

## Review

# Factors and Solutions Addressing Overcrowding in Emergency Department

Safinaz Alshiakh <sup>1\*</sup>, Fatema Abdulwahab <sup>2</sup>, Albatool Baz <sup>3</sup>, Bandar Ghonaim <sup>4</sup>, Suad Alanizi <sup>5</sup>, Saleh Altowygry <sup>6</sup>, Sultan Abu Tayli <sup>7</sup>, Albashiq Albalwi <sup>8</sup>, Ali Alhamidah <sup>9</sup>, Ali Al Ismail <sup>10</sup>, Fahad Alanazi <sup>11</sup>

<sup>1</sup> Department of Emergency Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

<sup>2</sup> College of Medicine, Royal College of Surgeons in Ireland - Medical University of Bahrain, Busaiteen, Bahrain

<sup>3</sup> Emergency Medical Service, King Abdullah Medical Complex, Jeddah, Saudi Arabia

<sup>4</sup> Department of Internal Medicine, Jeddah Eye Hospital, Jeddah, Saudi Arabia

<sup>5</sup> Hospital Administration, Directorate of Health Affairs, Hafr Albatin, Saudi Arabia

<sup>6</sup> College of Medicine, King Saud University, Riyadh, Saudi Arabia

<sup>7</sup> Department of Emergency Medicine, Imam Abdulrahman Al Faisal Hospital, Riyadh, Saudi Arabia

<sup>8</sup> College of Medicine, Ibn Sina National College, Jeddah, Saudi Arabia

<sup>9</sup> Department of Anesthesia, King Khalid Hospital, Hail, Saudi Arabia

<sup>10</sup> Department of Emergency Medicine, Qatif Central Hospital, Qatif, Saudi Arabia

<sup>11</sup> Department of Emergency Medicine, Shaqra General Hospital, Riyadh, Saudi Arabia

**Correspondence** should be addressed to **Safinaz Alshiakh**, Department of Emergency Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia. Email: [doctor\\_safi@hotmail.com](mailto:doctor_safi@hotmail.com)

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### Abstract

Overcrowding in emergency departments is a significant challenge in the world of medicine. Approximately 90% of the emergency departments face the issue of overcrowding. The causes of the phenomena are intensely contested, which makes it challenging to come up with effective, focused solutions. Individual patients, healthcare systems, and entire communities are all impacted by emergency department overcrowding. Crowding's detrimental effects on the delivery of healthcare services lead to delays, subpar care, and inefficiency, all of which have an adverse impact on the health outcomes of emergency patients. The purpose of this research is to review the available information about factors and solutions addressing overcrowding in emergency departments. Increased number of patients arriving in the emergency department, lack of resources, and the number of admitted patients waiting for transfer from the emergency department to a hospital ward are all contributing factors to the problem of overcrowding in the emergency department. The quality of medical care is directly impacted by emergency department overcrowding, which causes medication to be administered later than intended and raises the risk of morbidity and mortality among hospitalized patients. It also contributes to a number of unintended issues, including increased duration of waiting times, a decline in patient satisfaction, and a loss of revenue for medical facilities. Additional staff, observation units, hospital bed access, non-urgent referrals, ambulance diversion, destination control, congestion controls, and queuing theory are some of the possible solutions to overcrowding. Effective implementation of the strategies managing overcrowding at emergency department is needed.

**Keywords:** *emergency, department, overcrowding, solution*

**Introduction**

Overcrowding in hospital emergency departments (ED) has emerged as a global public health issue in recent decades. Several negative effects of ED overcrowding, include treatment delays for patients with serious illnesses, patient and staff dissatisfaction, inadequate management of severe pain, increased patient morbidity and mortality, and increased number of medical errors. The situation has gotten worse as a result of the rising numbers of ED attendance and patients needing admission (1). The ED is an acute care department attached to a healthcare facility that offers immediate medical assistance. The ED provides first treatment for a wide range of traumas, some of which may be life-threatening, due to the unscheduled nature of the patient's arrival. This calls for the immediate availability of resources in addition to the capacity to deliver high-quality medical care. Crowding and maybe overcrowding result when the supply is disproportionately greater than the demand. The term ED overcrowding refers to a severe overflow of patients in the treatment rooms, exceeding ED capacity and frequently requiring the provision of medical care in ED hallways and other improvised examination places (2). Boarding admitted patients, redirecting ambulances, and assisting patients on stretchers in corridors are all signs of ED congestion. Almost 90% of ED face the issue of overcrowding (3).

Forecasting patient needs for ED services is undoubtedly a crucial strategy for addressing the issue of ED overcrowding and scarce resources. EDs must include a significant amount of resilience in their style of operation to enable them to anticipate care demands and swiftly mobilize the necessary resources in order to meet the increasing requirement for emergency medical treatment. The conventional healthcare resources organization may not be able to handle a large number of patients, which usually leads to strain situations that raise the risk of medical errors, add stress to the medical personnel, and lower patient satisfaction. Therefore, precise forecasting of ED visits is essential for reducing the problem of congestion in EDs and enabling effective patient flow control. Several strategies have been developed over the years to enhance the accuracy of ED demand prediction and forecasts. The most popular models currently in use for predicting ED demand are time-series models (4). A scheduling and control strategy combined with appropriate resource management could hasten the patient handling process. Patients would spend less time in the ED, which would improve care

standards and boost patient throughput. To create a successful resource management strategy, it is first required to pinpoint the factors that affect a patient's length of stay and crowding in an ED. Numerous of these factors, such as non-urgent visits, patients who visit frequently, inadequate staffing and resource levels, and the time of year as in case of influenza season more crowding is expected, are well recognized (5).

The patient flow in the ED is impacted by disparities in between the capacity of the ED and the need for patient triage, diagnostic imaging, laboratory testing, and specialized consultations. Several studies have also pointed to the impact of high occupancy of over 90% and access block as additional contributing factors to poor patient outcomes, treatment delays, high mortality rates approximately 20%–30%, longer length of stay of inpatients, and hospital readmission. The majority 50%–75% of patients are admitted to hospitals through the ED, which helps to explain the high ED occupancy. To deal with the ED crowding, suggested solutions include increased resources, efficient management, operation research, critical thinking, chest pain observation units, rapid assessment zones, and clinical decision units. Many of the new dealing tactics are inspired by critical health-care thinking, which involve rebuilding the ideal routes, adding value stages, and eliminating nonvalue processes (6). The purpose of this research is to review the available information about factors and solutions addressing overcrowding in ED.

**Methodology**

This study is based on a comprehensive literature search conducted on October 21, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about Factors and solutions addressing overcrowding in ED. There were no restrictions on date, language, participant age, or type of publication.

**Discussion**

EDs are primarily intended to treat patients who suddenly deteriorate owing to acute exacerbations of chronic illnesses or injuries, or unexpected and potentially serious presentations of acute illnesses or injuries. The primary function of emergency medicine is

immediate provision of emergency care for individuals who are seriously unwell (7). Institutional overcrowding contributes to ED overpopulation by forcing admitted patients to board there. There is no proof that too many underprivileged patients or unnecessary visits cause overpopulation. ED overpopulation results in a number of issues for both patients and staff, including longer wait times, more ambulance diverted to other patients, longer stays, more medical errors, more patient deaths, and more harm to hospitals owing to financial losses. Overcrowding and boarding issues are not necessarily resolved by adding beds to the emergency department. Numerous strategies can be used to deal with ED overcrowding. Reducing boarding, maintaining nurse/patient ratios, and enhancing access to the intensive care unit can all be accomplished by smoothing out elective scheduled admissions. It is conceivable that there would not be a capacity problem if smoothing were implemented throughout the entire system. Discharges from inpatient units early in the morning also significantly reduce ED boarding (8).

### **Factors and Causes**

There are three types of elements that contribute to overcrowding: input, throughput, and output factors. Although these variables are distinct from one another, they are interrelated and regulated by underlying factors, making the overcrowding phenomena multidimensional and complicated.

**Input factors:** They are exemplified by the elements affecting how patients reach the ED. They comprise the duration of the waiting time, the number of patients who entered the ED, as well as their severity and complexity. One of the elements that contribute to crowding is input, but it is the least significant.

**Throughput factors:** These factors are also referred to as internal factors. They are depicted by the process time, which is the interval between accepting responsibility for the patient and the result including diagnosis and decision: discharge, hospitalization, and transfer. They comprise all additional examinations conducted in the ED including laboratory analysis and diagnostic imaging. In terms of quality of work, shift work, burnout, drop in performance, respect for shifts, and holidays of medical staff has an influence on these factors.

**Output factors:** They consist of patients boarding at the ED, hospital beds being available, and the length of time it takes for the internal and external transport to exit the ED. Overcrowding appears to be mostly caused by a lack

of hospital beds, but it is also primarily caused by a lack of home care. A global phenomena, the decline in beds which, in some reality, has declined by more than 50% in the past 20 years has resulted in exit block and the collapse of the possibility of hospitalizing patients. It is clear from output variables that the presence of patients who should be in the ward but are instead stationed in the emergency room, where they require ongoing medical assistance, has an impact on overcrowding (9).

Erenler et al. reported in their findings that a total of 38,579 patients received treatment in the observation room of the ED, with a mean length of stay of 164.1 minutes. The consultants' average time to arrive in the ED was 64 minutes. The most significant causes of ED overcrowding were longer duration of stay, delayed laboratory and imaging tests, delayed arrival of consultants, and insufficient inpatient beds (10). Mckenna et al. described in their study that shortage of hospital beds and a backlog of admitted patients are the main causes of ED overcrowding, making it obvious why the initiatives aimed at improving ED flow have only had a marginally positive impact. Diverting non-urgent patients has not significantly changed the flow of patients and compromises patient safety because many non-urgent patients will eventually need to be admitted to the hospital. While increasing ED capacity increases the capacity for boarded patients, it does little to shorten the time to admission, placing further strain on an already overburdened staff. Boarded patients still cause space restrictions restricting the capacity of the ED to see new patients, despite the fact that additional staff from the inpatient ward can help ease the load on the nursing staff (11).

Results of a retrospective study depicted that 41% of the patients who were admitted waited more than 10 hours before receiving a hospital bed. The majority of observed delays were brought on by a delay in receiving lab results, overworked ventilators and incubators in paediatric and neonatal intensive care units, a failure to use checklists for proper re-assessment of patients and early discharge, and an overflow of patients who were only admitted for nebulization and intravenous or intramuscular medication. Additionally, the admitting residents kept unstable patients in the emergency department for longer before admitting them to wards. The hospital's emergency room was severely overcrowded, overburdening effective standard care (12). Wibulpolprasert et al. stated that the increased number of patients, improper ED visits, the severity of patient ailments, laboratory investigations, cross-

departmental consultations, and types of health insurance have all been documented to be factors that are linked to overcrowding in the ED or longer ED stays (13).

### *Recommendations for the solution of overcrowding*

Based on the demand-supply principle, there are three main ways to decrease ED crowding and shorten extended ED length of stay: decrease care requests, boost resources, or better match demand and supply. Lowering the frequency of ED visits, removing pointless processes from ED care, and streamlining the way patients move through the system can all help to reduce demand (14). Pines and Bernstein recommended that a better strategy may be to match supply and demand, specifically attempting to enhance resource supplies such as ED beds and staff during busy periods. One illustration is an ED design that permits internal, as opposed to external, waiting areas. In this process, a patient is seen right away, and some patients such as those who can sit in a chair are placed in an internal waiting area where they can receive treatment or wait for tests to be performed. This procedure, commonly referred to as split-flow, enables the ED to flex up and down more effectively and start therapy earlier than waiting in a pre-evaluation period. Flexibility in staffing, or the ability to hire more people when demand is high, represents another supply-side intervention (15).

Feferman and Cornell described in their study that to address the issue of overcrowding in ED, a geriatrician was employed to evaluate and treat the growing number of elderly and chronic care patients. Additional beds were allocated to the medical service, and beds in different services were redistributed. The short-stay and ambulatory procedures facilities were extended to accommodate additional surgeries, and surgeons agreed to conduct more outpatient surgery. The installation of a physician-managed admission system also made sure that patients were admitted in the right way, all these aided in reducing the overcrowding of ED (16). Findings from the pilot study showed that with just a minor effect on yellow patients' wait times, adding one more physician to each shift would cut green patients' wait times to 2.5 hours. Keeping four physicians on staff and designating one physician just for green patients would cut the wait time for green patients in half to 1.5 hours and raise it by 15 minutes for yellow patients. Five physicians were assigned to each shift in the optimal simulation, with two physicians being assigned solely to green patients. By evenly allocating physicians to green and yellow patients and matching their availability to

anticipated demand patterns, waiting times can be decreased. Solutions to reduce overcrowding can be developed and tested using simulations of EDs (17).

Derlet and Richards recommended in their study that the number of patients who present to the ED with uncontrolled diabetes, hypertension, obesity, and hyperlipidemia could be reduced with routine primary care visits. Patients with prenatal and perinatal issues, sexually transmitted illnesses, and other conditions could be treated more simply at ambulatory clinics yet are frequently treated by ED physician. The prevalence of cancer is rising, and the ED physician frequently diagnoses cancer when examining patients who present with typical concerns. There should be more widespread use of routine screening for cancers such as ovarian, colorectal, breast, and cervical. Safety advancements in cars, such as seatbelts, airbags, dashboards, and frame construction, are one illustration of a good change. Patients who were injured in car accidents are now less likely to die or become disabled as a result of these modifications. Alcohol is well known to play a part in auto accidents, but recent efforts to minimize drunk driving have met with only patchy results. Serious injury trauma patients have the propensity to use a significant amount of ED resources as hours are frequently required for intubation, chest tubes, fracture management, and wound care in the emergency department (18).

Another microlevel method that could assist in connecting patients to non-traditional medical resources is the coordination of integrated care within the ED. In some cases, individuals go straight to the emergency room because they can't go around the healthcare system for a variety of reasons. This phenomena is especially prevalent among specific social groups, such as lower social classes, those with lower levels of literacy, and patients who worry about being judged and shamed because of their medical issues. Support from outside or ambulatorial health services can be used to reduce crowding and access to EDs. In order to prioritize and guarantee access to emergency diagnostic procedures for critically ill patients, imaging techniques for non-critically ill patients may be delegated to other qualified institutions. Additionally, the introduction of a follow-up system from a multidisciplinary perspective ought to provide strict and vigilant supervision of borderline patients who are discharged from the ED (19-21). Causes and solutions of overcrowding in ED are well-defined in literature however the issue of overcrowded ED still persists, there is need of effective implementation of the available recommendations and strategies to tackle



overcrowding also further research targeting the development of more feasible, immediate and evidence-based solutions to this grave problem of overcrowded ED is need of time.

## **Conclusion**

The overcrowding of EDs is a worldwide crisis that can have an impact on healthcare access and quality. The causes and solutions of the overcrowding of ED are known and well-explained however implementation of these suggested solutions is lacking also further research can be beneficial in designing a more practical way-out for resolving this issue.

## **Disclosure**

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There is no conflict of interest

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### ***Ethical consideration***

Non applicable

### ***Data availability***

Data that support the findings of this study are embedded within the manuscript.

### ***Author contribution***

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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