TUOMS Publishing Group

CrossMark
← click for updates

Original Article

The relationship between emergency department crowding and outcome of referred critical patients from other hospitals

Alireza Ala[1], Samad Shams-Vahdati*[2], Roshan Fahimi[1]

[1] *Emergency Medicine Research Team, Tabriz University of Medical Sciences, Tabriz, Iran*

[2] *Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran*

Abstract

Introduction: Emergency department overcrowding can affect the process of seeking help for critically ill patients in the emergency department. The aim of this study was to investigate the relationship between crowding and clinical outcome of referred critical patients from other hospitals.

Methods: This was a retrospective cross-sectional study performed on 583 critically ill patients (triage levels one and two) referred to the emergency department of Imam Reza Hospital, Tabriz, Iran, between 22 September 2016 and 22 March 2017. Clinical outcome was considered as death rate and the crowd was measured in terms of the number of patients per hour. Statistical analysis was performed using SPSS.

Results: The mean ± standard deviation (SD) of age was 49.5 ± 25.0 years old with 56.4% frequency of men and 43.2% women. About 53.5% of people were referred during peak hour. Evaluating the final outcome, 21.6% of patients died in the emergency department, while 41.5% and 36.9% were cured and discharged or hospitalized respectively. The mean ± SD duration of staying in the emergency department was 239.6 ± 233.0 minutes. A significant percentage of death was during the peak hour of emergency referrals. The final outcome got worse with an increased number of patients admitted to the emergency room.

Conclusion: Crowding in the emergency department deteriorated the treatment process of patients with a critical condition. Thus, the final outcome of the disease or the mortality rate of patients admitted to emergency worsened. Constructive measures to reduce the crowding in the emergency department should be considered.

Citation: Ala A, Shams-Vahdati S, Fahimi R. **The relationship between emergency department crowding and outcome of referred critical patients from other hospitals.** J Anal Res Clin Med 2017; 5(4): 118-21. Doi: 10.15171/jarcm.2017.023

Introduction

Crowding of emergency department has become a public health crisis and an international health issue for more than 20 years. Its effect on productivity, patients' satisfaction, and medical errors have been studied extensively. It is a growing concern in many countries all over the world, representing a serious problem in emergency departments (EDs). Emergency physicians have identified crowding in ED as a critical threat to the treatment and emergency care quality.[1,2]

In the Centers for Medicare and Medicaid Services (CMS), long length of stay (LOS) in the ED is associated with treatment delays, wrong diagnosis, low-quality cure, patients leaving without being seen or getting complete treatment steps, ambulance diversion, and finally low patients' satisfaction. Although measuring ED crowding based on patients transmit time intervals is a difficult complicated concept, its monitoring is a very important step to improve the quality of emergency care.[3-7] Even tiny effects of ED crowding on patients' safety may have large aggregate effects. Several studies reported that crowding of

emergency department leads to high mortality rate and worse patients' outcomes.[8]

Given the importance of ED crowding, as a major threat to public health, in this study, we aimed to assess the relationship of ED crowding and subsequent outcomes in a general population of ED.

Methods

In this retrospective cross-sectional study, 583 patients who have referred to the ED of Imam Reza Hospital, from 22 September 2016 until 22 March 2017 were studied. Patients were considered as the first and second triage emergency severity index (ESI) level. Triage ESI level one was defined for all the patients who needed life-saving measures. This ESI level included patients with cardiac arrest, respiratory distress, low O2 saturation (less than 90%), traumatic patients with no response to painful stimuli and respiratory rate < 6 per minute. Triage ESI level two was defined for all the patients who did not need life-saving measures. However, it was not possible to postpone their visits and two main steps should have been done: 1) checking vital signs, 2) immediate nursing measures.

Crowded times with the most referral patients attending to the ED of Imam Reza hospital during our study was supposed to be 3:00 pm till 11:00 pm.

Patients who had expired for any reason before entering to the ED or the ones in other levels of triage were excluded. Outcome, mortality rate and crowding based on numbers of referral patients per hour were assessed. All data were reported in the prepared forms and then analyzed. Statistical analysis was done by SPSS software (version 15, SPSS Inc., Chicago, IL, USA), and the data were analyzed by descriptive format for demographic and descriptive data. Student's independent t-test was used for comparison of quantitative data between the groups. P less than 0.050 was considered meaningful.

Results

In our study, 583 patients were studied with the mean ± standard deviation (SD) age of 49.5 ± 25.0 years. The youngest was 2 years old, whereas the oldest patient was 92 years old. 56.4% (329) of them were men and 43.6% (254) were women. About 43.2% (252) of patients were referred to the ED in crowded times.

53.5% (312) of patients were referred to the ED in winter and 46.5% (271) referred to the ED in warm months of the year.

The outcome of 21.6% (126) of the patients was death, 41.5% (242) were discharged and 36.9% (215) were admitted to wards. From all patients referred to the ED (215 were admitted) 25.1% (54) expired, and 74.9% (151) were discharged (Table 1).

Mean ± SD of systolic blood pressure (SBD) and diastolic blood pressure (DBP) were 126.6 ± 27.8 and 76.1 ± 14.8 respectively, in which minimum and maximum of SBP were 70 and 200 mmHg. The minimum and maximum of DBP were 50 and 110 mmHg.

The mean ± SD of pulse rate (PR) of patients was 89.49 ± 19.1 with the minimum of 38 and maximum of 180 beats per minute. The mean ± SD of respiratory rate (RR) was 16.9 ± 3.4, in which minimum RR was 10 and maximum was 32 breathes per minute. The mean ± SD of body temperature (BT) was 36.96 ± 0.40. The lowest BT was 36 °C and highest was reported 38 °C.

The mean ± SD of length of stay in ED was 239.6 ± 233.0 minutes, with a minimum of 7 minutes and maximum of 900 minutes. There was a statistically significant association between crowding of ED and mortality rate. Maximum mortality rate was related to the crowded times.

Table 1. Frequency and comparison of patients' outcome between rush and no rush time

Time	Expired [n (%)]	Discharge [n (%)]	Ward admission [n (%)]	P*
Rush time	67 (26.6)	83 (32.9)	102 (40.5)	0.001
No rush time	59 (17.8)	159 (48.0)	113 (34.1)	

*Student's independent t-test

Discussion

In our study, 583 patients (first and second level triage) with the mean ± SD age of 50.49 ± 25 years, in which 56.4% (329) were men and 43.6% (254) were women, were studied. In Schenkel study, the average age was 59.6 ± 17.8 with 56.1% men frequency.[9] In O'Connor et al. study 53.8% were men.[10] In another study, the mean age was 65 and 56.8% were men.[11] In Pines et al. study, 57.0% were men with the mean ± SD age of 44 ± 17 years.[12]

In Nasr-Esfahani et al. study, 484 patients were admitted to the ED with the mean ± SD age of 53.8 ± 20.3 which 55.8% were men.[13] In Cha et al. study, 46.3% were women and 53.7% were men and the mean age was 47 years.[14] In our study and similar to other studies, a number of men patients referring to the ED was higher than women patients which indicates their involvement in serious and high-risk occupations. The mean age of many studies is more than 50 years, demonstrating their relative reduction in quality of body habitus, and appropriate reactions to the dangers in this age. In our study, the mean SBP, DBP, PR, RR, BT, were 120.60 ± 27.80 mmHg, 70.09 ± 14.80 mmHg, 89.49 ± 19.10 beats per minute, 16.88 ± 3.40 breathes per minute, and 36.96 ± 0.42 degrees, respectively. In Schenkel study the average BP was 59.4 ± 16.2, PR was 89.1 ± 24.6 pulses per minute, and BT was 36.5 ± 1.2.[9]

Vital sign of patients referring to the ED depends on their diagnosis (trauma, cardiovascular disease, stroke, sepsis and etc.). Even patients' vital sign can change season by season, so differences in vital sign can be justified. In our study, 5.53% (312) were referred to the ED in cold days of the year, which could be due to the high prevalence of cardiovascular and respiratory disease in winter. In our study, duration of admitting in ED was 239.6 ± 233.0 minutes (4 hours). In another study, duration of physician initial assessment was 122.3 minutes in non-monitoring beds.[10] In Pines study, duration of staying in ED was 10.8 hours.[12] In Nasr-Esfahani et al.[13] and in Cha et al.[14] studies, duration of staying in ED was 10.4 ± 5.5 and 8

hours, respectively. The mean duration of hospitalization in our study was lower than others showing an advantage of ED of Imam Reza Hospital of Tabriz, Iran. It represents correct and immediate triage, expert medical workers, advanced and available diagnostic agents, expert physicians, and adequate emergency and hospital facilities. According to the hours of referring to the ED, in our study 43.2% (252) patients were referred during crowded times. Also, 6.2% (126) expired, and the final outcome of 1.3% (54) of patients admitted to the wards was death.

Increasing the number of patients can affect the mean time of the first visit by physicians.[15] The general mortality rate in the ED and those who were admitted was 8.30%. In Schenkel study, the mortality rate was 14.6%.[9] In Pines study, 44% were referred in the peak hours (3 pm to 11 pm) to the ED.[12] In O'Connor et al. study, 52% were referred to the ED during peak hours.[10] In our study, the mortality rate was relatively higher than other similar studies, which may be due to including critical patients with higher mortality rate in our study. Moreover, poor treatment facilities could be another potential reason. Improved treatment equipment would definitely promote diagnostic and therapeutic procedures. Results indicate a high percentage of mortality rates in rush hours. Our studies and other similar studies show that by increasing the number of patients admitting to the ED, final outcome (mortality) gets worse.

Conclusion

By increasing the number of patients and overcrowding in ED, the outcome gets poor with an increased mortality rate.

Authors' Contribution

Study design and supervision: Alireza Ala; analyzing and critical review: Samad Shams-Vahdati; data gathering and writing: Roshan Fahimi.

References

1. Institute of Medicine. Future of emergency care: Hospital-based emergency care at the breaking point. Washington DC: National Academies Press; 2006.
2. van der Linden C, Reijnen R, Derlet RW, Lindeboom R, van der Linden N, Lucas C, et al. Emergency department crowding in The Netherlands: Managers' experiences. Int J Emerg Med 2013; 6(1): 41. DOI: 10.1186/1865-1380-6-41
3. Cowling TE, Cecil EV, Soljak MA, Lee JT, Millett C, Majeed A, et al. Access to primary care and visits to emergency departments in England: A cross-sectional, population-based study. PLoS One 2013; 8(6): e66699. DOI: 10.1371/journal.pone.0066699
4. O'Malley AS. After-hours access to primary care practices linked with lower emergency department use and less unmet medical need. Health Aff (Millwood) 2013; 32(1): 175-83. DOI: 10.1377/hlthaff.2012.0494
5. McCarthy ML, Ding R, Pines JM, Zeger SL. Comparison of methods for measuring crowding and its effects on length of stay in the emergency department. Acad Emerg Med 2011; 18(12): 1269-77. DOI: 10.1111/j.1553-2712.2011.01232.x
6. Hwang U, McCarthy ML, Aronsky D, Asplin B, Crane PW, Craven CK, et al. Measures of crowding in the emergency department: A systematic review. Acad Emerg Med 2011; 18(5): 527-38. DOI: 10.1111/j.1553-2712.2011.01054.x
7. 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(2): 173-80. DOI: 10.1067/mem.2003.302
8. Niska R, Bhuiya F, Xu J. National Hospital Ambulatory Medical Care Survey: 2007 emergency department summary. Natl Health Stat Report 2010; (26): 1-31.
9. Schenkel S. Promoting patient safety and preventing medical error in emergency departments. Acad Emerg Med 2000; 7(11): 1204-22. DOI: 10.1111/j.1553-2712.2000.tb00466.x
10. O'Connor E, Gatien M, Weir C, Calder L. Evaluating the effect of emergency department crowding on triage destination. Int J Emerg Med 2014; 7: 16. DOI: 10.1186/1865-1380-7-16
11. Shin TG, Jo IJ, Choi DJ, Kang MJ, Jeon K, Suh GY, et al. The adverse effect of emergency department crowding on compliance with the resuscitation bundle in the management of severe sepsis and septic shock. Crit Care 2013; 17(5): R224. DOI: 10.1186/cc13047
12. Pines JM, Shofer FS, Isserman JA, Abbuhl SB, Mills AM. The effect of emergency department crowding on analgesia in patients with back pain in two hospitals. Acad Emerg Med 2010; 17(3): 276-83. DOI: 10.1111/j.1553-2712.2009.00676.x
13. Nasr-Esfahani M, Esmailian M, Nasri M. Causes of prolonged length of stay for patients referred to the emergency department; a cross-sectional study. Iranian Journal of Emergency Medicine 2014; 1(1): 45-9.
14. Cha WC, Song KJ, Cho JS, Singer AJ, Shin SD. The long-term effect of an independent capacity protocol on emergency department length of stay: A before and after study. Yonsei Med J 2015; 56(5): 1428-36. DOI: 10.3349/ymj.2015.56.5.1428
15. Amiri H, Shams Vahdati S, Ghodrati N, Taghizadueh A, Mahmoodivar S, Foroughi M, et al. The length of waiting for first visit and disposition in emergency department in Tabriz Imam Reza Hospital. Turk J Emerg Med 2008; 8(4): 160-3.