Research

Investigating the effect of the Asayar smart program on ambulance arrival time at the scene

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Abstract

Background

Communication is important in pre-hospital emergencies and the faster and more accurately it is done, the more effective the treatment process will be. With the advancement of technology, a mobile phone system equipped with the Asayar smart program replaces paper methods. By creating an online connection between doctors, technicians and treatment centres, Asayar will increase the speed of the treatment and transfer of the patient to hospital. One of the most important challenges of this program is the interruption of internet connections and the reduction of internet speed. This study was designed to investigate the effect of the Asayar smart program on ambulance arrival time at the scene and compare it with paper methods.

Methods

A descriptive-analytical cross-sectional study in the city of Isfahan in Iran, with a sample number of 700 missions performed by the paper registration method in 2017, and 230 missions registered by Asayar program method in 2018. The Propensity score matching method was used to analyse the data.

Results

The findings of the study showed that the use of the Asayar smart program in the pre-hospital emergency department of Isfahan has reduced times for ambulance arrival to the scene.

Conclusion

Using the Asayar smart program in a pre-hospital emergency can increase patient coordination and management.

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Introduction

Pre-hospital emergency services are a vital part of the healthcare system; often saving lives in acute situations and preventing health complications of injuries and other time-sensitive diseases (1-3). Disability and mortality are reduced if initial treatment of the patient is by trained pre-hospital emergency staff with up-to-date equipment when responding in the shortest possible time (4).

In Iran, the pre-hospital emergency department consists of various components, including the emergency call response centre (dispatch centre), ambulance personnel, consulting physician and the person in charge of the dispatch (5). The pre-hospital system is activated after the ambulance calls the dispatch centre and is responsible for answering telephone calls, sending a rescue unit to the scene, providing care to patients at the scene by trained people, continuing to provide care on the way to the hospital, delivering the patient to the medical centre and recording and documenting patient information (6). It is the role of dispatch to review and evaluate an emergency and determine whether to send out a rescue unit and activate the pre-hospital emergency department. If it is deemed that an ambulance is not required, dispatch will provide necessary instructions (7).

The connection between the different parts of the pre-hospital system has a significant effect on the arrival time of the ambulance, and good communication systems reduce the time to start treatment and therefore patient survival (8).

In Iran, the standard average time for an ambulance to arrive at the scene is 8 minutes in cities, 12 minutes on intercity roads and 14 minutes in metropolitan areas (9). Seconds are especially important for patients in cardiac and respiratory arrest. Studies show that with each minute reduced from the time of ambulance arrival, patient survival increases by 10% (10). Haghparast et al, in a study on the possibilities and barriers to providing care to patients in Iran, determined that communication and the availability of equipment and resources were considered one of the most important components in reducing the arrival time of the rescue unit to the accident site (1). Communication has changed tremendously in recent years which has led to the development and improvement of the quality of pre-hospital emergency services (3). The World Health Organization states that the use of electronic and telemedicine services and the provision of emergency medical equipment with high-tech equipment is one of the potential solutions to eliminate and reduce inequalities in the distribution of healthcare and facilitate equitable treatment for patients around the world (11).

After the collapse of the roof of Mehrabad airport in 1974 and the establishment of a pre-hospital emergency room in Iran, there have been many changes in the way pre-hospital emergency services are provided and the quality of medical care provided to patients. The level of education of human resources and the employment of skilled personnel with a university degree, the infrastructure of emergency bases and ambulances, and the equipment used to provide services have changed. A mobile phone system equipped with the Asayar smart program in 2017 will replace paper methods in Tehran, receiving the emergency call and recording the patient's information and all medical measures before hospital admission and during the dispatch to the hospital (12). This smart software can be run on mobile internet and allows the exchange of information, emergency addresses, main medical issue, vital signs, examinations and medical procedures performed on patients between emergency medical and hospital staff and plays an important role in the preparation of emergency triage (13).

This technology provides easy access to the geographical location of aid workers and provides the opportunity to support emergency services and improve coordination to manage as many patients as possible (3). Pre-hospital emergency operations staff can use this program to interact with the command room and exchange information. After arriving at the scene, technicians examine the patient and send the information along with vital signs to the consulting physician as well as the relevant hospital, and when needed, they can get an assignment from the consulting physician (14).

Smart pre-hospital emergency programs have increased the speed of treatment and patient transfer to a medical centre by establishing an online two-way communication between physicians and emergency medical technicians. These programs are also able to transfer patient information in the form of images and videos (15).

Advantages of electronic patient information registration over paper registration include more complete patient information options, system alerts in case of registration error, the ability to share information between technicians and physicians, the ability to record audio and photos and other citations and the ability to convert audio to text during the transfer of critically ill patients. Disadvantages of electronic recording include the interruption of internet communication, creating an unpleasant psychological feeling in patients and companions and disturbing the tactile sensitivity of digital devices (16,17). In a study by Pervez et al in Pakistan, lack of infrastructure and extensive internet network coverage and low mobile phone battery performance due to the simultaneous use of telephone calls and programs were identified as shortcomings of this communication type and the disruption of this technology was raised at critical times such as crises (18). The advantage of medical paper documents is that they are more accessible and do not require internet networks and Android scientific and cognitive skills (16). Paper documents can also be advantageous due to the working conditions in the pre-hospital system and the location of the ambulance in areas without adequate antennas and the need for 4G or 3G internet for proper operation of smart applications (19).

Although smart apps are considered as an innovation in the field of pre-hospital care and there are reports of their practicality

and satisfactory application, its effect on reducing pre-hospital emergency time indicators has not been proven. There is a need for further investigation in this field (20).

Research and studies in the field of smart pre-hospital emergency programs in Iran are limited. Given that this technology is new in Iran and has not been extensively researched, there is a need for further research in this field (21). The Asayar smart program is currently being used in Isfahan Emergency Medical Center and the desire to use this technology is based solely on experience and public information; Asayar will probably affect when the ambulance arrives at the scene. Therefore, this study was designed to investigate the effect of the Asayar smart program on the time of ambulance arrival to the scene.

Methods

This study is a cross-sectional descriptive-analytical study matching the desire score method with 700 samples of missions performed by the paper registration method in 2017, and 230 samples of registration by the Asayar software method in 2018 in Isfahan. After collecting the data, the information was entered into R software version 3.5.1 and using the desire propensity score matching method of the two groups in terms of confounding variables including mission time (work shift), diagnosis of disease, location of the accident, the outcome of the mission and the admission status of the hospital were matched. Descriptive statistics, Mann-Whitney and Wilcoxon statistical methods were used to analyse the data. In this study, the time of arrival at the scene in the Asayar program and the written method were compared.

In studies where randomisation is not possible, the propensity score matching method was used to reduce the effect of confounding variables. This method is one of the most advanced methods used to eliminate or minimise the effect of confounding variables. To obtain an estimate with the least amount of bias and using it, the ability to compare between groups is provided.

According to the study by Jahanshir et al, in the field of influential factors relating to the arrival of the ambulance in the pre-hospital emergency, factors such as age, gender, patient injury/illness, time of the accident and accompanying symptoms were identified as factors influencing the time of ambulance arrival at the scene (20). To eliminate the mentioned confounding factors, the statistical method of propensity score matching was used. In this method, all confounding variables that may affect the result of the study are identified and missions that are compared to each other are matched in terms of the above factors. For example, pre-hospital emergency missions during night shifts with night shifts, missions with patient records of loss of consciousness were compared.

Based on this, all the variables that played a role in calculating the score of inclination are matched and a similar distribution

in both groups is obtained for these variables (22). The most common criterion for modifying confounders in evaluating the matching propensity score is the use of the standardised mean differences (SMD) criterion. The best value for it is 0.25 to 0.1. Larger numbers indicate the over-dispersion of groups to examine the effect of the independent variable. One of the advantages of SMD is that it is not affected by the sample size (23).

After obtaining the code of ethics from Qom University of Medical Sciences and submitting it to Isfahan University of Medical Sciences, the samples were collected by stratified sampling method with an appropriate allocation approach from Isfahan Emergency Medical Management and Accident Management Center. In such a way that each month was considered as a class and within the classes (based on the number of files) sampling was done systematically.

To collect the data required for the study, we referred to the pre-hospital emergency paper forms as well as the electronic registration forms by Asayar method and according to the study by Nehme et al (24) identified a range of factors affecting the time intervals related to the arrival of the ambulance in the pre-hospital emergency such as age, gender, patient illness/injury, time of the accident and accompanying symptoms. This has been used in designing tools for data collection and taking into account all the above, a researcher-made checklist was designed and data was collected.

A researcher-made tool was designed to collect data, the information was entered into a checklist by the researcher and content validity was reviewed by 10 professors and experts in the field of pre-hospital emergency. To evaluate content validity quantitatively, two relative content validity coefficients and content validity index (CVI) were used. The CVI was calculated by summing the agreeing scores for each item divided by the total number of specialists (10 people). To determine the content validity coefficients, experts were asked to review each item based on the range of necessity, usefulness and adequacy. Then the answers were calculated according to formula number 1. In this regard, nE is the number of specialists who have answered the 'necessary' option and N is the total number of specialists. According to the calculated value, which is greater than the value of the table (62%), the validity of the content of the items was accepted. Regarding CVI in the design of each item, experts commented on the relevance of each item. The CVI for each item was then obtained by dividing the number of responses ranked third and fourth by the total number of respondents. The mean CVI was defined as the CVI scale. As the CVI score was higher than 0.79, the item was identified as suitable and the items were accepted.

Using the Asayar GPS smart app the phone is active 24 hours a day, therefore in all missions that were examined in this way, the effect of this distorter has been eliminated.

Results

The highest number of missions performed in both written and Asayar methods before and after matching is related to the night shift (Table 1). Most of the locations of missions performed in the two methods before data matching were related to residential missions and after matching were related to traffic routes. Matching data and minimising confusing variables compared to many traffic missions. Most of the missions performed in both written and pre-registration methods before and after data matching are related to transportation-related accidents (traffic accidents) and most of the missions performed in both the method of written registration and Asayar are related to patients transferred to the hospital (Table 2).

Table 3 shows the data dispersion of the statistical population of the study is high before matching, which has significantly decreased after matching. The highest dispersion of data was related to the diagnosis of diseases (SMD index = 53.3) which decreased sharply after matching and the data were matched (SMD index = 0.42). The mean time of ambulance arrival at the scene was 8.43 ± 2.30 in the Asayar program and 11.30 ± 2.69 in the written method. There was a significant relationship between the use of the Asayar program and the arrival time of the ambulance (Table 4).

Discussion

The gender distribution of patients in the statistical population in the two groups of Asayar and written registration is almost equal and is consistent with the results of the study of Moradian et al (25). Due to the longer working time on night shift (12 hours) compared to morning and evening shifts (6 hours), the higher number of night shift missions is reasonable and in line with the results of the study of Nikolai et al (26). Most of the disease diagnoses in the missions of the present study were related to accidents and incidents related to transportation, which is in line with the findings of the study by Zaraatchi et al (27). The results of the missions performed in the two methods of recording Asayar and written were related to patients transferred to the hospital, which is in line with other findings (25). The distribution of descriptive variables is preserved even after matching on the missions of the statistical community and is consistent with the results of similar studies.

Table 1. Descriptive data related to the variables of the statistical population in two methods: written and Asayar program

Variables		Written method		Asayar method	
		Before matching	After matching	After matching	After matching
		Number (%)	Number (%)	Number (%)	Number (%)
Gender	Male	382 (54%)	214 (56%)	120 (52%)	99 (51%)
	Female	318 (46 %)	167 (44%)	110 (48%)	94 (49%)
Shiftwork	Morning	212 (30.3%)	106 (27.8%)	59 (25.7%)	54 (28%)
	Evening	186 (26%)	95 (25.5%)	67 (29.1%)	54 (28%)
	Night	302 (43.1%)	187 (46.7%)	104 (45.2%)	85 (44%)
Location	Industrial	19 (2.7%)	(%3.7) 14	(%3.5) 8	7 (3.6%)
	Educational/administrative	11 (1.6%)	5 (1.3%)	6 (2.6%)	7 (3.6%)
	Health centre	24 (3.4%)	14 (3.7%)	7 (3%)	7 (3.6%)
	Sports/recreational	21 (3%)	17 (4.5%)	15 (6.5%)	11 (5.7%)
	Traffic lanes	228 (32.6%)	170 (47.2%)	85 (37%)	87 (45.1%)
Diagnosis	Heart	94 (13.4%)	51 (13.4%)	18 (7.8%)	17 (8.8%)
	Respiratory	45 (6.4%)	23 (6%)	18 (7.8%)	14 (7.3%)
	Stroke	14 (2%)	6 (1.6%)	11 (4.8%)	9 (4.7%)
	Epilepsy	31 (4.4%)	26 (6.8%)	8 (3.5%)	9 (4.7%)
	Mental disorder	15 (2.1%)	0 (0%)	9 (3.9%)	6 (3.1%)
	Fever and chills	3 (0.4%)	3 (0.8%)	1 (0.4%)	0 (0%)
	Blood pressure disorders	19 (2.7%)	10 (2.6%)	10 (4.3%)	4 (2.1%)
	Diabetes	16 (2.3%)	6 (1.6%)	4 (1.7%)	3 (1.6%)
	Decreased consciousness	44 (6.3%)	23 (6%)	11 (4.8%)	11 (5.7%)
	Women's emergency	10 (1.4%)	8 (2.1%)	2 (0.9%)	2 (1%)
	Transportation-related incidents	296 (42.3%)	194 (50.9%)	100 (43.5%)	100 (51.8%)
	Incidents not related to transportation	41 (5.9%)	19 (5%)	6 (2.6%)	6 (3.1%)
	Other	27 (3.9%)	12 (3.1%)	13 (5.7%)	12 (6.2%)

The mean time of ambulance arrival in Asayar program was 8.43 ± 2.30 and in the written method was 11.30 ± 2.69. There was a significant relationship between using the Asayar program and the time of ambulance arrival. Use of smart applications such as the Asayar program in pre-hospital emergencies has advantages such as eliminating time intervals caused by using paper methods. Time intervals are also decreased by the automatic systems in the dispatch centre and operational personnel, and reducing the time taken using the telephone or wireless to send an ambulance. Smart applications also eliminate the possibility of power and telephone interruption, time of transferring paper form from the recipient to the sender manually, the possibility of missing or forgetting the ambulance dispatch, illegibility of the biography or address taken by the recipient's biography. Such apps also reduce the arrival time of the ambulance to the patient so the findings of the present study on the use of this program are not unexpected.

The study of Piarsa et al also showed that using the Palsara smart app has reduced the average time it takes patients to start treatment and has led to faster ambulance arrival in patients diagnosed with stroke (28), which is consistent with the findings of this study. In the Afzali study in Kerman, the use of a pre-hospital automation system eliminated time wasted using a paper system and telephone communication times. The automated system also reduced the arrival time of ambulances to medical centres and led to faster recovery and discharge of patients (29), which is consistent with the findings of this study. Due to the active GPS in the Asayar smart program and monitoring the ambulance position by the dispatch centre on a moment-by-moment basis, it is possible to guide the pre-hospital emergency operations staff by the dispatch until they reach the relief location.

Also, online positioning and finding the helpline address via the phone's GPS has made it easier for pre-hospital emergency staff to reach the scene.

The finding of this study is in line with the results of the study of Delshad et al in Tehran, who examined the average time for an ambulance to arrive at an emergency scene with or without GPS. Given the undeniable benefits of GPS and its use for ease of positioning, the results of the study are acceptable (30). A study by Jaupi et al in Michigan also showed the use of GPS

Table 2. Descriptive data related to the distribution of the results of missions performed in two methods: written and Asayar statistical population

Variables	Groups	Written method	Asayar method
		Number (%)	Number (%)
Mission result	Transfer to a medical centre	578 (83.9%)	186 (80.9%)
	Initial measures and advice to visiting a medical centre	27 (3.9%)	11 (4.8%)
	Absence of the patient	6 (0.9%)	6 (2.6%)
	Lack of cooperation and obtaining a signature	37 (5.3%)	12 (5.2%)
	Cancellation by the guidance and control centre	30 (4.3%)	8 (3.5%)
	Delivery to another ambulance	0 (0%)	0 (0%)
	Death of the patient	10 (1.4%)	7 (3%)
	Establishment	3 (0.4%)	0 (0%)

Table 3. Investigation of statistical population data scatter before and after matching

Groups variables	Before matching		After matching	
	p-value	SMD	p-value	SMD
Shift work	>0.001	1.553	0.775	0.063
Location	>0.001	3.065	0.435	0.193
Diagnosis	>0.001	3.530	0.009	0.428
Mission results	>0.001	0.505	0.000	0.001

Table 4. Quantitative results

Groups Variables	Asayar method	Written method	p-value
	(N=330) mean (standard deviation)	(N=381) mean (standard deviation)	
When the ambulance arrives at the scene	8.43 ± 2.30	11.30 ± 2.69	>0.001

by STREAMS smart application in a pre-hospital emergency is useful for locating and reaching the accident site faster and considers its use necessary, which is consistent with the findings of this study (31).

A study by Pervez et al showed that the use of electronic programs in pre-hospital emergencies has increased time indicators and delayed initiation of treatment (32), which was not consistent with the findings of this study. The reason for this discrepancy seems to be the existence of poor infrastructure and a low-speed internet network in Pakistan. Meanwhile, according to the study of those who measured this technology in times of crisis, disruption in electronic networks is not far from expectation.

Conclusion

The results of this study showed using the Asayar smart software can reduce the time for an ambulance to reach the scene. In the paper method, compared to the Asayar system, the time for the ambulance to reach the scene and the hospital was increased. However, due to the advancement of technology and information technology this program is being used in some pre-hospital emergency centres. Given that the research environment of Isfahan metropolis was selected for this study and was suitable in terms of internet infrastructure and facilities, in cities and villages with impaired internet speed or infrastructure for smart applications the use of such technologies may fail. Therefore, it is suggested that a qualitative study be designed and implemented to explain the challenges of using smart information registration programs, including the Asayar program from the perspective of pre-hospital emergency technicians. Also, as this study did not address the opinions of pre-hospital emergency technicians, it is suggested that another study be designed and implemented on the effect of two methods of registration with the Asayar program and paper methods on job comfort.

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Competing interests

The authors declare no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

References

1. Bahadori M, Ghardashi F, Izadi AR, et al. Pre-hospital emergency in Iran: a systematic review. Trauma Monthly 2016;21:e31382. doi: 10.5812/trauma on.31382
2. Almasi S, Abedi H. Study of the relationship between people's expectations from and their satisfaction with emergency prehospital services in Sanandaj City, Iran. Biol Med (Aligarh) 2016;8:2-8. doi:10.4172/0974-8369.1000327
3. Abdellah OA, Aborokbah MM, Elfaki AO. Improving pre-hospital care of road traffic accident's victims with smartphone technology. International Journal of Interactive Mobile Technologies 2018;12:130-41.
4. Yadollahi S. The quality of documentation in pre-hospital emergency mission forms: a cross-sectional study. Iranian Journal of Emergency Medicine 2018;5:20.
5. Ellensen EN, Wisborg T, Hunskaar S, Zakariassen E. Dispatch guideline adherence and response interval: a study of emergency medical calls in Norway. BMC Emerg Med 2016;16:40.
6. Moghaddasi H, rabiei R, Mastaneh Z. Pre-hospital emergency information system in America and England: a review. Journal of Payesh 2014;13:383-91.
7. Hjälte L, Suserud B-O, Herlitz J, Karlberg I. Why are people without medical needs transported by ambulance? A study of indications for pre-hospital care. Eur J Emerg Med 2007;14:151-6.
8. Townsend K, Loudoun R, Wilkinson A. Improving people management in emergency services. 2018. Available at: https://research-repository.griffith.edu.au/handle/10072/388795?show=full
9. Safarabadi M, Pakniyat A, Dervishi A, Harorani M. The performance of emergency medicine services for patients with suspected acute coronary syndrome, Arak, Iran. Clin Res 2016;2:153-7.
10. Lin Y, Cheng A, Grant VJ, Currie GR, Hecker KG. Improving CPR quality with distributed practice and real-time feedback in pediatric healthcare providers: a randomized controlled trial. Resuscitation 2018;130:6-12.
11. Martinez R, Rogers A, Numanoglu A, Rode H. The value of WhatsApp communication in pediatric burn care. Burns 2018;44:947-55.
12. Shakeri K, Jafari M, Khankeh H, Seyedin H. History and structure of the fourth leading emergency medical service in the world: a review article. Arch Acad Emerg Med 2019;7(1).
13. Shakeri K, Jafari M, Khankeh H, Seyedin H. History and structure of the fourth leading emergency medical service in the world: a review article. ibid. 2019;7:e17-e.
14. Fitzpatrick D, Maxwell D, Craigie A. The feasibility, acceptability, and preliminary testing of a novel, low-tech intervention to improve pre-hospital data recording for pre-alert and handover to the emergency department. BMC Emerg Med 2018;18:16.
15. Martinez R, Rogers A, Numanoglu A, Rode H. The value of WhatsApp communication in pediatric burn care. Burns 2018;44:947-55.
16. Barnes L, American Academy of Orthopaedic S. Emergency care and transportation of the sick and injured. Sudbury, Mass; 2011.
17. Porter A, Badshah A, Black S, et al. Electronic health records in ambulances: the ERA multiple-methods study. Health Services and Delivery Research 2020.
18. Pervez F, Qadir J, Khalil M, et al. Wireless technologies for emergency response: a comprehensive review and some guidelines. IEEE Access 2018;6:71814-38.
19. Johansson A, Esbjörnsson M, Nordqvist P, et al. Technical feasibility and ambulance nurses' view of a digital

telemedicine system in pre-hospital stroke care–a pilot study. Int Emerg Nurs 2019;44:35-40.

20. Jahanshir A, Karimialavijeh E, Sheikh H, Vahedi M, Momeni M. Smartphones and medical applications in the emergency department daily practice. Emergency 2017;5(1).

21. Dadashzadeh A, Dehghannejhad J, Shams Vahdati S, Soheili A, Sadeghi Bazarghani H. The nature of prehospital medical interventions delivered to traumatic patients in Tabriz. Journal of Urmia Nursing and Midwifery Faculty 2017;15:159-67.

22. Austin PC, Jembere N, Chiu M. Propensity score matching and complex surveys. Stat Methods Med Res 2018;27:1240-57.

23. Amoah J, Stuart EA, Cosgrove SE, et al. Comparing propensity score methods versus traditional regression analysis for the evaluation of observational data: a case study evaluating the treatment of gram-negative bloodstream infections. Clin Infect Dis 2020;71:e497-505.

24. Nehme Z, Andrew E, Smith K. Factors influencing the timeliness of emergency medical service response to time critical emergencies. Prehosp Emerg Care 2016;20:783-91.

25. Rastegarfar B, Fooladband F. Time indicators of pre-hospital emergency services in stroke patients of Fars/Iran. Journal of Health Based Research 2019;5:165-74.

26. Ramadanov N, Klein R, Ramadanova N, Behringer W. Influence of time of mission on correct diagnosis by the prehospital emergency physician: a retrospective study. Emerg Med Int 2019. doi: 10.1155/2019/3727081

27. Zeraatchi A, Rostami B, Rostami A. Time indices of emergency medical services; a cross-sectional study. Iranian Journal of Emergency Medicine 2018;5:8.

28. Pearce D, Hocking G, Sahathevan R, Oqueli E, Bagot K, editors. Reducing variation in care and improving patient flow by streamlining communication: interim results from the Pulsara smartphone communication app. 2018.

29. Afzali F. The impact of emergency medical services (EMS) automation system on users workflow and patient care process. School of Health Information and Management, Kerman University of Medical, 2018.

30. Delshad V, Shemshadi H, Moradian MJ, et al. The effect of applying a global positioning system in ambulances on the response time of Tehran emergency medical service. Health in Emergencies and Disasters 2016;1:125-8.

31. Hosseini M, Berlin RR, Jiang Y, Sha L, editors. Adaptive clinical data communication for remote monitoring in rural ambulance transport. 2017 IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE); 2017: IEEE.

32. Pervez F, Qadir J, Khalil M, Yaqoob T, Ashraf U, Younis S. Wireless technologies for emergency response: a comprehensive review and some guidelines. ibid. 2018.