Comparison between Australasian triage scale and emergency severity index

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Received: 1 January 2020
Accepted: 23 January 2020
Published: 27 April 2020

The Egyptian Journal of Surgery 2020, 39:455–460

Background
The aim of triage system is to ensure that the treatment of patients in the Emergency departments will be according to their clinical urgency. Also, it decreases waiting time and helps in proper direction of the patients to the most suitable area for better assessment and treatment.
Aim of the Work
The purpose of this study is to compare the efficiency of Australasian Triage Scale versus the Emergency Severity Index triage systems.
Methods
Full medical history of 167 Patients arrived at the ED from January till March 2016 were recorded, chief complain, examination, resources number also were recorded and triaged by both systems.
Results
Our results revealed that the most frequent age group was between 20 to 40 years old, while the least frequent age group was ≥80 years old. The frequency of male patients was higher than the female patients. ATS and ESI were agreed in urgency level 1. Urgency level 2 and 5 was higher in ESI system while, Urgency level 3 and 4 was higher in ATS. The majority of the patients were discharged, while only 2.4 percent were dead. There were insignificant differences between ATS system and final outcome regarding degree of urgency. While, there was significant over-triage in urgency level 2, while there was significant under-triage in urgency levels 3–5 in comparison to final outcome.
Conclusion
We found that both systems are applicable, but ESI showed some limitation. So we recommended using ATS since it was easier to use and did not show any limitation.

Keywords:
Australasian triage scale, emergency department, emergency severity index, triage

Egyptian J Surgery 39:455–460

1110-1121

Introduction

The word triage came from the French verb (trier), it means to sort or pick up [1]. Triage has a basic role in emergency department (ED)s, where many patients are presented at the same time. The triage system aims to ensure that the treatment of the patient will be according to their clinical urgency state [2].

Triage systems in EDs play an important role in patients' categorization regarding their disease severity; it also decides the location and priority of the treatment given. Minimization of the in-hospital mortality and decreasing the time needed to treatment, length of stay, and the resources used are the main targets of any triage system [3].

There are many triage systems, but only five are considered the most effective; they are the systems of choice [4]. Four various five-level triage systems are accepted internationally, which are Australasian triage scale (ATS), Manchester triage system (MTS), Canadian triage and acuity scale (CTAS), and emergency severity index (ESI) [3,5].

The ATS was developed in Australia. ATS system categorizes the patients into five categories: category 1 (immediately life-threatening conditions) to category 5 (less urgent). The ATS is an effective way for estimating the severity of incoming patients by medical crew in the ED [5,6]. The ATS has an appropriate level of overall reliability in the ED, but it needs more work to reach a perfect agreement [7]. Using ATS, a great variability in the time of triage decisions was detected. Moreover, analysis of variance suggested presence of a difference between triage duration and staff, patients, and environmental variables [8].

The development of ESI system occurred in Boston, Massachusetts. It uses only one algorithm ratings from level 1 (the most acutely ill patients) to level 5 (the least resource-intensive patients). The triage staff evaluates the amount of resources required to discharge the patient from the ED in those not meeting criteria of ESI level 1 or 2. The ESI system can be used for both children and adults. The ESI integrates acuity and evaluates resource consumption to decide the priority of treatment [9–11].

Patients and methods

Patients

This prospective observational comparative study was done in the ED of Port Said General Hospital. The study included 167 patients arrived at the ED from January till March 2016. The study was approved by the ethics committee of faculty of medicine at Suez Canal University.

Inclusion and exclusion criteria

All the patients aged above 12 years old were eligible for inclusion in the study. Exclusion of those who aged below 12 years old or left the ED without being examined by a physician.

Methods

Full medical history was recorded with the following patients' data: patient name, mode of arrival, cause of admission, triage ratings by the triage team, urgency classification by the ED physicians, ED resources used, hospital admission rates (including death), and length of stay (LOS) in ED.

The documentation of the triage assessment included the following essential details:

(1) Date and time of assessment.
(2) Main presenting problem(s).
(3) Relevant medical and surgical history.
(4) Relevant assessment findings.
(5) Initial triage category allocated.
(6) Assessment and treatment area allocated.
(7) Any diagnostic, first aid, or treatment measures initiated.

Statistical analysis

All statistical data were analyzed using SPSS version 20.0 (IBM Corp., Released 2011, IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Differences were compared by χ^2 or Fisher exact tests or t-test. P value of less than 0.05 was considered significant. Analysis of variance test was followed by logistic regression analysis model of the dependent. Differences in distribution of urgency levels was tested by means of the Friedman's test.

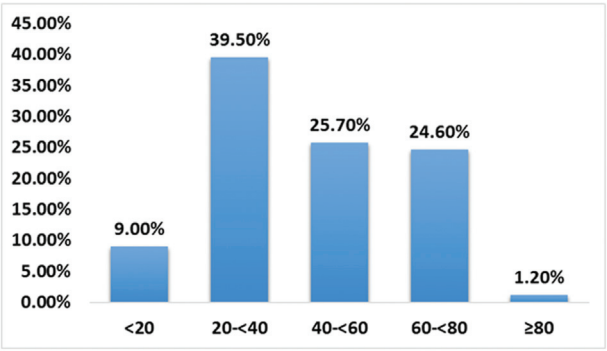
Results

The study included 167 patients arrived at the ED of Port Said General Hospital.

Regarding the age and sex distribution of the patients in our study, the most frequent age group was between 20 and less than 40 years, whereas the least frequent age group was the patients aged greater than or equal to 80 years (Fig. 1). The frequency of male patients was higher than the female patients (Fig. 2).

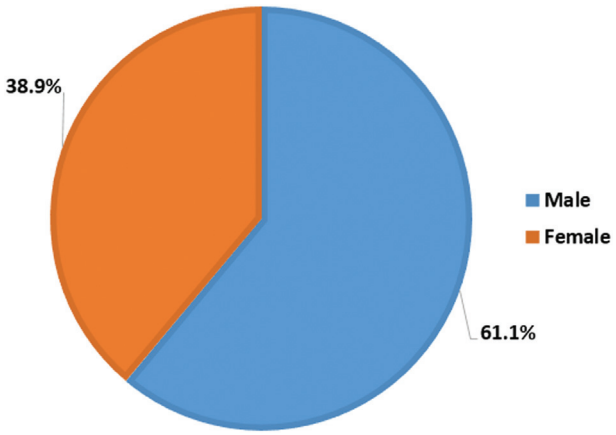
Table 1 shows the triage characteristics of the studied patients. The mean±SD time of arrival of the studied patients was 15.65±5.73 o'clock, with a range of 1.10 a.m. to 23.45 p.m. Most patients (83.2%) arrived by a private vehicle without an ambulance. The median delay time was 15 min with a range of 0–110 min. Emergency procedures were taking place at resuscitation room in 9.0% of the patients, at trauma section in 13.2% of the patients, and at the general emergency room in 77.8% of the patients.

Figure 1



Age (years) distribution among the studied triage patients.

Figure 2



Sex distribution among the studied triage patients.

Table 1 Triage characteristics of the studied patients

Variables	All triaged patients (*n*=167) [*n* (%)]
Time of arrival	
Mean±SD	15.65±5.73
Range	1.10–23.45
Mode of arrival	
Ambulance	28 (16.8)
Private vehicle	139 (83.2)
Delay or waiting time (min)	
Median	15.0
Range	0–110
Triage place	
Resuscitation room	15 (9.0)
Trauma room	22 (13.2)
General emergency room	130 (77.8)
Treatment place	
Resuscitation room	22 (13.2)
Trauma room	8 (4.8)
General emergency room	137 (82.0)

Table 2 Provisional diagnosis of the studied patients

Variables	All triaged patients (*n*=167) [*n* (%)]
Disturbed level of consciousness/coma	10 (6.0)
Fall from height/multiple trauma	3 (1.8)
Allergy	1 (0.6)
Chest pain	20 (12.0)
Abdominal pain/vomiting	29 (17.4)
Severe headache	34 (20.4)
Dyspnea	8 (4.8)
Stab wound	1 (0.6)
Minor trauma	25 (15.0)
Immunization	6 (3.6)
History of previous illness	11 (6.6)
Upper respiratory tract infection	10 (6.0)
Eye trauma	4 (2.4)
Suffocation	5 (3.0)

In our study, most patients (20.4%) experienced severe headache, whereas allergy and stab wound were the least frequent, as shown in Table 2.

Table 3 shows the history of co-morbid conditions and risk factors (age >65, cardiac risk factor, and mechanism of injury) among the studied patients. More than half of the patients (53.9%) did not have any history of comorbid chronic conditions. Most studied patients (73.1%) did not have any risk factors. Only 10.2% of the studied patients had three risk factors, 12.0% had two risk factors, and 4.8% had one risk factor.

The number of resources used in our study are listed in Table 4. Approximately 42% of the studied patients did not consume any resources.

Table 5 shows the degree of urgency in ATS and ESI triage systems in the studied patients. ATS and ESI triage systems were agreed in urgency level 1. Urgency levels 2 and 5 were higher in ESI system in comparison with ATS system. Urgency levels 3 and 4 were higher in ATS system in comparison with ESI system.

Table 3 History of comorbid conditions and risk factors among the studied patients

Variables	All triaged patients (*n*=167) [*n* (%)]
Comorbid conditions	
No history of comorbid conditions	90 (53.9)
History of comorbid conditions	77 (46.1)
Number of risk factors	
No risk factors	122 (73.1)
One risk factor	8 (4.8)
Two risk factors	20 (12.0)
Three risk factors	17 (10.2)

Table 4 Number of resources used for the studied patients

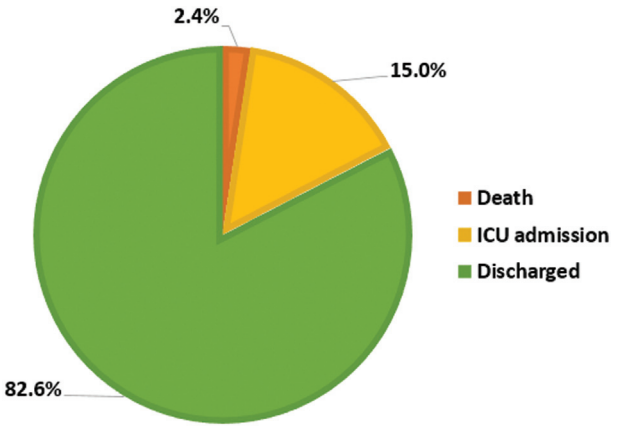
Variables	All triaged patients (*n*=167) [*n* (%)]
Number of resources	
0	70 (41.9)
1	48 (28.7)
2	20 (12.0)
3	21 (12.6)
4	7 (4.2)
5	1 (0.6)

Table 5 Degree of urgency in Australasian triage scale and emergency severity index triage systems in the studied patients (*n*=167)

Variables	ATS [*n* (%)]	ESI [*n* (%)]	χ^2 test	*P* value
Degree of urgency				
Urgency 1	6 (3.6)	6 (3.6)	0.00	1.00
Urgency 2	35 (21.0)	41 (24.6)	0.61	0.43
Urgency 3	13 (7.8)	12 (7.2)	0.04	0.84
Urgency 4	51 (30.5)	43 (25.7)	0.95	0.33
Urgency 5	62 (37.1)	65 (38.9)	0.11	0.74

ATS, Australasian triage scale; ESI, emergency severity index.
*$P<0.05$, significant.

Figure 3



Final outcome of the studied triage patients.

Table 6 Degree of urgency according Australasian triage scale system in comparison to final outcome of the studied patients (*n*=167)

Variables	ATS [*n* (%)]	Final outcome [*n* (%)]	χ^2 test	*P* value
Degree of urgency				
Urgency 1	6 (3.6)	4 (2.4)	0.41	0.52
Urgency 2	35 (21.0)	25 (15.0)	2.03	0.15
Urgency 3–5	126 (75.4)	138 (82.6)	2.60	0.11

ATS, Australasian triage scale. *$P<0.05$, significant.

Table 7 Degree of urgency according emergency severity index system in comparison to final outcome of the studied patients (*n*=167)

Variables	ESI [*n* (%)]	Final outcome [*n* (%)]	χ^2 test	*P* value
Degree of urgency				
Urgency 1	6 (3.6)	4 (2.4)	0.41	0.52
Urgency 2	41 (24.6)	25 (15.0)	4.83	0.028*
Urgency 3–5	120 (71.8)	138 (82.6)	5.52	0.019*

ESI, emergency severity index. *$P<0.05$, significant.

The final outcome of the studied patients is shown in Fig. 3. Overall, 82.6% had good prognosis, whereas 17.4% of them had poor prognosis (ICU admission or died).

Table 6 shows the degree of urgency according to ATS system in comparison with final outcome of the studied patients. There were insignificant differences between ATS system and final outcome regarding degree of urgency.

Table 7 shows the degree of urgency according to ESI system in comparison with final outcome of the studied patients. There was significant overtriage according to ESI system in urgency level 2, whereas there was significant undertriage in urgency levels 3–5 in comparison with the final outcome.

Discussion

There is pervasive and persistent need to develop an effective triage system with today's overcrowding in EDs, rising patient expectations, increasing financial pressure on emergency services, and limitation on staff number [1].

In this study, the mean age of studied patients was 42.86±18.27 years. The most frequent age group was between 20 years and less than 40 years, whereas the least frequent age group was the patients aged greater than or equal to 80 years. The mean age of patients with poor prognosis was significantly higher than the mean age of patients with good.

Our results agreed with similar studies that evaluated a new prognostic tool for in-hospital mortality in nonsurgical ED patients and assessed the predictors of mortality among emergency medical admissions. These studies showed that the higher the patient's age, the higher the risk of death within 30 days of hospital care after arrival at the ED. The results showed a 5% increase in mortality per year [12,13].

Moreover, Han *et al.* [14] stated that patients in old age groups (above 75 years of age) had a higher risk of death within 30 days after the ED arrival in comparison with younger patients having the same symptoms.

Furthermore, Platts-Mills *et al.* [15] recorded that ESI is not good in predicting which elderly emergency patients will need immediate life-saving intervention, showing a sensitivity and specificity of 42.3 and 99.2%, respectively.

Regarding sex distribution, the frequency of male patients was higher than the female patients (61.1 vs 38.9%, respectively). However, the female patients had higher prevalence of poor prognosis than male patients (58.6 vs 41.4%, respectively).

In similar prospect, Arslanian-Engoren [16] and Jneid *et al.* [17] had detected less improvement in outcomes in female sex in comparison with male sex. This may have occurred owing to underassessment, underdiagnosis, and undertreatment of women in EDs.

Kuhn *et al.* [18] have detected pervasive sex-related influences working against women from triage through to early ED treatment. This may be owing to differences in symptoms reported by women [19–21].

Our data revealed that there were insignificant differences between ATS system and final outcome

regarding degree of urgency ($P>0.05$). There was significant overtriage according to ESI system in urgency level 2, whereas there was significant undertriage in urgency levels 3–5 in comparison with final outcome ($P<0.05$).

In the same direction, Tanabe *et al.* [22] found that when triage urgency levels were compared with the 'real-outcome' urgency level, the ESI had an undertriage rate of 9% and an overtriage rate of 11%.

Using ESI system, most patients deemed by the expert panel to belong in urgency level 1 or 2 were undertriaged. Our result agreed with Storm-Versloot *et al.* [23] who recorded that ESI had the highest percentage of undertriage as compared with MTS and ISS. This variation between the reference standard and the formally structured systems may be owing to the fact that the expert panel of ED physicians knew what happened to the patient. Thus, they may have retrospectively evaluated such patients as being less (or more) urgent than they would have done on using a formally structured system and before knowing the outcome.Some studies found that the ATS improved triage practice. Physicians stated that their assessments of patients were more accurate, and consistent throughout the department. They reported better communication between medical staff and patients and their relatives and high triage accuracy. The overall agreement between ATS graduates and the chart auditor/expert within one level was 99.7% [24,25].

In relation to ATS triage decisions, Considine *et al.* [26] found that 61% of triage decisions were 'expected triage,' with 18% 'overtriage' and 21% 'undertriage decisions.'

In general, it is difficult to predict hospital admission. The predictions of hospital admission, resource use, and length of stay per urgency level in the triage systems in our study were consistent with other research studies [27–29].

Conclusion

(1) There were insignificant differences between ATS system and final outcome regarding the degree of urgency.
(2) There was significant overtriage according to ESI system in urgency level 2, whereas there was significant undertriage in urgency levels 3–5 in comparison with final outcome ($P<0.05$).

Recommendations

We found that both systems are applicable, but ESI has some limitation, so we recommended adapting ATS in the hospital ER, as it is easy to use and did not show any limitation as ESI. Moreover, we recommend training hospital staff on that system to improve outcome of ER and prevent further overcrowding.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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