

# 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 ( $t_{34} = 50.37$ ,  $p < 0.001$ ). 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.<sup>[1]</sup> 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.<sup>[2]</sup>

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.<sup>[3]</sup> Another study showed that 61% of patients in EDs in Iran have an ED stay of more than four hours, resulting in ED overcrowding (Jaberi).<sup>[2]</sup> 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”.<sup>[4]</sup> 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,<sup>[5]</sup> small hospitalization capacity, shortcomings of hospital systems, epidemics, delayed paraclinical services, hospitalization of critically-ill patients in ED,<sup>[6]</sup> and huge number of patients.<sup>[7]</sup> Some studies also attributed ED overcrowding to sociocultural factors such as big number of patients' family members attending the department,<sup>[7]</sup> inappropriate use of emergency services,<sup>[8]</sup> non-urgent ED visits, patients' frequent attendance at the department,<sup>[6]</sup> language-related problems, and cross-cultural barriers.<sup>[9]</sup> Other miscellaneous factors include being located

Hosein Babatabar-Darzi<sup>1</sup>,  
Iman Jafari-Iraqi<sup>1</sup>,  
Hosein Mahmoudi<sup>1</sup>,  
Abbas Ebadi<sup>2</sup>

<sup>1</sup>Trauma Research Center, Faculty of Nursing, Baqiyatallah University of Medical Sciences, Tehran, IR Iran, <sup>2</sup>Behavioral Sciences Research Center, Life Style Institute, Nursing Faculty, Baqiyatallah University of Medical Sciences, Tehran, IR Iran

**Address for correspondence:**  
Mr. Iman Jafari-Iraqi,  
Trauma Research Center,  
Faculty of Nursing, Baqiyatallah  
University of Medical Sciences,  
Tehran, IR Iran.  
E-mail: iman.jafari.1366@gmail.com

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

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,<sup>[17]</sup> controlling the destination of ambulances,<sup>[18]</sup> 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,<sup>[19]</sup> 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.<sup>[6]</sup> Other studies recommended strategies for increasing the number of patients who leave the department. These strategies include making plans to discharge patients before midday,<sup>[19]</sup> developing post-ED discharge units,<sup>[20]</sup> referring patients with nonemergency conditions to other units or centers, and providing counseling services.<sup>[6]</sup> 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.<sup>[21]</sup> SM has been used in different settings and conditions in nursing.<sup>[2,22-24]</sup>

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.<sup>[25]</sup> Rosen *et al.* (2015) also found that the simulation of lessons learned from past medical errors was effective in enhancing patient safety.<sup>[26]</sup> Other studies also reported training and education as significant factors contributing to patient safety.<sup>[27-29]</sup> 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  $\alpha$  of 0.05 and a  $\beta$  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.<sup>[23]</sup>

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.<sup>[25]</sup>

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	Frequency (%)		<i>p</i>
	Control group	Test group	
Gender			
Male	18 (51.40%)	17 (48.60%)	0.395*
Female	17 (48.60%)	18 (51.40%)	
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	
Age	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 ( $t_{34}=50.37$ )

### 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.<sup>[27,28]</sup> Moreover, some studies reported the effectiveness of nursing staff training in enhancing patient safety.<sup>[25,30]</sup> In the present study, nursing staff were trained about precise shift handover at patient bedside. Gagnier *et al.* also found that using a patient handover tool significantly lowered patient safety risks.<sup>[31]</sup> 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.<sup>[32]</sup> However, contrary to our findings, Jones *et al.* noted that training did not significantly affect patient safety.<sup>[33]</sup> 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, Puraghaei *et al.* (2015) also reported huge number of family members in ED as a significant factor behind

overcrowding and low patient safety in ED.<sup>[7]</sup> Ebrahimipour *et al.* (2014) also introduced ED overcrowding as a main reason for the incidence of medication errors among nurses.<sup>[34]</sup> 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 *et al.* (2012) also suggested developing discharge lounge as a strategy to ease ED overcrowding.<sup>[30]</sup> Yancer *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.<sup>[19]</sup> 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.<sup>[6,35]</sup> 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.

## Conclusion

Model-based interventions improve 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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Baqiyatallah Faculty of Nursing and Baqiyatallah hospital, Tehran, Iran

## Conflicts of interest

Nothing to declare.

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