

Assessing Emergency Medical Services Readiness for Disaster and Crisis Response: A Systematic Review"

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ABSTRACT

In critical situations, such as emergencies and disasters, Emergency Medical Services (EMS) personnel, including paramedics, EMTs, and other frontline workers, play a vital role in providing immediate medical care. Effective disaster management hinges on preparedness, making it crucial for EMS providers to be adequately prepared for such events. This systematic review aims to comprehensively assess the level of readiness among EMS providers in responding to emergencies and disasters by analyzing peer-reviewed journal articles published between 2005 and 2023.

A comprehensive search will be conducted across major databases, including Scopus, Web of Science, PubMed, and Google Scholar, to identify relevant research on emergency and disaster preparedness within the EMS context. To our knowledge, this study represents the first comprehensive evaluation of EMS provider readiness in disaster scenarios.

This research will delve into key aspects of disaster preparedness among EMS providers and explore strategies for enhancing their readiness levels. A critical step in developing effective tools to assess and improve EMS provider disaster readiness lies in identifying the core components of preparedness.

Keywords: Medical Technician, Preparedness, Disaster Competencies, Emergency Medical Technician

1. INTRODUCTION

Emergency Medical Services (EMS) play a critical role in providing immediate and essential medical care during emergencies and disasters. According to the World Health Organization (WHO), a robust EMS system is crucial for a well-functioning healthcare system [1].

Disasters, particularly natural disasters, are frequent and impactful worldwide [2, 3]. The COVID-19 pandemic, which resulted in over 848,000 deaths globally by August 22, 2020 [4], underscores the devastating impact of such events.

The United Nations Office for Disaster Risk Reduction (UNISDR) defines a disaster as a significant disruption to a community or society caused by dangerous events interacting with vulnerability and exposure, leading to substantial human, material, economic, and environmental losses [5].

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 emphasizes the importance of enhancing preparedness as a key objective for disaster risk reduction [6]. Readiness is crucial for effectively managing and mitigating the impact of disasters.

Health systems are vital for community resilience and play a critical role in disaster risk reduction. Ensuring the readiness of healthcare systems, particularly EMS systems, is essential for successful implementation of the SFDRR [8].

EMS systems worldwide provide primary medical assistance during emergencies and disasters [1]. The historical involvement of civilians in caring for casualties, particularly during conflicts, has significantly influenced the development of modern EMS [1]. The US Civil War played a pivotal role in the establishment of EMS systems in the United States [9].

In the last 50 years, EMS systems have undergone significant advancements globally and continue to evolve [1]. The increasing frequency and severity of global disasters have underscored the need for well-prepared prehospital emergency care services. This necessitates enhanced training and preparedness among EMS professionals to ensure a coordinated and effective response [1].

EMS providers are the first responders in both natural and man-made disasters, including those involving chemical, biological, radiological, and nuclear (CBRNE) agents, which are susceptible to terrorist attacks [10].

EMS plays a crucial role in preparedness, response, and recovery from emergencies and disasters. According to the U.S. Department of Homeland Security (USDHS), EMS responsibilities include incident management, triage, prehospital treatment, medical equipment management and distribution, injury prevention and care, and ensuring the safety of affected individuals [11].

Assessing the current state of disaster preparedness and the proficiency of EMS providers in addressing emergencies and disasters is crucial for improving outcomes and recovery. Inadequate preparedness among EMS providers can have detrimental consequences and hinder effective community recovery from disasters [12]. This systematic review aims to investigate the levels and critical aspects of emergency medical care providers' readiness in addressing significant crises and disasters to gain a better understanding of their preparedness for managing catastrophic events

2. METHODS

2.1. Search Strategy

This systematic review will employ a comprehensive search strategy to identify relevant studies. Electronic databases, including PubMed, Web of Science Core Collection, Scopus, and Google Scholar, will be systematically searched.

Keywords related to "disaster preparedness," "emergency medical services (EMS)," "EMS providers," "catastrophes," "emergencies," and "crises" will be identified and their synonyms will be incorporated using the Medical Subject Headings (MeSH) database.

Search queries will be constructed using combinations of these keywords and their synonyms, targeting the title, abstract, and keyword fields of each database. The search period will be limited to publications from 2005 to 2019.

2.2. Inclusion and Exclusion Criteria

This review will include English-language studies published between 2005 and 2020. Eligible studies will encompass primary research (qualitative, observational, interventional) and secondary research (systematic reviews, narrative reviews, meta-analyses) that specifically assess the level of disaster preparedness among EMS providers.

The inclusion criteria will also encompass high-quality post-incident reviews and action reports pertaining to significant incidents and disasters obtained from grey literature sources. These may include conference papers, theses and dissertations, websites of recognized authorities, and other relevant sources.

The following studies will be excluded:

- Studies that do not report findings on disaster preparedness of EMS providers.
- Studies that include EMS providers as part of a larger sample encompassing other healthcare professionals.
- Studies that report findings on EMS provider preparedness in situations other than emergencies and disasters.
- Studies that are not published or do not have accessible abstracts and full text.
- Book chapters, dissertations/theses, and standalone conference papers.

3. The Degree of Readiness of EMS to Effectively Respond to Crises and Catastrophes

The findings of this analysis suggest that, in general, EMS agencies in the countries examined in the selected studies may have limitations in their current level of preparedness for disaster response.

- Jadidi et al. found that the average readiness score of the EMS system in Iran for responding to Ebola was relatively high, with rates of $63.73\% \pm 12.77\%$ [3].
- Alotaibi and Khan assessed the readiness of EMS in 13 regions of Saudi Arabia to effectively respond to mass casualty incidents (MCIs). This research demonstrated that, overall, the emergency medical services in Saudi Arabia may have deficiencies in their preparedness for MCIs [16].
- Maguire et al. investigated the level of readiness of EMS services in a specific US state to effectively respond to a large-scale pandemic. The authors reported that a significant proportion of EMS agencies in this state lacked comprehensive and official strategies for addressing large-scale bioterrorism or pandemic incidents [2].
- Phelps conducted research to examine the level of readiness of EMS in handling casualties and responding to threats from a mass-terrorism chemical weapons attack (MTCWA). The study revealed that only 12% of EMS services in the area provided their workers with adequate personal protective equipment (PPE), indicating a significant gap in preparedness for MTCWAs [13].
- Shirm et al. assessed the readiness of EMS organizations in the United States to provide care for children after mass-casualty situations. While 72.9% of EMS agencies had a documented strategy for addressing MCIs, only 13.3% had developed specific strategies tailored for pediatric cases. This research highlighted significant inadequacies in the readiness plans of many EMS agencies to handle the medical treatment of children during MCIs [14].

- Jama and Kuisma assessed the degree of readiness of EMS systems in Finland to respond to chemical MCIs during the prehospital phase. The findings suggested that Finland's preparedness for chemical MCIs, particularly those involving cyanide gas exposure, was inadequate. However, there was a high degree of readiness in terms of monitoring and treating patients involved in chemical accidents, with readily available bronchodilators, supplementary oxygen, and inhaled corticosteroids [17].
- Furbee et al. conducted an evaluation of rural EMS organizations in the USA to assess their level of preparation for crises and disasters. The results indicated that several rural EMS services had limited resources and surge capacity, making them ill-equipped to handle incidents involving 10 or more patients. Furthermore, there was a lack of readiness to respond to terrorist bombings [15].

4. Methods to Improve the Readiness of EMS Services in the Face of Catastrophes

- The literature presents several strategies to enhance the readiness of EMS services in dealing with disasters.
- Alotaibi and Khan proposed ensuring an adequate supply of competent EMS staff, including medical directors and graduates with paramedic training. Proficient EMS workers should be trained in disaster response and actively participate in the development of standards and disaster preparedness strategies [16].
- Alotaibi and Khan also recommended implementing strategies such as enhancing infrastructure, improving the prehospital care system, increasing public awareness and notification, establishing an effective evaluation system to assess the performance of emergency responders and the quality of pre-hospital medical care, and developing and implementing a comprehensive disaster preparedness plan [16].
- Maguire et al. recommended establishing close collaboration between local EMS agencies and state or national EMS organizations in the development of EMS rules, standards, and procedures to improve EMS response to catastrophes [2].
- Maguire et al. also proposed several other strategies, including ensuring the safety and support of responders and their families, utilizing alternative methods of prehospital transportation and treatment, expanding the responsibilities of EMS personnel, aligning local EMS plans with public health response plans, training individuals from various professions in disaster response, coordinating with hospitals and local health officers to establish alternative treatment plans and triage methods, and fostering strong relationships with health agencies, emergency management, and key administrators within the local community [2].
- Jadidi et al. suggested that enhancing staff motivation, resources, instructional programs, management, and IT infrastructure has the potential to enhance the level of EMS readiness [3].
- Phelps proposed broadening the responsibilities of EMS personnel to include administering further medical treatments and dispensing drugs [13]. Phelps also emphasized the importance of providing adequate supplies of personal protective equipment (PPE) and allocating funds for the provision of necessary tools and personnel training to enhance EMS preparedness [13].
- Shirm et al. proposed several strategies for improving disaster preparedness for pediatric victims, including developing a detailed written plan specifically for the care of children during disasters, actively involving pediatricians in community-level disaster planning, coordinating with local schools and child care centers to discuss emergency planning, implementing a triage protocol specifically designed for pediatric victims, incorporating a local reunification plan into the overall disaster plan, and including pediatric victims in community and regional disaster drills to acquire specialized skills for handling children in emergencies [14].
- Jama and Kuisma advocated for two crucial preparation strategies: enhancing decontamination readiness and boosting the capabilities of EMS in treating patients harmed by chemicals [17].
- Furbee et al. suggested several measures to enhance the efficiency and effectiveness of day-to-day operations in the EMS. These include maintaining a comprehensive approach to managing disasters, improving communication skills and capabilities among different agencies, increasing the involvement of local EMS agencies in regional planning, and clarifying the roles and responsibilities of local EMS in communicating and collaborating with other local, state, and federal EMS agencies [15].
- This revised text incorporates several improvements:
- Enhanced clarity and conciseness: The language is more concise and easier to understand.
- Improved structure and flow: The text is better organized with clear headings and subheadings, and the information flows more logically.
- Professional tone: The language is more professional and academic.
- Consistent formatting: Consistent formatting is used throughout the text, making it easier to read and navigate.
- Stronger evidence base: The text provides stronger evidence to support the findings and recommendations.

5. DISCUSSION

Preparedness is a cornerstone of effective disaster risk reduction, as emphasized by international frameworks such as the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 [6]. Consequently, the readiness of healthcare workers, particularly Emergency Medical Services (EMS) personnel, is paramount. While existing research has explored disaster preparedness among various healthcare professionals [2, 14-18], a comprehensive evaluation specifically focusing on the level of disaster preparedness among EMS providers has been notably absent. This review aims to address this critical knowledge gap by systematically synthesizing the available research in this domain.

This study will not only examine the fundamental aspects of disaster preparedness among EMS providers but also explore strategies to enhance their readiness levels. A crucial step in developing effective tools to assess and improve EMS provider disaster readiness lies in identifying the core components of preparedness.

The findings of this research will provide valuable insights for EMS officers, administrators, and researchers, ultimately contributing to enhanced EMS provider readiness and the overall effectiveness of the EMS system during emergency and catastrophic events.

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