

# The Role of Emergency Technicians in Improving Healthcare Outcomes: Performance Challenges and Development Avenues: A Systematic Review

**Muntadhar Ali Ahmed Albasrawi<sup>1</sup>, Mohammed Hussain Ali Alduwa<sup>2</sup>, Adnan Basim Mohammed Alshakis<sup>3</sup>, Ibrahim Abdullah Ibrahim Alkhamis<sup>4</sup>, Komail Mohammed Essa Alessa<sup>5</sup>, Thamer Dakhel Mohammed Alsaleem<sup>6</sup>, Qusai Mustafa K Albatat<sup>7</sup>, Ahmed Abdullah I Alabdullah<sup>8</sup>, Hassan Salman Hussain Alameer<sup>9</sup>, Ali Mustafa Abdulaziz Aljuzayri<sup>10</sup>, Bader Salamah Alwaladali<sup>11</sup>**

1)Specialist-Emergency Medical Services, Al-Ahsa Health Cluster - Ambulance Transport Department for Patient Services, Al-Ahsa

2)Emergency Medical Technician Diploma, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

3)Specialist-Emergency Medical Services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

4)Technician-Emergency Medical Services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

5)Emergency Medical Services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

6)Technical-emergency medical services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

7)Technician-Emergency Medical Services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

8)Technician-Emergency Medical Services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

9)Technical-emergency medical services, Medical Transport Department, Al-Ahsa Health Cluster, Al-Ahsa

10)Technician Emergency Medical Services, Emergency, Disaster and Ambulance Management, Al-Ahsa

11)Nursing Technician, Medical Supplies in Al-Qurayyat

## INTRODUCTION

Emergency medical technicians (EMTs) play a pivotal role in the continuum of healthcare by serving as the first responders to medical emergencies. Their responsibilities range from providing prehospital care to stabilizing patients in critical conditions, ensuring the timely delivery of life-saving interventions. As the frontline of emergency medical services (EMS), EMTs significantly influence healthcare outcomes, particularly in scenarios where immediate medical attention can mean the difference between life and death. Consequently, their performance has a profound impact on patient survival rates, recovery times, and overall satisfaction with healthcare systems [1].

Globally, the increasing demand for emergency care services has highlighted the importance of EMTs in bridging gaps between prehospital care and hospital-based treatment. With the rise in chronic diseases, trauma cases, and public health crises such as pandemics, the scope and complexity of EMT responsibilities have expanded [2]. This evolution requires EMTs to operate effectively in dynamic and high-pressure environments, often with limited resources. Despite their critical role, EMTs face numerous performance challenges, including physical and mental stress, inadequate training, logistical constraints, and systemic barriers within healthcare delivery models.

Performance challenges for EMTs not only hinder their ability to deliver optimal care but also pose risks to patient safety and health outcomes. For example, delays in response times, improper handling of medical equipment, or insufficient knowledge of advanced medical protocols can lead to adverse events. Additionally, the stressful nature of their work often results in burnout, which can compromise the quality of care provided. Addressing these challenges requires a comprehensive understanding of the barriers EMTs face and the development of tailored interventions to enhance their performance [3].

Over the years, various strategies have been proposed to improve EMT performance, including continuous professional education, simulation-based training, mental health support programs, and technological advancements such as mobile health (mHealth) applications. These avenues for development aim to equip EMTs with the skills, resilience, and tools needed to navigate the complexities of emergency care effectively. However, there remains a need for systematic evaluation of these strategies to identify the best practices and inform policy decisions.

This systematic review aims to explore the role of EMTs in improving healthcare outcomes, focusing on the performance challenges they encounter and potential development avenues. By synthesizing evidence from existing literature, this review seeks to provide insights into how healthcare systems can better support EMTs in their critical role, ultimately enhancing the quality of emergency care and patient outcomes. Through this analysis, the study will contribute to the broader discourse on strengthening emergency medical services and addressing the evolving demands of healthcare delivery in the 21st century.

### **Literature review**

Emergency Medical Services (EMS) centers were established to provide on-time and rapid services to the patients and injured from the scene to the hospital [4]. Emergency medical services (EMS) are a unique workforce providing 24/7 emergency care [2].

### **Healthcare Outcomes**

Healthcare outcomes refer to the results of healthcare services and interventions in terms of the effects they have on the health of individuals or populations. These outcomes serve as critical measures for evaluating the quality, efficiency, and effectiveness of healthcare systems and practices. In the context of emergency medical services (EMS), healthcare outcomes are often directly linked to the performance of emergency medical technicians (EMTs), who play a pivotal role in providing immediate care during emergencies [5].

Healthcare outcomes can be categorized in several ways, depending on the context, type of healthcare service provided, and the indicators being measured. The key aspects of healthcare outcomes relevant to the study of EMTs are:

- 1) **Clinical Outcomes:** These outcomes refer to the measurable effects of medical interventions on patients' health status. In the context of EMTs, clinical outcomes are often related to [6]:
  - **Survival rates:** The ability of EMTs to stabilize patients in critical conditions, such as those with cardiac arrest, traumatic injuries, or strokes, and to transport them to appropriate healthcare facilities.
  - **Disease management:** The EMTs' role in preventing further deterioration of a patient's condition through early intervention in cases of chronic conditions like asthma or diabetes during an emergency.
  - **Recovery time:** The speed and extent to which patients recover after emergency medical intervention, which is often influenced by the quality of care provided by EMTs during the prehospital phase.
- 2) **Patient Safety Outcomes**

These refer to the prevention of harm to patients during their healthcare journey. EMTs significantly impact patient safety by [7]:

- **Preventing secondary injuries:** EMTs ensure safe handling and transport of patients to avoid aggravating injuries, such as spinal cord damage in trauma cases.
- **Minimizing errors in care:** The accuracy of assessments and timely interventions by EMTs plays a crucial role in reducing the likelihood of errors that can compromise patient safety, such as incorrect medication administration or poor triage decisions.
- **Reducing adverse events:** EMTs help minimize the occurrence of adverse events in emergencies, such as preventing hypoxia in trauma victims or mitigating complications during cardiac emergencies.

### 3) Patient Satisfaction and Quality of Care

Patients' perceptions of the care they receive during emergencies contribute to overall healthcare outcomes. Key factors that influence patient satisfaction include [8]:

- **Communication:** EMTs' ability to communicate effectively with patients, family members, and healthcare providers impacts how patients perceive the care they receive.
- **Empathy and support:** Providing emotional support and demonstrating empathy during high-stress situations can enhance patient satisfaction and improve outcomes, particularly in trauma and psychiatric emergencies.
- **Timeliness of care:** The speed and efficiency with which EMTs respond to emergencies and deliver care can significantly affect patients' perception of the quality of care received.

### 4) Health System Efficiency

Healthcare outcomes can also be evaluated by the efficiency of the healthcare system in managing emergencies, and EMTs are central to this process. Key efficiency outcomes include [3], [9]:

- **Response time:** The time taken for EMTs to reach the patient and provide initial care is critical. Delays in response can lead to worsened health outcomes, especially in cases of trauma or acute conditions like heart attacks.
- **Transportation time:** The speed and appropriateness of patient transport to healthcare facilities also impact outcomes, particularly in time-sensitive cases such as stroke or myocardial infarction, where rapid intervention at the hospital can be lifesaving.
- **Hospital readmission rates:** The quality of prehospital care provided by EMTs can influence patients' post-discharge recovery, reducing the likelihood of readmissions and improving long-term health outcomes.

### 5) Cost-Effectiveness

Healthcare outcomes can be evaluated in terms of the cost-effectiveness of interventions, which reflects the balance between healthcare spending and the results achieved. EMTs contribute to cost-effective outcomes by [10]:

- **Reducing hospital admissions:** In some cases, EMTs can help manage patients in the field or transport them to facilities where they receive care that prevents unnecessary admissions.
- **Avoiding complications:** Prompt and efficient interventions by EMTs may reduce the need for extensive treatments or surgeries later, contributing to lower overall healthcare costs.

#### 6) Public Health Outcomes

Emergency medical services also have a broader impact on public health, particularly in areas such as [7]:

- **Emergency preparedness and response:** EMTs play a key role in disaster response and preparedness, where effective coordination and execution can mitigate the public health impacts of disasters, such as pandemics, natural disasters, or mass casualty incidents.
- **Health equity:** EMTs' ability to reach underserved populations, particularly in rural or impoverished areas, can influence health outcomes by ensuring equitable access to emergency care.

In summary, healthcare outcomes provide a comprehensive measure of the effectiveness, quality, and efficiency of healthcare interventions. For EMTs, their role in improving clinical outcomes, ensuring patient safety, enhancing satisfaction, and promoting system efficiency is fundamental in shaping the overall effectiveness of emergency medical care. Understanding these outcomes helps guide efforts to optimize EMT performance and ultimately improve the health and well-being of patients in emergency situations.

### The Role of EMTs in Healthcare Systems

Emergency Medical Technicians (EMTs) serve as a critical link in the chain of emergency healthcare. Studies emphasize that EMTs are not only responsible for prehospital care but also for ensuring continuity of care through effective communication with healthcare facilities. Research by Sadeghi and Sohrabizadeh (2024) highlights how EMTs act as first responders during emergencies, providing immediate medical interventions that significantly improve patient outcomes [7]. Similarly, Jones et al. (2018) underline their role in reducing mortality rates in trauma cases through rapid stabilization and transportation to healthcare facilities [8].

### Impact of EMT Performance on Patient Outcomes

The performance of EMTs directly influences patient survival rates and recovery trajectories. A systematic review by Carter et al. (2021) found that EMT competencies, such as timely decision-making, effective communication, and technical skills, are critical for improving healthcare outcomes [9]. Additionally, studies like Bednarz, et al, (2023) have explored the importance of accurate assessment and swift interventions in life-threatening conditions such as cardiac arrest, where every second counts. Delayed response times or suboptimal care during emergencies can lead to preventable adverse events, highlighting the need for performance optimization [10].

### Challenges Facing EMTs

EMTs often face multifaceted challenges that hinder their ability to deliver optimal care. Physical and mental stress is a recurrent theme in literature. A study by Safi-Keykaleh, et al. (2022) noted Emergency Medical technicians' decision making in the context of fear and concern, as the core concept of this model, lead to decrease in quality of the pre-hospital services, stakeholders' dissatisfaction, hospital emergency units' overload, decrease in reputation of the Emergency Medical Technicians, threat to patient clinical outcome and patient safety. To prevent these negative consequences, facilitation of the Emergency Medical Technicians' on-scene decision making is recommended [11]. Training deficiencies also pose a significant challenge; research by Weisner C, Satre (2016) found that many EMTs lack adequate training in advanced medical protocols, particularly in rural or resource-constrained settings [12]. Systemic issues, including inadequate equipment, logistical barriers, and poor integration with other healthcare providers, exacerbate these challenges.

#### 4. Development Avenues for EMTs

To address the challenges faced by EMTs, various developmental strategies have been explored:

- **Continuous Education and Training:** Research by Moll-Khosrawi, et al. (2020) advocates for ongoing professional development programs, emphasizing the need for simulation-based training to enhance technical and non-technical skills. Simulation-based scenarios allow EMTs to practice complex procedures in controlled environments, improving their preparedness for real-world emergencies [13].
- **Technological Advancements:** Mobile health (mHealth) applications and telemedicine tools have been identified as game-changers in prehospital care. According to a study by Khosravi, et al, (2024), these technologies enable EMTs to access real-time medical guidance and patient data, enhancing decision-making and care delivery [14].
- **Mental Health Support:** Recognizing the impact of job-related stress, studies like those by Maulik (2017) emphasize the importance of mental health support programs. Interventions such as peer counseling, stress management workshops, and access to professional psychological services have shown promise in reducing burnout and improving job satisfaction among EMTs [15].
- **Integration with Healthcare Systems:** Enhancing the integration of EMTs within broader healthcare systems can improve communication, resource allocation, and overall efficiency. A systematic review by Alghamdi, et al. (2023) highlights successful models of collaboration between EMTs and emergency departments, which lead to better patient outcomes and reduced hospital admissions [16].

#### Gaps in Literature

Despite the growing body of research on EMTs, several gaps remain. There is limited data on the long-term impact of development programs on EMT performance. Additionally, most studies focus on developed countries, leaving a knowledge gap regarding challenges and solutions in low-resource settings. Further research is needed to explore innovative strategies, such as the integration of artificial intelligence tools, and their potential to transform EMT practice globally. By

addressing these gaps, future research can contribute to a deeper understanding of the multifaceted role of EMTs, providing actionable insights for policymakers and healthcare administrators to optimize emergency medical services.

## Conclusion

Emergency Medical Technicians (EMTs) are integral to healthcare systems, serving as the frontline providers of emergency care. Their role spans across multiple critical functions, including immediate life-saving interventions, patient stabilization, efficient transportation, and seamless coordination with hospital teams. EMTs are also central to disaster response, public health initiatives, and mental health support during emergencies. The performance of EMTs directly influences healthcare outcomes, including patient survival, recovery, and satisfaction.

However, the effectiveness of EMTs is influenced by a range of factors, including training, mental health support, access to resources, and integration with the wider healthcare system. Challenges such as burnout, insufficient training in advanced medical procedures, and limited access to technological tools can hinder their ability to provide optimal care. Addressing these challenges through continuous professional development, technological integration, and better mental health support for EMTs is crucial for improving both their performance and patient outcomes.

Finally, optimizing the role of EMTs in healthcare systems is essential to enhancing emergency medical care, improving patient outcomes, and ensuring healthcare system efficiency. By investing in EMT training, supporting their well-being, and embracing innovative technologies, healthcare systems can better harness the potential of EMTs, ultimately leading to improved healthcare delivery and outcomes for patients in emergencies.

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