**EDUZONE: International Peer Reviewed/Refereed Multidisciplinary Journal (EIPRMJ), ISSN: 2319-5045**
**Volume 13, Issue 2, July-December, 2024, Available online at: www.eduzonejournal.com**

# Exploring Novel Difficulties in Emergency Medical Services and Beyond by Conducting an Extensive Literature Study

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## ABSTRACT

**In developing countries like India, the ever-changing terrain presents a number of challenges for emergency medical services (EMS), despite the critical role they play in providing rapid medical treatment and transportation during emergencies. This literature review delves into these obstacles, highlighting the issues of unpreparedness for prehospital treatment, insufficient personnel, poor infrastructure, and the inconsistent inclusion of emergency care in medical curricula. The evaluation stresses the importance of improved triage systems, stronger interagency interaction, and the incorporation of OR techniques to optimize response times and resource allocation. The paper goes on to discuss how international collaborations could enhance India's EMS system and how initiatives are underway to develop specialized emergency medical training programs. The findings highlight the critical need to enhance emergency treatment infrastructure, especially in rural areas, to provide effective and timely patient care.**

**Keywords: Novel Challenges, Emergency Medical Services, Literature Study, Health Care System, India.**

## INTRODUCTION

EMS departments are crucial to providing emergency medical care quickly and efficiently. But EMS is continually developing, presenting new challenges that require creative solutions. This comprehensive narrative study explores suburban and urban EMS departments' primary difficulties and offers evidence-based remedies based on industry data, academic journals, and research projects. Operations Research (OR) analytical methods can help EMS departments make better resource allocation, service delivery, and operational efficiency decisions. Simulation, optimization, and mathematical modelling can improve resource utilization, reaction times, and operational efficiency in EMS departments. OR technology can improve patient transport routes, locate new EMS stations, and schedule ambulance deployment.

EMS agencies need triage systems to monitor patient flow and assign resources. Standardized triage processes allow EMS staff to evaluate patients faster and more correctly and ensure the most seriously ill receive early care. Validated triage methods and algorithms improve patient outcomes, resource allocation, and transfer reduction in EMS. Triage systems can rank patients by severity, resource availability, and proximity to an appropriate hospital. Lack of people hinders EMS operations, affecting care quality and speed.

Gujranwala shows how staff shortages effect service quality and speed. Improved training, telehealth integration, and recruitment and retention may solve this issue. Creative recruitment and retention techniques can help EMS departments avoid labor shortages and maintain a sustainable workforce. Competitive pay, ongoing training, and a good workplace are some of these measures. EMS departments may partner with local colleges and universities to recruit and train workers and reward long-term employees.

Interagency and interprofessional communication is essential for EMS operations. Hospitals, EMS, and other healthcare providers must communicate well to ensure patient handoffs, transfers, and continuity. However, developing accurate information systems and cooperative frameworks for information transmission and collaboration is still difficult. Developing dependable information systems and cooperative frameworks for information flow and collaboration is difficult. Interoperable electronic health records, telemedicine, standardized communication standards, and training programs improve interagency communication and patient outcomes. EMS services can use compatible EHRs to rapidly share patient data with hospitals and other healthcare providers. Telemedicine systems allow them to consult with doctors and other specialists remotely.

## LITERATURE REVIEW

**Newton, J. (2024)**explained, comprehended, and offered provider-informed policy suggestions pertaining to system level concerns from the frontline perspective. Nineteen semi-structured individual interviews with Primary or Advanced Care Paramedics (PCP/ACP) in Alberta were carried out. Regarding EMS response times and the workplace, participants were invited to express their opinions, insights, and suggestions. Thematic analysis was used to examine the interviews in order to find themes and subthemes. Poor reaction times and the EMS working environment were found to be the two main issues that warranted concern because they both affect and are influenced by one another. Paramedics noted specific issues with ED offloading, resource scarcity, low-acuity calls, and rural difficulty within response times. Four subthemes emerged about the EMS work environment: attrition, an unhealthy culture, organizational impediments, and the necessity of paramedic empowerment. The providers offered other proposals, such as establishing and growing emergency mobile integrated health (MIH) branches, exchanging 811 and 911 replies, and enforcing ED target offload times.

**Al Amiry, A.(2021)**investigated the interconnected impacts of the enormous rise in EMS calls worldwide, the impact of the COVID-19 pandemic on handling non-COVID-19 crises, and the side effects of dispatch centers being overloaded. It attempts to explain the available data regarding the EMS call bottleneck that occurred in the early stages of the global pandemic. We analyses the global numbers of EMS calls from March to June 2020, taken from news reports and published works. With specific keywords associated with EMS calls, ambulance delays, strokes, and cardiac arrest, only English-language articles were chosen. The primary resource for searching was Google Scholar. Following the application of the selection criteria, a total of 29 citations were selected, and five themes emerged as a pattern of knowledge: ambulance calls during COVID-19, ambulance response delays, reduced ambulance operator response time, mortality and morbidity among non-COVID-19 cases, and total ambulance call time. Globally, there has been an exponential rise in EMS calls as COVID-19 spreads, which is predicted to put a lot of strain on EMS dispatch centers. There are several reasons that are found and explained that contribute to the EMS call congestion.

**Cimino, J., & Braun, C. (2023)**evaluated the state of clinical research in prehospital care at the moment and noted knowledge gaps, as well as the difficulties and possibilities for further study. When it comes to time-sensitive crises including trauma, heart failure, stroke, haemorrhage, breathing problems, systemic infections, etc., prehospital care is essential to improving patient outcomes. Clinical research in prehospital care has gained popularity in recent years, bringing with it a number of new opportunities and concerns. Clinical research methodology urgently has to be adjusted for the prehospital care setting. However, because of the complicated setting, prehospital research has numerous obstacles that present particular difficulties for investigation, advancement, and assessment. This assessment provides an opportunity to draw attention to a number of issues, including scarce infrastructure and resources, moral and legal issues, scheduling limits, privacy and safety concerns, data collecting and processing, and research group homogeneity. The literature research also identifies other potential solutions, including the adoption of standardized protocols and recommendations, the application of artificial intelligence and (mobile) health technologies, and close coordination between emergency medical services (EMS) and hospital treatment.

**Wang, Y.et. al. (2020)**examined EM during the COVID-19 epidemic and five potential ramifications of the suggested framework to direct further research. People from all areas of life have always been concerned about emergency management (EM) because of the catastrophic effects that calamities can have. 2020's global COVID-19 outbreak has elevated EM to a key topic. Numerous academics have expressed interest in using mobile phone data for EM as a result of the widespread use of mobile phones. A comprehensive evaluation of the literature on the use of mobile phone data for EM is presented in this research, encompassing 65 relevant publications published between 2014 and 2019 from six electronic databases. A systematic approach is given to highlight the current status of research on the five issues that emerged from the examined studies about the use of mobile phone data for EM.

## METHODS

### Study design and setting

This narrative study looks at the present state of emergency medical services in India from multiple perspectives. The assessment was finished in 2017 between March and August. With a projected population of over 1.4 billion in 2023, India is an LMIC located in South Asia. India had a life expectancy of about 70 years in 2020 and a median age of about 28. The birth rate is 18.2 per 1000 people, and the population is increasing at a rate of about 1% per year. In 2022, the gross national income per capita was around $2270, with a literacy rate of about 77.7%, calculated using the Atlas technique ($7110, purchasing power parity). Outlays for healthcare account for over 3.01% of GDP. About eighty-five percent of children who are one year old have had all recommended vaccines. Accidents account for 355, 607 (age-standardized) deaths per

100,000 people, non-communicable diseases for 607, and communicable diseases for 75. Prevalence estimates for HIV/AIDS in India for 2021 were 0.22 percent.

**Search methods**
There is a lack of data regarding the Indian healthcare system. Utilizing internet resources such as PUBMED, Google Scholar, USAID, and WHO, a comprehensive literature review was undertaken.

**DEVELOPMENT OF EMS IN India**

**India's present health care system**
With a population of almost 1.4 billion, India is a South Asian nation with several regional languages spoken in addition to Hindi and English, which are the two official national languages. The 28 states and 8 union territories that make up the nation are further subdivided into districts and sub-districts. Both governmental and private health systems are part of India's healthcare system.

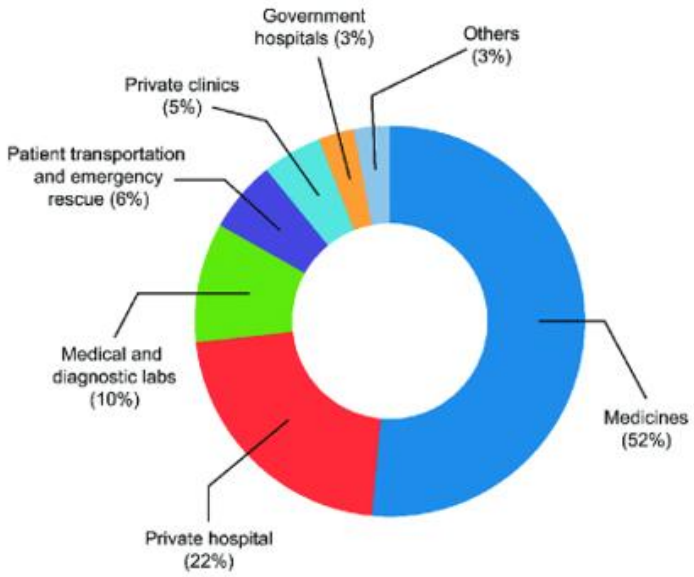


**Figure 1: India's Healthcare System**

Across the nation, there are numerous emergency care facilities and referral hospitals. India's health care systems can be broadly classified into the following categories:

- First-class hospitals comprise prestigious medical establishments like All India Institutes of Medical Sciences (AIIMS) and comparable reference hospitals. Examples are PGIMER Chandigarh and AIIMS New Delhi.
- Hospitals in the second category are state-run facilities and medical schools, like Lady Hardinge Medical College in New Delhi and Safdarjung Hospital.
- Hospitals in the third type are those that serve a particular state's region or zone, such as regional or zonal hospitals. Take the Regional Cancer Centers (RCCs) as an example.
- Hospitals in the fourth category: These are district hospitals that serve the people living in the districts.
- Hospitals in the fifth category: These are sub-divisional or block-level hospitals (CHCs) that provide primary and secondary healthcare services to smaller areas or sub-districts.

In India, medical care is mostly paid for via a fee-for-service system, and individuals are frequently obliged to buy supplies and prescription drugs straight from pharmacies. Even with improvements, health insurance plans still only cover a percentage of the total cost of care, with a large amount of it being paid out of pocket. In 2014, the percentage of overall health expenditure that came from personal funds was around 62.4%. The World Health Organization estimates that there are 7.8 doctors and 21 nurses for every 10,000 people in India. Because comprehensive emergency medicine curriculum are still developing, medical and nursing students in India have little exposure to specialized training in emergency care. This presents difficulty for emergency care practitioners in evaluating and managing a wide range of emergency conditions.

Regretfully, the country's healthcare system still finds it difficult to satisfy the populace's rising needs, particularly in rural areas. Among emerging economies, public health spending in 2021 was among the lowest at 1.28% of GDP. The growing incidence of emergency room mortality is partly caused by an insufficient pre-hospital transportation system, a dearth of skilled hospital personnel, and an increase in traffic accidents. Due to a dearth of emergency obstetric and neonatal care (EONC) kits and services in many locations, India is experiencing an increase in maternal and newborn mortality rates in addition to medical problems. Despite attempts to enhance healthcare infrastructure and access, maternal mortality, newborn mortality, and stillbirth rates continue to pose serious difficulties, particularly in developing nations.

**EMS in India**

Regrettably, India is a prime example of a developing nation, with many of its prehospital emergency systems lacking. According to the well-known "golden hour" of trauma, patient outcomes are better if they are taken to a specific trauma center within sixty minutes after the incident. The typical EMS response time in India varies greatly, from 15 to 30 minutes in metropolitan regions to much longer or not at all in rural and isolated locations. Because of this discrepancy, people frequently take care of patient transportation themselves, depending on their own cars, autorickshaws, or other modes of transportation instead of waiting for ambulances. This adds to India's high rates of pre-hospital emergency morbidity and fatality.


**Figure2: Emergency Medical Services**

Emergency care prior to hospitalization is inadequate, especially in rural areas. Ambulance services such as 108 Emergency Response Service are provided in big cities like Bengaluru, Delhi, Mumbai, and so on. However, a number of issues, including expensive costs, inadequate emergency equipment, a shortage of experienced paramedics, and bad infrastructure, frequently restrict the usage of emergency services. Private ambulance services cover the void in certain places, but not everyone can afford them. In the past few years, emergency medicine in India has made significant strides. These include:

- The creation of specialized emergency departments in large government hospitals, such as AIIMS and Safdarjung Hospital in New Delhi;
- The launch of the 108 Emergency Response Service, a free-to-call hotline that handles police, fire and medical emergencies in multiple states;
- The growth of emergency medicine as a specialty, with postgraduate courses in emergency medicine being offered since 2009.

India's health system has been strengthened by foreign nations and international organisations, especially in the area of emergency care. For instance, new prehospital care protocols and disaster management systems have been developed as a result of partnerships with international health organizations. Public-private partnerships and other initiatives have made a positive impact on emergency care and ambulance services in underprivileged communities. By promoting more thorough training programs and increasing awareness, student and professional organisations are also helping emergency medicine in

India grow. These organisations frequently advocate for improved professional training and facilities in emergency medicine while concentrating on teaching communities basic first aid, CPR, and other life-saving techniques.

## CHALLENGES AND RECOMMENDATIONS

The integration of emergency care into India's health systems faces a number of fundamental obstacles, including:

1. The **true range of acute presentations at health institutions is still underreported**, despite some data being available on inpatient diagnosis and treatment results regarding the burden of acute disease in India. It is challenging to estimate the actual burden of acute disease in India due to the absence of complete data, particularly in rural areas.
2. **A comprehensive strategy for triaging and resuscitating critically ill patients is frequently absent from healthcare facilities:** Acute patients in numerous hospitals around India are handled by distinct departments based on their age, gender, and the nature of their ailment (e.g., cardiac problems, obstetric emergency, etc.). Due to the lack of specialized acute intake rooms manned by professionals qualified in resuscitation and stabilization, this vertical strategy causes delays in the provision of appropriate emergency care.
3. **Emergency care is still not given priority on the global health agenda:** Emergency care is still under-represented in global health initiatives, despite the critical role that early stabilization and resuscitation play in lowering morbidity and mortality. While attempts are being made to enhance emergency care in India, neither the Sustainable Development Goals (SDGs) nor the Millennium Development Goals (MDGs) placed much emphasis on this area or any other large-scale global health funding strategy.
4. **Limited emergency medical centers:** India's rural areas still lack the infrastructure required to manage emergencies, despite the country's large cities having a number of well-equipped hospitals. District and regional hospitals lack the capacity to handle emergency cases, while tertiary care facilities and referral hospitals in urban areas—like the All India Institute of Medical Sciences (AIIMS) or state hospitals—are frequently overcrowded.
5. **Lack of emergency medicine in the curriculum:** Emergency medicine is still not required as part of the undergraduate curriculum in many Indian medical colleges. Although there is limited formal training in emergency medicine, some exposure to emergency care can be gained through internships or rotations in internal medicine or surgery.
6. **Limited specialization programs in emergency medicine:** In India, the field of emergency medicine is still relatively new, despite recent growth. As of 2023, the majority of emergency care in smaller hospitals is provided by general practitioners or physicians with expertise in other specialties, and there are very few medical schools that provide residency programs specifically focused on emergency medicine.
7. **Inadequate continuous medical education (CME) in emergency medicine:** In India, CME in emergency medicine is still relatively new. Professional associations such as the Indian Society for Emergency Medicine (ISEM) host conferences and workshops on emergency care, but frequent continuing medical education (CME) that focusses on developments in emergency treatment is still very important, particularly for rural areas.
8. **Lack of specialized publications and journals in the field of emergency medicine:** Although there are a few journals specifically focused on this area, such as the Journal of Emergencies, Trauma, and Shock (JETS), there are currently very few publications and research in this area.

Even if emergency treatment in India has improved recently, there are still many obstacles to overcome before a comprehensive system that guarantees prompt and effective care for all individuals can be established.In light of these issues impeding the growth of EMS in India, we suggest the following:

- Expanding the number of emergencies centers and equipping all hospitals' current emergency departments
- The medical schools urgently need to begin offering emergency medicine residency training.
- There is an immediate need to launch local emergency medicine-focused periodicals.
- Increased funding for emergency medicine research.
- India's pre-hospital system is developing.

## CONCLUSION

There are significant deficiencies in prehospital care, infrastructure, and personnel availability in India's emergency medical services (EMS), especially in rural regions. These major shortcomings are more common in more remote places. A comprehensive strategy is necessary to tackle these challenges. As part of this strategy, healthcare worker training programs should be improved, advanced triage systems should be put into place, and various operations research approaches should

be used to optimize resource distribution. Working together with global organisations and including emergency care into medical curricula might further enhance the efficacy of emergency medical services (EMS). To ensure that all Americans have access to high-quality, quick, and equitable emergency treatment, it is critical to fortify these systems. Over time, this will lead to better health outcomes for patients and potentially save lives.

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