

Improving Quality of Emergency Care in India by Implementing Trauma Registries

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Introduction

Injuries continue to kill 5 million people each year. Road traffic injuries claimed approximately 3,700 lives each day in 2015, about three-quarters of whom were men and boys. The Global Status Report on Road Safety 2018, launched by World Health Organization in December 2018, highlights that the number of annual road traffic deaths has reached 1.35 million. Road traffic injuries are now the leading killer of people aged 5 to 29 years and are the eighth leading cause of death. Fifty-four percent of deaths are pedestrians, cyclists, and motorcyclists, and every 24 seconds someone dies on the road.¹ Two of the three leading causes of injury deaths are road traffic injuries and falls. In India, the mortality and morbidity for the same injury severity is 16 times higher as compared with western data.

Trauma care systems in India are in primitive stages of development or are mostly nonexistent. There is a dearth of dedicated prehospital care providers and absence of trained manpower in prehospital, in-hospital acute trauma care, and rehabilitation. There is a complete lack of trauma-related hospital data (registry) and trauma quality improvement programs. There is a need of a broad framework of policies and protocols in a given geographical area for the seamless transition between each phase of care, integrating health resources. A well-coordinated team work between various agencies is needed to achieve the ultimate goal of care of the severely injured on the criteria based on “getting the right patient to the right place at the right time for the right care.”²

The organization of a trauma system has four impact pillars—organization of prehospital care facilities, hospital networking, communication systems, and organization of in-hospital care (acute care and definitive care). An efficient trauma care system demands integration of three critical elements—human resources (staffing and training), physical resources (infrastructure, equipment, and supplies), and the process (organization and administration).

At present, there is no systematic linkage system of information available from various entities involved in trauma response, like police, emergency services, and hospitals.

Also, a variation in the format of data collection is observed across states, even different hospitals have different formats of recording data in trauma cases. Most registries are limited to patients treated in trauma centers but exclude those who die at the scene or those with minor injuries who do not require hospital treatment. It is essential to set up reliable data collection and analysis procedures to move from experiential to evidence-based safety policies and strategies.³ Quality data on road traffic injuries can be maintained with adequate training and a data linking mechanism between the police, hospital, and transport departments.⁴ An integrated robust data platform needs to be established to guide all policies, programs, and interventions in the area of road safety.⁵ Successful deployment of trauma care systems, including the use of trauma registries, has played a significant role in the substantial decline in death and disability rates from injuries.

Trauma Registry

In trauma care systems, a trauma registry is a key infrastructural component. A trauma registry is a database composed of uniform data elements that describe the injury, along with demographics, prehospital information, diagnosis, care, outcomes, and costs of treatment for injured patients.^{6,7} The trauma registry is an essential management tool that contains detailed, reliable, and readily accessible information needed to operate a trauma center, and hence, should be maintained at all trauma centers. At the trauma center level, data from the registry helps in quality improvement, and at the state or country level, data aggregated and analyzed from registries at different trauma centers can highlight trends, help identify key areas of improvement, and analyze effectiveness of road safety and trauma care interventions.⁸

Keeping in view that globally health care system is challenged by increasing cost, the disease-specific registry data might serve as a multifarious and powerful tool kit. The registries, besides serving as platform for clinical and epidemiological research and improving the quality of care, also intend to bridge the gap between research and policy by facilitating evidence-based policy in public health.⁹ Trauma registries

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are essentially designed to collate data on acute phase care delivered to patients hospitalized for injuries. The registry database uses specific inclusion criteria to register patients in a consistent, reliable, and uniform manner. The inclusion criteria are essentially based on the established definition from the International Classification of Diseases (ICD).⁹

Initially, trauma registries were implemented as a useful tool for quality improvement process especially for the hospitals catering trauma patients; however, in subsequent years it has been implemented as part of integrated trauma health care systems. Previous studies have demonstrated the effect of trauma registries in decreasing the trauma mortality. These evidences have proven the importance of introduction of integrated trauma registries for developing sustainable trauma care systems.¹⁰⁻¹⁶

Studies have investigated the effectiveness of trauma systems using trauma registries. Between 1987 and 1997, Jurkovich and Mock¹⁰ have compiled and published 11 significant studies on trauma registry. A systematic review by Mann et al¹⁷ had found reduced mortality in severely injured patients with established trauma systems, compared with centers where no trauma system existed. In another large study involving level I and level II trauma centers across the United States, the authors evaluated the association between the footfall at the trauma center with the outcomes of injured patients.¹⁸ A study conducted between 1982 and 1989 by 139 North American hospitals has been considered the best-known national registry database so far. This Major Trauma Outcome Study had included 80,000 data observations in their registry. This study is still considered a “standard” to evaluate the performance by using Trauma and Injury Severity Score methodology.¹⁹

Trauma registries are essential to trauma system improvement.²⁰ Despite the burden of injury in low/middle-income countries (LMICs), the registry-related data in trauma is less as compared with developed nations.²¹ Study on 30-day in-hospital trauma mortality conducted in India by the Toward Improved Trauma Care Outcomes (TITCO) consortium was the first to use a robust prehospital registry data to evaluate the 30-day mortality outcome in India.²² Trauma registry has been used to assess the effect of delay in intensive care unit (ICU) admission from emergency department at level I trauma center in India in 2018.²³ Studies on comparative analysis of shock index with age with survival outcome of the patients were performed from the TITCO registry data in India.^{24,25} Similarly, other studies have also investigated the injury severity scores to predict mortality in different populations by using registry data.^{26,27}

Importance of Trauma Registry

Injury registry is the best way of monitoring changing trends, identifying new problems, selecting interventions, and measuring the impact of interventions in a timely manner. By identifying what interventions work with such information, it is possible to design and apply appropriate scientific interventions and monitor the results along with assessing the impact of interventions. Local, regional, and national trauma

registry systems will provide data required for planning and delivering effective injury prevention programs to communities and to the country at large.^{28,29} They will also help in improving and benchmarking quality of care in the upcoming trauma centers in an emerging economy like India.

The data in a trauma registry can be used in a variety of ways. The following sections describe uses that improve the care of injured patients across the continuum from injury prevention to outcomes measurement. In addition, they address the need for all trauma centers to participate in data aggregation at the local, state, and national levels. Trauma registries unlike injury surveillance platforms have the key component of “timely care” provided and hence can throw a very important light on the process of care in a trauma system. Process of care is of utmost importance in improving trauma outcomes in a trauma system as trauma/injury is a time-sensitive disease. Thus, participation and pooling of data from various trauma centers is required to improve trauma systems, shape public policy, and provide the opportunity for trauma centers to compare their outcomes with regional and national benchmarks.

A trauma registry serves its purposes only to the extent that the data that it contains is complete, accurate, and adherent to case inclusion criteria and individual data field definitions. Good quality, reliable, and representative information is very vital and is the foundation to formulate injury prevention programs in India.

Prehospital Care

Studies on prehospital registries have collected data on time of injury, time of arrival to trauma center, and transfer patterns. The information obtained through these registries has helped in analyzing the effect of early transport of trauma victims on outcomes which is preferable to extensive interventions on site.³⁰ Trauma registries can be used to obtain useful information on prehospital care. Trauma registries are already established in high-income countries and increasingly recognized as an important tool to improve trauma care system in LMICs in recent years.²⁹ A study in Brazil had pointed missing data in the rescuer forms who transferred the patients to trauma center by ambulance. There is a need to emphasize the need of prehospital data collection as most of the health care providers do not understand the importance of registering prehospital data.³¹

Measuring Process of Care and Trauma Quality Improvement

Trauma registries contribute to practice and processes that improve care.³² An integrated, well-established trauma registry provides an ideal opportunity for using information system to improve the performance process required for trauma systems. A crucial element in trauma systems development is the implementation of prehospital care to injured at injury site prior to arrival at a trauma center.³³

Every trauma center should be able to show that the trauma registry is used to objectively review the care

provided to individual patients and to identify variations in the processes and outcomes for groups of patients. The individual institutions, regional trauma system, and national aggregate can monitor a variety of parameters, track variability, and document improvement. This will also go a long way in accreditation of trauma centers and their grading into level I (highest level of care) through level III/IV (basic trauma care). Level of newly commissioned trauma centers in India are just based on the structure and manpower provided by the institution and does not take into account the trauma load, process of care, and outcomes of these centers. The Ministry of Health and Family Welfare, Government of India, is however considering formulating the standard treatment guidelines for trauma care and also key performance indicators (including structure, process, and outcomes) for the newly commissioned trauma centers. This will in the coming years help to compare and benchmark the trauma care provided in these facilities.

Examples of process indicators would include prehospital response times, presence and timelines of care, lengths of stay in the emergency department, timelines for life-saving procedures/imaging/surgery, length of stay in ICUs or hospital, incidence of complications, and comparison of expected and observed deaths, and cost. These variables can, in turn, be compared with past performances or benchmarks developed from regional or national averages. Thus, the trauma registry is a tool to drive the quality improvement process for individual hospitals, emergency medical services, regional trauma systems, and the provision of injury care at the national level.³⁴ A major component of developing a trauma system is a trauma quality improvement (TQI) program. An interventional study conducted in India have developed, implemented, and evaluated a TQI checklist for improving TQI processes. The study reveals that TQI checklist should be mandatory for all trauma centers managing trauma patients.³⁵

Public Health

The trauma registry is one important component of the comprehensive data system needed to describe the entire spectrum of injured patients. These data provide information about the incidence, care, cost, and outcome of injuries. In addition, these measures can be stratified further by age, sex, and ethnicity. The aggregation of trauma registry data for a specific geopolitical region to create a population-based depiction of injury as a disease process could be important information for departments of health. In the developed trauma systems, various regions already require submission of data to a state and national trauma registry. Registry data also may be used to inform public officials about trauma as a public health problem, thus serving as a basis for legislative and regulatory efforts.³⁶

Injury Prevention

The trauma registry helps the performance improvement strategies by monitoring the trends, providing data, including

distribution by age, geographic location, mechanism of injury, cause of injury, etc. The Canadian National Trauma Registry³⁷ and the Wisconsin Trauma Care Registry³⁸ are developed and implemented with the help of injury prevention process, to provide a basis for injury prevention approaches.

Trauma Systems and System Research

The needs of injured patients span the continuum of injury care from prevention to outcomes measurement. They are present in urban, suburban, and rural environments. In addition, they can cross geographic and political boundaries. The trauma center provides only a part of the overall care that injured patients require.³⁹

Trauma systems are needed to implement and organize systems of care that meets all the needs of injured patients. Such a system cannot exist without data collection and analysis. Individual trauma registries function as conscience keeper of trauma systems. Registry data should be shared and aggregated at the local, state, and national levels to assess trauma system function.⁴⁰

Research is a process used to advance our knowledge of injury. Valid questions can only be answered with reliable data. The trauma registry is a powerful source of such data. Trauma centers are encouraged to use their trauma registry data for research. Trauma registries have proven to be a useful tool for trauma research programs. Consistently and accurately collected trauma data can help answer some research questions using retrospective data or identify a research question that can be answered with a retrospective and concurrent data collection process. The hospital-based trauma registries are now increasingly considered as a valuable research tool.⁴¹

Outcomes Measurement

Trauma is a major cause of death and disability in our society. Outcomes measurements describe the results of interventions and management. Positive patient outcomes result from effective and efficient systems of care. Outcomes measurements focus on a wide variety of clinical results, including the quality of life and the level of function achieved by patients who survive trauma.^{42,43} Trauma registries are focused on mortality and process measures; however, the Victorian State Trauma Registry collects in addition the morbidity and functional outcome measures for adults as well as children routinely.⁴⁴

Resource Utilization and Cost Analysis

The trauma registry also may serve to document the resources required by the trauma program. It can facilitate reliable evaluation of treatments currently considered the standard of care, new strategies of care for injured patients, and the impact of innovative technology. This information can be used to justify institutional and financial support of needed personnel and capital expenditures. This type of analysis will become increasingly important as purchasers of

health care scrutinize the costs and outcomes of individual practitioners, hospitals, and systems that provide trauma care.⁹ The cost-effective analysis by using trauma registries have not been explored much previously and still untouched in many trauma registries running globally. Only few studies have been published so far for this purpose. Previous studies have shown the cost-effectiveness strategies using computed tomographic scanning for complete cervical spine evaluation⁴⁵ and nonoperative management of splenic injuries.⁴⁶ In another study, Orsay et al⁴⁷ have analyzed the registry data of motorcycle riders and linked financial crisis as a reason for not wearing helmets in Illinois state. In a first of its kind study from India, it has been shown that injury causes substantial financial burden on the health care systems and individual patients. It suggests that injury-related data can give a good insight into trauma-related financial burden on society.⁴⁸

Important Aspects of Implementation of Trauma Registry

Budgetary Certainty

Implementation of trauma registries requires considerable manpower and training. It also requires a committed staff at the level of individual trauma centers. Staff training includes training in data formats, data software, data collection and collation, data cleaning and management, and trauma scoring system (AIS, ISS, ICD-10, RTS). All this requires absolute budgetary certainty to engage and train these staff.

Role of Trauma Registry Custodian/Nodal Officer/In-Charge

It is important to acknowledge that high-quality data begin with high-quality data entry, and it is the trauma registrar/registry in-charge, who is responsible for performing this task. Most facilities have an onsite trauma registry in-charge. The trauma registrar is a vital member of the trauma team. Trauma registrars come from diverse backgrounds such as trauma surgery/clinical department, nursing, medical records, computer science, and medical informatics, among others. Ideally, the trauma registrar works directly with the trauma team and reports to the trauma program manager/trauma center administrator. Trauma registrars should receive initial training when they start the job. In North America, they must attend or have previously attended two courses within 12 months of being hired: (1) the American Trauma Society's Trauma Registrar Course or equivalent provided by a state trauma program and (2) the Association of the Advancement of Automotive Medicine's Injury Scaling Course. Centers are encouraged to support trauma registrar training by providing educational offerings within the facility.⁴⁹

Data Collection

In the planning stages for a registry, it is useful to consider the mechanisms for data collection and entry from medical records and the hospital information system. Data downloading from the hospital information system is expanding. The use of portable computers and hand-held devices for

data extraction and data entry is popular. It allows registrars to work concurrently from the medical record and interviews. Alternatively, a paper data form may be designed to record patient information for subsequent batch data entry. The least desirable method is postdischarge data extraction from the medical record. Once collected, these data are downloaded to the main registry. Provisions should be made to ensure timely and complete availability of prehospital care reports, operative notes, medical examiner reports, and other documents that may not always be present in the active medical records. The first assessment of data quality in a new trauma registry project (Australia-India Trauma Systems Collaboration [AITSC] Trauma Registry) in India found that most variables had low rates of missing data.⁵⁰

Data Deidentification

Hospitals are responsible for ensuring patient and hospital confidentiality. The passage of the Health Insurance Portability and Accountability Act by Congress in 1996 brought about major changes in the way internal and external data are handled at health institutions. The trauma program must ensure that appropriate measures are in place to meet the confidentiality requirements of the data. All reasonable means should be used to protect against threats, hazards, and unauthorized uses or disclosures of these data. The responsible parties should ensure that all persons dealing with these data are trained in protecting the confidentiality of patients. Actions to protect confidentiality should be firmly integrated in the administration of the registry so that identifying information is available only to people who have a need to know. The trauma registry in-charge should ensure that data if given to investigators for clinical/systems research is completely deidentified and that the research question for which data are being handed over is approved by the local ethics committee/institutional review board.

Data storage: The data should be stored in the institution's computer other than the Host Integration Server and a proper file backup should be maintained. Data must be captured in a prescribed case record form and further transferred to the Excel sheet and saved in the hard disk of the computer. Only authorized persons assigned by the institute should be allowed to access the registry data. There should be a centralized server for data storage with the particular programming according to the software used by the individual institutions for data collection.

Data Validation and Quality

The information provided by a trauma registry is only as valid as the data entered. Strategies for monitoring data validity are essential.⁵¹ The quality of registry data depends on the data validation process which requires a thorough data cleaning process, correction of data problems, and data management.⁷ It is essential to monitor the quality of services provided and maintenance for the improvement. The quality of care can be monitored by assessing quality indicators in trauma patient. This would allow in improvement of hospital mortality, functional outcomes, and quality of life of trauma victims.⁵²

Report generation and writing: A trauma registry can be valuable only if the data it contains can be transformed into useful information through the process of report writing. Trauma registry reports support decision making and guide the management of the trauma center. Most trauma registry software provides for the generation of several standard reports that summarize different ways to address specific questions or areas of concern. Most standard reports are oriented to anticipate the needs of a trauma center's performance improvement and patient safety program and provide the needed information. This capability should be built into the software itself or achieved by exporting the data to a separate spreadsheet, relational database, or statistical program. Trauma registry reports are available from India which is a single-centric registry report of a level I trauma center.⁵³ Also, a preliminary report of the multicentric study has been generated under the AITSC research project.⁵⁴

Efforts to Establish Trauma Registries in India

Over the past decade, there have been concerted efforts by different groups to establish multicentric hospital-based trauma registries. Some of the notable studies include:

1. Toward Improving Trauma Care Outcomes in India (TITCO) consortium.
2. The Australia-India Trauma Systems Collaborative (AITSC).
3. National Task Force project of ICMR—Structuring and improving trauma care systems through implementation of injury surveillance and trauma registry in India.

Conclusion

Injury is a major public health issue in India and globally. There is an urgent need of rigorous data capturing at all levels of trauma centers. Trauma registries are important for injury prevention and acute trauma care at resource constraint setting like India where the burden of injury is very high. Implementation of such registries in LMIC represents a promising frontier in global efforts to reduce the burden of injury. Therefore, a process of trauma data management is must for any hospital that cares for injured patients. The government and policy makers especially in developing countries should encourage and support the implementation of such registries in hospitals catering to trauma patients.

Conflict of Interest

None.

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