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Comparison of Triage Effectiveness Based on ESI and HEART Scale in Diagnosis of Outcome in Patients with Chest Pain

R. Gharaee (MSc)[1], S. Zohari Anboohi (PhD)[*2], H. Shiri (MSc)[2], M. Nasiri (PhD)[3]

1.Student Research Committee, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, I.R.Iran
2.Department of Medical Surgical Nursing, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, I.R.Iran
3.School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, I.R.Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Chest pain is one of the common causes of emergency department visit, but only 25-15% of them are diagnosed with acute coronary syndrome (ACS). However, unexplained cases of ACS have led to high mortality rates. The aim of this study was to compare the effectiveness of ESI triage (Emergency Severity Index) and HEART scale (Chest Pain Diagnostic Scale) in detecting the outcome of patients with complaints of chest pain.

METHODS: This descriptive study was performed on 200 patients with chest pain in emergency department of selected hospitals of Shahid Beheshti University of Medical Sciences in 2017. The ESI triage form, HEART and demographic information were completed for all patients. Six weeks later patients were re-evaluated in terms of heart problems.

FINDINGS: The compliance of the ESI triage and HEART scale in the high-risk group was 27.9% (24 people), the middle-risk group was 79% (62 people) and the low-risk group (30.6%) (11 people). In general, comparing the total scores, these two scales were consistent with 48%. Also, after considering the cut-off point 4.5, the sensitivity 85% and the specificity 89% with a 95% confidence interval for the HEART scale and sensitivity 95%, and the specificity 25% with a 95% confidence interval was found for the ESI triage.

CONCLUSION: According to the results of this study, despite its wide range, the ESI triage has shown a poor performance over the HEART scale. Therefore, the use of the combined HEART triage ESI scale can be very helpful.

KEY WORDS: *Chest Pain, Triage, Acute Coronary Syndrome.*

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[*]Corresonding Author: S. Zohari Anboohi (PhD)
Address: School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, I.R.Iran.
Tel: +98 21 88202511
E-mail: Irrgh1991@gmail.com

Introduction

Chest pain is one of the most common causes of emergency room visits that may be due to life-threatening conditions such as Acute Coronary Syndrome (ACS) (1, 2).

Early and accurate diagnosis of ACS is important because undetected cases have resulted in high mortality and were the largest source of emergency litigation in the United States in 2016 (3, 4). In fact, accurate and efficient triage of chest pain is a major health challenge (3, 5, 6). ESI triage is a five-level system for clinical decision making and management of patients referred to the emergency department and has been recognized as an accurate and robust triage system (5,7). ESI triage levels include: Level 1: Needs to be resuscitated, Level 2: Emergency patients, Level 3: Emergency patients with stable clinical status, Level 4: Non-emergency patients and Level 5: Patients in need of clinical care (8).

ESI triage, despite its wide acceptance and many strengths (ease of use and its relevance to emergency department resource forecasting) has limitations such as a strong dependence on the triage individual's clinical judgment, challenges in emergency resource allocation, limited accuracy and poor accuracy of classification of patients with a possible diagnosis of ACS (7,9,10). The HEART scale is a simple scoring tool to determine the risk of ischemic events in patients referred to the emergency department (1,11-13). Its speed, accuracy, and reliable results make it possible for the physician to safely discharge low-risk patients and quickly identify high-risk cases for future offensive operations without additional testing (14,15).

Due to the limitations of ESI triage in the classification of patients with chest pain, the need for a precision assistive device is felt. Since no HEART scale study has been used in the Iranian population so far, the efficacy of ESI triage for this specialized tool has not been established. Therefore, this study was conducted to compare the efficacy of ESI triage and HEART scale in patients with acute chest pain.

Methods

This cross-sectional study after approval by the Ethics Committee of Shahid Beheshti University of Medical Sciences with code of ethics IR. SBMU.PHNM.1395.679 was enrolled as purposive sampling on 200 patients referred to the emergency department of selected hospitals of Shahid Beheshti University of Medical Sciences in year 2017. Thus, of all the patients referred to the emergency department, only patients with complaints of chest pain were included in the study. Subjects with non-traumatic chest pain, pressure or chest discomfort, patient satisfaction, and over 21 years of age were included and they were excluded if they did not consent to participate in the study. Data were collected using demographic profile form, ESI triage and HEART scale. Validity of demographic form and HEART scale were confirmed by ten professors of Shahid Beheshti University of Medical Sciences.

The reliability of HEART scale was calculated 0.87 using Cronbach's alpha coefficient. ESI triage also divides patients based on the severity of the disease and the severity of the disease in five immediate-delayed priorities.

The HEART scale includes: patient history, ECG, age, cardiac risk factors, and troponin I levels. Each of these is scored from 0 to 2. Completely suspicious items score 2, nonspecific and specific items score 1 and completely nonspecific symptoms score 0. Overall, scores were classified as 0-3 for low risk, 4-6 for medium risk, and 7-10 for high risk. This scale was developed and validated in 2013 by Poldervaart et al. (16). After completing the ESI triage form by triage nurse and obtaining patient consent, demographic information form and HEART scale were completed. Six weeks later, all specimens were contacted and their status recorded for recurrence of heart problems, such as PCI, recurrent ACS, or death.

At ESI triage, the samples were divided into three groups: low risk (level 4 and 5), moderate risk (level 3) and high risk (level 1 and 2). After completing sampling and final diagnosis, the agreement between the three ESI triage groups and HEART scale were compared. Data were analyzed using SPSS software version 21 and mean, standard deviation, and percentile tests were used to describe the data and ROC curve analysis was used to determine sensitivity and specificity.

Results

Of the 200 patients participating in this study, 111 were male (55.5%) and 89 were female (44.5%). The mean age of patients was 53.7±15.61 years. Based on ESI triage, 29(14.5%) were in high risk group, 139 (69.5%) in medium risk group and 32(16%) in low risk group. According to HEART scale, 33(17.5%) were in high risk group, 78(39%) in medium risk group and 86(43%) in low risk group. The mean time of

examination by the Emergency Physician was 22±15 minutes, the mean stay in the Emergency Department was 15±10 hours, and the mean time for obtaining the ECG was 34±320 minutes. The mean duration of examination by a cardiologist was 4.5±6.5 hours and the mean thrombolytic time was 101±82 minutes. PCI was performed on average 68±35 hours.

Correlation between ESI triage and HEART scale was 30.6% in high risk group, 79.5% in high risk group and 27.9% in low risk group. Overall, 48% matched the total scores of these two instruments (Table 1). In addition, 25 (12.5%) patients had light triage and 18 (9%) patients had heavy triage and in total 43 patients (21.5%) had triage error. After six weeks, 100% of patients in the high-risk HEART group and 58.6% in the high-risk ESI group had cardiac failure (Table 2).

After considering the cut-off point of 4.5, sensitivity of 85%, specificity of 89%, PPV= 0.87, NPV= 0.87, LR+= 7.7 and LR=0.17 for HEART scale and sensitivity of 95%, specificity of 25%, PPV=0.53, NPV=0.84, LR=1.27 and LR = 0.20 were obtained for ESI scale. Also in the case of HEART scale the area under the curve was 0.94 with 95% confidence interval (0.91- 0.97) and in the case of ESI triage the area under the curve was 0.62 with 95% confidence interval (0.54-0.70) (Fig 1,2).

Table 1. Comparison and adjustment of HEART score and ESI triage level in patients referred to emergency department

score HEART		ESI triage level				
		Level 1	Level 2	Level 3	Level 4	Level 5
		High risk		Intermediate risk	Low risk	
		N(%)		N(%)	N(%)	
0-3	Low risk	0(0)	8(9.3)	54(62.8)	22(25.6)	2(2.3)
4-6	Intermediate risk	2(2.6)	8(10.3)	62(79.5)	6(7.7)	0(0)
7-10	High risk	5(13.9)	6(16.7)	23(63.9)	2(5.6)	0(0)
Total		7(3.5)	22(11)	138(69)	30(15)	2(1)

Table 2. Frequency distribution in terms of the incidence of heart problems and readmission after 6 weeks, based on the scale HEART

Follow up	Scale score HEART			Total
	0-3	4-6	7-10	
	N(%)	N(%)	N(%)	N(%)
Patients who have recurrent heart problems after 6 weeks	6(7.1)	52(65.8)	36(100)	94(47)
Patients who have not had a heart problem and readmission after 6 weeks	79(92.9)	27(34.2)	0(0)	106(53)
Total	85(100)	79(100)	36(100)	200(100)

Follow up	Triage ESI					Total
	Level 1	Level 2	Level 3	Level 4	Level 5	
	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)
Patients who have recurrent heart problems after 6 weeks	7(100)	10(45.5)	72(51.8)	5(16.7)	0(0)	94(47)
Patients who have not had a heart problem and readmission after 6 weeks	0(0)	12(54.5)	67(48.2)	25(83.3)	2(100)	106(53)
Total	7(100)	22(100)	139(100)	30(100)	2(100)	200(100)

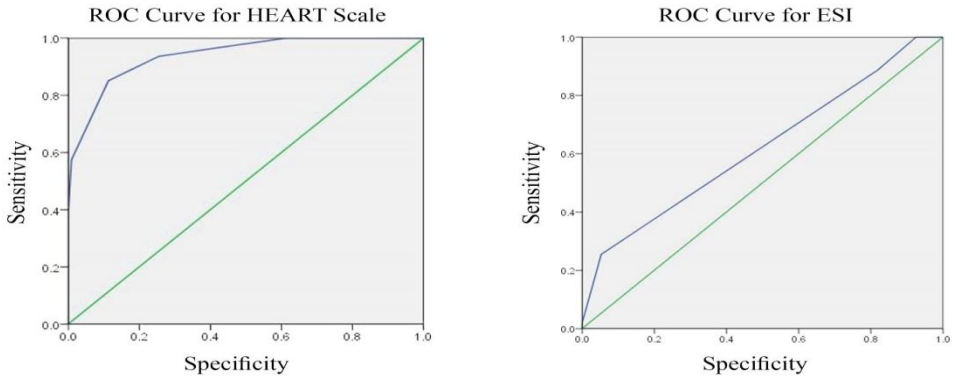

Figure 1. Determination of sensitivity and specificity for HEART scale and ESI triage of patients referred to the emergency department

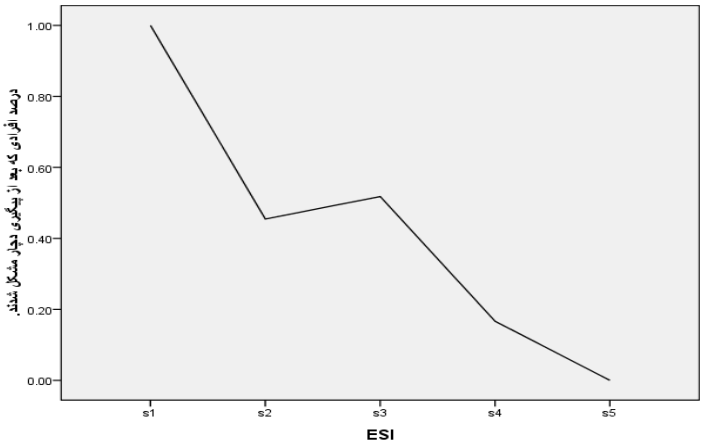

Figure 2. Comparison of ESI triage with hospital readmission and cardiac problems occurring after 6 weeks

Discussion

The findings of this study show that ESI triage did not predict the incidence of heart problems (58.6%), so that after six weeks, the incidence of cardiac problems in patients at level three was more than level two. But on the HEART scale, all high-risk cases have been identified. Leite et al. calculated this value for the Manchester triage 60.1% (1).

However, Mirhaghi et al recommend the ESI triage system as a reliable tool in the emergency department. But they believe that the results are not as they are in developed countries (17). Golzari et al. suggest that training of triage personnel can greatly enhance their skills (18), but Hinson et al. suggest that, despite continuous and accurate staff training, many patients with triage errors still remain (9). This disagreement confirms that the triage system sometimes has gaps and that the occurrence of light triage and delay in treatment cannot be ignored. Lack of assignment in the first six hours may crowd the emergency department and may influence triage nurse judgment and light triage. Fazel-Asgharpour et al. suggested that using dedicated cardiac triage is more efficient and reduces the time needed for patients to be examined and cared for (19). In this study, 21.5% of patients had triage error and the highest triage error was for level 3. Grossmann et al reported that the error rate of triage was 22.5% (20) and Farhadi et al stated that the highest percentage of triage error occurred at level 3 (23.7%) (21).

This can be substantially improved by providing sufficient staff or thinking up peak arrival times. In this study, 18.5% of patients presented with symptoms other than chest pain that, if ignored, would increase the risk of morbidity or mortality, which the HEART scale well identified. This is probably due to the HEART scale taking into account age, gender, and risk factors. Leite et al. suggest that these should be taken into account in determining the level of triage of patients (1).

Jellema et al. also introduce the HEART scale more efficiently than the Manchester triage scale (22). Six et al calculated the sensitivity of the HEART scale to 83% (23) and Jellema et al. to 85% (22). Backus et al estimated 83% of the effectiveness of the HEART scale (13), which is consistent with the results of the present study. Despite its range, the ESI triad has shown poorer performance than the HEART scale. One reason for this may be the generality of the ESI triage and less attention to proprietary symptoms. Despite the high speed in the

ESI triage compared to the HEART scale, the likelihood of neglected cases is high. So using this scale can be very useful. The HEART scale may also have limitations, although troponin I and ECG may make a definitive diagnosis, but the timing of these measures may allow the emergency department to be crowded. Therefore, further research is recommended in this field.

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