

Factors Affecting the Skill and Efficiency of Emergency Medical Service Staff in Mass Casualty Road Traffic Incidents: A Qualitative Study

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ABSTRACT

Aims Identifying the knowledge and skills of emergency medical technicians in mass casualty incidents can minimize the risks associated with the response. This study was conducted with the aim of investigating the factors affecting the skill and efficiency of emergency medical service staff in mass casualty road traffic incidents.

Participants & Methods The present research was conducted with a semi-structured qualitative method on 31 officials and personnel of pre-hospital emergency, Red Crescent and police forces who were selected by purposive sampling method from June 2018 to September 2019. Data were analyzed by conventional content analysis method

Findings Effective factors on skill and efficiency were identified in the two main categories of professional performance (with 2 subcategories of triage requirements and challenges and functional deficiencies) and employee competence (with 4 subcategories of necessity for psychological recovery, professional competence improvement, technician skill improvement, and commitment and professional ethics).

Conclusion Inability in triage, functional deficiencies and lack of knowledge and skills related to trauma at the scene of the accident, cause disruption in the professional performance of emergency medical service staff. Unpredictable conditions put additional stress on relief workers on the scene. Improving knowledge and skills, psychological recovery, compliance with moral values, and efforts to improve professional qualifications will improve competence and increase skills and efficiency at work. By training people in first aid, people-oriented management and using people's participation, people can be involved and their potential can be used to provide relief services.

Keywords Clinical Skill; Efficiency; Emergency Medical Services; Traffic Accidents; Mass Casualty Incidents

CITATION LINKS

[1] Textbook of health in emergencies ... [2] Textbook of health in emergencies ... [3] Time-efficiency factors in road tunnel rescue as ... [4] Global status report on road safety ... [5] Assessment of pre-hospital emergency ... [6] Emergency medical response in mass ... [7] Prehospital trauma systems reduce ... [8] The nature of prehospital medical ... [9] Patient safety and patient assessment in pre-hospital ... [10] Positive coping: a unique characteristic ... [11] Factors influencing pre-hospital care ... [12] Disaster preparedness and professional ... [13] Assessment competencies among emergency ... [14] Mass casualty response to mine explosion ... [15] A systematic review of controlled ... [16] Availability and utilisation of ... [17] Assessment of the level of knowledge of ... [18] Evaluation of clinical skills of ... [19] Facilitators and inhibitors of self-care behaviors among the ... [20] Qualitative content analysis: A focus ... [21] Hospital safety index: Guide for ... [22] Understanding nursing research-eBook ... [23] Qualitative research in nursing: Advancing ... [24] The Emergency Medical System ... [25] A study on the disaster medical response ... [26] Mass casualty response to mine ... [27] Assessment of the disaster medical ... [28] Factors defined by nurses as influential ... [29] A needs assessment for simulation-based training ... [30] Development of a critical incident stress ... [31] Restructuring and the production of ... [32] Assessing and exploring the competency ... [33] A study of knowledge, attitude and ... [34] The association between Emergency ... [35] Simulation-based assessment of paramedic ... [36] Informing a Canadian paramedic profile ... [37] A simulated wilderness exercise: the development ... [38] Desirable attributes of the ambulance ...

Introduction

Mass Casualty Incidents (MCI) refer to incidents that result in the injury of a large number of people and the available resources are not able to meet the needs of the affected society [1]. In other words, the health care system and personnel are affected in a short period of time due to the large number of casualties that are beyond local capabilities and resources [2]. According to the report of the World Health Organization (WHO), in the world, traffic accidents are the 9th cause of death, with 1.35 million deaths and 50 million injuries every year [3]. In Iran, road traffic deaths have decreased from 32.1 to 20.5 per 100,000 people in 2018 since 2015. In 2015, Iran ranked 8th in terms of traffic accident deaths among all countries in the world, but in 2018, this rank decreased to 53rd among other countries [4]. Emergency Medical Services (EMS) is one of the main components in the preparation stage and is at the forefront of responding to such incidents [5]. The main goal of EMS in MCIs is to reduce the rate of casualties, and the performance of EMS directly affects the survival rate of patients [6].

EMS is defined as a system that organizes all aspects of medical care provided to patients in the pre-hospital or out-of-hospital setting. In addition, EMS is the foundation for effective response in disasters and mass casualty incident management [5]. The availability of prehospital care reduces trauma mortality by 25%, and when combined with facility-based urgent emergency care and safe transportation, its cumulative effect will increase [7]. A study on therapeutic interventions applied by EMS staff in trauma patients showed that despite the fact that 92.46% of the injured had multiple trauma and head and neck trauma, only 11.5% of the injured had used a neck brace. In 98.7% of the missions, the EMS staff did not consult with the center doctor, and in 99.43% of the cases, patients were transferred to the hospital without coordination between the pre-hospital emergency and the receiving hospital emergency [8]. The unstable care environment in the pre-hospital system due to the uncontrolled volume of patients, variable levels of severity, lack of information, time sensitivity, stress and fatigue has made EMS unique [9]. EMS providers are exposed to many risks due to decision-making in critical situations and time constraints in performing their duties, as well as other negative physical, emotional and mental stressors [10].

In Iran, despite the many advances that have been made in EMS, there are many problems and shortcomings [11]. The quality of services provided in medical emergency management centers significantly reduces mortality before patients are referred to the hospital and at the scene. Improving the quality of emergency medical services requires accurate knowledge of the current situation and investigation of existing problems [12]. Emergency

medical technicians must be aware of their knowledge, skills, abilities, and self-efficacy so that they can perform the expected roles in incidents well. Also, identifying the knowledge, skills and abilities of emergency medical technicians and the gaps in their knowledge and skills before attending accidents, especially accidents with a large number of injured people, can minimize the risks associated with the response [13].

Despite a number of studies on EMS, there is little information about the actual capacity, performance and sustainability of Prehospital Emergency Medical Services (PEMS) [5] and the knowledge, skills and professional competencies of healthcare workers [12]. The main problem in caring for the injured in accidents is not the number of injured people who need treatment, but the quality and use of available resources. Accordingly, planning and management are the most critical elements for the optimal allocation of limited resources in such incidents. This goal will be achieved if health centers are at least prepared for various incidents [14]. In addition, previous studies have shown that the experience of staff trained and working in pre-hospital environments can be useful during accidents [15, 16]. The studies conducted in Iran have quantitatively shown that the skills and efficiency of EMS staff are not optimal in performing pre-hospital services [8, 17, 18]. Based on this, the present study was conducted qualitatively with the aim of investigating the factors affecting the skill and efficiency of EMS staff in Mass Casualty Road Traffic Incidents (MCRTI).

Participants and Methods

Since this study tried to discover the factors affecting the skill and efficiency of EMS staff in MCRTI, a qualitative research method with a conventional content analysis approach was used. Qualitative content analysis is a method for analyzing oral, visual and written data to provide knowledge and understanding of the phenomenon [19]. Conventional content analysis is one of the qualitative research methods used to analyze and interpret data. In this method, overt and hidden themes or patterns are identified in the text through the regular classification process [20]. Considering that the management of such incidents, which requires the coordination of multiple organizations and the allocation of resources, is complex [21], a qualitative research method was used to describe the phenomena and provide new knowledge, insight and practical guidance [20].

This study was conducted with in-depth interviews based on the experiences of beneficiaries in Yasuj, Yazd, Shiraz and Qom from June 2018 to September 2019. People with theoretical knowledge or practical experience including personnel of Relief Organizations in pre-hospital emergency centers, police department and Red Crescent Organization,

were interviewed about skills and efficiency of employees in MCRTI, with prior coordination. The participants in the study were 31 people, including emergency medical technician (n=9), emergency medical expert (n=5), Emergency Operation Center (EOC) officer (n=3), dispatch operator (n=3), head of medical emergency and accident management center (n=3), police (n=3), Red Crescent paramedic (n=2), Red Crescent rescue deputy (n=1), emergency medical specialist (n=1), and traffic officer (n=1) were selected by purposive sampling method. Having at least 2 years of work experience, a conscious desire to conduct an interview and the ability to express experiences were considered as criteria for entering the study.

Data were firstly collected through an unstructured interview and then through a semi-structured interview with open-ended questions. The main question of the interview was: "Explain the factors affecting the skill and efficiency of the EMS staff in MCRTI." In order to better clarify the information of the participants, exploratory questions such as "What do you mean?", "Please explain more", "Give an example of objective experience" were used. The interview ends with the question, "Do you think there was a topic that was not brought up or that you want to talk about more?" The duration of the interview varied between 25-110 minutes. The interviews were recorded using a mobile audio recorder in a quiet and appropriate environment and immediately converted into textual data accurately word for word.

In this research, Elo and Kyngäs analysis method was used, which includes open coding, creating classes and then reaching abstraction [22]. The analysis of each interview was done immediately after its completion and implementation of the interview. For this purpose, the interviews were listened to several times to get a general understanding of the interviews. Then the interviews were implemented and carefully studied several times. The extracted codes were classified based on similarities and differences. The emerged classes were placed in the main classes based on common meanings and concepts. Then the classes were compared and the theme emerged from the analysis and interpretation of the main classes.

Validation of data (Rigor): Lincoln and Guba criteria were used to validate the data [23]. Prolonged engagement of the researcher, sufficient participation and proper interaction with the participants and confirmation of the data by the participants (member check) helped to increase the credibility of the data. Dependability or stability of findings was provided through the use of colleagues' opinions (external check) and repeated reading of codes, classes and subclasses. Time triangulation and diversity of participants increased the reliability and confirmability of the data. The text of the interviews and the extracted codes and classes were

approved by two members of the faculty (peer check). Transferability or fittingness was made possible through the provision of quotes from participants for the rich explanation of data and scientific consultations with expert professors.

Findings

31 people, including 27 men and 4 women, with an mean age of 38 years and an mean work experience of 13 years participated in the study (Table 1).

Table1) Frequency distribution of demographic characteristics of the participants (n=31)

Demographic variables	No. (%)
Sex	
Male	28 (90.3)
Female	3 (9.7)
Age (years)	
25-30	5 (16.1)
31-35	11 (35.5)
36-40	7 (22.6)
Over 40	8 (25.8)
Work experience (years)	
2-5	2 (6.4)
6-10	8 (25.8)
Over 10	21 (67.7)
Education level	
Associate's degree	5 (16.1)
Bachelor's degree	15 (48.4)
Master's degree	7 (22.6)
General physician	1 (3.2)
Post Doc	3 (9.7)

Two main categories including professional performance (with 2 subcategories of triage requirements and challenges and functional deficiencies) and employee competence (with 4 subcategories of necessity for psychological recovery, professional competence improvement, technician skill improvement, and commitment and professional ethics) were identified (Table 2).

Table 2) Factors affecting the skill and efficiency of EMS staff in MCRTI
Categories , Subcategories , Codes

Professional performance
• Triage requirements and challenges
Unprincipled triage
Neglect of triage
Non-compliance with the triage protocol
Non-transfer based on triage
The need for the cooperation of relief organizations in triage
• Functional deficiencies
Inadequate EMS clinical skills
Inappropriate interaction of rescuers
The need for rescuers to interact
Need to retrain
Employee competence
• The necessity psychological recovery
Physical and mental fatigue
The necessity of maintaining the peace of relief workers
The need to reduce the psychological pressure of the injured
• Professional competence improvement
Need for mental preparation for EMS
The necessity of physical fitness
The necessity of professional competence for EMS
• Technician skill improvement
Applying the learned experiences
Inadequate skills of employees in busy routes
The necessity of innovation in services
Building trust with proper service
• Commitment and professional ethics
The need to preserve the dignity of the injured
Inadequate compliance with professional ethics

Professional performance: In this category, the subcategories of “the triage requirements and challenges” and “functional deficiencies” emerged.

• **Triage requirements and challenges:** In this subcategory, the codes of “unprincipled triage”, “neglect of triage”, “non-compliance with the triage protocol”, “no transfer based on triage”, and “the need for the cooperation of relief organizations in triage” appeared. Triage is the classification of patients based on the severity of injuries or illness. After evaluating the patient, the type of care he/she needs is determined. In triage, patients who need urgent care are prioritized. The EMS staff did not have the ability to make a decision in the triage of the injured when they were present at the scene due to the large number of injured and the prevailing atmosphere at the scene, and they classified the injured with red triage in the yellow group and after taking care and dispatching measures, they realized that they triaged wrongly. This has caused a delay in providing services to the injured who needed urgent services and has sometimes resulted in irreparable injuries, and they have sent injured people who did not need to be sent to the hospital, which has increased the workload and overcrowding of the emergency department.

“The personnel who arrive at the scene cannot do triage well, or if triage was done, they would transfer the injured who were in a better condition.” (Participant 8)

In triage, employees should focus only on the result and efficiency of the operation, regardless of individual feelings and characteristics. The most difficult decision is about the injured who, despite being alive and receiving medical measures, there is no hope of saving them, and by removing them, the chances of surviving and saving others will increase. *“In casualty triage, he/she gets a black tag, and his/her companions insist that we do life-saving measures for him/her. If we try to start CPR on this person, the lives of other victims who need immediate services will be at risk. We have to triage in the simulated scene to gain skill.”* (Participant 9)

• **Functional deficiencies:** In this subcategory, the codes of “inadequate EMS clinical skills”, “inappropriate interaction of rescuers”, “the need for rescuers to interact”, and “the need to retrain” appeared.

Inadequate clinical skills of relief workers were evident. The inability of EMS to perform critical care, especially opening the airway and stabilizing the spine, has caused irreparable injuries. For example, a technician who did not have the ability to open an injured person's airway has caused the patient to suffocate and die with a wrong action.

“My colleague had placed an LMA on the patient, but had not inflated the cuff. Another had it reversed, causing the patient to suffocate, while if the airway was in the same condition, the victim would have survived.” (Participant 7)

The need for the interaction of rescuers and the need for retraining were among the emerging codes. One of the ways to provide the human resources needed at the scene of the accident is to use the people present at the scene. In most cases, people at the scene of the accident prevent the relief organizations from providing services by causing crowding and disturbance. It is very difficult to prevent people from entering the scene of the accident, and the intervention of the security forces alone does not work. But the relief workers can turn this challenge into an opportunity by establishing proper interaction with the people and by teaching them general first aid and people-oriented management and using people's participation and take advantage of people's help and their potential to provide relief services.

“In the field of human resources, the most important challenges are people-oriented management and people's participation in the management of the incident scene. We failed to organize, educate and inform people in time to help us instead of disrupting and gathering.” (Participant 28)

Employee competence: In this category, the subcategories of “the necessity of psychological recovery”, “professional competence improvement”, “technician skill improvement”, and “commitment and professional ethics” emerged.

• **The necessity of psychological recovery:** Physical and mental fatigue of relief workers was one of the emerging codes. At the scene of accidents with mass casualties, the presence of a large number of people, the deterioration of the condition of the injured, and the unpredictability of the conditions make it difficult to provide services and put additional stress on the workers of relief organizations at the scene.

“We are under a lot of stress and we don't know about the situation. We do not know whether the rescue forces are present at the scene of the accident or not. There are agitated people on the scene and they lost their loved ones, and there are also people moving around. Therefore, the type of incident, the type of organs involved and the atmosphere of the scene can be involved in our stress.” (Participant 26)

The necessity of maintaining the peace of relief workers was another emerging code. One of the ways to reduce the stress of relief workers, especially medical emergency workers who are exposed to a lot of stress daily, is psychological recovery by holding psychological consultations.

“Because the pressures that are put on these people in accidents are very high, a good psychological recovery should be considered for them.” (Participant 18)

• **Professional competence improvement:** To improve professional competence, mental and physical preparation and professional capability are needed. The most important component of the pre-hospital emergency system is efficient and operational human resources that provide

emergency medical services in all types of accidents and diseases. Improving the knowledge and skills of this segment of the health system facilitates the provision of emergency care and improves professional competence. One of the reasons for the poor performance of emergency medical staff in providing pre-hospital trauma care is the lack of knowledge and skills related to trauma, which shows the need for professional empowerment in order to improve professional competence.

"Perhaps the mechanism of damage is such that they do not have external damage, but vital internal organs are in danger. The patient has symptoms of shock and symptoms related to trauma, the more knowledge we have in this field and the more studies we have, the more we will be able to do." (Participant 26)

- **Technician skill improvement:** One of the problems of emergency workers is their lack of skills on busy roads. Most of the Participants pointed out the large gap between the knowledge and skills of relief workers. In addition, relief workers gain a lot of experience in dealing with accidents over time, and they should benefit from these experiences. These workers can build trust in people by improving their skills and providing correct services.

"When people see that I start emergency treatment for someone who has a higher priority and get the ambulatory casualty out of the scene and am not confused, it gives them confidence and peace of mind." (Participant 24)

Considering the need to acquire different skills in different fields and the necessity of innovation in services, the interdepartmental training of relief organizations should be done in the form of scientific and practical workshops so that in addition to being aware of the performance of other organizations, they learn how to work with each other's equipment.

"We must have universal training, which means coordinated training programs between organizations. Red Crescent staff should learn to treat and emergency staff should learn to work with Red Crescent equipment to help each other in accidents." (Participant 31)

- **Commitment and professional ethics:** In addition to legal duties, emergency medical personnel have certain ethical responsibilities. They must fulfill their legal and moral responsibilities while taking care of the patient and maintain their dignity and status among the people and maintain their dignity and status among the people. Also, in case of negligence or failing in the legal duties that cause life, material and spiritual damage to the patient, they should be responsible for compensation for the damage caused by their actions according to the regulations. Preserving the dignity and privacy of the injured was one of the

emerging codes that was considered as an important moral issue.

"We must face the patient by respecting the moral values and be morally mature." (Participant 3)

Sometimes ethics are not observed at the scene of the accident and it causes the injured or their companions to complain. In this regard, the code of insufficient observance of professional ethics was raised.

"The first unpleasant thing for families when an accident happens is that women may not have proper clothes. Others may be taking pictures or filming, and our colleagues who arrive at the scene will fight with them." (Participant 23)

Discussion

This study was conducted qualitatively to determine the factors affecting the skills and efficiency of EMS staff in MCRTI and it is a new study. These factors appeared in the two categories of "professional performance" and "employee competence".

Professional performance is one of the skill and efficiency categories, which included subcategories of "the triage requirements and challenges" and "functional deficiencies". Triage requirements and challenges subcategory included codes such as "unprincipled triage", "neglect of triage", "non-compliance with the triage protocol", "no transfer based on triage", and "the need for the cooperation of relief organizations in triage".

Triage, as one of the most important skills of the EMS staff, has not been done well, so that the red casualties have been placed in the yellow (delayed) group, which has resulted in irreparable injuries to the casualties. In the present study, unprincipled triage code appeared in the data. In this regard, a study on the accident of the Iraqi pilgrims' bus showed that due to the lack of a recall plan and protocol, relief organizations were not dispatched at the same time. Crowding of people, traffic, and filming of some people present at the scene disturbed the evaluation of the scene, so that after the end of the rescue services, a 12-year-old child was found at the scene of the accident. The process of triage of the injured was complicated due to the intervention of those present at the scene, so that the injured of the green triage group were transferred to the hospital with a red label [24]. In the present study, the codes of non-compliance with the triage protocol and non-transfer based on triage also appeared. Another study showed that due to the collapse of the stadium roof and lack of access to the scene, EMS staff could not obtain accurate information on the number of injured, the type of injury, and the mechanism of injury. The absence of the incident command post and the lack of coordination between the relief organizations caused that no measures were taken to triage the patients at the scene, the information of the injured

was not recorded, and there was no specific plan to transfer the injured to medical centers [25].

In the present study, as in the above study, the triage neglect code appeared. Also, the evaluation of the accident scene in the Yurt mine explosion showed that the response plan, the command structure and the support of the scene were not successful [26]. In contrary of these studies, in a study, the emergency medical center checked the information of the scene of the accident including the number of injured, the severity of the injury, the number of vehicles involved, the mechanism of damage and the safety of the scene, and rescue teams and equipment were sent to the scene according to the needs. Triage was performed at the scene of the accident and the injured were classified according to the severity of the injury and were transferred to the nearest medical centers based on priority [27]. In the Yurt mine explosion, primary triage was performed at the scene, people with serious problems were transferred to the triage site 15 meters away from the mine opening, contaminated clothes were removed by local people and rescue forces, and secondary triage was performed by a doctor on site. Then the patients were transferred to the district hospital with the coordination of the triage officer. Triage in the mine explosion incident was effective in evacuating the injured in the early hours [26]. Therefore, triage is an essential skill for emergency medical personnel. Scene congestion and inadequate EMS skills lead to inappropriate triage. Scene congestion and inadequate EMS skills lead to inappropriate triage [24].

Functional deficiencies emerged as the second subcategory of employee skill and efficiency in the data obtained from the present qualitative study, which included the codes of "inadequate skills", "inappropriate interaction", "the need for appropriate interaction", and "the need for retraining".

Performing correct and timely treatment-care measures accelerates the provision of medical services to the injured at the scene of the accident. When the number of injured people is high and their injuries are severe, the role of skill, experience and competence of emergency medical workers and other workers of relief organizations will be more visible. In the golden opportunity, the skill of performing medical measures to preserve the life of the injured, such as the skill of cardiopulmonary resuscitation, opening the airway, stabilizing the spine and controlling bleeding, prevents the death and disability of the injured. EMS inability to perform critical care at the scene of the accident has resulted in irreparable injuries. Inadequate clinical skill was one of the codes that emerged in the present study. The results of Shakri *et al.*'s study to evaluate the knowledge and skills of emergency medical technicians in dealing with trauma victims showed that although most of the participants

(62.4%) had sufficient skills in caring for trauma patients, 37.6% had average skills [18]. Also, Abbasi *et al.*'s study showed that 39.7% of employees had sufficient knowledge and skills about triage and nuclear medicine [17]. In this regard, the results of Parsa Yekta *et al.*'s study showed that experience is a dynamic concept. In other words, if a person wants to learn and improve his clinical skills, he should take an active role in gaining experience [28].

In the present study, the code of necessity of retraining emerged. Similar to the results of the present study, the result of Wehbi *et al.*'s study showed that many EMS providers need training to maintain or improve their clinical and non-clinical skills. Many emergency personnel may not have much time to handle complex or challenging cases that require emergency care. Therefore, it is necessary to develop educational programs to create capacity and respond to emergency needs [29].

Another category was the employee competence, which emerged with four subcategories including the necessity of psychological recovery", "professional competence improvement", "technician skill improvement", and "commitment and professional ethics".

In this study, the deterioration of the condition of the injured and the unpredictability of the scene conditions have created additional stress for the emergency medical technicians and it is necessary for them to undergo psychological recovery. In line with our results, Donnelly and Bennett in their study find exposure to mass casualty incidents stressful for EMS workers [30]. Mahoney's study showed that mental distress in EMS employees is not only due to exposure to traumatic events, but also comes from the way the organization reacts at the managerial and organizational level [31].

The weak skill of the employees has shown the need to improve the professional competence of the technicians. By improving the skills and competence of the workers of relief organizations, especially the medical emergency workers, the quality of their services at the scene of the accident will increase. Holding educational workshops improves the performance of relief organization employees. Said *et al.*'s study in Malaysia showed that EMS workers have sufficient knowledge and skills in emergency alerting, scene assessment, and patient evaluation. However, they do not have the necessary knowledge and skills in invasive methods such as drug administration [32]. Kumar *et al.*'s study showed that the performance score of participants in pre-hospital and emergency care was lower than the average [33]. Studenk *et al.* examined the relationship between performance at the scene of an accident and in simulated stations and theory exams in the United States. The results showed that among 133 participants, 96% and 32% obtained an acceptable score in practice and theory, respectively [34]. Also, similar to the results of the present study, the results

of the study to evaluate the skills of pediatric resuscitation using mannequins by emergency paramedical staff, showed that the participants in many cases including airway care, ventilation, correct use of tubes, calculation and prescription medicines and fluids were problematic [35]. Nevertheless, the study by Kumar *et al.* showed that emergency medical workers do not have enough knowledge and skills and need continuous in-service training [33].

Commitment and professional ethics, as one of the emerging subcategories in the category of professional competence, includes many concepts such as empathy, honesty, commitment, behavior and ethics of care service providers [36]. The study of Ebadi and Fouten showed that emergency medical workers, with a sense of responsibility in performing their duties, provide higher quality services for the injured. Emergency medical staff manage the accident scene with their competence and expertise and provide their services at the scene [10]. Ford *et al.*'s study showed that the participants describe the professional competence of their team very favorably [37]. Kilner recommends that professional competence be considered when hiring emergency medical staff [38].

The results of the study indicate that in pre-hospital services in accidents, emergency medical workers must acquire the necessary skills and efficiency so that the least injuries and deaths occur. In case of proper pre-hospital care and appropriate triage of the injured, hospital care is also facilitated. Therefore, proper triage, cooperation of other relief organizations, proper interaction, psychological recovery, retraining, improving the professional competence and practical skills of technicians, as well as adherence to the obligations and professional ethics of these employees seem essential. Providing emergency services to save the lives of the injured in accidents requires skilled people. Medical emergency workers are responsible for clinical care in emergency situations based on independent judgment, decision-making skills and prioritizing interventions. Medical emergency workers should be scientifically upgraded and have appropriate physical and mental conditions in order to have the necessary efficiency in high-stress situations of accidents with a large number of injured people.

One of the limitations of the current research was the lack of answering the phone to continue the interview, in which case we asked the questions to other participants. One of the strengths of this study was the use of the experiences of EMS workers in four provinces of the country, who had experienced traffic accidents with many casualties due to the high traffic of passenger buses. It is suggested to investigate the effect of computer simulation and operational training on the skill and efficiency of emergency medical workers in future studies.

Conclusion

The skill and efficiency of EMS staff in MCRTI are affected by the challenges in triage and the functional deficiencies. One of the reasons for the poor performance of EMS staff in providing pre-hospital trauma care is the lack of knowledge and skills related to trauma. Improving the knowledge and skills of this segment of the health system facilitates the provision of emergency care. The deterioration of the condition of the injured and the unpredictability of the scene conditions have created additional stress for the emergency medical technicians and it is necessary for them to undergo psychological recovery. Having adequate professional scientific and practical skills, observing ethical values and trying to improve professional qualifications will improve the competence of employees. By general first aid training, people-oriented management and the use of people's participation, the potential of people can be used to provide relief services.

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Ethical Permissions: This study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences in Yazd with code IR.SSU.SPH.REC.1397.020. Written consent was obtained from the study participants. Confidentiality and the right to withdraw from the research at any time and in any part of the study were informed to the participants. The interview time was determined according to the wishes of the participants.

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References

- 1- Ardalan A, Khankeh H, Mehrabi Tavana A, Nejati A, Masoumi G. Textbook of health in emergencies and disasters. 1st Edition. Tehran: Mehr-e Ravash; 2016. [Persian]
- 2- Alazmy W, Samarkandi O, Williams B. The history of emergency medical services response to mass casualty incidents in disasters, Saudi Arabia. *J Emerg Medi Trauma Acute Care*. 2020;2020(1):1-10.
- 3- Hylander J, Saveman B-I, Björnstig U, Gyllencreutz L, Westman A. Time-efficiency factors in road tunnel rescue as perceived by Swedish operative personnel—an interview study. *Int J Emerg Serv*. 202;11(2):312-24.
- 4- World Health Organization. Global status report on road safety 2018 [Internet]. Geneva, World Health Organization; 2018 [Cited 2020 Feb 28]. Available from: <https://www.who.int/publications/i/item/9789241565684>.

- 5- Mehmood A, Rowther AA, Kobusingye O, Hyder AA. Assessment of pre-hospital emergency medical services in low-income settings using a health systems approach. *Int J Emerg Med.* 2018;11(1):53.
- 6- Chou C-C, Chiang W-C, Chen AY. Emergency medical response in mass casualty incidents considering the traffic congestions in proximity on-site and hospital delays. *Transport Res Part E Logist Transport Rev.* 2022;158:102591.
- 7- Henry JA, Reingold AL. Prehospital trauma systems reduce mortality in developing countries: a systematic review and meta-analysis. *J Trauma Acute Care Surg.* 2012;73(1):261-8.
- 8- Dadashzadeh A, Dehghannejhad J, Shams Vahdati S, Soheili A, Sadeghi Bazarghani H. The nature of prehospital medical interventions delivered to traumatic patients in Tabriz. *Nurs Midwifery J.* 2017;15(3):159-67. [Persian]
- 9- Hagiwara MA, Nilsson L, Strömsöe A, Axelsson C, Kängström A, Herlitz J. Patient safety and patient assessment in pre-hospital care: a study protocol. *Scand J Trauma Resusc Emerg Med.* 2016;24(1):14.
- 10- Ebadi A, Froutan R. Positive coping: a unique characteristic to pre-hospital emergency personnel. *Electronic Physician.* 2017;9(1):3575-83.
- 11- Khorasani-Zavareh D, Mohammadi R, Bohm K. Factors influencing pre-hospital care time intervals in Iran: a qualitative study. *J Inj Violence Res.* 2018;10(2):83-90.
- 12- Goniewicz K, Goniewicz M. Disaster preparedness and professional competence among healthcare providers: Pilot study results. *Sustainability.* 2020;12(12):4931.
- 13- Aliakbari F, Aein F, Bahrami M. Assessment competencies among emergency nurses for responding in disaster situation with Objective Structured Clinical Examination. *J Health Promot Manag.* 2014;3(3):47-57. [Persian]
- 14- Raeisi AR, Mohajervatan A, Mehraein Nazdik Z. Mass casualty response to mine explosion: a case report in Iran. *Health Emerge Disast Q.* 2019;4(3):173-8.
- 15- Bøtker MT, Bakke SA, Christensen EF. A systematic review of controlled studies: do physicians increase survival with prehospital treatment? *Scand J Trauma Resusc Emerg Med.* 2009;17(1):12.
- 16- Hyde P, Mackenzie R, Ng G, Reid C, Pearson G. Availability and utilisation of physician-based pre-hospital critical care support to the NHS ambulance service in England, Wales and Northern Ireland. *Emerg Med J.* 2012;29(3):177-81.
- 17- Abbasi E, Nosrati A, Nabipour I, Emami SR. Assessment of the level of knowledge of Physicians in Bushehr Province about preparedness and response for nuclear emergency. *Iran South Med J.* 2005;7(2):183-9. [Persian]
- 18- Shakeri K, Fallahi Khoshknab M, Khankeh H, Hosseini MA, Hoseinzadeh S, Haghi Monie N. Evaluation of clinical skills of medical emergency personnel in Tehran emergency center confronting the trauma. *J Health Promot Manag.* 2012;1(4):16-24. [Persian]
- 19- Heidari T, Zainat Motlagh S, Afrasiabifar A, Hosseini N, Fooladi M. Facilitators and inhibitors of self-care behaviors among the Iranian patients with type 2 diabetes: A qualitative research. *J Clin Care Skills.* 2021;2(4):187-94.
- 20- Elo S, Kääriäinen M, Kanste O, Pölkki T, Utriainen K, Kyngäs H. Qualitative content analysis: A focus on trustworthiness. *SAGE open.* 2014;4(1):1-10.
- 21- World Health Organization. Hospital safety index: Guide for evaluators. 2nd Edition. Washington D.C.: WHO, PAHO; 2019.
- 22- Burns N, Grove SK. Understanding nursing research-eBook: Building an evidence-based practice. 5th Edition. Maryland Heights, Missouri: Elsevier Health Sciences; 2010.
- 23- Streubert HJ, Carpenter DR. Qualitative research in nursing: Advancing the humanistic imperative. 4th Edition. Lippincott Williams & Wilkins; 2011.
- 24- Keykaleh MS, Sohrabizadeh S. The Emergency Medical System (EMS) response to Iraqi pilgrims' bus crash in Iran: a case report. *BMC Emerg Med.* 2019;19(1):38.
- 25- Cha M-I, Kim GW, Kim CH, Choa M, Choi DH, Kim I, et al. A study on the disaster medical response during the Mauna Ocean Resort Gymnasium collapse. *Clin Exp Emerg Med.* 2016;3(3):165-74.
- 26- Raeisi AR, Mohajervatan A, Mehraein Nazdik Z. Mass casualty response to mine explosion: a case report in Iran. *Health in Emergencies and Disasters.* 2019;4(3):173-8.
- 27- Lee HY, Lee JI, Kim OH, Lee KH, Kim HT, Youk H. Assessment of the disaster medical response system through an investigation of a 43-vehicle mass collision on Jung-ang expressway. *Accid Anal Prev.* 2019;123:60-8.
- 28- Parsa Yekta Z, Ahmadi F, Tabari R. Factors defined by nurses as influential upon the development of clinical competence. *J Guilan Univ Med Sci.* 2005;14(54):9-23. [Persian]
- 29- Wehbi NK, Wani R, Yang Y, Wilson F, Medcalf S, Monaghan B, et al. A needs assessment for simulation-based training of emergency medical providers in Nebraska, USA. *Adv Simul.* 2018;3(1):22.
- 30- Donnelly EA, Bennett M. Development of a critical incident stress inventory for the emergency medical services. *Traumatol Int J.* 2014;20(1):1-8.
- 31- Mahony K. Restructuring and the production of occupational stressors in a corporatised ambulance service. *Health Sociol Rev.* 2005;14(1):84-96.
- 32- Said MN, Sukonthasarn A, Wangsrikhun S, Chanpransit C. Assessing and exploring the competency of prehospital emergency medical service personnel in Klang Valley, Malaysia: A mixed method approach. *Int Med J Malaysia.* 2014;13(2):7-19.
- 33- Kumar S, Agarwal AK, Kumar A, Agrawal G, Chaudhary S, Dwivedi V. A study of knowledge, attitude and practice of hospital consultants, resident doctors and private practitioners with regard to pre-hospital and emergency care in Lucknow. *Indian J Surg.* 2008;70(1):14-8.
- 34- Studnek JR, Fernandez AR, Shimberg B, Garifo M, Correll M. The association between Emergency Medical Services field performance assessed by high-fidelity simulation and the cognitive knowledge of practicing paramedics. *Acad Emerg Med.* 2011;18(11):1177-85.
- 35- Lammers RL, Byrwa MJ, Fales WD, Hale RA. Simulation-based assessment of paramedic pediatric resuscitation skills. *Prehosp Emerg Care.* 2009;13(3):345-56.
- 36- Tavares W, Bowles R, Donelon B. Informing a Canadian paramedic profile: framing concepts, roles and crosscutting themes. *BMC health Serv Res.* 2016;16(1):477.
- 37- Ford R, Webb H, Allen-Craig S, Goodwin V, D'Antonio J, Lofts C. A simulated wilderness exercise: the development of relational competence in paramedic students. *Int J Paramed Pract.* 2015;5(11):14-21.
- 38- Kilner T. Desirable attributes of the ambulance technician, paramedic, and clinical supervisor: findings from a Delphi study. *Emerg Med J.* 2004;21(3):374-8.