Original Article

The Impact of Team Triage Method on Emergency Department Performance Indexes: A quasi-interventional study

Abstract

Introduction: One of the effective methods of patient triage in the emergency department (ED) is the use of team triage, including physicians and nurses. Considering that there is no conclusive evidence about the effectiveness of team triage, this study aimed to investigate the effect of the team triage method on ED performance indexes. **Methods:** The present study is a quasi-interventional study in which 200 patients were referred to the ED in the hospitals of Tabriz in 2020. Participants were randomly assigned to two groups (team triage and conventional triage) and were evaluated. Data were collected by a three-part questionnaire including the participants' demographic characteristics, the five-level triage form, and Press-Ganey satisfaction questionnaire were used. Data were analyzed by SPSS.22 statistical software. **Results:** The results showed that the mean score of waiting time for the first physician visit in team triage was statistically significantly lower than the conventional triage ($P = 0.001$). Furthermore, the mean score of waiting time for receiving the first treatment in team triage was statistically significantly lower than the conventional triage ($P = 0.001$). Finally, the mean score of patients' satisfaction in team and conventional triage was statistically significantly higher in team triage ($P = 0.001$). **Conclusion:** The study findings revealed that the team triage method, in comparison to conventional triage, decrease the waiting time for receiving the first service and length of stay, but leads to more patient's satisfaction. Therefore, to improve the performance indicators of the ED, it is recommended that hospital managers use the team triage method.

Keywords: *Conventional method, emergency department, patients' satisfaction, team method, triage*

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Introduction

Hospitals are one of the most important parts of health-care system and are responsible for providing services such as assessment, diagnosis, treatment, and rehabilitation. Therefore, adequate and accurate hospital functions could improve patient outcomes and early return to a routine life.[1] The emergency department (ED) is the gateway to the hospital and one of the critical aspects of hospitalization and patient care when faced with major accidents and high-risk health conditions. Thus, having highly skilled nursing and medical staff on duty at all times assures that proper administration and supervision has been applied to address urgent needs.[2]

Undoubtedly, the main and primary role of the ED is to treat critically ill and seriously injured patients.[3] Several factors could delay patients' treatment in the ED, such as overcrowding of ED and prolonged waiting

time.[4,5] Evidence shows that a long stay in the ED increases patient dissatisfaction due to adverse outcomes. To prevent these possibilities, referred patients to the ED should be immediately triaged and treated.[6]

Triage comes from the French "trier," to sort or allocate and means prioritization of patients for urgent health-care management.[7] Triage is a vital part of admission and patient management in an emergency room and applied to reduce errors, divide workload, and offer immediate care. A desirable triage system could accurately assess acuity and provide the required urgent care after a correct and timely diagnosis.[8]

Appropriate triage plan could increase the quality of care services, increase overall satisfaction, decrease waiting time and hospital stay, reduce morbidity and mortality, and increase the efficiency and effectiveness of ED services in parallel with the associated costs. In contrast, inefficient triage plan could lead to the loss and waste

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of valuable resources, treatment delays, dissatisfaction, and poor health outcomes. Therefore, the application of an effective triage system is one of the basic steps for the efficient management of the ED.[9]

Any standard triage system should be simple and designed to increase patients' trust in the health-care providers.[10] A wide range of ED triage systems are used in different parts of the world, and among them, there is a current and popular five-level Emergency Severity Index (ESI). The ESI system is commonly used in hospital EDs,[11] where patients are divided into five disease severity levels. Level 1 is the most severe and Level 5 is the least severe condition.[12] The ESI levels are numbered one through five, with Level 1 indicating the greatest urgency. However, Levels 3, 4, and 5 are determined not by urgency but by the number of resources expected to be used as determined by an experienced nurse. The levels are as follows: Level 1 (immediate, lifesaving intervention required without delay), Level 2 (high risk of deterioration or signs of a time-critical problem), Level 3 (stable, with multiple types of resources needed to investigate or treat), Level 4 (stable, with only one type of resource anticipated), and Level 5 (stable, with no resources anticipated except oral or topical medications, or prescriptions).[13]

The majority of hospitals in the United States use the ESI triage system for their patients.[14] Research studies have confirmed the accuracy of the ESI triage system by triage nurses and other health providers when providing emergency services for patients.[8,15]

One of the most important indicators for the performance evaluation of a five-level triage system is noticed the wait time for receiving emergency services, length of stay, and patient satisfaction in the ED.[16,17] In particular, the wait time duration in the ED was one of the main components with a significant impact on patient's satisfaction with ED services.[17,18] Other studies have shown that wait time for ED services was directly related to patient satisfaction.[6,19]

While the application of the five-level triage system increases the accuracy of the triage process, it does not always produce the best results, especially when the major responsibility for triage is assigned to the "triage nurse" alone.[20] The traditional triage model by ED nurses often requires a rapid patient assessment process. Therefore, creative strategies are necessary to improve the time frame for patient assessment upon arrival and admission. One approach is the fast track or a rapid system of triage teamwork system rather than having a single triage nurse.[21] Evidence suggests that teamwork in health-care delivery will generate better health outcomes for patients.[22] Different triage models have been introduced to address the problem of overcrowding in EDs. Several studies have shown that providing more physicians at the first receiving stage can improve the efficiency and quality of care. The concept of team triage, on the other hand, includes

physicians and/or nurse practitioners, in the triage process along with ED nurses.[23]

Due to the importance of waiting time to receive services, length of stay, and patient satisfaction at the ED, researchers examined various interventions and found the creation of a triage team of nurses and physicians was the best approach.[20,24] These studies indicated that a triage team of nurses and physicians fulfilled performance criteria by shorter waiting time, length of stay, and patient satisfaction. However, other studies in this area have reported contradictory results.[25-27] The importance of patient triage in ED for a better patient outcome can be accomplished using innovative, evidence-based methods and because the subject of the team triage model has not been examined in Iran; therefore, the aim of this study was to investigate the effect of team triage method on ED performance indexes.

Methods

Study design and setting

A quasi-interventional study design was used to examine the effects of team triage method on the ED performance indexes at Sina Hospital in Tabriz, Iran, in 2021. The ED of Sina Hospital is located on the first floor of the hospital. This ward has 16 active beds including 12 beds for adults and 4 special beds for children, along with facilities such as oxygen and central suction, advanced central monitoring. This department has a triage room, a nursing station, a cardiopulmonary resuscitation room, and operating room. There are two physicians, six nurses, two auxiliary nurses, one service personnel, and two guards in the ED in each work shift. On average, about 2,500 patients are hospitalized per month in the emergency department, most of them with symptoms of drug poisoning, heart attack and trauma.

Sampling and participants

Over 2 months from February to April 2020, 200 patients who met the inclusion criteria were selected by convenience sampling method and then randomly assigned to two groups (team and conventional). To determine the required sample size, a pilot study was conducted with a sample size of 20 eligible patients. Considering the mean and standard deviation obtained from this study (74.99 ± 2.5) at a 95% confidence level, test power (80%), and 5% mean error, the required sample size using the following formula was calculated to enroll 90 patients for each group. Considering the estimated 10% attrition in each group, the final sample size was selected to include 200 for both groups. However, in our study, none of the samples were excluded from the research process and the entire samples were investigated [Figure 1].

$$n = \frac{\left[Z_{\left(1-\frac{\alpha}{2}\right)} + Z_{(1-\beta)} \right]^2 \times \left(\sigma 1^2 + \sigma 2^2 \right)}{(\mu 1 - \mu 2)^2}$$
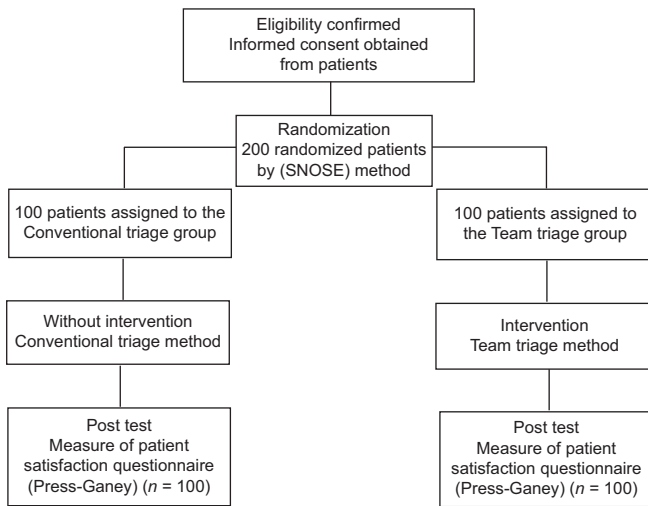
Figure 1: Flow chart of the study

Sample size calculation formula:

n (number of sample), α (Type 1 error) = 0.05, β (Type 2 error) =0.2, $Z\left(1-\dfrac{\alpha}{2}\right)$ = 1.96.

$Z(1-\beta)$ =0.84, δ (standard deviation), μ (mean).

The inclusion criteria upon consent to participate in the study included admission to the ED and triaged for services, the ability and alertness to complete the questionnaires. The exclusion criteria also included reluctance to continue taking part in the study, worsening the clinical situation, and inability to answer questions and/or contracting COVID-19.

Intervention/team and conventional approach

The experienced nurses (with at least 3 years of work experience in ED) triaged a group of admitted patients at the ED in a conventional method and another group of patients admitted to the ED were triaged by a team of nurses and physicians using the five-level ESI. In the conventional method, the triage nurse performed an initial assessment of the patient, and, after determining the relevant triage level, referred the patient to the emergency physician. Regarding the triage team, it can be said that the nurse and the doctor each had duties, but in the end, they worked together harmoniously. For example, the nurse performed the initial examination of the patients and their leveling, and, in some cases, consulted with the doctor in this field. This physician also performed clinical examinations such as laboratory tests, radiological imaging, and prescribing medication based on the nurse's data and the patient's emergency needs.

Random selection of samples (patients) for team and conventional triage methods was done by researchers on all days of the week and all shifts. Therefore, to randomize the selection, the sequentially numbered opaque sealed envelope (SNOSE) method is used by sealed envelopes with sequential numbering to blinding the two groups of participants and researchers. Envelopes were numbered through random number generation computer software. Sealed envelopes containing group numbers were distributed to the patients by a coinvestigator, and then the numbered envelopes were opened to identify the participants' group type, and the patients of each group were identified. To avoid gender bias, we tried to vary the gender composition of the team in terms of selecting nurses and doctors. Three teams and six triage nurses participated in this study in different shifts. Furthermore, we explained the method and purpose of the study to the nurses and doctors so that no particular problem would arise in the study process.

Instruments

Data collection tools included: demographic characteristics' questionnaire, emergency index registration form, and patient satisfaction questionnaire (Press-Ganey). Demographic characteristics questionnaire assessed for gender, age, marital status, level of education, chief complaint, etc., A researcher-made registration form for the emergency indexes composed of 22 items asking questions based on the five-level standard triage of the ESI. Questions consisted of emergency indices such as patient waiting time for the first physician visit (per minutes), time of receiving the first service (per minutes), agreement between the triage unit and the emergency physician, personalized discharge, leave of emergency care without treatment, and total number of triage cases during the shift.

Patient satisfaction questionnaire, according to Press-Ganey obtained patient satisfaction data. The main part consists of 20 questions in three parts: assessment of satisfaction when attending the emergency room (8 questions), physician visits (9 questions), and care provider's satisfaction (3 questions). Its scoring was based on a Likert scale (very good = 5, good = 4, average = 3, poor = 2, and very poor = 1 point). The range of scores was 20–100 and higher scores indicated higher satisfaction.[28]

To evaluate the reliability of the emergency index registration form, the agreement evaluation method was used. In this case, during a pilot study, data were extracted and recorded on the form, and then, the agreement coefficient was calculated between the observers (Kappa = %98). Furthermore, the validity of the questionnaire was based on face and content validity. The questionnaires were evaluated by 10 research experts and professors at Tabriz University for necessary modification based on their suggestions with Content Validity Index (0.80). The reliability of the patient satisfaction questionnaire after translation to Persian was previously assessed and used in Iran by Soleimanpour *et al.* using Cronbach's alpha coefficient (0.79–0.96).[28] In this study, reliability was established through piloting the tool among 20 patients referred to the ED and Cronbach's alpha coefficient by test–retest method showed patient satisfaction questionnaire reliability of (0.85).

Ethical statement

This study was approved by the Ethics Committee of Tabriz University of Medical Sciences (Ethical approval No: IR.TBZMED. REC.1398.491) on July 14, 2019. Informed consent was obtained from all participants with emphasis on data security, confidentiality, privacy, and freedom to join or withdraw from the study at any time.

Statistical analysis

Data were analyzed by SPSS statistical software (SPSS for Windows, version 22.0; SPSS Inc., Chicago, Illinois, USA), including descriptive statistics (number, percentage, and mean and standard deviation) and inferential statistics (Chi-square and independent t-test). The Kolmogorov–Smirnov test indicated the normality of the data distribution. Furthermore, Cohen's kappa coefficient test was used to evaluate the accuracy of the triage of two groups with triage of emergency physicians before intervention. The statistical significance is considered < 0.05.

Results

Demographic characteristic results showed no significant differences between the two groups [Table 1]. There was a complete agreement between the triage in both groups when the emergency physicians triaged and classified patients (Cohen's kappa coefficient = 1). The average wait time for the first physician visit was 3.5 min for team triage and 8.79 min for conventional triage efforts, with a statistical significance of (P = 0.001, t = −8.65). The average wait time for receiving the first treatment in team triage was 7.8 min and for conventional triage was

17.9 min, with a statistical significance of (P = 0.001, t = −9.36) [Table 2 and Figure 2]. Finally, the mean score of patients' satisfaction for team and conventional triage was 95.15 and 73.91, respectively, with a higher statistical significance for team triage versus conventional (P = 0.001, t = 5.06) [Table 3 and Figure 3].

Discussion

The purpose of this study was to investigate the effect of team triage compared to the conventional method on the ED performance indexes. The results showed an average wait time for the first visit and the average wait time for receiving the first treatment in team triage were statistically significant and shorter than the conventional triage method. In this regard, the result of studies shows that team triage
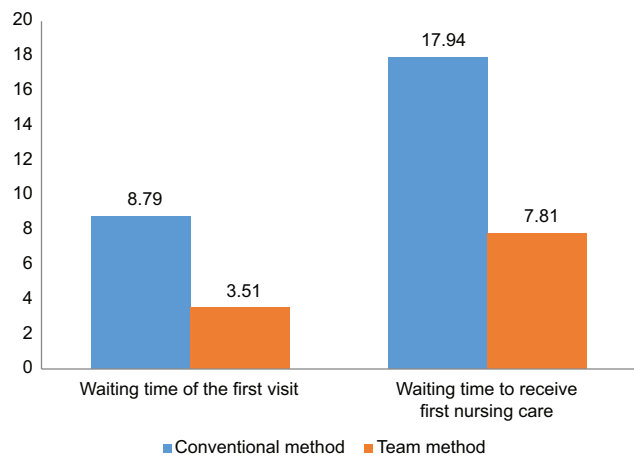

Figure 2: Comparison of waiting time for the first visit and waiting time for receiving the first treatment to patients in the team and conventional triage

Table 1: Comparison of the patients' demographic characteristics in team and conventional triage method (*n*=200)			
Variables	**Team triage, *n* (%)**	**Conventional triage, *n* (%)**	***P***
Gender			
Male	67 (67.0)	54 (54.0)	χ^2=0.267, *P*=0.62
Female	33 (33.0)	46 (46.0)	
How to refer			
Personal car	89 (89.0)	86 (86.0)	χ^2=0.129, *P*=0.96
Ambulance	11 (11.0)	14 (14.0)	
Previous referral			
Yes	3 (3.0)	5 (5.0)	χ^2=0.332, *P*=0.48
No	97 (97.0)	95 (95.0)	
Consciousness status			
Alert	9 (9.0)	12 (12.0)	χ^2=0.144, *P*=0.95
Response to verbal stimuli	91 (91.0)	88 (88.0)	
Triage level			
Level 1	20 (20.0)	11 (11.0)	χ^2=0.347, *P*=0.107
Level 2	29 (29.0)	39 (39.0)	
Level 3	29 (29.0)	28 (28.0)	
Level 4	22 (22.0)	21 (21.0)	
Level 5	-	1 (1.0)	
Age (year), mean±SD	41.66±18.13	41.04±19.57	*t*=0.226, *P*=0.82

χ^2: Chi-square test; *t*: Independent *t*-test. SD: Standard deviation

Table 2: Comparison of waiting time for the first visit and waiting time for receiving the first treatment to patients in team and conventional triage

Variables	Triage type	Mean±SD	Mean difference (CI 95%)	*t, P*
Waiting time of the first visit	Team method	3.51±1.18	5.38 (0.21–6.25)	−8.65, 0.001*
	Conventional method	8.79±2.60		
Waiting time to receive first nursing care	Team method	7.81±2.53	11.23 (3.24–14.74)	−9.36, 0.001*
	Conventional method	17.94±3.35		

*Statistical significant (*P*<0.01). *t*: Independent *t*-test. SD: Standard deviation; CI: Confidence interval

Table 3: Compare patient's satisfaction in team and conventional triage

Variables	Triage type	Mean±SD	Mean difference (CI 95%)	*t, P*
Physician's visit time satisfaction	Team method	43.49±3.49	10.55 (4.82–16.01)	3.85, 0.001*
	Conventional method	32.94±3.26		
Attending time satisfaction	Team method	38.42±3.25	7.73 (2.5–14.96)	4.16, 0.001*
	Conventional method	30.69±3.28		
Care provider's satisfaction	Team method	13.24±1.65	2.96 (1.10–5.75)	2.65, 0.001*
	Conventional method	10.28±1.36		
Total satisfaction	Team method	95.15±7.42	21.24 (9.56–31.08)	5.06, 0.001*
	Conventional method	73.91±5.93		

*Statistical significant (*P*<0.01). *t*: Independent *t*-test. SD: Standard deviation, CI: Confidence interval
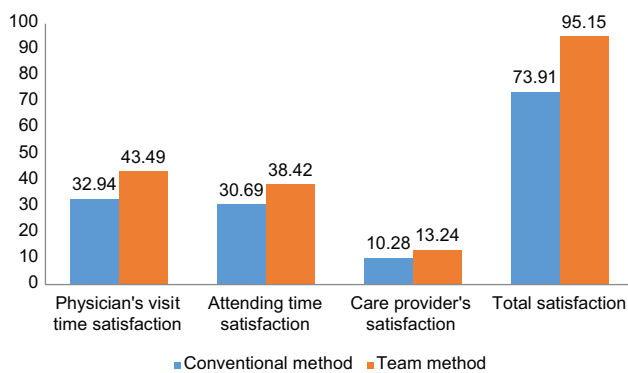

Figure 3: Compare patient's satisfaction in team and conventional triage

will reduce ED crowding, patient waiting time, time of first physician visit, and poor patient outcomes such as morbidity and mortality,[20,25,26] which is consistent with the results of our study. For instance, Shea and Hoyt reported the use of the triage team model in the ED greatly reduced patients' waiting time.[21] Similarly, Heslin *et al*. found that, compared to traditional triage, team triage increased the rate of patients' discharge and reduced the discharge time duration.[20] In Lauks *et al*.'s study, the use of a physician–nurse assessment team in the emergency room significantly reduced patients' waiting time,[26] similar to the results of our study.

Some studies have highlighted the importance of having a physician as a member of triage team. Travers and Lee asserted that a team of a senior emergency physician with a triage nurse reduced the waiting time for offering rapid treatment in the ED.[29] Similarly, Oredsson *et al*. found that fast-track method in the ED and using a physician in triage could reduce patient waiting and stay times in the ED.[30] Consistent with our findings, Choi *et al*. included physician

intervention in patient triage and found a significant reduction in patients' waiting time.[31] In contrast, Ming *et al*. reported no definitive evidence of clinical trials to support team triage can improve patient flow in the ED[25] and suggested further investigations. Whereas French *et al*. revealed that triage type has no effect on waiting time of patients in the ED,[27] opposite of our findings. These inconsistencies could be due to the different methodology and participant characteristics in each study.

The patient satisfaction level in the ED was significantly higher in the team triage group compared to the conventional as Hwang *et al*. reported when they used the fast-track method of team triage consisting of a nurse and an emergency technician.[32] In an Iranian study by Reihani *et al*., researchers showed that patients were dissatisfied with a long waiting period to see a physician in the ED and for a long stay in the ED.[19] Our study participants also reported similar experiences. Yet again, French *et al*. found that triage type did not affect patient satisfaction in the ED[27] which is not consistent with the results of our study.

The research review results and their interpretations, compared to this study, reveal that most studies support patient satisfaction and waiting time in the ED are inversely related.[6,18] This conclusion can be logical because the physician and nurse in the triage room, in cooperation and consultation with each other, evaluate and perform interventions for patients. In other words, it can be claimed that the cooperation of an experienced nurse and physician leads to a more accurate triage of patients. Therefore, compared to the traditional method, in this method, patients are visited and treated faster. Recognizing that the team triage method can reduce the waiting time and thus increase patient satisfaction, prudent hospital administrators

should consider these findings to improve ED services by decreasing waiting time, hospital stay, and increasing patient satisfaction levels. Furthermore, the results of this study show a positive effect on interprofessional practice in the ED, similar to Dreher-Hummel *et al.* study.[33]

One of the limitations of this study was the psychological condition of participants in the ED when completing the questionnaires could have affected their answers. Another limitation is the convenience sampling method and self-reporting of questionnaires, leading to less generalizability of the findings. Researchers aim at conducting future studies without these limitations.

Conclusion

The current study findings show that team triage, compared to conventional triage in the ED, can reduce the waiting time for the initial physician visit and receiving treatment and increase of patient satisfaction. Therefore, to improve the performance indexes of the ED, it is recommended that hospital administrators facilitate the use of the team triage method in emergency units by conducting training sessions and workshops to train skilled and efficient personnel to improve the quality of ED indexes and patient health outcomes.

Conflicts of interest

There are no conflicts of interest.

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