Overcrowding Management and Patient Safety: An Application of the Stabilization Model

Abstract

Background: Emergency department is among the most crowded hospital units. The function of this department considerably affects the functions of other hospital units as well as patient satisfaction. The Stabilization Model is a strategy with potential effectiveness in managing overcrowding in emergency department. This study aimed to determine the effects of overcrowding management based on the stabilization model on patient safety in emergency department. Materials and Methods: This pretest-posttest quasi-experimental was conducted in 2015 in the emergency department of a teaching hospital located in Tehran, Iran. Primarily, the perceived safety of 35 patients was assessed using the Patient Safety Assessment Questionnaire. Then, an overcrowding management intervention was implemented based on the stabilization model. Finally, the perceived safety of 35 newly recruited patients was assessed after the intervention. The SPSS software (v. 16.0) was employed for data analysis through the Chi-square, the Kolmogorov-Smirnov, and the independent-sample t tests. Results: The mean (SD) score of patient safety was 27.45 (8.43) in the control group and 34.45 (4.04) in the intervention group and the between-group difference was statistically significant (t1 = 50.37, p < 0.001). The rate of patient safety increased from 65% at baseline to 82% after the intervention. Conclusions: Overcrowding management based on the stabilization model can significantly enhance patients’ perceived safety. Therefore, this strategy can be used to ease emergency department overcrowding and enhance patient safety and care quality.

Keywords: Emergencies, hospitals, Iran, patient safety

Introduction

Emergency Department (ED) is among the most crowded hospital units, to which many patients with different high-risk health conditions are admitted.[1] Most patients who are hospitalized in this department are usually transferred to other hospital units. Consequently, the function of the ED considerably affects the functions of other units and the satisfaction of patients.[2]

Overcrowding of ED has turned into a major health problem because the number of EDs is falling while the number of patients who need emergency care services is increasing. A former study reported that the number of elderly patients referring to EDs has considerably increased.[3] Another study showed that 61% of patients in EDs in Iran have an ED stay of more than four hours, resulting in ED overcrowding (Jaber). [2] Currently, there is still no clear definition for ED overcrowding and it is broadly defined as “the situation in which ED function is impeded primarily because of the excessive number of patients waiting to be seen, undergoing assessment and treatment, or waiting for departure comparing to the physical or staffing capacity of the ED”.[4] Many factors can contribute to ED overcrowding. These factors include staff shortage, structural weaknesses such as inadequate number of EDs and small internal space of EDs,[5] small hospitalization capacity, shortcomings of hospital systems, epidemics, delayed paraclinical services, hospitalization of critically-ill patients in ED,[6] and huge number of patients.[7] Some studies also attributed ED overcrowding to sociocultural factors such as big number of patients’ family members attending the department,[7] inappropriate use of emergency services,[8] non-urgent ED visits, patients’ frequent attendance at the department,[6] language-related problems, and cross-cultural barriers.[9] Other miscellaneous factors include being located

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in a teaching hospital[10] and prolonged hospitalizations in the department.[6] ED overcrowding is associated with different consequences. Safety-related consequences of ED overcrowding include high in-hospital mortality rate,[11] increased risk of medical errors,[12] delayed treatment, delayed patient transfer to other hospital units, and failure to manage patients’ problems.[6] Its financial consequences are prolonged hospital stay,[11] increased healthcare costs,[6,11] and physicians’ reduced productivity.[13] Other consequences of ED overcrowding include reduced quality of student education,[14] ambulance diversion,[15] prolonged periods of pain and agony, patient dissatisfaction, violence, broken therapeutic relationship, poor patient outcomes, and low patient safety.[16]

Many strategies have been developed for easing ED overcrowding. For instance, one strategy is to minimize the number of patients who refer to the department through building adjacent primary health care centers,[17] controlling the destination of ambulances,[18] and providing patients with easier access to outpatient services. Another strategy is to increase the efficiency of ED services through calling for the staff of other hospital units to work in ED in case of overcrowding, regularly assessing patients’ medical records by nurses,[19] establishing supervisory units, increasing the number of hospital beds, promoting the functions of adjacent units, accelerating the process of paraclinical care delivery, and increasing the physical space of the department.[6] Other studies recommended strategies for increasing the number of patients who leave the department. These strategies include making plans to discharge patients before midday,[19] developing post-ED discharge units,[20] referring patients with nonemergency conditions to other units or centers, and providing counseling services.[6] One of the strategies for managing and easing ED overcrowding is the Stabilization Model (SM). SM was developed by Mahmoudi in 2011 and deals with stabilizing the immediate situation. This model holds that ED overcrowding inhibits situation stabilization and jeopardizes patient safety. Therefore, it proposes strategies, such as safe practice, in order to ease overcrowding, stabilize the immediate situation, and enhance patient safety. Situation stabilization in ED is a dynamic process which begins when a patient enters the department, is influenced by the behavior of nurses, patients, and family members, and finally results in stabilization.[21] SM has been used in different settings and conditions in nursing.[22-24]

Previous studies assessed the effectiveness of different strategies in enhancing patient safety in ED. For instance, Negarandeh et al. (2013) reported that using healthcare services provided by clinically competent nurses enhanced patient safety.[25] Rosen et al. (2015) also found that the simulation of lessons learned from past medical errors was effective in enhancing patient safety.[26] Other studies also reported training and education as significant factors contributing to patient safety.[27-29] However, none of these studies addressed the effects of overcrowding management on patient safety in ED. Consequently, this study was conducted to determine the effects of overcrowding management based on SM on patient safety in ED.

Materials and Methods

This two-group pretest-posttest quasi-experimental study was conducted in autumn 2015 in the ED of Baqiyatallah teaching hospital, Tehran, Iran. The ED of this hospital contained 64 beds with 154 staff, including 102 nurses and 52 nursing aides. The study population consisted of all patients who referred to the setting. Based on the results of a former study and with an α of 0.05 and a β of 0.10, the Altman’s nomogram showed that thirty patients were needed for each group. In order to compensate a probable attrition of 10%, 35 patients were conveniently and consecutively recruited to each group, that is an experimental and a control group. Selection criteria were complete consciousness and basic literacy skills to fill out the study instrument.[23]

A demographic questionnaire (with items on participants’ age and gender) and the Patient Safety Assessment Questionnaire (PSAQ) were used for data gathering. The PSAQ comprises 21 items and measures patient safety. The possible answers to the items are “Yes,” “No idea,” and “No” which are scored 2, 1, and 0, respectively. Therefore, the total PSAQ score can range from 0 to 42 with higher scores representing greater patient safety. Reliability of the questionnaire was assessed and confirmed elsewhere through the split-half method and with a correlation coefficient of 0.87.[25]

In order to prevent the sensitization of ED staff to the study, the first author started working in the study setting as a nurse colleague for several months. Accordingly, he attempted to establish close relationships with ED staff and observe the processes of patient admission, treatment, and care. Thereafter, the managers of ED were informed about the aim and the methods of the study. Then, 35 patients were recruited to the control group and patient safety assessment was done for them at the time of their hospital discharge. After that, the study intervention was started by making necessary changes to the infrastructures of ED. Initially, a part of ED which included six beds was considered and equipped as the discharge lounge. Moreover, a meeting was held with ED head-nurse and security staff to inform the security staff about the new schedule for managing family members in the department. This new schedule had been developed based on the overcrowding management component of SM which holds that reducing the number of people in a situation facilitates the stabilization of the situation. This schedule, named the environmental management schedule, contained two main parts. Reducing the number of patients’ family members: Except for the family members of patients who were on complete bed
rest, had a Glasgow Coma Scale score of less than 13, or aged seventy or more, other family members were asked by the security staff to leave ED. The first author and the in-charge nurses supervised this strategy. Limiting the number of people entering ED: There were different entrances to ED. Accordingly, except for the main entrance, all ED entrances were closed by the security staff and family members were required to enter the department through the main entrance.

Another main component of the study intervention was discharge management. In order to effectively manage discharged patients, the discharge lounge was considered for their temporary stay. Moreover, ED nurses were asked to check patients’ medical records every two hours. These strategies helped the acceleration of patient discharge. The first author supervised the implementation of these strategies either alone or in collaboration with hospital supervisor or ED head-nurse. The other main component of the study intervention was patient safety enhancement. The first author trained 75 ED nurses and asked them to check patients’ medical records every two hours, perform shift handover at patients’ bedside, ask patients’ names before the implementation of nursing procedures, and raise side rails of ED beds.

The study intervention was implemented for one whole month. In other words, ED nurses were allowed to practice and get accustomed to the study intervention for one month. After that, PSAQ was used to assess the safety of 35 new patients during morning and evening shifts in a whole week. The gathered data were analyzed using the SPSS software (v. 16.0, SPSS Inc., Chicago, IL, USA) and through performing the Kolmogorov-Smirnov and the independent-sample t tests.

**Ethical considerations**

This study was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences, Tehran, Iran (code: IR.BMSU.REC.1395.245). Participants were provided with necessary information about the study, confidentiality of their personal information, and their freedom to unilaterally withdraw from the study. Then, informed consent was obtained from all of them.

**Results**

The means (SD) of participants’ age in the control and the experimental groups were 59.37 (17.65) and 57.62 (15.72), respectively. There was no significant difference between the groups regarding the participants’ age and gender [Table 1]. In the control group (i.e., before the intervention), the mean (SD) score of patient safety was 27.45 (8.43). In the experimental group (i.e., after the intervention), this value significantly increased to 34.45 (4.04). In other words, after the one-month SM-based overcrowding management intervention in ED, the level of patients’ perceived safety increased significantly [Table 1].

**Table 1: Comparison of the study groups regarding the participants’ age, gender, and perceived safety**

| Variable          | Control group | Test group | p       |
|-------------------|---------------|------------|---------|
| Gender            |               |            |         |
| Male              | 18 (51.40%)   | 17 (48.60%)| 0.395*  |
| Female            | 17 (48.60%)   | 18 (51.40%)|         |
| Age               | Mean (SD)     | Mean (SD)  |         |
|                   | 59.37 (17.65) | 57.62 (15.72)| 0.690** |
| Perceived safety  | 27.45 (8.43)  | 34.45 (4.04)| <0.001**|

*Chi square & **Independent-Sample t-tests (t_{13}=50.37)

**Discussion**

This study was conducted to determine the effects of SM-based overcrowding management on patient safety in ED. Study findings indicated that SM-based overcrowding management was effective in improving the level of participants’ perceived safety. Overcrowding management is a comprehensive package which contains staff training, environmental planning (i.e., controlling the number of people entering an environment), and discharge management (i.e., facilitating and accelerating the process of discharge). These components can have synergistic effects on patient safety and thus, it is impossible to judge about the pure effects of each component.

A main component of the study intervention was staff training. While training the nursing staff of the study setting, we emphasized the importance of accurate and precise shift handover at patient bedside. Seemingly, this strategy, in adjacent with other strategies, helped improve patient safety in this study. Earlier studies also showed that staff training improved the rate of reporting medical errors and thereby, enhanced patient safety. Moreover, some studies reported the effectiveness of nursing staff training in enhancing patient safety. In the present study, nursing staff were trained about precise shift handover at patient bedside. Gagnier et al. found that using a patient handover tool significantly lowered patient safety risks. Another aspect of staff training in this study was related to raising side rails. Similarly, Godlock et al. found that implementing interventions to prevent patient fall significantly enhanced patient safety. However, contrary to our findings, Jones et al. noted that training did not significantly affect patient safety. This contradiction may be due to the differences in the interventions, methodologies, settings, and samples of these studies.

Environmental planning and overcrowding management are also among the main factors contributing to patient safety. In this study, we reduced the number of patients’ family members who attended ED. This intervention might also have contributed to the higher perceived safety among participants after the intervention. In line with our findings, Puraghaci et al. (2015) also reported huge number of family members in ED as a significant factor behind
overcrowding and low patient safety in ED.\[7\] Ebrahimipour \textit{et al.} (2014) also introduced ED overcrowding as a main reason for the incidence of medication errors among nurses.\[34\] All these findings show that the overcrowding of clinical settings can negatively affect nurses’ practice, increase the likelihood of clinical errors, and endanger patient safety.

The third main component of the study intervention was discharge management which was performed through developing a discharge lounge and regularly assessing patient medical records for discharge-related medical orders. Together with other components of our SM-based overcrowding management intervention, discharge planning helped ease ED overcrowding and enhance patient safety. Boyle \textit{et al.} (2012) also suggested developing discharge lounge as a strategy to ease ED overcrowding.\[35\] Yancer \textit{et al.} (2006) also implemented a capacity management intervention and found that strategies such as regularly assessing patients’ medical records by nurses, performing patient discharge before midday, and preventing discharge delay were effective in easing ED overcrowding.\[19\] Long waiting time for discharge reduces patient satisfaction and negatively affects patient outcomes and clinical effectiveness.

Other studies pointed to other ED overcrowding management strategies such as increasing the number of ED staff and beds.\[6,35\] These strategies are too costly and hence, may be refused by healthcare authorities and managers. Accordingly, we did not include them in our intervention. This study had some limitations. One of the limitations was the overcrowding of the study setting which caused problems in the collection of the data and implementation of the intervention. The other limitations were small sample size, short follow-up assessment period, and impossibility of blinding.

\textbf{Conclusion}

Model-based interventions improves the efficiency of systems. This study concludes that the SM-based overcrowding management program is effective in easing ED overcrowding and enhancing patient safety. Therefore, the authorities of different healthcare settings, including clinics and hospital wards, can use this program to manage overcrowding and improve patient safety in their settings. Future studies are recommended to evaluate the effects of this program on other patient outcomes such as patient satisfaction and stress.

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\textbf{Conflicts of interest}

Nothing to declare.

\textbf{References}

1. Mehrabian F, Rahbar Taramsari M, Keshavars Mohamadian S. Quality of services in training and medical emergency centers. J Guilan Univ Med Sci 2014;23:15‑21.
2. Shamsi V, Mahmoudi H, Nir MS, Darzi HB. Effect of job specialization on the hospital stay and job satisfaction of ED nurses. Trauma Mon 2016;21:e25794.
3. Ukkonen M, Jämsen E, Zeitlin R, Pauniaho S-L. Emergency department visits in older patients: A population‑based survey. BMC Emerg Med 2019;19:20.
4. Statement on Emergency Department overcrowding. Australas Coll Emerg Med 2011;16:57.
5. Pitts SR, Niska RW, Xu J, Burt CW. National hospital ambulatory medical care survey: 2006 emergency department summary. Nat Health Stat Rep 2008;1:38.
6. Hoot NR, Aronksy D. Systematic review of emergency department crowding: Causes, effects, and solutions. Ann Emerg Med 2008;52:126‑36.e1.
7. Puraghaei M, Sadegh Tabrizi J, Aslan Abadi S, Moharam Zadeh P, Ghiami R, Elmdust N. Study of risks in emergency department at Tabriz Imam Reza hospital. Med J Mashhad Univ Med Sci 2015;58:302‑9.
8. Carret MLV, Fassa ACG, Domingues MR. Inappropriate use of emergency services: A systematic review of prevalence and associated factors. Cad Saude Publica 2009;25:7‑28.
9. Terui S. Conceptualizing the pathways and processes between language barriers and health disparities: Review, synthesis, and extension. J Immigr Minor Health 2017;19:215‑24.
10. Mahdizade A, Mahmoudi H, Ebadi A, Rahimi A. Expectations of faculty of nursing schools in Tehran on administrative management of schools: A qualitative study. J Hayat 2012;18:52‑66.
11. Sun BC, Hsia RY, Weiss RE, Zingmond D, Liang LJ, Han W, \textit{et al.} Effect of emergency department crowding on outcomes of admitted patients. Ann Emerg Med 2013;61:605‑11.e6.
12. Eriksson J, Gellerstedt L, Hilleräls P, Craftman ÅG. Registered nurses’ perceptions of safe care in overcrowded emergency departments. J Clin Nurs 2018;27:e1061‑7.
13. Hamden K, Jeanmonod D, Guéritier D, Jeanmonod R. Comparison of resident and mid‑level provider productivity in a high‑acuity emergency department setting. Emerg Med J 2014;31:216‑9.
14. Mahler SA, McCartney JR, Swoboda TK, Yorek L, Arnold TC. The impact of emergency department overcrowding on resident education. J Emerg Med 2012;42:69‑73.
15. Salway R, Valenzuela R, Shoemberger J, Mallon W, Viccellio A. Emergency department (ED) overcrowding: Evidence‑based answers to frequently asked questions. Rev Méd Clin Las Condes 2017;28:213‑9.
16. Cheung T, Lee P, Yip P. Workplace violence toward physicians and nurses: Prevalence and correlates in Macau. Int J Environ Res Public Health 2017;14:879.
17. Gentile S, Vignally P, Durand A-C, Gainotti S, Sambuc R, Gerbeaux P. Nonurgent patients in the emergency department?
18. Shah MN, Fairbanks RJ, Maddow CL, Lerner EB, Syrett JJ, Davis EA, et al. Description and evaluation of a pilot physician-directed emergency medical services diversion control program. Acad Emerg Med 2006;13:54-60.

19. Yancer DA, Foshee D, Cole H, Beauchamp R, de la Pena W, Keeffe T, et al. Managing capacity to reduce emergency department overcrowding and ambulance diversions. J Comm J Qual Patient Saf 2006;32:239-45.

20. Lynn SG, Kellermann AL. Critical decision making: Managing the emergency department in an overcrowded hospital. Ann Emerg Med 1991;20:287-92.

21. Mahmoudi H, Mohammadi E, Ebadi A, Taheri F. Stabilizing the situation in an emergency ward: A grounded theory study of how emergency nurses provide care in emergency wards. J Crit Care Nurs 2017;10:1-6.

22. Moayed MS, Mahmoudi H, Ebadi A, Nia HS. Stress and fear of exposure to sharps in nurses. Iran J Psychiatry Behav Sci 2016;10:e3813.

23. Moayed MS, Mahmoudi H, Ebadi A, Salary MM, Danial Z. Effect of education on stress of exposure to sharps among nurses in emergency and trauma care wards. Trauma Mon 2015;20:e17709.

24. Moridi J, Mahmoudi H, Ebadi A, Rahmani A, Moradian ST. The effect of cardiopulmonary resuscitation clinical audit on the patient survival in the emergency room. Arch Trauma Res 2018;7:121-6.

25. Negarandeh R, Pedram Razi S, Khostravinezhad M. Effect of clinically competent nurses services on safety and patients’ satisfaction in an emergency department. Hayat 2013;19:53-64.

26. Rosen MA, Goeschel CA, Che X-X, Fawole JO, Rees D, Curran R, et al. Simulation in the executive suite: Lessons learned for building patient safety leadership. Simul Healthc 2015;10:372-7.

27. Verbakel NJ, Langelaan M, Verheij TJ, Wagner C, Zwart DL. Effects of patient safety culture interventions on incident reporting in general practice. Br J Gen Pract 2015;65:319-29.

28. Patterson MD, Geis GL, LeMaster T, Wears RL. Impact of multidisciplinary simulation-based training on patient safety in a pediatric emergency department. BMJ Qual Saf 2013;22:383-93.

29. Moradian ST, Najafloo M, Mahmoudi H, Ghiasi MS. Early mobilization reduces the atelectasis and pleural effusion in patients undergoing coronary artery bypass graft surgery: A randomized clinical trial. J Vasc Surg 2017;35:141-5.

30. Boyle A, Beniuk K, Higginson I, Atkinson P. Emergency department crowding: Time for interventions and policy evaluations. Emerg Med Int 2012;20:1-8. doi: 10.1155/2012/83861.

31. Gagnier JJ, Derosier JM, Maratt JD, Hake ME, Bagian JP. Development, implementation and evaluation of a patient handoff tool to improve safety in orthopaedic surgery. Int J Qual Health Care 2016;28:363-70.

32. Godlock G, Christiansen M, Feider L. Implementation of an Evidence-Based Patient Safety Team to Prevent Falls in Inpatient Medical Units. Medsurg Nurs 2016;25:17-23.

33. Jones F, Podila P, Powers C. Creating a culture of safety in the emergency department: The value of teamwork training. J Nurs Admin 2013;43:194-200.

34. Ebrahimpour F, Shahrokhi A, Ghodousi A. Patients’ safety and nurses’ medication administration errors. Scientific Journal of Forensic Medicine 2014;20:401-8.

35. Di Somma S, Paladino L, Vaughan L, Lalle I, Magrini L, Magnanti M. Overcrowding in emergency department: An international issue. Intern Emerg Med 2015;10:171-5.