Original Article

Accuracy of Emergency Severity Index, Version 4 in emergency room patients' classification

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Article info

Abstract

Introduction: Emergency Severity Index Version 4 (ESI v.4) is a validated triage tool for emergency departments, with an easy training system optimizing the allocation of limited resources to emergency patients. The present study aimed to determine the outcomes of triage with ESI v.4 method in all five levels of patients triage in emergency departments.

Methods: In this retrospective observational-descriptive study, following the training courses and implementation of triage with ESI v.4 method, the third quarter of 2008 was randomly selected for study. In this period, all patient files with their codes ending in zero were selected equaling one-tenth of all files. Triage levels and outcomes were extracted and the obtained data from 1309 were expressed using descriptive statistics.

Results: The mean age of the patients was 40.73 ± 21.37 years and 59.4% of the subjects were males. Classification of patients by ESI v.4 level was as the following: 1 (4.0%), 2 (11.6%), 3 (52.8%), 4 (25.5%) and 5 (6.1%). Hospitalization rate by ESI v.4 level was as below: 1 (80.76%), 2 (23.68%), 3 (25.75%), 4 (11.76%) and 5 (14.5%).

Conclusion: The rate of hospitalization decreased from ESI level 1 to ESI level 5. Although the findings of this study were in line with the previous reports, some discrepancies indicated the existing inaccuracy in out-patient hospitalization system in the evening and night shifts and also at stage 5 triage level.

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Introduction

Triage is a method to screen and consider the priority of the patients in the emergency room (ER) to be visited by emergency physicians and to start the proper management appropriate to the severity index.[1] The proper triage/management is a method which is not only fast but also accurate.[2-11] To the best of our knowledge, no comprehensive similar study on triage has previously been conducted in Iran so far. In addition, basically emergency medical services (EMS) in Iran do not follow a classical or approved method. Considering the high turnover of patients in ER in most hospitals in

Iran, lack of adequate beds in these places, and huge number of patients who are transferred by EMS, a proper fast and accurate triage system seems a necessity. After establishment of Emergency Medicine as a new specialty in Tabriz University of Medical Sciences (Tabriz, Iran) standardizing emergency department was initiated as the pattern of classic emergency ward. Therefore, appropriate patient survey was required to design a suitable plant for triage and approaching the patients based on Emergency Severity Index Version 4 (ESI v.4) which seemed as a proper method with an easy triage system optimizing the allocation of limited resource to emergency patients.

After starting to use efficient and available diagnostic and management tools and decreasing morbidity and mortality of emergent patients, we were to make sure triage ESI v.4 was the most proper way to prioritize patient. The present study aimed to determine the outcomes of triage with ESI v.4 method in all five levels of patients triage in ED.

Methods

Implementation of ESI v.4 was performed in a two-hour workshop for professors and emergency medicine residents. All interns were trained on the first day of each month for two hours. Then they were assessed on 30 patients to make sure their knowledge was improved. The results showed that 99% of the interns scored 22 of 30 in these assessments. Regarding ESI v.4 all participants who scored more than 22 were eligible to be assigned for triage. Basically, triage of patients was observed by residents, and sometimes emergency medicine professors. This was a retrospective observational-descriptive study. In order to assess the accuracy of this method for triage, it was conducted as a pilot study for three months, within three months of summer 2008. HIS (Hospital Information System) helped us to choose the patients profile whose digital number ended in zero. Overall, 1 of 10 multiple trauma patients in all ages and genders were selected. Triage forms based on

ESI v.4 flowchart were inserted in patients' profiles. Priority of triage was defined as follows: (level 1: life threatening, level 2: needed urgent diagnosis or management, level 3: other then level 1 or 2 who needed more than one diagnostic or management procedures, level 4: needed only one procedure or resource, level 5: does not need any procedure or diagnostic resource). Finally, discharge note, admission note in regular ward, or admission note in intensive care unit (ICU) or coronary care unit (CCU), transfer to operation room (OR) or sudden death in ER, were recorded. Some of the subjects transferred to other hospitals for orthopedic, gynecologist, ophthalmology or psychiatry procedures were excluded from this study. However, the patients transferred to our cardiac center were included. Data collection was performed from patients profile and all patients or their guardians provide our centers with a written informed consent considering the fact that our center is an educational academic center. The obtained results in all five groups were evaluated by SPPS for Windows (version 15; SPSS Inc., Chicago, IL, USA).

Results

In this period, we found 1577 profiles with codes ending in zero. The transferred patients to other hospitals (except the cardiac center) were 122 cases who were excluded from this study since they were not being followed up. 84 cases were excluded from this study due to unwillingness to undergo diagnostic management procedures. 61 profiles were incomplete and we could not consider them in this study. Therefore, all profiles were 1309. There were 482 multiple trauma patients and 827 non-traumatic patients aged 1-93 years (with the average ages of 40.73 ± 21.37 years) which mostly were in their 3rd decades of lives. There were about 777 males (59.4%) and 532 females (40.6%). Among 1309 cases, 52 were in triage level 1, 152 cases in triage level 2, 691 cases in triage level 3, 334 cases in triage level 4, and 80 cases in triage level 5; the majority of patients

were in level 3 (Figure 1). The most frequent chief complaint among traumatic patients was accidents and for non-traumatic patients was abdominal pain. Overall, 10.0% of the patients complained about abdominal pain. In this study, without concerning the level of triage the results were: discharged patients 76.5%, admission in internal ward 19.6%, admission in ICU 5.0%, admission in CCU 7.0%, transferred to operating room 2.1% and death 1.0% (Figure 2). As shown here, most of the patients were discharged.

- Triage level 1: discharged patients 42.3%, admission in internal ward 19.2%, admission in ICU 9.6%, admission in CCU 3.8%, transfer to operating room 9.6% and death 15.4%. As shows, most of the patients were discharged patients.

- Triage level 2: discharged patients 76.3%, admission in internal ward 17.1%, admission in ICU 7.0%, admission in CCU 0.0%, transfer to operating room 3.3% and death 2.6%. In this level, majority of patients were discharged after proper management.
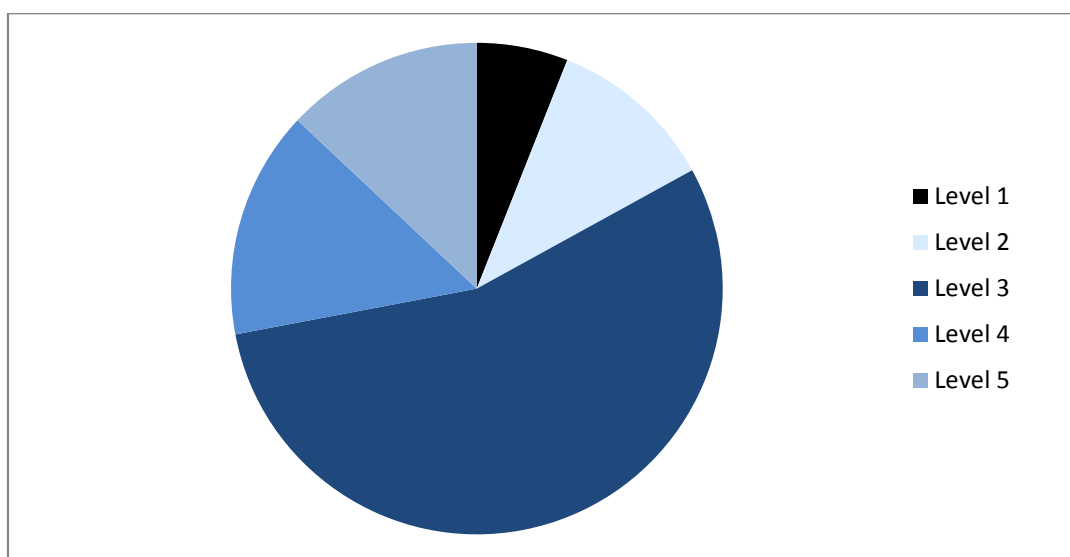

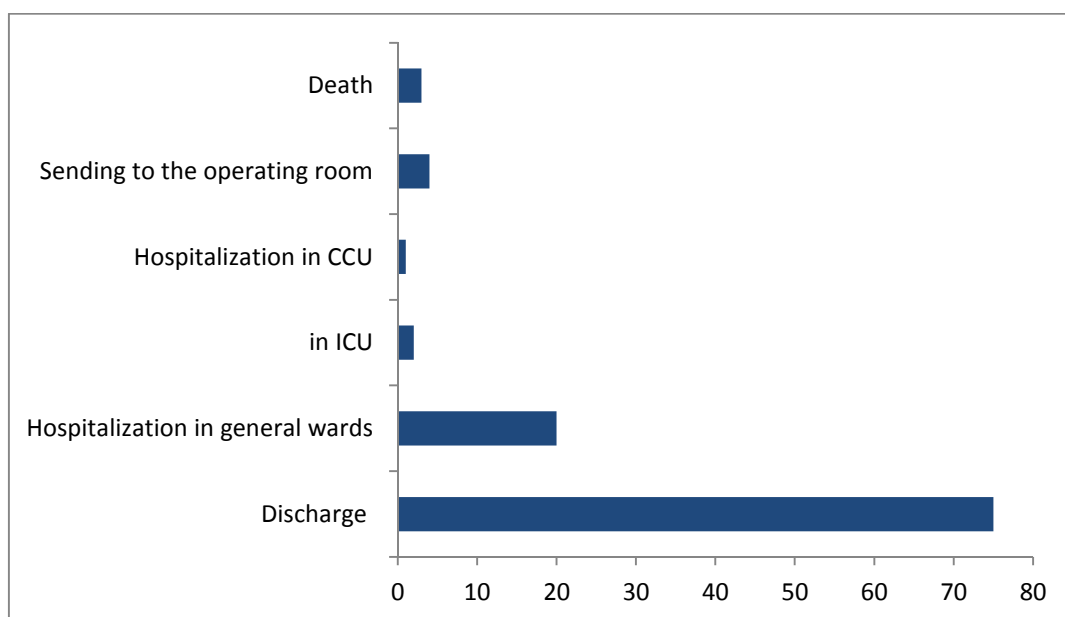**Figure 1. Frequency distribution of patients based on ESI v.4 (Emergency severity index)**

Figure 2. Patient's outcome without concerning triage level

- Triage level 3: discharge d patients 77.4%, admission in internal ward 23. %7.0, admission in ICU 0%, admission in CCU 0.0%, transferred to operating room 1.2% and death 1.5%. In this level discharged patients were most of the patients.

- Triage level 4: discharged patients 88.3%, admission in internal ward 9.9%, admission in ICU 0.3%, admission in CCU 0.0%, transferred to operating room 1.5% and death 0.0%. In this level most of the patients were discharged ones.

- Triage level 5: discharged patients 83.8%, admission in internal ward 15.0%, admission in ICU 0.0%, admission in CCU 0.0%, transferred to operating room 1.3% and death 0.0%. In this level, most of the patients were discharged.

If we consider all the admitted patients to internal ward, ICU, CCU, and operating room and expired patients as admitted patients to this hospital, we could conclude that the patients admitted to this hospital were 23.4% of the whole patients.

Figure 3 illustrates the rate of admitted patients at different levels of triage. As can be seen, the highest rate of admission is in level 1.

Discussion

Admission to the hospital becomes more appropriate with the triage level and ESI method.[12,13] According to some studies, the number of admitted patients has a reverse correlation with the triage level. The higher the triage level, the lower the rate of admission. In a study to show the accuracy of ESI by Eitel et al.[14] the number of admitted patients was considered as an index for assessment of ESI accuracy. In this research which was performed on 1042 patients selected from 7 hospitals in the U.S., 352 patients (33.8%) were admitted into hospitals. Among these hospitals, 83.0% were from triage level 1, 67.0% from level 2, 42.0% from triage level 3, 8.0% from triage level 4, and 4.0% from triage level 5. In this study, there were no major changes between the level of triage and the rate of admission in 7 hospitals in ER. Nearly 100% of triage level 1, 60-80% level 2, 30-50% levels 3 and none of the patients in level 4 and 5 were admitted in the hospital.[1] As it is indicated, the number of hospitalized patients decreased in higher triage levels. In another study performed on 493 patients, Wuerz et al. showed that 92.0% of triage level 1, 61.0% of level 2, 36% of triage level 3, 10.0% of level 4, 0.0% of level 5 were admitted.[15]

In a similar study on 403 patients, Tanabe et al. showed that 80.0% of level 1, 73.0% of level 2, 51.0% of level 3, 6.0% of level 4 and
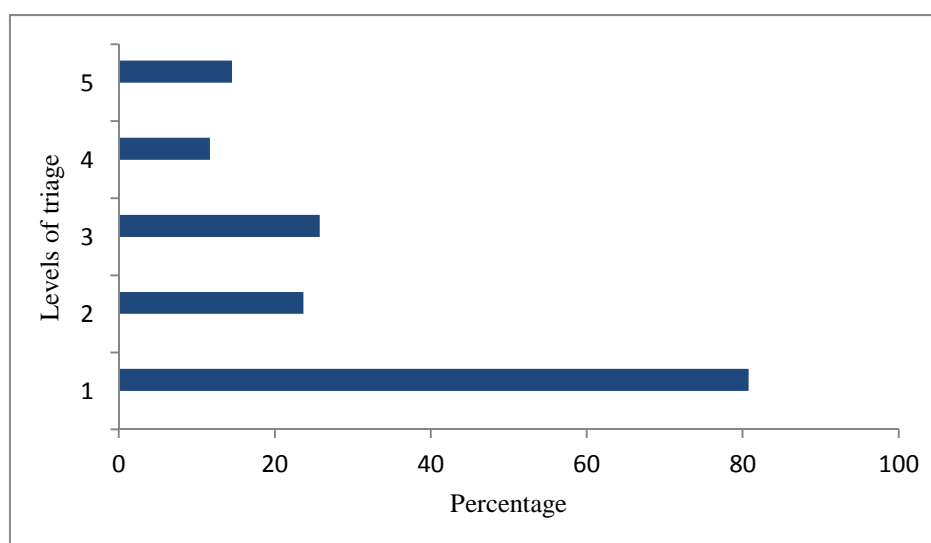

Figure 3. Hospitalization at different levels of triage

5% of triage level 5 was admitted.[13] We compared the results of our study to previous studies in figure 4. The results of our study revealed that in triage level 1, 3 and 4 the results were compatible with recent studies but in levels 2 and 5 it was lower and higher than others, respectively. It should be mentioned that one of the reasons contributing to the increased number of level 5 triage patients was that elective patients were admitted from the emergency department admission rather the main admission center in the evening and night shifts. Therefore, it seemed as if triage level 5 patients were hospitalized. This could have made bias to our study; however, it was inevitable due to lack of abundant staff.

Furthermore, in a study performed by Tanabe et al., patients admitted in ICU were 40.0% of triage level 1, 12.0% of level 2, 2.0% of level 3, 0.0% of level 4 and 0.0% of level 5. Our study shows that the higher the score of triage level, the less admitted patient in ICU, as well. Therefore, the majority of patients admitted in ICU were from triage level 1. Evaluating our and previous studies, it could be concluded that the number of admitted patients in ICU decreases as the triage level increases from1 to 5. This is compatible with the results of other similar studies as well.[13]

However, in current study the incidence of admitted patients with triage level 1 was less than previous studies (10.0% in our study vs. 40.0% in similar studies).[13,14] This difference could be due to different distribution of ill patients who needed ICU in these two studies.

Concerning this different in admitted patients in internal ward on triage level 2 in this study, it could be probably concluded that some of the patients with triage level 2 could be placed in triage level 1. This would be due to insufficient triage staff who were not being trained properly.

Besides, we have to consider that some of the items in triage ESI v.4 are related to appropriate cooperation of the patients in ER. Our hospital is a referral hospital with the highest rate of patients' turnover in our province (East Azerbaijan).[3] Due to high turnover and crowded department, performing triage with high quality performance is difficult. This problem has somehow contradiction with the exact definition of triage which is preparation of the proper diagnostic-managed resource for life-threatening patients based on triage level. Despite using ESI v.4 method for triage, it seems that we have to train triage staff to increase their skills and accuracy in triage. Some of the triage forms were still incomplete which we did not include them in this study. This study was retrospective,
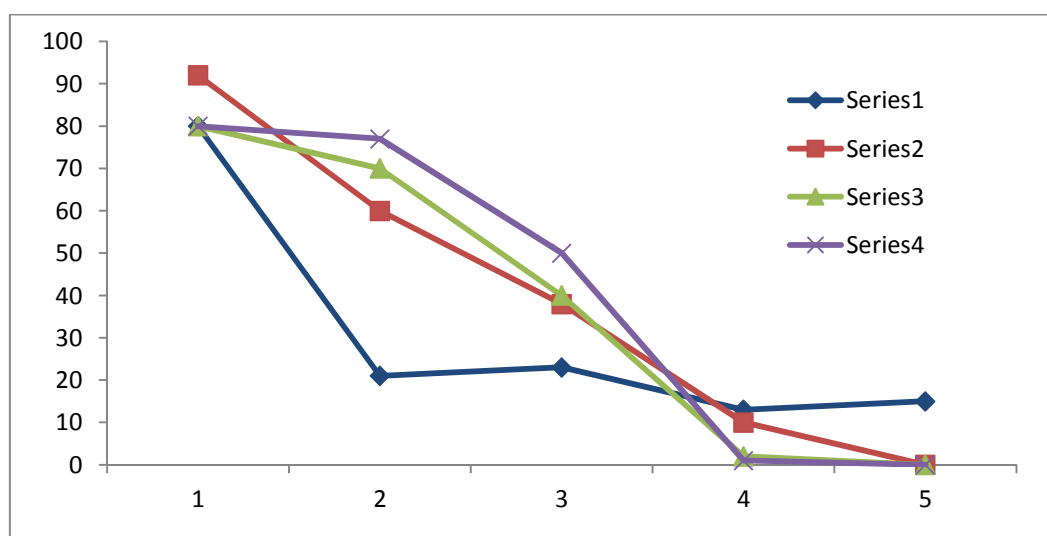

Figure 4. The comparison of the hospitalization rate based on the triage level in the emergency department of Imam Reza Hospital and other studies

therefore the whole information had single input and we were not able to crosscheck the data by other staff.

Conclusion

Nonetheless, the results of this study, as a pilot research, could establish new proposal in this regard in future and improve management of patients in ER. Based on our study, some of the patients in level 1 could be categorized in level 2. Overall, training courses for triage staff should be established more strictly in order to improve their skills. Patient admission system should also be modified for elective patients refereeing to the emergency department in the evening or night shifts.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgements

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