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Review Article

A narrative review of trauma care delivery in india: challenges and opportunities

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Abstract

It is estimated that the cost of road accidents in India is around 3% of the Gross Domestic Product of the country. On average, 400 persons die daily in road accidents in India, and cities, such as New Delhi and the national capital region are on the top of the list of road accident causalities. Based on the Basilica agreement, the Indian government has initiated various policy changes and infrastructure development along the national highways which include the redesign of blindspots on the roads and the infliction of heavy penalties for the violation of traffic rules and compliances. On the academic front, the Indo-US Emergency Medicine forum has inaugurated an academic college for emergency medicine in India that cooperates with various government and private healthcare providers and policymakers for the improvement of emergency/trauma care delivery. Lately, few business schools and healthcare educational institutes have focused on interdisciplinary training and research centers in the area of emergency care delivery. Policymakers are also proactively working with various organizations to implement new rules and compliance mechanisms. This prospective study entails a detailed review of the literature using keywords in the PubMed journals, news articles, and media reports. Authors encountered studies in the area of trauma care delivery in India and other countries in their comprehensive field research. Almost 100% of the cases were medico-legal and only one case out of 100 was an insured patient. Furthermore, 87% of the cases were new and only 13% were review cases. Based on the conducted analysis, the number of accidents reduced across the country after the implementation of the New Motor Vehicle Act in the year 2019. It is worth mentioning that, the government launched awareness programs for the public as well. Some of the major challenges identified included lack of coordination and institutional mechanisms for an integrated emergency care delivery, poor referral processes, inadequate ambulance services, lack of third-party coordination, and poor in-hospital resources, particularly in public healthcare organizations. Apart from these, there was an acute shortage of trained emergency medicine experts at all levels. Trauma care delivery is a complex issue and its accomplishment requires good coordination and collaboration among stakeholders. The study identified various challenges and opportunities for the improvement of trauma care delivery in India. There is an immense need and opportunity for the modification of the emergency care delivery system through the introduction of appropriate changes in the transportation policy, emergency care delivery models, institutional mechanisms, such as referral process, and appropriate resource allocation at different levels of care delivery system.

Keywords: Coordination, Diagnosis, Emergencies, Out of Pocket Expense, Trauma

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Introduction

The government of India has launched the world's largest public health program "Ayushman Bharat", popularly known as "Modi" care for low-income families in collaboration with state governments. This program is expected to help low-income families through the improvement of affordability and accessibility of quality care by empaneling both public and private healthcare providers. It should be mentioned that the scheme is portable across the country. Based on the new health policy, the Indian government has increased public spending on health from 1.2% of Gross Domestic Product (GDP) to around 2.5% of the GDP starting from the year 2019. Apart from these, the Ministry of Road Transport and Highways has set up trauma care centers along national highways under Public-Private Partnership (PPP) agreements and saved many lives during the last three years. According to a study conducted by the Ministry Of Road Transport and Highways, the number of road accident deaths declined by about 24% between the years 2017 and 2018. This decline can be attributed to "multi-pronged initiatives", such as better road-traffic enforcement and an improvement in emergency care. According to the latest report on road accidents, 467,044 road accidents happened in India in 2018 which corresponded to about 53 accidents and 17 deaths per hour (1-3). It should be noted that around one-third of the deaths occur in urban areas. Accordingly, road accidents are the fifth leading cause of death in India (4).

Healthcare delivery in India is complicated due to such factors as quality and quantity of available manpower resources, socio-economic condition, low rate of literacy, geographically dispersed and inadequate infrastructure, high levels of Out-of-Pocket Expenses (OOPs), low public spending on health (1.2% of GDP for a long time). Lack of proper incentives for collaboration/ coordination, complicated Medico-Legal Cases (MLCs), and poor enforcement of rules are among other major challenges faced by healthcare providers in India. Regarding emergency care delivery, a major challenge includes the lack of emergency care facilities, such as a referral system connecting primary and secondary health care service providers. A study conducted by Thim et al. referred to the lack of coordination among police, ambulance service providers, Non-Government Organizations (NGOs), and administrative support in emergency care delivery (5).

The Out-of-Pocket Expenses (OOPs) in India are one of the highest in the world and are estimated to be around 71%. It is mainly due to low public health spending on health (1.2% of GDP) for a long time. This accounts for 5 to 10% of household income (2). Demand for emergency medical care in India is on the rise mainly due to the high rate of road accidents. According to the latest study conducted by Babu et al, the availability of resources is quite good at the level I hospitals, whereas the availability of resources and skilled manpower is highly inadequate at level II and III hospitals. Nursing and paramedic staff is a challenge at Level II hospitals whereas almost all resources are in deficit at level III hospitals (6).

According to a study performed by World Health Organization (WHO) in 2015, the expenses of 207,551 fatalities in India accounted for 3% of GDP. The Medical Council of India (MCI) suggested suitable academic and training programs for capacity building in Emergency Medicine (EM) in India (7). About 12% (17,666 out of 207,551 in the year 2015) of the fatalities in India occur in Uttar Pradesh State alone. The health infrastructure status is also very poor which makes it difficult to access emergency care services. Primary health centers and sub-centers have very few qualified doctors, paramedical staff, and other clinical services. Public hospitals are overcrowded due to poor economic conditions, lack of health insurance, and financing mechanisms (8).

In this paper, various challenges and opportunities in emergency/trauma care delivery are presented in the context of India.

Materials and Methods

This field study was conducted at one of the largest government hospitals in India based on a detailed

literature review (3-6, 15-17). An extensive search has been conducted on the literature using related keywords in the PubMed journals, news articles, media reports, and research studies in the area of trauma care delivery in India and other countries. Moreover, relevant studies have been considered for detailed analysis, and various challenges and mechanisms for improving care delivery were identified in this study.

The authors have also interacted with emergency care delivery providers including ambulance service providers, police forces, transport service providers, NGOs, and hospital nurses and paramedics.

Results

Thim et al. have observed the distribution of accident occurrences reported at a large public teaching hospital in the state of Uttar Pradesh (Table 1). It is noted that around 70% of the accidents happened between 6 am and 6 pm and mainly on the highways and between two-wheelers and heavy vehicles. This study also reported that almost 100% of cases were medico-legal cases except in the case of one patient who had health insurance. Furthermore, 87% of the cases were new and the rest were review patients. Only around 10% of the cases had access to the nearest hospital and the rest had referred to a large public hospital on their own. Only one case was brought to the hospital by a public emergency vehicle (108 Ambulance Service). In many cases of the accident, patients were brought to the hospital by two-wheelers. It should be noted that around 35% of reported cases were children below 15 years old (5).

Table 1. Distribution of the occurrence of accidents

Time of accident	Number of cases
12 am -6 am	7
6 am-12 pm	37
12 pm -6 pm	32
6 pm-12 am	17
Not known	7
Source: Thim et al. 2018 (5)	

According to a study conducted by Peden and Pietro, Bloomberg philanthropies committed around 125 million US dollars during 2010-14 to reduce road traffic injuries (RTI) and fatalities in ten low and middle-income countries including India (8). These ten countries account for 50% of the global road traffic fatalities. The interventions included capacity building on road safety, media campaigns, advocacy on health, improved legislation, and enforcement of rules. Based on the experience of these interventions, new partnerships on global road safety have been established in ten cities in five countries for the implementation of interventions on behavior, infrastructure, vehicles, enforcement of rules, and legislation for the reduction of RTIs. Another study conducted by Goli et al. identified various drivers involved in road accidents, reported hospitalization costs and suggested short-term and long-term measures that should be done to reduce the rate of road accidents (4). These include measures to curb corruption, strengthen road safety measures, build safe and resilient road networks, create awareness on safe driving, and implement administrative reforms.

Garza-Reyes et al. in their study have proposed a mathematical model and simulation for the improvement of transport services and logistics performance of Emergency Medical Services systems and suggested the theory of Constraints and Lean Manufacturing in the context of Mexico (9). The study performed by Sheu and Pan proposed a method for designing a seamless centralized demand-driven emergency supply network through the integration of three sub-networks (shelter, medical, and distribution networks) to support emergency logistics operations against large-scale natural disasters (10). Another study conducted by Brailsford et al. suggested a system dynamics model for emergency and on-demand healthcare in Nottingham, England, based on interviews with key individuals across healthcare and social care systems and developed a conceptual map. It was observed that admissions from general practice had the greatest influence on occupancy rates in hospitals (11), and that reduction in the emergency

admission of a small number of elderly patients led to the reduction of bed occupancy by 1% per annum over five years. Boonmee et al. have addressed the emergency humanitarian logistical problem through the combination of an exact algorithm and a heuristic algorithm (12). Another study performed by Khaldi et al. addressed the issue of emergency visits on weekly basis using Artificial Neural Networks (ANN) and reported that the ANN outperformed other models including Auto-Regressive Integrated Moving Average (ARIMA; 13).

Discussion

This section of the study highlights various challenges and opportunities in trauma care delivery in India. Based on the analysis of relevant studies and media reports, different challenges in this field were identified. These included challenges pertaining to patients, trauma care providers, government agencies, such as traffic police, transport, and highways department, as well as policymakers (5-6, 14-17). Some of the suggested mechanisms are presented in (Table 2).

Table 2. Mechanisms Suggested for Improving the Emergency Care Delivery

Dimension	Access	Affordability	Quality of care
Patient	Establishment of an adequate number of emergency care facilities at accident areas (Blind spots)	Provision of health insurance particularly for the bottom of the pyramid patients. Provision of 24x7 ambulance services.	Improvement of facilities, technologies, doctors, medicines. The adoption of information and communication technologies (ICT) for timely information
Provider	Improvement of availability of specialist doctors and paramedical and coordination among different sectors.	Provide various services within the hospital at controlled prices.	The provision of an adequate number of specialists
Processes	Improvement of admin procedure, Medico-Legal Cases (MLC), access to essential services, such as ambulances.	Timely delivery of services through proper integration of data and resources, such as critical equipment and resources.	Integration of inter and intra resources and processes for timely access and delivery of care.
Technology	Use ICT for accessing medical (labs, diagnostic, ambulances) and communication channels.	Provision of basic and advanced diagnostic and clinical services for improving the efficiency of resources	Provision of education for stakeholders on the use of technology.

• Established a sound referral process at both public and private hospitals along the national highways.
• Allocation of an adequate number of ambulances with suitable staff.
• Provision of third-party coordinators in critical areas, such as transfer of patients at different stages.
• Improvement of the processes through better digital communication and care delivery.
• Provision of training to the care providers on the application of the latest technologies and care delivery processes.
• Revision of existing policies and organization structure to support the care delivery.

• **Patients related:** in many cases, injured patients and their attendants have inadequate awareness about their rights. They often fail to call or communicate to the emergency service providers, such as 108 ambulances, police, or the hospital, and this way they lose precious time before reaching the proper hospital.

• **Hospital related:** Many hospitals/ emergency care providers are government organizations and they face a serious shortage of clinical and non-clinical workforce, inadequate number of emergency beds, and diagnostic services. Moreover, these organizations experience inefficient care delivery processes (administrative as well as support services), ineffectual management, overload on all the resources (more than 150% of capacity), poor coordination with other stakeholders, noncompliance to treatment protocols, and lack of trained and professional manpower.

• **Police and other governmental agencies related:** There is a huge coordination gap among police, ambulance, legal procedures, insurance companies, and government agencies apart from medico-legal cases related issues.

• **NGOs and other Stakeholders related:** Other organizations involved in facilitating the emergency care delivery include NGOs, Corporate Social Responsibility (CSR), blood banks, international clubs, such as Rotaract club and Lions club. Organizations, such as Indo-US Emergency Medicine are involved in capacity building in partnership with medical schools at the national level, and these need to be strengthened further. These organizations need to be integrated into suitable institutional and communication mechanisms that can help improve care delivery.

Based on the challenges identified, the following mechanisms were suggested for improving trauma care delivery. These are mainly focused on patients, processes, care providers, and technology and care delivery policy. (Table 2) presents mechanisms for improving access, affordability, and quality of care.

Regarding the limitations of the present study, one can refer to the fact that since this study is based on the analysis of few studies in the area of trauma care delivery; therefore, it cannot be generalized at the national level. This study can be a starting point for further research in the area of trauma care delivery.

Conclusion

Trauma care delivery is highly complex due to the interdependencies of providers, fragmented processes, lack of coordination, weak policies, and lack of strict enforcement. The establishment of a referral process can help the patient reach the hospital faster. Patients suffer as a result of delays in transfer to the nearest hospital and delays caused by lengthy hospital admission processes. This can be addressed through the allocation of a sufficient amount of resources including manpower, technological resources, and administrative support for the efficient use of resources. The provision of 24-hour ambulance services, helpline, and mobile applications is strongly recommended. Moreover, suitable systems are suggested for tracking patients within the hospital, and revision of care delivery policy for trauma care delivery is strongly suggested in this regard. It can be concluded that the integration of emergency/trauma care service providers and processes is very critical for efficient and effective care delivery.

This study was based on the data collected over a period of six months from one major hospital and samples were predominantly road accident cases. Further studies can focus on multi-period and multi-hospital studies covering a larger number of cases.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this study.

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