

Revitalizing Emergency Care Ecosystem in India through Comprehensive Transformation and Innovative Solutions

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Abstract

Emergency care is a critical pillar of healthcare systems, serving as the initial point of contact for individuals facing acute conditions. However, consistent access to prompt emergency care remains a challenge in many regions, particularly low and middle-income countries (LMICs), where a substantial burden of disease is attributed to emergencies. This paper explores the emergency care ecosystem in India, emphasizing the role of first responders, effective communication, ambulance services, and trained healthcare staff. It also highlights challenges, solutions, technological advancements, and the benefits of implementing an emergency surveillance system to improve emergency care services. The multifaceted approach includes strengthening pre-hospital care systems, equipping communities with basic first aid skills, optimizing ambulance services, strengthening formal education and training in emergency care, harnessing technological solutions, data-driven insights, innovative approaches, and telemedicine. These efforts collectively aim to establish a seamless continuum of care, minimize patient treatment delays, and ensure that healthcare professionals are both incentivized and adequately prepared for high-stress emergency environments. Additionally, addressing violence against healthcare professionals and ensuring equitable access to emergency care are crucial components of the transformation agenda. This transformation is not only essential for saving lives, reducing disabilities, and advancing universal health coverage but also addresses a critical gap in India's healthcare landscape by enhancing the efficiency and accessibility of emergency care services.

Keywords: Emergency Care Ecosystem, Continuum of Care, Referral Systems, Pre-hospital Care, First Responders, Surveillance, Telemedicine

Introduction

Emergency care stands as an indispensable pillar within the healthcare system, acting as the first point of contact for individuals afflicted by acute conditions, including injuries, communicable diseases, non-communicable diseases, and complications of pregnancy. However, the consistent availability of prompt emergency care remains a challenge in select regions, often due to resource limitations or exorbitant costs.^[1]

In low and middle-income countries (LMICs), nearly half of the cumulative disease burden emanates from emergency medical conditions and injuries, emphasizing the criticality of timely response.^[2,3,4] In Southeast Asia alone, 90% of deaths and 84% of disability-adjusted life years (DALYs) are due to emergency and trauma conditions.^[6] According to the Disease Control Priorities Project (DCP2), an effective and operational emergency care system could potentially address up to 45% of the disease burden in LMICs, improving healthcare outcomes significantly. Among the leading causes of mortality in LMICs, such as ischaemic heart disease, stroke, lower respiratory infections, chronic obstructive pulmonary disease (COPD), and diarrheal diseases, a significant number manifest as emergencies, necessitating time-sensitive interventions that exhibit better outcomes with high-quality acute care. Analogously, various causes of maternal and neonatal fatalities and injuries follow the same pattern.^[5]

In the context of India, conditions such as acute myocardial infarction, cerebrovascular accidents, Diabetic Ketoacidosis, sudden breathlessness, stroke, poisoning, obstetric emergencies, and Road Traffic Injuries stand prominent as the primary contributors to mortality.^[6] The accessibility of assured emergency services remains predominantly concentrated at the tertiary healthcare level, leading to undue pressure on these facilities, amplifying their burden and resulting in substantial out-of-pocket expenses. Additionally, the opportunity for timely treatment within the "golden hour" is gravely compromised.

District hospitals (DHs) are critical in delivering comprehensive emergency services at the closest point of care, ensuring timely interventions and higher chances of survival. However, they face limitations, including resource scarcity encompassing physical infrastructure, equipment, and adequately trained personnel. Inconsistencies in standard operating protocols and practices further hinder emergency care quality. The evolving role of emergency care now includes prehospital services, effective communication systems, emergency surveillance, and linkages with Critical Care Blocks (CCBs) for seamless service delivery. Addressing these challenges is vital to improving emergency care outcomes.

To address the above challenges and guide the States & UTs in establishing a fully functional Emergency at District Hospitals, the Operational and Technical Guidelines on Emergency Care Services have been formulated and nationally disseminated by the Government of India.^[7] These guidelines must be implemented effectively, ensuring their integration into routine practice. Moreover, establishing standardized protocols and practices across DHs can significantly improve the overall quality and effectiveness of emergency care services, culminating in improved outcomes for patients across the spectrum of critical health situations.

This discussion paper, based on extensive deliberations, held at the National Dissemination of the "Operational & Technical Guidelines on Emergency Care Services at District Hospitals." explores the existing emergency care ecosystem, emphasizing the role of first responders, effective communication, referral services, and trained healthcare staff. It also highlights challenges, solutions, technological advancements, and the benefits of implementing an emergency surveillance system in India's quest to establish reliable emergency care services.

1. Emergency Care Ecosystem in India

In the healthcare sector, emergency medical care is at times undervalued, particularly in low- and middle-income countries, due to several misconceptions. These misconceptions often involve combining emergency care solely with ambulance services and fixating on transportation while overlooking the significance of community and medical facility-based care.^[6] One of the most prevalent misbeliefs is the perception that emergency treatment is inherently costly. This perception tends to focus on the high-tech aspects of clinical care, neglecting simpler and more efficient techniques. Nevertheless, endeavors to improve emergency care should not translate into increased financial burdens for many individuals worldwide. This is because emergency care serves as the primary gateway to the healthcare system and plays a pivotal role in achieving universal health coverage (UHC).

1.1 Pre-hospital care: Challenges and probable solutions in the referral mechanism

In many cases, the immediate delivery of emergency medical care and the rapid transportation of injured individuals from the injury site to a healthcare facility can save lives, reduce short-term disabilities, and significantly enhance long-term outcomes. Unfortunately, many parts of the world lack the capacity to provide this fundamental level of medical assistance.

In India, there exists a basic pre-hospital Emergency Medical Service (EMS) that requires modernization and integration with state and national-level hospitals. State government-regulated ambulances, managed by the Emergency Management and Research Institute (EMRI) under a common toll-free number, 108, are responsible for pre-hospital care. Additionally, India lacks a universal toll-free number for emergencies, leading to confusion with multiple numbers for various emergencies. Surprisingly, only 3% of ambulance providers are capable of delivering the necessary care, even though 54% of deaths could be prevented through an efficient pre-hospital care system.^[6]

Emergency care is time-sensitive, with critical emphasis on the initial "platinum ten minutes" and the "golden hour." Strengthening the transportation system, particularly in remote and challenging terrains where response times are quite long and patient stabilization is crucial, is paramount. An effective pre-hospital trauma care system should be simple, sustainable, practical, efficient, and adaptable. Since pre-hospital trauma care has the potential to save lives and limbs, it should not be limited to those who can afford it.

In addition to implementing basic systems of care, certain administrative elements must be in place to ensure that a prehospital care system is both effective and sustainable. For example, each episode of care should be documented, not only because it is important to monitor the processes and outcomes of care, but also because incident records provide important insights into the nature and location of community hazards and how many injuries might be prevented.

1.2 Community engagement: Role of first responders and bystanders in emergency care

In situations where there is a lack of pre-hospital trauma care infrastructure, the initial and fundamental level of such a system can be established by educating community members who are willing to learn basic first aid techniques. It has been demonstrated in published literature that training the community in first aid can equip them with the means to respond to emergencies.^[8,9] These individuals can be trained to

identify emergencies, request professional assistance, and administer initial treatment until formally trained healthcare personnel arrive to provide further care. To raise awareness within the community, promotional campaigns should be conducted through various media channels such as television, radio, social media, Google reviews, and by showcasing success stories and facilitating discussions.

It is of utmost importance to empower Self Help Groups (SHGs) in rural areas, enabling them to function as emergency response teams during critical situations and educating Panchayats about the role and significance of first responders. It may also be feasible to identify highly motivated or strategically positioned individuals, such as public servants, taxi drivers, or community leaders, and provide them with training to offer a more comprehensive level of pre-hospital care. In addition to acquiring a broader set of first-aid skills, this group could receive education on the fundamental principles of safe rescue and transportation.^[10] Another valuable approach is the implementation of Basic Life Support (BLS) training programs in schools to educate children and enhance awareness. At the same time, the public should be guaranteed protection when they step in to assist road accident victims, ensuring that bystanders are both empowered to help and confident they won't face adverse consequences, including legal liability, for aiding an injured individual as envisaged under the Good Samaritan law.

1.3 Role of referral systems

Around 29000 ambulances are functioning under NHM^[11], and their rational deployment as per the population norms, burden and terrain needs to be done. The actual percentage of people utilizing ambulance services also needs to be looked into, especially in metropolitan cities. A Control, Command and Facilitation Centre for the operationalization of ambulance services is indispensable to close the loop. Establishing a singular, comprehensive emergency number covering trauma, fire, police, medical issues, etc., and disseminating it broadly among the masses is imperative.

Furthermore, establishing a common triage language for communication between paramedics and nursing staff is crucial. This uniform communication method helps avoid confusion and delays in treatment, facilitating efficient and effective patient care. Furthermore, establishing a well-defined inter-hospital and intra-hospital transfer system, at the same time, ensuring the receiving hospital is prepared to provide care can lead to timely interventions, thus saving lives.

In addition, implementing Green Corridors, similar to the model used for organ donation, can be pivotal in saving lives during time-sensitive emergencies. By creating dedicated routes for shifting patients from lower to higher facilities, swift access to necessary care can be ensured, thereby, minimizing delays.

1.4 Role of medical colleges and centres of excellence

Staff shortages and unequal distribution of the available human resources pose significant obstacles to achieving universal health coverage. Moreover, formal education and specialized training in emergency care are neither accessible nor obligatory for individuals engaged in emergency care roles. Beyond numerical inadequacies, challenges encompass various aspects, including management, motivation (attraction and retention), competency, supply, and the necessity for an appropriate skill mix. The current imperative is to enhance the capacity of emergency care providers, ensuring continuous professional

development and skill advancement in the realm of emergency care. This approach is vital for overcoming the multifaceted challenges and bolstering the effectiveness of emergency healthcare services.

Medical colleges can serve as mentoring hubs for district hospitals under their ambit for providing continuous support to handle emergencies. For this, the telemedicine platform can be leveraged. Developing emergency care services does not necessarily involve a lot of financial outlay. Instead, it involves restructuring, training, protocols, and integration to establish a common language within healthcare systems that addresses emergency care promptly.

These guidelines are tailored in such a way as to strengthen the district hospitals. Adoption of district hospitals by medical colleges and initiating DNB courses at the DH level will add additional impetus. Furthermore, around 90 NELS centres have been operationalized to date and can be utilized to train doctors, nurses and paramedics in emergency care. Skill labs being utilized for undergraduate medical students can be used for training doctors, nurses and paramedics at District Hospitals involved in emergency care services. More mechanisms of engagement with lower-level facilities and tertiary care shall be identified, ensuring a continuum of care. All the trainings being held shall be recognized and shall be utilized and translated into practice. A mentor-mentee model can be effective for continuous skill improvement. Furthermore, it is important to document the data related to training and check their effectiveness in terms of improvement of indicators.

It is important for the States/UTs to consider incentives for healthcare staff working who are delivering in high-stress emergency environments. There should be a mechanism for incentivization, to avoid burnout and ensure ongoing skill enhancement for healthcare personnel.

2. Transforming Emergency Care Services

Advances in medical care and technology have expanded the scope of what has been the traditional domain of emergency services. Transformation encompasses a multifaceted approach towards enhancing emergency care services in India. Firstly, the aim is to gain a comprehensive understanding of how technological solutions and innovations can be harnessed effectively. This entails recognizing the pivotal role of collaborations and partnerships in addressing the current gaps within the emergency care ecosystem. By leveraging these partnerships and technological advancements, the goal is to facilitate a transformation in the delivery of emergency care services. Additionally, it is crucial to acknowledge the challenges hindering equitable access to these services. To overcome these obstacles, the implementation of an emergency surveillance system is being considered, as it holds the potential to usher in a paradigm shift in the way emergency care is provided across the country, ultimately improving the overall healthcare landscape.

2.1 Emergency Surveillance Systems: its development, challenges & opportunities

In essence, two crucial aspects warrant in-depth examination: the specific data to be gathered and the meticulousness with which this data should be collected. The report on the country-level assessment of emergency and injury care vividly underscores a significant gap between secondary and tertiary care.^[6] The emergency care system, along with facility-based care, is in its nascent stage within the country. This state is characterized by fragmented services spanning pre-hospital care to facility-based care,

encompassing both government and private sectors. Moreover, a scarcity of adequately trained personnel, and financial resources, as well as insufficient legislation and regulations further afflict the system. Evident deficiencies exist in ambulance services, healthcare infrastructure, human resources, and equipment, impeding the provision of optimal care. Fundamentally, the emergency care system rests on three pillars: prehospital care, hospital/facility-based care, and the financial aspect. Currently, all these components of the emergency care system function disparately. Therefore, a comprehensive evaluation of the existing gaps in facility-based emergency care and its interconnection with the broader emergency care system becomes essential. The only viable means to achieve this assessment is through extensive data collection. Data collection needs to be done at 3 levels: Prehospital level, Hospital level and post-hospital level.

It is very important to know what data we are collecting and above that how are we reporting that data. Details such as door-to-needle time, door-to-thrombolysis time, and door-to-stretcher time, need to be captured with a proper IT system in place, so that the loopholes in the quality care can be determined.

2.2 Data-driven insights and Evidence-based practices in transforming emergency care

Among the passive, active and sentinel methods of data collection, the most effective and robust approach is the active method. An illustrative instance of this is evident in Tamil Nadu, where the State Government has effectively integrated the emergency, accident, and trauma care system. The commitment from the government is underscored by a well-established governance framework that extends to the remotest areas, with comprehensive contributions from private partners. The implementation of an emergency ambulance app provides individuals with the ability to seek immediate assistance.

The 108-ambulance service operates seamlessly under a PPP model, utilizing a single toll-free number available around the clock. EMTs, thoroughly trained through hands-on guidance, administer prehospital care. However, challenges arise upon the patient's arrival in the hospital. The lack of assurance in facility-based care can lead to life loss or prolonged treatment. In other scenarios, 55% of fatalities result from ambulance delays or unavailability. This underscores the necessity to shift public perception, requiring brainstorming and comprehensive data capture.

Collecting substantiated data enables targeted adjustments within the ecosystem. The heightened awareness prompted by COVID-19 emphasizes the urgency of reinforcing the underdeveloped emergency care system. Collaborating with IT firms and stakeholders to optimize data collection and utilization is vital in this pursuit, at the same time maintaining the privacy, security and confidentiality of the data.

G20 also talks about proper data collection and the proper utilization of that data. There is need to have proper data to establish the areas where there is a need for emphasis on the services i.e., the underserved and economically backward areas. Urban slums are another area where data collection needs to gear up and it needs to be brought under the radar, as there is an immense population shift which is happening over time and access to quality services is becoming a challenge.

2.3 Technological advancements and innovative solutions for improving quality and accessibility

An app similar to cab services such as Uber and Ola for ambulances can be developed, ensuring easy access and quick response. A multi-modal system to cater to non-tech-savvy users in rural areas, allowing direct calls to system-regulated ambulances can also be considered. The ambulance routes and health care facilities can be optimized by utilizing GPS technology in the app to assign the nearest ambulance to the patient's location. A live dashboard to monitor and display real-time bed availability across medical facilities can be developed to enhance transparency and aid efficient allocation of patients to hospitals with available beds. Synchronization of data collection methods to ensure effective and efficient results and utilizing integrated data for continuous improvement of the ambulance and healthcare system.

2.4 Potential of telemedicine and teleconsultation

Tele-consultations, proven successful during COVID, have saved numerous lives. District hospitals, acting as a link between lower-level facilities and medical colleges, offer support to the health teams as well as facilitate specialist advice from medical colleges, enhancing patient care. Leveraging this facility, and establishing round-the-clock tele-clinics across various facilities will enable immediate resolution of patient queries and issues, minimizing the need for unnecessary travel and enhancing convenience.

An example of technology put to good use in our country is the "Save Heart Initiative" in Kashmir which includes a virtual hospital for cardiac emergencies, and has been successful in saving countless lives annually, showcasing the potential of technology in healthcare. The Neurology Department at AIIMS has been utilizing online platforms to assess CT scans ensuring timely treatment for stroke patients during the critical golden hour.

2.5 Violence against healthcare professionals: Zero tolerance policy to ensure their safety in clinical establishments

A recent article published in the Lancet underscores the alarming prevalence of violence in India.^[12] Beyond physical aggression, abusive methods are equally concerning. The World Health Organization has defined workplace violence in the health sector as incidents where staff is abused, threatened, or assaulted in circumstances related to their work, including commuting to and from work, involving an explicit or implicit challenge to their safety, well-being, or health.^[13] From 2007 to 2019, India has seen 153 reported incidents of violent assaults against HCWs. This number, while underreported, is still atypically high for a country that is not in a conflict zone.^[14, 15]

Analyzing the surge in violence against healthcare providers unveils a predominant catalyst: the mismatch between demand and supply. Addressing this necessitates, as a primary step, augmenting the supply by elevating the number of healthcare professionals, thereby mitigating the increasing demand. Nonetheless, it's essential to remember that quality accompanies quantity. Effective communication skills are pivotal in interacting with individuals. Although substantial clinical training is offered across various levels and facilities, a noticeable gap exists in providing soft skills training.

Still, situations may arise where people take law into their hands. To handle such cases, it is important to understand that this law needs to be revisited and amended and then implemented strictly. Hospital policy should be clearly defined mentioning the procedure to handle the problematic situations, such as no clustering of relatives should be allowed security should ensure orderliness at all times and even the law

implementation agencies such as senior police officers should make regular visits at district hospitals and other facilities addressing all the complaints wherever required.

2.6 Equitable access to emergency care services

Equity, as defined by World Health Organization (WHO), encompasses the absence of avoidable or remediable disparities among various groups of people, be it along social, economic, demographic, or geographical lines. It holds immense significance, especially in the context of UHC, where the goal is to ensure that all individuals can access a complete spectrum of high-quality healthcare services without encountering financial strain. This principle is enshrined in India's National Health Policy of 2017 and is further emphasized through the National Health Mission. The government is actively pursuing equity through diverse initiatives, including Ayushman Bharat Health and Wellness Centres (HWCs) and the Pradhan Mantri Jan Arogya Yojana (PMJAY), which extends comprehensive insurance coverage to a substantial portion of the population, encompassing emergency care services as well.

However, a significant challenge at present revolves around the identification and mapping of healthcare facilities that possess the necessary infrastructure to deliver a comprehensive array of emergency care services under one roof and facilities having equipment which are operational and used optimally.

2.7 Strategies to address disparities in access and outcomes

Significant efforts have been made towards reducing out-of-pocket expenditure (OOPE), evident in the establishment of repositories enabling cashless treatment for trauma victims. Similarly, advocating for cashless facilities for "Red" triage patients could represent a substantial stride forward. Private sector involvement constitutes ~ 50% of emergency care, particularly in areas where public health readiness is currently insufficient. Collaborative partnerships with the private sector are advisable to bridge this gap. Gujarat's Mamta scheme serves as a model worth replicating in other regions. The provision of Economically Weaker Sections (EWS) beds by numerous hospitals contributes to achieving equitable care. Nonetheless, regular audits are imperative to assess and regulate the utilization of EWS beds effectively.

Conclusion

It is important for the States/UTs to have an action plan in place for the implementation of these guidelines and subsequently strengthening of the entire emergency care ecosystem as a step towards achieving UHC. Strengthening and upgradation of infrastructure, drugs, diagnostics, equipment, periodic training of the healthcare staff as well as continuous monitoring of care and feedback will be required to bring about effective and assured delivery of services. Focus should be given on capacity building of human resources at all levels. For this, collaboration at various levels needs to be strengthened. Handholding support to District Hospitals by Medical Colleges may be leveraged to bring expertise of tertiary care. Strengthening and upgradation of infrastructure so that it is technology-enabled as well as climate resilient. At the same time, collaborating with IT experts is necessary for designing vehicle mapping and real-time location systems. Mechanisms need to be in place to continuously monitor and evaluate the quality of service delivery. Learnings from models being implemented in the States can be replicated and adopted by other States/UTs.

Conflict of Interest

The authors declare no conflicts of interest.

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