Challenges in trauma management in a developing economy

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Abstract

Introduction
Trauma accounts for a significant proportion of death and disability globally, and the impact is particularly enormous in developing low- and middle-income countries. Apart from cost-effective preventive strategies to reduce the risk of trauma, the determinants of favourable outcomes following trauma include the immediate onsite emergency care, the expertise of manpower, availability of infrastructure and appropriate facilities for care and access to specialised care. In many developing countries challenged by multiple communicable and non-communicable disorders, compounded by ailments and rudimentary health systems and inadequate manpower (in terms of absolute numbers and depth of experience and training), there is a disparate unacceptably higher mortality and morbidity from trauma compared to developed countries. The aim of this review was to discuss the challenges in trauma management in developing countries.

Conclusion
Challenges to trauma care include inadequate pre-hospital trauma care protocol, staff with limited training in trauma management, non-availability and poor distribution of resources, communication deficiencies, transportation and general infrastructure deficits, lack of a holistic approach to trauma management, ignorance of the populace on basic life support measures, cultural and health-seeking behaviours preferring alternative unconventional care and absent or limited institutional and governmental action to address trauma care. Strategies targeting these challenges, and employing/adapting mechanisms proven to be effective in developed countries will reduce the burden of disease attributable to trauma in developing countries.

Introduction
According to the World Health Organization, global burden of disease estimates for disability-adjusted life years (DALYs) in 2009 (a measure of overall disease burden expressed as the number of years lost due to ill-health, disability or early death), with an estimated global average of 2,585 DALYs per 100,000. Importantly, the DALYs in most of the developing countries, particularly in sub-Saharan Africa and countries experiencing internal conflicts, far exceeded this global average, and nearly doubled the DALYs attributable to malignant neoplasms. According to the WHO, injury accounts for 16% of the global burden of disease, a burden that is especially notable in low- and middle-income countries, which bear approximately 90% of the total burden of injury. As such, it is clear that trauma is at the fore in the hierarchy of diseases ravaging the expanding population in many developing countries including Nigeria, where the dual dilemma of communicable diseases such as malaria and HIV/AIDS and emerging non-communicable cardiovascular diseases have put enormous strain on the overstretched albeit inadequate health system. Many developing countries are behind in their response towards improving trauma management systems whose spectrum, quantum, future prospects and practices have continued to expand.

In developing countries, preventable trauma death rate is reportedly as high as 73.7%³. Trauma is the sixth leading cause of death and disability worldwide, resulting in five million or 10% of all deaths. Half of the deaths due to trauma occur in individuals aged 15–45 years, and it is the leading cause of death in this age group, and a major cause of death in all age categories. Death from injury is twice as common in males as females. Trauma-related mortality is potentially preventable by implementing an effective trauma system and adapting interventions that have been utilised in developed countries and evidenced to significantly reduce both morbidity and mortality. The variability in interventions available in developed and developing countries underlies the fact that trauma-related mortality in developing low-income countries is nearly double that in developed high-income countries.

The spectrum of trauma in surgical accident and emergency units in developing countries includes that due to unintentional trauma (such as road vehicular accidents resulting in fractures, head injuries, burns, lacerations, falls, domestic, industrial and sport accidents) and intentional trauma (for instance from self-inflicted injuries and violence). Another dimension is the occurrence of war-related trauma in some regions, further compounding the burden of trauma. Furthermore, undocumented

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Trauma management

Many advances in trauma care in recent years have been derived from experience with injuries suffered in war or with penetrating injuries resulting from interpersonal violence especially in the United States. A trauma system refers to a package of interventions aimed to provide a coordinated and systematic means of delivering rapid definitive care to trauma patients. It represents a continuum of integrated care that is a coordinated effort between out-of-hospital and hospital providers with close cooperation of medical specialists in each phase of care. Trauma management systems also emphasise the importance of timeliness in improving outcomes.

The advanced trauma life support (ATLS) is a training program for medical doctors in the management of acute trauma developed by the American College of Surgeons. It emphasises on the treatment of the greatest threats to life first. It involves the primary survey and secondary survey.

Pre-hospital emergency medical systems

Management of patients on the field is often done by ambulance personnel under supervision. Unlike in developing economies, most developed countries have emergency medical service systems that are staffed with advanced life support personnel including paramedics, nurses or physicians. The essential elements of a pre-hospital trauma care system include prompt communication and activation of the system, timely response of the system, correct assessment, sorting, emergency treatment as well as prompt and safe transport of injured patients to a formal health care facility when necessary.

Pre-hospital triage

Triage is the process of grouping injury victims according to the severity of the trauma and risk of death. Pre-hospital care providers can be trained to carry out this process according to a checklist of criteria or injury severity scoring. Also, the mechanism of injury, for example a fall from a height more than 5 m or polytrauma, is used to group patients.

Primary survey

This is the first and key part of the assessment of patients presenting with trauma. It involves quick assessment and identification of life-threatening conditions with simultaneous resuscitation. Time is very crucial as most life-threatening conditions require prompt management. Suspected spine injury will require immobilisation of the spine with orthosis and carefully log rolling the patient in order to protect the spinal cord and prevent further damage of the cord.

The chest must be examined carefully to assess adequacy of breathing and ventilation. The aim is to identify and manage six life-threatening thoracic conditions such as airway obstruction, tension pneumothorax, massive haemothorax, open pneumothorax, flail chest segment with pulmonary contusion and cardiac tamponade. These conditions sometimes require specialist care in order to save the patient’s life.

Haemorrhage is the predominant cause of preventable post-injury deaths. The source of bleeding should be identified and bleeding should be stopped. This can be achieved by application of pressure, limb elevation, application of a tourniquet, clamping the injured vessel and use of haemostats.

A basic neurological assessment is made during the primary survey using the Glasgow Coma Scale. The patient’s level of consciousness, pupill size and reaction, lateralising signs and sensory level in case of spinal cord injury are determined. A detailed neurological assessment is done when the patient has been stabilised. The patient should be...
undressed and fully examined in order to identify occult injuries. Careful attention should be paid to the temperature control to prevent hypothermia.

Secondary survey
Following the resuscitation efforts and normalisation of vital signs, the secondary survey can begin. It is a thorough head-to-toe evaluation of the trauma patient. Each region of the body must be fully examined. Investigations and definitive management can be instituted following the secondary survey.

Challenges in trauma management in Nigeria
There are several challenges facing effective trauma management in Nigeria and several other developing countries. Some of them are:

Inadequate pre-hospital trauma care protocol
Pre-hospital care is an important and intrinsic aspect of trauma care that is glaringly inadequate in most developing countries. The management of injured patients on the field is often left to bystanders and lay sympathisers at the scene of accidents, with occasional input from ambulance personnel—paramedics and non-paramedics who themselves also often have limited training and need supervision. The goal of an efficient pre-hospital trauma care is to combine minimal transport time with adequate resuscitation. Few victims receive treatment at the crash scene and even fewer receive safe transport to the hospital by ambulance. Injured people are usually cared for and transported to the hospital by relatives, untrained lay people or commercial drivers. Because the pre-hospital care is so poorly developed, all injured patients are taken directly to the nearest hospital or traditional healers depending on local availability and cultural preferences. Consequently, many deaths occur at the crash scene or on the way to the hospital. Inappropriate administration and organisation had been identified as one of the critical barriers to effective pre-hospital care in developing countries. As a consequence, trauma care is often delayed by prolonged transportation time, delivered at facilities without any emergency preparedness for trauma care, with wide variability in practice and eventual outcome. There is thus an urgent need to implement cost-effective but affordable pre-hospital emergency response systems in rural and urban settings that can be integrated into the existing framework of health care in developing countries.

Lack of training and continued training of emergency trauma care staff
A study carried out in Iran on the barriers and facilitators to provide effective pre-hospital trauma care for road traffic injury victims concluded that inadequate knowledge and skills of staff is an important barrier to effective trauma management. This finding is in line with similar studies carried out in Ghana and Mexico. This finding can be explained by the inappropriate practical education, poor educational plans and insufficient motivation among staff to attend training courses. Most of the hospital staff in the developing countries are not fully aware of their roles in trauma management. The introduction of the ATLS courses has coincided with the development of trauma systems and is likely to be an essential component of success. It should be seen as the beginning of trauma resuscitation training.

There is a chronic shortage of qualified trauma surgeons in many developing countries. Most of the trauma surgeons in developing countries work in big urban hospitals, and as such most trauma patients are treated by persons with no trauma training. Therefore, an urgent need exists for increased personnel training in trauma management. Training medical personnel is very expensive, time-consuming and not easily affordable to resource-poor countries of sub-Saharan Africa. In some countries outside of Africa, non-physician healthcare providers and, in some cases, lay persons have been trained to provide essential trauma care. For example, in Cambodia, training volunteer laypersons to recognise severely injured people, and provide basic first aid and wound care, decreased mortality from trauma from 40% to 9%. There is also a belief that trauma management training content of the medical school curriculum is deficient in many areas of the world, Africa inclusive.

The WHO Global Initiative for Emergency and Essential Surgical care was aimed at improving emergency surgical, trauma and obstetric care at the district hospital level. This program has been implemented in African countries, including Ghana, Mozambique and Ethiopia. Another program recently introduced by the WHO is the MENTOR-VIP program aiming to develop human resource capacity in injury prevention by providing mentoring opportunities to relevant professionals.

However, non-specialist and non-physician healthcare providers can only cater adequately to patients with minor to moderately severe injuries. There is still a desperate need for the training of trauma surgeons in sub-Saharan countries to manage severely injured patients. Thus, if trauma systems and trauma centres were to be well developed and staffed, then medical personnel training would become very important both at the specialist level and at less specialised cadres.

Another challenge in trauma management training in developing countries is the pernicious effect of brain drain on the continent’s human resource component of capacity. Brain drain, which has been defined as the migration of health
personnel in search of better standard of living and quality of life, is responsible for taking 23,000 African health professionals to high-income countries each year. While it would be difficult or impossible to stem this trend, there are indications that such brain drain can be made beneficial. In 2006, about $300 billion—nearly three times the world’s foreign aid—was remitted home by migrant workers. A percentage of these earnings could be invested in research and development so that opportunities for highly skilled and educated individuals can improve at home. Finally, expatriate and diaspora physicians can contribute their skill and expertise to the teaching and training of their counterparts in developing countries via well-structured exchanges and can also contribute to patient management either directly or through telemedicine.

The Royal College of Surgeons of England concluded that some trauma deaths were associated with the delivery of emergency care by inexperienced doctors. In contrast, survival after major injury is positively related to increased experience and greatest when consultants are present early in the resuscitation. A trauma team must identify a single leader who is senior to other members of the team in order to command the authority and respect required for clear decision making.

Lack of appropriate medical infrastructure and resources
The improved survival and functional outcome among injured patients in developed economies can be partly attributed to high-cost equipment and technology. Much of this high-end technology is unaffordable and unavailable to victims of developing nations. Most of the physical resources for in-hospital care in terms of infrastructure and equipment are already available at secondary and tertiary care hospitals and need moderate upgrades. A study carried out in Iran in 2008 showed that shortages of ambulances and dispatch sites were important barriers to providing effective pre-hospital trauma care. Moreover, the inappropriate distribution of resources was another limitation to trauma care which was explained by the general shortage of resources.

A study carried out in Pakistan showed that inappropriate communication network, ineffective medical consultation and inefficient referral system are important factors that hinder the provision of effective trauma care on the scene or when transporting the victims to the hospital. Poor communication networks can be attributed to the limited number of radio channels and unavailable maps related to the referral system.

Ignorance and counterproductive health-seeking behaviour of the populace
Several studies from Africa have shown that the majority of Africans with traumatic injuries patronise traditional healers before ever considering orthodox practitioners. Many of these studies showed that the majority of morbidity from trauma results from complications of management by traditional healers. There are indications that this situation will not change soon because existing evidence suggests that exposure and education has minimal impact on decisions to patronise traditional healers.

Moribund institutional and governmental policies
The decreasing death rates from injuries witnessed in most developed countries are because the governments in these countries have recognised the need to develop coordinated injury prevention programs based on sound epidemiologic principles and the raised awareness among the population about the principles of accident prevention. There are, however, obstacles along the way. Most African nations are impoverished and shackled by their burden of external debt while there is a severe shortage of tertiary trained health experts and sometimes widespread corruption; all these factors have impaired governments’ ability to adopt the measures that should have been adopted to stem the rising injury epidemics.

Absence of a proactive government has been identified as one of the critical barriers to effective trauma management due to its influence on all the other essential components of emergency medical service. Misconceptions among health policy makers, and emergency medical service managers, and low level of motivation among staff contribute to poor administration and organisation of trauma management services.

Recommendations
The emphasis regarding reducing the burden of trauma should be on the role of preventive measures in reducing the risk of trauma as this is ultimately the most cost-effective intervention. Public education through the press and incorporation of preventive education in early school curriculum, driver education and training and provision of safe road networks and improvements in transportation and general road safety are useful interventions. Integrated emergency dispatch or central call reception is one of the strategies recommended by the World Health Organization (WHO) for enhancing communication between pre-hospital and hospital health care providers.

It has been successfully demonstrated in Ghana that pre-hospital care for road crash victims could be improved by training commercial drivers. Other low-cost models include basic trauma life support, training of first responders consisting of members of the police, road traffic marshals, Red Cross and other youth organisations as well as volunteers.
in the community. Though there is paucity of literature on the effectiveness of first responders in improving trauma outcome in a civil population, some studies have demonstrated their effectiveness in warfare.\(^45\)

Specifically, the development or adaptation of a comprehensive educational plan for pre-hospital trauma care employing trained Emergency Medicine Specialists is recommended. Training staff in basic life support measures has proven to be effective in low- and medium-income countries. Training of manpower in acute care and pre-hospital services should be a priority.

Furthermore, provisions of physical resources for pre-hospital care and communication systems, and organisation and integration of pre-hospital services with definitive care facilities so that patients can be transported to an appropriate facility in the shortest possible time, are recommended.

In addition, establishment of apex institutions with quality trauma patient care facilities and designation of levels of trauma centres based on facilities and expertise available will ensure that patients are appropriately cared for based on the level of injury. Such trauma centres can also serve as research and training institutions that will help the nation’s administrators formulate policies regarding the organisation of trauma care facilities.

Development of trauma registries, which provide a means of collecting continuous, standardised injury data that offer advantages over discrete means of injury surveillance such as retrospective or prospective data collection, is important. Trauma registry records will offer evidence-based capacity building outcomes that will guide subsequent treatment and resource allocation, an important consideration for resource-poor countries. While such systems have been widely established and have proved to be very useful in developed countries, their application in developing countries has been hindered by issues of cost, complexity and political will. However, numerous studies have shown that trauma registries can be incorporated into existing trauma care framework in resource-poor settings.

The single, most important factor in reducing injury and injury mortality remains the political will to back up policies aimed at reducing the impact of trauma. The wheel need not be re-invented, as most of the measures needed to combat the risk factors have already been proven in high-income countries. African governments as well as governments of other developing economies can provide the necessary framework that would allow for the selection, adaptation and implementation of measures that are appropriate to the local setting.\(^46\)

Strengthening the health insurance system and allocating funding specifically to provision of care at subsidised rates for trauma patients to improve utilisation of appropriately staffed hospitals can facilitate improving access to specialised trauma care. This would reduce the number of people not using hospitals due to poverty.\(^47\)

Incorporation of new and emerging technology which has been found useful in other aspects of healthcare, such as telemedicine, is currently being employed in different parts of the world. For patients with minor injuries in remote rural and inaccessible locations, it offers the potential to provide urgent or emergency treatment without the need for the patient to travel long distances and the avoidance of the associated expense and danger.

**Conclusion**

The challenges in trauma management in a developing economy are centred on, but not limited to, inadequate pre-hospital trauma care protocol, lack of training and retraining of staff, poor health care infrastructure and limited manpower and the absence of proactive institutions and governments motivated to reduce the burden of trauma. Trauma surgeons and allied healthcare professionals need to intensify their research efforts to clearly define the determinants and complexities and the epidemiology of the trauma and its care in developing countries, and thus build a strong and logical basis for advocacy. Trauma management requires a well-orchestrated multispecialty team approach. Most trauma deaths are preventable by developing suitable preventive measures, implementing an effective trauma system and adapting interventions that have been implemented in developed countries that have led to significant reduction in both morbidity and mortality. Urgent measures need to be taken to improve trauma management services in order to reduce the morbidity and mortality from trauma.

**Abbreviations list**

ATLS, advanced trauma life support; DALYs, disability-adjusted life years.

**References**


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