Validity of Triage Performed by Nurses Educated by Train-of-Trainer Workshop Participants; a Cross-sectional Study for Assessment of Cascade Training System

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Abstract

Introduction: In 2010, a national triage train-of-trainer (TOT) workshop was held in Tehran, Iran.

Objective: The present study aimed to assess the validity of the triage performed by the nurses educated by those who participated in TOT workshop.

Method: This cross-sectional study was carried out in 6 teaching hospitals from 4 universities in Iran. Inter-rater and intra-rater reliability of performed triage by participations was measured. Thirteen nurses were randomly selected. Thereafter, at the end of each working shift, patient data recorded in the daily data registry forms were collected. Then, duration of hospital stay, number of cases admitted to general wards or intensive care units, number of cases discharged from the ED within 12 hours and mortality rate were compared with the triage level determined by the nurse.

Results: In total, 30 nurses with a mean age of 28.4 ± 3.7 years were enrolled. In this study, 1491 triage cases (61.6% male) were evaluated, of which 4.2% were triaged as level 1, 18.3% as level 2, 37.1% as level 3, 20.4% as level 4 and 20.0% as level 5. The following outcome was observed: 3.64% were discharged, 6.29% were hospitalized, 3% died and 2.3% were discharged against medical advice without completing treatment. The correlation of determined triage level and patients' duration of hospitalization was significant based on one-way ANOVA test (p = 0.000). The outcome of the patients significantly correlated with the level of triage determined by the study nurses (p = 0.000).

Conclusion: Based on the findings, it appears that triage performed by the study nurses educated by those who participated in TOT workshop through cascade training system had perfect validity.

Key words: Education; Emergency Department; Outcome Assessment; Reproducibility of Results; Triage

INTRODUCTION

The word triage is derived from the French verb "trier", meaning separating and splitting, and may date back to the time that critically ill patients in a war were separated from those who could go back to the front (1). Hospital triage is an approach used for classifying the massive number of patients presenting to emergency department (ED) in order to determine the severity of the disease and the priority of care (2). Previously, patients were triaged during crises such as wars and earthquakes, and in overcrowded EDs; overall, at times that the number of visitors was higher than what could be admitted and treated (3). However, currently, a considerable increase is observed in the visitors of EDs in most hospitals where overcrowding is a serious problem (4, 5). Therefore, the triage unit has been planned and is operational in most hospitals and trained nurses are responsible for performing this important task. The triage nurse determines which patient can wait and conversely, which one needs immediate medical care by rating them. Correct triage has a significant effect on patient flow in various parts of ED and controls or even prevents overcrowding of the patients to some extent (6).

Various triage systems have been designed, of which emergency severity index (ESI) has been approved by the Iranian ministry of health and is

operational all over the country. This method is currently one of the most common and accepted systems in hospital triage (7-9). In Iran, ESI nurse triage was first implemented in Imam Khomeini Hospital affiliated with Tehran University of Medical Sciences (TUMS) in 2008 and is now available in hospitals affiliated to 9 major universities of Iran.

In 2010, national train-of-trainer (TOT) workshop was held by members of national triage committee, accidents and medical emergencies management center, Iranian nursing association and emergency medicine department of TUMS in Tehran, Iran. One hundred and fifteen prominent nurses from 9 major scientific centers of Iran took part in this 3-day workshop and were taught how to perform triage using ESI method. At the end of the workshop, the participants took a written as well as oral test and those who scored at least 70% were given the license to teach triage to other nurses in their provinces, according to the cascade training system.

Hospital triage leads to the determined aims if it is continuously monitored and reviewed. Thus, monitoring the triage system is one of the major pillars for proper performance of triage system, which should be performed at regular time intervals. It can be said that success of triage depends on the presence of a team that regularly monitors the triage system, identifies its obstacles, and makes the required changes. Monitoring the triage system will help identify the weak points of the program and the staff, and then fix them. Monitoring the triage system often involves determining validity, reliability, and outcome (10). A few years after holding the national triage TOT workshop, when many nurses perform triage in various regions of Iran, we decided to evaluate the validity of their triage. Therefore, the present study aimed to assess the validity of the triage performed by the nurses educated by those who participated in TOT workshop in 6 teaching hospitals and referral centers from 4 major universities of Iran.

METHODS

Study design

This cross-sectional study lasted one year (2013-2014) and throughout 1-month periods 6 hospitals consist of Imam Khomeini, Shariati, and Sina in Tehran, Imam Khomeini in Sari, Imam Reza in Mashhad, and Imam Reza in Kermanshah affiliated to 4 major universities of Iran including TUMS, and also Mashhad, Mazandaran, and Kermanshah University of medical sciences. The protocol of the study was approved by the research council of emergency medicine department of TUMS and the required license was obtained from ethics committees of all 4 universities corresponding to the hospitals in which the study was performed. The researchers adhered to principles of privacy and did not intervene in the process of providing care for the patients throughout the study period.

Train-of-Trainer workshop

In 2010, a TOT triage workshop was conducted by Tehran University of Medical Sciences in Tehran, Iran, in which 150 trainers from all 9 major centers of the country participated. The course consisted of two main parts: "teaching triage algorithms" and "triage installment in hospital system", which was delivered in 16 hours in two consecutive days.

Participants

Since more than 3 years had passed since the national TOT workshop, initially, the nurses participating in this program underwent a qualification test to assess the inter-rater reliability. To this end, they were given 30 scenarios to determine the triage level. If they passed the test, they were given permission to teach triage in their own center. Then nurses who had volunteered in the selected centers for participating in the study were trained by the national TOT workshop participants who were allowed to teach during an 8-hour training course. In the next step,127 nurses who were trained by the national TOT workshop participants were selected, and underwent a qualification test for assessment of inter-rater reliability, and those who scored at least 70% were allowed to perform triage.

Inter-rater reliability assessment

For this purpose, 30 written scenarios were designed by an expert panel and given to 127 nurses who participated in the study to determine the triage level of each case.

Intra-rater reliability assessment

In this step, 30 nurses were selected randomly (5 per hospital) and the same 30 scenarios were given to them again after 2 weeks to determine the triage level of the cases.

Validity assessment

At the end of each working shift for the 30 nurses selected in the last step, patient data were recorded in the daily data registry forms. Data collection continued until the data of at least 75 consecutive patients from 2 to 3 work shifts were collected. Then duration of hospital stay, number of cases admitted to regular or intensive care units, number of cases discharged from the ED within 12 hours and mortality rate were compared with the triage level determined by the nurse.

Statistical analysis

To perform statistical analysis, the obtained data were entered to SPSS-22 statistical software as code sheet and master sheet. For the qualitative variables, frequency and for quantitative variables, mean ± standard deviation and interval were calculated and the results are presented as tables and figures. One-way ANOVA and t-test were used to compare the groups quantitatively, Kruskal-Wallis and Mann-Whitney tests were used for qualitative comparison. The results were calculated with 95% confidence interval and p-value less than 0.05 was considered significant.

RESULTS

In total, 30 nurses with a mean age of 28.4 ± 3.7 years participated in this study. Baseline and demographic characteristics of the nurses participating in this study are summarized in Table 1.

In this study, 1491 triage cases were evaluated, 4.2% of which were triaged as level 1, 18.3% as level 2, 37.1% as level 3, 20.4% as level 4 and 20.0% as level 5 (figure 1). In addition, 919 (61.6%) cases were male, 569 (38.2%) were female and 3 (0.2%) had undetermined sex. Regarding the outcome, 64.3% were discharged, 29.6% were hospitalized, 3% died and 2.3% were discharged against medical advice without completing treatment and decision making steps. Mean duration of hospitalization for patents triaged as levels 1, 2, 3, and 4 were 11.0±2.7, 8.1±1.6, 6.1±1.4, and 4.5±1.0 days, respectively, and the correlation of determined triage level and patients' duration of hospitalization was significant based on one-way ANOVA test (p = 0.000).

Table 1: Demographic and baseline characteristics of nurses who participated in the study

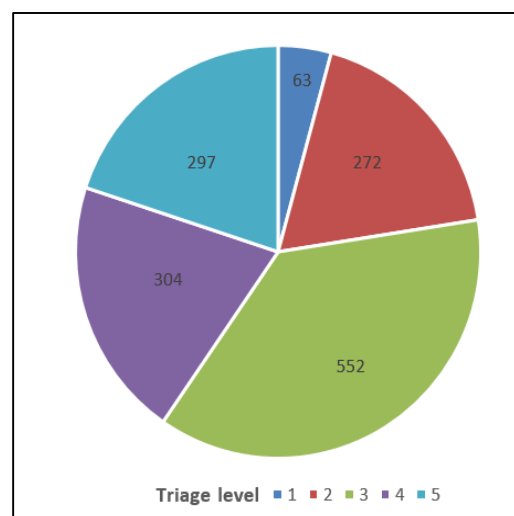| Variable	Number (%)
Sex	
Male	3 (10.0)
Female	27 (90.0)
Educational degree	
Bachelor	29 (96.7)
Master	1 (3.3)
Experience (year)	
< 5	23 (76.7)
≥ 5	7 (23.3)
Previous triage course	
Yes	19 (19.0)
No	11 (11.0)

Figure 1: Frequency of patients in different triage levels

Baseline characteristics of patients triaged by nurses in the current study are shown in Table 2. Significantly more men were triaged as levels 1 and

Table 2: Baseline characteristics of patients triaged by studied nurses

Variable	Triage level 1	2	3	4	5	P
Sex						
Male	45 (4.9)	178 (19.4)	344 (37.4)	187 (20.3)	165 (18.0)	0.06
Female	18 (3.2)	94 (16.5)	208 (36.6)	117 (20.6)	132 (23.2)	
City						
Tehran	24 (6.7)	85 (23.6)	127 (35.3)	72 (20.0)	52 (14.4)	0.457
Kermanshah	8 (2.0)	75 (19.2)	195 (49.9)	87 (22.3)	26 (6.6)	
Sari	4 (1.1)	27 (7.2)	104 (27.7)	80 (21.3)	160 (42.7)	
Mashhad	28 (7.7)	85 (23.3)	126 (34.5)	67 (18.4)	59 (16.2)	
Outcome						
Discharged	2 (0.2)	90 (9.4)	291 (30.4)	283 (29.5)	292 (30.5)	
Admitted	41 (9.3)	156 (35.3)	230 (52.0)	15 (3.4)	0 (0.0)	0.000
Died	21 (47.7)	21 (47.7)	2 (4.5)	0 (0.0)	0 (0.0)	
Discharged AMA*	0 (0.0)	5 (10.6)	29 (61.7)	8 (17.0)	5 (10.6)	
Intensive care unit						
Yes	9 (2.6)	112 (31.8)	218 (61.9)	13 (3.7)	0 (0.0)	0.000
No	32 (36.8)	42 (48.3)	13 (14.9)	0 (0.0)	0 (0.0)	

*AMA: against medical advice

3 than women but overall, triage level and sex of the patients did not have a significant correlation based on NPar-test and Mann-Whitney U test (p = 0.06). The highest number of level 5 patients was reported in Sari, levels 3 and 4 in Kermanshah, level 2 in Tehran and Mashhad and level 1 in Tehran, yet city did not have a significant relationship with the number of patients in different triage levels (p = 0.475). The higher the triage level, the higher the discharge rate was, and the lower the triage level, the higher the hospitalization rate and of course mortality were. In fact, the outcome of the patients significantly correlated with the level of triage determined by the study nurses according to NPar-test and Kruskal–Wallis test (p = 0.000). Of the 439 patients who were hospitalized, 352 (80.2%) cases were transferred to general departments and 87 (19.8%) cases were admitted to intensive care units. The correlation of triage level determined by the study nurses and patients' need for hospitalization in intensive care unit was significant based on NPar test and Mann-Whitney U test (p = 0.000).

DISCUSSION

We evaluated, and based on the results, confirmed the reliability and validity of nurse triage performance in 6 teaching hospitals affiliated to 4 major universities of medical sciences and referral centers. These nurses had been trained in a cascade system and the results indicate the efficiency of this educational method for passing on triage knowledge.

In recent years, the concept of triage in ED has been widely accepted, and has attracted much attention all around the world. Therefore, studies have focused on reliability and validity assessment of various triage systems. Nurses are usually responsible for triage, so they constitute the study population in these studies.

Proper education is a key step in performing triage correctly (11). Various methods exist for transferring triage knowledge, which have been evaluated in various studies. However, it is obvious that one educational method does not produce the same effectiveness for all audiences. Furthermore, nurses may have participated in different educational courses prior to this course and have dissimilar baseline knowledge levels; therefore, various methods and educational programs should be considered and tested for different individuals. In fact, a suitable training method should be appropriately selected for the majority (12). Hammad et al. recently investigated the current

status of triage practice and knowledge among emergency nurses in Changsha, Hunan Province, China. They reported that almost half of the participants had received specific triage training, either by their employer or an educational organization or at a conference. Their findings highlighted variability in triage practices and training of emergency nurses in that area (13). Written case scenarios may theoretically appear to be a feasible tool to examine nurses' competence for accurately rating a patient's acuity by applying ESI across different settings in a standardized fashion. However, competency of ESI scenarios have some ambiguity and result in different answers between scenario authors and nurses who completely know the ESI algorithm. As is true for any instrument used to test clinicians' ability to determine a clinical rating, test questions should be assessed for performance criteria (14). However, triage training is usually performed via exposing the nurses to various training scenarios, outcome based validity assessment, which is what we did in the current survey, would be so valuable in this regard (12, 15, 16). Under-triaged patients may spend a longer duration in the waiting room, which leads to delay in receiving care. Such patients have an increased potential for poor outcomes (17). Regardless of participation in previous training courses or years of ED experience, nursing triage retraining program has been shown to increase accuracy of triage categorization, leading to a decreased risk of poor patient outcomes (18).

All the study nurses had learned triage via cascade method and through other nurses who were trained directly in national TOT workshop. Considering the success of national triage TOT workshop in correct and proper education of nurses and success of those individuals in correct teaching of triage to other nurses in their own cities, it appears that triage training can be continued using the cascade method. Thus, proper planning can be done for other hospitals of the country that currently do not perform triage.

Limitation

Despite the efforts of the researchers, evaluation and detection of all the sub-branches of nurses who attended the national TOT program across the country was not possible and only 4 out of 9 major educational centers were assessed. Obviously, participation of other hospitals of the country would have added value to the findings of the present study.

CONCLUSIONS

Based on the findings, it is likely that triage

performed by the study nurses that were trained by those who participated in the TOT workshop through cascade training system had perfect validity.

AUTHORS' CONTRIBUTION
All the authors met the standards of authorship based on the recommendations of the International Committee of Medical Journal Editors.

CONFLICT OF INTEREST
None declared.

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