

# Effect of Triage Training on Concordance of Triage Level between Triage Nurses and Emergency Medical Technicians

NEZAR GHANBARZEHI<sup>1</sup>, ABBAS BALOUCHI<sup>2</sup>, SAKINEH SABZEVARI<sup>3</sup>, FATEMEH DARBAN<sup>4</sup>, NASTARAN HAYDARI KHAYAT<sup>5</sup>

## ABSTRACT

**Introduction:** The transfer of care occurs frequently between emergency medical technicians and emergency ward nurses during which emergency medical technicians transfer the patients from the society to the hospital. This transfer of care often occurs under crowded conditions and in high acuity which would pave the way for a disruption of communication.

**Aim:** This study aimed to investigate the effect of training Emergency Severity Index (ESI) triage on concordance of triage level between emergency medical technicians and triage nurses.

**Materials and Methods:** This interventional study was conducted on all triage nurses and emergency medical technicians in Iranshahr City in winter of 2014. Five triage nurses and 30 emergency medical technicians were included into the study

using census. To collect data, Personal Information Form (PIF) and ESI Triage Criterion were used. During the project implementation, patients were separately classified before and after triage training by emergency medical technicians and triage nurses. To analyse the data, kappa coefficient under SPSS 16 statistical software was used.

**Results:** According to the study results, Cohen's kappa concordance coefficient showed that triage concordance between emergency medical technicians and triage nurses before training was 0.20 which was at an unfavorable level. After training, Cohen's kappa concordance coefficient reached 0.62, which showed a desirable level of concordance as well as a significant difference after training.

**Conclusion:** It is recommended to train and use common triage system to facilitate transfer or delivery of care between emergency medical technicians and triage nurses.

**Keywords:** Emergency severity index (ESI), Emergency ward, Emergency ward nurses

## INTRODUCTION

Transfer or delivery of care facilitates and perpetuates care [1]. The transfer of care occurs frequently between emergency medical technicians and emergency ward nurses during which emergency medical technicians transfer the patients from the society to the hospital. This transfer of care often occurs under crowded conditions and in high acuity which would pave the way for a disruption of communication [2,3].

The greater the crowd of patients in the emergency ward is, the longer time the medical emergency technicians should wait to deliver the patient to the emergency ward nurses during which they could help the requesting patients outside the service system [4]. The increased transfer time inside the hospital and spending so much time to deliver the patient to the emergency nurses by emergency medical technicians is among the important public health problems. That is because this waste of time makes emergency medical technicians fail to respond the needs of society timely and quickly [5]. The quick accurate triage of patients is the key to successful performance in the care of patients. The term "triage" is derived from the word "Trier" which means "to prioritize" and "sort out" used initially in case of war, disasters and mass casualties. Later, this concept was used in emergency wards where patients referred to without scheduling and planning [6]. A desirable triage system should be able to accurately identify the patients who need urgent care and guiding them to the right path, provide a fast access to the diagnostic and therapeutic measures [6]. An improper triage wastes resources, delays in admission and treatment of patients, and leads to the patients' dissatisfaction and incidence of adverse consequences. However, a proper triage can help to determine the patients' treatment line, facilitate their stabilization processes and their admission [7]. Most emergency wards use five-level ESI (Emergency Severity Index) triage system [8]. Five-level triage is the gold standard in emergency medicine which enjoys high popularity in many countries [9-11]. According to this system, patients are classified into five levels based on the

severity of their disease and their need for facilities. Level one is the highest severity of damage and level five is the lowest severity of damage [11]. ESI system was designed for emergency wards where patients referred to with different complaints [7,12] and its reliability was confirmed by numerous studies that evaluated the use of these tools by nurses [13].

However, pre-hospital triage system tends to trust the patient's complaints and his/her clinical condition. Studies showed that determination of early triage acuity had the most important impact on the time of the transfer of patients to the inpatient wards [14,15]. In their study titled as "A review of emergency ward nurses' knowledge about hospital triage" in which 70 emergency ward nurses from all hospitals of Sistan and Baluchestan including Khatam Al-Anbia hospital of Iranshahr participated, Mirhaghi and Roodbari concluded that nurses were not familiar enough with hospital triage knowledge [16]. A common triage system and triage concordance between emergency medical technicians and triage nurses may facilitate the relationship between them and promote the quality of care during the transfer period.

## AIM

This study aimed to assess the effect of triage training on concordance of triage level between triage nurses and emergency medical technicians.

## MATERIALS AND METHODS

This interventional study was conducted in 2014 on emergency medical technicians and all triage nurses working in one of the training hospitals in the city of Iranshahr. Thirty five emergency medical technicians and 5 triage nurses were included into the study using census. Then, five emergency medical technicians were excluded because of their discontent and restrictions for participation, and finally, 30 of them were included into the study. According to a similar study [17], 78 patients were selected for triage as samples by simple randomized sampling method. Exclusion

criteria included change of place of service for triage nurses and emergency medical technicians. Meanwhile, the inclusion criteria for patients was their transfer to the hospital by technicians of 115 Emergency Service and exclusion criteria for patients was death before getting visited by triage nurses, outpatient treatment and non-transfer of patient to hospital. The data collection tool included Personal Information Form (PIF) and Emergency Severity Index (ESI) Triage Criterion [17]. ESI contains personal information such as age, gender, marital status and education level and triage form was based on ESI. The validity of these tools was approved by 10 members of the nursing faculty and emergency medical professionals that expert in field of Emergency and triage. To assess its reliability, all observations were conducted by one of the researchers. In addition, Inter-rater reliability was used to avoid data entry bias. Emergency Severity Index Triage has 5 levels. Decision-making in Level 1 and Level 2 is performed based on the patients' illness severity and in level 3 to 5, it is performed based on the amount of resources needed. Accordingly, patients in level 1 have the highest urgency and patients in level 4 and 5 have the lowest urgency [17,18]. To prevent selection bias, all patients if have inclusion criteria and referral to triage ward are consider for study.

Letter to conduct the research obtained from Research deputy of Nursing School. For critically ill patients who needed life-saving measures and had no time to fill out the triage form, emergency medical technicians were allowed to fill out the triage form for patient when delivering the patient to emergency nurses in the hospital. After completing the triage form for 78 patients by emergency medical technicians and triage nurses, intervention was performed. During the intervention, emergency medical technicians and triage nurses were trained by two triage training nurses about ESI triage. This training was performed in a two-day workshop; learning tools included handouts derived from ESI triage book [17]. Moreover, to classify the participants, they were given case examples for practice and review. In the post-intervention stage, subjects were controlled for two weeks after the workshop. After the two weeks of review, post-test was performed during which emergency medical technicians and triage nurses were retested. This post-test was similar to pre-test. At the end, triage level of pre-test and post-test of two groups were analysed to determine their concordance of triage level. According to the inequality of the number of triage nurses and emergency medical technicians, which was among the study limitations, data were inserted into spss version 22 for analysis. For data analysis, weighted kappa index ( $\kappa$ ) was used to assess the concordance of triage level between medical emergency technicians and triage nurses. That is, after weighting by Van derWulp and Van Stel based on the proposed method, the weighted kappa coefficient was reported 95%. Kappa index of less than 0.2 was considered poor state, 0.21-0.4 as a relatively weak state, 0-0.41 as medium state, 0.61 -0.8 as good state and above 0.8 as excellent [19].

## RESULTS

The information related to the participants' personal information is shown in [Table/Fig-1]. According to the study results, Cohen's kappa coefficient test showed that the degree of concordance of triage between emergency medical technicians and triage nurses was 0.20 before triage training, which represented poor concordance between them. Cohen's kappa coefficient test also showed that the concordance of triage between emergency medical technicians and triage nurses was 0.62 after the intervention which is at a good level [Table/Fig-2&3].

## DISCUSSION

The results showed poor concordance of triage level between triage nurses and emergency medical technicians before training Emergency Severity Index (ESI) triage. Before triage training,

Demographic characteristics		Triage nurses	Emergency medical technicians
		n(%)	n(%)
Gender	Male	2(40)	30(100)
	Female	3(60)	0
Marriage status	Single	2(40)	1(3.3)
	Married	3(60)	29(96.7)
Education	Diploma	0	8(26.7)
	Associated diploma	0	21(70)
	Bachelor	5(100)	1(3.3)
Age (Mean±SD)		5.5 ± 30.6	3.2 ± 31.2
Experience		2.8 ± 4.8	5.3 ± 7.5

[Table/Fig-1]: Demographic characteristics of participants.

	Levels	Triage Nurses					Total	p-value
		Level 1	Level 2	Level 3	Level 4	Level 5		
Emergency Medical Technicians	Level 1	5	4	0	0	0	9	0.001
	Level 2	0	12	5	4	0	21	0.001
	Level 3	0	13	10	5	2	30	0.001
	Level 4	0	6	3	5	0	14	0.001
	Level 5	0	0	1	3	0	4	0.001

[Table/Fig-2]: The overall concordance of triage level between emergency medical technicians and triage nurses before triage training.

	Levels	Triage Nurses					Total	p-value
		Level 1	Level 2	Level 3	Level 4	Level 5		
Emergency Medical Technicians	Level 1	2	2	0	1	1	6	0.001
	Level 2	0	19	1	1	0	21	
	Level 3	0	3	18	2	0	23	
	Level 4	0	0	8	17	1	26	
	Level 5	1	0	0	0	1	2	
Total		3	24	27	21	3	78	

[Table/Fig-3]: The overall concordance of triage level between emergency medical technicians and triage nurses after triage training.

Cohen's kappa concordance coefficient was 0.20 indicating a weak triage concordance between emergency medical technicians and triage nurses. The overall concordance of triage between emergency medical technicians and triage nurses was 0.62 after the intervention which is at a good level. This poor triage concordance could have been caused by lack of common triage training courses and lack of use of common triage between emergency medical technicians and triage nurses. On the other hand, this poor concordance may be caused by the difference between the two groups in terms of education level or lack of sessions held on triage training during the education of the two groups.

After ESI triage training, Cohen's kappa concordance coefficient reached 0.62, which showed a good level of concordance between emergency medical technicians and triage nurses. In a study, Buschhorn et al., reported the kappa coefficient between pre-hospital emergency technicians and triage nurses to be 0.40 after teaching ESI triage to the pre-hospital emergency technicians. They also reported the overall concordance of ESI triage level between pre-hospital emergency technicians and triage nurses to be at a moderate level [20]. This difference could be due to the difference in research environment, not training both groups simultaneously (triage nurses and pre-hospital emergency technicians) and the difference in education levels between the two groups in the above study. On the other hand, occupation of pre-hospital technicians in the study of Buschhorn et al., included emergency medical technicians and firefighters, while in the

present study only emergency medical technicians were reviewed. The results of Khatibian et al., showed that after the intervention of training, Kappa coefficient test reached 0.71 which showed a relatively good concordance between the researcher and nurses. These results were consistent with that of the present study [21]. In a study, Khayat et al., also obtained the weighted kappa to determine the observers' concordance between triage nurse and physician after teaching triage to nurses to be 0.87, which indicates an excellent concordance between the two groups [22]. Although the type of the triage trained in the two above studies is common with this study, they are different from this study in type and time of training and the studied groups. Meanwhile, the results of this study are consistent with that of the study of Aghababaeian et al., in which after training with triage training video through the Start method, the emergency medical technicians' performance accuracy reached 57.75% [23]. The study of Cone et al., titled as "the two-hour review of intervention (education)", showed the impact of using start triage in improving the triage of accidents and medical emergencies and that the triage ability was improved after the intervention compared to the pre-test [24]. The above studies are different from this study in terms of location, the type of trained triage as well as the type of training, but their results are consistent with this study [25,26].

## LIMITATION

The limitations of this study include triage time difference for emergency medical technicians, triage nurses and trainers. To solve this problem, missions outside the city were excluded due to the increased time interval from visiting by emergency medical technicians to visiting by triage nurses and trainers. Lack of knowledge of triage nurses in emergency ward about triage was among other limitations of this study. However, after the study, a triage training course was held for these nurses.

Another executive limitation of this study was the small number of triage nurses and the disproportion between the number of emergency medical technicians and triage nurses. To solve this problem, a change was made in the number of patients who were triaged by the two groups.

## CONCLUSION

The study results indicated the positive impact of triage training on concordance in classification of emergency medical technicians and triage nurses. So, it is recommended to train common triage system to improve care transfer and the relationship between emergency medical technicians and triage nurses.

## REFERENCES

- [1] Parry C, Coleman EA, Smith JD, Frank J, Kramer AM. The care transitions intervention: a patient-centered approach to ensuring effective transfers between sites of geriatric care. *Home Health Care Services Quarterly*. 2003;22(3):1-17.
- [2] Happ MB, Capezuti E, Strumpf NE, Wagner L, Cunningham S, Evans L, et al. Advance care planning and end-of-life care for hospitalized nursing home residents. *Journal of the American Geriatrics Society*. 2002;50(5):829-35.
- [3] Shanley C, Whitmore E, Conforti D, Masso J, Jayasinghe S, Griffiths R. Decisions about transferring nursing home residents to hospital: highlighting the roles of advance care planning and support from local hospital and community health services. *Journal of Clinical Nursing*. 2011;20(19-20):2897-906.
- [4] Ball JC, Ross A. The effectiveness of methadone maintenance treatment: patients, programs, services, and outcome: Springer Science & Business Media; 2012.
- [5] Ekundayo OJ, Saver JL, Fonarow GC, Schwamm LH, Xian Y, Zhao X, et al. Patterns of emergency medical services use and its association with timely stroke treatment findings from Get with the Guidelines-Stroke. *Circulation: Cardiovascular Quality and Outcomes*. 2013;6(3):262-69.
- [6] Hans EW, Van Houdenhoven M, Hulshof PJ. A framework for healthcare planning and control. *Handbook of healthcare system scheduling*: Springer; 2012. P. 303-20.
- [7] Eitel DR, Rudkin SE, Malvey MA, Killeen JP, Pines JM. Improving service quality by understanding emergency department flow: a White Paper and position statement prepared for the American Academy of Emergency Medicine. *The Journal of Emergency Medicine*. 2010;38(1):70-79.
- [8] Lindberg SO, LerchelaCour J, Folkestad L, Hallas P, Brabrand M. The use of triage in Danish emergency departments. *Dan Med Bull*. 2011;58(10):A4301.
- [9] FitzGerald G, Jelinek GA, Scott D, Gerdzt MF. Republished paper: Emergency department triage revisited. *Postgraduate Medical Journal*. 2010;86(1018):502-08.
- [10] Farrohknia N, Castrén M, Ehrenberg A, Lind L, Oredsson S, Jonsson H, et al. Emergency department triage scales and their components: a systematic review of the scientific evidence. *Scand J Trauma Resusc Emerg Med*. 2011;19(42):1-13.
- [11] Parenti N, Manfredi R, Reggiani MLB, Sangiorgi D, Lenzi T. Reliability and validity of an Italian four-level emergency triage system. *Emergency Medicine Journal*. 2010;27(7):495-98.
- [12] Gilboy N, Tanabe T, Travers D, Rosenau AM. Emergency Severity Index (ESI): A triage tool for emergency department. Rockville, MD: Agency for Healthcare Research and Quality Retrieved from <http://www.ahrq.gov/professionals/systems/hospital/esi/esi1.html>. 2011.
- [13] Singer RF, Infante AA, Oppenheimer CC, West CA, Siegel B. The use of and satisfaction with the Emergency Severity Index. *Journal of Emergency Nursing*. 2012;38(2):120-26.
- [14] Singer AJ, Thode Jr HC, Viccellio P, Pines JM. The association between length of emergency department boarding and mortality. *Academic Emergency Medicine*. 2011;18(12):1324-29.
- [15] Boyle A, Beniuk K, Higginson I, Atkinson P. Emergency department crowding: time for interventions and policy evaluations. *Emergency Medicine International*. 2012;2012.
- [16] Mirhaghi A, Roudbari M. A survey on knowledge level of the nurses about hospital triage. *Iranian Journal of Critical Care Nursing*. 2011;3(4):165-70.
- [17] Tanabe P, Gimbel R, Yarnold PR, Kyriacou DN, Adams JG. Reliability and validity of scores on The Emergency Severity Index version 3. *Academic Emergency Medicine*. 2004;11(1):59-65.
- [18] Wuerz RC, Milne LW, Eitel DR, Travers D, Gilboy N. Reliability and validity of a new five-level triage instrument. *Academic emergency medicine*. 2000;7(3):236-42.
- [19] van der Wulp I, van Stel HF. Adjusting weighted kappa for severity of mistriage decreases reported reliability of emergency department triage systems: a comparative study. *Journal of Clinical Epidemiology*. 2009;62(11):1196-201.
- [20] Buschhorn HM, Strout TD, Sholl JM, Baumann MR. Emergency medical services triage using the emergency severity index: is it reliable and valid? *Journal of Emergency Nursing*. 2013;39(5):e55-e63.
- [21] Mahnaz Khatibian A, Karampourian A, Soltanian A, Asadi HK, Salimi R, Khalili Z. The effects of the Emergency Severity Index triage education via problem-based learning on the triage nurses' performance and the patients' length of stay in the Emergency Department. *JCRPS*. 2014;3(2):73-63.
- [22] Khayat NH, Poor HS, Rezaei MA, Mohammadina N, Darban F. Correlation of Revised trauma score with mortality rate of traumatic patients within the first 24 hours of hospitalization. *Zahedan Journal of Research in Medical Sciences*. 2014;16(11):33-6.
- [23] Aghababaeian H, Taheri N, Sedaghat S, Bahrami N, Maniei M, Ahvazi LA. Studying the effect of triage video training through START style on awareness level of emergency medical staffs and their performance. *Iran J Crit Care Nurs*. 2013;6(3):205-12.
- [24] Cone DC, Koenig KL. Mass casualty triage in the chemical, biological, radiological, or nuclear environment. *European Journal of Emergency Medicine*. 2005;12(6):287-302.
- [25] Kiani F, Balouchi A, Shahsavani A. Investigation of nursing students' verbal communication quality during patients' education in zahedan hospitals: southeast of Iran. *Global Journal of Health Science*. 2016;8(9):331.
- [26] Sakineh S, Nezar G, Fatemeh D, Nastran Hk. The overall concordance of triage level between emergency medical technicians, triage nurses and instructor. *Medical Surgical Nursing Journal*. 2015;4(2):23-17.

### PARTICULARS OF CONTRIBUTORS:

1. Msc of Nursing, Department of Nursing, Iranshahr University of Medical Sciences, Iranshahr, Iran.
2. Msc Student, Department of Nursing, Zabol University of Medical Sciences, Zabol, Iran.
3. PhD of Nursing Education, Department of Nursing, Medical Education Development Center, Kerman University of Medical Sciences, Kerman, Iran.
4. Faculty of Nursing, Department of Nursing, Iranshahr University of Medical Sciences, Iranshahr, Iran.
5. Faculty of Nursing, Department of Nursing, Iranshahr University of Medical Sciences, Iranshahr, Iran.

### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Sakineh Sabzvari,  
PhD of Nursing Education, Nursing Department, Medical Education Development Center,  
Kerman University of Medical Science, Kerman, Postal code: 9993139146, Iran.  
E-mail: hosienshadadi@gmail.com

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