Assessing trauma care at the district and provincial hospital levels: a case study of hospitals in Kenya

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ABSTRACT

Trauma is a major cause of death and disability worldwide, of which more than 90% occur in low- and middle-income countries. Given the magnitude of this inequality, research efforts over the last decade have highlighted the need for trauma care systems in LMICs. This was further emphasized by the World Health Assembly's 2007 Resolution 60.22, which called on national governments and the World Health Organization (WHO) to strengthen trauma care globally. This study used two tools, hospital flowcharts and the World Health Organization's Trauma Care Checklist, to describe trauma care capacity at two hospitals in Kenya and ways in which this capacity can be strengthened. We found these hospitals had a large volume of trauma, but due to the lack of intensive care units, specialized trauma units, and axillary services, such as orthopedics and neurosurgery, the hospitals had a limited ability to provide definitive care for injured patients in critical condition. Additionally, organizational capabilities, such as trauma registries, trauma-specific training, and quality improvement programmes were lacking. The state of trauma care at district and provincial levels in Kenya demonstrates a strong case for national and global investment in clinical and systemic interventions.

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Introduction

Trauma is a major cause of death and disability worldwide. Of the more than five million trauma-related deaths that occur each year, more than 90% occur in low- and middle-income countries (LMICs). Given the magnitude of this inequality, research efforts over the last decade have highlighted the need for trauma care systems in LMICs. This was further emphasized by the World Health Assembly's 2007 Resolution 60.22, which called on national governments and the World Health Organization (WHO) to strengthen trauma care globally. A key objective in Resolution 60.22 was to devise standardized tools to assess the capacity of facility-based trauma care services that should be available at health facilities throughout the world. Experience from high-income countries shows that improving the organization and planning of a trauma care system could lower mortality by 25%. If this could be achieved in LMICs, a million lives could potentially be saved.

Kenya is an example of a LMIC with an increasing burden of trauma, especially with regard to road traffic injuries (RTIs). Between 1983 and 2008, RTI-related fatalities more than doubled from a rate of 11.4 to 24.6 deaths per 100,000 population. Despite this more than two-fold increase in mortality, little has been studied in Kenya to describe trauma care in terms of prehospital, hospital, and rehabilitative care. In Kenya, formal prehospital care systems, including triage, transport, and communication, are limited. Once an injured patient arrives at the hospital, the capability of that hospital to provide trauma-related care is based on the hospital's level, such as a district, provincial, or national referral hospital. District-level hospitals are managed by a medical superintendent and serve as coordinating and referral centers for smaller units. Provincial hospitals serve as the referral point for the district hospital. There are 129 district-level hospitals and nine provincial hospitals. There are three national referral hospitals in Kenya, of which two are located in Nairobi and one in the city of Eldoret. The capacity of hospitals at the district and provincial level to provide trauma care has not been studied.

The aim of this study is to use two tools, hospital flowcharts and WHO's Guidelines for Essential Trauma Care, to describe the current capabilities for trauma care at the hospital level in Kenya.
Kenya. Specific aims are to describe clinical capabilities as well as organizational and administrative capabilities in two hospitals in Kenya. Understanding these capabilities allows us to perform a targeted needs assessment of hospital-based trauma systems. In a time when trauma research in low- and middle-income countries is urgently needed, describing the capacity to care for the injured patient at the district-level hospital is a key step towards understanding and investing in trauma care.

Methods

We used key informant interviews from two hospitals in the Kenyan districts of Naivasha and Thika to describe the provision and capacity of trauma care in a hospital setting. The Naivasha District Hospital (NDH) is a 143-bed district-level hospital that serves the constituency of Naivasha, a district located within the Rift Valley Province, with a population of 376,000. Thika Level 5 Hospital (TL5H) is a 265-bed provincial-level hospital located in Thika District of the Central Province, with a population of 693,000. Seventeen key informant interviews were conducted over a one-month period in 2011 with hospital administrators, procurement officers, physicians, nurses, and laboratory technicians at the study hospitals (Table 1). These participants were purposely selected given their position at the hospitals and ability to describe clinical, organizational, and administrative capabilities at various levels within the study hospitals.

Additional interviews were conducted over a two-month period between May and June, 2012. During the in-depth interviews, participants were asked to describe the flow of injured patients through a hospital with particular attention on the capacity of each point of care. The interviews were open-ended and probing and were audiotaped and transcribed. Researchers also took detailed notes during the interviews. These notes were used to develop hospital-specific flowcharts. The flowcharts provided a diagrammatic picture of the multiple points at which trauma care is provided in each hospital. The flowcharts were reviewed and revised with subsequent interviewees on an ongoing basis using a constant comparison analysis. To capture the extent to which each facility had the capacity to provide trauma care, the WHO’s Trauma Care Checklist was completed for each hospital’s current capacity and capabilities with regard to trauma care. The checklist is outlined in WHO’s Guidelines for Essential Trauma Care and includes two main categories: (1) clinical capabilities and (2) organization and administration capabilities, of which each has defined subcategories. During the interviews, the checklists were completed using a four-point scale that rated each category as adequate, partially adequate, inadequate, or absent. ‘Adequate’ was defined as present and used appropriately; ‘partially adequate’ was present but was not used consistently; ‘inadequate’ was defined as present but not functional; ‘absent’ was defined as not present in the hospital. Interview responses were cross-tabulated to assign each sub-category a rating based on the consensus among the pooled responses.

Data collection continued until data points became redundant and interviews showed repetitive patterns in the flow of trauma care and consistency among responses to the WHO’s Trauma Care Checklist. Verbal informed consent was obtained from all study participants. Ethical approval for the study was obtained from the Johns Hopkins Bloomberg School of Public Health Institutional Review Board in Baltimore, Maryland, and the Ministry of Health and Sanitation and the Ministry of Medical Services in Kenya.

Results

Flowcharts of NDH and TL5H trauma care systems illustrate the services available to trauma patients (Figures 1 and 2). NDH did not have a formal casualty department but had an outpatient department that triaged injured patients. Patients were triaged either to the operating room, in-patient wards, X-ray department, discharged home, or referred to a higher level of care (Figure 1). If a patient required surgical intervention, the patient was brought to one of two operating theaters, which were staffed by nursing and on-call physicians 24 hours a day. NDH did not have an intensive care unit and does not provide mechanical ventilator support outside the operating theater. Patients who required such care were referred to the provincial hospital in Nakuru or to Kenyatta National Hospital in Nairobi.

TL5H had a casualty department that triaged patients to the operating theater, in-patient surgical ward, X-ray department, home, or referral (Figure 2). Like NDH, TL5H did not have an intensive care unit and referred patients who required this care to the Kenyatta National Hospital. TL5H had three operating theaters: one for minor operations, one for major operations, and one designated for obstetrics and gynecology.

Following an operative intervention, patients were taken to the post-operative recovery area. In TDH there were five recovery beds, but only two blood pressure and EKG monitors. Supplemental oxygen was available for only one patient at a time. In both hospitals, if patients required intensive care, they were transferred using the hospitals’ ambulances; these were not equipped with a mechanical ventilator, so if the patient was intubated, they were ventilated with a manual bag-valve mask. Bottlenecks identified through the flowcharts focused on the outpatient and casualty departments, where injured patients would arrive with little to no advanced notification. Healthcare providers were immediately required to divert their attention away from other patients to treat the injured. With minimal pre-warning, healthcare providers stated that they were poorly equipped to triage and delegate care, especially in settings with multiple injured patients.

In terms of trauma care clinical capabilities, both NDH’s outpatient department and TL5H’s casualty department were...
equipped with adequate basic supplies, but in general lacked advance definitive management resources (Table 1). Advanced airway equipment and chest tube equipment were kept and used in the operating theater and not elsewhere in the hospitals. Pulse oximeters and ventilators were only available in the operating theater for patients receiving or recovering from a surgical intervention. Few manual blood pressure cuffs were available and functional in the outpatient department and casualty department. TL5H had a resuscitation ‘crash cart’ available in the casualty department, which contained basic airway management equipment including suction devices and nasal airway tools and Advanced Cardiac Life Support drugs. In NDH’s and TL5H’s X-ray departments, ultrasound machines were present and functional, but were not used for trauma patients. Exams such as the Focused Assessment with Sonography in Trauma (FAST) exam were not performed. Both hospitals have laboratory services available...

Figure 1. Patient Flowchart, Naivasha District Hospital, Kenya, 2012.

Figure 2. Patient Flowchart, Thika Level 5 Hospital, Kenya, 2012.
24 hours a day that dispensed packed red blood cell blood products. Other blood products such as platelets or fresh frozen plasma are not available. NDH is not equipped with operative orthopedic equipment, limiting their ability to provide external fixation and perform internal fixation procedures.

With regard to organization and administration capabilities, both hospitals had a medical record system in place (Table 2). NDH’s outpatient department used an electronic medical record system. If a patient was admitted to NDH’s inpatient ward, their medical chart would be converted to a paper chart. In TL5H, healthcare providers completed a standardized trauma form for each injured patient and wrote a brief description of the injuries in a hand-written logbook. Formal trauma registries were absent in both hospitals. Trauma specific training and quality improvement programmes were absent in both hospitals. In terms of a ‘trauma team,’ NDH established such a team, comprised of hospital administrators, physicians, and nurses; however, its operational capacity was still under development. TL5H did not have such a team.

Discussion

This study is the first of its kind to use a combined method of flowcharts and checklists to describe hospital-based trauma care. With these tools, we found the hospitals had systems in place to provide care to the trauma patient. As illustrated through the hospitals’ flowcharts, when patients arrived at the hospital, they were triaged in the equivalent of an emergency department. From there, they were triaged to the operating theater, the hospitals’ inpatient wards, or the X-ray department for further work up. While these systems were in place, there were bottlenecks, particularly in triage areas due to lack of advanced notification of the arrival of injured patients, and throughout the hospital due to lack of resources.

We used the Trauma Care Checklist to quantify the availability of essential, basic equipment, and found in most cases, equipment to be partially adequate. Even more concerning, however, was the deficiency of trauma-specific organizational and administration capabilities. In particular, trauma registries, training, coordination, and quality improvement were often not readily available or not available at all.

Due to limited data analysis, the true outcome of injured patients in both hospitals was unknown. While NDH and TL5H captured data on the incidence of trauma patients through hand-written logbooks and electronic medical records, the hospitals did not have systems in place to tabulate and review such data. Formal trauma-specific training was absent in both hospitals. CME course certification, such as Advanced Trauma Life Support (ATLS) courses, was not available primarily due to the costs of such courses. In terms of coordination, TL5H did not have a trauma team; NDH designed a trauma team, but had not implemented it. Such a team with pre-assigned roles, especially in trauma mass casualties, would be particularly important as we identified limited preparedness as a bottleneck within the hospital-based trauma systems.

We recognize that meeting the need to enhance infrastructure and provide trauma equipment is difficult, especially in a time of fiscal constraints and limited budgets. However, given NDH and TL5H’s strong commitment to improve trauma care, we can use the findings from this study and collaboratively invest in the hospitals’ organizational capabilities by strengthening four key areas that are currently lacking: 1) trauma registry development; 2) trauma training; 3) trauma team development; 4) quality improvement.

First, we plan to implement standardized electronic trauma registries and allow for on-going analysis. Many studies have described the importance of hospital-based trauma registries in LMICs. In addition to quantifying the type and severity of injuries sustained, trauma registries can collect the data needed to describe the type of care provided and link this to outcome data. Further, NDH and TL5H can use the data captured through their trauma registries to identify deficits in patient care and inform areas of improvement.

Second, we will provide hospital-based trauma training tailored to the current capabilities of the district and provincial hospitals. The training will allow providers at every point of care, whether it is the outpatient department, casualty department, operating theater, or inpatient wards as illustrated in the flowcharts, to have the appropriate clinical capabilities and a forum to express concerns or make suggestions. Low-cost trainings have been implemented in Tanzania, Ghana, India, and Ecuador, which showed significant improvement in trauma care resuscitation and outcomes.

Third, as part of this training, we propose to design and implement trauma teams. Few studies from LMICs have reported on the design, implementation, and subsequent outcome attributed to the development of trauma teams. However, the need for improved communication and organization within hospitals has long been described. The team approach to care of the injured can enhance measurement capacity, accountability, and sustainability. The team, comprised of hospital administrators, physicians, and nurses, could identify healthcare providers to receive trauma specific training.

Fourth, we can improve hospital-based trauma care through quality improvement (QI) programmes. A functioning QI programme includes a systematic examination of processes used in service delivery, operations research, teamwork assessment, use of data to measure outcomes, and managerial practices, and can be utilized even within health systems facing austere resource constraints. These processes are based on the principles of identifying patient needs; defining how processes of care function within the system; measuring results through data systems; and involving teams of administrators, healthcare providers, and advocates in this process. Identifying patient needs and defining processes of care can be achieved through participatory action research, using root cause analyses and problem solving tools. In addition to improving quality, QI programmes can lead to cost savings. Guidelines to implement trauma care QI in LMICs at the hospital level have been developed by the WHO and can serve as a valuable resource. The team can also ensure that the Functioning Trauma QI programmes help identify problems or gaps in the care of the injured and emphasize a systems improvement approach. Such a process was recently described in Pakistan’s Aga Khan University hospital with promising results that showed trauma QI programmes decreased hospital mortality and morbidity.

Our study was limited in that only two hospitals in Kenya were studied. However, the conclusions drawn from this study can help strengthen the trauma care system within the studied hospitals and serve as a model for other facilities in Kenya providing care for the injured. In addition, the study highlights hospital flowcharts and the WHO’s Trauma Care Checklist as valuable tools to describe a healthcare facility’s trauma care system. It is with this intention that other healthcare facilities in LMICs can use these methods to assess their own trauma care capabilities.

Strengthening the delivery of trauma care has the potential to strengthen other medical fields within a hospital. Trauma-related clinical capabilities, such as airway protection, timely interventions and referrals, and organizational capabilities, such as an interdisciplinary team approach, can apply to many
medical specialties, such as maternal, emergency, and pediatric health. Thus improving trauma care can serve as an entry point to enhance the hospital system as a whole.

As the burden of injury in LMICs approaches endemic proportion, effective trauma care systems in LMICs are crucial. While this study has focused on hospital-based trauma care,

<table>
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<tr>
<th>Capability</th>
<th>Rating</th>
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<tbody>
<tr>
<td>Basic airway management</td>
<td>Adequate</td>
</tr>
<tr>
<td>Advanced airway management</td>
<td>Partially adequate</td>
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<tr>
<td>Chest tubes</td>
<td>Partially adequate</td>
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<tr>
<td>Oxygen</td>
<td>Partially adequate</td>
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<tr>
<td>External hemorrhage control</td>
<td>Adequate</td>
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<tr>
<td>IV access and appropriate fluids</td>
<td>Partially adequate</td>
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<tr>
<td>Blood transfusion capabilities</td>
<td>Partially adequate</td>
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<tr>
<td>Basic closed fracture management</td>
<td>Adequate</td>
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<tr>
<td>Wound care</td>
<td>Adequate</td>
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<tr>
<td>Splinting of fractures</td>
<td>Adequate</td>
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<tr>
<td>External fixation</td>
<td>Partially Adequate</td>
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<tr>
<td>Internal fixation</td>
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<tr>
<td>Spinal immobilization</td>
<td>Partially Adequate</td>
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<td>Organizational and Administrative Capabilities</td>
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<td>Organized documentation of trauma cases</td>
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<tr>
<td>Trauma quality improvement programme</td>
<td>Absent</td>
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<tr>
<td>Trauma team</td>
<td>Partially adequate</td>
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1 Rating based on a four point scale: Adequate (present and used appropriately); Partially adequate (present, but use is either not assured, not available all the time, or not readily available); Inadequate; Absent.

2 POP: Plaster of Paris
we recognize that this is one aspect within the spectrum of care for the injured patient. Equally essential is the provision of adequate prehospital care and rehabilitation for the injured. Little has been described regarding pre- and post-hospital care in Kenya. Describing trauma care at the hospital level is a first step toward describing trauma care as a spectrum of care, from the time at which the injury occurs in the prehospital setting to rehabilitation. The tools used in this study offer a means with which to perform this effective, low-cost needs assessment of trauma care at the district-level hospital that could be used in similar settings throughout LMICs. If we could then channel findings from such research initiatives to enhance trauma care systems, we may be well on our way to saving a million lives.

Conflict of interest

None to declare.

Acknowledgements

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