

Adverse effects of overcrowding on patient experience and care

John Collis presents the findings of a systematic literature review of how the number of people in emergency departments affects service delivery

Summary

There has been much investigation into the causes and management of overcrowding, but little about how it affects care delivery. The author therefore undertook a systematic literature review of the subject. This revealed that diverse areas of care are affected by overcrowding, and confirmed its adverse effects on patient experience and care.

Keywords

Overcrowding, patient care, literature review, patient flows, communication

EMERGENCY CARE staff around the world, including those who work to waiting-time operational standards, must sometimes cope with excessive patient numbers.

The causes and effects of overcrowding in emergency departments (EDs) have been examined and attempts have been made to predict or model the phenomenon (Rossetti *et al* 1999, Hoot and Aronsky 2006, Hoot *et al* 2008, Wargon *et al* 2009). Yet there appears to be no single definition of a crowded or overcrowded ED (Hwang and Concato 2004, Hoot and Aronsky 2008). As the American College of Emergency Physicians (ACEP) (2006) states, its causes are 'multifactorial and span the entire healthcare system'.

Hwang and Concato (2004) identify 23 different definitions of overcrowding. Of these, eight (35 per cent) relate to conditions, such as staff perceptions of overwork and a lack of beds and trolleys, that are specific to EDs; 11 (48 per cent) relate to conditions, such as staff shortages and a lack of inpatient beds, that are specific to hospitals; and one (4 per cent) relates to conditions, such as periods of ambulance diversion, that are external to hospitals. The remaining three (13 per cent) definitions relate to combinations of these conditions.

These findings confirm the suggestion that overcrowding occurs 'when the identified need for emergency services exceeds available resources for patient care in the emergency department, hospital, or both' (ACEP 2006).

The American College of Emergency Physicians (2006) claims that overcrowding prevents patients from being treated in appropriate clinical areas and causes them to remain in EDs unnecessarily or leave before their treatments are complete.

Research by Coughlan and Corry (2007) suggests that relatives, as well as patients, are affected by ED overcrowding. Meanwhile, Hoot and Aronsky (2008) suggest that overcrowding hinders care delivery, while King *et al* (2006) state that it can raise 'serious concerns about the safety of care within the emergency department'.

Systematic review

Preparation The author decided to undertake a systematic review of the literature on the effects of overcrowding to discover how working systems can be improved to reduce the phenomenon, and thereby to improve patient experiences and staff morale.

The aims of the review were to:

- Identify, evaluate and summarise published studies of the effects of overcrowding in EDs on patient care and patients' relatives.
- Identify how patients' experiences can be improved.
- Identify where further research into the subject is needed.

The review was undertaken using a meta-analysis technique, which aims to reduce bias by 'the systematic identification, appraisal, synthesis and statistical aggregation of all relevant studies

on a specific topic according to a predetermined and explicit method' (Moher *et al* 1999).

The search was conducted on electronic databases, access to which was provided by Loughborough University, the RCN and University Hospitals of Leicester NHS Trust, and by searching the internet using Google Scholar.

Three electronic databases were searched for influential articles published between 2003 and 2009: the British Nursing Index, CINAHL and Medline. The search term was 'emergency department or accident and emergency or A&E and overcrowding or crowding' and the search fields were titles or abstracts published between 2003 and 2009. A total of 516 citations were produced.

The more general search using Google Scholar with the same search term and fields produced 4,480 citations. Some of these had already been produced by the database search while some were unrelated to the subject. Additional studies were identified by examining the reference lists of those found in the first two search methods.

Inclusion criteria included:

- Primary research on the effects of crowding in hospital emergency departments between 2003 and 2009.
- All research designs.
- English language publications.
- Articles with full text access.

Exclusion criteria included:

- Studies set in other emergency care facilities, such as NHS walk-in centres or urgent care centres.
- Editorials, commentaries and case reviews.

Descriptive statistics were provided with odds ratios calculated for each dichotomous variable and reported using confidence intervals of 95 per cent. Medians, means and ranges were determined for populations.

Findings The search from all sources produced 21 relevant citations. After a further review, three of these citations, namely an editorial summary by Hollander and Pines (2007), an article on the possible causes rather than the effects of overcrowding by Jayaprakash *et al* (2009), and an editorial by Mah (2009), were rejected because they failed to meet the inclusion criteria.

Of the 18 remaining studies, which are described in Table 1, 14 had been identified in the database search; two, by Schull *et al* (2004) and Sprivulis *et al* (2006), had been found in reference lists; and two, by Mitchell *et al* (2009) and Liu *et al* (2009), had been found in searches of publication websites.

Thirteen of the studies originated in the US, two in Australasia, two in Canada and one in the Republic of Ireland, all countries in which there is no limit on patient waiting times in EDs before assessment, treatment and either admission or discharge.

Sixteen of the studies are quantitative. Of the other two, one, by Coughlan and Corry (2007), is a qualitative and descriptive study and the only one to originate in Europe. The other, by Pines *et al* (2007b), is a prospective cross-sectional study. Eight studies are based on data from single centres, the rest on data from many centres, all in urban hospitals.



Overcrowding in emergency departments can hinder care delivery and raises concerns about patient safety

Table 1 Characteristics of the 18 articles included in the final review

Subject	Author	Country	Study type	Duration	Patient population	Number given analgesia
Pain and pain management	Hwang <i>et al</i> (2006)	US	Retrospective	12 months	158	82*
	Hwang <i>et al</i> (2008)	US	Retrospective	Two one-month periods	1,068	NA
	Mills <i>et al</i> (2009)	US	Retrospective	Nine months	976	649
	Mitchell <i>et al</i> (2009)	Australasia	Retrospective	11 months	254	232
	Pines and Hollander (2008)	US	Retrospective	18 months	13,578	6,746
Cardiac events	Diercks <i>et al</i> (2007)	US	Observational	21 months	42,780	NA
	Pines <i>et al</i> (2009)	US	Retrospective	Seven years	4,574	NA
	Schull <i>et al</i> (2003)	Canada	Retrospective	Two four-month periods	3,609	NA
	Schull <i>et al</i> (2004)	Canada	Retrospective, observational	Three years	3,452	NA
Administration of antibiotics for pneumonia	Fee <i>et al</i> (2007)	US	Retrospective	18 months	344	NA
	Pines <i>et al</i> (2006)	US	Retrospective	One year	24 hospital sites	NA
	Pines <i>et al</i> (2007a)	US	Retrospective	Four years	694	NA
Mortality and morbidity	Liu <i>et al</i> (2009)	US	Retrospective	Three days from a six-month period	151	NA
	Sprivulis <i>et al</i> (2006)	Australasia	Retrospective	Three years	62,495	NA
Patient experience	Coughlan and Corry (2007)	Ireland	Qualitative, descriptive	–	Four patients and three relatives	NA
	McCarthy <i>et al</i> (2009)	US	Retrospective	One year	235,928 across four hospitals	NA
	Pines <i>et al</i> (2007b)	US	Prospective, cross-sectional	Five weeks	644 patients, 703 doctors, 716 nurses	NA
	Pines <i>et al</i> (2008)	US	Retrospective, cohort	Four years	1,501 hospitalisations concerning 1,469 patients	NA

Overcrowding factors	Result
Number of patients in the emergency department (ED) as a proportion of available beds.	When EDs are at more than 120 per cent capacity, pain assessments may not be documented.
Census, number of patients waiting in hallways, or 'boarders', and boarding burden.	As the number of boarders increases, oligoanalgesia becomes more likely.
Bed-occupancy rate and numbers of waiting patients, boarders and total patient-care hours.	Overcrowding increases the time to analgesia.
Total patient-care hours.	No significant correlation between overcrowding and delay in the time to analgesia was found.
Bed-occupancy rate and numbers of waiting patients and hours spent on patient care.	Overcrowding delays in the provision of analgesia.
Length of stay.	Long ED stays are associated with decreased use of guidelines and higher mortality rates
Bed-occupancy rate, average length of stay, and numbers of waiting patients, boarders and patient-care hours.	Overcrowding is associated with poor treatment outcomes in patients admitted with chest pain.
Ambulance diversions.	Overcrowding is associated with delays in transport of patients with chest pain.
Ambulance diversions.	Overcrowding is associated with delays in thrombolysis in patients with acute myocardial infarction.
Number of patients in the ED.	Overcrowding is associated with delays in the administration of antibiotics.
Length of stay.	Overcrowding is associated with delays in administration of antibiotics for pneumonia but not in percutaneous intervention for acute myocardial infarction.
Total patient-care hours.	Overcrowding is associated with delays in administration of antibiotics.
Number of boarders.	Overcrowding increases the frequency of undesirable events.
Hospital occupancy and blocking of access.	Overcrowding is associated with a 30 per cent increase in mortality.
Length of stay of more than 12 hours.	As lengths of stay rise, patients become dissatisfied.
Waiting-room, treatment and boarding times, and clinical inpatient occupancy rate.	Overcrowding is associated with timeliness of care in the ED.
Bed-occupancy rate, waiting-room time, total patient care hours, ED census, waiting-room census and boarders.	Overcrowding is associated with a perception that emergency care has been compromised.
Waiting, boarding and ED treatment times, and hallway placement.	Overcrowding is associated with patient dissatisfaction.

* from 128 patients, NA = not applicable

None of the studies originated in the UK, where, until recently, the Department of Health (DH) (2000, 2001) imposed an ED waiting-time standard of four hours from arrival to admission, transfer or discharge.

The 18 studies, which concern more than 350,000 patients, examine the effects of overcrowding on:

- Pain and pain management.
- Cardiac events.
- Administration of antibiotics for pneumonia.
- Morbidity and mortality.
- Patient experience.

Discussion Coughlan and Corry (2007) examine the experiences of patients and their relatives in an overcrowded ED, citing, for example, how one patient waited in the ED for five days before being admitted to a ward. The authors conclude that people were generally dissatisfied with their experience of the ED.

The authors acknowledge, however, that their findings are based only on the experiences of participants during their participation, and so cannot be applied generally. They also state that the study population was smaller than they had wished, indicating that data saturation was probably not achieved, and that bias in the results cannot be ruled out because some of the population may have been prompted to participate by their own experiences of long waits in EDs (Coughlan and Corry 2007).

Most of the studies ($n=13$) took place in the US, where hospitals must meet care-quality targets to ensure they receive full payment under the social insurance programmes that provide health coverage (Joint Commission Organization (JCO) 2010).

Three US studies concern JCO (2010) standards for the administration of antibiotics in the treatment of pneumonia, which at the time the studies were carried out should have been undertaken within four hours of patient arrival, and two US studies concern JCO (2010) standards for percutaneous intervention for ST-elevation myocardial infarction or new left-bundle branch block, which should be undertaken within 90 minutes of patient arrival.

The studies show that these interventions can be delayed or omitted due to overcrowding. Because these metrics are used to determine hospital performance, the reputation and income of the hospitals concerned, and their ability to treat patients in the future, are adversely affected.

It should be noted that, since the studies concerning the treatment of pneumonia were published, the JCO (2010) standard has been extended from four to six hours from patient arrival.

The study by Pines *et al* (2006), which is included in the pneumonia studies in Table 1, considers how overcrowding affects timings for pneumonia antibiotic administration and percutaneous interventions for myocardial infarction. Both metrics are used to determine hospital performance.

Four of the 13 US studies show that overcrowding affects pain and pain management adversely, in contrast to an Australasian study by Mitchell *et al* (2009), which finds no correlation between overcrowding and pain management, possibly due to the importance attached to pain management in Australian EDs.

Eleven of the 13 US studies are retrospective. Of the other two, one, by Pines *et al* (2007b),

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is a prospective and cross-sectional study of how overcrowding affects the quality of care delivery. It is based on the opinions of a sample population of more than 2,000 patients, physicians and nurses, recorded over five weeks.

The other, an observational study by Diercks *et al* (2007), suggests that the outcomes of cardiac-event interventions in EDs are related to the degree of overcrowding, which in turn depends on how overcrowding is measured.

The study also shows that, as patients remain in EDs, staff compliance with guideline treatments worsens while morbidity rates increase.

The two Canadian studies, by Schull *et al* (2003, 2004), suggest that overcrowding occurs when ambulances are diverted to other EDs, and that there are delays in transportation for patients with potential cardiac problems or in thrombolysis for patients with acute myocardial infarction, perhaps because of increased travelling times.

Two studies, one from the US and one from Australia, provide evidence that overcrowding increases mortality and morbidity rates among patients who are admitted from EDs.

Limitations This review has some limitations, particularly in its application to the UK, in that all of the studies included originated from only four countries, while seven originated from the same facility in the US.

Conclusion

This review was undertaken to find and present evidence that overcrowding in EDs can have detrimental effects on the care given to patients.

Evidence from Australia, Canada, the Republic of Ireland and the US indicates that overcrowding affects patient care by delaying treatment, impeding pain management and increasing mortality and morbidity.

To reduce overcrowding in EDs, working practice may have to be modified. Coughlan and Corry's (2007) suggest, for example, that communication between patients and staff can be improved by allocating a medical practitioner and a registered nurse to each group of about five patients. This would give doctors and nurses single points of contact with patients and so should ensure the prompt delivery of treatment.

Emergency department staff should examine their practices to ensure that patients can be located at all times. This may involve changing how EDs display information.

Meanwhile, a systemic review of patient flows should be undertaken in each hospital to prevent overly long stays in EDs due to lack of suitable beds, particularly in light of the imminent abandonment of the four-hour operational standard in England.

New hospitals and facilities such as radiology, to which emergency patients are often referred, may be needed to allow more people to attend EDs.

Finally, it is recommended that research is undertaken in the UK into the effects of overcrowding on patient privacy and dignity.

Online archive

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This article has been subject to double-blind review and has been checked using antiplagiarism software

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