ORIGINAL RESEARCH

Emergency Department Performance Indexes Before and After Establishment of Emergency Medicine

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Abstract

Introduction: Emergency department performance index (EPI) greatly influences the function of other hospital's units and patient satisfaction. Recently, the Iranian Ministry of Health has defined specific national EPI containing five indexes. In the present study the performance indexes of emergency department (ED) in one educational hospital has been assessed before and after establishment of emergency medicine. **Methods:** In the present cross-sectional study the ED of Shohadaye Tajrish Hospital, Tehran, Iran was assessed during one-year period from March 2012 to February 2013. The study was divided into two six-month periods of before and after establishment of emergency medicine. Five performance indexes including: the percentage of patients were disposed during 6-hour, leaved the ED in a 12-hour, had unsuccessful cardiopulmonary resuscitations (CPR), discharged against medical advice, and the mean time of triage were calculated using data of department of medical records on daily patients' files. Then, Mann-Whitney U test was used to make comparisons at P<0.05. **Results:** The average triage time decreased from 6.04 minutes in the first six months to 1.5 minutes in the second six months (P=0.06). The percentage of patients leaving the ED in a 12-hour decreased from 97.3% to 90.4% (P=0.004). However, the percentage of disposed patients during 6-hour (P=0.2), unsuccessful CPR (P=0.34) and discharged against medical advice (P=0.42) did not differ between the two periods. **Conclusion:** It seems that establishment of emergency medicine could be able to improve ED performances indexes such as time to triage and leave in a 12-hour period.

Key words: Emergency department performance index; emergency medicine; patient discharge; triage

Introduction:

E mergency department performance index (EPI) greatly influences the function of other hospital's units and also patient satisfaction. Base on official reports Iran's emergency departments (ED) admit approximately 30 million critically ill and ambulatory patients all over the country. This great population increases the potential of medical errors and the duration of patients' waiting time in ED (1-3). There are various methods to assess the performance and function in different organizations. These methods generally originate from theories, attitudes or situations. They can evaluate the achievement of predetermined goals or aims in an organization. Continuous and correct implementation of these methods improves the function and efficacy of units (4-6). EPI as one of these methods can be used to monitor the performance of EDs (4). Recently, the Ira-

nian Ministry of Health has defined specific national EPI containing five indexes for the assessment of EDs' performance. This is measurable and realistic assessment method with definite frameworks and time intervals (7, 8). These five indexes consist of 1: The percentages of patients were disposed during 6-hour of presentation to ED; 2: the percentage of patients leaved the ED in a 12-hour period; 3: percentage of unsuccessful cardiopulmonary resuscitations (CPR); 4: percentage of discharge against medical advice; and 5: the average time of triage (panel 1). Based on the above mentioned, in the present study the performance indexes of ED in one educational hospital has been assessed before and after establishment of emergency medicine.

Methods:

Study design and setting

In the present cross-sectional study the ED of Shohadaye Tajrish Hospital (Shahid Beheshti University of Medical sciences, Tehran, Iran) was assessed during one-year period from March 2012 to February 2013. This assessment was carried out based on Iranian national EPI designed by Ministry of Health (panel 1). The

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Panel 1: National emergency department performance index (EPI)

Index	Data necessary of calculation	The method used for calculation
The percentages of patients were disposed during 6-hour	the number of patients were disposed in 6 hours; the total number of patients hospitalized temporarily; the time of admission into the emergency ward; the time of disposition	the ratio of patients hospitalized temporarily in the emergency ward, whose cases were disposed in 6 hours to the total number of patients hospitalized temporarily in the emergency ward
The percentage of patients leaving the ED[1] in a 12-hour	the number of patients hospitalized temporarily in the emergency ward; the times of admission into and discharge from the emergency ward	the ratio of patients hospitalized temporarily in the emergency ward, whose cases were disposed in 12 hours from the admission and discharged to the total number of patients hospitalized temporarily in the emergency ward
Unsuccessful CPRs[2]	The total number of CPRs; the number unsuccessful CPRs	the ratio of the number of unsuccessful CPRs to the total number of CPRs at a time interval; successful CPR was defined as cases in which the patient had spontaneous circulation and did not need CPR again for at least 20 minutes
Discharge against medical advice	the number of patients hospitalized temporarily; the number of patients discharge against medical advice	the ratio of patients discharge against medical advice despite the advice of the emergency physician to the total number of patients hospitalized temporarily in the emergency ward
Mean time of triage	duration of triage; triage level; the total number of the patients in the same triage level	the ratio of the total duration of patient triage to the total number of patients in the same triage level

1: Emergency department; 2: Cardiopulmonary resuscitations

study was divided into two six-month periods of before and after establishment of emergency medicine.

Data collection
All necessary data, assigned in panel one, were collected using patients' files at the end of each 24-hour shift by department of medical records' staffs. Then the data were rechecked by the emergency unit manager and were entered into the database designed for the study. Finally, the five indexes calculated for each day, separately.

Statistical analysis
Data were entered into SPSS 21.0 statistical software and reported in means ± standard deviations. Differences between the two periods of the study were evaluated by Mann-Whitney U test. Also, since changes made after the establishment of emergency medicine, probably takes time to appear, the difference between the first and last quarters of study period were compared. Statistical significance was defined at P<0.05.

Results:
The mean of triage time was 6.04 minutes at the first six-month, decreasing to 1.5 minutes during the second half of the study period (P=0.016). The percentage of patients leaving the emergency unit in a 12-hour at the first and second study periods were 97.3% and 90.4%, respectively (p=0.004). There were no significant changes in the percentage of cases disposed in a 6-hour (P=0.2), the percentage of unsuccessful CPRs (P=0.34), and percentage of discharge against medical advice

(P=0.42) (Table 1). Evaluation of differences in performance indexes between the first and last quarters of the study period showed no significant differences between any of the indexes (table 2). Comparing the first and last quarter showed 1.1% decrease in the percentage of patients had been disposed during the first 6-hour, 7.6% in patients leaving the emergency unit in a 12-hour, and 60% in the mean of triage time (p>0.05). The percentage of unsuccessful CPRs and the percentage of discharge against medical advice were not significantly different between two quarters.

Discussion:
The finding of the present study showed that establishment of emergency medicine results in a more efficacious triage. On the other hand, the percentage of patients leaving the emergency unit in the 12-hour period decreased significantly. Although the number of patients discharge against medical advice and the mean of cases disposed in a 6-hour decreased at the end of the study, the differences were not statistically significant. The decrease in triage time can be explained by the fact that in the hospital under study, before establishment of emergency medicine, triage was carried out by general practitioners. This kind of triage had two main disadvantages: first, the triage duration was long and second; all the triage levels (from level 1 to level 5, based on Emergency Severity Index) were referred to the emergency ward. However, after establishment of emergency medicine, triage of patients was carried out by the

Table 1: Comparison of performance indexes between the first and second halves of the study

Index	First 6 months		Second 6 months		p
	Mean	SD1	Mean	SD	
Mean of triage time (minutes)	6.04	7.7	1.5	0.27	0.016
Patients were disposed in 6 hours (%)	94.4	1.6	93.1	1.8	0.2
Patients were disposed during 6 hours, discharged during 12-hour (%)	97.3	0.8	90.4	0.6	0.004
Unsuccessful CPRs (%)	64.9	21.1	74.4	13.2	0.34
Discharge against medical advice (%)	20.7	1.1	19.4	2.0	0.42

1: Standard deviation

Table 2: Comparison of performance indexes between the first and last quarters of the study

Index	First quarter		Last quarter		p
	Mean	SD1	Mean	SD	
Mean of triage time (minutes)	3.5	0.25	1.4	0.14	0.08
The patients whose cases were disposed in 6 hours (%)	95.0	0.94	93.9	0.17	0.08
The patients discharged from the emergency ward in 12 hours (%)	97.5	0.8	89.9	0.47	0.08
Unsuccessful CPRs (%)	55.7	20.1	88.0	14.2	0.13
Discharge against medical advice (%)	20.2	1.4	20.8	1.6	0.56

1: Standard deviation

emergency residents, which resulted in a shorter triage time and referral of level 5 patients to the outpatient clinic. This fact resulted in a change in the pattern of patients referring to the emergency ward, i.e. the number of critically ill patients increased. Since, there were lacking resource regarding number of intensive care unit (ICU) and monitoring room these patients remained in the emergency ward. Therefore, during the second half of the study period the percentage of patients who remained in the emergency unit for more than 12-hour, subsequently increased. The previous studies have shown that one of the factors responsible for crowdedness of emergency units is patients' not leaving the emergency ward due to any causes (9-11). Queuing theory, suggests that an increase in using a service results in an increase in waiting to receive services (12, 13). Theoretically, when the capacity of a system remains low, the waiting duration of users for the service will increase (12). Extension of this theory to the emergency unit emphasizes the fact that an increase in the occupation of hospital beds results in an increase in crowdedness of emergency units, subsequently. Bowker and Stewart reported a frequency of 98% for unsuccessful CPR cases (14). Peberdy et al reported a frequency rate of 87% for such cases (15). As shown in Tables 1 and 2, there was an increase in the number of unsuccessful CPRs in the present study. Although the difference was not statistically significant, it was noticeable (55.7% vs. 88%). Such a difference was attributed to improving and correcting the method used to record unsuccessful CPRs. By definition, a CPR is successful if the patient has spontaneous circulation after the procedure and does not require repetition of CPR

for at least 20 minutes. However, before establishment of emergency medicine, each CPR, which resulted in spontaneous circulation in the patient, was considered a successful CPR (even if CPR was again needed in less than 20 minutes). Therefore, correction of the method used to register the reports resulted in more accurate and reliable statistics. The literature review in the present study did not bring up a study, which has particularly evaluated the performance indexes of emergency units. The majority of studies available have evaluated the management and human resource aspects. For example, Rahman et al reported that hospitals in which the head of the emergency unit is an emergency medicine specialist with experienced personal exhibit better performance in rendering emergency services (16). Movahedina et al evaluated timing indexes in an emergency unit and reported that timing indexes in the emergency unit of Firouzgar Hospital were standard, which was attributed to the presence of emergency physicians' establishment in the unit (17). Other studies are in opposing opinion (18, 19).

Limitation

The patients referred to ED during two period of study are not necessarily the same. On the other hand, differences may be due to more accurate fulfilling patient's timetables after nursing educational courses. In addition, our hospital guidelines and resistance of other wards against admission of patients, limit on-time disposition.

Conclusion:

It seems that establishment of emergency medicine could be able to improved emergency department performances indexes such as time to triage and 12-hour

disposition.

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