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EMERGENCY DEPARTMENT CONGESTION: FACTORS CONTRIBUTING TO CONGESTION AND SOLUTION TO RESOLVE THE SITUATION

KEMENTERIAN KESIHATAN MALAYSIA

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SUMMARY

Emergency department crowding is a sentinel indicator of health system functioning. While often dismissed as mere inconvenience for patients, impact of ED crowding on avoidable patient morbidity and mortality is well documented but remains largely under appreciated. Therefore, a systematic review was conducted to identify relevant studies on EDs congestion. Electronic databases yielded various causes for EDs congestion and solution. The key to a sustainable solution is to realign health care financing to allow hospitals to keep inpatient capacity below a critical threshold of 90%; beyond that, hospital throughput dynamics will inevitably lead to ED crowding.

Keywords: congestion; emergency department; hospital; systematic review; solution

INTRODUCTION

Emergency departments or EDs offer vital service involving emergency, urgent cases, and disaster management globally that required immediate support via a rapid diagnosis and the administration of a medical or surgical treatment in a very short period (1). ED play a significant role in an acute healthcare system (2) including providing rapid care for life-threatening illnesses and injuries (3). EDs is one of the most crowded hospital departments that received patients with numerous medical conditions, including high-risk patients, are admitted (1).

It is certain and established that overcrowding represents one of the main problems that has been affecting global health and the functioning of the healthcare system in the last decades, and this is especially true for the emergency department (ED) (4). Since 1980, overcrowding has been identified as one of the main factors limiting correct, timely, and efficient hospital care (4). Overcrowding in EDs refers to the situation that contributed to the malfunction of the ED to offer the medical service which can be appear due to the imbalance between the constant increase in the healthcare demand for example the number of patients awaiting visit, receiving treatment and others (4). This problem is widespread worldwide and leads to the negative impact to the health services (1). In light of the need of finding solutions that can put an end to hospital overcrowding, this review aims, through a review of the literature, to summarize the triggering factors, as well as the possible solutions that can be proposed. The objective of this review was to provide the updated on comprehensive synthesis of the causes and solutions to EDs overcrowding.

MATERIAL & METHOD

We conducted a systematic review through electronic databases search to identify relevant studies. We searched for published and ready-to-publish articles in bibliographic databases, including PubMed, ISI Web of Science, Science Direct, Scopus, Cochrane Library and Google Scholar.

We also searched bibliographies of the identified papers and relevant information to identify relevant studies. The keywords used in the search were the following: Overcrowding; Emergency Department; Length of Stay; Waiting time; inpatient boarding, Triage, Hospital Emergency Services, ED Patient Flow, Ambulance diversion, Emergency Outpatient Unit and Patient Safety. Inclusion criteria were: (1) studies with quantitative details and information on the relationship between the causes that lead to overcrowding in Emergency Departments and the consequences that this phenomenon entails; (2) studies describing possible strategies already adopted or adoptable in the future to address the effect that overcrowding has on the Emergency Department were considered. Exclusion criteria were studies not in English and not directly pertinent to the query string or studies not containing sufficient information on the relationship between overcrowding and Emergency Departments. Two authors screened the title and abstracts. The full text of relevant studies was retrieved and assessed. Each reference of the included studies was cross-checked to identify further studies. A complete consensus was achieved through discussion for the studies included in this review.

DISCUSSION

Considering the growing importance of overcrowding in EDs and its potential effects on the wellness of patients and employees, the need to develop strategies to deal with or mitigate the problem has become evident. As has been described, the causes leading to overcrowding in EDs are multiple, starting with input causes and ending with output causes. Only knowledge and awareness of the issue can lead us to put in place the most appropriate strategies to be able to counteract the problem and bring it under control. This review presents a summary of the main indicators of overcrowding although there is currently no gold standard.

CONCLUSION

In this regard, numerous strategies have been collected and proposed in order to be implemented both at the ED level and at the hospital level. The goal should be to carry out an approach that takes into consideration not just the ED but also the hospital, the health care system in general and the country.

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RESULTS

A total of 131 studies was included in this review.

Study characteristics

Overall, 22 countries and one multiple or mixed countries included in this review with many studies were reported from the USA (46 articles or 35.1%), followed by Australia and Canada (14 articles or 10.7%) as well as Multiple countries (10 articles or 7.6%). The multiple countries articles are the countries that include more than one country in the published article for example Van Der Linden MC, 2017 conducted the study in Pakistan & Netherlands and Kingswell C, 2017 articles that performed in Canada, the United States, and Australia. Other countries also reported factors and solutions to ED crowding that also included in this review as shown in **Table 1.**

Most in this review were patients (64 studies or 48.1%), followed by hospital data (31 studies or 23.3%), staff (13 studies or 9.8%) and parents/families (3 studies or 2.2%). From the manual search, another 22 studies or 16.6% were included. A total of two studies included more than one respondent in their studies.

This review addressed either the factor or solution or both factor and solution to ED crowding. Of 131 included studies, 51 studies or 38.9% both factor and solution to ED crowding. Another 40 or 30.5% studies investigated factors that lead to ED crowding and 38 studies or 30.6% investigated the solution to overcome the ED crowding.

No	Country	No of articles included	Percentage (%)
1	Australia	14	10.7
2	Belgium	1	1.3
3	Canada	14	10.7
4	Mix/multiple country	10	7.6
5	China	2	1.5
6	England	2	1.5
7	Greece	1	1.3
8	India	1	1.3
9	Iran	2	1.5
10	Ireland	6	4.7
11	Israel	2	1.5
12	Japan	1	1.3
13	Korea	2	1.5
14	Netherlands	4	3.2
15	New Zealand	1	1.3
16	Saudi Arabia	5	3.8
17	Spain	1	1.3
18	South Africa	1	1.3
19	Sweden	2	1.5
20	Switzerland	3	2.3
21	Taiwan	3	2.3
22	United KIngdom	2	1.5
23	United state	46	35.1
	Total	131	100

Table 1: List of countries reported the factors and solution to ED crowding included in this review.

Factors contributing to ED crowding

The factors contribute to ED crowding have broadly categorised into patient, hospital, others, and system effects as stated at **Table 2**.

Patient (Input)
In the patient category, about 21 subcategories had been identified that lead to the factors of ED crowding. Being long wait or delay for hospital admission/triage had been reported as the highest followed by disease complexity and age of the patients. **Table 2** showed a detailed list of other subcategories for patients.

Hospital (Throughput)
In the hospital category, about 28 subcategories had been identified that lead to the factors of ED crowding. Most of study stated that insufficient place/ bed/ stretchers had been reported as the highest factor (leads to the factor of ED crowding. Followed by delay on service/ treatment/ lab/ discharge and shortage of staff, hospital resources and equipment. **Table 2** showed a detailed list of other subcategories for hospital.

Discharged (Output)
This category identified two subcategories that lead to the factors of ED crowding with the highest factor identified as inefficient planning of discharging patients, ED as 'holding unit/ long stay at ED.

Others
In this category, the subcategories are spiritual/cultural value/language while one study reported unfamiliarity with the regulations governing inter hospital transfers that led to the factor of ED crowding and changing of the hospital system.

Factor	Causes
Input (Patient): due to the volume of patients arriving and waiting to be seen	• Presentations with more urgent and complex care needs • Long waiting time or delay for hospital admission/triage • Complexity of disease and age of the patients Emergencies • No access to a primary care doctor • Poor and uninsured, medical/health insurance • Limited access to diagnostic services in primary care or community • Inappropriate use of emergency services • Unnecessary visits, "Frequent flyer" patients and non-urgent visits • Self-referral process and the number of escorts accompanying a patient • Habit/preference • Referral by a health care provider • Refused to visit Primary care/clinic
Throughput (Hospital): due to the time to process and/or treat patients'	• Insufficient place/ bed/ stretchers (leads to the factor of ED crowding. • Delay on service/treatment/lab/discharge. • Bed availability (both in the ED and in the hospital) • Shortage of staff, hospital resources and equipment • ED as 'holding unit/ long stay at ED • High number of patients • Consultation • Case-mix report • Waiting or unavailable specialist • Repeated diagnostic • Complicated study case • Closing the waiting room • Cancellation of outpatient and surgical elective cases • Increase of demand • Size of ED/hospital • The use of advanced machine • Discharge time from ED or transfer • Non-medical or injured for non-emergent care factors for admission in ED • Block access • Seasonal/ Outbreaks • Experience staff
Output (Discharge): due to the volume of patients leaving the ED	• Inefficient planning of discharging patients • Unfamiliarity with the regulations governing inter hospital transfers
Others	• Spiritual/cultural value/language • Change of hospital system

Table 2: Main causes of overcrowding

Solution of ED crowding

Whereas the solution of ED crowding is also being investigated and reviewed which it had broadly categorised into patient, hospital, system, and others as stated at **Table 3.**

Patient/Input
In the patient category, 3 subcategories had been discovered that contribute to the solution of ED crowding. Educating patients about their children's disease had been reported as the highest solution of ED crowding followed by another 2 subcategories; better financial and home care.

Hospital/Throughput
Hospital categorised had been identified as the major factor contributing for the solution of ED crowding with 29 subcategories had been identified. Most of study reported that the major solution of this situation is better ED management or access, increase hospital service (lab and others) and additional of staff. **Table 3** showed a detailed list of other subcategories for hospital.

Discharged/Output
In the system category, five subcategories are reported with the increased of hospital service system is named as the major factors contribute to the solution of ED crowding followed by the introduction to the 4h system; from the patient register to the ED until admitted or discharge from the ED. **Table 3** showed a detailed list of other subcategories for hospital.

Others
Other categories have five subcategories that associated the solution of ED crowding. Most study reports educated caregivers and adequate funding and resources for EDs will help to resolve the problem. **Table 3** showed a detailed list of other subcategories for hospital.

Factors	Solution
Patient/Input	• Home care • Better organised and active discharge planning • Educate patients about their children disease • Better financial
Hospital/Throughput	• Strengthening of the primary health care • Availability of bed • Increase hospital service (lab and others) • Internal transportation service • Adoption or revise of a triage scale/room • Additional of staff • Better management/access • Present of physician or specialist in ED • Multidisciplinary • Implement program to decrease the ED crowding • Reduce or variable time on treatment/waiting/admission • Better privacy and security within the departments • Communication • Training • Expanding clinic hours • Consider using waiting room • Reduce time of ward admission • Policy • Increased the speed of test request • Early or improving discharge of inpatients from ED or transfer to another institution • Refer patients away from ED • Redesign ED • Create protocol/guideline/plan • Targeting specific patient • Telemedicine • Improving hospital operational efficiency • Time of discharge • Improve collaboration between specialties/clinics • New technology
Discharged/Output	• Increased hospital service system • Introduction to the 4h system • Computerized short messaging service to inform care providers of patient delay • Simulation platform that runs in ED • Software or computer simulation for better ED service
Others	• Review the demands of EDs • Adequate funding and resources for EDs • Prevention of illness • Educate caregiver • Augmented continuity of care

Table 3: Solution of ED crowding.