Overcrowding in Emergency Department

Subjects: Emergency Medicine

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Overcrowding in Emergency Departments (EDs) is a phenomenon that is now widespread globally and causes a significant negative impact that goes on to affect the entire hospital.

overcrowding emergency department hospital admission

1. Introduction

The Emergency Department (ED) is one of the most crowded hospital units, where many patients with various medical conditions, including high-risk patients, are admitted [1]. The main purpose of the ED is to treat emergency and urgent cases that need immediate assistance through a rapid diagnosis and the administration of a medical or surgical treatment in a very short time. It has now been established that the malfunctioning of health services in the community leads to improper access to the ED, especially in the geriatric and pediatric age groups [1][2][3]. ED's crowding, sometimes referred to as overcrowding, has been identified as a problem for a timely and efficient assistance since the 1980s [4].

Overcrowding can be defined as a situation in which the performance of the emergency department is compromised, mainly due to the excessive number of patients waiting for consultation, diagnosis, treatment, transfer, or discharge [2][5]; overcrowding is characterized by an imbalance between supply and demand [2].

Although many factors contribute to overcrowding, the latter depends essentially on three factors: the incoming volume of patients (input), the time to process and treat patients (throughput), and the volume of patients leaving the ED (output) [6].

Among the different factors, patient boarding was found to be one of the most significant [7]. Boarding is the practice of keeping patients admitted to the ED for prolonged periods due to inadequate capacity of inpatient wards [7][8]. Boarding, and overcrowding in general, has negative effects on patient care, mortality, morbidity, patient satisfaction, and quality of care [4][9][10]. These also contribute to a longer length of stay (LOS) in the ED, an increased rate of patients leaving the ED without being seen (LWBS, left without being seen), and increased medical errors [11][12][13].

ED overcrowding has turned into a serious health problem, as the number of EDs is decreasing, while the number of patients requiring emergency services is increasing [11][13]. It has been reported in the literature that

overcrowding occurs most often in EDs with an annual volume of over 40,000 visits [11][14].

An accurate measurement of crowding in the ED and an evidence-based understanding of its impact are essential prerequisites before attempting to find solutions [6]. Although there are various scores for estimating the different degrees of overcrowding, to date, there is still no gold standard for measuring this phenomenon [4][15]. A review in the literature suggests that overcrowding is defined by the following three estimation indices: National Emergency Department Overcrowding Score (NEDOCS), Community Emergency Department Overcrowding Score (CEDOCS), and Severely-overcrowded-Overcrowded and Not-overcrowded Estimation Tool (SONET). The most frequently used score is the NEDOCS, developed by Weiss and colleagues [15]; NEDOCS converts a series of variables into a score, which is related to the degree of overcrowding perceived by the professionals performing their tasks at that moment. The scale has a range between 0 and 200 points, where a rating of 101 or more indicates a condition of overcrowding [16].

Finally, among the measurement systems that can be evaluated to estimate overcrowding, we also have ED occupancy, ED length of stay, ED volume, ED boarding time, number of boarders, waiting room number, and the Emergency Department Work Index (EDWIN) score. So, in order to develop efficient solutions to overcrowding, it is essential not only to understand its various causes and effects but also to estimate its actual impact on the health care system [4].

2. Causes of ED Overcrowding

As anticipated, the problem of overcrowding in EDs can be due to multiple factors, which may be represented by the input–throughput–output model (**Table 1**). Overcrowding is a multifactorial and complex phenomenon; these different factors are independent from one another but are closely connected and influenced by additional factors [10][17][18].

Table 1. Main causes of overcrowding.

Factors	Causes
Input *due to the volume of patients arriving and waiting to be seen*	Presentations with more urgent and complex care needs • Emergencies
	Increase in presentations by the elderly
	High volume of low-acuity presentations (LAPs)
	Access to primary care • The poor and uninsured who lack primary care
	Limited access to diagnostic services in community • The malfunctioning of health care services in the community

Factors	Causes
	Inappropriate use of emergency services • Unnecessary visits • “Frequent flyer” patients • Nonurgent visits • The majority of ED incomings resulted from self-referral process
	The number of escorts accompanying a patient
Throughput *due to the time to process and/or treat patients*	ED nursing staff shortages Low staffing and resource levels
	Presence of junior medical staff in ED
	Delays in receiving test results and delayed disposition decisions
	Number of tests (blood test and urinalysis) required to be performed per patient
	Too long a consultation time
	Patient degree of gravity
	Bed availability (both in the ED and in the hospital)
Output *due to the volume of patients leaving the ED*	Boarding
	Exit block
	Lack of available hospital beds
	Inefficient planning of discharging patients
	An increase in closures of a significant number of EDs
Others	Time of the year • Influenza season • Seasonal illness
	Weekend, holiday periods
	COVID-19

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3. Effects and Consequences of Overcrowding in EDs

The most evident effect of overcrowding in the performance of an ED is an increase in patient waiting time; this increase causes an increment in the number of patients leaving the ED before being visited by a physician, which

is defined as left without being seen (LWBS); moreover, it has been observed that a group of patients complains of a progressive worsening of health conditions and returns shortly afterwards to be hospitalized (return visit). Several studies have found that the quality of treatment in overcrowded situations worsens significantly; it has been shown that in patients with myocardial infarction, an increase in door-to-needle time, the time between patient evaluation and drug administration, was significantly longer in overcrowded situations compared to normal timing [2]. An Australian retrospective study showed a clear increase in mortality of patients admitted to the ED during an overcrowded shift compared with those admitted during a normal shift. The authors of this study calculated that there are 13 deaths per year in their hospital due to overcrowding in the ED [19].

Overcrowding reduces ED capacity, affects quality of care, increases the risk of adverse outcomes for patients, especially cardiac and intubated patients, and increases the risk of hospital-acquired infections and the likelihood of patient management errors [20][21].

ED staff also suffer the effects of overcrowding; job satisfaction is affected by these stressful situations, and overcrowding has been identified as a major reason for staff reduction [2][22].

The potential financial impact of overcrowding is not insignificant; in fact, the resulting increase in reconsultations and hospitalizations, worse quality of treatment, dissatisfaction of health care staff, and morbidity lead to higher treatment costs [2][23]. According to a study, boarding increases the cost by USD 6.8 million over 3 years. Reducing boarding times by just one hour would increase revenue by USD 13,298 per day or USD 4.9 million per year [4][24][25].

Return visit (RV) is often used as a quality indicator for ED because it can be caused by premature discharge, missed diagnosis, or failure of treatment or discharge planning [26]. RVs not only delay adequate treatment of patients, but also increase resource use and medical costs [26][27]. Other factors, such as disease progression, lack of improvement, or patient concern and fear about their condition, contribute to this problem. Overcrowding is a health problem worldwide that leads to an increase in diagnostic and medical errors [26][28]; ED staff must always provide high-quality care to patients; therefore, when the ED is overcrowded, physicians accelerate the patient discharge process to prepare an empty bed for new patients [2].

4. Solution to Overcrowding

Regarding the resolution of overcrowding, several actions are needed, not only at the medical level but also at the bureaucratic level. These can be divided into two levels that act in synergy: microlevel and macrolevel strategies [4][10] as shown schematically in **Table 2**.

Table 2. Microlevel and macrolevel strategies.

Strategies	Solutions
Microlevel strategies *applied at the level of the Emergency Department*	Acceleration of diagnostic pathways

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Strategies	Solutions
Macrolevel strategies *applied at the hospital and/or care system level*	Fast track
	Outpatient services outside the ED
	Setting home care
	Observation unit
	Team triage Artificial intelligence (AI) and machine learning
	Simplifying the admission process
	Reverse triage
	Smoothing elective admissions
	Early discharge
	Weekend discharge
	Full capacity protocol or action plan
	Legislation and guidelines

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