

Overcrowding and possible solutions for a busy paediatric emergency department

Muhammad Irfan Habib,¹ Khalid Mehmood Khan²

Abstract

Objective: To quantify the extent of emergency department overcrowding in a tertiary care hospital and to identify possible solutions.

Methods: This retrospective study was conducted at the National Institute of Child Health, Karachi, and comprised data of all patients presenting to the emergency department from November 2014 to January 2015. Data was collected through the health management information system which generates daily report of patients. Patients who stayed at the emergency department for 4 or more hours were included.

Results: Of the 6,505 patients, 2,757(42.38%) were discharged straightaway while 2,555(39.27%) were admitted to different wards and subspecialties. Besides, 934(14.35%) patients left the department against medical advice, 147(2.25%) expired, 89(1.36%) were referred to other hospitals, 20(0.30%) were dead on arrival and 3(0.04%) left without being seen by a physician. Of those who were admitted, 1,049(41%) patients stayed for more than 10 hours before getting the main hospital bed. Mostly, the delays observed were due to delay in getting lab reports, already preoccupied ventilators and incubators in paediatric and neonatal intensive care units, not using checklist for proper re-assessment of patients and early discharge, overburdened by patients coming in just for nebulisation and intravenous or intramuscular medications, the admitting residents detain the unstable patient longer in emergency department before admission to wards.

Conclusion: The emergency department of the hospital faced significant overcrowding which overwhelmed efficient standard care.

Keywords: Overcrowding, Emergency department. (JPMA 67: 1398; 2017)

Introduction

Emergency department (ED) overcrowding is a serious and growing problem throughout the world. ED crowding has become a major barrier in providing timely emergency care in the United States.^{1,2}

Patients who present to EDs often face long waiting times to be treated, and those who require admission have even a longer wait for an inpatient hospital bed.³ The United States is not alone in the overcrowding problem. In Canada, the issue of overcrowding in "accident and emergency rooms" is a serious national issue⁴ and a recent study used an expert panel to identify factors that were deemed key determinants of ED crowding.⁵ In Australia, ED overcrowding has resulted in ambulance diversions from hospitals in Sydney.⁶ Other countries, including Great Britain and Taiwan, have also reported overcrowding.⁷

Reasons for overcrowding in ED are numerous.⁸ Recently, the American College of Emergency Physicians' (ACEP) crowding resources task force adopted the definition of

ED crowding to be "a situation in which the defined need for emergency services outstrips available resources in the ED."⁹ This situation occurs in hospital ED's when there are more patients than staff and ED treatment beds, and waiting times exceed a reasonable period. Overcrowding has led to a number of problems, including prolonged waiting times, stress and aggressive behaviour of the attendants, increased suffering for those in pain, unpleasant therapeutic environments, and, in some cases, poor clinical outcomes.⁸

The EDs are structured to evaluate and manage patients for a couple of hours.¹⁰ Patients without serious illnesses are discharged and 30%-40% of patients found to have serious illnesses are admitted to the hospital. It can take approximately an hour to transfer the patient to a hospital bed. When the delay in transfer of admitted patients from the ED to the hospital bed is longer than 4 hours, this is classified as overcrowding. When this happens, the ED becomes gridlocked. In our ED, which is a major teaching hospital in Pakistan, the prolonged stay of a large number of patients has been the major problem encountered in daily practice. The scenario is prevalent not only in our hospital, but also in other hospitals in the country. Because ED crowding is a reflection of supply and larger

¹Child Life Foundation, ²National Institute of Child Health, Karachi.

Correspondence: Muhammad Irfan Habib. Email: dr.irfanhabib@gmail.com

demand mismatches in the health care system, the problem cannot be resolved by examination of the ED in isolation. The current study was planned to analyse some of the specific causes of overcrowding and possible solutions. By analysing the duration and causes of prolonged stay, we attempted to better delineate the problem and propose possible solutions. The data may be helpful in persuading hospital administrators to adopt necessary changes to improve the quality of ED patient care.

Patients and Methods

This retrospective study was conducted at the National Institute of Child Health (NICH), Karachi, and comprised data of all the patients presenting to the ED from November 2014 to January 2015. Data was collected through the Health Management Information System (HMIS) that generates daily reports. The study was approved by the institutional ethics committee with a waiver of the requirement for informed consent.

The NICH ED sees around 170,000 patient visits and is the hub of residency training programme for general paediatrics.

The ED is supported by the Child Life Foundation, a non-governmental organisation (NGO). It is the first public-sector emergency department in the country with a well-established triage system to filter the patients according to severity of condition and urgency of need. It has a separate resuscitation room for critically ill or level-1 patients.

The ED is staffed by full-time senior registrars who have successfully cleared their Fellowship of College of Physicians and Surgeons Pakistan (FCPS) part-2 in paediatrics. Then there are on-call rotating senior residents from paediatric medicine training programme, paediatric surgery, paediatric intensive care unit (PICU), neonatal intensive care unit (NICU) and paediatric nephrology. They are responsible for providing treatment and admitting patients into wards with the backup support of senior registrar.

More than 90 percent of patients who visit NICH's ED every year are from lower and lower-middle income households. They cannot bear the full cost of their treatment in any private hospital. To support their treatment free of cost, the Child Life Foundation along with NICH is endeavouring to fulfil the demands in order to deliver best possible medical care to these underprivileged people.

Only those patients whose stay at the ED was prolonged, i.e. they stayed there for 4 or more hours, were included.

We used the HMIS for the study. HMIS records the date and time of registration for each ED visit. Patients are registered as soon as they enter the department after being triaged; therefore, the registration time identifies their time of arrival in ED. The HMIS also generates daily report of patients whose stay is longer than 4 hours in the ED and the specialty under which they are admitted or are discharged for home treatment. All charts of such patients were reviewed and the reasons for the prolonged stay were abstracted from the ED charts.

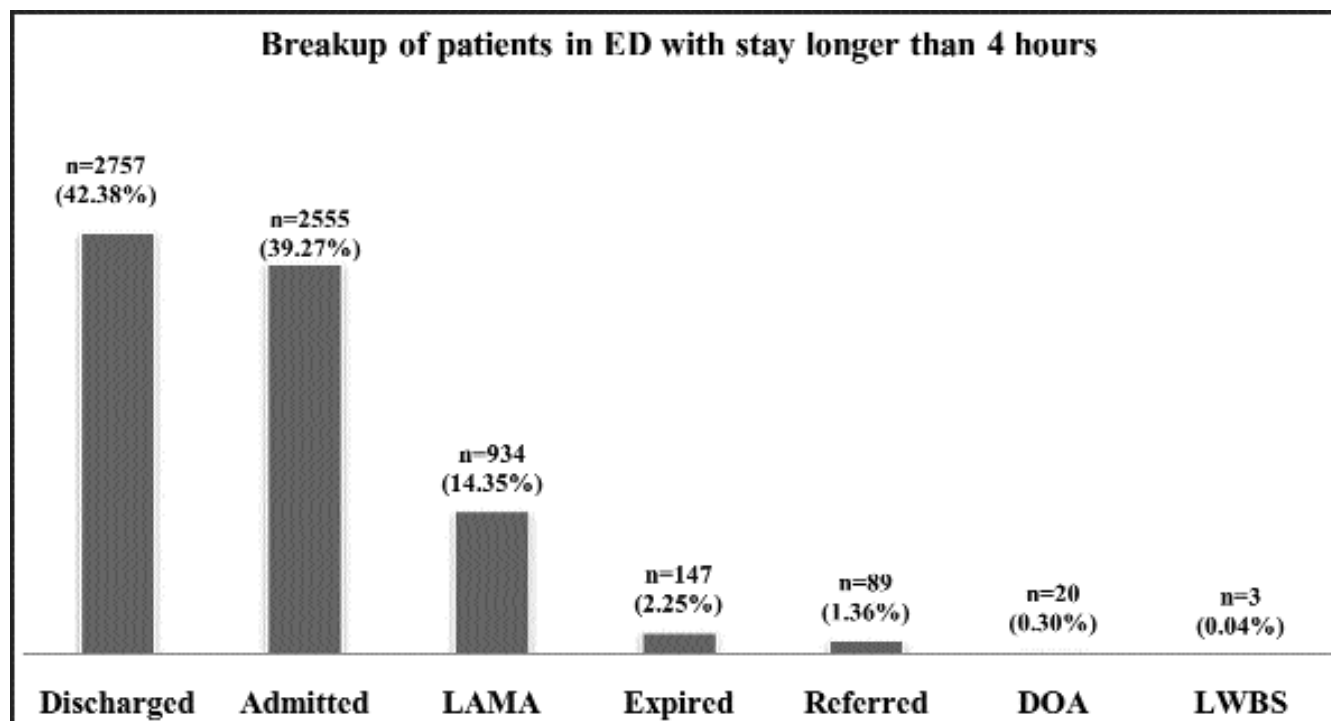
The data was extracted from patient's assessment and treatment record sheet being used. A single reviewer performed chart review and data collection in a non-blinded manner using the physician reports from the ED record. Demographic data, including age and gender, was recorded. Explicit criteria for clinical data were defined before chart review and included patient's disposition and the reasons for delay. The former included (a) Admission to hospital, (b) discharged home, (c) transferred to other facility, (d) left against medical advice, (e) expired in ED, and dead on arrival. Further subdivisions of level-1 or patients who needed resuscitation were noted.

1. The reasons for delay observed and discussed with administration and organisation's reformers included: (a) unavailability of beds, incubator and ventilator for patients planned to be admitted to the hospital, (b) unnecessary hold of critically ill patients in ED by the admitting residents for further stabilisation, (c) delays in service provided by laboratory, and ancillary services, and shortage of staff, (d) flow of patients coming for only intravenous (IV) or intramuscular (IM) medications and for nebulisation from home or being referred from main consulting clinic of hospital, and (e) no proper provision available for reassessment of patients in ED, especially during step-down process to other non-critical areas or to decide for early discharge or disposal from ED.

The data was compiled in the form of statistical graphs through Microsoft Excel (version 2010).

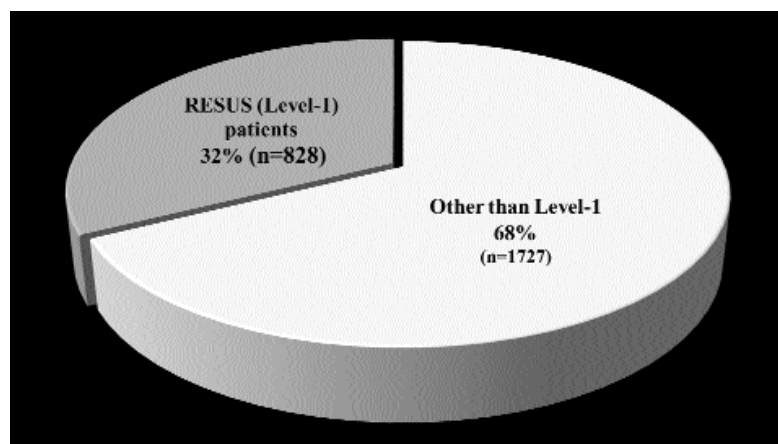
Results

Of the 40,569 patients, 6,505 (16.03%) stayed in the ED for more than 4 hours. Of them, 2,757 (42.38%) were discharged straight away from the ED, while 2,555 (39.27%) were admitted into different wards and subspecialties of the hospital. In addition, 934 (14.35%) left against medical advice (LAMA), 147 (2.25%) expired, 89 (1.36%) were transferred to other hospitals (referred), 20 (0.30%) were already dead on arrival (DOA) and 3 (0.04%) left without being seen (LWBS) by a physician (Figure-1).



ED: Emergency department. LAMA: Left against medical advice. DOA: Dead on arrival. LWBS: Left without being seen.

Figure-1: Disposition of ED patients with stay longer than 4 hours during the study.



PICU: Paediatric intensive care unit. NICU: Neonatal intensive care unit. RESUS: Resuscitation.

Figure-2: Percentage of Level - 1 or critically ill patients who need PICU/NICU and stay of > 4 hours.

Of those patients who were admitted to wards or different sub-specialties and stayed in the ED for more than 4 hours, 828(32.4%) were triaged as level-1 or critically ill patients who needed PICU/NICU care (Figure-2).

Moreover, in 1,049(41%) patients for whom admission had been decided in the main hospital beds upstairs, the

length of stay was more than 10 hours in ED before getting that admission (Figure-3).

Of those who were discharged with stay of more than 4 hours in the ED, the most common age groups were: 931(33.76%) neonates (aged less than 28 days), 711(25.78%) infants (28 days - 12 months), 683(24.77%) were aged 1-5 years, and 432(15.66%) were aged above 5 years. Thus, 2,325(84.33%) patients were aged below 5 years (Figure-4).

Similarly, of those who stayed for more than 4 hours in ED before getting hospital bed, the most common age groups were: 850(33.26%) infants (aged 28 days - 12 months), followed by neonates (less than 28 days) 719(28.14%), patients between the age of 1 and 5 years 572(22.38%), while 414(16.2%) patients were more than 5 years old. Therefore,

2,141(83.79%) of the admitted patients were aged below 5 years (Figure-5).

Of all, 11,723(29%) patients were documented as level-5 according to the emergency severity index(ESI) or having least urgent complaints coming in ED after the main

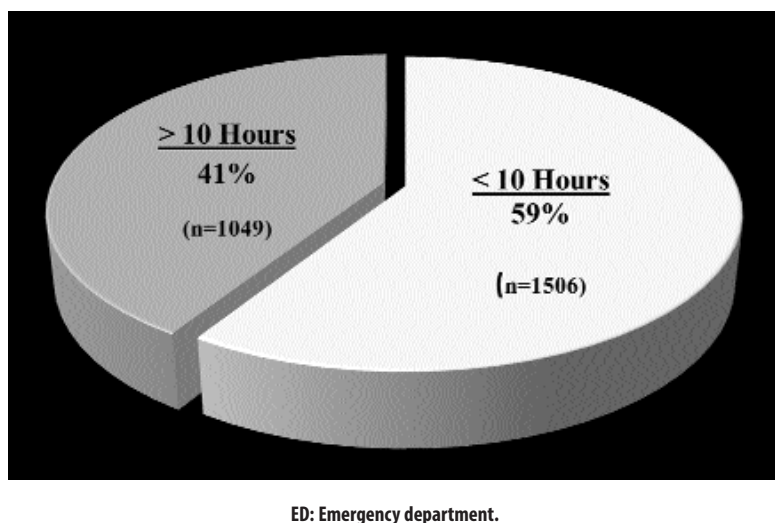


Figure-3: Length of stay of admitted patients in ED to the main hospital bed.

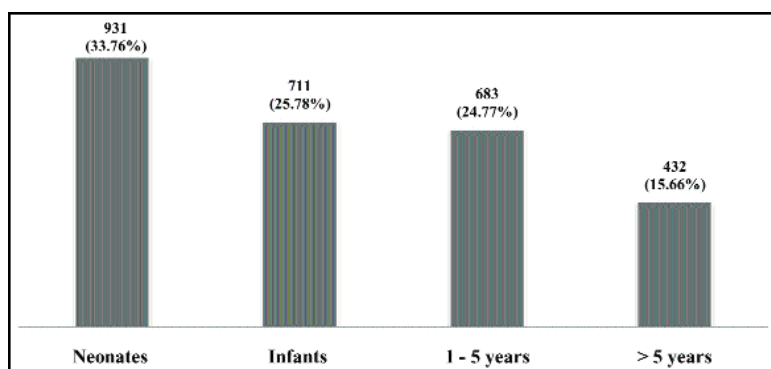


Figure-4: Age Distribution of patients discharged in more than 4 hours.

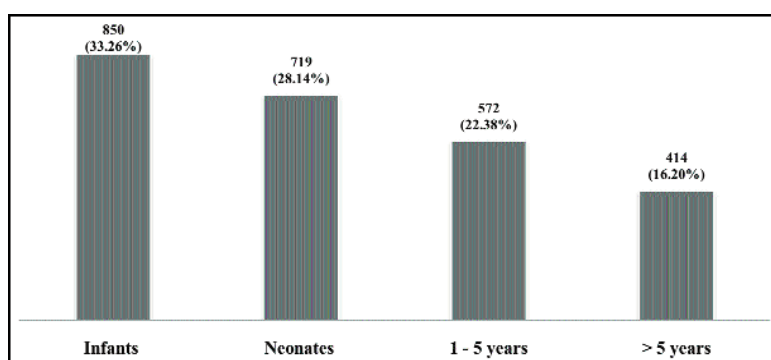


Figure-5: Age Distribution of patients admitted in more than 4 hours.

consulting clinic of the hospital get closed at noon (Figure-6).

Moreover, 2,174(5.35%) patients came in just for nebulisation, IV or IM medications either from home or

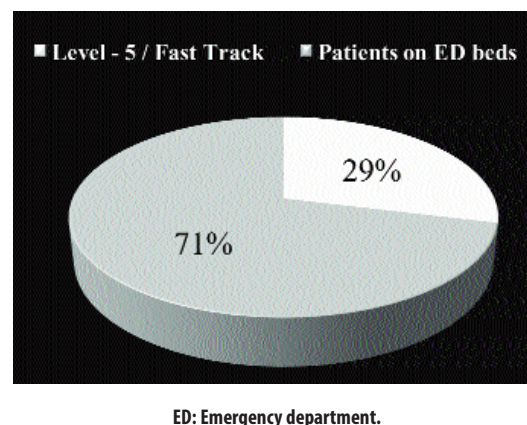


Figure-6: Percentage of patients with level-5 or with least urgent complaints.

referred by the main consulting clinic.

Discussion

ED overcrowding is closely related to a decrease in subjective patient satisfactions^{11,12} and objective quality care.¹³⁻¹⁵

In our study, 6,505 patients stayed in the ED for more than 4 hours before being discharged or admitted into hospital. Most of them waited for reports of their blood tests sent to the main laboratory of the hospital, while waiting for final assessment by ED physician to admit or to discharge. Some time lapse occurred due to delay in intervention or treatment required either due to shortage of nursing staff or due to already overburdened nursing staff and doctors. This problem is now rectified with organisational reform which is trying to overcome the issue with hiring of more manpower required.

Usually, the lab took 4 to 6 hours to generate the reports almost for all patients who had a stay of more than 4 hours in ED. The most common complaints of patients presenting in the ED was diarrhoea and vomiting, so physicians were facing delay in receiving serum electrolytes report for early decision of either to discharge or to admit the patients after intravenous rehydration. Similarly, neonates were waiting for serum bilirubin report to decide either for phototherapy treatment or to send them back home for sunlight exposure. Similarly, the patients with fever and fit were waiting for haematology and metabolic profiles result.

The issue has been discussed with our organisational reforms and the decision to get point-of-care testing (POCT) is in process for quick reporting and early decisions for patients staying in ED for longer period of time. It will definitely decrease the length of stay that will impact the quality of care as well.

The common reason for ED overcrowding in our study was the inability to move patients from the ED to an inpatient bed; the finding was in agreement with other studies.^{16,17} The first step in solving this problem, therefore, is to maximise the hospital's ability to accept additional ED patients into wards.^{4,18} Expanding inpatient hospital bed capabilities, especially intensive care unit (ICU), is a long-term solution. Most of the patients in the study who needed admissions to the wards were less than 5 years old. The option can be to increase the number of beds with sizes for children aged less than 5 years, so that it can create some additional space in different wards by replacing large-size beds. The beds may be made available if the in-patients are discharged early in the day. Appointment of an admission coordinator familiar with the admission and inpatient procedures of every ward may be helpful.⁴

In the current study, 32% patients needed care in PICU and NICU. Some of them needed ventilator support as well, but there were limited numbers of ventilators in the hospital and they were mostly preoccupied. One of the options was to move the critically ill patients outside hospital as they needed immediate care in PICU/NICU setting after confirmation of unavailability of space inside the hospital. The Child Life Foundation and NICH have signed a memorandum of understanding (MoU) with a Karachi-based private hospital with good PICU/NICU setting and it was willing to serve these patients free of cost on a charity basis. We regularly refer some patients who need immediate ICU care to the private set-up.

Similarly, there is a pressing need for another NICU in the hospital as 28.14% of the 2,555 neonates whose stay in ED lasted more than 4 hours needed NICU care.

Under ideal conditions, all ED-attending patients needing inpatient care should be admitted into the wards within 4 hours. This was not possible, however, without available beds. If the holding of admission needing patients in the ED has become a common practice, it would be better to develop a holding unit or an acute care unit (ACU) for a subset of patients who would otherwise wait in the ED for a prolonged period while being treated for their conditions.^{4,20} We can thus elevate the quality of care and comfort of the patients. The critical care beds would be then available for new needy patients, and their waiting

time may also be reduced. Many EDs in the United States have developed observation units to further clarify which patient really needs hospital admission. With these observation units, many patients avoid hospital admission even after initial treatment in the ED that would have led to hospitalisation. The American College of Emergency Physician (ACEP) has published a textbook summarising the scientific background for observation services,²¹ reports on managing observation units²² and chest pain units in EDs²³ as well as a textbook on implementing and managing observation units.²⁴

In this study, 29% of all the patients were of level-5 or having least urgent complaints coming in ED, especially in the afternoon and late evening after the main consulting clinic of the hospital gets closed at noon. So ideally, there should be a separate area in these timing for the least urgent cases for proper utilisation of space and manpower (both clinical and non-clinical) in ED for those who need genuine acute care.

Some more observations from the study were noted and possible solutions were identified. For example, of those patients who stayed in ED, 1,049(41.05%) had a stay of more than 10 hours (Figure-3). So, the possible solutions discussed above with a proper step-down or observation unit will be very helpful for a better impact on quality of care provided.

1) Shortage of ED staff should be fulfilled on an immediate basis for in-time proper intervention and management of patients required inside ED and that is one of the important risk factors compromising the quality of care in our set-up. One reason for delay in transfer of patients from ED to the hospital bed was the shortage of nurse aids.

2) There should be a day care unit outside ED for patients who are coming in just for nebulisation, and IV or IM medications. It will ease the burden on ED staff and physicians who are already overburdened. Although their percentage, i.e. 5.35%, was small with length of stay of less than 4 hours, it was one of the factors involved in delay of treatment to patients being admitted in non-critical areas of ED due to interruption faced by the nursing staff.

3) There should be a checklist for reassessment of patients in ED, especially in a proper step-down area for quick recovery and stabilisation of ill patients that will result in a shorter duration of stay in ED.

4) There should be a separate consulting area in afternoon and evenings for patients of level-5, coming in with least urgent complaints.

5) Emergency physicians and administrators from different hospitals should join to develop a realistic and effective protocol to facilitate inter-facility transfer and prevent patient dumping.⁴

6) ED overcrowding is multidisciplinary problem that can only be solved by joint efforts of various departments and the administration of the hospital.

Conclusion

The ED faced significant overcrowding which overwhelmed efficient standard care.

Disclaimer:

1. Oral presentation at Symposium of National Institute of Child Health, 2016.

2. Poster presentation at Emirates Society of Emergency Medicine Conference in December 2015.

Conflict of Interest: None.

Source of Funding: None.

References

- Andrulis DP, Kellermann A, Hintz EA, Hackman BB, Weslowski VB. Emergency departments and crowding in United States teaching hospitals. *Ann Emerg Med.* 1991; 20:980-6.
- Derlet RW, Richards JR, Kravitz RL. Frequent overcrowding in US emergency departments. *Acad Emerg Med.* 2001; 8:151-5.
- Asplin BR, Magid DJ, Rhodes KV, Solberg LI, Lurie N, Camargo CA Jr. A conceptual model of emergency department crowding. *Ann Emerg Med.* 2003; 42:173-80.
- Kondro W. Relief at a price for emergency wards in Ontario. *Lancet.* 1998;352:1451.
- Schull MJ, Slaughter PM, Redelmeier DA. Urban emergency department overcrowding: defining the problem and eliminating misconceptions. *CJEM.* 2002; 4:76-83.
- Doherty L. Crowded hospitals diverting patients. *The Sydney Morning Herald.* 1998 November 3.
- Shih FY, Ma MH, Chen SC, Wang HP, Fang CC, Shyu RS. ED overcrowding in Taiwan: facts and strategies. *Am J Emerg Med.* 1999; 17:198-202.
- Derlet RW, Richards JR. Overcrowding in the nation's emergency department: complex causes and disturbing effects. *Ann Emerg Med.* 2000; 35:63-8.
- ACEP Crowding Resources Task Force. Responding to Emergency Department Crowding: guidebook for chapters. Dallas TX: American College of Emergency Physicians; 2002. [Online] [cited 2003 July 19]. Available from: URL: <http://www.acep.org/library/pdf/edCrowdingReport.pdf>
- Saunders CE, Makens PK, LeBlanc LJ. Modeling emergency department operations using advanced computer simulation systems. *Ann Emerg Med.* 1989; 18:134-40.
- Nerney MP, Chin MH, Jin L. Factors associated with older patients' satisfaction with care in an inner-city emergency department. *Ann Emerg Med.* 2001; 38:140-5.
- Hansagi H, Carlsson B, Brismar B. The urgency of care need and patient satisfaction of a hospital emergency department. *Health Care Manag Rev* 1992; 17: 71-5.
- Miró O, Antonio MT, Jiménez S, De Dios A, Sánchez M, Borrás A. Decreased health care quality associated with emergency department overcrowding. *Eur J Emerg Med.* 1999; 6:105-7.
- Miró O, Sanchez M, Milla J. Hospital mortality and staff workload. *Lancet.* 2000; 356:1356-7.
- Bindman AB, Grumbach K, Keane D, Rauch L, Luce JM. Consequences of queuing for care at a public hospital emergency department. *JAMA.* 1991; 266:1091-6.
- Espinosa G, Miró O, Sánchez M, Coll-Vinent B, Millá J. Effects of external and internal factors on emergency department overcrowding. *Ann Emerg Med.* 2002; 39:693-5.
- Forster AJ, Stiell I, Wells G, Lee AJ, van Walraven C. The effect of hospital occupancy on emergency department length of stay and patient disposition. *Acad Emerg Med.* 2003; 10:127-33.
- [No authors listed]. American College of Emergency Physicians: Measures to deal with emergency department overcrowding. *Ann Emerg Med.* 1990; 19:944-5.
- Olson CM. Hospital admission through the emergency department: the obstructed pathway. *JAMA.* 1991; 266:2274.
- Thom Mayer. American College of Emergency Physicians. Emergency department observation units. *Ann Emerg Med.* 1988; 17:95-6.
- Graff L. Observation Medicine. Boston: Butterworth Heinemann, 1993.
- Brillman J, Graff LG, Dunbar L. American College of Emergency Physician Section of Observation Services: management of observation units. *Ann Emerg Med.* 1995; 25:823-30.
- Graff L, Joseph A, Andelmann R, Bahr R, DeHart D, Espinosa J, et al. American College of Emergency Physician: Chest pain units in emergency departments. *Am J Cardiol.* 1995; 76:1036-39.
- Graff L. Observation units: Implementation and management strategies. Dallas, TX: American College of Emergency Physicians, 1998.