

Management Strategies for Overcrowding in Emergency Medicine Department: A Narrative Review

RAJIV RATAN SINGH¹, PRADEEP KUMAR YADAV², SHOBHNA YADAV³

ABSTRACT

Emergency Medicine Departments (EMDs) are one of the busiest hospital departments in the world, as they are typically the first point of contact for health emergencies and are designed and resourced to manage them. However, due to their potential overflow, EMDs contribute to overcrowding. Overcrowding in the Emergency Department (ED) of hospitals can harm hospitals financially and have negative impacts on patient care, such as lengthening waiting times, diverting ambulances, increasing length of stays, raising medical errors, and elevating patient mortality rates. The COVID-19 pandemic has exacerbated the critical situation for EMDs, making it imperative to reduce overcrowding and improve EMD efficiency for patient welfare and safety during this pandemic. Controlling overcrowding should be carried out by the authorities responsible for regulations. This review discusses the effects of EMD crowding on patients' health status and explores potential solutions through strategic management, including executive leadership involvement, hospital-wide coordination strategies, data-driven management, and performance accountability.

Keywords: Emergency department, Overcrowding, Patient care, Patient flow, Triage, Waiting time

INTRODUCTION

Globally, the Emergency Medicine Department (EMD) is among the most crowded departments in hospitals. It often operates beyond its intended capacity, as it is the primary point of contact for health emergencies and is not adequately resourced to handle the volume, resulting in overcrowding [1-3]. This overcrowding hinders the department's ability to provide timely and quality care, thus failing to fulfill its main objective [4,5]. EMDs play a vital role in disease diagnosis, isolation, and, if necessary, patient hospitalisation [6]. Patients admitted to this department typically present with various high-risk diseases [7], leading to longer waiting times for staff care and increased patient discomfort due to the rush [8,9].

Considering the COVID-19 pandemic as a state of emergency, significant measures should be taken to restructure healthcare organisations and EMDs before the disease spreads. The demand for emergency care has significantly increased in the current environment, making effective management of EMDs a critical concern for the community health system [10]. The consequences of EMD overcrowding are severe and can result in compromised quality of care, delayed treatment and recovery time, increased treatment costs, and diminished patient satisfaction [11]. Therefore, overcrowding can be defined as a situation where the demand for emergency healthcare services exceeds the available resources, thereby hindering the functioning of EMDs [12].

Several factors contribute to EMD overcrowding, including staff shortages, structural limitations such as insufficient beds and equipment, inadequate functional space, and limited capacity for hospitalisation compared to the number of patients [13]. EMD overcrowding has a negative impact on healthcare and leads to adverse patient outcomes. The inability to provide timely treatment to patients can compromise the quality and outcomes of emergency healthcare services [14]. EMD crowding is a significant global challenge that needs to be addressed through the development of strategies targeting the identified causes [15]. This review aims to convey a clear message to emergency policymakers. Overcrowding in the emergency department can be reduced by implementing triage systems, ensuring prompt bed assignment, transferring patients to other clinical departments, implementing home oxygen therapy, and transferring patients to the nearest care facility that

provides a higher level of care, facilitated by an integrated emergency Command Centre [16].

1. FACTORS RESPONSIBLE FOR OVERCROWDING IN EMD

There are several factors that directly or indirectly contribute to overcrowding in the Emergency Medicine Department (EMD).

1.1 Factors related to patients

- Critical illness:** A significant number of critically ill patients requiring emergency medical attention and timely admission, but facing delays in admission, can be a major cause of EMD overcrowding [17,18].
- Increase in demand:** The growing demand for emergency and urgent healthcare services impacts EMD crowding. This increase is partly due to a large proportion of patients with minor health issues who could be managed by general practitioners, but still utilise emergency services [19,20].
- Age:** Older individuals are more likely to experience serious illnesses and require emergency care. Notably, the population has seen a proportional increase in the number of older people [21].
- Lifestyle:** Unhealthy lifestyles, including alcoholism and smoking, often lead to emergency situations and frequent hospital visits and admissions [22]. Patients can play an active role in improving their health and reducing the burden on EMDs by making lifestyle changes such as quitting alcohol and smoking, adopting a balanced diet, exercising regularly, managing stress levels, and getting adequate sleep [23].
- Increased number of attendees:** The presence of excessive attendants accompanying patients contributes to unnecessary crowding in the EMD [24].

1.2 Factors related to the management of emergency services delivery

- Registration process:** Slow registration processes can cause crowding in the EMD.
- Lengthy waiting conditions and emergency care:** Crowding in the EMD can occur when there is a high number of patients

waiting to be seen, delays in assessing and initiating treatment for patients already in the EMD, or delays in discharging patients who have received treatment [1,25].

- c) **Delay in diagnostic test results:** Inefficiencies in reporting diagnostic test results by radiologists and laboratory workers can affect patient experiences and lead to overcrowding in the EMD. Implementing quick point-of-care emergency inquiries and utilising point-of-care ultrasound as a radiological examination can improve emergency care [26,27].
- d) **Discharge planning:** Lack of communication between individuals responsible for bed availability and the discharge of inpatients is a major cause of crowding [28].

1.3 Factors related to EMD staff

- a) **Shortage of staff:** A shortage of emergency care providers contributes to EMD crowding, as there are often more patients waiting to be seen than the EMD's staffing capacity can accommodate [29,30].
- b) **Lack of communication between staff and physicians:** Ineffective communication between hospital staff and doctors can compromise the standard of patient care. Successful collaboration and the delivery of optimal care require effective communication among healthcare professionals [31].
- c) **Staff working efficiency:** The increasing patient volume has created a heavier workload for EMD staff, resulting in delays in providing emergency services to patients. These factors impact both patient health and the well-being of EMD professionals [32].
- d) **Misdiagnosis:** Preventing misdiagnosis and delays in treatment in the ED requires a collaborative and patient-centred approach [33].
- e) **Policies:** Micro-level strategies that can be implemented in the emergency department include the use of standardised diagnostic pathways and the establishment of a holding area. At a macro-level, hospitals should streamline the admissions process, establish flow management centres, increase outpatient care, and develop comprehensive emergency plans [34].

1.4 Factors related to the premises and materials of EMD

- a) **Structural limitations and premises shortage:** Insufficient numbers of EMDs and limited internal space can contribute to difficulties and overcrowding [18].
- b) **Shortage of beds for admitting emergency patients:** Crowding in EMDs is not solely caused by the arrival of a large number of patients, as research has shown. Instead, a shortage of beds for inpatients has been identified as the primary cause of EMD crowding [35].
- c) **Shortage of assessment and planning zones:** The lack of assessment and planning zones hinders early physician evaluation, direction, and decision-making, leading to EMD overcrowding [36].

2. CONSEQUENCES OF OVERCROWDING

Overcrowding in the EMD has been proven to have adverse consequences for patients, staff, and the healthcare system. These consequences primarily relate to patient safety and financial issues [36].

2.1 Safety-related consequences

- a) **Increased risk of medical errors:** EMD overcrowding is a major contributing factor to the occurrence of medical errors among nursing staff [36]. Misinterpretation and reporting errors can lead to medication errors, including the administration of incorrect or contraindicated medications. Overcrowding also leads to unnecessary delays in receiving medication [37].
- b) **Delayed assessment and treatment:** Overcrowding leads to delayed assessment, increasing the risk of patients not being

properly examined and subsequently affecting treatment and patient recovery [38].

- c) **Delayed patient transfer to other hospital units:** Delayed assessment of patient conditions can hinder decision-making and the timely referral of patients to other hospital units for treatment [39].
- d) **Decreased efficiency and quality of care:** Decreased staff efficiency and lower quality of care result in difficulties managing patients' problems and lead to poor patient outcomes. Delayed attention and healthcare services can compromise the quality of emergency services and subsequent outcomes [2].
- e) **Increased morbidity and mortality rates:** EMD crowding has been linked to increased inpatient morbidity and mortality rates. The association between increased mortality rates and EMD crowding highlights the importance of addressing overcrowding as a major concern for community health [40,41].
- f) **Increased stress and physical violence towards staff:** EMD staff experience increased stress and frustration due to the higher workload. Physicians also experience increased stress due to overcrowding [42-44]. A study by Medley DB et al., reported a significant association between EMD overcrowding and violence towards staff, with physical violence being most frequently observed [45].

2.2 Financial consequences

EMD overcrowding has financial implications, as it can lead to prolonged average inpatient length of stay and increased chances of readmission to the EMD due to inadequate medical care resulting from overcrowding. This further contributes to the overall cost of healthcare for patients [46].

Other consequences of EMD overcrowding include an increased number of patients leaving the hospital without being seen. As the hospital reaches its maximum admission capacity, ambulances may be diverted to other hospitals for patient admission and care. This can result in prolonged periods of pain, suffering, dissatisfaction, aggression, and a disrupted therapeutic relationship for patients [47,48].

3. STRATEGY FOR THE MANAGEMENT OF OVERCROWDING

Overcrowding in the EMD is a global issue that requires comprehensive solutions. EMDs should develop action plans to address the negative consequences of overcrowding. This strategy should focus on managing and streamlining patient flow by determining whether patients can be treated in the EMD's outpatient department or require admission and emergency treatment based on their overall clinical condition and preliminary investigation reports [49]. Implementing interventions to improve EMD performance is crucial. Research suggests that there is potential for cost savings as general practitioners tend to order fewer tests and admissions, while patient satisfaction increases [50].

A. Strategies addressing management at the EMD level

Triage: Triage is the process of assessing the severity of an injury or illness shortly after a patient's arrival in the emergency department. It involves prioritising patients and directing them to the appropriate treatment area. Various triage instruments are used, and [Table/ Fig-1] provides an elaboration on the five main triage instruments currently in use [51,52].

1. REDUCING TIME OF STAY

Reducing the time patients spend in the EMD is essential for improving patient flow and reducing overcrowding [53]. Efficient functioning of the EMD improves patient satisfaction and can lead to a decrease in mortality and morbidity rates, as well as a decline in the length of stay at the EMD [54].

Parameter	Australasian Triage Scale	Manchester Triage Scale	Canadian Triage and Acuity Scale	Emergency severity index
Time to initial assessment	10 min	n. s.	n. s.	n. s.
Time to contact with doctor	Immediate/10/30/60/120 min	Immediate/10/60/120/240 min	Immediate/15/30/60/120 min	Immediate/10 min/n. s.
Performance indicators	I: 97.5%; II: 95%; III: 90%; IV: 90%; V: 85%	n. s.	I: 98%; II: 95%; III: 90%; IV: 85%; V: 80%	n. s.
Re-triage	n. s.	As required	I: continuously; II: 15	As required
Pain scale	Four-point scale	Three-point scale; considered as essential factor in triage	Ten-point scale	Visual analog scale (10 points); if score >7/10, consider allocation to ESI 2

[Table/Fig-1]: Five main triage instruments.

To categorise hospitals, we use four broad domains: executive leadership participation, hospital-wide coordinated strategies, data-driven management, and performance accountability [55]. Based on these criteria, hospitals can be grouped into high performers, improving performers, and low performers. High-performing hospitals consistently achieve outstanding results in areas such as patient safety, clinical outcomes, and patient satisfaction. They often have highly skilled and experienced medical staff, advanced medical technologies and facilities, and a strong commitment to providing high-quality care [56]. Improving hospitals implement strategies and initiatives aimed at enhancing the quality of patient care, increasing efficiency and effectiveness of hospital operations, and improving the overall patient experience [57]. Low-performing hospitals fall short in terms of quality of patient care, safety, and operational efficiency. They may have high rates of patient readmissions, hospital-acquired infections, long wait times, and low patient satisfaction [58].

2. PRIMARY CARE PHYSICIANS

Limited access to healthcare is a significant contributing factor to EMD overcrowding. Primary care physicians play a crucial role in managing and treating a wide range of medical conditions, including chronic illnesses, sudden illnesses, and injuries [59]. They also provide preventive care through vaccinations, health screenings, and guidance on maintaining a healthy lifestyle. Primary care physicians coordinate their patients' treatment with other healthcare professionals, such as specialists and hospitals. They diagnose and treat medical conditions and play a vital role in educating patients about their health and helping them make informed decisions about their care [60].

3. PREFERENCE-BASED ALLOCATION

Patients should be treated based on the severity of their condition. Less severe patients can be allocated to a dedicated clinical area where they can be assessed and treated in a timely manner by a specialised clinical team. Critically ill patients should be given priority and examined by a team of senior doctors, general practitioners, nurse practitioners, junior physicians, or a combination of these healthcare professionals [61]. Patients with severe non-critical conditions can be treated in designated areas where their condition can be assessed for severity and medication can be administered under observation [62].

4. STAFF TRAINING

Training for EMD professionals is crucial to ensure high-quality patient care. It is important to educate staff on the importance of

accurate and clear shift handovers at the bedside to improve patient safety. This can also lead to improved patient care reporting rates and enhance patient safety through nursing staff [63].

5. BEDSIDE REGISTRATION AND ADDITIONAL BEDS

Implementing bedside registration can expedite the admission process and provide convenience to patients. When beds are available, critically ill patients can be promptly admitted to the inpatient ward, where they can be registered and concurrently assessed by a dedicated medical team. Additionally, there should be provision for additional beds in the EMD [64].

6. ENVIRONMENTAL PLANNING

Managing EMD overcrowding includes reducing the number of attendants accompanying patients, which has been found to contribute to improved perceived safety. The presence of a large number of family members in the EMD can contribute to overcrowding and may compromise patient safety [65].

7. DISCHARGE MANAGEMENT

Effective discharge management involves identifying patients who do not have serious illnesses and are likely to be discharged quickly. This can be achieved by establishing a discharge lounge to facilitate the discharge process and regularly assess patients' medical records for discharge-related medical guidelines. Lengthy waiting times for the discharge process can diminish patient satisfaction and have a negative impact on outcomes and clinical efficacy [66].

B. Strategies Addressing Access Block

1. **Access block:** The inability to transfer patients from the EMD to an inpatient ward once their treatment has been finished at the EMD is one of the main causes of overcrowding. To address this issue, patients need access to a different inpatient ward [67].
2. **Holding units:** Holding units can play a role in alleviating access block. These units are established at the EMD for clinical decisions and observation. In these units, space is reallocated for quick assessment and holding patients, which helps resolve overcrowding in the EMD through carefully designed clinical management protocols and necessary staff support [68].

C. Strategies Addressing System

1. **Process redesign:** The existing process at the EMD needs to be redesigned, including clinical guidelines and protocols, to reduce the use of the ED for non-urgent medical care [69].
2. **Implementation of new technology:** A emerging strategy involves incorporating new technologies into the EMD to address overcrowding [70].
 - a) **Computerised clinical support systems:** Clinicians can quickly access patient information through computerised provider entry forms and order entry. This support system also provides electronic messages such as alerts, reminders, and patient flow through a computer-assisted dashboard [71].
 - b) **Mobile devices:** Various mobile devices and workstations, including laptops, iPods, wireless computers, and mobile workstations, can be employed in the EMD to improve workflow [71].
 - c) **Telemedicine/Telecommunication Technology:** Telemedicine infrastructure, which has been in existence for many years but has been more activated during the COVID-19 pandemic, facilitates the transmission of reports of pathological and radiological studies, videos, images, and physiological data through telecommunication technology. This helps provide care to patients who are distantly located from the clinician. Telecommunication from physicians is usually conducted

virtually, saving time and transportation costs for patients while enabling timely assessments and diagnostic or personal care whenever required [72,73].

- d) **Electronic health record:** Nowadays, EMDs heavily rely on electronic health records. Access to these records enables the management and exchange of patient health information virtually [74]. Key components of electronic health records include a clinical data repository, clinical decision support systems, computerised physician order entry, and an electronic medication administration record [75]. These records are available to emergency care providers and can be shared through health information exchange programs, allowing the sharing of laboratory and radiological test reports, illness-related information, and medication records [76].

CONCLUSION(S)

The EMD, being the nexus for patient overcrowding, should be considered a major public health concern. The high inflow of patients with severe illnesses results in various consequences and significantly restricts the EMDs' ability to deliver excellent emergency and urgent care. The management of overcrowding should be implemented by the authorities responsible for providing care during the COVID-19 pandemic. It is imperative to decrease overcrowding in EMDs for the welfare and safety of patients during this pandemic.

REFERENCES

- Asplin BR, Magid D, Rhodes K, Solberg LI, Lurie N, Camargo CA. A conceptual model of emergency department crowding. *Annals of Emergency Medicine*. 2003;42(2):173-80. <https://doi.org/10.1067/mem.2003.302>.
- Hoot NR, Aronsky D. Systematic review of emergency department crowding: Causes, effects, and solutions. *Annals of Emergency Medicine*. 2008;52(2):126-36. <https://doi.org/10.1016/j.annemergmed.2008.03.014>.
- Higginson A, Gray RJ, King M, Dance RJ, Williamson SDR, Butler NMH, et al. Near-100 MeV protons via a laser-driven transparency-enhanced hybrid acceleration scheme. *Nat Commun*. 2018;9(1):724. <https://doi.org/10.1038/s41467-018-03063-9>.
- Fatovich DM, Hirsch RL. Entry overload, emergency department overcrowding, and ambulance bypass. *Emerg Med J*. 2003;20(5):406-09. <https://doi.org/10.1136/emj.20.5.406>.
- American College of Emergency Physicians- ACEP. Policy statements. *Ann Emerg Med*. 2013;61(6):602-03. <https://doi.org/10.1016/j.annemergmed.2013.02.012>.
- Khilji MF, Al Jufaili M. Emergency department changes to combat COVID-19 in Oman. *Disaster Med Public Health Prep*. 2022;16(5):2083-90.
- Davey K, Jacob S, Prasad N, Shri M, Amdur R, Blanchard J, et al. Characteristics and expectations among emergency department patients in India. *PLOS Global Public Health*. 2022;2(2):e0000009. <https://doi.org/10.1371/journal.pgph.0000009>.
- Derlet R, Richards J, Kravitz R. Frequent overcrowding in U.S. emergency departments. *Academic emergency medicine: Acad Emerg Med*. 2001;8(2):151-55. <https://doi.org/10.1111/j.1553-2712.2001.tb01280.x>.
- Pines JM. Moving closer to an operational definition for ED crowding. *Acad Emerg Med*. 2007;14(4):382-84. Doi: 10.1197/j.aem.2006.11.018.
- Pines JM, Hilton JA, Weber EJ, Alkemade AJ, Al Shabanah H, Anderson PD, et al. International perspectives on emergency department crowding. *Acad Emerg Med*. 2011;18(12):1358-70. Doi: 10.1111/j.1553-2712.2011.01235.x.
- Trzeciak S, Rivers EP. Emergency department overcrowding in the United States: An emerging threat to patient safety and public health. *Emerg Med J*. 2003;20(5):402-05. <https://doi.org/10.1136/emj.20.5.402>.
- Savioli G, Ceresa IF, Gri N, Bavestrello Piccini G, Longhitano Y, Zanza C, et al. Emergency Department Overcrowding: Understanding the Factors to Find Corresponding Solutions. *J Pers Med*. 2022;12(2):279. <https://doi.org/10.3390/jpm12020279>.
- Salway RJ, Valenzuela R, Shoenberger JM, Mallon WK, Viccellio A. Emergency Department (ED) overcrowding: Evidence-based answers to frequently asked questions. *Rev Médica Clínica Las Condes*. 2017;28:213-19.
- Johnson KD, Winkelman C. The effect of emergency department crowding on patient outcomes: A literature review. *Adv Emerg Nurs J*. 2011;33(1):39-54. <https://doi.org/10.1097/TME.0b013e318207e86a>.
- Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L. Emergency department crowding: A systematic review of causes, consequences and solutions. *PLOS ONE*. 2018;13(8):e0203316. <https://doi.org/10.1371/journal.pone.0203316>.
- Swedish Council on Health Technology Assessment. (2010). Triage methods and patient flow processes in emergency departments: A systematic review. Swedish Council on Health Technology Assessment (SBU).
- Becker J, Dell A, Jenkins L, Sayed R. Reasons why patients with primary health care problems access a secondary hospital emergency centre. *S Afr Med J*. 2012;102(10):800-01. <https://doi.org/10.7196/samj.6059>.
- Penson R, Coleman P, Mason S, Nicholl J. Why do patients with minor or moderate conditions that could be managed in other settings attend the emergency department? *Emerg Med J*. 2012;29(6):487-91.
- Lowthian JA, Jolley DJ, Curtis AJ, Currell A, Cameron PA, Stoelwinder JU, et al. The challenges of population ageing: accelerating demand for emergency ambulance services by older patients, 1995-2015. *Med J Aust*. 2011;194(11):574-78. <https://doi.org/10.5694/j.1326-5377.2011.tb03107.x>.
- Leonard C, Bein KJ, Latt M, Muscatello D, Veillard AS, Dinh MM. Demand for emergency department services in the elderly: An 11 year analysis of the Greater Sydney Area. *Emerg Med Australas*. 2014;26(4):356-60.
- Verelst S, Pierloot S, Desruelles D, Gillet JB, Bergs J. Short-term unscheduled return visits of adult patients to the emergency department. *J Emerg Med*. 2014;47(2):131-39.
- Sadegh Tabrizi J, Seyedhejazi M, Fakhari A, Ghadimi F, Hamidi M, Taghizadeh N. Preoperative education and decreasing preoperative anxiety among children aged 8-10-year-old and their mothers. *Anesth Pain Med*. 2015;5(4):e25036. <https://doi.org/10.5812/aapm.25036>.
- Nijman J, Hendriks M, Brabers A, de Jong J, Rademakers J. Patient activation and health literacy as predictors of health information use in a general sample of Dutch health care consumers. *J Health Commun*. 2014;19(8):955-69. <https://doi.org/10.1080/10810730.2013.837561>.
- Rathlev NK, Chessare J, Olshaker J, Obendorfer D, Mehta SD, Rothenhaus T, et al. Time series analysis of variables associated with daily mean emergency department length of stay. *Ann Emerg Med*. 2007;49(3):265-71.
- Habib MI, Khan KM. Overcrowding and possible solutions for a busy paediatric emergency department. *J Pak Med Assoc*. 2017;67(9):1398-403.
- Patel PB, Combs MA, Vinson DR. Reduction of admit wait times: The effect of a leadership-based program. *Acad Emerg Med*. 2014;21(3):266-73. <https://doi.org/10.1111/acem.12327>.
- Paul JA, Lin L. Models for improving patient throughput and waiting at hospital emergency departments. *J Emerg Med*. 2012;43(6):1119-26.
- Cha WC, Ahn KO. Emergency department crowding disparity: A nationwide cross-sectional study. *J Korean Med Sci*. 2016;31(8):1331-36.
- Lindner G, Waitok BK. Emergency department overcrowding. *Wien Klin Wochenschr*. 2021;133(5-6):229-33. <https://doi.org/10.1007/s00508-019-01596-7>.
- Lauks J, Mramor B, Baumgartl K, Maier H, Nickel CH, Bingisser R. Medical team evaluation: Effect on emergency department waiting time and length of stay. *PLoS one*. 2016;11(4):e0154372. <https://doi.org/10.1371/journal.pone.0154372>.
- Albina JK. Patient abuse in the health care setting: The nurse as patient advocate. *AORN J*. 2016;103(1):74-80. <https://doi.org/10.1016/j.aorn.2015.10.021>.
- Lorenzen B, Schwartz A. Changes in emergency department patient volume and acuity associated with early stages of the COVID-19 pandemic in a unique environment. *Perm J*. 2021;25:20.212. <https://doi.org/10.7812/TPP/20.212>.
- Hashim MJ. Patient-centered communication: basic skills. *Am Fam Physician*. 2017;95(1):29-34.
- Savioli G, Ceresa IF, Gri N, Bavestrello Piccini G, Longhitano Y, Zanza C, et al. Emergency Department Overcrowding: Understanding the factors to find corresponding solutions. *J Pers Med*. 2022;12(2):279. Published 2022 Feb 14. Doi: 10.3390/jpm12020279.
- Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L. Emergency department crowding: A systematic review of causes, consequences and solutions. *PLoS One*. 2018;13(8):e0203316. <https://doi.org/10.1371/journal.pone.0203316>.
- Anderson JS, Burke RC, Augusto KD, Beagan BM, Rodrigues-Belong ML, Frazer LS, et al. The effect of a rapid assessment zone on emergency department operations and throughput. *Ann Emerg Med*. 2020;75(2):236-45. <https://doi.org/10.1016/j.annemergmed.2019.07.047>.
- Kulstad EB, Sikka R, Sweis RT, Kelley KM, Rzechuch KH. ED overcrowding is associated with an increased frequency of medication errors. *Am J Emerg Med*. 2010;28(3):304-09. <https://doi.org/10.1016/j.ajem.2008.12.014> PMID: 20223387.
- Burström L, Louise L, Maaret EC, Wiklund T, Enlund M. Improved quality and efficiency after the introduction of physician-led team triage in an emergency department. *Ups J Med Sci*. 2016;121(1):38-44. Doi: 10.3109/03009734.2015.1100223.
- Jo S, Jeong T, Jin YH, Lee JB, Yoon J, Park B. ED crowding is associated with inpatient mortality among critically ill patients admitted via the ED: Post hoc analysis from a retrospective study. *Am J Emerg Med*. 2015;33(12):1725-31. Doi: 10.1016/j.ajem.2015.08.004. PMID: 26336833.
- Plunkett PK, Byrne DG, Breslin T, Bennett K, Silke B. Increasing wait times predict increasing mortality for emergency medical admissions. *Eur J Emerg Med*. 2011;18(4):192-96.
- Miró O, Antonio MT, Jiménez S, De Dios A, Sánchez M, Borrás A, et al. Decreased health care quality associated with emergency department overcrowding. *Eur J Emerg Med*. 1999;6(2):105-07.
- Trout A, Magnusson AR, Hedges JR. Patient satisfaction investigations and the emergency department: What does the literature say? *Acad Emerg Med*. 2000;7(6):695-709.
- Bond K, Ospina MB, Blitz S, Afilalo M, Campbell SG, Bullard M, et al. Frequency, determinants and impact of overcrowding in emergency departments in Canada. *Healthc Q*. 2007;10(4):32-40. PMID: 18019897.
- Medley DB, Morris JE, Stone CK, Song J, Delmas T, Thakrar K. An association between occupancy rates in the emergency department and rates of violence toward staff. *J Emerg Med*. 2012;43(4):736-44.

- [45] Wylie K, Crilly J, Toloo G, Fitzgerald G, Burke J, Williams G, et al. Review article: emergency department models of care in the context of care quality and cost: A systematic review. *EMA- Emerg Med Australas*. 2015;27(2):95-101.
- [46] Fatovich DM, Nagree Y, Sprivilis P. Access block causes emergency department overcrowding and ambulance diversion in Perth, Western Australia. *Emerg Med J*. 2005;22(5):351-54. <https://doi.org/10.1136/emj.2004.018002> PMID: 15843704.
- [47] Cheung T, Lee P, Yip P. Workplace violence toward physicians and nurses: Prevalence and correlates in Macau. *Int J Environ Res Public Health*. 2017;14(8):879.
- [48] Kayipmaz AE, Demircan. A pandemic hospitals and reorganizing emergency departments. *Turk J Med Sci*. 2021;51(SI-1):3221-28.
- [49] Austin EE, Blakely B, Tufanaru C, Selwood A, Braithwaite J, Clay-Williams R. Strategies to measure and improve emergency department performance: A scoping review. *Scand J Trauma Resusc Emerg Med*. 2020;28(1):55. <https://doi.org/10.1186/s13049-020-00749-2>.
- [50] Khangura JK, Flodgren G, Perera R, Rowe BH, Shepperd S. Primary care professionals providing non-urgent care in hospital emergency departments. *Cochrane Database Syst Rev*. 2012;11:CD002097.
- [51] Christ M, Grossmann F, Winter D, Bingisser R, Platz E. Modern triage in the emergency department. *Dtsch Arztebl Int*. 2010;107(50):892-98.
- [52] Smith DT, Snyder A, Hollen PJ, Anderson JG, Caterino JM. Analyzing the usability of the 5-level Canadian triage and acuity scale by paramedics in the prehospital environment. *J Emerg Nurs*. 2015;41(6):489-95. <https://doi.org/10.1016/j.jen.2015.03.006>.
- [53] Taylor C, Bengler JR. Patient satisfaction in emergency medicine. *Emerg Med J*. 2004;21(5):528-32.
- [54] Guttman A, Schull MJ, Vermeulen MJ, Stukel TA. Association between waiting times and short term mortality and hospital admission after departure from emergency department: Population based cohort study from Ontario, Canada. *BMJ*. 2011;342:d2983.
- [55] Geelhoed GC, de Klerk NH. Emergency department overcrowding, mortality and the 4-hour rule in Western Australia. *Med J Aust*. 2012;196:122-26.
- [56] Ahluwalia SC, Damberg CL, Silverman M, Motala A, Shekelle PG. What defines a high-performing health care delivery system: A systematic review. *Jt Comm J Qual Patient Saf*. 2017;43(9):450-59. Doi: 10.1016/j.jcjq.2017.03.010.
- [57] Zoutman DE, Ford BD. Quality improvement in hospitals: Barriers and facilitators. *Int J Health Care Qual Assur*. 2017;30(1):16-24. <https://doi.org/10.1108/IJHQA-12-2015-0144>.
- [58] Girotra S, Cram P, Popescu I. Patient satisfaction at America's lowest performing hospitals. *Circulation. Circ Cardiovasc Qual Outcomes*. 2012;5(3):365-72. <https://doi.org/10.1161/CIRCOUTCOMES.111.964361>.
- [59] Gerber JS, Prasad PA, Fiks AG, Localio AR, Grundmeier RW, Bell LM, et al. Effect of an outpatient antimicrobial stewardship intervention on broad-spectrum antibiotic prescribing by primary care pediatricians: A randomized trial. *JAMA*. 2013;309(22):2345-52. Doi: 10.1001/jama.2013.6287.
- [60] Snelgrove JW, Jasudavicius AM, Rowe BW, Head EM, Bauer GR. "Completely out-at-sea" with "two-gender medicine": A qualitative analysis of physician-side barriers to providing healthcare for transgender patients. *BMC Health Serv Res*. 2012;12:110. <https://doi.org/10.1186/1472-6963-12-110>.
- [61] Jeddian AR, Lindenmeyer A, Marshall T, Rashidian A, Sayadi L, Jafari N. Caring for acutely ill patients in general wards: A qualitative study. *Arch Iran Med*. 2016;19(9):639-44.
- [62] Oredsson S, Jonsson H, Rognes J, Lind L, Göransson KE, Ehrenberg A, et al. A systematic review of triage-related interventions to improve patient flow in emergency departments. *Scand J Trauma Resusc Emerg Med*. 2011;19:43.
- [63] Garzonis K, Mann E, Wyrzykowska A, Kanellakis P. Improving patient outcomes: Effectively training healthcare staff in psychological practice skills: A mixed systematic literature review. *Eur J Psychol*. 2015;11(3):535-56. <https://doi.org/10.5964/ejop.v11i3.923>.
- [64] Derlet RW, Richards JR. Ten solutions for emergency department crowding. *West J Emerg Med*. 2008;9(1):24-27.
- [65] Cowdell F, Lees B, Wade M. Discharge planning. *Armchair Health Serv J*. 2002;112(5807):28-29.
- [66] Dunn R. Reduced access block causes shorter emergency department waiting times: An historical control observational study. *Emerg Med (Fremantle)*. 2003;15(3):232-38. PMID: 12786644.
- [67] Richardson D, McMahon KL. Emergency department access block occupancy predicts delay to surgery in patients with fractured neck of femur. *Emerg Med Australas*. 2009;21(4):304-08. <https://doi.org/10.1111/j.1742-6723.2009.01201.x> PMID: 19682016.
- [68] Forster AJ, Stiell I, Wells G, Lee AJ, van Walraven C. The effect of hospital occupancy on emergency department length of stay and patient disposition. *Acad Emerg Med*. 2003;10(2):127-33. PMID:12574009.
- [69] Mieirol DB, de Oliveira ÉBC, da Fonseca REP, Mininel VA, Zem-Mascarenhas SH, Machado RC. Strategies to minimize medication errors in emergency units: An integrative review. *Rev Bras Enferm*. 2019;72(suppl 1):307-14.
- [70] Dexheimer JW, Borycki EM. Use of mobile devices in the emergency department: A scoping review. *Health Informatics J*. 2015;21(4):306-15.
- [71] Bennett P, Hardiker NR. The use of computerized clinical decision support systems in emergency care: A substantive review of the literature. *J Am Med Inform Assoc*. 2017;24(3):655-68.
- [72] Kelton DK, Szulewski A, Howes D. Real-time video telemedicine applications in the emergency department: A scoping review of literature. *Can J Emerg Med*. 2018;20(6):920-28.
- [73] Hollander J, Carr B. Virtually perfect? telemedicine for COVID-19. *N Eng J Med*. 2020;382(18):1679-81.
- [74] Hersh WR, Totten AM, Eden KB, Devine B, Gorman P, Kassakian SZ, et al. Outcomes from health information exchange: Systematic review and future research needs. *JMIR Med Informatics*. 2015;3(4):e39.
- [75] DesRoches CM, Campbell EG, Rao SR, Donelan K, Ferris TG, Jha A, et al. Electronic health records in ambulatory care: a national survey of physicians. *N Engl J Med*. 2008;359(1):50-60. Doi: 10.1056/NEJMsa0802005.
- [76] Shapiro JS, Crowley D, Hoxhaj S, Langabeer J, Panik B, Weltge A, et al. Health information exchange in emergency medicine. *Annals of emergency medicine*. 2016;67(2):216-26. <https://doi.org/10.1016/j.annemergmed.2015.06.018>.

PARTICULARS OF CONTRIBUTORS:

1. Professor (Junior Grade), Department of Emergency Medicine, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.
2. Assistant Professor, Department of Forensic Medicine, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.
3. Medical Officer, Department of UPPMS, CHC Chinhat, Lucknow, Uttar Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Pradeep Kumar Yadav,
647/37A/468, Sita Vihar Colony Jankipuram Extension,
Lucknow-226031, Uttar Pradesh, India.
E-mail: dctrprdp@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Dec 06, 2022
- Manual Googling: Mar 24, 2023
- iThenticate Software: Apr 08, 2023 (4%)

ETYMOLOGY: Author Origin**EMENDATIONS:** 7**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? NA
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Nov 17, 2022**Date of Peer Review: **Feb 11, 2023**Date of Acceptance: **Apr 12, 2023**Date of Publishing: **Aug 01, 2023**