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Effect of the implementation of cardiac triage scale on the time indices of patients with chest pain

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ABSTRACT

Background: Chest patient is the most common symptom in coronary artery disease, but its diagnosis is a complex issue and high mortality is attributed to this symptom. Therefore, the timely diagnosis and treatment is essential. The present study was conducted to determine the effect of implementation of cardiac triage scale on time indices in patients with chest pain.

Methods: In this clinical trial study with control group, study population was the patients referred to emergency ward of Farabi hospital in Mashhad in 2014. 60 patients were selected purposefully and then were randomly allocated into intervention and control group. The patients in intervention group were triaged through using cardiac triage scale by researcher and in control group through emergency severity index and by nurse. Data analysis was done through using descriptive statistics, Chi-square and Mann Whitney in SPSS 21.

Results: The beginning of 6-hours hospitalization ($p < 0.001$), the time of the first visit by specialist ($p < 0.001$) and the time of the first electrocardiogram ($p < 0.001$) in intervention group was shorter than the control group.

Conclusion: The results of the study showed that the special triage of cardiac patients can decrease the time of assessment and caring of them. Thus, the using of this method is recommended for early care of cardiac patients.

1. Introduction

Cardiovascular diseases are among the most common disorders associated with severe consequences, which significantly affect the mortality rate and lifestyle of the patients.[1] Delayed diagnosis or evaluation of cardiac patients undoubtedly increases the possibility of complications and mortality.[2] This is because cardiac deaths (e.g., myocardial infarction) often occur within the first few hours after the onset of symptoms and ventricular dysrhythmias.[3] Therefore, cardiac patients must refer to the hospital immediately after the manifestation of the symptoms in order to receive appropriate clinical measurements.[4]

Chest pain is considered the most frequent symptom of coronary artery disease as the majority of cardiac patients refer to emergency departments with this evident symptom. Despite the availability of various modern assessment tools, detection of coronary artery disease remains a complex healthcare issue, as well as the most intricate challenge faced by emergency department physicians and nurses.[5] According to statistics, 5% of acute myocardial infarction cases and 4.6% of the patients with unstable angina are not diagnosed accurately, and 60% of the hospitalizations in such cases are unnecessary due to improper diagnosis.[1] On the other hand, complexity of the detection of cardiac diseases may prevent early diagnosis and lead to delayed treatment.[6] Triage or sorting is carried out in order to prioritize emergency cardiac patients for diagnostic and therapeutic procedures. Furthermore, triage is applied to identify the patients who are not able to wait until visitation by a physician. Qualified triage nurses are responsible for the prompt and precise detection of a small percentage of cardiac patients requiring emergency

care. Moreover, these nurses must prioritize other patients who do not need emergency care and are able to wait for medical evaluation.[7] In fact, triage of patients is a hierarchical decision-making process, through which the patients are classified based on the severity of their condition. As an inherent element of healthcare management, triage is employed in providing health care for emergency patients in emergency units and is considered an imperative concept in emergency sections.[8]

Accurate triage is the key to the success of emergency departments in every hospital. Triage errors are likely to occur due to the assignment of inaccurate triage levels by nurses due to the misconception or unawareness of the variables and triage criteria of the patients. This leads to the under-triage of cardiac patients, which prolongs their waiting time and delays early care causing the deterioration of patient conditions.[1]

Triage errors occur due to several reasons, including the lack of knowledge regarding high-risk conditions and improper interpretation of vital signs of patients.[9] Under-triage of cardiac patients is associated with delayed diagnosis and treatment, which might lead to various complications or even death. In emergency departments, under-triage could cause complications during the hospitalization of patients. Therefore, decreasing the rate of under-triage is a major healthcare concern in emergency units.[10]

Triage criteria primarily aim to prevent delayed provision of emergency care in high-risk patients.[11, 12] Furthermore, the main principle of this scale is to identify and isolate the patients who require emergency care, as well as to prioritize those who are able to wait for physician visitation without problems.[13-15] During the past two decades, several standard triage scales have been developed, which are mainly applied based on the severity of patient conditions.[16]

Currently, the Emergency Severity Index (ESI) is an effective triage system used for cardiac patients in emergency departments. ESI classifies patients into five levels based on disease severity and the required facilities. In this system, the role of nurses is to determine the severity of patient conditions based on the defined algorithm. Although ESI offers a general approach to evaluate the severity of disease, it does not contain specific guidelines regarding the cardiovascular risk factors. As such, emergency nurses are responsible for decision-making in this regard. This could lower the possibility of bias in the triage of cardiac patients, thereby preventing inaccurate triage and prolonged treatment process.[11]

Previous studies have denoted errors in the application of conventional triage scales. For instance, findings of Mirhaghi et al. (2011) indicated that emergency unit nurses in Sistan-Baluchistan province (Iran) classified 48% and 8.57% of cardiac patients as higher priority and low-priority cases, respectively.[16] Similarly, Kamrani et al. (2013) reported the rate of under-triage to be 23.7% in the hospitals affiliated to Shahid Beheshti University of Medical Sciences in Tehran, Iran.[17] These findings signify the loss of the "golden time" to provide care services for high-risk cardiac patients. Triage errors are associated with the delayed identification of high-risk patients. Considering the complex nature of cardiac diagnosis, disregard of chest pain complaints by emergency nurses may lead to severe complications and deferred treatment of cardiovascular patients. Given the sensitivity and complexity of cardiac diagnosis, developing a new triage scale with superior quality is essential to reducing the time interval between the referral of patients with cardiac symptoms and initial electrocardiography (ECG) in order to optimize the quality of care. This study aimed to evaluate the effect of the implementation of a cardiac triage scale on the time indices of patients with chest pain referring to emergency departments.

2. Methods

2.1. Design

This clinical trial was conducted with a control group on the patients referring to Farabi Hospital of Mashhad, Iran in 2014.

2.2. Participants and setting

In this study, Sample size was calculated at 30 patients per each group based on a pilot study using the following formula, (ρ_1=0.28, ρ_2=0.0, $Z_{1-\alpha/2}$=2.58, $Z_{1-\beta}$=0.64).

Patients were selected via purposive sampling and randomly divided into two groups of intervention and control. For the random allocation of patients to the study groups, we used the obverse and reverse method. Control subjects were triaged by a triage nurse based on the ESI, while patients in the intervention group were triaged using the cardiac triage scale designed by the researcher.

Inclusion criteria of the study were as follows: 1) referral to emergency department with chest pain complaint; 2) age of 18-65 years; 3) no history of chest trauma and 4) available contact number for follow-up (obtained from the patients or their companions). Patients with inaccurate or incomplete clinical records and those transferred to other clinics were excluded from the study.

2.3. Instruments

Research instruments were forms of triage time indices and demographic characteristics, cardiac triage scale, and ESI triage system. Collected data included age, gender, systolic blood pressure, diastolic blood pressure, pulse rate, respiratory rate, arterial blood oxygen saturation, and date and time of the recording of time indices.

With regard to triage time indices, we recorded the following data for the intervention and control groups: time of entering and leaving the triage room, time of the first visit by a general practitioner, time of checking practitioner orders by a nurse, starting time of the six-hour hospitalization, time of the first visit by a specialist, and time of the initial ECG. Triage time index forms were attached to the clinical records of patients, and all the medical team members were asked to complete the section regarding their function in the due time.

ESI is a common instrument with easy application consisting of five levels of emergency department triage, which categorizes emergency cardiac patients through the simultaneous evaluation of disease severity and treatment. The ESI triage system was first developed by Richard Wuerz and David Eitel in 1999. According to this scale, the triage nurse must classify the patients based on two criteria of disease severity and required care facilities. Disease severity is determined by the assessment of cardiovascular risk factors, warning signs, and vital signs, while the required care facilities are determined by a qualified emergency nurse.[11, 18] This method of triage is regularly used in the emergency department of Farabi Hospital, and all the triage nurses engaged in this unit are familiar with the function and application of the ESI triage system.

In this study, a cardiac triage scale was designed based on valid resources[19-21] by the researcher and specialists of cardiology, emergency medicine, and nursing, and the validity of this scale was evaluated as well. This scale consisted of four stages; in the first stage, the vital signs and arterial blood oxygen saturation of the patient were controlled. If the vital signs accorded with the specified limits presented in form A, the patient would be assigned to triage level one. By this method, patients with critical conditions waited for a shorter time to be visited by a physician and were immediately transferred to the resuscitation room. In the second stage of the triage scale in this study, high-risk patients received clinical evaluation. If these patients were classified as high-risk based on the predetermined criteria due to the presence of specific symptoms in their medical records, the third stage of triage would be carried out.

At this stage, ECG was performed on the patients and in case of ST-segment elevation, left bundle branch block or arrhythmia, the patient would be classified as triage level one. However, in the absence of electrocardiographic criteria, the patient was considered as triage level two. If the patient did not meet the criteria of the second stage, he/she would enter the fourth stage of decision-making. If the patient met the criteria of the fourth stage, he/she would be assigned to triage level three; otherwise, the patient would be classified as triage level four (Figure 1).

Categorization of patients using the cardiac triage system in this study was similar to the classification of the ESI triage system. In the ESI, patients with the highest acuity are assigned to triage level one, and those with the lowest acuity are classified as triage level five. However, due to the exigency of care provision for cardiac patients, level five was not defined in our cardiac triage system.

In this study, consistent instruments were used to measure the vital signs of emergency cardiac patients. All the devices, including the pressure gauge (NFOR), pulse oximeter (Nellcor), and SANE-IE ECG machine (made in China), were investigated in terms of equivalent form reliability, and their correlation-coefficient with similar instruments was confirmed as well.

2.4. Data Collection

In the intervention group, upon the referral of the patients to the triage room, they were inquired by the researcher regarding their major complaint, and the triage process initiated after providing a focused, concise history of the patients. In addition, vital signs and demographic data of the patients in the intervention group were recorded. In case of suspected acute coronary syndrome (irritating pain for more than 20 minutes or occurring more than twice within the past 24 hours), ECG was performed on the patients in the triage room. Afterwards, the triage level of the patients was determined according to the cardiac triage criteria based on patient conditions, clinical complaints, and electrocardiographic changes. In the next stage, patients were transferred to a suitable place (e.g., emergency ward one or two, blue or purple medical room), and transfer times were recorded in triage time index forms.

In Farabi Hospital of Mashhad, emergency ward one is responsible for receiving patients with triage level one and performing cardiopulmonary resuscitation, while emergency ward two attends to patients with triage level two providing temporary six-hour hospitalization.

In this study, cardiac patients with triage levels three, four, and five were visited in the blue medical room, purple medical room, and clinic, respectively. For the accurate implementation of the five-level ESI triage system, sampling was carried out in the clinic of Farabi Hospital considering the adequate equipment and segregation of triage rooms based on different levels in this healthcare center.

In the control group, triage was performed by a triage nurse. Similar to the intervention group, complaints of these patients were investigated, and vital signs were measured and recorded as well. Following that, patients were classified into different levels based on the common ESI triage algorithm (Figure 2).

2.4. Ethical considerations

Required permits were obtained from the authorities of Mashhad University of Medical Sciences and the selected hospital, and study protocol was approved by the Ethics Committee of this university.

2.5. Statistical analysis

Data analysis was performed in SPSS version 21 using descriptive statistics (mean and standard deviation). In addition, Chi-square test was used to compare gender, and Mann-Whitney U test was applied to compare systolic blood pressure, diastolic blood pressure, heart rate, respiratory rate, arterial blood oxygen saturation, age, and mean of triage time indices between the intervention and control group

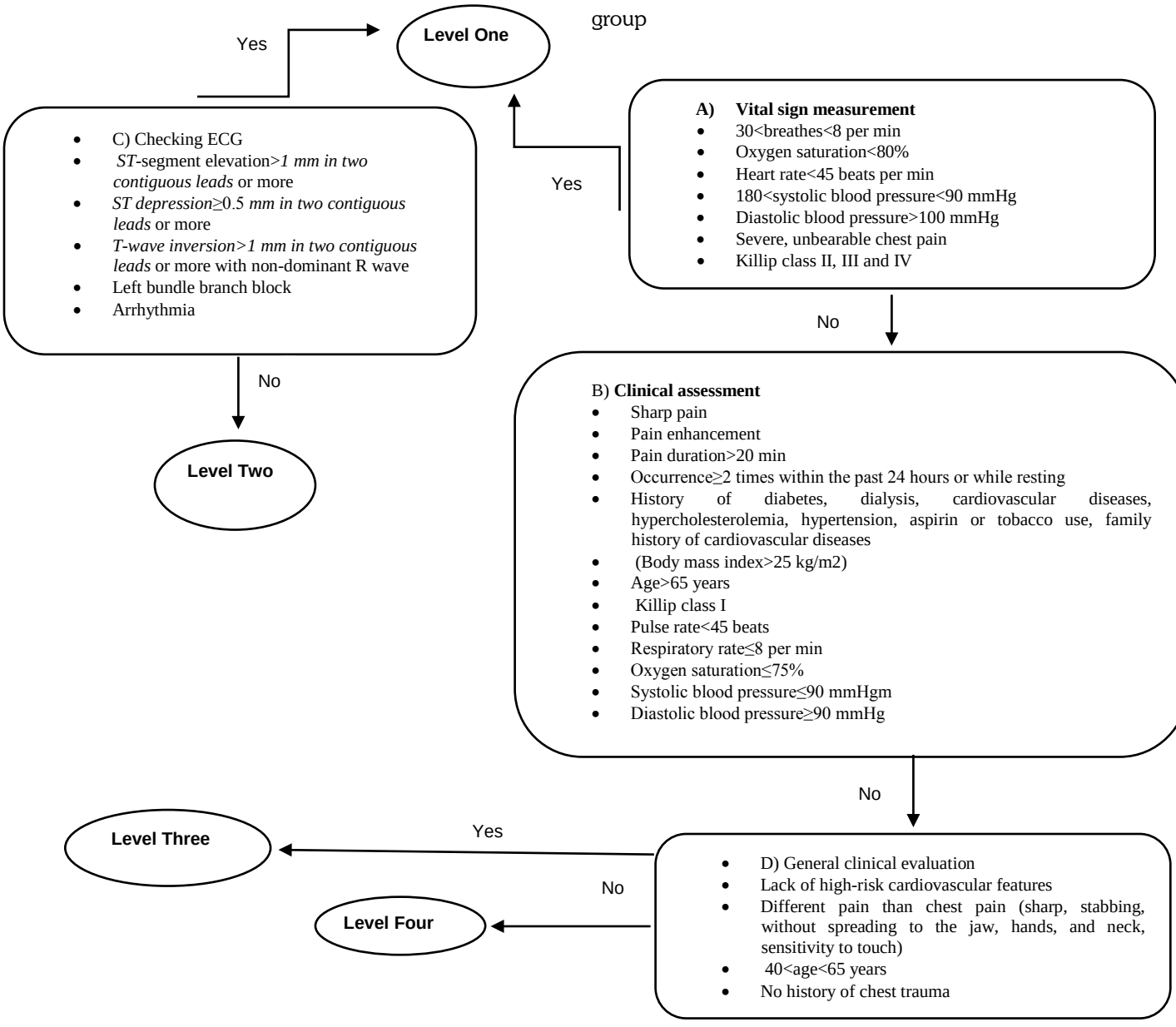

Figure 1. Process of patient triage in intervention group (cardiac triage)

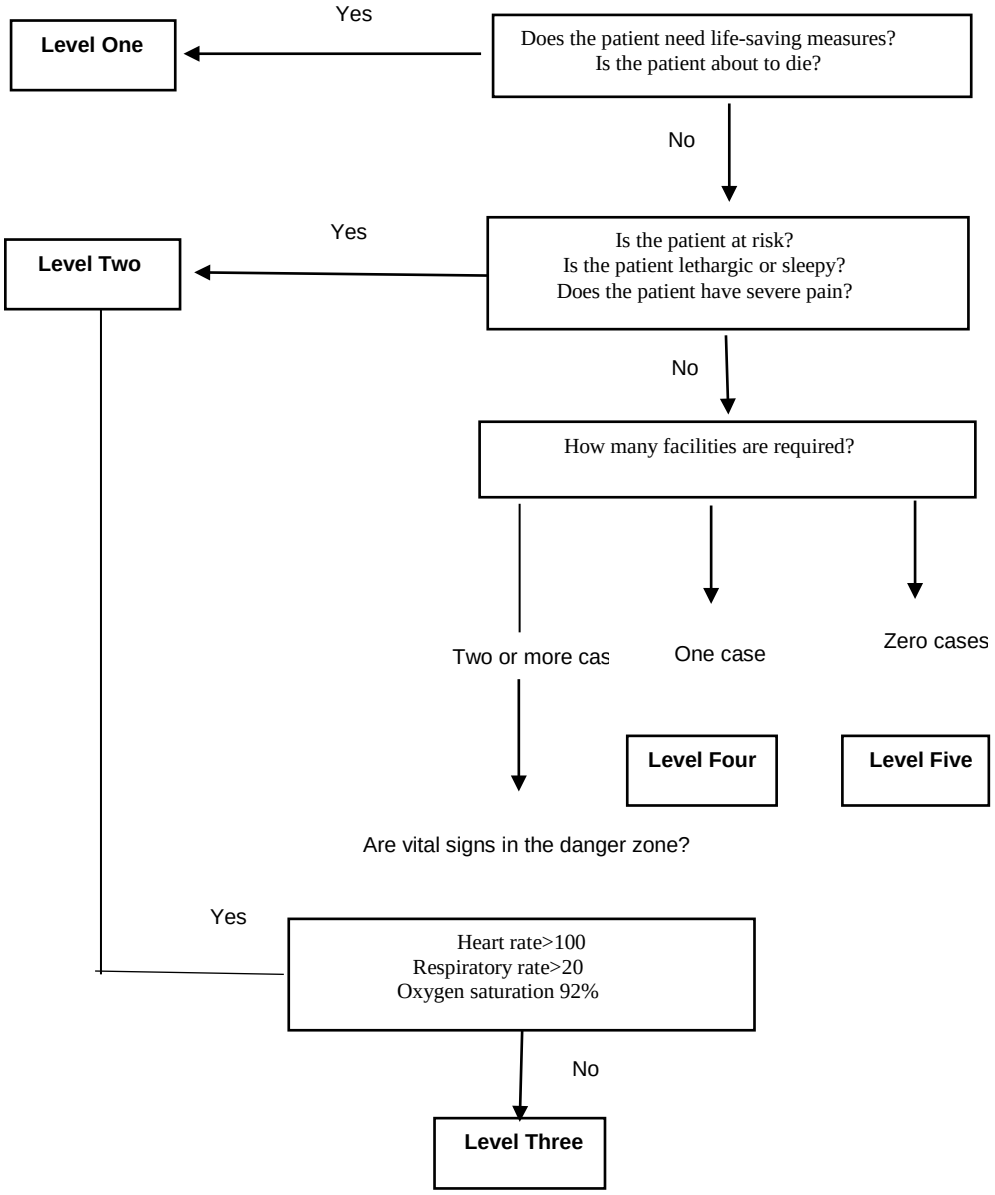

Figure 2. Process of patient triage in control group (ESI triage system)

Level one: patients requiring critical care and life-saving measures.
Level two: patients with lower priority compared to level-one patients (not able to wait).
Level three: patients requiring more than one diagnostic facility.
Level four: patients requiring only one diagnostic facility.
Level five: patients not requiring any facilities.

3. Results

Demographic characteristics of the participants are presented in Table 1. According to the information in this table, there were no significant differences between the demographic variables of the two groups.

Although the length of stay in the triage room was slightly higher in patients of the intervention group compared to the control group, our findings indicated that the starting time of the six-hour hospitalization ($P<0.001$), time of the first visit by a specialist ($P<0.001$), and time of the initial ECG ($P<0.001$) were significantly lower in the intervention group compared to the control group (Table 2).

Table 1. Demographic characteristics of patients

Variables	Group	Intervention	Control	p
		N (%)	N (%)	
Sex	Male	18 (60)	16(53.3)	**0.60
	Female	14(46.7)	12 (40)	
Systolic blood pressure,	M±SD	143.0±22.0	146.0± 21.75	**0.75
Systolic blood pressure	M±SD	85.0±10.42	86.67±7.58	**0.63
Pulse	M±SD	79.93± 12.11	79.90± 11.47	**0.91
respiration	M±SD	14.57±2.76	14.80 ±2.02	**0.63
Arterial blood oxygen saturation	M±SD	91.70 ±3.04	91.73±3.38	**0.84
Age	M±SD	48.30± 9.11	46.30±	**0.62

* Chi-square ** Mann-whitney test

Table 2. Comparison of mean of time indices in intervention and control group

time indicators (Minuets)	intervention	control	*p
	M±SD	M±SD	
Duration of the entry and exit of the room triage	4.0 ± 0.00	2.0 ± 0.01	6.32
Duration of the first visit to general practitioner	16.0 ± 0.04	16.0 ±0.04	0.120
Physician advise	28.0±0.04	32.0±0.11	0.055
Physician check-up time by emergency nurse	27.04 ± 0.04	37.0± 0.11	<0.001
Duration of the first visit to specialist	49.0 ± 0.09	73.0 ±0.26	<0.001
Duration of the first electrocardiogram	7.0±22.0	21.0 ± 10.0	<0.001

* Mann-whitney test

4. Discussion

According to the results of the present study, cardiac patients who were triaged using the designed cardiac triage scale were evaluated and received medical care within a shorter time compared to the patients who were triaged using the ESI system. Therefore, given the importance of implementing urgent and appropriate care for cardiac patients, an accurate, specific protocol must be followed in case of patients with chest pain referring to emergency departments.

In a study, Widgren et al. (2011) claimed that use of appropriate triage in emergency departments could lead to the prompt and accurate evaluation of patients within a shorter time. Considering the demanding nature of emergency care, this method could eliminate unnecessary healthcare measures and provide emergency patients with effective care immediately after referral. Statistics are suggestive of a significant difference in the implementation of triage systems by trained personnel compared to untrained counterparts,[22] which is in line with the results of the current study. In our study, nurses of the control group were not specialized triage nurses and had rotational shifts, and each clinical shift had a different triage nurse. On the other hand, triage was performed by a trained, qualified triage nurse in the intervention group. Although the method of triage employed in the present research differed from the study by Widgren et al., assessment of the vital signs of patients upon referral to the emergency department was emphasized in both these scales, which could explain the congruity of the findings.

In a review study, Ebadi et al. (2014) reported that the majority of patients with myocardial infarction received necessary medical care after more than three hours since the onset of cardiac symptoms.[23] This finding, which is consistent with the results of the present study, highlights the paramount importance of implementing cardiac triage as it depicts the low efficacy of common triage systems for emergency cardiac patients.

In another research, Dehghani et al. (2012) investigated patient waiting time for receiving medical, nursing and paraclinical services in the emergency department of Shahid Sadoughi Hospital of Yazd, Iran. Using a triage form, the researchers determined the average time of patient examination by a general practitioner, implementing primary clinical measurements, consultation, and ECG to be 3, 6, 19 and 19 minutes, respectively. This finding is

inconsistent with the results of the current study,[24] and the difference in this regard could be due to the variations in study populations.

In a retrospective study, Atzema et al. (2010) reported that the average time interval from referral to the hospital until the initial ECG was 12 minutes. Furthermore, the researchers denoted the importance of reconsidering ESI triage system for cardiac patients. Unlike the current research, Atzema et al. did not design a specific triage system; nevertheless, they emphasized the significance of revising the ESI triage system.[20]

In another study in this regard, Ferlini et al. (2016) noted the necessity of performing ECG in the triage of patients with suspected cardiac disorders. Correspondingly, it was stated that hospitals with a special site to carry out ECG in emergency departments had significantly faster and more accurate triage processes. This finding is in congruence with the results of the current study.[25] In their research, Jabbary et al. (2011) evaluated the amount of time wasted before receiving diagnostic and therapeutic services in cardiovascular patients. According to the findings, patient waiting time from obtaining physician prescription until performing the initial ECG was 55 minutes, while the time interval between emergency department referral and the final visitation by a physician was 19.5 minutes. Despite the lack of a standard triage scale, results of the mentioned study are consistent with our findings in the control group, which highlight the importance of using specific scales in the triage process of patients with cardiovascular diseases.[26]

In this regard, Arslanian-Engoren et al. (2010) conducted a study aiming to improve decision-making and minimize the length of accurate triage process for cardiac patients. To do so, emergency nurses received training, and the results indicated that training of emergency nurses on the triage of cardiac patients had a significant effect on accurate decision-making within the shortest time.[6] This is in line with the findings of the current study. It is also noteworthy that in the present study, triage of the patients was performed by the researcher in order to ensure the proper implementation of triage and reduce the possibility of errors.

The main limitation of the current research was that the standard intervention in the control group was performed by a nurse, while the main intervention was implemented by the researcher, which might have affected the final results.

5. Conclusion

According to the results of this study, implementation of a cardiac triage scale in emergency departments positively affects triage time indices in patients with chest pain. Implementation of a specialized triage scale is crucial in the emergency unit of every hospital, especially in case of patients with severe diseases (e.g., myocardial infarction), in which shortening the waiting time of patients to receive medical care and treatment is of paramount importance. Therefore, it is recommended that specific triage scales be developed and implemented for emergency cardiovascular patients. Furthermore, it is suggested that future studies in this regard train emergency department nurses on this protocol, so that they are able to examine triage time indices during the implementation of triage.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

Azam Fazel-Asgharpour: monitoring study procedures, participation in statistical analysis and critical revision of the manuscript. Ameneh Barfi-dokht: implementation of research procedures, data collection, participation in the critical revision of manuscript. Amir Hossein Mirhaghi: designing the study protocol, monitoring study procedures, participation in the critical revision of manuscript. Mohammad Taghi Shakeri: participation in research and data analysis, participation in the critical revision of manuscript. Toktam Kianian: participation in the critical revision of manuscript.

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References

1. Hoseinian A, Pourfarzi F, Sepahvand N, Habibzadeh S, Babapour B, Doostkami H, et al. The study of interval between onset of the clinical symptoms and streptokinase receiving in patients with acute myocardial infarction. Journal of Ardabil University of Medical Sciences 2012; 12(1): 16-24. [Persian]
2. HU MG. Economic and social commission for asia and.the.pacific.2012..Availabla.from:.http://www.unescap.org/resources/economic-and-social-survey-asia-and-pacific-2012

3. Rezaey K, Kohestany H, Baghcheghy N, Yazdankhah-Fard M. Evaluation of the time interval between the onset of symptoms to hospitalization in acute myocardial infarction cases admitted, in bushehr port in 2009. Journal of Arak University of Medical Sciences 2009; 11(4): 67-75. [Persian]
4. Bolvardi E, Feizdisfani H, Kamandi M. The effect of ESI teriage, in improving the time of fibrinolytic therapy in patients with acute ST-elevation MI medical. Journal of Mashhad University of Medical Sciences 2014; 57(2): 495-504. [Persian]
5. Husted E. Principles of triage during a mass casualty incident: mass, start, id-me, rpm. Ohio responds: Availabe from: http: //www. ohioresponds.gov. 2014 [cited 2011 15 April].
6. Arslanian-Engoren C, Hagerty B, Eagle KA. Evaluation of the ACT intervention to improve nurses' cardiac triage decisions. Western Journal of Nursing Research 2010; 32(6): 713-29.
7. Bolvardi E, Feiz DH, Kamandi M. The effect of ESI terriage, in improving the time of fibrinolytic therapy in patients with acute ST-elevation MI. Medical Journal of Mashhad University of Medical Sciences 2014; 57(2): 495-504
8. Fernández JB, Ezquerra EA, Genover XB, O.Callaghan AC, Gárriz II, Nácher JJJ, et al. Chest pain units. organization and protocol for the diagnosis of acute coronary syndromes. Revista Española de Cardiología 2002; 55(2): 143-54.
9. Afrasiabifar A, Hassani P, Fallahi-Khoshknab M, Yaghmaei F. Decision making process of seeking medical help among myocardial infarction patients at the onset of symptoms. Quarterly Iranian Journal of Nursing Research 2008; 6(6-7): 85-93. [Persian]
10. Zare-Mehrjardi Y, Hoboubati M, Safaee-Nik F. Improvement of waiting time for patients referring to emergency room using discrete event simulation. Journal of Shahid Sadoughi University of Medical Sciences 2011; 19(3): 302-12. [Persian]
11. Gilboy N, Tanabe T, Travers D, Rosenau AM. Emergency severity index (ESI): A triage tool for emergency department. Rockville, MD: agency for healthcare research and quality retrieved. Available from.http://www.ahrq.gov/professionals/systems/hospital/si/esi 1 html. 2011.
12. Wiebe RA, Rosen LM. Triage in the emergency department. Emergency Medicine Clinics of North America 1991; 9(3): 491-505.
13. Vora N, Tung CE, Mynash M, Tai W, Garcia M, Kemp S, et al. Magnetic resonance imaging based transient ischemic attack triage in the emergency department is feasible and safe. Stroke 2013; 44(Suppl 1): 133.
14. Mélot C. To score or not to score during triage in the emergency department? Intensive Care Medicine 2015; 41(6): 1135-7.
15. Sánchez M, López B, Bragulat E, Gómez-Angelats E, Jiménez S, Ortega M, et al. Triage flowchart to rule out acute coronary syndrome. The American Journal of Emergency Medicine 2007; 25(8): 865-72.
16. Mirhaghi AH, Roudbari M. A survey on knowledge level of the nurses about hospital triage. Quarterly Iranian Journal of Critical Care Nursing 2011; 3(4): 165 -70. [Persian]
17. Kamrani F, Ghaemipour F, Nikravan M, Majd HA. Prevalence of miss triage and outcomes under triage of patients in emergency department. Quarterly Journal of Health Promotion Management 2013; 2(3): 17-23. [Persian]
18. Beveridge R, Clarke B, Janes L, Savage N, Thompson J, Dodd G, et al. Implementation guidelines for the Canadian emergency department triage & acuity scale (CTAS).1998..Available.from:.http://caep.ca/sites/caep.ca/files/ caep/files/ctased16.
19. Osborne AD, Ali K, Lowery-North D, Capes J, Keadey M, Franks N, et al. Ability of triage decision rules for rapid electrocardiogram to identify patients with suspected ST-elevation myocardial infarction. Critical Pathways in Cardiology 2012; 11(4): 211-3.
20. Atzema CL, Austin PC, Tu JV, Schull MJ. Emergency department triage of acute myocardial infarction patients and the effect on outcomes. Annals of Emergency Medicine 2009; 53(6): 736-45.
21. Graff L, Palmer AC, LaMonica P, Wolf S. Triage of patients for a rapid (5-minute) electrocardiogram: a rule based on presenting chief complaints. Annals of Emergency Medicine 2000; 36(6): 554-60.
22. Widgren BR, Jourak M. Medical emergency triage and treatment system (metts): a new protocol in primary triage and secondary priority decision in emergency medicine. The Journal of Emergency Medicine 2011; 40(6): 623-8.
23. Ebadi A, Sheikhi M, Rahmani H. The importance of cardiac triage for patients with cardiovascular disease. Advances in Natural and Applied Sciences 2014; 8(15): 42-6.
24. Dehghani-Ahmadabad A. Evaluation of patients waiting times for medical services. The First Congress on Clinical Governance and Continuous Quality Impovement 2012. [Persian]
25. Ferlini M, De Ferrari G, Moroni G, Roversi P, Potenza A, Leonardi S, et al. Strategies for reducing door to balloon time in patients with acute myocardial infarction undergoing primary percutaneous coronary intervention: the Pavia experience. Giornale Italiano di Cardiologia 2016; 17(1): 51-7.
26. Jabbari A, Jafarian M, Khorasani E, Ghaffari M, Majlesi M. Emergency department waiting time at Alzahra hospital. Health Information Management 2011; 8(4): 511. [Persian]

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