

## Conference Paper

# Bed Management Strategy for Overcrowding at the Emergency Department: A Systematic Review

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## Abstract

ED crowding has become an emerging threat to patient safety and health systems worldwide. As the problem of ED crowding continues to evolve, it is important to see factors that influence the overcrowding at the emergency department. Hospital beds are a scarce resource and always in need. When the accident and emergency department admits a patient, there may not be an available bed that matches the requested speciality. Hence, the lack of available hospital beds has become a major difficulty, and changing bed-management policy could improve the patient flow. A systematic review conducted the PRISMA flowchart using online databases such as ProQuest and Google scholar with bed management, emergency department, overcrowding as keywords, restricting academic journals and articles published between 2003 and 2016. There are some factors associated with ED crowding. Identifying, developing and implementing strategies to improve the hold time required and other barriers would be important to improve patient flow. Changing policies for hospital bed management is worth exploring to improve hospital patient flow and LOS (Length of stay). With this insight, the hospital administration can be better equipped to devise strategies to reduce bed overflow and therefore improved patient care.

**Keywords:** bed management, emergency department, overcrowding

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Received: 17 October 2018

Accepted: 5 November 2018

Published: 5 December 2018

Publishing services provided by  
Knowledge E

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Selection and Peer-review under the responsibility of the 2nd ICHA Conference Committee.

## 1. Introduction

Emergency rooms play an important role by providing continuous access to healthcare 24 hours a day, 7 days a week, The lack of available hospital beds is a major difficulty in managing patient flow in emergency rooms (ERs). The ER patient flow competes against the flow of planned hospital admissions for the same beds and the lack of

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clearly defined policy on either prioritizing ER patient flow over planned admissions or vice versa contributes in a disordered system [1].

Overcrowding has been described as the most serious problem and most avoidable cause of harm facing the hospital systems [2]. The American College of Emergency Physicians defines overcrowding as the situation when the identified need for emergency services exceeds available resources for patient care in the ED, hospital, or both [3]. Another definition of overcrowding is the condition that exists when the demand for the emergency department services exceeds the available supply or there is an inability to move patients to inpatients area [4]. Overcrowding due to poor patient flow increases the risk for more than 500,000 patients a year in UK emergency department [5] and is linked to increased mortality [6] and reduces the capability of ED staff to anticipate surge pressures from adjacent emergency facilities.

Hospital beds are a scarce resource and therefore bed planning and allocation play an important role in the overall planning of hospital resources. When the accident & emergency department decides to admit a patient and if the allocated bed matches the specialty required, then this is an accepted case. The hospital calls this a 'contained' case as the patient is kept within the correct clinical specialty. If there is no available bed that matches the requested speciality at the point of demand then the results in bed 'overflow'.

The overflow speciality is likely to be medically not too distant from the requested specialty for better nursing care [7]. Bed management has been an issue from time to time in hospitals, but due to the increase of demand it has become more critical. In addition, bed management has become an important criterion in delivering quality and cost effective health service [8].

Bed management is the allocation and provision of beds especially in hospital where beds in specialists wards are a scarce resource [8]. The bed occupancy rate (BOR) at the hospital and especially at the speciality level, changes due to the inherent variation of supply and demand by day of the week and time of the day. The decision to allocate an overflow bed, or to let the patient wait longer at emergency department, can be a complicated one. Policies may exist as guiding principles, such as 'no waiting beyond 6 hour at Emergency department' rule. However, in practice, there are more factors to be considered, such as the extent of accident and emergency department crowding, projected demand and supply (for example, planned discharges) [7].

Therefore, it is essential to understand the cause of overflow in order to provide an effective and efficient service to reduce bed overflow and therefore improved patient care in the hospitals.

## 2. Methods

### 2.1. Data source

This study is a systematic review using PRISMA flowchart, the data source are online databases such as ProQuest and Google scholar with bed management, emergency department, overcrowding as the keyword and with restrictions academic journals and articles from 2003–2016.

### 2.2. Search strategy

In ProQuest the authors searched the following keyword 'bed management' with no year restriction, resulting in 1972 articles found. The first restrictions is *academic journals* because the scientific articles which presented research results, written by researches and aimed for academic readers. The articles must have been reviewed by experts within the same subject area before publication. From the first restriction, there are 472 articles found. The next, period or time restriction is applied, choosing only articles that have been published during 2003 – 2016 and there are 454 articles found, the authors take the last 13 years to limit the time span of the study. Author also add a subject and classification restriction, resulting in 49 articles. For eligibility we add a second keyword into '*bed management*' AND '*overcrowding*' to filter all the journals thus getting closer to the title and research purpose, so the authors get the final result for 18 articles. The detailed selection process was described in Figure 1.

## 3. Results

In the research conducted by Morri, Boyle, Beniuk and Robinson in United Kingdom (UK), it is found that the largest cause of crowding is the flow of patients into the department. This is influenced by the volume and nature of the demand. The time based 4 h standard in the UK has also probably increased flow into ED's, by making access more available. Shortage of nurses, junior medical staff and specialty doctors impact heavily on crowding [9]. Another cause for non-availability ED beds is because admitted patients waiting for transfer from the ED to inpatient units then become restrict the EDs capacity to accept new arrivals and consume Ed's resources [10].

The negative consequences of ED crowding such as delays in diagnosis and access can result in unnecessary death and disability. Crowding can also lead to delays in the

TABLE 1: Results of selection process.

No.	JOURNAL TITLE	AUTHORS	METHODS	VARIABLE	ANALYSIS	RESULTS
1.	Consequences for overcrowding in the emergency room of a change in bed management policy on available in hospital beds, Australia (2016)	Claret, Pierre-Graud Boudemaghe, et al	Computerized simulation & observational descriptive study	Number of patients per day who had to wait for a bed in the ER	1. This computerized simulation Estimate the number of patients waiting for a hospital bed on each day. 2. At the observational study found the correlation between the LOS in the ER and the hospital bed occupancy rate.	1. From 5388 patients were admitted to the ER during the month of January 2013 there are 307 patients had to wait in the ER bed waiting area for a hospital bed to become available. 41 were surgical patients and 266 were medical patients. This represented an average approximately 10 patients per day. 2. 10% increase of BOR induces 18 minutes in ER average waiting time and have a longer LOS
2.	Emergency department crowding: towards an agenda for evidence-based intervention, UK (2011)	Morris, Z. S. Boyle, A. Beniuk, K. Robinson, S.	Conceptual synthesis approach (systematic review)	Impact, causes and consequences from ED crowding	Determine the causes & synthesise existing knowledge around the problem of emergency department (ED) crowding	The largest cause of crowding is the flow of patients into the department. Other factors are associated with crowding are poor physical design & shortage of physical space equipment and computers, difficulties in accessing medical notes, tests, results and ancillary services and time spent on discharging or arranging follow up appointments.
3.	A Bed Management Strategy For Overcrowding in the Emergency Department, USA (2012)	Barrett, Lynn Ward-Smith, Peggy	Retrospective review	Patients wait time from ED to transferred to other unit	The average time from ED arrival to discharge is decreased	Decreasing the wait time allows the ED to care for another patient, decreased mortality rate from 2,9 in 2009 to 2,2 in 2010. Decreasing the wait time for inpatient bed improved 1% of patient satisfaction and increased revenue.

No.	JOURNAL TITLE	AUTHORS	METHODS	VARIABLE	ANALYSIS	RESULTS
4.	The Relationship Between Emergency Department Crowding and Patient Outcomes: A Systematic Review, USA (2014)	Carter, Eileen J Pouch, Stephanie M Larson, Elaine L	Systematic review	Patient health outcomes	<ul style="list-style-type: none"> <li>ED crowding is associated with higher rates of inpatient mortality among those admitted to the hospital from the ED and discharged from ED to home.</li> <li>ED crowding is associated with higher rates of individuals leaving the ED without being seen by care provider</li> </ul>	<ul style="list-style-type: none"> <li>Based on 3 international studies, the relationship between ED crowding and patient 30 day mortality was significantly 1,26 greater among paediatric patients with confidence interval 1,02–1,59.</li> <li>From the five studies that examined the relationship between ED crowding and rates of patients leaving ED without being seen by care provider ranged from 213 to 14.170 and reported a positive correlation between ED crowding measures and patients leaving the ED prior to receiving care.</li> </ul>
5.	The probability of patients being admitted from the emergency department is negatively correlated to in-hospital bed occupancy – a registry study, Sweden (2014)	Blom, Mathias C Jonsson, Fredrik Landinolfsson, Mona Ivarsson, Kjell	Retrospective descriptive study	Bed occupancy	<ul style="list-style-type: none"> <li>On the crude analysis, the admitted fraction as smaller in strata of increasing in hospital occupancy. The admitted fractions were 31.5%, 30.9%, 29.9%, and 28.7% for levels in hospital occupancy &lt; 95%, 95–100%, 100–105% and &gt;105%.</li> <li>The odds ratio after been adjusted for admission was decreased being 0,88 for occupancy level 95–100%, 0,82 for occupancy level 100–105%, and 0,74 for occupancy level &gt; 105% relative to the odds ratio for occupancy level &lt; 95%</li> </ul>	<ul style="list-style-type: none"> <li>Both crude and the adjusted analysis revealed a negative association between in-hospital occupancy and the odds ratio of patient admission.</li> <li>High in hospital occupancy is associated with decreased odds ratios For admission of patients presenting in the ED</li> <li>Physicians admit patients who could be managed safely in the outpatient setting.</li> </ul>

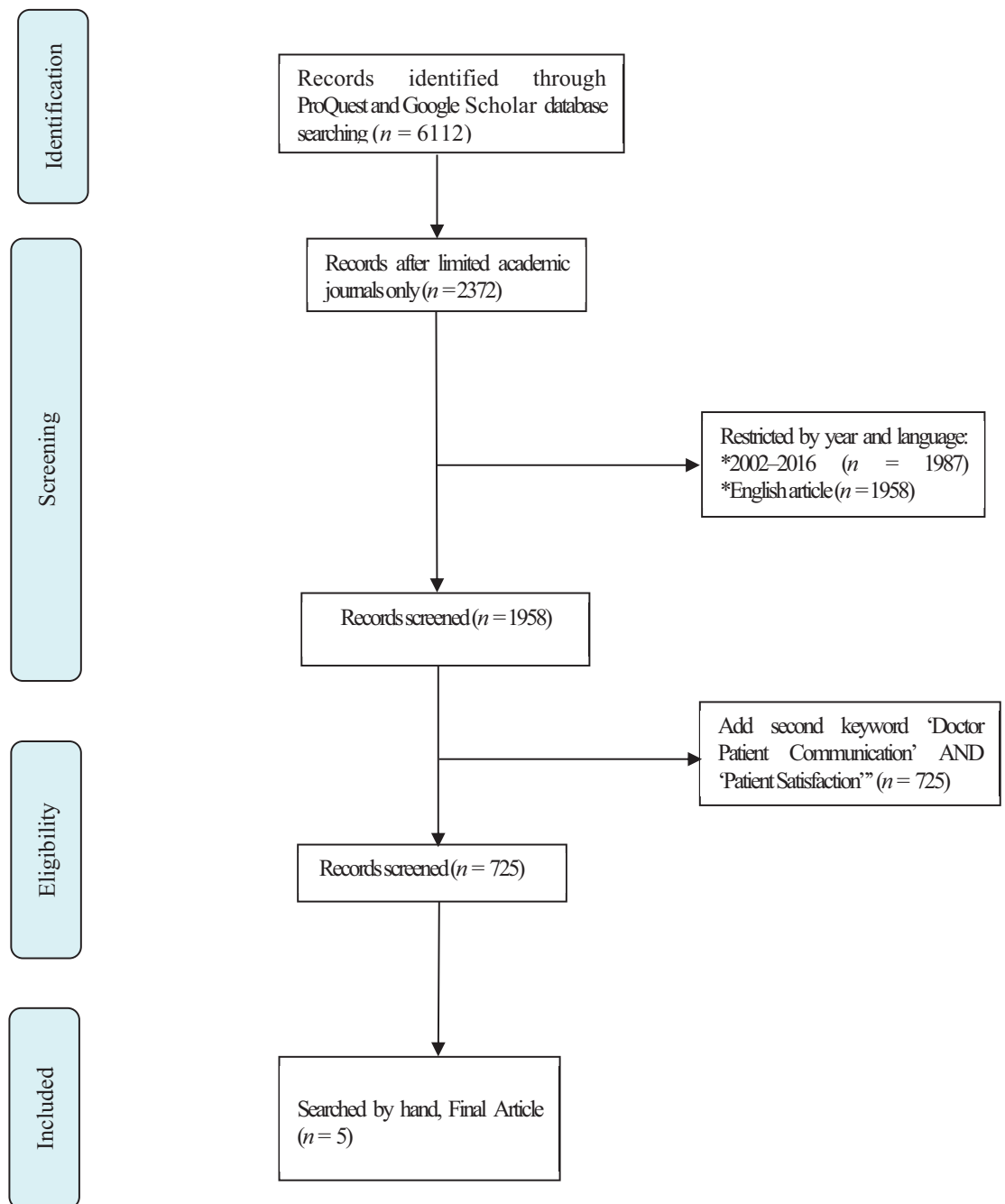


Figure 1: Flow chart of study selection.

administration of antibiotics and thrombolytic, and increase errors such as mislabelling radiology and pathology request forms [9].

A systematic review literature by Barret, Ford and Ward-Smith in United States of America (USA) reported that 30 – day mortality was significantly greater among paediatric patients exposed to ED – crowding. In other retrospective stratified cohort study, authors reported that the risk of 10-day inpatient mortality for patients admitted

to the hospital via the ED during crowding periods was 34% higher compared to those admitted during non-crowding periods [11].

Improving policies for better hospital bed management is a major concern, especially to limit ER overcrowding. An observational study in 2003 found a strong correlation between the LOS in the ER and the hospital bed occupancy rate (Forster et al., 2003). Indeed, a slight increase in the bed occupancy rate (10%) induces 18 minutes increase in ER average waiting time (12–24 min) [1].

On the study consisted of a computerized bed management simulation based on day-by-day data collected from 1 to 31 January 2013 in a teaching hospital, included 2347 patients proved that the least efficient was the one that gave priority to emergency patients presenting with a medical condition. The scenario that exhibited the best efficiency was the one that gave priority to planned admissions and surgery [1].

The study by Barret, Ford and Ward-Smith said that the need to address overcrowding in the ED is hypothesized timelessness of the care provided, patient satisfaction, and the productivity of the ED staff. Based on 12 months data from 2010 of 10,967 patients in Kansas City a bed management strategy showed the majority of this time decrease 113 minutes occurred in the wait for an inpatient bed, once the decision to admit was made. At this hospital, the overall risk-adjusted mortality rate decreased from 2,9 in 2009 to 2,2 in 2010 correlated from the wait time to be transferred from EDn inpatient. Between 2009 and 2010, patients satisfaction scores improved by an overall composite score of 1%. Decreasing the wait time also allows the ED to care for another patient, an additional of 2.936 patients. Increasing the number of patients seen by 2936 in 2010 had the potential to increase the hospital revenue. During the same time, the overall hospital mortality decreased by 0.07% and patient satisfaction scores improved 1% [11].

Another study by Blom, Jonsson, Landin-Olsson and Ivarsson stated that there is association between emergency department (ED) overcrowding and poor patients outcomes, where in-hospital occupancy is associated to the probability of patients being admitted from the ED. The data was taken from Helsingborg General Hospital in southern Sweden, said that in-hospital occupancy was significantly associated with the decreases odds ratio for admission in the study population. From 118,668 visits included, the admitted fractions were 31.5%, 30.9%, 29.9% and 28.7% for levels in hospital occupancy < 95%, 95–100%, 100–105% and > 105%.

## 4. Discussion

There are five factors associated with ED crowding: diversion, boarding, the increase of patients leaving without treatment, higher than usual waiting times [12]. These factors can be used to determine when an emergency department is crowded and to distinguish periods of crowding from periods of excess patient volume resulting in congestion.

Changing policies for hospital bed management are worth exploring to improve hospital patient flow and LOS. Downstream bed management is only one of the factors for potentially improving the overall organization function. Other factors include the need to reorganize channels upstream and strengthen the internal organization of ER's.

It is critical to advancing practice to understand what is feasible and acceptable in the context of ED crowding, and using this to change practice in a deliberate and considered way.

Improving the hold time required for transfer to an inpatient bed is one intervention toward improving the care provided in an ED. Identifying, developing, and implementing strategies to improve other barriers is warranted.

ED crowding is associated with higher rates of inpatient mortality among those admitted to the hospital from the ED and discharged from the ED to home. ED crowding is also associated with higher rates of individuals leaving the ED without being seen.

The association between in-hospital occupancy level and decreased probability for admission is supported by the findings of physicians among at reducing admissions when in hospital beds are scarce.

## 5. Conclusion

ED crowding is an important issue in today's health care system. Because the need for health care services is expected to increase as the population continues to age, the issue of ED crowding will become even more important.

ED crowding also plays an important role in increasing the mortality rate and also the medical error. In this review author hope that we can reduce the ED crowding by knowing the bed management system very well to avoid major incident.

The collaboration between clinicians and managers, optimized patient flow more efficient and to reduce hospital admissions, support earlier discharges, and prevents



from the unnecessary transit of patients from home to hospital to avoid overcrowding in ED's.

With this insight, the hospital administration can be better equipped to devise strategies to reduce bed overflow and therefore improved patient care.

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