Original Article
Eurasian Journal of Critical Care

Evaluation of the Accuracy of The Emergency Department's Nurses' Triage Decision Using the ESI System

Gultekin Akyol[1], Cem Oktay[2], Fatma Selman[3]
[1] Health Sciences University Sancaktepe Sehit Prof. Dr. İlhan Varank Training and Research Hospital
[2] T.R. Akdeniz University Faculty of Medicine Department of Emergency Medicine
[3] Biruni University Faculty of Medicine Department of Emergency Medicine

Abstract

Background: Emergency triage is extremely important in reducing morbidity and mortality. The aim of this study is to compare the accuracy of triage categorization decisions of triage nurses with the Emergency Severity Index (ESI) system categorization determined after the emergency room evaluation of patients.

Methods: In this descriptive, cross-sectional study, patients who were admitted to Akdeniz University Hospital Emergency Service Adult Triage Area between 01-14 March 2018 and then admitted to the emergency department were evaluated retrospectively.

Result: Triage scores of 3324 patients were analyzed. The kappa concordance value between the score of the triage nurse and the scores of the physicians using ESI was found to be 0.416. It was determined that the triage staff gave a triage score 1/4 lower than the ESI. In the presence of tachypnea, an increase in the low triage rate and a decrease in the high triage rate of the patients were found. It was determined that the most accurate triage scores were given in nephrological and cardiovascular disorders. The most faulty triage decisions were eye disorders and oncological emergencies. In patients between the ages of 18-65, statistically significantly higher triage was performed. Patients with chronic diseases and a history of continuous drug use were given lower triage.

Conclusion: In order to increase the accuracy of triage, it is necessary to increase the medical knowledge of the triage nurse and to provide practical training especially on real cases with a triage score of 2-4.

Keywords: Emergency, triage decision, patient management

Introduction

Emergency services are one of the departments where patient admission cannot be restricted. Patients can apply to emergency services 24 hours a day, 7 days a week, with any complaint. Although the number of patient applications varies, the emergency service should be at the same level and quality at all hours of the day. There has been a significant increase in emergency room admissions in recent years. This increase in the intensity of admission causes delays in the evaluation and treatment of emergency patients and negatively affects patient satisfaction and service quality (1, 2). This situation has revealed the necessity of applying emergency room triage in order to determine the urgency of more urgent patients without delay in their diagnosis and treatment.

"Emergency Medical Triage" is an application made to separate patients who need urgent medical care due to their medical condition and those who may wait, and it is called "Triage" in short. The origin of the word triage is based on the French verb "trier" and it means "to classify, to separate" (3, 4).

The Emergency Severity Index (ESI), which is used in the USA, is the most frequently used and recommended among the five-category triage systems (5). One of the most common problems encountered in the triage process is correct evaluation. The triage classification that the patient will receive with the evaluation to be made in the first care will affect the onset of the treatment, survival, waiting period and discharge.

ESI, which is also used in our study, was first introduced in 1998 by Richard Wuerz and David Eitel. The last update, the 4th Version, was published in 2012 (6).

The aim of this study is to compare the triage categorization of the patients who applied to Akdeniz University Hospital Emergency Service by the triage nurse who has emergency room experience and who has been trained in triage, with the ESI system categorization determined according to the examinations, treatments and interventions performed during the evaluation of the patients in the emergency department.

Materials ve Method

This descriptive, cross-sectional study was conducted at Akdeniz University Hospital Emergency Service, which has approximately 100,000 patient admissions annually. In

Corresponding Author: Gultekin AKYOL **e-mail:** drgultekinakyol@gmail.com
Received: 01.11.2023 • **Revision:** 13.11.2023 • **Accepted:** 12.12.2023
DOI: 10.55994/ejcc.1352144

Cite this article as: Akyol G, Oktay C, Selman F. Evaluation of the Accuracy of The Emergency Department's Nurses' Triage Decision Using the ESI System. Eurasian Journal of Critical Care. 2023;5(3): 89-95

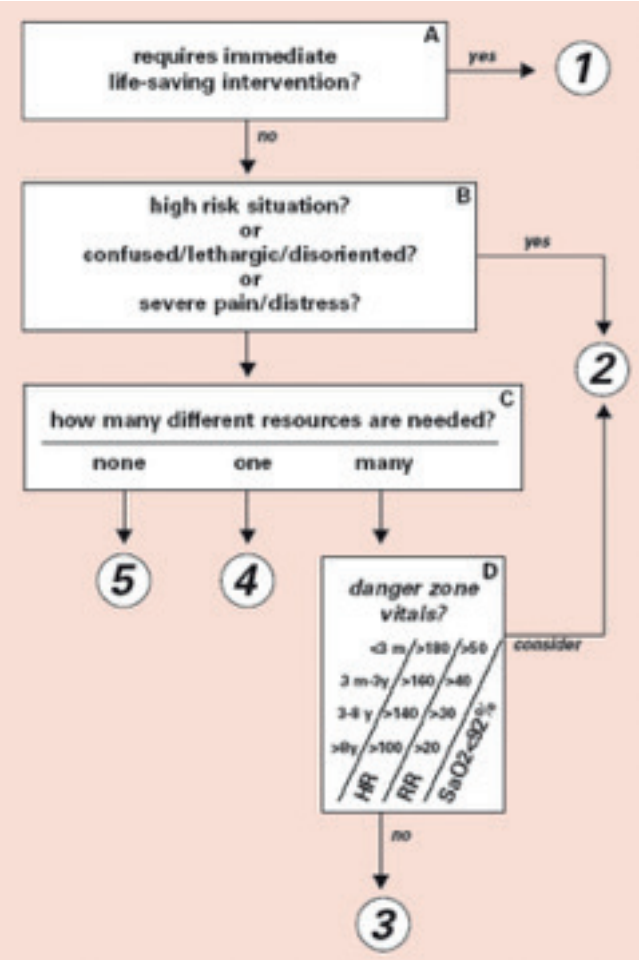

Figure 1: ESI Algorithm

this study, the triage categorization of all patients who were admitted to the Akdeniz University Hospital Emergency Service Adult Triage field between 01-14 March 2018 and then admitted to the emergency room were retrospectively analyzed.

During the study period, all patients who applied for emergency department adult triage were included in the study. Patients who left the emergency service without permission, refused examination or treatment, and whose data were incomplete were excluded from the study.

Age groups were classified as "**children**" for 0-17 years old, "**young**" for 18-65 years old, "**middle age**" for 66-79 years old, and "**old**" for 80 years and over.

The patients were examined in three different time periods in terms of application hours to the emergency department. They were divided into 3 groups as "**day**" between 08:00 and 15:59, "**evening**" between 16:00 and 23:59 and "**night**" between 00:00 and 07:59.

Patients admitted to the emergency department were evaluated by healthcare personnel who had at least two years of emergency service experience and received 8 hours of theoretical and practical training on emergency room triage.

Diseases such as diabetes mellitus, asthma, chronic obstructive pulmonary disease, coronary artery disease, cerebrovascular accident, cancer, hypertension, thyroid diseases and rheumatological diseases were evaluated in the chronic diseases section.

In the comparison of the categories determined by the triage nurse with the ESI, if the triage category given by the triage nurse was higher than it should be (for example, triage category 2 instead of 3), it was considered as "**high triage**", if low (for example, triage category 5 instead of 4) it was considered as "**low triage**".

During the initial evaluation of the patients in the triage area, the Triage Category was determined by looking at blood pressure, body temperature, finger-tip oxygen saturation, heart rate and respiratory rate while asking the patient's complaints and taking a short history. Blood pressure, pulse oximeter and heart rate values were measured with a monitor. Temporal thermometer was used for temperature measurement. This information was recorded in the Emergency Triage Module in Akdeniz University Hospital Hospital Information Management System (MiaMed®).

ESI categorization for each patient was determined by two emergency physicians. When there was a discrepancy between two physicians, a third emergency physician determined the ESI triage category and the determined categorization were accepted as the gold standard. The categories determined in the triage unit at the time of the patient application were compared with the ESI triage categories determined by examining the information about the patient's entire care.

Descriptive statistics were presented with frequency, percentage, mean, standard deviation, median, minimum, and maximum values. In the analysis of categorical data, Fisher's Exact Test (Fisher's Exact Test) was used if the expected value was less than 5 and the cell percentage was greater than 20%, and if it was small, the Pearson Chi-Square (Pearson Chi-Square) Test was used. Differences between two dependent ratios were evaluated using the McNemar Test. Analyzes were performed using the IBM Statistical Package for the Social Sciences (SPSS) 23.0 program. $p < 0.05$ was considered statistically significant.

Results

Between March 1, 2018 and March 14, 2018, when the study was conducted, 3858 patients applied to Akdeniz University Hospital Adult Emergency Service. According to the records of the Hospital Information Management System, 467 patients with missing data in the patient files and 25 patients who left the emergency department before their treatment was completed were not included in the study. 40 patients, who can not be identified by whom the triage evaluation was performed were excluded from the study. The patient flow chart is shown in Figure 2.

The mean age of 3324 patients included in the study was 40.35 ± 18.2 years. 1649 (49.6%) of the patients were

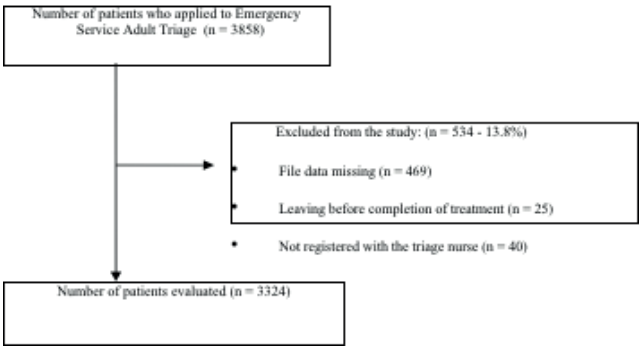

Figure 2: Characteristics of the Patient Group

female and 1675 (50.4%) were male. While 86.7% of female patients (n = 1429) were between the ages of 18-65 (young age), this rate was found to be 86.5% (n = 1449) in men.

When the categorization of the incoming patients by triage personnel was examined, it was observed that there was an excess in Category 3 (n = 1357, 40.8%) and Category 4 (n = 1378, 41.5%) patients. While only 21 patients (0.6%) were Category 1, 209 patients (6.3%) were determined as Category 2. The category of 359 patients (10.8%) was evaluated as Category 5 by the triage nurses (Figure 3).

In the classification made by two emergency physicians according to the ESI categorization, the same ESI category was determined in 3246 of 3324 patients. The categorization of 78 patients (2.3%) who had inconsistency between the decisions of the two emergency physicians was evaluated by a third physician. According to the evaluation made by the third emergency physician, it was observed that the triage error rate of the first emergency physician was 1.41%, while the error rate of the second physician was 1.23%. When the harmony between the two physicians was examined, it was observed that there was a perfect fit (Kappa = 0.968).

In the evaluation of emergency physicians retrospectively, considering all patient information, 21 patients (0.6%) Category 1, 558 patients (16.8%) Category 2, 1178 patients (35.4%) Category 3, 987 patients (%) Category 4 and 580 patients (17.4%) were determined as Category 5 (Table 1).

When we compared the evaluation made by the triage nurse and the results of the evaluation made retrospectively according to ESI, it was observed that the harmony between them was moderate (Kappa = 0.412) (Table 1).

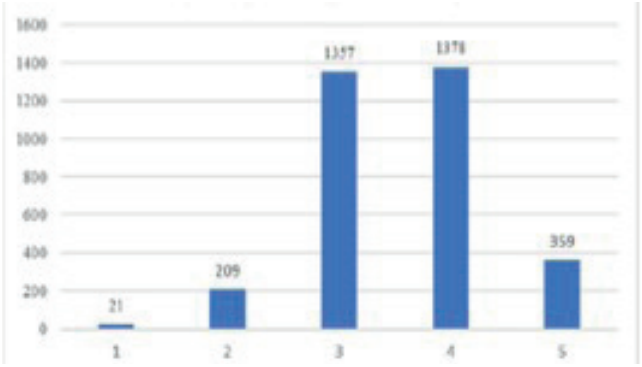

Figure 3: Number of patients according to the categorization made by the triage nurse

According to the ESI categorization accepted as the gold standard in the study, 66.0% of 558 patients determined as Category 2, 36.2% of 1178 patients determined as Category 3 and 11.8% of 987 patients determined as Category 4 it was seen that a lower category was given by the triage nurses. When the scores of triage nurses and emergency physicians were compared, significant differences were found especially in patients in category 2. Since patients with triage level 2 require urgent care and treatment, it is of great importance that they are better categorized by triage nurses, their triage level is determined correctly and they are taken to the appropriate care-treatment area more quickly. According to the ESI categorization, 62.2% of 580 patients designated as Category 5, 19.1% of 987 patients designated as Category 4, and 1.4% of 1178 patients designated as Category 3 were given a higher triage category by triage nurses (Table 1).

Table 1: Comparison of the triage score determined by the triage officer at the time of application with the ESI score

Triage Nurses' Score	ESI SCORE					Total
	1	2	3	4	5	
1	21 (%0,6)	0	0	0	0	21 (%0,6)
2	0	192 (%5,7)	16 (%0,4)	1 (%0,03)	0	209 (%6,3)
3	0	281 (%8,4)	836 (%25,1)	188 (%5,6)	52 (%1,5)	1357 (%40,8)
4	0	78 (%2,3)	309 (%9,2)	682 (%20,5)	309 (%9,2)	1378 (%41,5)
5	0	7 (%0,2)	17 (%0,5)	116 (%3,4)	219 (%6,5)	359 (%10,8)
Total	21 (%0,6)	558 (%16,8)	1178 (%35,4)	987 (%29,7)	580 (%17,4)	3324 (%100,0)

Note: The area made by the triage personnel and determined as high triage according to the ESI categorization is light turquoise; the area designated as low triage is gray in color.

The number of patients who underwent low triage by triage nurses was 808 (24.3%), and the number of patients who underwent high triage was 566 (17.0%). It was determined that these differences between triage increased in Category 3 and Category 4. When looking at the difference between age groups and gender, no significant difference was found. The majority of the patients (86.6%) were between the ages of 18-65.

In the examination performed among the age groups of the patients, it was found that the high triage rate was higher in younger patients (p = 0.000) (Table 2).

It was learned that 65.2% (n = 2170) of the patients who applied to the emergency department did not use medication continuously. It was observed that the low triage rate increased, while the high triage rate decreased in patients using medication (p = 0,000).

Table 2: Relationship between triage accuracy and age group

Age Groups	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
Children	6 (%15,0)	28 (%70,0)	6 (%15,0)	40 (%1,2)
Young	712 (%24,7)	1646 (%57,2)	520 (%18,1)	2878 (%86,6)
Middle age	69 (%21,7)	215 (%67,6)	34 (%10,7)	318 (%9,6)
Old	21 (%23,9)	61 (%69,3)	6 (%6,8)	88 (%2,7)
Total	808 (%24,3)	1950 (%58,6)	566 (%17,0)	3324 (%100,0)

*Percentage of column **Percentage of rows

When evaluated according to whether there was a chronic disease in the history of the patients, it was found that 59.5% (n = 1981) had at least one chronic disease. In the presence of a chronic disease, a worsening in triage categorization was observed (p = 0.000) (Table 3). When the accuracy of triage was examined, an increase in correct triage and a decrease in high triage were observed in the presence of a chronic disease. However, the presence of a chronic disease caused an increase in the number of patients undergoing low triage (Table 3).

Table 3: Relationship between triage accuracy and chronic disease

Chronic Disease	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
Yes	380 (%28,3)	816 (%60,7)	148 (%11,0)	1344 (%40,4)
No	428 (%21,6)	1134 (%57,3)	418 (%21,1)	1980 (%59,6)
Total	808 (%24,3)	1950 (%58,7)	566 (%17,0)	3324 (%100,0)

*Percentage of column **Percentage of rows

During the study period, it was found that the highest number of admissions to the emergency department were 32.5% during the day. There was no significant difference between the patients' admission time and triage assessment (p = 0.066) (Table 4).

Table 4: Evaluation of triage accuracy by application time

Application time	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
Day	369 (%25,1)	863 (%58,6)	241 (%16,4)	1473 (%44,3)
Evening	168 (%25,0)	399 (%59,3)	106 (%15,8)	673 (%20 ,3)
Night	271 (%23,0)	688 (%58,4)	219 (%18,6)	1178 (%35,4)
Total	808 (%24,3)	1950 (%58,7)	566 (%17,0)	3324 (%100)

*Percentage of column **Percentage of rows

The methods of applying the patients to the emergency department were examined in two separate classes: "by ambulance" and "by their own means". The number of patients admitted by ambulance was 198 (6.0%), and the number of outpatients was 3128 (94%). Category 3 patients constituted the majority of patients (n = 85) brought by ambulance. In the group of patients who came with their own means, there were more patients with Category 4 (n = 1300) (p = 0.758).

The application complaints of patients who applied to the emergency department were analyzed in 15 sub-categories. Trauma patients constituted 11.51% (n = 383) of the patients who applied to our emergency department. It was determined that the most frequent admissions were complaints related to ear, nose and throat diseases (20.5%), gastrointestinal system diseases (12.2%), traumatic conditions (11.5%) and cardiovascular system diseases (9.6%).

When the application complaints and triage accuracy rates were examined, nephrological disorders with 79.4% and cardiovascular diseases with 73.4% were determined to be the most accurately triaged disease groups. Eye diseases (43.3%) and oncological diseases (50.0%) were determined as the group with the worst triage accuracy.

Considering the vital signs obtained during the triage application of the patients included in the study, the mean systolic blood pressure was 129.4 ± 21.0 mmHg, the average diastolic blood pressure was 73.9 ± 12.1 mmHg, the median respiratory rate was 20 breaths / min (minimum 14 - maximum 60), the median heart rate was 91 beats / min (minimum 38 - maximum 201) and the average oxygen saturation was 97.3 ± 2.4%.

While the correct triage evaluation was made in 86% (n = 68) of the patients with oxygen saturation below 90% (hypoxic), it was observed that this rate decreased to 58% (n = 1882) in non-hypoxic patients (Table 5).

Table 5: Relationship between triage assessment and hypoxia

Hypoxia	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
Yes	10 (%0,3)	68 (%2)	1 (%0,03)	79 (%2,9)
No	79 8 (%24)	1882 (%56,6)	565 (%16,9)	3245 (%97,6)
Total	808 (%24,3)	1950 (%58,6)	566 (%17,0)	3324 (100,0)

*Percentage of column **Percentage of rows

When the respiratory rate and triage accuracy were examined, it was observed that when the respiratory rate was more than 20 breaths per minute (tachypnea), there was an increase in the low triage rate and a decrease in the high triage rate (p = 0.000) (Table 6).

Table 6: Relationship between triage assessment and tachypnea

Tachypnea	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
Yes	167 (%33,7)	287 (%57,9)	41 (%8,3)	495 (%14,9)
No	641 (%22,7)	1663 (%58,7)	525 (%18,7)	2829 (%85,1)
Total	808 (%24,3)	1950 (%58,7)	566 (%17,0)	3324 (%100,0)

*Percentage of column **Percentage of rows

When we examined the accuracy of triage with heart rate, it was found that there was no significant change with bradycardia (heart rate <60 beats / minute) (p = 0.168).

When the effect of blood pressure values on triage decision was examined, no significant difference was observed in terms of hypotension (systolic blood pressure <90 mmHg) (p = 0.628) and hypertension (systolic blood pressure> 140 mmHg) (p = 0.086).

The triage of the patients at the time of admission was performed by personnel who had at least 2 years of emergency service working period and had triage training. Of the 21 personnel who did triage, 15 were female (71.4%) and 6 were male (28.6%). No statistically significant difference was observed in the accuracy of triage in terms of gender (p = 0.075), duration of professional training (p = 0.304), years of employment in the profession (p = 0.086), and years of work in the emergency department (p = 0.034) (Table 7).

Table 7: Relationship between the working time of healthcare professionals in the emergency department and the accuracy of triage

Years of work in emergency department	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
2	121 (%27)	247 (%55,1)	80 (%17,9)	448 (%13,5)
3	203 (%24)	508 (%60)	135 (%16)	846 (%25,5)
4	207 (%25,9)	475 (%59,4)	118 (%14,8)	800 (%24,1)
5	56 (%23,5)	139 (%58,4)	43 (%18,1)	238 (%7,2)
6	43 (%25)	97 (%56,4)	32 (%18,6)	172 (%5,2)
7	12 (%35,3)	20 (%58,8)	2 (%5,9)	34 (%1,0)
8	77 (%20,1)	229 (%59,8)	77 (%20,1)	383 (%11,5)
9	3 (%13,6)	13 (%59,1)	6 (%27,3)	22 (%0,7)
10	85 (%22,7)	217 (%58)	72 (%19,3)	374 (%11,3)
18	1 (%14,3)	5 (%71,4)	1 (%14,3)	7 (%0,2)
TOTAL	808 (%24,3)	1950 (%58,6)	566 (%17,0)	3324 (100,0)

*Percentage of column **Percentage of rows

When the accuracy of the triage performed by the examining physician was evaluated, no significant relationship was observed between the duration of the study and the triage accuracy (p> 0.05) (Table 8).

Table 8: Relation between the seniority of the emergency physician and the accuracy of triage

Seniority	Triage Accuracy			Total (Number, %*)
	Low Triage (Number, %**)	Correct Triage (Number, %**)	High Triage (Number, %**)	
Low	458 (%24,9)	1086 (%59,1)	294 (%16,0)	1838 (%55,3)
İntermediate	269 (%25,1)	607 (%56,7)	195 (%18,2)	1071 (%32,2)
Senior	81 (%19,5)	257 (%61,4)	77 (%18,6)	415 (%12,5)
Total	808 (%24,3)	1950 (%58,6)	566 (%17,0)	3324 (100,0)

*Percentage of column **Percentage of rows

Discussion

Emergency services are among the departments where the number of patient applications cannot be known and limited in advance. Any patient who thinks that his / her complaint is urgent can apply to the emergency services for 24 hours. There is a wide scale in patients' complaints ranging from minor complaints to cardiopulmonary arrest. Applying at any time of the patients with all kinds of complaints prevents working with appointments. With the exceeding of the capacities of emergency services, the application of triage becomes obligatory. All these situations necessitated the application of effective and reliable triage.

In an ideal emergency room, every patient who applies should be examined and treated as soon as possible. Hospitals should use a triage system appropriate to the number of patients presenting to emergency services, the characteristics and resources of these patients. They can develop this system over time, as well as use triage methods, which are widely used in the world and whose validity and reliability have been proven.

The triage system determined by the Ministry of Health is used in our emergency department. Our aim in this study was to compare the triage categorization performed by experienced and trained triage personnel of the patients who applied to the emergency department with the Emergency Severity Index (ESI) system categorization determined according to the examinations, treatments and interventions performed during the evaluation of the patients in the emergency department.

The triage category of 82.3% of the patients who were admitted by the triage personnel within a two-week period

was determined as Category 3 or 4. According to ESI, this rate was 65.1%. While there was full compliance in Category 1, it was observed that healthcare personnel gave lower triage category than the ESI categorization in other categories. Prospective studies should be conducted to determine why healthcare personnel identify lower categorization. It should be evaluated whether the categorization system is a problem or a deficiency in the clinical decision of the triage personnel. Although the health personnel evaluating the patients included in the study in the triage department of the emergency department should be much more experienced, it should be ensured that the health personnel working in this department regularly receive the necessary training and certification programmed for the functioning of the emergency department, and they should receive practical and theoretical training on these issues at regular intervals.

We used the "inter-rater agreement" test, which is thought to be the most appropriate to compare two changes of this type, in order to compare the ESI category, which was formed as a result of the triage performed during the emergency admission of the patient and the evaluation of the physician examining it (7). In our study, the weighted kappa value calculated with the inter-rater consistency test was among the median limits. The weighted kappa value was calculated as 0.76 for ESI version 2 and 0.89 for ESI version 3 (8, 9). In a study conducted for ESI version 3, the weighted kappa value was determined to be 0.84-1.00 over the standard scenario (10). In another study conducted on real patients for ESI version 1, it was reported that the weighted kappa value was found to be 0.80 (11).

Rahmani et al. in their study, a significant difference was observed in the comparison between the triage personnel and the doctor and the kappa value was calculated as 0.659 (12). In another study conducted by Esmailian et al., nurse-doctor triage compliance was found to be over 90% (13). However, in the study of Goransson and von Rosen, a triage personnel success rate of 58% was observed, similar to our study (14).

Considering the excessive triage and low triage rates, the acceptable high triage rate suggested in the American Committee of Trauma Surgeons (ACSCOT) book was stated as 50% and the low triage rate as 10% (15). In our study, the low triage rate was 24.3%, while the high triage rate was 17%. In the triage evaluation performed by healthcare personnel in our emergency department, it was found that the low triage rate was higher than the acceptable value. It was thought that it would be beneficial to use more information and case examples for these complaints in the training of triage personnel.

We found that the low triage rate was significantly higher in the triage evaluation of patients with chronic diseases and continuous medication. It can be thought that the questioning of chronic illness and continuous drug use was done inadequately by triage personnel.

It was observed that a significantly lower triage category was given by triage personnel in patients with tachypnea. A similar situation was observed in the studies of Hinson et al. (16). In many emergency departments, health personnel working in the triage department may often ignore this parameter and may not prioritize it, but perhaps the parameter that should be paid the most attention in triage is respiratory rate. According to our last assessment, which is considered to be the gold standard, it was thought that vital signs should be taken more seriously by triage personnel. It was observed that the respiratory rate parameter used in triage assessment was one of the most important parameters in the evaluation of the triage score of the patient and the triage score was low especially in tachypnoea cases.

It has been observed that triage success increases when patients are hypoxic. We evaluated this situation, which is similar to ESI, as the deterioration in the patient's vitals increased the attention of the triage nurses.

When the time of admission to the emergency service and the way of admission were examined, no significant differences were observed. While the number of admissions to our emergency department during the daytime was high, Rahmani et al. in their study, unlike our study, reported that there was an increase in patient admissions during the night time (12).

In the study conducted by Källberg et al., it was stated that the biggest reason for triage errors was the tenure of the triage personnel in the emergency department (17). However, as in our study, it has been reported in many studies that the experience of triage personnel is not related to triage errors. In our study, it may be that the duty period of the triage personnel in the emergency department did not make a difference in the triage decision and that the health personnel in our emergency department started to triage after 2 years of experience. This situation suggests that the 2-year period is sufficient in terms of experience.

When the correct triage rates are examined, it is seen that the most correct triage is done in nephrological diseases with 79.4% and cardiovascular diseases with 73.4%. Eye diseases (43.3%) and oncological diseases (50.0%) are the worst triage diseases. The reason for this situation may be the negligence of the triage personnel for chronic diseases such as cancer and the lack of knowledge of the branch where emergency medicine practice is less, such as eye diseases. According to the results of the study, the high triage accuracy rate of patients presenting with cardiovascular symptoms is a positive result, but the triage accuracy rate of patients presenting with oncological diseases is low. In some regions of our country, the elderly population is densely populated and there is a significant increase in the number of individuals with oncological diseases every day, and the possible emergencies of oncological diseases in such patients are also increasing and most of them require urgent follow-up, treatment and hospitalization. Therefore, triage procedures of patients admitted to the emergency department due to oncological diseases should be carried out carefully like other important situations.

Limitations

Our study had some limitations. The pain scale, which has an important place in the ESI triage scale, was excluded from the evaluation because it was not entered into the system by the triage staff and by the attending physician many times simultaneously. Failure to evaluate triage adequacy in pediatric patients can be seen as a limitation of the study, since patients over the age of 18 and pediatric traumas were admitted to our emergency department.

Since our study was conducted in a health center where the number of outpatient admissions is relatively low compared to the emergency departments of training-research hospitals and university hospitals in other large cities, the importance of the professional experience of triage personnel in terms of triage accuracy could not be statistically revealed. A multicenter study can be conducted on this subject or more data can be obtained by keeping the study population larger.

If age groups and age ranges could have been determined more realistically and in accordance with the scientific study, more significant differences in triage scores between age groups could have been detected.

In addition to the parameters used in ESI Triage scoring, assessments such as finger prick blood glucose and brief neurological assessment can also be evaluated depending on the patient's medical history and may be useful in triage assessment.

Conclusion

As a result of our study, it was seen that triage personnel gave a lower triage category than expected, although they had an acceptable triage success in general. In order to increase the accuracy of triage, it is necessary to increase the medical knowledge of the triage nurse and to provide practical training on real cases, especially about patients with triage category 2-4. In order to eliminate the triage errors due to the deficiencies in the anamnesis and vital signs, it is necessary to extend the triage time allocated for each patient and to increase the number of triage units in rush hours.

Disclaimer: None.
Conflict Of Interest: None.
Funding Sources: None.

References

1. Shiber JR, Longley MB, Brewer KL. Hyper-use of the ED. Am J Emerg Med 2009;27:588-94.
2. Pines JM, Prabhu A, McCusker CM, Hollander JE. The effect of ED crowding on education. Am J Emerg Med 2010;28:217-20.
3. Iserson KV, Moskop JC. Triage in medicine, part I: Concept, history, and types. Ann Emerg Med 2007;49:275-81.
4. Ünalan Gedik H. Afetlerde Triyaj ve Komuta Sistemi. Erişim tarihi: 08 Mayıs 2018. http://www.acilveilkyardim.com/acil-bakim/triyaj.html.
5. Dong SL, Bullard M: Emergency department triage. In Rowe B, Lang E, Brown M et al (eds): Evidence-Based Emergency Medicine. Oxford, WileyBlackwell, 2009, pp 58-65.
6. Gilboy N, Tanabe P, Travers DA, Rosenau AM, Eitel DR. Emergency Severity Index, Version 4: Implementation Handbook. AHRQ Publication No. 05- 0046-2. Rockville, MD: Agency for Healthcare Research and Quality. May 2005.
7. Dong SL, Bullard M: Emergency department triage. In Rowe B, Lang E, Brown M et al (eds): Evidence-Based Emergency Medicine. Oxford, WileyBlackwell, 2009, pp 58-65.
8. Tanabe P, Gimbel R, Yarnold PR, Adams JG: The Emergency Severity Index (Version 3) 5-level triage system scores predict ED resource consumption. J Emerg Nurs. 2004;30:22-9.
9. Wuerz RC, Travers D, Gilboy N, Eitel DR, Rosenau A: Implementation and refinement of the Emergency Severity Index. Acad Emerg Med. 2001;8:170-6.
10. Baumann MR, Strout TD. Evaluation of the Emergency Severity Index (version 3) triage algorithm in pediatric patients. Acad Emerg Med. 2005;12:219-24.
11. Bruijns SR, Wallis LA, Burch VC: A prospective evaluation of the Cape Triage Score in the emergency department of an urban public hospital in South Africa. Emerg Med J. 2008;25:398-402.
12. Rahmani F, Majd PS, Bakhtavar HE, Rahmani F. Evaluating the accuracy of emergency nurses in correct triage using emergency severity index triage in Sina hospital of Tabriz: a cross-sectional analysis. J Emerg Pract Trauma 2018;4:9-13.
13. Esmailian M, Zamani M, Azadi F, Ghasemi F. Interrater agreement of emergency nurses and physicians in Emergency Severity Index (ESI) Triage. Emerg (Tehran) 2014;2:158-61.
14. Goransson KE, von Rosen A. Interrater agreement: a comparison between two emergency department triage scales. Eur J Emerg Med 2011;18:68-72.
15. Resources for optimal care of the injured patient. American College of Surgeons Committee on Trauma. Chicago, American College of Surgeons, 1999, pp 98.
16. Hinson JS, Martinez DA, Schmitz PSK, Toerper M, Radu D, Scheulen J, et al. Accuracy of emergency department triage using the Emergency Severity Index and independent predictors of under-triage and over-triage in Brazil: a retrospective cohort analysis. Int J Emerg Med 2018;11:3.
17. Källberg AS, Göransson KE, Östergren J, Florin J, Ehrenberg A. Medical errors and complaints in emergency department care in Sweden as reported by care providers, healthcare staff, and patients - a national review. Eur J Emerg Med 2013;20:33-8.