

## Pilot Design and Set up of Babol Emergency Data Bank (BEDB), North of Iran

Soraya Khafri<sup>1</sup>, Shayan Alijanpour<sup>2,3\*</sup>, Abolghasem Lali<sup>3</sup>, Samaneh Fathi<sup>3</sup>, Mostafa Mostafazadeh-Bora<sup>3,4</sup>, Mohadeseh Salehi<sup>3</sup>, Nafiseh Najafi<sup>3</sup>, Narges Hossein Gholipour<sup>3</sup>, Naghmeh Ramzani<sup>3</sup>, Zeinab Adrang<sup>3</sup>, Reza Ekhtiary<sup>3</sup> and Mehdi Aghagol Abastabar<sup>3</sup>

<sup>1</sup>Assistant Professor of Biostatic, Department of Epidemiology and Biostatistics, Babol University of Medical Sciences, Babol, Iran

<sup>2</sup>MSc Student of Critical Care Nursing, Student Research Committee, Isfahan University of Medical Science, Isfahan, Iran

<sup>3</sup>Education, Research and Planning Unite, Pre-hospital Emergency Organization and Emergency Medical Service Center, Babol University of Medical Sciences, Babol, Iran

<sup>4</sup>MSc of Medical-Surgical Nursing, North Khorasan University of Medical Sciences, Bojnurd, Iran

**\*Corresponding Author:** Shayan Alijanpour, MSc Student of Critical Care Nursing, Education, Research and Planning Unite, Pre-hospital Emergency Organization, Babol University of Medical Sciences, Babol, Iran.

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### Abstract

**Background:** Electronic Health Record is one of key ways for decline expenditure associated health care system. Due to Babol pre-hospital emergency organization did not have any electronic health record, this study was conducted.

**Methods:** This descriptive cross-sectional study on 5,453 missions of Babol pre-hospital emergency, which lead to outpatient treatment or transfer to hospital between 2015 to 2016 was conducted. The data was gathered through designed data sheet by access software. Babol Emergency Data Bank (BEDB) was included demographic data, trauma data, treatment intervention, chief complain and the prehospital time interval. Activation time (AT), Time (rT), Response Time (RT), On-scene time (OST), Transport time (TT), Total Pre Hospital time (TPHT), In hospital time (HT), Return Time (RT), Total Mission Time (TMT) defined. Data was analyzed by SPSS 23. T test, chi square was used and the significance level was set at 0.05.

**Results:** The 5,453 missions that entered in BEDB. Most of patients (42.4%) aged between 18 to 45 years old. Of 11 Babol Emergency code, Distribution the type of mission was 2206 (40.5%) urban vs. 1773 (32.5%) rural. Most chief complaint 1583 (29.03%) was trauma. The difference in mean-time according Base type were all statistically significant except OST and HT ( $p > 0.05$ ). In addition, the mean-time according traffic pass way rT (0.001), RT, TT, TPHT ( $< 0.0001$ ), OST (0.009), RT (0.04) and TMT (0.002) and location AT (0.009), rT (0.001), RT, TT, TPHT, RT, TMT ( $< 0.0001$ ) and HT (0.04) were statistically significant. the highest missing was seen first in drug history (91%), second sign and symptom (69%) and third in temperature (55%). The lowest missing was seen in code type of Babol Ambulance (0.01%) and mission conclusion.

**Conclusion:** Missing data in emergency organization form was high in several parameters. It suggests that the application with obligatory filling and alarm is used to reduce the missing problem. Also, providing of Infrastructures by health care manager such as suitable equipment is important.

**Keywords:** Medical Informatics; Pre-Hospital; Emergency; Electronic Health Record

## Introduction

Information technology has changed various aspect lives. Also, healthcare system is affected by Information technology that directed to the better delivery of care and basic changes [1]. The internal changes in health systems and the evolution of a disease based attitude to health-based and personal based attitude to community-based recently and adventurous advancement in information technology in the world have led to the use of this technology in improving the quality of health services. Different countries have contributed to the evolution of this idea, and each has designed and implemented a comprehensive plan according to national circumstances and requirements [2].

One of the important method in Information technology is Electronic Health Records (EHR). That is an electronic version included various aspects health data of patient that managed, used and created by organization health and only healthcare providers can use for treatment and care of patient [3]. EHR systems use different level and forms in health care systems include hospitals, pharmacies, general practitioner surgeries, and other health care providers [4-6]. The use of an electronic system requires the preparation of various aspects of organizational and technical factors that created complex challenges because of lack of knowledge about Information Technology, safety data, complexity of medical data, be multi-purpose of the hospital, being various units of the hospital and many health care personnel [7-10].

In Iran as Developing countries need more attention to Information Technology. Developing countries are countries with low Socioeconomic and poor Information Technology and Health Information Technology. Most of these countries have poor development indexes and careful expenditure limited financial incomes [11]. EHR is one of the key way for decline expenditure associated health care system. Today, EHRs can direct to decreasing the charge of healthcare services, decreasing the medical errors, and raising the patient's satisfaction [12].

EHR is important because of especial condition of structural of Iran's health system. This character include variation of disease in reprobated areas and concentration of resources in large cities, dramatic effect of awareness in improving health and reducing the disease incidence, the necessity of immediate access to patients' health records by physician, access to information and disease statistics in medical research, medical cooperation as the essential requirement for synergy, the need of professional counseling without the physical presence of patients, the necessity of increasing treatment efficiency, patients' reverence and providing the best service with the least concern for patients and relatives and also providing the necessary equipment for physician [13].

Compared to the other countries, Iran has the lowest the standard. Also, there is non-compliance between determined standard and registered points. The lack of a control organization for preparation the relevant standards in the system, easy access and security, and on the other hand going some information, indicating the Ministry's deficiencies Health and Care of Iran to establish the necessary standards Information recording system [14]. Attention to importance of EHR in decline cost of treatment and benefits for health care system, the aim of present study to Design and set up of electronic data bases of emergency patients in Babol for first time in north of Iran.

## Material and Methods

This descriptive cross-sectional study was conducted on all missions of Babol medical emergency, which lead to outpatient treatment or transfer of patient. Sampling method was Census and the inclusion criteria were all of patient that lead to outpatient treatment or transfer to the hospital between 2015 to 2016. Exclusion criteria include of forms which not filled any item or operators not can read what technician fill.

### Ethic

This study was approved by the Ethics Committee of Babol University of Medical Sciences (Ethics Code No. MUBABOL.REC.1396.13).

### Design and set up software

In this study data was gathered through designed data sheet. First, the initial data sheet for recording information in Access software (Microsoft Office Version 2016) is designed by the emergency personnel of 115 Babol, and after confirmation by an expert on the medical emergency department and Statistics Consultant after a month is used.

### Data collection

After ethics approval and permission from the universities, the information is initially recorded with the corresponding coordination and training to personnel for recording the patient information at the same time when contacting the operator 115 in the relevant software. A staff member is also responsible for completing the case if the file is incomplete.

The personnel participating in the project, all of them are emergency staff, are divided into several categories. These categories include Operator staff, Completing personnel, statics consultant and Personnel responsible for software and training. After the call, the operator personnel import the demographic information into the application „Access” in the patient record. Initial information’s of the patient’s record, including chief complain, history of disease, type of emergency, the condition of the injured person, past medical history, shall be recorded first. Data bank complete based on sign and symptom type. Then the end of each month, the compellation staff edits the patient records and According to the patient’s records, the previous information is edited. After completing the information and updating the monthly information of the emergency missions in 2015, the final file will be completed by the Dispatch Officer that was shown in figure 1. Before completing the data bank, general information will be released with the licensees of the project executives.

ID	GCS	Temperature	PR	SBP	DBP	RR	O2SAT	Pupil	Respiration	Respiration R	Heart sound	Hear
5 13	Normal		75	110		60	11	Left.right.Norar	Regular	Regular	Normal	Reg
6 15	Normal		95	130			18	Left.right.Norar	Regular	Regular	Normal	Reg
7 7	Normal		90	100		70	14	Left.right.Norar	Regular	Regular	Normal	Reg
8 15	Normal		92	110		90	16	Left.right.Norar	Regular	Regular	Normal	Reg
9 3								Left.right.Norar				
10 15	Normal			110		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
11 15			112	125		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
12 15	Normal		66	95			14	Left.right.Norar	Regular	Regular	Normal	Reg
13 15	Normal		73	120			13	Left.right.Norar	Regular	Regular	Normal	Reg
14 15	Normal		80	130		80	13	Left.right.Norar	Regular	Regular	Normal	Reg
15 15	Normal		78	120		80	20	Left.right.Norar	Regular	Regular	Normal	Reg
22 14	Normal		78	140		90	20	Left.right.Norar	Regular	Regular	Normal	Reg
23 15	Normal		80	120		80	18	Left.right.Norar	Regular	Regular	Normal	Reg
24 15	Normal		78	150		90	15	Left.right.Norar	Regular	Regular	Normal	Reg
25 15	Normal		70	150		80	13	Left.right.Norar	Regular	Regular	Normal	Reg
26 15	Normal		75	180		100	13	Left.right.Norar	Regular	Regular	Normal	Reg
27 15			74	145		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
28 15	Normal		90	110		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
29 15			96	80		60	14	Left.right.Norar	Regular	Regular	Normal	Reg
30 15			96	90		65	15	Left.right.Norar	Regular	Regular	Normal	Reg
31			80	170		80	15	Left.right.Norar	Regular	Regular	Normal	Reg
32 15			76	110		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
33 10	Normal		68	85		60	14	Left.right.Norar	Regular	Regular	Normal	Reg
34 15			74	90		60	14	Left.right.Norar	Regular	Regular	Normal	Reg
35 15			96	120		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
36 15			98	135		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
37			78	110		70	15	Left.right.Norar	Regular	Regular	Normal	Reg
38 15			78	120		80	14	Left.right.Norar	Regular	Regular	Normal	Reg
39 15	Normal		85	110		60	15	Left.right.Norar	Regular	Regular	Normal	Reg
40 15	Normal		80	120		80	15	Left.right.Norar	Regular	Regular	Normal	Reg
41 15	Normal		45	100		60	13	Left.right.Norar	Regular	Regular	Normal	Reg
42 12	Normal		125	110		60	17	Left.right.Norar	Regular	Regular	Normal	Reg

Figure 1

### Variable definition

In this study data was gathered through an „Access” file. This file including several variables.

### Demographic data

The first part included demographic characteristics (age, sex, type of emergency station, Emergency location, hospital acceptance, mission result, drug history, past medical history).

### Trauma data

This part of access file was registered accident road and injured person status. Fracture type, dressing, type of trauma, kind of injury, having bleeding, traffic Pass way, injured condition, injured number, type of vehicle, type of machine, and trauma place).

### Treatment intervention

In this part recorded treatment intervention for the patients. Suction, distal pulse, serum therapy, o2 therapy, respiration rhythm, heart rate, blood pressure)

### Chief complaint

This variable is the main cause of emergency contact for patient. This part was included vision weakness, gynecology, endocrine, Infectious, poisoning, trauma, Nervous, heat exhaustion, abdominal pain, cardiac, cerebral, Digestive, Kidney, and pulmonary.

### Prehospital time definitions:

1. **Activation time (AT):** Time required for EMS to deploy after emergency call.
2. **Reaction Time (rT):** The amount of time that the technician takes the mission from dispatch and move from the base.
3. **Response Time (RT):** The amount of time spent from calling to ems until the ems code reach to patient location.
4. **On-scene time (OST):** Time spent on scene by EMS.
5. **Transport time (TT):** Time from departing scene to arrival at the hospital.
6. **Total Pre Hospital time (TPHT):** Spent time from calling to EMS to arrive patients to hospital
7. **In hospital time (HT):** Delivery time to the hospital.
8. **Return Time (RT):** Time spent to return to emergency base after delivery to hospital.
9. **Total Mission Time (TMT):** Total time from calling to EMS until return to base.

### Data analysis

Eventually gathered data was analyzed by SPSS 23. T test, chi square was used and the significance level was set at 0.05.

## Result

### Demographic

Of 5453 missions that entered in BEDB, 2924 cases (53.1%) male and 2011 cases were (36.9%) female. The age of the patients (42.4%) was between 18 to 45 years old. Of 11 Babol Emergency code, Distribution the type of mission was 2206 (40.5%)urban vs. 1773 (32.5%) rural. Most chief complaint 1583 (29.03%) was trauma. Other Demographic characteristics were shown in table 1.

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	2924	53.6
	Female	2011	36.9
Age	Under8	330	6.4
	8 to 18	316	6.1
	18 to 45	2198	42.4
	45 to 60	942	18.2
	Upper 60	1402	27
Emergency base	Urban	2206	40.5
	Road	1773	32.5
	Rural	1473	27
Traffic Pass way	High-way	26	0.5
	Main Road	1876	34.4
	By-way	773	14.2
	Rural Road	555	10.2
Chief complain	Vision Weakness	631	11.6
	Gynecology	12	0.2
	Endocrine	53	1
	Infectious	15	0.3
	Poising	6	0.1
	Heat Exhaustion	1	-
	Trauma	14	0.3
	Nervous	184	3.4
	Abdominal Pain	3	0.1
	Cardiac	303	5.6
	Cerebral	149	2.7
	Digestive	57	1
	Kidney	15	0.3
	Pulmonary	187	3.4
	Trauma	1583	29.03
Other	1022	18.7	

**Table 1:** Demographic characteristics of Babol Emergency Data Bank, Babol, Iran.

### Arrivals times

The result showed that the mean time of arrival according parameters. The difference in mean- time according Base type were all statistically significant except OST and HT ( $p > 0.05$ ) (Table 2). In addition, the mean- time according traffic pass way rT (0.001), RT, TT, TPHT ( $< 0.0001$ ), OST (0.009), RT (0.04) and TMT (0.002) and location AT (0.009), rT (0.001), RT, TT, TPHT, RT, TMT ( $< 0.0001$ ) and HT (0.04) were statistically significant (Table 3).

Variable	Category	AT	rT	RT	OST	TT	TPHT	HT	RT	TMT
Base	Urban	0.75 ± 1.44*	5.44 ± 3.14	6.19 ± 3.45	9.89 ± 3.95	9.68 ± 4.76	27.34 ± 8.29	11.36 ± 7.62	10.06 ± 6.86	47.58 ± 14.45
	Road	0.71 ± 1.17	6.68 ± 3.86	7.39 ± 4.05	9.72 ± 3.68	12.17 ± 4.82	31.03 ± 8.12	12.08 ± 7.76	11.91 ± 7.17	55.53 ± 13.52
	Rural	1.03 ± 1.87	7.07 ± 4.28	8.11 ± 4.67	9.97 ± 3.88	17.41 ± 7.59	37.18 ± 9.75	11.67 ± 7.54	12.55 ± 8.66	64.35 ± 16.83
	p-value	< 0.0001*	< 0.0001	< 0.0001	0.15	< 0.0001	< 0.0001	0.16	< 0.0001	< 0.0001
Total		0.82 ± 1.5	6.28 ± 3.7	7.12 ± 4.10	9.91 ± 3.91	12.82 ± 6.65	31.52 ± 9.64	11.71 ± 7.68	11.25 ± 7.54	55.21 ± 16.59

**Table 2:** Assessment the times of Babol pre-hospital emergency mission according bases.

Data was shown as Mean ± SD.

Anova test used in spss 24 between different parameter.

Abbreviations: Activation time (AT), Reaction Time (rT), Response Time (RT), On-scene time (OST), Transport time (TT), Total Pre Hospital time (TPHT), In hospital time (HT) and Return Time (RT) and Total Mission Time (TMT).

Variable	Category	AT	rT	RT	OST	TT	TPHT	HT	RT	TMT
	Main	0.78 ± 1.56	6.07 ± 3.53	6.86 ± 3.93	9.70 ± 3.51	12.70 ± 6.86	30.67 ± 9.58	12.26 ± 8.06	11.14 ± 7.46	54.78 ± 16.96
	Traffic Pass way	0.75 ± 1.16	6.61 ± 4.10	7.36 ± 4.24	10.22 ± 4.28	13.06 ± 6.54	32.26 ± 9.72	11.78 ± 7.31	11.15 ± 7.50	56.71 ± 15.83
	Rural	0.92 ± 1.59	6.73 ± 4.17	7.66 ± 4.35	10.18 ± 3.96	14.38 ± 6.26	34.20 ± 8.57	11.49 ± 6.61	12.09 ± 7.98	59.83 ± 14.93
	p-value	0.27	0.001	< 0.0001	0.009	< 0.0001	< 0.0001	0.64	0.04	0.002
location	Intra-city	0.75 ± 1.45	5.45 ± 3.14	6.21 ± 3.47	9.95 ± 3.96	9.79 ± 4.86	27.48 ± 8.39	11.30 ± 7.68	10.03 ± 6.88	47.74 ± 14.53
	Extra-city	0.87 ± 1.59	6.90 ± 4.07	7.77 ± 4.38	9.89 ± 3.87	14.64 ± 6.91	33.95 ± 9.52	11.97 ± 7.67	12.0 ± 7.85	59.92 ± 16.07
	p-value	0.009	0.001	< 0.0001	0.58	< 0.0001	< 0.0001	0.04	< 0.0001	< 0.0001
Total		0.82 ± 1.5	6.28 ± 3.7	7.12 ± 4.10	9.91 ± 3.91	12.82 ± 6.65	31.52 ± 9.64	11.71 ± 7.68	11.25 ± 7.54	55.21 ± 16.59

**Table 3:** Assessment the times of Babol pre-hospital emergency mission according Traffic Pass way and location

Data was shown as Mean ± SD.

Anova test used in spss 24 between different parameter.

Abbreviations: Activation time (AT), Reaction Time (rT), Response Time (RT), On-scene time (OST), Transport time (TT), Total Pre Hospital time (TPHT), In hospital time (HT) and Return Time (RT) and Total Mission Time (TMT).

### Missing

Assessment of correctness of filling the data sheet showed that missing data in several parameters of emergency organization Form. As shown in figure 2, the highest missing was seen first in drug history (91%), second sign and symptom (69%) and third in temperature (55%). The lowest missing was seen in code type of Babol Ambulance (0.01%) and mission conclusion.

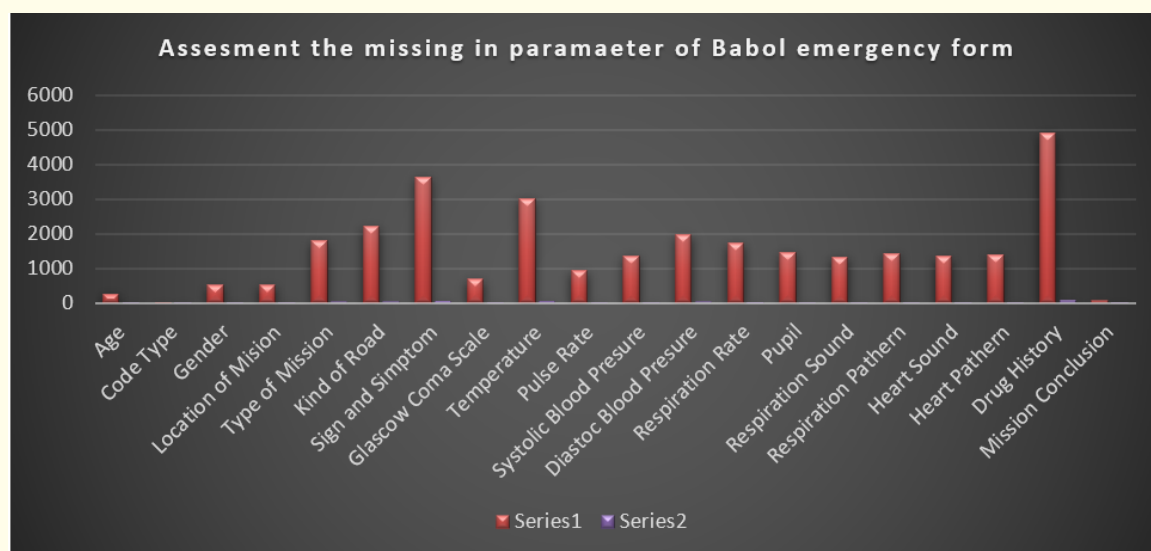


Figure 2

## Discussion

Current study due to importance of design and set up the data bank for official work and research was conducted. In emergency mission sheet, missing data was high that similar with Agrawal, *et al.* study, many important data were missed. The most frequency of missing was drug history and sign and symptom. Maybe, the patients in accident scene was not alert correctly. Also, it might ignore by emergency personal because of especially condition of the patients (loss of conscious) that cannot take information or lack of consideration of emergency personal. Also, emergency personal consider treatment intervention usually [15].

There is significant relation between the response time, base type, traffic pass way, and location. Also, the most times were in rural base, rural pass way, and extra-city location. The result of study of Breen, *et al.* study, indicates response time within nine minutes in rural and urban region was 29% and 44% respectively. Also, ambulance station was effective factor in response time. On other hand, 46% response the within nine minutes was in distance of five miles in ambulance base, while only 5% within nine minutes within a six to ten miles then ambulance statin [16]. The Lam, *et al.* study in Singapore indicated that ambulance response times in the traumatic patients is relation to place of the incident. Long ambulance response times were in "Home" or "Commercial" locations more than "Road" incidents [17].

According of our finding study, OST was higher in the rural base and intra-city location, but they were no significant. In traffic pass way variable, alternative pass way was higher than Rural and main pass way significantly. Similar to our study, the result of Paravar, *et al.* study in kashan indicates on scene time was in roads out of the city longer than city street significantly [18]. Similar to finding of our study, Gonzalez, *et al.* [19] report similar OST for survivors and non-survivors in an urban setting. However, in the rural setting they report that OST was significantly longer for non-survivors. Though Petri, *et al.* [20] reported that mean OST was significantly lower among decedents, they stratify patients into groups on the basis of international service system. Four studies report on patients suffering penetrating injuries. Eachempati, *et al.* [21], Funder, *et al.* [22] and Honigman, *et al.* [23] report that the OST did not differ significantly between survivors and non-survivors. In the study of Nagata, *et al.* in japan, the finding indicate that Geographical area can effect on OST significantly [24].

The other finding of our study, results indicate that base type, traffic pass way, and location were significant. Transport time was longer rural base, rural pass way, and extra-city location. In the studied in kashan, the aim of study prehospital trauma care in road traffic accidents, result indicate that roads out of the city were long transportation time [18]. Feero, *et al.* [25] show no significant difference between unexpected survivors versus unexpected deaths, Newgard, *et al.* [26] also fail to show a significant association between mortality and TT in minutes. However, Gonzalez, *et al.* [19] and Petri, *et al.* [20] show that non-survivors have a significant shorter TT. McGuffie, *et*

*al.* [27] divided the included patients into urban or rural groups for analysis, they report no association in both rural and urban settings between mortality and TT. However, they did show TT to be a significant factor when total length of the hospital stay was modelled, longer TT was associated with a longer hospital stay. Three studies report on patients suffering penetrating trauma. Eachempati, *et al.* [21] and McCoy, *et al.* [28] show no increased odds of mortality for longer TT. However, Swaroop, *et al.* [29] show significantly shorter TT for hypotensive patients versus normotensive patients. No correlation is made with mortality. Kidher, *et al.* [30] report no statistically significant effect of TT on mortality for thoracic trauma. McCoy, *et al.* [28] also report on blunt injury, they were unable to find an association between TT and mortality.

The other finding of current study indicates Total pre hospital time was higher in the rural bases, rural pass way, and Extra-city location significantly. The study of Nilsson, *et al.* in northern Swedish population in 2016 showed that the median of Total prehospital delay was 5.1 hours. Also, Distance to hospital was effective factor in Total pre-hospital delay. When Total pre-hospital delay was under 2 hours, median of Distance to hospital was 7 kilometers, but in Total pre-hospital delay higher 2 hours, the distance of the hospital was 49.8 kilometer. The Association between Total pre-hospital delay and Distance to hospital was significant [31].

Tien, *et al.* showed a non-significant trend using multivariate logistic regression analysis, suggesting that patients who arrived within the 'golden hour' had a lower mortality than those outside of the 'golden hour'. Dinh, *et al.* [32] report a rise in mortality with increasing TPT. They fail to show an association between mortality and the 'golden hour' or arrival < 30 minutes. They report survival benefit for patients arriving < 90 minutes. Gonzalez, *et al.* [19], Petri, *et al.* [20] and McGuffie, *et al.* [33] showed TT to be a significant factor of influence on mortality as well as on length of hospital stay in undifferentiated trauma patients. Possibly because it is expected to lead to more effective care sooner.

Total Mission Time (TMT) is related to Total time from calling to EMS until return to base that in the current study  $55.21 \pm 16.59$ . Similar to our finding study, the result of study of Zeraatchi, *et al.* in the Zanjan indicate that the most frequency round trip time was between 36 - 70 minutes and lower 35 minute to 26.4 and 19.7% respectively [34].

In the other study of Esmailiranjbar, *et al.* in kerman, the mean (SD) for total out of hospital time was 31.3 (8.3) minutes. Also, the other result of current study show that total out of hospital time increases by 1 minute, the 24-hour mortality rate will rise by 3% [35].

Time of arrival is an important factor in emergency medical system that can help the mortality rate of patient prehospital time intervals in trauma patient transportation by emergency medical service: association with the first 24-hour mortality [36].

Similar all health technologies, the electronic medical record (EMR) have benefits and disadvantages. The benefit of EMR including medical errors reduction, instant and immediately access to patient information by all of health care worker, the existence of a legible and accurate record, improving efficacy of the hospital in providing care. But this system has big challenge especially trained personal for using of it and excess expenditure of these [37].

This challenge is more complicated in the developing countries because of existence health technology substructure in a country, internet penetration, Information and communications technology skills amongst the stakeholders particularly the clinicians, users' perceptions on ICT, and voluntariness in the use of technology. It is necessary cooperation between various organizations in this countries and providing funds for electronic records infrastructures [38]. The review of the article between developing countries and developed countries indicate that developing countries need proper system for Emergency care for the increase of treatment standard and reduction mortality rate [39].

## Conclusion

According to the results, it can be concluded that the Missing data in Emergency Organization Form was high in several parameters. Also, education and training for completing forms are important legally. For the development of this system need trained personnel, proper funding by health care manager, suitable equipment, and correct communication system. It suggests that the application with



obligatory filling and alarm, to reducing missing problem. also, Time of arrival is an important factor in emergency medical system that can help the decline of the mortality rate of patients [36]. Role of ems in emergency management developed worldwide and specialized for leadership, education and response. Attention to ems role in management of time can help patient management and decline pre-hospital time. Decrease of pre hospital time depends on various factors. It needs to provide more infrastructures and structure of emergency medical.

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### Conflict of Interest

There was no conflict of interest.

### Authors' Contributions

Dr Soraya Khafri, designed the study, supervised the study and approved the final version. Shayan Alijanpour, designed the study, data analysis and prepared the manuscript. Dr Ahmad Mohamad Pour and Mostafa Mostafazadeh-bora participated in data analysis and the writing manuscript. Samaneh Fathi, Mohadeseh Salehi, Nafiseh Najafi, Narges Hossein Gholipour, Naghmeb Ramzani, Zeinab Adrang, Reza Ekhtiary and Mehdi Aghagol Abastabar participated in collecting the data.

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