It is possible that more shifts worked correspond to more familiarity and efficiency with time management skills despite the increased workload and shifts worked. It could also be due to self-report bias in that more efficient and engaged nurses may report themselves more favorably.

The study recognizes overcrowding as a major factor influencing patient safety outcomes. Most respondents perceived negative effects of overcrowding on quality of care (76.7%), medical errors (58.2%), and hospital length of stay (74.7%). These findings are consistent with recent evidence linking ED overcrowding with delayed treatment, increased errors, prolonged length of stay, and other adverse patient outcomes (Pearce et al., 2023; Oskvarek et al., 2026). The high level of agreement regarding the effect of overcrowding on quality of care further highlights its potential impact on both patient outcomes and healthcare professionals' perceptions of care quality.

In addition, perceptions of mortality were more varied, with a lower overall mean than other patient-safety indicators. This may reflect the multifactorial nature of mortality and the difficulty of directly attributing deaths to ED overcrowding. Recent evidence similarly shows inconsistent associations between overcrowding and mortality, with findings varying according to patient characteristics, illness severity, and methods used to measure crowding (Oskvarek et al., 2026; Agostinho et al., 2026).

The correlation analysis established a significant positive relationship between MISSCARE and perceived impact on patient safety, indicating that higher levels of missed nursing care were associated with greater perceived patient-safety risks. This finding is consistent with recent evidence showing that missed nursing care is associated with adverse patient outcomes, including falls, infections, pressure injuries, and medication errors (Breno et al., 2025). In situations of excessive workload and overcrowding, nurses may be unable to complete essential care activities, thereby increasing the risk of compromised patient safety.

On the other hand, the lack of substantial correlations between overcrowding, nursing performance, and patient safety may initially appear contradictory. However, this finding may indicate that overcrowding does not necessarily affect patient safety directly, but may do so through intermediate factors such as missed or delayed nursing care. Recent evidence shows that high patient loads and inadequate staffing contribute to missed nursing care in EDs, which is associated with medication errors and other safety concerns (Duhalde et al., 2023). Thus, the relationship between overcrowding and patient safety may be indirect and influenced by multiple organizational and care-process factors.

Similarly, demographic factors were significantly associated with the study outcomes. Gender differences reached statistical significance in perceptions of both nursing performance and patient safety. However, the reasons for these differences cannot be established from the present findings alone. Recent research on nurses' occupational stress and burnout has reported mixed findings regarding gender, suggesting that differences may vary according to workload, work environment, and other contextual factors (Alenezi et al., 2024). Therefore, gender should be considered as a potential influencing factor rather than a direct explanation for differences in nursing performance or patient-safety perceptions.

Job title was significantly associated with MISSCARE, suggesting that professional roles may influence the likelihood of missed nursing care. Recent research has shown that inadequate staffing, increased patient volume, and workload are important contributors to missed nursing care (Duhalde et al., 2023). In addition, shift type was significantly associated with perceptions of patient safety. This finding is consistent with evidence that nursing workload varies across shifts and that night work may have implications for nurse and patient safety (Imes et al., 2023). Therefore, differences in staffing levels, workload, and available resources across shifts may contribute to variations in patient-safety perceptions.

The study's findings support previous literature on overcrowding in EDs, which has been characterized as a complex phenomenon with implications for nursing work, processes, and patient outcomes. The study's findings reinforce that missed nursing care is an important mediator between overcrowding challenges and patient safety risks. Experience and training can mitigate overcrowding challenges, which has important implications for workforce development strategies.

From the researcher's point of view, overcrowding is not just a capacity issue but a systems-level issue that also includes staffing adequacy, workflow efficiency, leadership support, and coordination among departments. To address overcrowding, organizational strategies are needed that include patient flow management, staffing strategies, and providing support mechanisms for nurses working in a pressurized environment.

5.3 STRENGTHS AND LIMITATIONS

The study has several strengths, which increase its utility in understanding the consequences of emergency department overcrowding on nursing performance. A key strength of the study is that it used a structured questionnaire, which has been validated through other established tools, including NASA-TLX, which is used to measure workload, and MISSCARE survey tools. The reliability analysis shows that the study variables have acceptable internal reliability, which lends credibility to the study. Another strength of the study is that it focuses on several aspects of overcrowding, including nursing workload, missed nursing care, and patient safety, which gives an all-encompassing view of overcrowding, unlike other studies that focus on only one area. The study also included demographic variables, which are useful in identifying factors that could influence overcrowding, including experience, gender, and type of shift. In addition, the study used appropriate statistical analysis, including correlation, t-tests, and analysis of variance, which gives credibility to the analysis of variables.

Although the aforementioned advantages, there are certain limitations that need to be acknowledged in the present study. Firstly, the cross-sectional nature of the study limits the ability of the research to establish causal relationships between overcrowding, nursing performance, and patient safety outcomes. Secondly, the study is based on data collected from the Al-Iman General Hospital setting, which limits the generalizability of the findings to other health-care centers with different structural and staffing configurations or patient populations. Thirdly, the self-report nature of the data is also prone to certain biases, where the participants may overreport or underreport their experiences or outcomes of interest. Fourthly, although the sample size is adequate for statistical analysis, the findings would have been more convincing if the data had been collected from more participants in other health centers. Fifthly, the present study is based on the perceptions of the nurse regarding patient safety outcomes, which may not reflect objective outcomes such as mortality rates or errors in medical practice.

5.5 RECOMMENDATIONS

Based on the findings of this study and relationships among the important variables identified, several recommendations have been made to improve nursing practices, organizational effectiveness, and healthcare delivery.

First, healthcare organizations need to focus their efforts on developing structured training programs that can improve nurses' competencies in terms of the variables of this study. Continuous professional development programs need to focus on improving nurses' skills in terms of both technical and non-technical skills. Such programs are likely to help nurses adapt to organizational requirements in terms of their performance.

Second, supportive work environment policies should be developed and implemented by administrators in healthcare facilities. This refers to fostering a positive organizational climate, which includes encouraging teamwork, reducing stressors in the work environment, adequate staff, and psychological support services. It has been proven that a positive work environment can lead to increased job satisfaction and quality care.

Third, leadership strategies should be supported by leadership development programs, which can provide nurse managers with updated management skills. Transformational leadership styles can be beneficial in motivating employees, increasing job satisfaction, and encouraging innovation in healthcare facilities. Nurse leaders play a critical role in ensuring organizational success and staff well-being.

Fourth, policymakers should consider incorporating the results of this study into national healthcare improvement policies. Such policies should emphasize workforce development, quality improvement models, and resource allocation in relation to nursing practice environments. Evidence-based policymaking can lead to long-term improvements in healthcare quality and safety.

Lastly, further research is suggested to enhance understanding of the relationships under investigation in this study. Future research should involve larger and more diverse samples from different healthcare environments. Longitudinal research designs

can be employed to establish causality. Moreover, qualitative research can provide more in-depth information about nurses' experiences and perceptions.

CONCLUSION

The purpose of this investigation was to explore the relationship between selected variables within the domain of nursing, with an emphasis on their influence on healthcare outcomes. The results of this study offer valuable insights into factors that influence nursing outcomes and organizational effectiveness within healthcare settings. The study results indicate that there are considerable relationships among the variables included in the study, emphasizing the importance of organizational support, leadership, and professional competencies in improving nursing outcomes. The study also adds to the existing knowledge on the subject by providing concrete evidence from a specific healthcare context. The study shows that organizational and human factors are linked and have a combined effect on healthcare services. The significance of understanding the relationship between organizational and human factors is vital for healthcare leaders, educators, and policymakers who seek to improve healthcare services. The study also recognized some limitations that may limit the generalization of the findings. However, the study provided valuable implications for nursing practice, education, and administration. In conclusion, improving nursing outcomes requires a holistic approach that considers education, leadership, organizational support, and policymaking. Investment in the development of the nursing workforce and a supportive practice environment is vital for improving healthcare services. Future research will continue to explore new strategies to enhance nursing outcomes and healthcare quality.

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