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Systematic Review

Time Indicators in The Pre-Hospital Performance in Iran and Causes of a Delay in Reaching the Scene of Disaster: A mini systematic review

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Abstract

Introduction: Awareness of status of pre-hospital time indicators and possible factors contributing to the delay taken is critical in making decisions. Therefore, this study aimed at conducting a mini review of time indicators in pre-hospital performance in Iran and investigating their possible cause of delays.

Methods: The study data were collected using keywords such as pre-hospital, ED 115, response time, arrival time, time interval, site of the accident in Iran and its English equivalents from Google scholar, PubMed, MagIran, SID databases and Google search engine, manual searching of journals, gray literature and selected references. To search for articles, time limit has not been considered.

Results: Among 346 original articles found, 11 articles were included in the study. The average arrival times of the pre-hospital emergency services to the scene for urban and roads are 8.5±1.2 and 11.9±1.7 minutes, respectively. Dispatching ambulances from non-main areas due to lack of ambulances busy traffic routes, non-standard distribution of emergency sites, bad weather and failure to comply with the priority passing of ambulance by people were the main reasons of the pre-hospital delays.

Conclusion: The results of studies in Iran represent satisfactory performance in the pre-hospital of emergency. Planning for resolving the problem of ambulance dispatching from non-main areas due to lack of ambulances and traffic can be the top priority of the relevant authorities.

Introduction

One of the most important parts of the health system is pre-hospital centers, and emergency cares are critical except in the treatment of critically ill patients [1]. Pre-hospital care, including treatment and care, begins in the patient's bedside and ends in the hospital emergency [2]. Many changes have been made in the pre-hospital care system from its inception in 1960, until now, including in its personnel and equipment [3]. In Iran, the emergency 115 as trustee services for pre-hospital was established in 1976. Since this is area of the confluence with the community and it is the first direct encounter with patients and their families, timely pre-hospital presence is absolutely essential. Fast, efficient and effective care in this section could save the lives of patients in critical stages [4]. Finding high-risk patients as soon as possible and providing medical management required for them are the purposes of pre-hospital care [5]. In occurrence of an incident, if the case is given necessary services in the first 2-8 minutes, 40% of patients can be saved from certain death [6].

One of the evaluation indicators of pre-hospital care noted in previous studies is the response time to emergencies and reaching the stage [7-9]. The time reaching the patient's bedside is the

key factor their survival and reducing the side effects caused by accident [10, 11]. According to world statistics, 5 minutes for an ambulance to reach the accidental patients and less than 8 minutes to heart patients, reduce their mortality and morbidity. Response times in many metropolis centers of Iran have been reported more than the international standards [12, 13].

In Iran, studies of this field report different values for the time parameters of the pre-hospital care. Recognizing the importance of awareness than performance of time indicators in decisions, and considering that the longer response time causes many complications, paying attention to performance of time indicators and the possible factors contributing to the delay taken is vital. Therefore, the present study aimed to conduct a mini review of the performance of time indicators in the pre-hospital in Iran and to investigate its possible delay causes.

Methods

This systematic review and meta-analysis was conducted in accordance with the systematic review approach adopted from the book entitled "A Systematic Review to Support Evidence-Based Medicine" (2017) [14].

The study data were collected by using keywords such as pre-hospital, emergency 115, response time, arrival time, time interval, site of the accident and Iran and its Persian equivalents from Google scholar, PubMed, MagIran and SID databases and Google search engine, manual searching of journals, gray literature and selected references. To search articles, time limit was not considered. Articles were searched in Farsi and English.

The inclusion criteria of the articles were studies investigating the 115 emergency response or causes of delay in reaching site of the accident of the studies in Iran. Exclusion criteria included articles presented on seminars, case reports, and letters to the editor.

First, titles of all articles were reviewed and articles that were not compatible with the study objectives were excluded. Later in, the abstract and full text articles were studied to identify studies that included exclusion criteria and had weak connection with the study objectives. The primary outcome consisted of 346 articles searched. After removal of unrelated articles, duplicated between databases, poor relation with the study objectives were 11 cases in the study (Figure 1). Selected articles were fully investigated, and the information needed by table design (Extraction table), including the author name, year of study, the sample size, temporal index of pre-hospital care, percent of missions in less than 8 minutes, and reasons for the delay, was extracted and summarized.

Two reviewers evaluated the articles reporting quality according to the checklist of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) [15]. Controversial cases were referred to a third author.

Comprehensive Meta-analysis (CMA): Version 2 software was used to estimate and conduct a meta-analysis to estimate average time interval between the emergency call and arrival of an ambulance at the scene. To report the results, forest plot was employed. In the forest plot, the size of each square shows the sample size and the lines on each side of the square show the confidence interval (CI). To measure heterogeneity of studies, Q and I2 indicators were used. I2 index higher than 50% was suggested as indicative of substantial articles heterogeneity.

Results

In this study, we examined the results of 11 articles [1, 16-24]. Table 1 shows the article details.

Time indicators of pre-hospital care

Table 2 presents definitions of different time indicators providing pre-hospital emergency services according to the study of Bilir and Altintas [25].

Among the indicator presented in Table 2, the indicator "Time interval between the emergency call and the arrival of an ambulance at the scene." seems to extremely critical [26]. According to the WHO standard, value of this indicator for urban areas is 8 minutes and 15 minutes for the main road [27]. In 9 articles of 11 studied articles, performance of this indicator was reported for urban areas whose average was estimated 8.5±1.2 [6.8 – 10.8 CI 95%] minutes (Figure 2). In 3 articles, performance of this indicator was reported for the road whose average was estimated 11.9±1.7 [9.3 – 14.5 CI 95%] minutes (Figure 3). In 3 articles, percent of conducted missions was reported less than 8 minutes that were are 2.5, 8.5 and 72.5 percent, respectively.

The causes of delays in the mission

Only 2 of the 11 reviewed articles investigated the causes of delayed missions. Their most important ones can be cited to dispatching ambulances from other areas of the main areas due to lack of ambulances, traffic and crowded routes, non-standard distribution of emergency bases, bad weathers, and failure to comply the emergency passes priority by the people.

Discussion

According to the accepted standards, the most appropriate time to reach prehospital at the scene and disaster relief service for 8 minutes. The results of studies in Iran indicated that the time for the pre-hospital emergency care in 8.5 minutes was very close to the international standard, representing satisfactory performance in the pre-hospital emergency care of Iran.

As mentioned, the average performance of pre-hospital emergency care in Iran is 8.5±1.2 minutes. Average performance of pre-hospital emergency care in the related studies represents the most functional differences, and most of them are not very satisfactory. In one study by Campbell (2007), this amount was 9.8 minutes [28]. In the study of Kleindorfer (2003), it is reported that approximately 93 to 97 percent of the missions were conducted within 10 minutes [29]. Campbell and Gridley (2008) reported this time 8.2 minutes [30], which corresponds to the performance of pre-hospital emergency care in Iran. In this study, 9 articles reported the time indicator "time interval between the emergency call and ambulance arrived at the scene," and 2 articles in Tehran and 1 article in Shiraz reported significant values in these two towns that were very high compared to other cities. The main reason could be the bustle and traffic of these cities and also distance from the location of scene to the

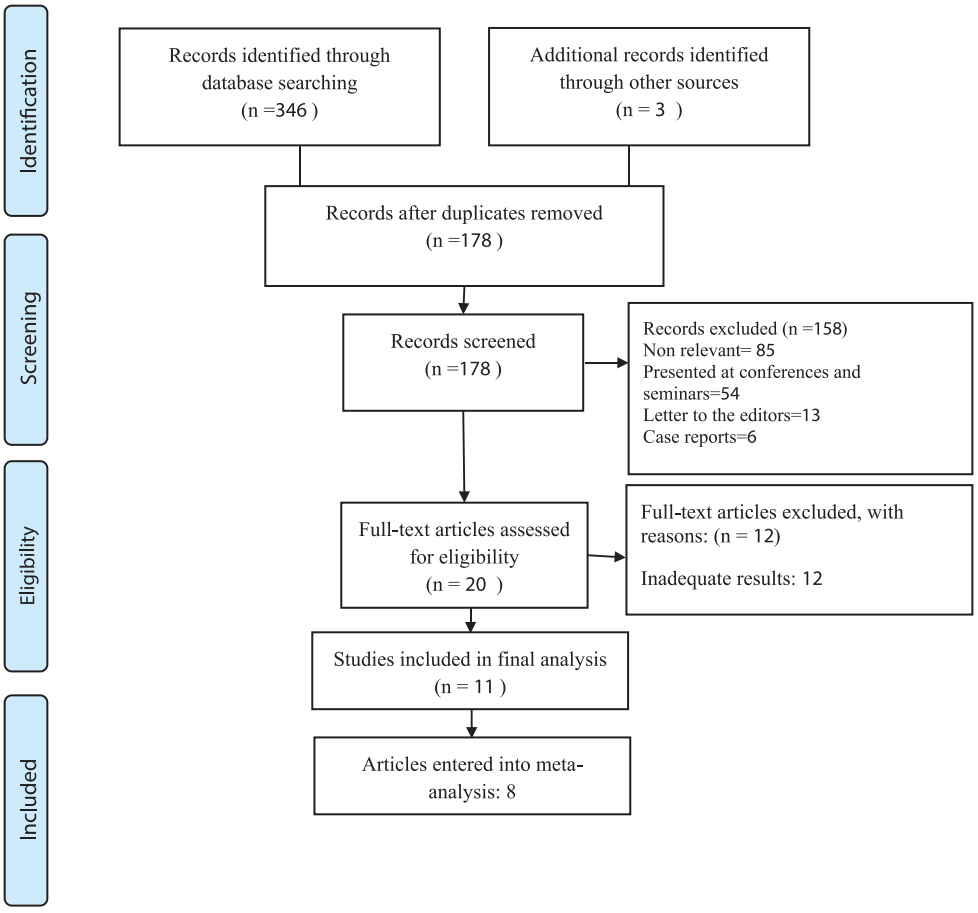

Figure 1. Graph of the process of selection of papers

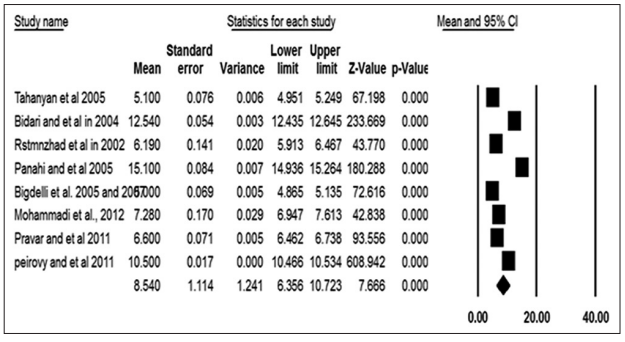

Figure 2. Average time interval between the emergency call and the arrival of an ambulance at the scene in city era estimated based on the random effect

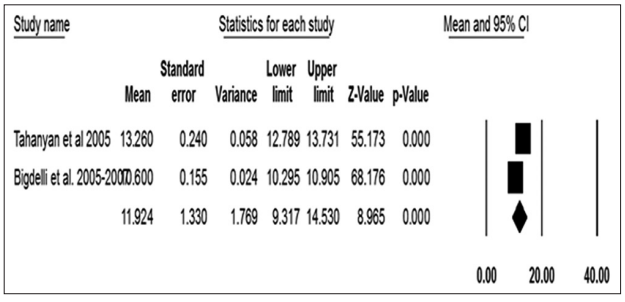

Figure 3. Average time interval between the emergency call and the arrival of an ambulance at the scene in road estimated based on the random effect

emergency pre-hospital sites. Bigdelli et al. [18] also in one study in Urmia pointed to this point. Thus, planning to solve the problems of pre-hospital emergency care in large cities is a top priority.

One of the main reasons for possible delays in pre-hospital emergency missions is ambulance dispatching from areas other than the main ones due to lack of ambulances. Jarrel et al. (2007) in their study regard poor management in distribution of emergency ambulances and bases as one of the main reasons for increasing the performance time of pre-hospital emergency care [31]. Since dispatching the nearest available emergency services to the scene could be highly critical, arriving at the scene must be successful in the work of disaster relief [32]. Strategic planning and coordination needed to replace ambulances and uniform distribution of workload bases emergency due to size of the workload and priority interventions to reduce distances may be indicators of the time performance of pre-hospital emergency treatment.

Another factor is traffic and bustle routes, especially in large cities, which contributes to the increase in the time indicator of the pre-hospital emergencies. The results discussed in this article also suggest that time indicators performance of emergency in Tehran in comparison to other cities is undesirable. The studies by Ayrik Cuneyt (2006) [33], Shabghare (2009) [34] and (Alawi) (2009) [35] also showed that traffic was one of the reasons for the delay in the pre-hospital emergency missions.

Table 1. Details of the articles were reviewed

The author and year	City of study	The sample size	Indicators of time in minutes							Factors affecting in delay
			Time interval between the emergency call and ambulance arrived at the scene	Time interval between emergency calls and dispatch ambulances	Time interval between the arrival of an ambulance at the scene and leaving Site of the accident	Time interval between leaving and arriving ambulance to the emergency department	Time interval between the dispatch of an ambulance on site and to return it into the the site	Total time interval	Percent of fewer than 8 minutes missions	
1. Tahanyan et al. 2005	Golestan	1000	5.1±2.4 City 13.26±7.6 road	-	9.92 Minutes	8.3 Minutes	-			
2. Moradian et al. in 2011	Shiraz	20662	-	-	-	-	-	-	2.5	Dispatch ambulances from other areas of the main areas In the absence of ambulances, Going the wrong address, delay of ambulance giving the wrong address, bad weather, the long path, busy route
3. Assar Roudi 2005	Mashhad	103	-	-	-	-	-	-		Waste of time for non-emergency missions, urban inappropriate texture, violation of ambulance priority by the public, work traffic of some areas and the fatigue caused, Lack of law enforcement relating to the Yield sign of relief vehicle by traffic inappropriate physical location of some of the sites
4. Mehrabian et al. in 2005*	Gilan	17139	5.86 Urban Road 2:26	-	-	-	-	-		
5. Bidari and et al. in 2004	Tehran	500	12.54±1.2			34.37	Announced the base to the hospital: 47.31			
6. Rstmnzhad et al. in 2002	Ardabil	578	6.19±3.4	-	12.3	6		31		
7. Panahi and et al. 2005	Tehran	6787	15.1±6.9	3.8	23.5		-	-	8.5	
8. Bigdelli et al. 2005 and 2007	Urmia	2027	Urban 5±3.1 10.6±7 Road		6.1 Urban 9.2 Road	6.3 Urban 17.1 Road		37.2	72.5	
9. Mohammadi et al., 2012-2013	Kermanshah	500	7.28±3.8	3.81	16.73	12.72				
10. Pravar and et al. 2011-2012	Kashan	1931	6.6±3.1		10.7	13				
11. peirovy and et al. 2011-2012	Shiraz	84084	10.52±5		16.64	19.41		42.33		

* not included in meta-analysis due to not report Standard Deviation (SD)

Table 2. Defines the time indices of the different pre-hospital emergency service

Indicators	Definition
Response time	Time Interval between the emergency call and ambulance arrived at the scene,
(call to dispatch interval) delay time	Time Interval between emergency calls and dispatch ambulances
(Time at the scene) Scene time	Time interval between the arrival of an ambulance at the scene and leaving the scene
Total run time	A total of three time interval Scene Time, Response time, Transport time
Transport time	Time interval between leaving and arriving ambulance to the emergency department
Round trip time	Time interval between the dispatch of an ambulance on site and to return it to the site

This problem can be solved by acquainting the pre-hospital emergency technicians with alternate and proper routes of the city, using satellite systems and GIS, training people to open the way for ambulances, using express lanes and using ambulances motors.

The study limitation is the poor report of results in the included studies such as no mention of study setting (city or road), inadequate report of time indicators, small sample size and no mention of reasons for delays.

Conclusion

The results of studies in Iran showed that the average time to reach the pre-hospital emergency care to the scene in urban areas and roads was 8.5 and 11.9 minutes, respectively, representing satisfactory performance in Iran for pre-hospital emergency care. Dispatching ambulances from other areas of the main areas due to lack of ambulances and bustle routes and traffic was one of the most important reasons for the delay in the arrival of emergency medical services. In this regard, planning to resolve this problem can be of top priority for authorities.

Conflict of interest

None.

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