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ORIGINAL ARTICLE

Evaluation of the Consequences and Costs of the Anglo-American System in the Pre-Hospital Emergency Department of Yazd in 2018

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A B S T R A C T

Background: One of the most important tasks of health care managers is allocateing resources, controling them and ensuring their effective use when available. This study examines the consequences and costs of emergency services in Yazd in 2018.

Methods: This was a descriptive-analytical study performed on patients of 11 centers in Yazd in 2018. The population of the city was approximately 750,000 in 2018 (1). Direct and indirect costs were extracted, and the consequences and costs of Yazd emergency in 2018 were calculated in riyal and Dollars.

Results: This study showed that in 2018, out of 173154 contacts, 37988 cases led to the dispatch of an ambulance, and the response rate was 18 %. The rate of hospitalization was 52 %. The average time of dispatch in Yazd pre-hospital emergency department was (10:48) in 2018. Of the 59 high-risk patients who were transported to Yazd's pre-hospital emergency in 2018, 5 patients had successful cardiopulmonary resuscitation(discharge from the hospital). In other words, effectiveness and saving people from death was 8.4 %. Depreciation costs in the pre-hospital emergency department of Yazd in 2018 amounted to 65,061 Dollars (9,759,264,923 Rial). The cost of personnel salaries and benefits was 39669829 Dollars (59504743663 Rial). This amount was about 40 % of the total cost of the year for pre-hospital emergency in Yazd city. The average cost of each mission-dispatch was 25 Dollars (3775967 Rial).

Conclusion: This study examines the consequences and costs of per hospital emergency department in Yazd in 2018. The high number of unnecessary calls to Yazd emergency department calls for the need to raise public awareness. Moreover, the lack of need to transfer half of these people to hospital requires training and retraining of telephone triage nurses.

Key words: Ambulance, Pre-hospital, Medical emergencies, Anglo-American , Cost

Introduction

The greatest role considered for pre-hospital emergencies at the beginning of its existence was transporting the people wounded and killed in wars. Until World War II, it was not organized and coherent in structure (2). Nowadays, by organizing and writing a description of pre-hospital emergency duties, the necessary measures to be taken have become more specific, and the duties are clearer and more precise than before (3). One of the most important tasks is the management of this department in health system, with regard to the allocation of resources, and efficiency (4, 5). The Emergency Medical Services System (EMS) is an ongoing care system that which begins with initial contact ,and is accompanied by patient care and

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transfer of patients to an appropriate medical facility. It also covers mass casualties and injury prevention (2, 6). Pre-hospital emergency, which is responsible for the rapid and comprehensive relief and treatment of all emergency patients injured in accidents, is one of the essential and invincible pillars of public hospitals (7, 8). An ambulance is a vehicle equipped with medical equipment that transports patients to medical centers (9). Emergency services can significantly reduce the mortality of patients (10). The first recorded use of the ambulance dates back to a thousand years before Christ, which was used in wars (11). Iran Emergency Medical Center was established in 1975. The pre-hospital emergency provides effective, coordinated and timely health care and safety services to victims of accidents or illnesses using special personnel and facilities. In a study by Stiell et al. (11-13), the survival rate for out-of-hospital cardiac arrest was 2.5 %, This showed an improvement of 5.2 % after the provision of defibrillators, which was US $ 2,400 per person per year, had economic efficiency (14).

Emergency services around the world are divided into two main models: The Franco-German system, in which pre-hospital care is provided by physicians, and the Anglo-American system, in which pre-hospital care is provided by trained technicians at the basic, intermediate, and advanced levels. In both models, there is an attempt to use modern techniques, tools and technologies to reduce medical errors and increase the quality of pre-hospital emergency services (15-22). Most systems around the world today have a variety of combinations of both models (3, 15, 17). Franco-German's system is based on the philosophy of "Stay and Stabilization". The philosophy of this model is to transfer hospital to patient' s bed (3, 12, 16). In this method, the work is usually done by physicians with extensive expertise and highly advanced technology.

In this model, more than other methods of patient transfer, ambulances and other kinds of equipment such as helicopters and coastal ambulances are used. This model usually includes a set of extensive healthcare systems and is widely implemented in Europe, where the team is led by emergency medicine. Therefore, in Europe, pre-hospital emergency care is almost always provided by an emergency physician (10, 17, 23-30).

Emergency physicians working in this area, have the authority to judge patients in complex clinical and medical settings at home or on the scene . In doing so, many clients were treated on-site, and were not transported to hospitals.

Countries such as Germany, French, Greece, Malta and Austria have fully developed the Franco–German system (3, 12, 13, 16, 18, 27). In contrast to the Franco- German system is the Angelo-American system, which is based on the philosophy of "Picking and Taking". The goal of this system is to quickly transport patients to the hospital to reduce pre-hospital interventions.

The system is usually connected to public safety services such as police or fire departments, instead of health systems and trained emergency technicians managing the pre-hospital emergency system. This system depends on ground ambulances. Almost all patients in the Angelo-American model are transferred to the emergency department of hospitals for emergency care.

Countries useing this delivery model include the United States, Canada, New Zealand, Oman and Australia (3, 12, 13, 31).

In a study by Patterson, P.D, the total emergency costs were calculated. The average annual turnover was 10.7 % (32). Considering that the Anglo-American method is being implemented in pre-hospital emergencies in Iran and there is no documentation on the consequences and costs of this method, we examined the consequences and costs of this method in order to provide better this way so that the cost is more effective, we have provided solutions and these solutions are available to policymakers in this field.

Materials and Methods

1) This was a descriptive-analytical study on patients in Yazd in 2018. Pre-hospital emergency

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services were performed using the Angelo-American system; Yazd has 11 emergency stations and the same number of active ambulances. The population included approximately 750,000 people. This study consists of 3 phases. In the first phase, articles in domestic and foreign journals, and published articles, dissertations, and conferences in the database of review studies were studied. Then, follow-up groups of the Anglo-American system in the pre-hospital emergency department were identified, and a checklist of the desired outcomes for data collection was prepared.

After conducting a review study and using the searched articles, the cost groups related to the Angelo-American system was identified according to the objectives of the study. After that, a checklist for the cost groups was prepared.

Accordingly, direct and indirect costs were extracted. In the third phase, using the checklist of cost groups and outcomes prepared in the previous phases, data of the consequence groups were collected by referring to the patients' files, who referred to Asayar emergency system. Then, the researchers went to the accounting sector of Yazd Emergency Medical Center, and then analyzed the data with EXCEL and $SPSS_{16}$ software.

Regarding the validity, first, for face validity , the checklist was provided to 10 experts and professors to insert corrective comments. For sampling in the present study with a variance of (1.2) (taken from previous studies) and error rate of 5 % the sample size of 2000 patients who used the Yazd pre-hospital emergency in 2018, we considered that to collect data on the consequences of We referred to their case file. Yazd's emergency expenses were calculated in Rial in 2018, and total expenses were converted into Dollar. This study by obtaining the code of ethics by (IR.SSU.SPH.REC.1398.133) Registered.

Results

In 2018, out of a total of 173154 contacts with to Yazd medical emergency center, 37988 calls led to the dispatch of an ambulance and the response rate was 18 %. Also, the rate of dispatch, 52 % was and the average time of dispatch in Yazd emergency department in 2018 (10:48). The number and percentage of successful resuscitation regarding high-risk people are among the indicators of pre-hospital emergency. According to the data, 59 high-risk people were registered, from whom 5 people (8.4 %) had successful resuscitation (discharge from the hospital).

Costs were calculated separately or in combination, based on the checklist and framework obtained from previous studies (33). 150,000$ was considered to calculate the costs.

One of the main expenses for emergency is the cost of staff salaries and benefits, which for Yazd emergency in 2018 was 59504743663 Rial (396698.29 Dollars). This was about 40 % of the total cost of the year. The average cost of each dispatch was 3775967 Rial, or in other words, the cost of each dispatch was $ 25.

Expenses of depreciation and wear regarding equipment and facilities used in the pre-hospital emergency department of Yazd was approximately 7 %, which in 2018 amounted to 9,759,264,923 Rial or 65,061 Dollars.

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Table 1. Total expenses of Yazd emergency department in 2018

Total expenses of Yazd emergency in 2018	Cost in Rial	Cost in Dollars
Cost of employees compensation service	59504743663	39669.82
Cost of using goods and services	56717720184	378118.13
Financial costs and rent	121746667	811.64
Social welfare costs	11382761861	75885.07
Other expenses (fines, insurance, compensation service, years and employees leave)	5955220278	39701.46
Depreciation fee (indirect)	9759264923	65061.76
Total	143441457576	599274.88

Table 2. Indirect costs in Yazd pre-hospital emergency in 2018 (Rial)

Depreciation cost of assets	Amount
Depreciation cost of innovations	59675000
Building depreciation cost	2015520948
Facility depreciation cost	90193835
Depreciation of machinery and equipment	937562266
Depreciation of technical tools and equipment	807606
Depreciation cost of vehicles	5112873259
Cost of furniture depreciation and appointments	1527560342
Depreciation cost of other assets	15071667
Total depreciation cost	9759264923

Discussion

By reviewing patients' files in Yazd Emergency department, data from at least 51 patients were recorded. This is more in line with the Angelo-American system and can provide more accurate and comprehensive information than the Franco-German system. The research receives 28 information elements (34).

Byrne et al. (35) examined the relationship between response time and mortality rate in vehicle accidents. They found that the effect of time on mortality rate was significant (35).

In the study by Altintaş et al. (36), the average response time was 9 minutes (36). However, in Yazd emergency department, it was 7:59. The average time obtained in this study was more than 59 seconds for pre -hospital emergencies compared to the prioritization of effective components of dr.bahadori.

In another study (37) regarding Shiraz's emergency room, 49.9 % of the calls were answered between 8 to 10 minutes, which is more than the standard time (37). Bahadori et al. (38) concluded that the required time to reach the emergency location in urban areas of the country, except Tehran, was 7 minutes and in suburban areas it was 14 minutes. The ambulance per 100,000 population was 3.1, which in this study was less than 2 for the city of Yazd (38). Nichol et al. (39) showed that a 1-minute decrease in the average response time results in an absolute increase in survival rate between 0.4 % to 0.7 % (39).

the average time of dispatch(10:48), which is the same as the time spent to take the patient to a suitable medical center, was also in the pre-hospital emergency department of Yazd in 2018. Peralta LMP examined the Mexico City Emergency Department. They found that the minimum time was 6:7 minutes, and the maximum time was 61 minutes. This could cover weaknesses and give the researchers incorrect information (40).

Dadashzadeh et al. (41) found that the averagetime of activation, response, and presence on the scene and transfer of patients to the hospital were 2.3, 10.0, 8.1 and 9.1, respectively (41).

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Although the emergency response time was used to measure performance in the world, it seems that the patient recovery index should be considered for emergency performance (42).

Studies have shown that the rate of survival and discharge from the hospital increases threefold with the presence of a physician (43).

In the present study, based on the Anglo-American system, no doctor is sent to the patient's bedside in other parts of the world. In order to estimate the survival of high-risk patients in this study, 59 patients at the red triage level in 2018 were selected, 5 of whom had successful resuscitation (discharge from the hospital). These data showed that, in the pre-hospital emergency department of Yazd city based on the Anglo-American system, the effectiveness rate was 8.4 %.

In the study by Stiell IG et al. (14),the survival rate for out-of-hospital cardiac arrest was 2.5 %, which showed a 5.2 % improvement after the provision of a defibrillation set (14).

In Amsterdam, Joey Depp et al. (44) revealed that 40 % of the annual calls (165,000) received at the dispatch center were rejected under national protocols, and 30 % of the patients were treated on-site; therefore, there was no need for them to be transferred by an ambulance to a medical center or hospital (44).

82 % of the calls (115 calls) did not require the dispatch of an ambulance. Moreover, 48 % of the dispatches did not lead to a transfer to hospital. The frameworks specified in previous studies for costs were used.

A study published by Lerner et al. (33) developed a general framework for measuring emergency components (33).

Another important point obtained from both similar articles and the findings of this study is that the cost of labour for society is more than the cost of maintaining and establishing a unit.

In the study by Ebrahimi et al. (45), the average cost of each dispatch was 2114337 ± 217786 Rial, 51.7 % of which (1660129 ± 1578445 Rial) related to staff salaries, 24.1 % (406824 ± 375083 Rial) related to the current expenses of each base, 02.2 % (42761 ± 42822 Rial) concerned medical supplies, and 23.0 % (4476 ± 4796 Rial) related to depreciation in each pre-hospital emergency dispatch (45).

It also seems that the most cost-effective approach to field triage entirely related to triage characteristics and adherence to shipping methods of triage-based emergency medical services (46).

In Patterson's study, the overall mean weight of annual rate regarding turnover was 10.7 %. The annual turnover rate in different types of emergencies is very different (32). The cost of staff salaries and benefits for Yazd emergency in 2018 was 59504743663 Rial (396698.2 Dollars).

A study by Valenzuela et al. (47), examined cardiac arrest patients for whom the emergency system was established, and the cost was $ 8,886.0 per year of life saved. Outpatient treatment by paramedics was more cost-effective than a transplant of heart, liver, bone marrow, or chemotherapy for acute leukaemia (47).

The use of telehealth in pre-hospital emergency medical services found a potential reduction of 6.7 % in potential non-essential medical visits, and a total reduction of 44 minutes in total ambulance service return times.

The average cost of remote treatment was 167 Dollars, which was statistically 103 Dollars less than the control group, generating 928,000 Dollars in annual cost savings, or 2,468 Dollars in cost savings per face-to-face visit (48). In a study by Lee Michael et al. (49), it was shown that 5 to 10 percent of a country's health expenditures are allocated to pre-hospital emergencies (49).

Conclusion

The high number of calls and lack of the need for an ambulance or even the need for special treatment in nearly 80 % of the cases, which is very different from the standards, necessitates the urgent need to raise public awareness.

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Unnecessity of transfering half of the cases indicates the need for training or retraining of telephone triage nurses. Statistics also show that the presence of a physician in the emergency team reduces the number of deaths and injuries. This requires improvements in the structure of emergency procedures by the Anglo-American method.

The availability of rescue equipment and facilities, such as the automatic defibrillator in crowded centers and public education, can lead to the rescue of more people in the golden tiem. The appropriate arrangement of the centers and the provision of ambulances at the standard level can be useful in reducing the arrival time, and of course saving more and more human beings.

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Conflict of interests

The authors declared no conflict of interests©.

Authors' contributions

Pakdaman M designed research; Nikafshan AR conducted research; Askari R, Dehghan A, and Pahlavanpoor SR analyzed data; and Nikafshan AR wrote the paper. Nikafshan AR had the primary responsibility for final content. Authors read and approved the final manuscript.

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References

1. Isna. *The latest statistics of the population of Yazd province and cities.* 2018. Available from URL: https://www.isna.ir/news. Last access: May 10, 2022.
2. Landman AB, Lee ChH, Sasson C, Van Gelder CM, Curry LA. Prehospital electronic patient care report systems: Early experiences from emergency medical services agency leaders. PLoS One. 2012; 7(3): e32692. doi: 10.1371/journal.pone.0032692.
3. Abuzeyad F, Alqasem L, Al Farras MI, Al Jawder ShS, Al Qasim Gh, Alghanem s. Emergency medicine in the Kingdom of Bahrain. International Journal of Emergency Medicine. 2018; 11(1): 4. doi: 10.1186/s12245-018-0163-1.
4. Moghimi R, Anvari A. An integrated fuzzy MCDM approach and analysis to evaluate the financial performance of Iranian cement companies. The International Journal of Advanced Manufacturing Technology. 2014; 71(1-4): 685-98. doi: 10.1007/s00170-013-5370-6.
5. Kordestani Gh, Bakhtiari M, Biglari V. Ability of combinations of cash flow components to predict financial distress. Business: Theory and practice. 2011; 12(3): 277-85. doi: 10.3846/btp.2011.28.
6. Law J, Vanderploeg J .An emergency medical planning guide for commercial spaceflight events. Aviat Space Environ Med. 2012; 83(9): 890-5. doi: 10.3357/asem.3345.2012.
7. Edlin G, Golanty E. *Health and wellness*. Jones & Bartlett Publishers; 2021.
8. Saberinia A, Aminizadeh M, Valy L, Mahmoudi Maimand F. Report on the experience and performance of emergency medical personnel in 2019. 2012. Available from URL: https://sid.ir/paper/816574/fa. Last access: May 7, 2022. [In Persian]
9. *Definition of the word from the Oxford dictionary.* Available from URL: https://www. oxfordlearnersdictionaries. com/. Last access: July 10, 2022.
10. Zakariah A, Stewart BT, Boateng E, Achena Ch, Tansley G, Mock Ch. The birth and growth of the national ambulance service in Ghana. Prehosp Disaster Med. 2017; 32(1): 83-93. doi: 10.1017/S1049023X16001151.
11. de Anda HH, Moy HP. EMS Ground Transport Safety. Available from URL: https://pubmed.ncbi.nlm. nih.gov/32644397/. Last access: May 15, 2022.
12. Bahrami MA, Maleki A, Ranjbar Ezzatabadi M, Askari R, Ahmadi Tehrani GH. Pre-hospital Emergency Medical Services in developing countries: A case study about EMS response time in Yazd, Iran. Iranian Red

[DOI: 10.18502/jebhpme.v7i1.12354]

Crescent Medical Journal. 2011; 13(10): 735-8.
13. Bahadori MK, Ravangard R. Determining and prioritizing the organizational determinants of Emergency Medical Services (EMS) in Iran. Iranian Red Crescent Medical Journal. 2013; 15(4): 307-11. doi: 10.5812/ircmj.2192.
14. Stiell IG, Wells GA, Field BJ, Spaite DW, Maio VJD, Ward R, et al. Improved out-of-hospital cardiac arrest survival through the inexpensive optimization of an existing defibrillation program: OPALS study phase II. Ontario Prehospital Advanced Life Support. JAMA. 1999; 281(13): 1175-81. doi: 10.1001/jama.281.13.1175.
15. Al-Shaqsi S. Models of international Emergency Medical Service (EMS) systems. Oman Medical Journal. 2010; 25(4): 320-3. doi: 10.5001/omj.2010.92.
16. Al-Shaqsi SZK. EMS in the sultanate of Oman. Resuscitation. 2009; 80(7): 740-2. doi: 10.1016/j.resuscitation.2009.04.011.
17. Williams B. Management of Emergency Demand. Ambulance Services. 2015; 43-50.
18. Dick WF. Anglo-American vs. Franco-German Emergency Medical Services system. Prehosp Disaster Med. 2003; 18(1): 29-35. doi: 10.1017/s1049023x00000650.
19. Dib JE, Naderi S, Sheridan IA, Alagappan K. Analysis and applicability of the Dutch EMS system into countries developing EMS systems. The Journal of Emergency Medicine. 2006; 30(1): 111-5. doi: 10.1016/j.jemermed.2005.05.014.
20. Rodigin A. An update on emergency care and emergency medicine in Russia. International journal of emergency medicine. 2015; 8: 42. doi: 10.1186/s12245-015-0092-1.
21. Cottrell EK, O'Brien k, Curry M, Meckler GD, Engle PP, Jui J, et al. Understanding safety in prehospital emergency medical services for children. Prehosp Emerg Care. 2014; 18(3): 350-8. doi: 10.3109/10903127.2013.869640.
22. Hoyt RE, Yoshihashi AK. *Health informatics: Practical guide for healthcare and information technology professionals*. 6nd ed. Science & Medicine: 2014. p. 533.
23. Zia N, Shahzad H, Baqir SM, Shaukat, Sh, Ahmad H, Robinson C, et al. Ambulance use in Pakistan: An analysis of surveillance data from emergency departments in Pakistan. BMC Emergency Medicine. 2015; 15(Suppl 2): S9.
24. Xu H, Xian Y, Woon FP, Bettger JP, Laskowitz DT, Ng YY, et al. Emergency medical services use and its association with acute ischaemic stroke evaluation and treatment in Singapore. Stroke and Vascular Neurology. 2020; 5(2): 121-7. doi: 10.1136/svn-2019-000277.
25. Wilson MH, Habig K, Wright Ch, Hughes A, Davies G, Imray ChHE. Pre-hospital emergency medicine. Lancet. 2015; 386(10012): 2526-34. doi: 10.1016/S0140-6736(15)00985-X.
26. von Vopelius-Feldt J, Powell J, Morris R, Benger J. Prehospital critical care for out-of-hospital cardiac arrest: An observational study examining survival and a stakeholder-focused cost analysis. BMC Emerg Med. 2016; 16(1): 47. doi: 10.1186/s12873-016-0109-y.
27. Timm A, Maegele M, Lefering R, Wendt K, Wyen H. *Pre-hospital rescue times and actions in severe trauma. A comparison between two trauma systems: Germany and the Netherlands.* Injury. 2014; 45(Suppl 3): S43-S52. doi: 10.1016/j.injury.2014.08.017.
28. Shah MN. *The formation of the emergency medical services system.* American Journal of Public Health. 2006; 96(3): 414-23. doi: 10.2105/AJPH.2004.048793.
29. Strobel ChE, Karpinski E, Levy AM, Davison S. A Modified EMS System: Transport Ambulance. 2016.
30. Owusu-Ansah S, Moore B, Shah MI, Gross T, Brown K, Gausche-Hill M, et al. *Pediatric readiness in emergency medical services systems.* Pediatrics. 2020; 145(1): e20193308. doi: 10.1542/peds.2019-3308.
31. Kahn Ch. Commentary: Making a difference in emergency medical services. Annals of Emergency Medicine. 2011; 57(2): 169-71. doi: 10.1016/j.annemergmed.2010.11.010.
32. Patterson PD, Jones ChB, Hubble MW, Carr M, Weaver MD, Engberg J, et al. The longitudinal study of turnover and the cost of turnover in emergency medical services. Prehosp Emerg Care. 2010; 14(2): 209-21. doi: 10.3109/10903120903564514.
33. Lerner EB, Nichol G, Spaite DW, Garrison HG, Maio RF. A comprehensive framework for determining the cost of an emergency medical services system. Ann Emerg Med. 2007; 49(3): 304-13. doi: 10.1016/j.annemergmed.2006.09.019.
34. Moghaddasi H, Rabiei R, Mastaneh Z. Pre-hospital emergency information system in America and

[DOI: 10.18502/jebhpme.v7i1.12354]

England: A review. Payesh. 2014; 13(4): 383-91. [In Persian]
35. Byrne JP, Mann NC, Dai M, Mason SA, Karanicolas P, Rizoli S, et al. Association between emergency medical service response time and motor vehicle crash mortality in the United States. JAMA Surg. 2019; 154(4): 286-93. doi: 10.1001/ jamasurg. 2018.5097.
36. Altintas KH, Bilir N. Ambulance times of Ankara emergency aid and rescue services' ambulance system. European Journal of Emergency Medicine. 2001; 8(1): 43-50. doi: 10.1097/00063110-200103000-00009.
37. Moradian MJ, Peyravi MR, Ettehadi R, Pourmohammadi K. Studying the time of response and results of delay in emergency medical system. Quarterly Scientific Journal of Rescue and Relief. 2013; 5(2): 30-9. [In Persian]
38. Nasiripur AA, Bahadori MK, Tofighiet Sh, Gohari MR. Prehospital emergency performance in Iran View of comprehensive coverage plan. Journal of Critical Care Nursing. 2010; 2(4): 3-4. [In Persian]
39. Nichol G, Detsky AS, Stiell IG, Rourke KO, Wells G, Laupacis A. Effectiveness of emergency medical services for victims of out-of-hospital cardiac arrest: A metaanalysis. Annals of Emergency Medicine. 1996; 27(6): 700-10. doi: 10.1016/s0196-0644(96)70187-7.
40. Peralta LMP. The prehospital emergency care system in Mexico City: A system's performance evaluation. Prehospital and Disaster Medicine. 2006; 21(2): 104-11. doi: 10.1017/s1049023x00003447.
41. Dadashzadeh A, Dehghannejhad J, Shams S, Sadegi H, Hassanzadeh F, Soheili A, et al. Situation of response and transport time in pre-hospital traumatic patients from scene to hospital in Tabriz–Iran. Nursing and Midwifery Journal. 2016; 14(8): 728-37. [In Persian]
42. Al-Shaqsi SZKh. Response time as a sole performance indicator in EMS: Pitfalls and solutions. Open Access Emergency Medicine: OAEM. 2010; 2: 1.
43. Sefrin P, Kuhnigk H. The position of the emergency physician in the emergency medical service. Anasthesiologie, Intensivmedizin, Notfallmedizin, Schmerztherapie: AINS. 2006; 41(1): 2-8. doi: 10.1055/s-2006-924965.
44. Dib J, Naderi S, Sheridan IA, Alagappan K. Analysis and applicability of the Dutch EMS system into countries developing EMS systems. The Journal of Emergency Medicine. 2006; 30(1): 111-5. doi: 10.1016/j.jemermed.2005.05.014.
45. Ebrahimi Pour H, Pourahmadi E, Vafayinezhad R, Badie Aval Sh. Total cost of pre-hospital emergency missions based on the activity-based costing model and its comparison with the cost of private emergency pre-hospital emergency services in Mashhad in 2016. Quarterly Journal of Management Strategies in Health System. 2019; 4(2): 86-96. doi: 10.18502/mshsj.v4i2.1405.
46. Newgard CD, Yang Zh, Nishijima D, McConnell KJ, Trent SA, Holmes JF, et al. Cost-effectiveness of field trauma triage among injured adults served by emergency medical services. Journal of the American College of Surgeons. 2016; 222(6): 1125-37. doi: 10.1016/j.jamcollsurg.2016.02.014.
47. Valenzuela TD, Criss EA, Spaite D, Meislin HW, Wright AL, Clark L. Cost-effectiveness analysis of paramedic emergency medical services in the treatment of prehospital cardiopulmonary arrest. Ann Emerg Med. 1990; 19(12): 1407-11. doi: 10.1016/S0196-0644(05)82609-5.
48. Langabeer JR, Champagne-Langabeer T, Alqusairi D, Kim J, Jackson A, Persse D, et al. Cost-benefit analysis of telehealth in pre-hospital care. J Telemed Telecare. 2017; 23(8): 747-51. doi: 10.1177/ 1357633X16680541.
49. Lee MH, Schuur JD, Zink BJ. *Owning the Cost of Emergency Medicine: Beyond 2 %.* Annals of Emergency Medicine. 2013; 62(5): 498-505. doi: 10.1016/j.annemergmed.2013.03.029.

[DOI: 10.18502/jebhpme.v7i1.12354]