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The Effect of Start Triage Education on Knowledge and Practice of Emergency Medical Technicians in Disasters

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ABSTRACT

Introduction: Pre-hospital triage is one of the most fundamental concepts in emergency management. Limited human resource changes triage to an inevitable solution in the management of disasters. The aim of this study was to evaluate the role of education of simple triage and rapid treatment (START) in the knowledge and practice of Emergency Medical Service (EMS) employees of Eastern Azerbaijan.

Methods: This is a pre-and post-intervention study conducted on two hundred and five (205) of employees of EMS sector, in the disaster and emergency management center of Eastern Azerbaijan Province, 2015. The utilized tool is a questionnaire of the knowledge and practice of individuals regarding START triage. The questionnaire was filled by the participants pre- and post-education; thereafter the data were analyzed using SPSS 13 software.

Results: The total score of the participants increased from 22.02 (4.49) to 28.54 (3.47). Moreover, the score of sections related to knowledge of the triage was a necessity and the mean score of the section related to the practice increased from 11.47 (2.15) to 13.63 (1.38), and 10.73 (3.57) to 14.93 (2.78), respectively, which were statistically significant.

Conclusion: In this study, it was found that holding the educational classes of pre-hospital triage before the disasters is effective in improving the knowledge and practice of employees such as EMS technicians and this resulted to decreased error in performing this process as well as reduced overload in hospitals.

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Introduction

Triage is one of the most important management and decision-making concepts in emergency wards and disasters.¹⁻³ There are two sub-categories of triage namely hospital and pre-hospital triage.⁴ Generally, when there is an overflow of patients in the emergency ward of hospitals or when there are numerous casualties and injured people at the accident scene, triage is the only way of developing the maximum facility for the maximum number of patients.⁵⁻⁶ The three major principles at the occurrence of a disaster are triage, transfer, and treatment.⁷ One of the triage systems widely accepted and used to manage disasters is the simple triage and rapid treatment (START) system, first applied in the US in the

1980s. In other words, START was done at the scene of unexpected incidents in a preliminary fashion and involves passing alongside some casualties who died; hence attempts are merely directed towards people who have a higher chance of survival.⁸ As a result of the simplicity of the START system, learning of it is fast and easy. However, as other quick triage protocols, it has some limitations including negligence of the injury mechanism, limited assessment, and failure to monitor patients with a mild or moderate injury, whose transfer is delayed.⁹

The triage of injured people is a vital skill. Although there are systems for guiding emergency medical service (EMS) employees in decision-makings on triage, there are a few evidences which confirm the validity of these

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systems.¹⁰ Sedaghat *et al.*, concluded that the level of awareness and performance of EMS personnel about pre-hospital triage in Northern Khuzestan is low.¹¹ Also, Aghababaeian *et al.*, concluded that awareness of EMS about the START system is less than optimal.¹²

As a developing country, Iran has always been subject to disasters over the past years.¹¹ The solution required for solving the problems associated with these disasters and incidents include preparedness and planning, application of advanced systems, ensuring the policy of accountability, existence of a successful scientific and executive program and availability of sufficient resources of emergency and trained as well as skilled human resources.¹² A large number of victims during mass-casualty incidents are referred to emergency wards and this event may disrupt the normal flow of patient in a crowded emergency ward.¹³ Ideal management of disaster is not the only addition of methods to dealing with urgencies; rather all casualties should be assessed for the provision of treatment and transfer. The issue of casualty prioritization for treatment, should also be investigated.¹⁴

After the occurrence of Varzeghan and Ahar earthquakes on Aug. 2012 in East Azarbaijan, IR Iran, it was observed that the knowledge and practice of EMS employees about triage in disaster (START) were very low based on the patients were transported to our emergency ward of Emam Reza hospital by EMS.¹⁵ Thus, a study on START triage education to EMS employees was conducted. The aim of this study was to determine the role of education in improving the awareness and performance of pre-hospital EMS employees in Eastern Azerbaijan Province in 2015, considering START and doing jaw thrust (airway maneuver at the time of crisis and during START triage).

Materials and methods

This research is a one group pre- and the post-test study conducted in 2015 in the disaster and emergency management center of Eastern

Azerbaijan Province, affiliated to Tabriz University of Medical Sciences. Five cities of the province were selected based these cities are auxiliary cities in our province namely Tabriz, Ahar, Marand, Maragheh, and Mianeh cities and all employees of pre-hospital emergency service in these cities and cities around them were selected. Auxiliary cities in our province were selected by Tabriz University of Medical Sciences from about 30 years ago, and the education programs of the health care providers in these cities and around of them were conducted in auxiliary cities. This process is based on the decentralization policy. The inclusion criteria included being a member of pre-hospital emergency services while the exclusion criteria were the reluctance to continuing the cooperation in the study and not filling the post-test questionnaire. In these cities, 250 people of the EMS personnel were included in the study, but according to the exclusion criteria, the results of 205 individuals were assessed. A written informed consent form was taken from all the participants based on explanation of the study conditions. The current study was confirmed by the ethical committee of Tabriz University of Medical Sciences under the code "TBZMED. REC. 1394. 2" 19. 04.2015.

In order to evaluate the level of awareness and performance of participants, a multiple choice question test (MCQ) was added in the form of a pre-test. Similarly, to assess the skills of managing the jaw thrust airway maneuver a healthy person was used and hypothetical conditions were developed using simulated patient (following the acquisition of informed consent). The questionnaire consists of three parts. The first part of the questionnaire was about the demographic features of participants (age, gender, level of education, and years of work experience), the second part was about knowledge of participants (15 questions) and the third part is about the practice of participants (19 questions). The Validity and reliability of questionnaire that we used in this study had already been examined and confirmed in the study by Aghababaeian *et al.*,

Chronbach's alpha was 88% about awareness questions and was 83% about performance questions. Also Pearson correlation coefficient in retest exam was 0.8.¹² In the second section of the questionnaire, the questions 1-3 were related to the significance and necessity of triage, questions 4 and 5 were related to the preliminary measures taken by the triage technician when confronted with patients, questions 8 and 9 dealt with the major goals of the triage while questions 12-15 were associated with familiarity and application of colors in grouping of patients during triage. In the third part of the questionnaire, the questions were divided according to triage class. The Questions 2, 6, 8, 10, 13, 14, 17, and 19 were related to the immediate class, while Questions 9 and 18 were associated with the dead-dying class.¹⁶ The score of every correct answer was 1.

Based on our study design, all 205 participants in 5 groups (in 5 auxiliary cities) were categorized. First, the age, gender, level of education, and years of work experience of participants were recorded, then pretest was conducted. This was followed by running an educational class regarding the principles of triage during disasters along with management of airway¹⁶ for the studied participants. Training model was based on lecture model and based on the scenarios designed for disaster together with group discussions. The class was handled by one of the faculty member of the university for all participants and the duration of the class was two hours. Eventually, following 2 hours after completion of the class, post-test was done with the same questions considered in the pre-test. Awareness and practice of participants was evaluated with questionnaire results.

Considering the evaluation of jaw trust maneuver, a simulated patient was employed following the acquisition of informed consent. Two faculty members of the university, as an evaluator and referee, assessed the airway maneuver procedure, where the scoring was based on the degree of accomplishment of the procedure as good or weak. If the opinion of the referees was the same, it was recorded;

otherwise, the opinion of a third person (a faculty member) was used. First, before the training, the procedure of the maneuver was evaluated, followed by offering the training of the method of the maneuver to the participants in the form of lecture, using the available slides and practical model. Then the participants were reevaluated.

The data were analyzed by SPSS 13. To describe the data, descriptive statistics consisted of frequency; percentage and mean (standard deviation) were used. To test the normality of the distribution of the data, Kolmogorov-Smirnov test was used. To compare the qualitative variables, Chi-square statistical test was used, while for comparing the quantitative variables between pre and post test results, paired t-test was used. A p-value lower than 0.05 was considered significant.

Results

In this study, 205 participants were included. The mean age of the participants was 34.97 ± 6.42 years (the range was 23 to 50 years old). The mean background of work experience was 9.44 (5.85) years (range=2-26 years). A total of 197 participants (96.1%) were the technician of the medical emergency, and 6 (2.9%) were operators, and 2 (1%) were drivers. As many as 179 cases (87.3%) were married while 26 of (12.7%) were single.

The mean score of all questions in the pre-test and post-test was 22.02 (4.49) and 28.54 (3.47), respectively. The mean scores related to awareness of the necessity of triage in pre and post-test was 11.47 (2.15) and 13.63 (1.38), respectively. In the performance section, these scores were 10.73 (3.57) and 14.93 (2.78), respectively. In order to compare the obtained results and evaluate the role of education in the areas of awareness and performance, in addition to comparing the total scores and individual pre- and post-test, the questions were also evaluated in specified classes. Table 1 presents the comparison of the findings of the two exams regarding the second section of the questionnaire (awareness of the necessity

of triage). Table 2 provides the pre- and posttest scores related to the second part of the

questionnaire (measurement of individuals' performance in triage).

Table 1. Comparison of the results of pre- and posttest regarding awareness of the necessity of triage

Variables	Pre-Test N (%)	Post-Test N (%)	P-value*
Necessity of triage			
Question 1	196 (95.6)	205 (100)	0.004
Question 2	149 (72.7)	199 (97.1)	<0.001
Question 3	186 (90.7)	188 (91.7)	0.72
Primary measurements			
Question 4	85 (41.5)	150 (73.2)	<0.001
Question 5	142 (69.3)	192 (93.7)	<0.001
Main goal of triage			
Question 8	182 (88.8)	179 (87.3)	0.64
Question 9	160 (78)	187 (91.2)	<0.001
Understanding and application of triage colors			
Question 12	157 (76.6)	202 (98.5)	<0.001
Question 13	120 (58.5)	192 (93.7)	<0.001
Question 14	169 (82.4)	198 (96.6)	<0.001
Question 15	171 (83.4)	194 (94.6)	<0.001

N (%): Number of correct answer, *Chi-square test

Table 2. Comparison of the scores of pre- and posttest related to measurement of performance of individuals in triage

Variables	Pre-Test N (%)	Post-Test N (%)	P-value*
Delayed category			
Question 2	90 (43.9)	125 (61)	0.004
Question 6	60 (29.3)	127 (62)	<0.001
Question 8	108 (52.7)	172 (83.9)	<0.001
Question 10	111 (54.1)	158 (77.1)	<0.001
Question 13	92 (44.9)	127 (62)	0.001
Question 14	74 (36.1)	145 (70.7)	<0.001
Question 17	80 (39)	11 (57.6)	<0.001
Question 19	36 (17.6)	163 (79.5)	<0.001
Immediate category			
Question 1	167 (81.5)	194 (94.6)	<0.001
Question 3	163 (79.5)	171 (83.4)	<0.001
Question 4	108 (52.7)	161 (78.5)	<0.001
Question 5	91 (44.4)	165 (80.5)	<0.001
Question 7	167 (81.5)	187 (91.2)	0.004
Question 11	173 (84.4)	191 (93.2)	0.005
Question 12	159 (59.6)	175 (85.4)	0.04
Question 15	160 (78)	167 (81.5)	0.39
Question 16	100 (48.8)	160 (78)	<0.001
Dead/dying category			
Question 9	123 (60)	186 (90.7)	<0.001
Question 18	118 (57.6)	184 (89.8)	<0.001

N (%): Number of correct answer, *Chi-square test

Considering the quality of the jaw thrust airway maneuver, based on comments of referees, only 45 people (21.9%) managed to do the maneuver appropriately in the pre-test stage. In the post-test stage, 181 subjects (88.3%) did this maneuver with a good quality.

Using chi-square test, a comparison of the quality of jaw thrust maneuver in the pre- and post-test stages indicated a statically significant difference ($P < 0.001$).

Discussion

Our study revealed that education relatively has an important role in improving the knowledge and performance of EMS employees considering pre-hospital START triage during disasters, with the scores of the participants have a significant difference between the pre- and post-test. In this study, 96.1% of participants were technicians of medical emergencies whose mean age was 34.97 (6.42) and their mean years of work experiences was the result of multiple developments of pre-hospital emergency centers and the associated personnel in recent years. This can justify holding training courses and performing periodic evaluations related to their occupational issues. The significance of the youngness of this class of health employees has also been highlighted in the study of Sedaghat et al.,¹¹ and Aghababaeian et al.¹²

The experience of people, usually mentioned in the form of working years, was also investigated as an influential factor affecting the accuracy of performing triage. In the meta-analysis by Considine et al., it was reported that experience is not an effective independent factor on triage of patients while the knowledge and performance of people are the major factors determining the success of this issue¹⁷ Moreover, the area of knowledge and performance is the only section for which large-scale planning should be done, so as to improve and stabilize it for healthcare service employees.^{17,18} Considering the low mean working experiences of participants in this study, this issue finds more significance that these people have been in working conditions

for 15 to 20 years and their performance in this duration will have a considerable impact on the performance of health system especially in the emergency wards of the province. Based on our study results, through proper planning and relearning courses, it is possible to improve the status of pre-hospital triage in a long-term and permanent fashion.

In the study by Sedaghat et al., the mean scores of knowledge and performance of participants were 5.69 (2.5) and 5.78 (3.2), respectively, showing a low level.¹¹ Abbasi et al., also revealed that the level of knowledge of physicians in Bushehr province is very low, regarding the confrontation with a disaster¹⁹. The study by Kilner also indicated that the level of knowledge and performance of physicians and nurses were similar and even far greater than the paramedical personnel. This again highlights the significance of periodic education for EMS employees.²⁰

The results of our study showed that holding training courses regarding the significance, necessity, and procedure of START triage have a great influence on improving their knowledge and performance of EMS employees. In this study, the overall score of the test had increased significantly from 22.02 (4.49) to 28.54 (3.47) after education ($P < 0.0001$). In the study by Aghababaeian et al., the mean scores of knowledge and performance of people before the training were 5.8 (2.8) and 5.5 (3.7), which increased to 12.69 (1.9) and 14.36 (2.8), respectively.¹² Chen et al., evaluated the response percentage of subjects before and after training class as 55.8 and 87.8%, respectively. Following the training, the level of over triage and under triage of the participants declined from 28.6 and 15.5% to 1 and 11.2%, respectively.²¹

These points emphasize the significance of holding training courses for EMS personnel. Further, the classification of questions in this study indicates that training is effective in improving their knowledge of the concepts and their necessity along with their application. In the questionnaire related to the performance of individuals, it was found that the performance improved towards all patients

including delayed, immediate, and dead/dying patients (Table 2). It was also observed that the levels of over triage and under triage had also declined (Table 2).

One of the limitations of our study was that we were not able to evaluate the long-lasting persistence of knowledge and performance of participants following the training class. Because of the aim of study was the evaluation of knowledge of EMS in East Azarbaijan as a global, we did not compare the results of the study based on participants cities. Moreover, another limitation was the inability in holding an operational maneuver for evaluating the quality of performance of participants in triage on the scene.

Conclusion

Running training courses and relearning to enhance the knowledge and performance of EMS personnel have effective roles in better management of incidents and disasters. Considering the trivial role of experience in the performance of people in comparison with their knowledge and awareness and the low mean age of EMS personnel in the province, it is suggested that regular training courses are incorporated in the curriculum of this group of health employees so that through repetition of the concepts and reviewing hypothetical situations, principles of triage are internalized.

Furthermore, doing field maneuvers can play remarkable roles in stabilizing the theoretical instructions in people. Evaluation of other training methods such as role modeling and application of multimedia tools and comparing them with each other along with evaluation of people within greater intervals following training courses are also suggested for determination of the best training strategy. Considering the necessity of running training classes, it can be stated that well-documented planning is crucial for running training classes within suitable and regular periods.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

References

1. Aylwin CJ, König TC, Brennan NW, Shirley PJ, Davies G, Walsh MS, et al. Reduction in critical mortality in urban mass casualty incidents: analysis of triage, surge, and resource use after the London bombings on July 7, 2005. *Lancet* 2006; 368 (9554): 2219-25. doi:[10.1016/S0140-6736\(06\)69896-6](https://doi.org/10.1016/S0140-6736(06)69896-6).
2. Dadashzadeh A, Abdollahzadeh F, Shams Vahdati S, Lotfi M, Ghojzadeh M, Bagheri Mehmandousti S. Causes of delay in patient triage in the emergency departments of tabriz hospitals. *Tr J Emerg Med* 2011; 11 (3): 95-8. doi: [10.5505/1304.7361.2011.59354](https://doi.org/10.5505/1304.7361.2011.59354).
3. Göransson KE, Von Rosen A. Interrupter agreement: A comparison between two emergency department triage scales. *Eur J Emerg Med* 2011; 18 (2): 68-72.
4. Azhough R, Shams Vahdati S, Faraji F, Faraji M, Ghorbanian M, Ramouz A, et al. One-day triage course for nurses, it is essential. *Journal of Emergency Practice and Trauma* 2015; 1 (2): 52-5.
5. Fry M, Burr G. Current triage practice and influences affecting clinical decision-making in emergency departments in NSW Australia. *Accident and Emergency Nursing* 2001; 9 (4): 227-34.
6. Risavi BL, Salen PN, Heller MB, Arcona S. A two hour intervention using START improves prehospital triage of mass casualty incidents. *Prehosp Emerg* 2001; 5 (2): 197-9.
7. Ramesh AC, Kumar S. Triage, monitoring, and treatment of mass

- casualty events involving chemical, biological, radiological, or nuclear agents. *J Pharm Bioallied Sci* 2010; 2 (3): 239-47. doi: [10.4103/0975-7406.68506](https://doi.org/10.4103/0975-7406.68506).
8. Armstrong JH, Frykberg ER, Burris DG. Toward a national standard in primary mass casualty triage. *Disaster Med Public Health Prep* 2008 ; 2 (Suppl 1): S8-S10. doi: [10.1097/dmp.0b013e31818582a5](https://doi.org/10.1097/dmp.0b013e31818582a5).
 9. Neal DJ, Barbera JA, Harrald JR. -PLUS prehospital mass-casualty triage: a strategy for addressing unusual injury mechanisms. *Prehosp Disaster Med* 2010; 25 (3) : 227-36.
 10. Lerner EB, Schwartz RB, Coule PL, Weinstein ES, Cone DC, Hunt RC, et al. Mass casualty triage: an evaluation of the data and development of a proposed national guideline. *Disaster Med Public Health Prep* 2008; 2 (S1): S25-34. doi: [10.1097/dmp.0b013e318182194e](https://doi.org/10.1097/dmp.0b013e318182194e).
 11. Sedaghat S, Aghababaeian H, Taheri N, Sadeghi Moghaddam A, Maniey M, Araghi Ahvazi L. Study on the level of knowledge and performance of North Khuzestan medical emergency 115 personnel on pre-hospital triage. *Iranian Journal of Critical Care Nursing* 2012 ; 5 (2) : 103-8. (Persian)
 12. Aghababaeian HR, Taheri N, Sedaghat S, Bahrami N, Maniee M, Araghi Ahvazi L. Studying the effect of triage video training through START style on awareness level of emergency medical staffs and their performance. *Iranian Journal of Critical Care Nursing* 2013; 6 (3): 205-12. (Persian)
 13. Lerner EB, Schwartz RB, Coule PL, Pirrallo RG. Use of salt triage in a simulated mass casualty incident. *Prehosp Emerg Care* 2010; 14 (1): 21-5. doi: [10.3109/10903120903349812](https://doi.org/10.3109/10903120903349812).
 14. Lee JS, Franc JM. Impact of a two-step emergency department triage model with start, then CTAS, on patient flow during a simulated mass-casualty incident. *Prehosp Disaster Med* 2015; 30 (4): 390-6. doi: [10.1017/s1049023x15004835](https://doi.org/10.1017/s1049023x15004835).
 15. Pouraghaei M, Jannati A, Moharamzadeh P, Ghaffarad A, Far MH, Babaei J. Challenges of hospital response to the twin earthquakes of august 21, 2012, in East Azerbaijan, Iran. *Disaster Medicine and Public Health Preparedness Journal* 2017:1-9. doi: [10.1017/dmp.2016.153](https://doi.org/10.1017/dmp.2016.153)
 16. Marx J, Hockberger R, Walls R. *Rosen's emergency medicine - concepts and clinical practice : expert consult*. 8th ed. Philadelphia: Elsevier Saunders; 2013.
 17. Considine J, Botti M, Thomas S. Do knowledge and experience have specific roles in triage decision-making? *Acad Emerg Med* 2007; 14 (8): 722-6. doi: [10.1197/j.aem.2007.04.015](https://doi.org/10.1197/j.aem.2007.04.015).
 18. Wang C, Wei S, Xiang H, Xu Y, Han S, M Kangara OB, et al. Evaluating the effectiveness of an emergency preparedness training programme for public health staff in China. *Public Health* 2008; 122 (5): 471-7. doi: [10.1016/j.puhe.2007.08.006](https://doi.org/10.1016/j.puhe.2007.08.006).
 19. Abbasi E, Nosrati A, Nabipour I, Emami SR. Assessment of the level of knowledge of Physicians in Bushehr Province about preparedness and response for Nuclear Emergency. *Iranian South Medical Journal* 2005; 7 (2) : 183-9.
 20. Kilner T. Triage decisions of prehospital emergency health care providers, using a multiple casualty scenario paper exercise. *Emerg Med J* 2002; 19 (4): 348-53.
 21. Chen KC, Chen CC, Wang TL. The role tabletop exercise using START in improving triage ability in disaster medical assistance team. *Ann Disaster Med* 2003; 1 (2) : 78-84.