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Challenges of Triage in Mass Casualty Incidents from the Perspective of Emergency medical technicians: A Qualitative Content Analysis Study

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Abstract

Introduction: Emergency medical technicians (EMT) face numerous challenges when triaging casualties in mass casualty incidents (MCIs), which may adversely affect their professional performance. Accordingly, the present study was conducted to elucidate the challenges of triage in MCIs from the perspective of emergency medical technicians in southern Iran.

Methods: This qualitative study employed a conventional content analysis approach. Data were collected through 18 semi-structured interviews with 18 emergency medical technicians. Data analysis was performed using the Graneheim and Lundman content analysis method.

Results: Analysis of the data resulted in the extraction of four main categories and nine subcategories. The identified themes and subthemes included deficiencies in the communication system (insufficient professional competencies of operators; infrastructural shortcomings), inadequacy of organizational resources (inefficiency of human resources; insufficiency of physical resources), ineffective on-scene management (intra-organizational management challenges; inter-organizational management challenges), and deficiencies in the sociocultural context (crowd gathering and congestion; interference in technicians' decision-making; public emotional reactions and violence).

Conclusion: The findings of the present study indicate that the challenges of triage in MCIs are extensive and multidimensional. From the perspective of personnel, the most critical barriers include deficiencies in communication systems, inadequacy of organizational resources, ineffective on-scene management, and shortcomings in the sociocultural context. These factors impose an additional psychological burden on emergency medical technicians. Overall, the identified challenges operate within an interconnected causal network, such that weakness in any single component adversely affects the others and ultimately disrupts the performance of emergency medical technicians in carrying out accurate and systematic triage at the scene. Senior emergency medical service managers are advised to use the findings of this study for strategic planning and policy making aimed at addressing the challenges affecting triage in MCIs and to implement appropriate measures to mitigate these issues.

Introduction

Prehospital emergency care comprises a system of personnel, facilities, and equipment designed to provide effective, coordinated, and timely care to victims and to transfer them to the nearest appropriate medical center. This system plays a vital role in reducing mortality and improving patient outcomes in emergencies, particularly in traffic accidents and mass casualty incidents (1,2). Timely response and rapid patient assessment by emergency medical technicians, facilitated through appropriate and effective triage, are of paramount importance (3,4).

The primary objective of prehospital emergency services is the rapid stabilization of patients and their safe transfer to suitable healthcare facilities for further treatment. Achieving this objective requires emergency medical personnel to possess strong triage competencies and sound clinical decision-

making skills, enabling them to deliver optimal care under unpredictable conditions and within limited timeframes (5). Proper triage can facilitate appropriate patient referral, reduce mortality rates, improve the quality of healthcare services, maximize the utilization of available resources, reduce costs, and minimize time wastage (6).

One of the most critical and essential responsibilities of emergency services is the triage and prioritization of patients in mass casualty incidents (MCIs) (7). According to the World Health Organization, MCIs are defined as events in which the number of casualties exceeds the response capacity and available resources of the affected area, including personnel, equipment, and time. These incidents vary in nature and cause and are categorized accordingly, with each category presenting distinct challenges for prehospital emergency systems (8).

In a systematic review, Dolatabadi et al. (2022) concluded that one of the major challenges in prehospital triage is the lack of a precise and efficient triage model or system (9). Bijani et al. (2024) identified overcrowding, resource limitations, communication barriers, and inconsistencies in training and implementation as key challenges in triaging patients in emergency departments. They emphasized that investment in standardized training, integration of advanced technologies, and strengthening communication strategies are essential to address these challenges (10).

In a review study, Baziyar et al. (2020) highlighted that the diversity and multiplicity of triage systems contribute to confusion among emergency technicians when prioritizing casualties (11). Thompson et al. (2017) conducted a descriptive study aimed at identifying barriers to effective triage implementation in MCIs in teaching hospitals in New York. The study included 100 emergency nurses and physicians. The findings indicated that the most significant barriers from the participants' perspective were staff shortages, insufficient physical space, deficiencies in communication systems, inadequate training, and the absence of comprehensive and standardized triage protocols for MCIs (12).

Background in Iran

The emergency care department was first established in Tehran, Iran, in 1975, marking the beginning of prehospital emergency care in the country. Thereafter, emergency care departments gradually expanded to other cities. At present, 3,200 emergency centers are operational nationwide. Personnel working in prehospital emergency care typically hold either an associate degree or a bachelor's degree in the relevant field. In addition, nurses with bachelor's or master's degrees may also serve in prehospital emergency care. Each shift is required to have a minimum of two staff members on duty. Moreover, prehospital emergency care systems employ only men, and no female personnel are recruited.

A review of the literature indicates that relatively few studies have employed qualitative approaches to elucidate the challenges of triage in mass casualty incidents (MCIs) from the perspective of emergency medical technicians. To achieve a comprehensive understanding of this concept and identify its multiple dimensions, qualitative methodologies can be particularly valuable, as they enable researchers to

explore phenomena within their cultural context through the perspectives of individuals with substantial experiential knowledge of the subject (10).

The primary aim of qualitative research is to explore and interpret human experiences, recognizing that each individual's perception of reality is shaped by unique lived experiences. By immersing themselves in participants' experiential worlds, researchers can gain nuanced insights into the phenomenon under investigation from the participants' viewpoints.

Accordingly, a qualitative approach was adopted in the present study to elucidate the challenges of triage in MCIs from the perspective of emergency medical technicians, with a focus on identifying the challenges they encounter and achieving an in-depth understanding of these issues. Without a thorough understanding of the experiences of emergency medical technicians in triaging casualties during MCIs, it is not possible to adequately understand these challenges or propose effective solutions. Therefore, the present study was conducted with the aim of elucidating the challenges of triage in MCIs from the perspective of emergency medical technicians in southern Iran.

Methods

Design

The present study employed a descriptive qualitative design, which is an appropriate approach for exploring a research question and examining how individuals understand a particular phenomenon (13, 14). This design is especially useful when knowledge of a given population's perceptions of a concept is limited, because it enables researchers to develop a deeper understanding of human experience within its specific context (15).

Setting

the participants in this study were 18 pre-hospital EMS personnel working in the Fasa emergency center in Fars Province, southern Iran.

Inclusion and Exclusion Criteria:

The inclusion criteria were at least one year of work experience in pre-hospital emergency services and prior experience in triaging casualties in mass casualty incidents (MCIs). The exclusion criterion was unwillingness to continue participation in the study for any reason.

Participants and sampling

No formal relationship existed between the researchers and the participants before the study commenced. The study participants comprised 18 pre-hospital EMS personnel who were recruited

through purposive sampling followed by snowball sampling. To prevent networking bias, we initiated multiple independent recruitment chains starting from different EMS stations, rather than relying on a single referral pathway. The first participant was purposefully selected based on their vast clinical experience in pre-hospital triage and their ability to provide rich, descriptive data regarding the challenges of MCIs. The first participant was then asked to identify a colleague with substantial knowledge of and experience in the topic under investigation. In this way, additional participants with a strong understanding of the study topic were selected on the basis of information provided by previously recruited participants. Sampling continued until data saturation was reached. In this study, after sixteen interviews, Data Saturation was achieved, and two more interviews were conducted to confirm the absence of new data.

Data collection

Data were gathered through 18 semi-structured, individual, in-depth interviews conducted between September 2025 and March 2026. Before the formal interviews, the research team provided a detailed explanation of the study objectives, the anticipated length of the interviews, and the measures in place to protect privacy. All interviews were audio-recorded. The interviews were conducted face-to-face in the EMS conference room at times convenient for the participants. The corresponding author (MA), an associate professor of nursing with extensive experience in qualitative research, conducted all interviews. The interview guide was developed on the basis of the research team's perspectives and the available literature. Each interview, lasting approximately 45–90 minutes, began with general questions such as "How long is your work experience?" and "Can you describe a typical day at your work?". Thereafter, more focused questions aligned with the study aim were posed. These included:

- • Based on your experience, what challenges do emergency medical technicians encounter when triaging casualties in mass casualty incidents (MCIs)?
- • What competencies or skills are required for emergency medical technicians to effectively perform triage of casualties in MCIs?
- • Based on your experience, what strategies do you propose to address the challenges faced by emergency medical technicians in triaging casualties during MCIs?

All interviews were conducted in accordance with the main aim of the study. In addition, follow-up questions were used to clarify participants' responses, for example: "Can you elaborate on that point?", "What do you mean by that?", and "Can you give an example or describe your own experience?"

Data analysis

The data were analyzed using Graneheim and Lundman's method (2004), which involves five stages: 1. transcription of the recorded interviews; 2. careful review of the transcripts to identify both manifest and latent elements of the discourse, enabling the researcher to become immersed in the data and develop a comprehensive understanding of participants' perspectives; 3. repeated reading of the transcripts to

identify meaning units, which were extracted as sentences or paragraphs from the interview statements and texts; 4. formulation of initial or open codes from the meaning units. This stage involved reading each interview text several times, extracting key sentences, and recording them as codes. Related codes were then clustered into subcategories according to similarity; 5. integration of subcategories to form the final themes.

Accordingly, before coding began, each interview transcript was read repeatedly to ensure a thorough understanding of its content. After this preliminary review, the text was examined carefully to identify meaning units, which were then assigned specific codes. Throughout the coding process, the broader context was consistently taken into consideration. A consolidated code list was prepared and, through semantic review and analysis by comparing similarities and differences, these codes were organized into distinct subcategories. The emerging categories and subcategories were then discussed, refined, and confirmed by the research team (16). Three members of the research team manually analyzed the interviews through iterative coding and thematic analysis. Whenever disagreements occurred among coders, review sessions were held, during which discrepancies were resolved through group discussion and by returning to the raw data until consensus was reached.

Rigor (trustworthiness of the data)

To evaluate the quality of the data collected, Lincoln and Guba's criteria, credibility, transferability, dependability, and confirmability, were applied (17). To satisfy these criteria, sufficient time was devoted to data collection and repeated examination, a heterogeneous sample was ensured, and consensus regarding coding and code extraction was reached among the research team. Moreover, the findings were reviewed with participants to verify accuracy, and the data analysis process, together with the coding approach, was examined in consultation with two faculty members familiar with the research topic. To strengthen confirmability, participants were asked to confirm the accuracy of the identified categories and subcategories. The participants' characteristics and the interview procedures were described in detail to enhance the transferability of the findings. Furthermore, the researchers restricted textual review in order to reduce bias during interview conduction, analysis, and coding, thereby improving data validity. In addition, during data collection and analysis, the researchers employed bracketing. Bracketing is a qualitative research technique used to minimize the effects of preconceptions, which may otherwise compromise the research process.

Ethical considerations

All participants provided written informed consent before taking part in the study. The study was conducted in accordance with the principles of the revised Declaration of Helsinki, which sets out ethical guidelines for medical research involving human participants. Participants were assured that their information would remain anonymous and confidential. In addition, the study was approved by the

Institutional Research Ethics Committee of Fasa University of Medical Sciences, Fasa, Iran (Ethical Code: IR.FUMS.REC.1404.138).

Results

The participants had a mean age of 33.78±6.00 years, and their mean work experience was 9.56 ± 4.41 years. Further demographic characteristics are presented in Table 1.

The factors and challenges associated with triage in mass casualty incidents (MCIs) in prehospital emergency care were classified into four main categories and nine subcategories. These included deficiencies in the communication system (insufficient professional competencies of operators; infrastructural shortcomings), inadequacy of organizational resources (inefficiency of human resources; insufficiency of physical resources), ineffective on-scene management (intra-organizational management challenges; inter-organizational management challenges), and deficiencies in the sociocultural context (crowd gathering and congestion; interference with technicians' decision-making; public emotional reactions and violence).

Theme 1: Deficiencies in the Communication System

Deficiencies in the communication system emerged as one of the primary and most fundamental themes identified from the experiences reported by the majority of participants. This category comprised two subcategories: insufficient professional competencies of operators, including inadequate knowledge, limited experience, delayed decision-making, stress and anxiety, and insufficient familiarity with geographic locations; and infrastructural shortcomings, such as the absence of an integrated communication network, insufficient dispatch communication lines, lack of Asayar network coverage under certain conditions, absence of radio communication (walkie-talkies) in ambulances and at the scene, and lack of GPS systems.

1.1. Insufficient Professional Competencies of Operators

In this regard, one participant stated:

"*In one mission, a dispatch staff member instructed us to respond to an incident involving several casualties. However, upon arrival at the scene, we were confronted with a very large number of injured individuals. Unfortunately, due to insufficient professional competence, knowledge, and skills, the dispatch personnel had been unable to obtain comprehensive information and had provided incomplete details to the operational team*." (Participant 10)

Another participant reported:

"*At the scene of a bus rollover, the dispatch operator was unfortunately unable to make prompt and accurate decisions or coordinate effectively. When I spoke with him, it became clear that he lacked experience and was overwhelmed. I could sense fear and anxiety in his voice. He was unable to perform*

proper and systematic triage. For example, he did not know what vehicles were involved, how many casualties there were, or what level of support needed to be dispatched." (Participant 4)

1.2. Infrastructural Shortcomings

Another subcategory of communication system deficiencies was infrastructural limitations, which many participants identified as a major barrier to effective scene management and patient triage in MCIs. In some cases, technicians were forced to leave the scene in order to establish communication with the dispatch center and request additional resources, thereby interrupting or delaying the triage process.

In this regard, one participant stated:

"*When we arrived in the village after the earthquake, neither the base station phone nor our mobile phones had network coverage. We were unable to establish communication, so we had to travel about five kilometers away, leaving the patients behind, just to contact dispatch. In other words, there was no stable communication infrastructure that would allow us to remain on-site and conduct triage*." (Participant 11)

Another participant noted:

"*As we approached the scene, we needed additional support and had to coordinate with dispatch. Unfortunately, neither the radio nor the Asayar network had coverage, so we had to move about one kilometer away to make contact. There was no relay system or communication tower available to allow us to stay in place*." (Participant 15)

Theme 2: Inadequacy of Organizational Resources

Inadequacy of organizational resources was another major category of challenges in triage during MCIs, comprising two subcategories: inefficiency of human resources and insufficiency of physical resources.

2.1. Inefficiency of Human Resources

Regarding human resource inefficiency, one participant described their first encounter with a mass casualty scene as follows:

"*When we entered the scene, my colleague and I were alone, facing a large number of casualties. There was chaos, foggy weather, and distressed family members pulling us toward their injured relatives. My heart rate increased; I was frightened and did not know where to begin. My hands were shaking, and out of fear, I forgot to perform triage properly and did it inadequately. At that moment, I realized that what we are taught at university is very different from real-world conditions, and in emergency services, we face a shortage of trained triage officers who can effectively manage the scene*." (Participant 9)

2.2. Insufficiency of Physical Resources

For several years, the prehospital emergency system has been operating with an aging fleet while providing services during accidents and disasters. In addition to the deterioration of ambulances, there is a severe shortage of vehicles. Nearly all participants identified the lack of ambulances as one of the most critical challenges affecting triage in MCIs.

In this regard, one participant stated:

"*Because the ambulance at the neighboring base was out of service, their workload was transferred to us, expanding our coverage area. This out-of-area mission and the long response time led to public dissatisfaction. People were complaining, saying we arrived late, and when we did arrive, we came with only one ambulance*." (Participant 7)

Theme 3: Ineffective On-Scene Management

Ineffective on-scene management was another key challenge influencing triage in MCIs from the participants' perspective. This category comprised two subcategories: intra-organizational management challenges and inter-organizational management challenges. Factors such as the absence of a unified command structure at the scene, inadequate emergency drills conducted by prehospital services, lack of pre- and post-incident coordination meetings, absence of unified leadership among all responding agencies, and inter-agency disagreements regarding roles and responsibilities were identified as major challenges affecting effective triage in MCIs.

3.1. Intra-organizational Management Challenges

The absence of a unified command structure within the prehospital emergency system was identified as a key factor contributing to ineffective on-scene management. Many participants emphasized the lack of a single commanding authority whose directives would be followed by all personnel and who could alleviate the psychological burden and individual responsibility borne by technicians. The presence of a unified incident commander at the scene enhances coordination, reduces operational chaos, and ultimately improves the speed and accuracy of triage performed by the triage team.

One participant, who arrived first at the scene and was performing triage as the triage officer, described the experience as follows:

"*After some time, the backup units (additional ambulances) arrived at the scene. I instructed them to transport a specific casualty, but unfortunately, one of my colleagues stated that he would not transfer the patient because the patient's condition was too critical. In the absence of a unified command at the scene, patient prioritization becomes disrupted, rendering the triage process ineffective and leading to disorder and increased mortality among patients*." (Participant 3)

3.2. Inter-organizational Management Challenges

Another subcategory of ineffective on-scene management was inter-organizational management challenges. Many participants identified the lack of coordinated inter-agency management as a major barrier to effective triage in MCIs. The absence of a unified command structure across all responding agencies was frequently cited as a critical issue.

Referring to a bus rollover incident, one participant stated:

"*Almost all emergency response units were present at the scene, and everyone was giving different instructions. They were even telling us to transfer deceased individuals. Decisions were changing from moment to moment, and the situation had become chaotic. If a trained individual had been in charge, someone whose authority was recognized by all operational organizations, patient triage would have been conducted more effectively, and the scene would have been managed appropriately*." (Participant 3)

Theme 4: Deficiencies in the Sociocultural Context

Deficiencies in the sociocultural context constituted another major category of challenges in triage during MCIs. This category comprised three subcategories: public crowding and congestion, interference with technicians' decision-making, and public emotional responses and violence.

4.1. Public Crowding and Congestion

One of the primary challenges reported by most emergency medical technicians was obstruction of access routes, which delayed ambulance arrival at the scene. Participants indicated that this blockage was often caused by bystanders parking their vehicles before and after the incident site out of curiosity or to record videos. Such obstruction of entry and exit routes represents a sociocultural challenge that significantly affects triage processes in MCIs.

In this regard, one participant, referring to an incident that occurred on Sizdah Bedar, stated:

"*The route to the scene was completely blocked. We drove as close as possible with the ambulance, but I eventually had to run nearly one kilometer carrying the jump bag and triage kit. When I arrived, people were complaining, asking where the ambulance was. I was alone, exhausted from running that distance, and this led to delays in providing care to the injured*." (Participant 13)

4.2. Interference with Technicians' Decision-Making

Another subcategory of sociocultural challenges was interference with clinical decision-making by bystanders, which was frequently reported by participants. This interference disrupted the triage process and compromised the technicians' concentration.

One participant explained:

"*At the scene of a bus rollover in foggy conditions, while I was triaging patients, one of the relatives grabbed my hand and pulled me toward their own patient. No matter how much I asked them to wait, they refused.*

Eventually, I had to interrupt triage and attend to that patient, which halted the triage process and disrupted my concentration for assessing the remaining casualties." (Participant 4)

4.3. Public Emotional Reactions and Violence

Another critical challenge related to sociocultural deficiencies was the threat of violence against technicians, including threats with weapons. According to participants, such threats were typically made by relatives of the injured. In these situations, technicians were compelled to abandon triage activities to ensure their own safety, which disrupted the sequence and integrity of the triage process.

One participant stated:

"*During a bus rollover in a mountainous area, my colleague and I were triaging patients when family members began shouting loudly, which distracted us. This made it difficult to hear patients who needed help and consequently delayed their transfer to medical centers. As a result, our triage was performed with less accuracy, and we had to spend more time assessing patients*." (Participant 9)

Physical assaults against personnel were also reported as a significant sociocultural challenge affecting triage in MCIs.

One participant described the experience as follows:

"*While we were triaging patients at the scene, several individuals, who appeared to be intoxicated, approached us aggressively, spoke disrespectfully, pushed us, and grabbed my colleague by the collar. I had to intervene to prevent harm to my colleague. In such situations, as a technician, instead of focusing on triage, I must prioritize protecting my own safety to avoid injury*." (Participant 7)

Discussion

Deficiencies in the communication system emerged as one of the principal categories in the present study, encompassing the greatest number of codes and subcategories. Within this domain, the identified shortcomings fell into two main subcategories: deficiencies in dispatch operators' professional competencies and infrastructural limitations. The findings indicated that limited knowledge and experience among dispatch operators, delays in decision-making, elevated stress and anxiety, and insufficient familiarity with geographic locations were among the most prominent manifestations of operator-related deficiencies. In parallel, the absence of an integrated communication network and the lack of signal coverage under certain conditions were identified as key infrastructural barriers, both of which substantially complicated the triage process during mass casualty incidents (MCIs). Overall, the findings underscore that inadequate knowledge, limited experience, and heightened stress and anxiety among dispatch personnel play a critical role in shaping the effectiveness of operational triage in MCIs.

Professional inefficiency among dispatch operators was identified by participants as a significant factor affecting triage in mass casualty situations. Based on participants' experiences, the dispatch unit

functions as the central intelligence and command hub of prehospital emergency services. However, when personnel who lack the requisite expertise and competencies are employed, mission execution is disrupted. Such deficiencies may result in inaccurate reporting of casualty numbers, incorrect transmission of incident locations, and delays in mobilizing auxiliary units, all of which exert a substantial negative effect on prehospital triage outcomes.

Consistent with the present findings, Naboure et al. (2024) identified a shortage of experienced personnel in dispatch units as one of the primary challenges affecting triage performance and the delivery of prehospital emergency care (18). Similarly, Dami (2015) emphasized the increasingly pivotal role of dispatch centers in prehospital emergency systems, describing them as the first link in the chain of emergency response. Accordingly, the knowledge and skill level of dispatch personnel are critical determinants of both decision-making accuracy and overall operational success (19). Telephone triage personnel must therefore possess strong clinical knowledge and advanced history-taking skills, enabling them to identify patient problems through targeted questioning and to provide appropriate guidance when necessary. Continuous training is thus essential to ensure optimal performance.

Furthermore, Keating et al. (2025), in their review of triage systems in high-risk environments, conceptualized dispatch centers as the “primary intelligence hub” during MCIs, emphasizing that the quality of information transmitted from these centers directly affects the accuracy of on-scene triage (20).

Another major contributor to communication system deficiencies identified in the present study was infrastructural inadequacy. Participants highlighted the lack of an integrated communication network and unreliable signal coverage as critical barriers. These findings are consistent with those reported by Bijani et al. (2024), who, in a qualitative study of emergency medical technicians in southern Iran, identified infrastructural barriers, including insufficient communication equipment and the absence of early warning systems, as key components of ineffective organizational management (10). Their findings further indicated that emergency personnel were often unable to coordinate effectively with dispatch centers and other response teams because of inadequate communication tools. Additionally, economic sanctions were reported to have contributed to shortages of equipment and spare parts, thereby negatively affecting operational efficiency (10).

Huang (2026), in an analysis of a mass casualty incident in Sanchia, Taiwan, similarly reported that although digital support tools were available, they were not activated during the initial response phase. Consequently, personnel relied on handwritten notes and verbal communication to track patients and relay information to hospitals. This finding highlights the critical importance of robust, reliable communication systems that remain functional under high-stress conditions (21). Likewise, Xu et al. (2025) identified systemic inefficiencies, poorly designed workflows, and the absence of electronic decision-support tools as major barriers to effective triage in adult emergency departments. The present findings reinforce this perspective, particularly by emphasizing the central role of the dispatch system as the initial link in the communication chain (22).

The second major category identified in this study was organizational resource inadequacy, comprising two subcategories: human resource inefficiency and physical resource limitations. Within the domain of human resource inefficiency, participants reported a shortage of specialized triage personnel, fear of making incorrect decisions, anxiety induced by crowd pressure, and insufficient mastery of triage protocols.

Consistent with these findings, Bijani et al. (2019) reported that the employment of inexperienced personnel lacking appropriate expertise, together with shortages of facilities and equipment, were among the most significant challenges affecting triage quality in emergency settings (23). Similarly, Mousavi et al. (2016) found that nurses with insufficient clinical knowledge and skills demonstrated low levels of clinical decision-making ability (24). Xu et al. (2025) further identified nurse-related factors, including experience, educational level, cognitive approach, and fatigue, as key determinants of triage efficiency. The present study corroborates these findings, as participants explicitly highlighted fear of incorrect decision-making and anxiety due to crowd pressure as major challenges (22).

Additionally, Abdulnabi and Hiti (2025), in their systematic review of triage tools for MCIs in hospital settings, reported that in low- and middle-income countries, prehospital services tend to prioritize patient transport over on-scene triage. This shift effectively transfers the burden of triage entirely to hospitals and significantly reduces the time available for resource preparation. Their study also found that in 93% of military triage cases, formal triage tools, such as color-coded tags and five-level algorithms, were not utilized; instead, responders favored simplified or binary approaches, such as “urgent vs. non-urgent,” to facilitate rapid decision-making (25).

Within the subcategory of physical resource limitations, participants reported shortages of ambulances, insufficient availability of triage tags, lack of sheltered spaces for conducting triage, and inappropriate triage tag formats. Similarly, Bijani et al. (2024) identified shortages of essential medical equipment and the absence of adequate physical space for triage as fundamental challenges that significantly increase the operational duration of triage processes (10).

Hamidizadeh et al. (2024), in their qualitative study aimed at exploring challenges affecting the provision of high-quality services from the perspective of emergency medical technicians in southern Iran, identified shortages of ambulances, modern medical equipment, and consumable supplies as one of the subcategories within three principal categories, all of which directly influence triage quality (26). Similarly, Chia et al. (2024), in a study conducted in Taiwan on improving triage processes during mass casualty incidents, demonstrated that inadequate physical space and the absence of standardized triage tags significantly increase triage operational time. In that study, the initial triage duration was approximately 104 minutes, which decreased to 34 minutes following process improvements, underscoring the substantial impact of removing physical and procedural barriers on triage efficiency (27).

Within the category of inter-organizational management challenges, participants highlighted the absence of unified command across all emergency response forces, insufficient coordination between

emergency medical services and other responder agencies, and inter-organizational disagreements regarding role delineation. Bijani et al. (2019) similarly reported that lack of inter-organizational coordination and the absence of a unified command structure at mass casualty scenes lead to task overlap, redundancy, and the loss of critical time required to save victims (23). These challenges are likely attributable to unclear role definitions among responding agencies, such as fire services, the Red Crescent, and emergency medical services, as well as the lack of regular joint simulation exercises.

In this regard, Matijic et al. (2025) emphasize that effective emergency coordination depends on robust communication among hospitals, emergency responders, and governmental agencies. The use of digital platforms and real-time data sharing facilitates faster decision-making and more efficient resource allocation. Furthermore, helicopter transport and mass evacuation protocols can optimize patient distribution and reduce the burden on individual healthcare facilities (28). Naboure et al. (2024) also identified challenges arising from the increasing demand for emergency services, which are directly related to incident scene management and planning for mass casualty responses (18).

The fourth category identified in this study was deficiencies in the sociocultural context, encompassing two subcategories: public crowding and congestion, and public emotions and violence. Participants referred to factors such as blockage of access and exit routes due to vehicle congestion, insistence by bystanders that their relatives be prioritized for triage, psychological pressure on technicians, threats involving weapons, shouting and chaos at the scene, physical assaults on personnel, and disregard for emergency instructions. These findings are consistent with multiple studies conducted in Iran. Rahimi et al. (2025) identified challenges in public education and awareness as one of the eight principal categories affecting Iran's prehospital emergency system, emphasizing that public interaction with emergency personnel, unrealistic expectations of services, and lack of cooperation at incident scenes are key sociocultural factors influencing service quality (29). Similarly, Hamidzadeh et al. (2024) identified sociocultural challenges, including cultural and socio-environmental barriers, as the third major category in their study, highlighting their significant impact on the delivery of high-quality prehospital emergency services (26). Vafaei Nasab et al. (2025), in a review study conducted in Iran, also reported sociocultural factors as major challenges in prehospital emergency systems during disasters, including public behavior toward emergency personnel, unrealistic expectations, and lack of cooperation at incident scenes (30).

Hadian et al. (2021), in a qualitative study involving 45 prehospital personnel in Iran, demonstrated that workplace violence in this professional group is highly prevalent, to the extent that some participants reported that virtually no personnel had completed their service without experiencing some form of workplace violence. They identified multiple contributing factors, including cultural issues, lack of public awareness regarding the roles of emergency personnel, and psychological pressures associated with crisis situations (31). This finding is fully consistent with the results of the present study.

Our findings further indicate that public crowding and violence impose substantial psychological strain on emergency technicians. However, recent international literature provides a more nuanced perspective

on this interaction. Friesen et al. (2024) argue that bystanders at incident scenes should not be viewed solely as obstacles; rather, they can be conceptualized as “unstructured responders” who, if supported by intelligent dispatch systems and public training, may expand service coverage during the critical early moments of an incident (32).

Study Limitations

The present study examined only the perspectives of emergency medical technicians; the views of other key stakeholders, including senior emergency managers, hospital staff, Red Crescent personnel, fire services, and injured individuals as recipients of triage services, were not explored. Furthermore, because of differences in cultural context and the socioeconomic conditions of Iran compared with those of other countries, and given the qualitative nature of the study, the findings are not statistically generalizable to broader populations. Replication of this study in other countries and across diverse regions of Iran is therefore recommended. Another limitation was the lack of analysis of gender differences in responses to triage-related challenges, which may warrant investigation in future research. Additionally, the possibility of recall bias among participants should be acknowledged, as experiences related to past incidents may have been distorted or forgotten over time. Finally, the dynamic nature of prehospital emergency systems and ongoing changes in structures, equipment, and training may influence the temporal relevance of some findings.

Implications for Practice

This study identified a wide range of challenges affecting triage among emergency medical technicians, based on participants’ lived experiences. These findings can inform strategies to improve the quality of prehospital emergency services and enhance personnel triage competencies. Senior emergency system managers may use these insights to design targeted interventions addressing infrastructural, human resource, and managerial challenges, thereby strengthening system preparedness for future mass casualty incidents. Additionally, the implementation of regular inter-organizational drills and the development of standardized national triage protocols represent key practical applications of this research.

Conclusion

The findings of the present study demonstrate that triage challenges in mass casualty incidents are multifaceted and complex. From the perspective of emergency personnel, the most critical barriers include deficiencies in communication systems, inadequacy of organizational resources, inefficiencies in on-scene management, and limitations within the sociocultural context. Senior emergency medical authorities are encouraged to use these findings to inform policy making and strategic planning aimed at mitigating these challenges and improving the effectiveness of triage processes in mass casualty events.

Abbreviations

EMS
Emergency Medical Services
MCIs
Mass Casualty Incidents
EMT
Emergency medical technicians

Declarations

Data Availability

The datasets generated and/or analyzed during the present study are not publicly available in order to protect participant confidentiality and to comply with national regulations; however, they may be obtained from the corresponding author upon reasonable request.

Consent for Publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this study.

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Authors' Contributions

All authors (AR, MB, MH and MA) have participated in the conception and design of the study. AR contributed the data collection and pre-pared the first draft of the manuscript. MB, MH and MA, critically revised and checked closely the proposal, the analysis and interpretation of the data and design the article. All authors read and approved the final manuscript.

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Table

Table 1. Demographic characteristics of the participants (N = 18)

Participant ID	Age (Years)	Gender	Academic Degree	Work Experience (Years)
1	32	Male	Associate Degree in EMS	8
2	27	Male	BSN	4
3	38	Male	Associate Degree in EMS	7
4	32	Male	Associate Degree in EMS	8
5	43	Male	B.Sc. in EMS	17
6	31	Male	Associate Degree in EMS	7
7	28	Male	B.Sc. in EMS	5
8	33	Male	BSN	9
9	49	Male	B.Sc. in EMS	15
10	32	Male	B.Sc. in EMS	8
11	29	Male	B.Sc. in EMS	7
12	33	Male	B.Sc. in EMS	9
13	27	Male	Associate Degree in EMS	4
14	29	Male	B.Sc. in EMS	5
15	38	Male	Associate Degree in EMS	13
16	38	Male	BSN	16
17	38	Male	B.Sc. in EMS	18
18	34	Male	B.Sc. in EMS	12

Note. EMS = Emergency Medical Services; BSN = Bachelor of Science in Nursing; B.Sc. = Bachelor of Science.