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Michelle J. Thompson Date

A Comprehensive Review of the Emergency Medical Services System in Kenya

By

Michelle J. Thompson
Master of Public Health
Master of Science in Nursing
2013

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

A Comprehensive Review of the Emergency Medical Services System in Kenya

By Michelle J. Thompson

Background: Kenya, a low-income country, is disproportionately affected by a high burden of morbidity and mortality from emergencies, trauma and road traffic injuries. It has been deemed one of ten countries that accounts for 50% of the world's traffic accidents. Studies have shown that even rudimentary Emergency Medical Services (EMS) can alleviate significant death and disability from emergencies. Currently, Kenya's EMS is fragmented and lacks standards and coordination. Furthermore, there has been no research specifically on EMS or pre-hospital care in Kenya, and no baseline assessment to comprehensively describe its current status.

Methods: A qualitative research study was conducted with in depth key informant interviews. Snowball sampling was used to identify interviewees, and data collection ended when saturation was reached. A total of 17 interviews were conducted in Nairobi, Kenya that lasted an average of two and a half hours each. Transcribed interviews were coded and analyzed using a qualitative and mixed methods data software called Dedoose. Key themes were identified and summarized.

Results: Seven main themes regarding the development of EMS emerged from the analysis: 1) Burden of Emergencies and Trauma in Kenya, 2) Accident Prevention, 3) EMS Policy and Funding, 4) EMS Communications Systems Capacity, 5) Ambulance and Transport Services Capacity, 6) Training and Curriculum for EMS Providers, and 7) Research, Data Collection and Sharing in the Pre-Hospital Environment. Each topic was divided into background information, insights provided by the interviewees, and recommendations specific to the topic. Results were put into context of the Kenyan setting and WHO expert guidelines.

Conclusion: This study brought together people from all aspects of the Kenyan health sector, with a common goal of developing EMS in a coordinated and sustainable manner. The use of qualitative research added a rich depth of quality, as it truly represents the voices of those who have dedicated years of work into emergency response and the pre-hospital care system. As Kenya utilizes the results and recommendations from this study, and continues to progress with coordination and effort, their EMS has the potential to become one of the most robust systems in all of Africa.

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Table of Contents

List of Abbreviations and Definition of Terms

Abbreviations:

Abbreviation	Definition
A&E	Accident and Emergency Department (Kenyan/British Terminology)
ACLS	Advanced Cardiac Life Support
AHA	American Heart Association
ALS	Advanced Life Support
CCK	Communications Commission of Kenya
ED	Emergency Department (American Terminology)
EM	Emergency Medicine
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
GOK	Government of Kenya
ICU	Intensive Care Unit
KCEMT	Kenya Council of Emergency Medical Technicians
KIE	Kenya Institute of Education
KNH	Kenyatta National Hospital
KRCS	Kenya Red Cross Society
MOH	Ministry of Health
NDOC	National Disaster Operations Center
PSV	Public Service Vehicle
RTI	Road Traffic Injury
WHO	World Health Organization

Ambulance Companies Commonly Mentioned:

Company	Description
E+	Considered to be private, owned and operated by the Kenya Red Cross, established by the constitution as a public EMS service. Patients can purchase a membership into this company to receive EMS services.
St. John	The oldest and most well known EMS service in Kenya, established in 1928. Considered both public and private in that it will generally transfer any patient and has been established by the constitution as a public EMS service, yet still relies on private funding for operations.
AAR	AAR: A private EMS company mainly based out of Nairobi. Patients can purchase membership through this organization for walk-in clinic needs and EMS services.
Avenue	A private EMS company based out of the private Avenue hospital
AMREF Flying Doctors	The air medical company in Kenya. The only EMS company with international accreditation and fully equipped ICU services. This is also a private organization and is run on memberships.
City of Nairobi	The public ambulance system in Nairobi affiliated with the fire department. This is a free service to the public although are far under capacity.

Chapter 1: Introduction

Introduction and Rationale

Background

Kenya, an East African country located in the Horn of Africa, hosts over 40,000,000 citizens and nearly half a million refugees (OCHA, 2010). Emergency Medical Services (EMS) in Kenya is in high demand for many reasons. First, in recent years, Kenyans have been victims of many injuries related to flash floods, infectious disease outbreaks, building collapses, terrorism, and post-election unrest (CDC, 2011a). Second, road improvements and an increase in the number of vehicles on the roads have led to an increase in traffic accidents. Over 3000 lives are lost yearly on Kenyan roads, and this has been made worse by the use of motorcycles for passenger transport (ASIRT, 2012). Road traffic injuries are now among the top ten causes of death in Kenya (CDC, 2011b) and trauma accounts for 21% of emergency departments visits (Wachira, Wallis, & Geduld, 2011). The lack of pre-hospital care and consistent ambulance response to road accidents are significant contributors to the morbidity and mortality from these emergencies (Macharia, Njeru, Muli-Musiime, & Nantulya, 2009).

Healthcare in Kenya is based on a tiered system with six different levels that can be pictured in a pyramid, with the majority of the population receiving care from the bottom, and from the more specialized facilities at the top. These tiers, starting at the bottom of the pyramid, are: 1) Community, village, household, families, or individuals, 2) Dispensaries and clinics, 3) Health centers, maternity centers, nursing homes, 4) Primary Hospitals, 5) Secondary Hospitals, and 6) Tertiary Hospitals (Wachira & Martin, 2011). There are also private hospitals that are generally more expensive and not affiliated with the government. Additionally, there are private and public, or government run, EMS providers.

Currently, there is no mechanism in place to facilitate the transfer of emergent patients between facilities or from the pre-hospital site of the emergency to a receiving facility. Therefore, patients are often brought to hospitals in private vehicles and taxis. Although there are some ambulance services in the urban areas, they are not affordable for the average Kenyan, and do not have the capacity to meet the needs of the country's 12 million urban inhabitants (Wachira & Martin, 2011).

The lack of an Emergency Medicine specialty among physicians is also problematic. Anesthesiologists or medical officers run the intensive care units, and these units are limited to either tertiary public hospitals or private facilities. Often primary care doctors or residents with no emergency training are in charge of staffing emergency departments (EDs). Rural community hospitals are often only staffed by clinical officers, which are similar to physician's assistants in the United States. This means that for most Kenyan hospitals, the providers with the least amount of training are responsible for the most critically ill patients.

Gaps in ambulance systems, emergency transfer coordination, and emergency medicine training contribute to Kenya's classification as a country in the lowest of Arnold's three developmental stages of Emergency Medicine (Arnold, 1999).

Expert Guidelines for EMS Development

The World Health Organization's "Prehospital Trauma Care Systems" document (Sasser, Varghese, Kellermann, & Lormand, 2005) provides guidelines for the development of an EMS system in countries where there is none, or where the current one is ineffective and underdeveloped. The document breaks down the essential pieces of lifesaving pre-hospital treatment that can be implemented with good buy-in from the key stakeholders, but at little cost compared to the expensive ambulances and medical equipment boasted by many developed countries. The guidelines identify essential skills, equipment, and supplies that will allow trained lay people as well as health care providers to identify emergencies, and to stabilize and transfer patients to appropriate facilities. Many of the interventions described include training lay people, taxi drivers, and community leaders in basic first aid and basic life support. Additionally, the document gives guidelines describing an efficient and sustainable approach to trauma care that will increase the likelihood of patients reaching the hospital alive. Many of these interventions include basic training on the safe way to handle trauma patients as well as immediate life or limb saving interventions. Lastly, the document provides guidelines to governments and policymakers regarding how to administer and fund an EMS program, incorporate EMS into existing systems of care, and implement quality surveillance and data management that can guide future development. Summaries of specific guidelines will be discussed throughout this thesis.

History of EMS in Kenya

A mass disaster spurred the initiation of EMS development in Kenya. On August 7, 1998, a truck bomb exploded at the U.S. Embassy in Nairobi, killing an estimated 240 people and injuring over 5000 (Abdallah, Heinzen, & Burnham, 2007). The lack of emergency response, trained EMTs, and triage at the scene were known contributors to the morbidity and mortality from this disaster. In response, $40 million USAID dollars became available to Kenya to develop its disaster preparedness and recovery capacity, and strengthen mass casualty care programs (Abdallah et al., 2007). One key achievement of this influx of funding was the training and graduation of the very first class of EMTs. In 2002, USAID funding was discontinued (Abdallah et al., 2007). The trained EMTs took it upon themselves to continue to develop EMS services, but the lack of funding made the process slow and arduous, and resulted in sporadic responses of highly variable quality and response time during disasters and day to day emergencies.

Identified Categories of EMS Development

Recognition of the importance of EMS resulted in numerous meetings between stakeholders and the Ministry of Health (MOH). EMS conferences, largely coordinated by the MOH and the Centers for Disease Control and Prevention (CDC) have revealed four main areas that need to be addressed in Kenya to move forward with EMS development. These are 1) communication, 2) transport, 3) training, and 4) data management. Policy and funding are two other areas that are considered to span across the four themes, as they interplay with each. Additionally, defining the burden of emergencies in Kenya, as well as discussing their prevention and impact on EMS, are also considered important.

Components of the four developmental themes were already being tackled through a myriad of projects and systems being developed by key players in EMS in Kenya, all with the goal of the development of EMS. However, there was no operational framework to promote the consistent coordination between the projects' implementers. Additionally, although these four areas have been readily agreed upon during the conferences, they were based upon anecdotal personal experiences, rather than hard evidence. It is a priority to create an evidence-based report to provide the gold standard for development of EMS in Kenya, support the work already being done, and guide the way forward.

Ramifications, Social, and Economic Costs of the Problem

The lack of a coordinated EMS system in Kenya contributes to unnecessarily high morbidity and mortality. The burden of mortality from trauma and road traffic injuries afflicts all cultures and socioeconomic classes, but the developing world is burdened with the highest rates and worst outcomes (Macharia, Njeru, Muli-Musiime, & Nantulya, 2009). In Kenya, numbers compiled by police reports and alternate sources on the number of annual road traffic deaths range from 3000 to 13,000 (WHO, 2010), and Kenya has been deemed one of ten low to middle income countries that account for 50% of the world's traffic accidents (WHO, 2010). Data collected from other countries consistently show that the economic burden of injury, whether it be death or disability, can be extremely taxing (Sasser, Varghese, Kellermann, & Lormand, 2005). In addition to trauma and road related injuries that affect individuals and families, Kenya has a high burden of disasters, both natural and man-made. Disasters such as drought, famine, flooding, epidemics, fires, and terrorism together affect over 1.5 million people a year worldwide (PreventionWeb, 2013). Research has shown that the best way to have a well functioning disaster response system is to first have an effective basic pre-hospital trauma care system (Sasser et al., 2005).

Significance for Public Health

Huge disasters captivate the attention of funders and humanitarian responders worldwide. However, for countries with limited resources, funds allocated to day-to-day trauma and injuries would have a greater impact on reducing morbidity and mortality across all age spans than funds allocated for disaster response (Sasser et al., 2005). In Kenya, however, more funds are channeled towards large disasters, leaving day-to-day emergency response to be funded by the consumer. The prompt provision of care in an emergency, and rapid and safe transport of victims to a health care facility equipped to manage these patients has been shown to save lives, reduce long term disability and improve long term patient outcomes (Sasser et al., 2005). This is especially critical when the breadwinner of the family is disabled or when working members of the family must leave the workforce in order to care for a disabled family member. The amount of productivity lost in these circumstances can become exponential (Sasser et al., 2005).

Problem Statement

Although it has been widely documented that trauma, road traffic injuries, and acute medical conditions are a growing public health problem, there is a distinct paucity of literature describing the extent of the problem in developing countries. This is particularly true in Kenya. There have been meetings among stakeholders to discuss the issue of emergency response, but there has been no baseline assessment to actually detail the current status of EMS in Kenya. All published information is specific trauma data for individual hospitals in Kenya, or is focused more broadly on injuries than the response to emergencies. Other information on the current state of EMS is simply anecdotal evidence from conversations with the public on the current state of emergency response. There are no policies or laws that dictate standards for EMS communication, transportation, training and curriculum, documentation and data collection, and no centralized data to help define the strengths and weaknesses of the system. The result of this is that the EMS system is fragmented and uncoordinated, with each EMS provider operating independently and within self-imposed standards.

The World Health Organization's 2005 document on EMS development shows that the world's experts in health have deemed the development of pre-hospital care systems, even in developing countries, an important public health intervention. Additionally, research in many developing countries has shown over and over that the death and disability rate has significantly decreased when an emergency system is in place (Razzak & Kellermann, 2002). Mortality and disability-adjusted-life-year (DALY) statistics for acute conditions that could benefit from pre-hospital emergency care are quite high in many low-income countries (Razzak & Kellermann, 2002). Experts suggest that in low-income and under-resourced countries, the development of even a rudimentary emergency system would pay dividends in the mortality and lost DALYs that could be averted. Often, emergency and EMS systems are the last part of the health care system in a country to be developed, and therefore public health messaging, interventions, and focus should be spent on educating the public about the importance of EMS and assisting countries to develop their own EMS systems.

The need for a developed EMS system has been demonstrated, yet until there has been a baseline assessment demonstrating the strengths and weaknesses of the current EMS system, there is no framework from which to start the developmental process. Therefore, the first step to solving Kenya's complex issues is to provide a comprehensive analysis of the current EMS system and provide recommendations thereof. This study will use qualitative research methods to obtain a baseline assessment of the current state of EMS in Kenya, and then utilize evidence based literature on EMS development to create a comprehensive White Paper, similar to the 1966 paper in the United States, detailing the current state of EMS in Kenya, the internationally accepted guidelines for EMS development, and recommendations of how to meet these standards. This foundational initiative will serve as a step in leading Kenya to become the second African nation with a developed EMS system, following South Africa.

Purpose Statement

Although there is a paucity of published literature on EMS in Kenya, there is a wealth of information on the status, issues, and ways forward in EMS development that can be obtained through interviews with key stakeholders. The purpose of this study was to conduct a baseline assessment of the current status of EMS in Kenya. The goal of this project is to compile evidence-based information on the current Kenyan EMS system that can be used to guide the development of a unified and efficient EMS system for the country. The information will be obtained from a thorough review of the existing literature and interviews with Kenyan EMS stakeholders. A summary of the findings will be compiled in a comprehensive report, or White Paper. The report will also include recommendations that can be distributed and used by all EMS stakeholders to move forward with EMS development. The approach used for this project will be based on the lessons learned from the 1966 US report "Accidental Death and Disability: The Neglected Disease of Modern Society" (National Academy of Sciences, 1966). This document changed the course of EMS in the USA and paved the way to implementing a fully developed EMS system. It is the ambition of this project to achieve similar achievements by replicating the process in Kenya.

Project Objective:

Describe the state of Emergency Medical Services (EMS) in Kenya, to be used as an operational framework for the development of a coordinated and standardized EMS system.

Specific Project Aims:

1. Review the literature for internationally accepted guidelines for the development of EMS systems in developing countries.
2. Conduct key informant interviews, using qualitative research methods, to obtain a baseline assessment of the status of EMS in Kenya.
3. Develop recommendations for the development of EMS in Kenya from the synthesis of the qualitative data analysis and literature review.
4. Compile the information into a comprehensive report, a White Paper for Kenyan EMS systems development.
5. Present the final, completed report to the Kenyan Ministry of Health and key stakeholders in Kenyan EMS development.

Significance Statement

There has been no baseline assessment of the current EMS system in Kenya. However, stakeholders and policy makers have been increasingly interested in the subject over the past decade, and particularly in recent years since there has been an increase in individual emergencies and wide spread disasters. This research will provide a comprehensive picture of the current state of EMS in Kenya and provide a road map for the way forward. It will hopefully lead to new policies, comprehensive reform, and address one of the most under-researched problems that afflict Kenya today.

Chapter 2: Literature Review

Introduction to Literature Review

There is a paucity of literature on the subject of EMS in Kenya. This literature review includes the only two articles that could be found specific to Kenya EMS, articles on the development of EMS in lower and middle-income countries (LMIC), as well as on the development of EMS in developing countries.

The literature review was limited to English language articles no older than 10 years. Key words and phrases searched included: "EMS Kenya," "Emergency Medical Services Kenya," "pre-hospital care Kenya," "pre hospital care Kenya," "Road Traffic Injuries Kenya," "EMS in Eastern Africa," 'EMS development Kenya," "EMS development East Africa," "EMS in East Africa," "emergency development Kenya," "EMS developing world," "Emergency medical services in the developing world," and "Emergency medical services in low income countries." These searches resulted in a total of 63 articles. When articles focusing on research on in-hospital emergency settings, essential trauma care, or road traffic injuries but did not focus on EMS were eliminated, only 10 articles were pertinent to this study. Only two of these articles were specific to EMS in Kenya. This illustrates the deep need for further research on the subject of EMS in Kenya.

EMS in Kenya

<u>*The State of Emergency Care in Kenya*</u>

In 2011, Wachira and Martin (2011) published an article in the *African Journal of Emergency Medicine* that gives an excellent summary of the state of emergency care and EMS in Kenya. Healthcare in Kenya starts at the community level, with community health workers, and increases through community clinics, health centers, primary hospitals, secondary hospitals, and lastly, the two tertiary hospitals located in Nairobi and Eldoret. Ideally, patients can be treated at the level of the facility that meets their medical or surgical need, and can be transferred up levels of care if indicated. However, this rarely happens, as some hospitals are so rural that they either do not have phone access or are located in areas where roads are impassable (Wachira & Martin, 2011). To compound the problem, emergency medicine is not a specialty for physicians in Kenya, and therefore physicians obtain very little instruction and experience in emergency medicine during their training. There is no organized trauma system and therefore, the entire emergency treatment system is fragmented (Wachira & Martin, 2011). EMS is even less developed, and as a result, most patients are transported to hospitals by means other than an ambulance and having received no pre-hospital care (Wachira & Martin, 2011). The few public and private EMS companies that exist have limited resources, and most of them have 10 or less ambulances, which is not nearly enough to service the population (Wachira & Martin, 2011). Since trauma is one of the leading causes of death and disability in Kenya, this system needs to be much improved.

Patient Transfer Practices by Hospitals in Western Kenya

One main element of ambulance use in Kenya is the transfer of patients between hospitals, often from smaller to larger hospitals for more specialized care. Often, in the developing world, the process of transfering critically ill patients contributes to increased morbidity and mortality as well as delays in definitive treatment (Kuremu, Tenge, Wakuloba, & Wambati, 2008). During transfer, the standard quality of care was not maintained, as shown in a cross sectional descriptive study that was conducted in

Western Kenya to evaluate these practices. This study took place in the accident and emergency department (A&E) of the Moi Referral Hospital, one of the two tertiary hospitals in Kenya. Patients who arrived from another facility were included in the study over the course of six months, and their escort filled out the survey. In all, the transfer of 97 patients was evaluated on several core measures that should be included in any intra-hospital transfer (Kuremu et al., 2008). Only 56% of the patients were transferred by ambulance, 60% had a nurse escorting them, 85% had documentation of their treatment and care en-route, 24% had monitoring done en-route, and 27% arrived so dehydrated they required resuscitation (Kuremu et al., 2008). Of those who required resuscitation, only 14% had adequate respiratory and airway support, 32% had oxygen provided, 34% had intravenous fluids, 30% had a nasograstric tube, 23% had urethral catheters, 50% with long bone fractures were splinted, and only 3% who required cervical spine immobilization had received a c-collar (Kuremu et al., 2008). These actions should be routine for all patients who require resuscitation, and standard of care is that 100% of critical patients should have had these basic needs for medical intervention met, particularly interventions that address airway, breathing, circulation, and disability. This egregious failure to meet basic standards of care for critical patients shows that the EMS training, equipment, and system in Kenya is lacking the basic mechanisms for safe patient transfer and treatment and must be developed adequately in order to prevent the unnecessary death and disability of the ill and injured.

EMS in Specific Low and Middle Income Countries (LMIC)

Three studies focused on LMICs' country implementation of EMS systems. These studies were conducted in Sri Lanka, Iran, and Iraq.

Sri Lanka

Sri Lanka has a fairly new pre-hospital EMS system and is considered a low income country (Zimmerman, Bertermann, Bollinger, & Woodyard, 2013). Like Kenya, it has had an influx of displaced persons and has experienced civil unrest. In 2007, an EMS system was initiated. In 2009, it became fully implemented and modeled after the US system, and the government and private sector came together to support a coordinated EMS system (Zimmerman et al., 2013). A study, published in 2013, looked at the implementation of this system, using both process and operational indicators (Zimmerman et al., 2013). The study was conducted by reviewing training logs for EMTs, doctors, and nurses, as well as community awareness sessions, and also logs of the utilization rate of the EMS system. Utilization information was gathered mostly from the central dispatch center that responded to the country's newly established toll free emergency short code number, 1-1-0 (Zimmerman et al., 2013). The study showed that in the first 11 months of operation, the system responded to more than 2000 emergency calls, with minimal financial loss. This was considered a success for a newly established system, and in terms of utility and financial stability, is to be considered a model pre-hospital system for low income countries (Zimmerman et al., 2013). It is important to see that another LMIC that has a long history of complex issues, such as the tsunami, can have a successful implementation of an EMS system with the proper support and coordination. This is the desire of many of the stakeholders in Kenya.

Iran

Iran is another LMIC that has focused on the development of an EMS system to combat the high mortality from road traffic injuries (RTI). In a qualitative study, 15 pre-hospital trauma care professionals in Tehran participated in in-depth interviews to determine what was hindering an effective pre-hospital trauma care process (Haghparast-Bidgoli, Hasselberg, Khankeh, Khorasani-Zavareh, & Johansson, 2010). The results of this study showed seven categories of EMS that could be improved: 1) administration and organization, 2) staff qualifications and competencies, 3) availability and distribution of resources, 4) communication and transportation, 5) involved organizations, 6) lay people, and 7) infrastructures (Haghparast-Bidgoli et al., 2010). The core theme that emerged throughout these seven categories was "interaction and common understanding" (Haghparast-Bidgoli et al., 2010). Although these categories are not identical to the ones that emerged in Kenya, they encompass very similar issues and show that there are similar challenges in operating a functional EMS system in a developing country. Additionally, the theme of interaction and common understanding parallels with many of the Kenyan EMS key stakeholders' desires to see collaboration and coordination in the EMS system. As EMS is currently a trending popular public health theme in many LMICs, it is helpful to see studies like this that add to the knowledge base of what some of these countries are experiencing as they develop their systems.

Iraq

Iraq has experienced high numbers of casualties due to years of war, but also experienced high mortality from issues that affect other LMICs, such as road traffic injuries (RTIs). A study, which gathered data between 1996 and 2004, prospectively looked at patients who were treated in the pre-hospital setting. A total of 2,349 patients were registered in the study, with the goal of measuring time intervals, interventions performed, the effect of pre-hospital treatment, and mortality (Wisborg, Murad, Edvardsen, & Husum, 2008). During the course of the study, 88 paramedics were trained in Northern Iraq. These paramedics were then charged with the responsibility to hold training sessions on trauma care in their local villages. Study data were collected by the paramedics and supervising physicians, and patients were followed through their hospitalization and data from their definitive care was collected as well. Following the training, mortality of victims of war injuries decreased from 28.7% to 9.4% (p=0.001) and the time from injury to first medical help decreased from 2.4 hours to 0.6 hours (p=0.002) during this time period (Wisborg et al., 2008). Additionally, time from injury to hospital admission decreased an average of 6.8 hours (p=0.001) during the study period (Wisborg et al., 2008). Retention of paramedics during the program was 72% after 8 years. Patient treatment effect was measured using standardized injury severity scores and showed significant improvements in physiologic function after pre-hospital treatment in severe and moderately injured patients (Wisborg et al., 2008). Importantly, the study also showed that paramedics used basic life saving skills in nearly all patients, but rarely used advanced skills, such as intubation (Wisborg et al., 2008). Still, their outcome measures showed their system was significantly effective in the period of eight years. This study shows that even low-tech EMS systems can have a tremendous positive effect on morbidity and mortality. As Kenya works on implementing a coordinated EMS system, lessons from this study can be applied.

EMS Development in Developing Countries

Most of the literature on the topic of developing EMS in LMICs consists of reports by world experts who have synthesized literature or worked for years in the field. This is likely due to the fact that there is not yet a wealth of research on the subject, however, research on trauma and injury as well as basic life saving care have led international experts to define the development of EMS as a very important topic in public health. The last section of this literature review will focus on literature published by these experts who make the argument that the development of EMS in LMICs is an essential step in reducing unnecessary disability and death in today's world.

Assessment of Pre-hospital Care in 13 LMICs

Since it has been shown in prior research that most deaths occur before the patient has a chance to get to the hospital, focus on pre-hospital care systems is essential (Nielsen et al., 2012). A large, multi country study was conducted to describe the current status of pre-hospital care in a wide range of LMICs in Asia, Africa, and Latin America (Nielsen et al., 2012). A 32 question, five page cross-sectional survey was conducted looking at pre-hospital care in 13 LMICs, including Kenya. The survey was based upon the WHO's *Prehospital Trauma Care* publication, that had already been pilot tested in several different countries (Nielsen et al., 2012). The survey also had some open ended questions for qualitative analysis, and key EMS stakeholders in each country were interviewed.

Results of this study were divided into six different themes: 1) Methods of transport, 2) Training, 3) Organization, 4) Funding, 5) Access, and 6) Barriers (Nielsen et al., 2012). The surveys showed that there was a wide variation in the means of transport for emergency patients, from rickshaws, to private vehicles, to taxis and buses, to ambulances. In general, basic life support capabilities during transport were only available in the middle-income countries (Nielsen et al., 2012). All but two countries had some level of first responder training, and multiple levels of training for EMS providers, however utilization of this training could not be determined, and certification for trainings varied significantly by country (Nielsen et al., 2012). Low income countries showed little organization between EMS services and nearly non-existent communication with receiving facilities (Nielsen et al., 2012). Comparatively, many middle-income countries had nationalized EMS systems or at least national policies for EMS (Nielsen et al., 2012). Interestingly, all countries surveyed, except Kenya, provided some government-funded transportation to patients. And most sites had a common emergency access number, although the availability and effectiveness of this number varied significantly, with most low income countries, including Kenya, finding the number ineffective in gaining rapid access to emergency response (Nielsen et al., 2012). Data showed that in general, access to EMS care was low. Lastly, five top barriers to EMS were identified by the study: 1) inadequate funding, 2) lack of legislation to set standards, 3) lack of leadership within the system, 4) lack of integration among multiple systems, and 5) no standards accreditation for EMS providers (Nielsen et al., 2012).

This study reinforces the argument that LMICs have great challenges in their EMS systems and that as a result, there is increased morbidity and mortality from trauma and emergencies in these countries. This study's recommendations for the development of EMS are very similar to the recommendations for Kenya's EMS system, including the wide-spread establishment of a toll free emergency number, increased first aid training, formal EMS training, increased and sustainable funding, integration and coordination of EMS services within countries, and improved organization and leadership (Nielsen et al., 2012). Once these themes are addressed, large improvements in the development of EMS can be actualized.

Trauma Still a Neglected Disease of Modern Society

In 1966, the US White Paper (National Academy of Sciences, 1966) transformed the development of EMS systems in the United States. However, over nearly half a century later, trauma is still neglected in modern society, especially in LMICs. Ten percent of the world's deaths are from trauma, and this accounts for more fatalities than from malaria, tuberculosis, and HIV/AIDS combined (Sakran, Greer, Werlin, & McCunn, 2012). The highest burden of disability adjusted life years (DALYs) lost from injury and trauma are in Africa, with 15 DALYs per 1,000 (Sakran et al., 2012). Road traffic injuries and violence account for the highest number of injuries.

Trauma and injuries have been classified as non-communicable diseases, and specifically, surgical diseases. Although many aspects of the medical system must be implemented in order to reduce the burden of surgical disease, pre-hospital care, such as discussed in the 1966 White Paper, is hugely important. Studies have shown that trauma deaths outside the hospital are inversely related to economic status, with the greatest death rates in low income settings (Sakran et al., 2012). The time it takes to reach definitive care can increase these death rates, and time is increased in countries like Kenya, with no centralized emergency number, like 9-1-1 in the US, or the economic burden on the injured to pay up front for ambulance services (Sakran et al., 2012). This paper suggests that to decrease the burden of surgical disease, and specifically trauma, developing an efficient and effective pre-hospital care system must be one of the top priorities, because the implementation of world-class surgical services in hospitals will not save lives if the majority of the injured are still dying in the pre-hospital setting, or while being transported to the hospitals (Sakran et al., 2012).

A Systemic Review and Meta-Analysis of Pre-Hospital Trauma Systems

Worldwide, most trauma deaths occur outside the hospital, yet there has been limited research showing whether or not mortality can be decreased by investing in LMICs' EMS systems. There have been some smaller studies evaluating specific EMS systems, but no comprehensive analysis. This meta-analysis, through methodological selection, took eight studies and conducted analysis, looking at mortality, injury scores and outcomes, and pre-hospital time (Henry & Reingold, 2012). The main question asked by the researchers was to evaluate the probability of death given the presence or absence of a pre-hospital system, calculated using relative risks ratios. The results of the meta-analysis showed that pre-hospital systems had a protective effect against mortality, and most of the studies included in the analysis had a statistically significant decrease in mortality when pre-hospital trauma systems were in place. Overall, the studies showed that pre-hospital systems reduce mortality by 25% (Henry & Reingold, 2012). Studies were stratified according to rural and urban settings, and a slightly higher treatment effect was shown in the rural setting, with a 29% risk reduction compared to 21% in the urban setting (Henry & Reingold, 2012). This meta-analysis showed that overall, pre-hospital trauma systems reduce mortality in developing countries, particularly in middle-income countries. Since it has been shown that prompt medical interventions saves lives, there is a substantial benefit for trauma victims to have a pre-hospital system in place (Henry & Reingold, 2012). This should be priority for policy makers in these countries.

Promoting Emergency Medical Care in the Developing World

Research has shown over and over that pre-hospital care can have a positive impact on morbidity and mortality for emergency patients, saving many lives and preventing DALYs lost. Additionally, injuries and trauma disproportionally affect the developing world, and emergency care is disproportionately lacking in the same population. Generally, in the setting of limited health care resources, resources are often spent on primary and preventative care. In one article, David Anthony reviews current literature on EMS in developing countries to determine if funneling resources for emergency care is a logical and beneficial idea (Anthony, 2011).

The first question that Anthony asked was whether or not pre-hospital and emergency care systems in LMICs have a positive impact on morbidity and mortality. Several studies have shown that even rudimentary EMS systems have reduced the mortality rate significantly. This is mostly due to the decrease in treatment delay. Even in rural settings, patients who have access to EMS receive care more rapidly than those who do not, and often these early interventions can save lives and prevent disability (Anthony, 2011). Overall, EMS systems positively impact health outcomes, even in developing countries.

Next, Anthony looked at the cost of EMS in developing countries. Some argue that money would be better spent on immunization campaigns and simple primary care services (Anthony, 2011). However, when looking at the global disease burden, and trauma being one of the major causes of mortality in all age groups, emergency care has huge potential to decrease global disease burden, and save lives and years of disability costs (Anthony, 2011). Since males of working age have the highest burden of injury and trauma, the costs go beyond the initial injury care, but can be life long in terms of wages lost. Ultimately, when emergency care is integrated into the healthcare system as a whole, there is the greatest financial and patient health benefit (Anthony, 2011).

Lastly, Anthony looked at whether or not there was community buy-in for emergency services. Evidence has shown that community ownership is essential for successful public health programs (Anthony, 2011). Evidence has also shown that emergency care systems are greatly desired in developing countries. Communities surveyed have reported a strong perceived need for emergency services (Anthony, 2011). This is no different than in Kenya, where respondents felt that developing EMS needed to be the top priority of health policy makers.

Anthony (2011) makes the argument that developing EMS systems in LMICs is essential to the health care system, can decrease the global burden of disease, is worth the monetary resources, and is a perceived need among most communities.

Emergency Medical Systems in LMICs: Recommendations for Action

Emergency medical care, to be effective, needs to provide care for all members of society. In Kenya, there are well-functioning EMS services, but they are only available to the richest segment of society which creates health disparities in which the poor, who experience the highest burden of emergencies, are the least likely to receive emergency care. To truly develop a fully functioning system, it needs to encompass the emergency needs of everyone (Kobusingye et al., 2005).

A paper by Kobusingye and colleagues (2005) delineated key recommendations on developing EMS systems in LMICs. Recommendations focused on pre-hospital and in-hospital components, transportation, equipment and communication, training, and financing. A functioning system includes a pre-hospital care component, with emergency transportation and treatment that links with emergency care at a hospital. It has been shown that an effective pre-hospital system includes accessible and rapid transportation and the deployment of people with life-support skills and training (Kobusingye et al., 2005). In countries where the health care system is fragmented, paramedics and ambulances may not be cost effective or feasible. However, training of lay persons in first aid and developing plans for transport, such as taxis and buses, has been shown to be effective in reducing morbidity and mortality from emergencies in some developing countries (Kobusingye et al., 2005). Basic equipment and the ability to communicate must also be available for a functioning system to operate. In a world where there are huge populations without telecommunication structure, this can be challenging, and context specific interventions must be implemented in response to this challenge (Kobusingye et al., 2005). Additionally, standardized training programs have shown to be very effective in LMICs that have been studied. In one case, mortality from injury fell by 50% after Advanced Trauma Life Support was taught (Kobusingye et al., 2005). This shows the importance of investing in training for emergency responders. Lastly, money is a huge barrier in accessing emergency care. Emergency systems must be sensitive to the needs of the poor, as often they do not access systems because they are unable to pay (Kobusingye et al., 2005). Although there is no standardized way to address this complexity, it must be taken into consideration each time a country develops a health care system, and in particular, an emergency system. Ultimately, as the burden of trauma, injury, and other emergencies continue to grow in the world, interventions must be put into place, even in the lowest resource settings, to save lives and prevent disability.

Summary

Pre-hospital emergency care is an underdeveloped and under-researched public health issue that disproportionately affects LMICs. When LMICs have implemented

EMS systems, even at rudimentary levels, they have consistently seen significant improvements in morbidity and mortality from emergencies and trauma. Although there is cost associated with implementing EMS, the cost saved in reducing the global burden of morbidity and mortality from trauma and injury, as well as long term cost benefits in DALYs saved outweighs the costs of the system. LMICs that have fragmented healthcare systems should focus on training lay people in basic life support and first aid, as well as developing plans for emergency transportation.

In Kenya, there is a paucity of literature on EMS. However, the literature available shows that the system is fragmented and not readily accessible to most residents. Additionally, the EMS systems that are available operate independently of one another and there is no standardization of equipment or training of personnel. Therefore, there is no standardized definition of what emergency response means in Kenya.

With no published Kenyan research dedicated specifically to pre-hospital EMS, the qualitative study is likely the most comprehensive evaluation done on the subject for Kenya. Most of the literature reviewed that was generalized to LMICs were reports written by experts. These same themes and concepts were echoed in the qualitative study conducted in Kenya. Ultimately, the research conducted in Kenya fills a gap in the literature and meets an important need for Kenyans as they evaluate and make plans to develop and coordinate their EMS system.

Chapter 3: Methods

Introduction

The research presented in this thesis took place in two separate parts, a qualitative research study and a White Paper that was developed utilizing the results from the study and existing literature. This methodology section outlines the process of the qualitative research that was conducted.

Population and Sample

The population chosen for the qualitative research was anyone involved in the EMS system in Kenya, with the sample being key stakeholders in Kenyan EMS located in Nairobi, to include personnel currently serving as EMS providers, to include EMTs, nurses, and administrators within EMS organizations, key leaders within the Ministry of Health (MOH), leaders within the National Disaster Operation Center (NDOC), individuals involved in communications in Kenya, and doctors and nurses who work in the Accident and Emergency Departments (A&Es). Those sampled had direct experience in providing emergency care, had personal experience to give them knowledge of the current status of EMS in Kenya, were currently key in policy advocacy for EMS, were involved in disaster response, or had key leadership roles with the power to enact change for the EMS system.

Participants were identified initially by convenience sampling, and later by snowball sampling as the study progressed. This ultimately tapped into a great networking resource and provided access to key leaders who typically have guarded schedules. With snowball sampling, a diverse sample was included, and provided their own unique perspectives on the current state of EMS in Kenya, and what their perceived priorities were to enact key change. A total of seventeen in depth interviews were conducted, with a total of eighteen interviewees. All interviews were one on one except for one interview that included two interviewees at once. Interviews were stopped when saturation of information was reached during the interviews, and when it became evident that the key leaders in EMS had been identified and interviewed. All aspects of EMS were covered, including the private and public sector, and government and disaster response agencies' perspectives. Additionally, towards the end of the interview process, key informants started to refer the interviewer to people who had already been interviewed, which made it evident that the key people had been identified.

Study Site

Interviews were all conducted within the city of Nairobi, Kenya, and those sampled were all currently living and working in Nairobi, although some had had EMS experience in other parts of Kenya. Nairobi, the capital of Kenya, represents all ethnic groups and religions present in Kenya (CIA, 2012). The most recent data shows that Nairobi hosts over 3 million residents, making it the largest city in Kenya (CIA, 2012). This does not take into account the estimated almost 1 million people who live in the various slums contained within the Nairobi city limits. Nairobi was chosen for the study site because all major EMS companies are based out of Nairobi, and all government offices are there as well. Additionally, all EMT training takes place in Nairobi and the majority of the country's ambulances are stationed throughout the city. Therefore, it hosts the most concentrated number of people who are actively involved in EMS development and who meet the criteria for the population studied. Interviews mostly took place in the location of the interviewees' jobs, but sometimes were conducted in coffee shops and cafes before the workday started. Although there was a questionnaire used to guide the interview process, interviews were conducted informally with a pen and paper to record responses, in hopes to not intimidate the interviewees and to provide a relaxed and open environment that would encourage honest conversation.

Rationale for Population Selection

Due to the current paucity of literature and policy to define EMS in Kenya, the intent was to identify the population with the greatest knowledge of the current status of EMS from those most knowledgeable about and most invested in the subject. Since there is not much literature to back up their statements, it was important to identify individuals who were most likely to identify true, objective, and consistent components of the current EMS system, and who would give recommendations that would represent and benefit the EMS community at large. The concept in choosing this population is that a well-rounded, comprehensive, and accurate picture of EMS could be acquired through interviews, instead of just from the perspective of EMTs.

Ethical Considerations

The research process was initiated by gaining the appropriate ethical consent from both the Emory University IRB and the Kenya Council of Science and Technology (KCST), Kenya's certifying board for research. Emory IRB exempted this study from IRB review and approval based on the fact that it did not meet the criteria for research on human subjects or the criteria for a clinical investigation. The standards for KCST were more stringent, particularly for foreign researchers. A proposal was submitted under the authority of Moi University in Eldoret, Kenya, with a Kenyan physician and professor as the official project advisor. The proposal was reviewed by the KCST and a research permit for the specific purposes of conducting qualitative research in EMS development was issued.

Instruments

Information was collected during key informant interviews, during June and July 2012. An interview questionnaire was developed as a research tool for the purposes of the project. Questions were inspired from the original USA White Paper (National Academy of Sciences, 1966) and from information gathered from gray literature of past EMS conferences held in Nairobi. Collaborators at Moi University in Eldoet, Kenya, and at the Centers for Disease Control and Prevention (CDC) in Nairobi and Atlanta then reviewed and made edits to the questionnaire before the instrument was finalized (see appendix). The questionnaire consisted of 101 questions, broken into three sections. The three sections were entitled: 1) General Information, 2) Information Specific to Emergency Service Providers, and 3) Information Specific to Key Informants and Policy Makers. Each section was further divided in a series of subsections on the key foundational aspects of EMS that had been identified by prior EMS conferences and meetings in Nairobi, as well as in the USA White Paper. For example, the subsections under “Information Specific to Key Informants and Policy Makers” were: 1) Training and Curriculum for EMS Providers, 2) Appraisal of Research and Data Collection in Shock, Trauma, and Resuscitation, and 3) Policy. Other sections were broken up in a similar manner. Not all interviewees were asked the 101 questions, but rather they were questioned on the areas of expertise they represented. The research tool was not field tested prior to use, however, each interviewee was asked at the end of the interview if important topics had been omitted. All said that they felt the interview was comprehensive and covered all pressing issues. Additionally, once the results and recommendations were written, the draft form was emailed back individually to each of the 18 original interviewees for their comments or corrections. This was one method of validating that the information derived from the interviews was an accurate representation of the key stakeholders. The interviewees were given the opportunity to provide feedback if they discerned they are misrepresented, and any changes were incorporated into the final draft. Once completed, the final copy was distributed back to each interviewee for general dissemination, as well as to the key leaders and policy makers in Kenya.

Data Collection

Information was collected through key informant interviews conducted in English. Verbal consent was obtained. The interviewer read the consent form to each interviewee. The form explained that the data collected would be typed into a computer, de-identified, and presented as a collective in an EMS White Paper for Kenya. Interviewees were assured that confidentiality would be maintained, and that they would have the opportunity to view the final document prior to its release to the public. During the interviews, the interviewee's answers would lead the interviewer into which question to ask next, allowing for the interviewee to expand on subjects and topics important to him or her, and to ensure that the interview tool did not narrow the focus of the interview. Interviews were recorded with a pen and paper, in order to create an open environment. Since many of the interviewees' answers could come across as negative or judgmental of the current EMS system or of their employers, they were more at ease not being recorded and not having a computer present. The average interview time was two and a half hours, with the shortest interview lasting one hour and the longest lasting four hours.

Data Analysis

Data was analyzed using a qualitative and mixed methods data software called Dedoose. Interviews were transcribed from the original paper and pen documents into Microsoft Word documents, and labeled according to the date they were conducted. Interviews were de-identified. Documents were uploaded into Dedoose. Broad codes were created within Dedoose, based upon the interview topics. Focused reading of a select group of interviews revealed that these codes were relevant, and several more codes were created as key themes began to emerge. Sub-codes were created to further define each theme. In total, 13 codes and 34 sub codes were created throughout the analysis process, for a total of 47 codes. Excerpts were tagged with codes. Excerpts with the same coding were grouped into an Excel spreadsheet, reviewed, and summarized in the Kenya White Paper.

Chapter 4: Results and Recommendations

Introduction

The key informant interviews provided a wealth of information on the current state of EMS in Kenya. This chapter will describe the demographics of the interviewees, and then report the in depth results from the interviews, divided into the seven main topics that emerged from analysis: 1) Burden of Emergencies and Trauma in Kenya, 2) Accident Prevention, 3) EMS Policy and Funding, 4) EMS Communications Systems Capacity, 5) Ambulance and Transport Services Capacity, 6) Training and Curriculum for EMS Providers, and 7) Research, Data Collection and Sharing in the Pre-Hospital Environment. Each topic is then divided into three sections that: 1) state what was known about the topic prior to this project, 2) summarize the insights provided by the project participants, and 3) provide a list of recommendations. The results of the interviews are put into context of the WHO expert guidelines.

Demographics

Demographic information was collected on the participants' gender, age, number of years the interviewee had worked for the organization, and occupation. The majority of participants were male. The mean age was 42 years and, on average, participants had worked for eight and a half years for their current organization (see Table 1). Seven general categories of occupation were identified. Participants could be categorized into more than one occupation. For example, a head nurse who works at the MOH would be counted in three categories: nurse, MOH representative, and leadership/ management. The 18 participants held a total of 49 different roles. Most held a leadership or management position. A third of the participants were either a private EMS provider or a nurse.

Table 1: Demographic Information of Key Informant Interviewees

Demographic	Totals (n=18)
Male	13 (72%)
Age (years)	Range 28-55 (m = 42)
Years Worked for Current Organization	Range <1-25 (m = 8.5)

Table 2: Occupational Breakdown of Key Informant Interviewees

Occupation	Totals (n=18)
MOH Representative	2 (11%)
Public EMS Provider	4 (22%)
Private EMS Provider	6 (33%)
Emergency Preparedness and Response	4 (22%)
Nurse	6 (33%)
Physician	2 (11%)
Leadership / Management	15 (83%)
Total Roles by 18 Participants	49

Burden of Emergencies and Trauma

Background

The prompt provision of care in an emergency and rapid and safe transport of victims to a health care facility equipped to manage these patients has been shown to not only save lives, but to reduce long term disability and improve long term outcomes (Sasser et al., 2005). This is especially critical when the breadwinner of the family is disabled or working members of the family have to leave work in order to care for a disabled family member. The amount of productivity lost in these circumstances can become exponential (Sasser et al., 2005).

There is a paucity of published data on pre-hospital care in Kenya. The majority of published research has been on road traffic injuries (RTIs), since these account for such high morbidity and mortality worldwide, with particular burden in the developing world (Macharia et al., 2009). Numbers compiled by Kenyan police reports and alternate sources on the number of annual road traffic deaths range from 3000 to 13,000 (WHO, 2010), and Kenya is one of ten low to middle income countries that account for 50% of the world's traffic accidents (WHO, 2010). These numbers are not only concerning in terms of the high numbers of deaths and disability resulting from these accidents. Data from other countries consistently show that the high number of RTIs is economically taxing (Sasser et al., 2005). These extremely high financial and road death numbers explain Kenya's focus on RTIs. Putting resources into the development of pre-hospital care systems, such as EMS, could have huge positive impacts on both economics and human resources.

Results from Key Informant Interviews

Key informants provided insights on key issues contributing to mortality from road traffic injuries in Kenya. By far, the key informants attribute most emergencies to vehicle related incidents, such as road crashes or pedestrians getting hit by vehicles. As one respondent described it so well, *"Every day there are reports of drinking and driving, overspeeding, and no safety belts. Rules are broken and when a trauma occurs, they die in the pre-hospital setting. Roads are improved but the normal Kenyan doesn't follow rules rightly. Pedestrians get hit by cars on the highway all the time. Especially along Thika Road."* In general, it's not just the large number of road related injuries and deaths that are adding to the burden, but rather the way they are being handled. The key informants overwhelmingly attributed death and injuries from road accidents to the lack of pre-hospital care. The majority of patients are transported to the hospitals by "Good Samaritans," or individuals on the street who desire to help out of the goodness of their hearts. As one interviewee said, *"If an ambulance responds, it's a lucky [patient], because the public actually called."* A recent research study confirmed this when it showed that more than 75% of RTI victims were transported to the hospital by an unknown private party, or a "Good Samaritan" (Macharia et al., 2009). Less than 2% of these RTI victims reached the hospital by an ambulance (Macharia et al., 2009).

Three main reasons were identified as playing a key role in the high rates of mortality before reaching the hospital. First, key informants consistently reported that the improper handling of emergent trauma patients at the scene by Good Samaritans contributes to much higher death and disability than if trained EMS workers were on the scene. There are significant barriers to this, however, and most ambulance attendants lack the necessary training and skills, and ambulances take a long time to arrive on the scene.

Interviewees reported that the lack of funding was contributing to the burden of emergencies in Kenya. EMS organizations, whether considered private or public, do not get funding from the government, even though they are technically mandated to provide emergency care and transport to anyone, paying or not. There is also a feeling of mistrust between the EMS providers, because of business competition that prohibits collaboration. Ultimately, most interviewees felt there needs to be more government involvement in EMS, to provide funding and policy to help foster coordination and provide resources for timely and quality access to emergency care.

Recommendations

- Increase government funding in pre-hospital interventions that would alleviate the greatest causes of morbidity and mortality.

- Pass into law policy that coordinates EMS systems.
- Focus on decreasing the disparity in access of quality emergency care.

Accident Prevention

Background

Injury control is often stratified into two types of prevention: primary and secondary (Sasser et al., 2005). Primary prevention consists of avoiding, or preventing, the occurrence of injuries, or at least implementing ways to decrease their severity. Secondary prevention consists of providing adequate medical response and treatment to minimize the severity of disability or harm following an injury. Ideally, primary prevention is the first choice in the control of injury, and since accidents are never completely preventable, adequate secondary prevention procedures should be in place. An example is the use of seatbelts. Although measures can be put in place, such as the primary prevention of enforcing speed laws to decrease the incidence of auto accidents, seatbelts have been proven to save lives as an effective secondary prevention when the accident happens. Although the effectiveness of prevention is often difficult to measure, experts in the field of emergency management agree that since injury ranks among the top ten causes of death and disability for all age groups, preventative measures must be present in policy and in practice (Sasser et al., 2005).

Results from Key Informant Interviews

The key point made by nearly all interviewees regarding road and traffic safety and accident prevention is that there are great safety laws in Kenya, but that they are not enforced. There are many governing bodies that control vehicle and road safety, such as the Ministry of Roads, Kenya Revenue Authority, and Transport and Licensing Board. In recent years, there was a set of rules called the "Michuki Rules" that were implemented across Kenya. These rules, named after a former Minister of Roads, regulated seatbelt wearing in all vehicles, strict speeding regulations, and rules specific to vehicle capacity for public service vehicles (PSVs) such as busses and matatus, which are ubiquitous public transportation vans that are often cheaper than busses and crowded with people. There were a lot of deaths prior to this from extreme overloading of PSVs, which caused mass casualties when they rolled over. Interviewees overwhelmingly reported that during the two years that the Michuki Rules were being enforced, Kenyan roads were much safer. In fact, the Michuki Rules decreased the number of road accidents significantly during the two years they were being enforced, although there were concerns that the rules were so crippling to public transportation companies that they were not sustainable (Nairobi Chronicle, 2009). Regardless, enforcing traffic safety rules takes a lot of manpower. The police are responsible for enforcing traffic rules, but as one interviewee said*, "They spend a lot of time looking for bribes."* It is well known that police are overworked and underpaid, and often feel they must practice corruption in order to feed their families.

There have been attempts from various EMS companies to target the "black spots" or parts of roads that have frequent accidents, by staging ambulances in those areas. To intervene in this problem and try to decrease mortality in these locations, one EMS program has developed Highway Rescue Centers, located in black spots. *"We train communities so they are equipped in terms of skills in rescue. They have containers of EMS equipment and medications. These people [Good Samaritans] are first on the scene and often cause more fatalities in the rescue. About 60% die because of mishandling of* *the incident. So, centers try to bridge that gap. We have about nine centers total right now [utilizing trained Good Samaritans], and they are having a great impact. Fatalities have decreased in these areas."*

Although these methods have been helpful in emergency response, it is important to focus on prevention. Many interviewees suggested implementing better enforcement of laws, building pedestrian flyovers over large highways that have had a lot of pedestrian casualties, incentivize police to not need to be bribed, and support development of road infrastructure.

Recommendations

- Revive the Traffic Act and Michuki Rules, implementing them in a sustainable manner.
- Infrastructure funding should give priority to building pedestrian flyovers on major highways and building good roads that are well demarcated.
- Overhaul the Kenyan police force in a manner that will incentivize them to not need bribes. Corruption must be dealt with from its roots.
- Focus on training of the public. Basic first aid classes offered to lay people can have a huge impact on saving the lives of trauma victims. There should also be more training and utilization of volunteers to respond to the accidents, such as the Highway Rescue Centers.

EMS Policy and Funding

Background

Without policy, there is no guarantee that standards will be set nor adhered to. Without funding, the best plans in the world cannot be successfully implemented.

Finances are a challenge when there are competing priorities in health budgets, and historically, emergency response has not been at the forefront of public health interventions (Sasser et al., 2005). In a country like Kenya, where infectious diseases such as HIV/AIDS, tuberculosis, malaria, respiratory infections, and diarrheal diseases are still causing high rates of morbidity and mortality, it can be difficult to convince policy makers to move already limited funds towards emergency response (CDC, 2011a). Creativity sometimes must be utilized in finding money outside the Ministry of Health, such as with the highways and transportation budgets, fuel tax, or vehicle registration fees (Sasser et al., 2005). Policy and legislation is key, and the sustainable support of politicians and country leaders must be garnered for a sustainable system (Sasser et al., 2005). Policy creates standards for training, certification, licensure, skills, requirements, equipment, data collection, accepting facilities, financing, communications requirements, disaster response, and other items necessary to be a highly functioning part of the health care system (Sasser et al., 2005).

In 2010, Kenya adapted a new constitution. In this document, the right to receive emergency care was given to Kenyans. Additionally, Kenya was broken up into 47 counties, and each county was mandated to have at least one ambulance in order to provide emergency care to its inhabitants. This powerful mandate has given hope to EMS providers, that the development of EMS will start gaining momentum. As one key informant said, *"The constitution changed things. Kenyans know their rights and know they have the right to emergency care."* However, unlike most constitutional mandates, there was no funding clause attached. Pre-hospital emergency services were a right given to Kenyans, but the constitution provided no tangible way for this to be realized. In this mandate, the oldest EMS provider in Kenya, St. John, and one of the most well-known, Red Cross's E+, were designated as official EMS providers that were required to provide care to any patient, regardless of their ability to pay. However, neither organization has received any government funding to make this a realistic possibility. Additionally, Kenyatta National Hospital (KNH) in Nairobi is the national referral, or tertiary, hospital, and the "catch-all" for any patient, especially the non-paying patients. Many ambulances just take patients to KNH by default, sometimes bypassing other national or private hospitals that have the capability to provide lifesaving care and take some of the burden off KNH. As with EMS, KNH is under-funded and also feels the burden of being mandated to care for everyone but not having adequate resources.

Results from Key Informant Interviews

The overwhelming response by the interviewees regarding the presence of EMS policy in Kenya is that "there is none." About half of the respondents were aware that in 1999, an EMS policy draft was created and sent forward to Parliament. That same policy draft has been revised on several occasions but has yet to be made into law. In the meantime, EMS providers have watched Parliament actualize other policy drafts, such as the alcohol and tobacco policies. It is widely felt that EMS development cannot go forward without a government sponsored act, or policy. As one interviewee said, *"There must be a policy on curriculum, training, acquiring ambulances, driving and the use of the siren, equipment, the level of personnel, documentation, reports, and on pricing."* All of the respondents who commented on policy said that policy should be developed to standardize the entire EMS system, from standards for ambulances, training, equipment, funding mechanisms, dispatch and communication, training and certification of EMTs, and policies on where to take patients from both the scene of the emergency and during inter-hospital transfers. A very prominent theme in the interviews was that it is the government's responsibility to take the lead. EMS stakeholders overwhelmingly agree that it should be a government-controlled entity, as they feel the private sector has not been effective. As one interviewee eloquently put it, *"The government can only police things when they provide resources."* Overall, interviewees are disenchanted by the efficiency of the Government of Kenya, and ultimately, are just hoping that there is a way that EMS will be developed in a standardized manner that will serve the needs of all Kenyans. In fact, one third of interviewees said that the single biggest obstacle to pre-hospital EMS response is lack of policy and lack of central funding for EMS services. Combined, policy and funding lay the foundation for a successful standardized and coordinated EMS system.

Currently, from a governmental standpoint, the Department of Nursing Services at the Ministry of Health (MOH) has taken the primary leadership role in the development of EMS. They have become advocates for EMS and their backing has provided much credibility to many of the trainings and development of curriculum. However, the key informants most involved in policy development all lamented this passion for EMS development has not been taken much further in the MOH, and the consensus among interviewees was that ultimately, EMS needs to be a standalone entity. The development of policy would contribute greatly to the recognition of EMS as their own organization under the MOH, with mentorship and continued support from the Department of Nursing Services. The government has also taken a role in EMS by purchasing ambulances for public use. However, most interviewees were aware of these ambulances, but did not know where they had gone or how they were being utilized. One key informant involved in the government confirmed that there have been over 1000 ambulances donated to public hospitals by the National Hospital Insurance Fund (NHIF) in coordination with the Ministry of Health. However, there is no follow up on how they are utilized. As this interviewee said, *"We wash our hands of them after they are donated, but we should probably have a contract or service agreement with the receiving organization with reports back of monthly statistics and vehicle status, standards, and number of patients carried. But this hasn't happened."*

From a private sector standpoint, Kenya Council of Emergency Medical Technicians (KCEMT) has been the leading organization for standards, training, and policy for EMS. Most of the private EMS stakeholders are involved with KCEMT, or at least consider them the experts in the country on everything EMS. KCEMT is responsible for most of the training and certification of EMTs, and have partnered with the MOH's Department of Nursing Services to legitimize this. However, there are some exceptions to this rule. There are still the 1000 government-donated ambulances operating in Kenya that have no governing authority. Also operating in Kenya are two internationally renowned organizations, AMREF Flying Doctors and Kenya Red Cross Society's E+. Both are large players in pre-hospital care, and neither subscribe to KCEMT. E+ is regulated by Red Cross standards, and have their own policies and training requirements that differ from KCEMT's, and the Flying Doctors are the only pre-hospital emergency care organization in Kenya that has actually been accredited by an international accrediting body, and therefore they hold to the standards of their accrediting organization. Even though KCEMT, E+, and the Flying Doctors are all high quality organizations that are contributing greatly to the development of EMS and emergency care of Kenyans, the system remains fragmented. All interviewees who were in leadership roles said that there needs to be one governing body that holds all pre-hospital care providers, whether they be private or public, to the same minimum standards.

Recommendations

- Priority should be given to the newly updated EMS bill currently in Parliament, making it law, especially in light of the new constitutional mandate.
- Policy should establish minimum standards for EMS that all private and public EMS providers must adhere to. If providers desire of their own will and with their own funding to go above and beyond these standards, then that is acceptable.
- The government should establish a budget for pre-hospital care and establish a funding clause attached to the constitutional mandate for emergency services so that EMS providers can effectively carry out their responsibilities to the Kenyan people.
- EMS should be officially recognized as its own profession, not a subsidiary of nursing or any other medical hierarchy.
- Consider social insurance (NHIF) to help fund EMS and to capture under resourced Kenyans.

EMS Communications Systems Capacity

Background

A highly functioning EMS system requires a communication network where providers of care from the pre-hospital environment can effectively communicate with receiving hospitals, and where people in need can easily communicate their requests for emergency services. A breakdown in this process can delay care, decrease continuity of care, and contribute to poor outcomes for injured patients (Sasser et al., 2005). The WHO guidelines call for a toll free, short code phone number that can be called from any landline or mobile phone that will activate emergency response (Sasser et al., 2005). They also suggest a centralized, either national or regional, call center to process the calls and connect them to the correct emergency response service (Sasser et al., 2005).

Establishing a centralized and coordinated communication system for EMS and emergency response is one of the core aspects of a successful EMS system. Currently, there is no centralized system for EMS communication in Kenya, and each EMS provider has a slightly different mechanism for emergency communication. This section will discuss communication in regards to receiving notification of emergencies, dispatching responders, communication between emergency personnel, communication en-route, and communication with the receiving hospital.

Results from Key Informant Interviews

Activating EMS: A Toll-Free Short Code Number

One of the primary aspects present in a functioning EMS system is a common, toll free, short code number that can be called to activate emergency response. In the USA, we have the number 911. Anywhere in the USA, at any time, for any emergency, this number will connect the caller to a local dispatcher that can activate either EMS, fire, or police, or provide other information. In Kenya, there is no such number. Historically, as a remnant of the British colonization, the number 999 has been the emergency number used, as it is the UK's emergency number. However, not one single interviewee said that number is functioning, will activate help, or is a reliable emergency number. In a country that has gone mostly to mobile phones, 999 is a landline and does not function well. Also, it is a number connected to the police department. If someone answers, which is rare, the police will take down a message and pass it along to an ambulance company, either by carrying the message on foot if they are close in proximity or by a personal phone call, and then the ambulance company will need to call the original caller and find out more about the emergency. This is counter-productive to activating an immediate response in an emergency situation. When asked if the public considered 999 an emergency number, some of the responses painted a clear picture of the system, *"999 does not work because no one answers it,*" and, *"999 is no longer working,*" and, "*people consider 999 an emergency number, but they know it doesn't work."* At one point, 112 was established as an emergency number for Safaricom mobile customers, but the public is not educated about this number, and according to one interviewee, "*999 and 112 are collapsed, so agencies are just coming up with their own numbers*."

In an effort to overcome the lack of a common, short code emergency number, each EMS company has established their own phone lines that are used for activating EMS. Except for the Red Cross's E+, none of these companies have a short code number (4 digits or less), and none of them are toll free for the caller. This means if the caller does not have airtime, then they cannot call. Since less than 1% of Kenyan's use plans that allow them to pay later (CCK, 2013), this can be problematic. It also means that the callers need to have the numbers handy if they need to call, since there are many different numbers for all the different EMS companies. When asked how people can access EMS, one interviewee said, "*Anybody, if they have the phone number.*" In general, the interviewees placed the responsibility for establishing a short code, toll free emergency line on the back of the Communications Commission of Kenya (CCK). CCK is responsible for all phone lines in Kenya, and has the ability to allocate emergency lines as a public service. Although CCK is not responsible for funding the infrastructure to support emergency phone lines, they are responsible for providing the short number for all mobile providers. In Kenya, the major mobile providers are Safaricom, Airtel, Telcom, Essar (YU), and Orange. In order for a short number to work, CCK would need to establish this and then each mobile provider would be mandated to activate this number within their network. Because of the needed investment in resources, neither CCK nor the mobile providers have been compelled to pursue this. However, the interviewees hope that with the constitution mandating access to emergency care, change will come. Additionally, the National Disaster Operations Center (NDOC), responsible for coordinating disaster response in Kenya, wishes to coordinate a standardized communication system. As one NDOC representative said, *"Consider 9-11 in America, and the bombing here, all phones were blocked. VHF was handy but not coordinated. All organizations have their own communication so sometimes there are too many or too few resources to a place. NDOC's challenge has been getting services coordinated"*

Every interviewee said that the predominant way they are notified of an emergency they need to respond to is via phone. Every EMS provider, both public and private, has some form of dispatch center for their own organization that uses phones or two-way radios. There is no central dispatch center, but rather each organization has their own dispatch center that can dispatch and communicate with their own ambulances. Interviewees also identified that they are sometimes notified of an emergency by a person running up on foot or by an ambulance simply driving by an accident scene. There is no standard notification procedure. However, once a dispatcher is notified of an emergency, he will send the closest ambulance to respond. Most of the EMS providers are only based in Nairobi, but larger companies such as E+ have central and regional dispatchers that can route calls to outside locations if needed.

Communication at the Scene

Once at the scene of the emergency, there is no common communication system between EMS and other emergency personnel, such as police and fire, or the receiving health care facility. In a functioning EMS system, there is a central dispatch that will handle the communication between the various emergency organizations, and ensure critical messages regarding safety, complexity of the emergency, and resources are communicated between emergency providers. Formerly, in Kenya, there was a communication link between St. John, the police, and Kenyatta National Hospital (KNH) when USAID provided funding between 1998 and 2002 (Abdallah et al., 2007). However, once the funding stopped, this line of communication ceased to exist. Every interviewee said that the only way emergency personnel communicate with one another is phone-to-phone, person-to-person. Some of the more prepared EMS agencies have lists of emergency numbers that the dispatcher can call, but this is not across the board. NDOC has discussed trying to coordinate the systems of communication between emergency personnel, but their focus is predominately on coordinating mass disaster events, and therefore they have not prioritized the coordination of communication on smaller, daily occurring emergencies. There are stories of successful communication between agencies, but these stories tend to be the sensational rather than the normal. An example is the coordination between police and AMREF Flying Doctors to transport a large number of critical patients following a bus accident in a rural part of Kenya. AMREF needed more carrying capacity, and so the police allowed their helicopter to be used. With the police's helicopter and AMREF's equipment and human resources, they successfully rescued seven critical patients. However, even in the middle of this success story is the underlying theme that communication between organizations was managed through private phone calls and did not result from pre-existing communication infrastructure or established protocols.

<u>Communication En-Route</u>

There were two aspects of communication en-route that were addressed with the interviewees. One was communication with physicians if they needed further advice on the management of a critical patient. The other was communication between EMS and the hospital to notify them that the patient was to arrive. Interviewees that had undergone EMT training from KCEMT all reported that they were taught to communicate with hospitals and physicians en-route during their EMT course. However, they also stated that communication en-route rarely happens. As one EMT lamented, "*There aren't even doctors trained in emergencies. All EMTs, we only have identified one doctor as knowing emergencies, so we always call the same doctor.*" For private EMS companies that are associated with a hospital or medical association, there is always the option to call on a mobile phone and be connected with a physician, although there is no set protocol. For public EMS, there is no form of communication. This is problematic since the WHO guidelines state that there needs to be medical control, or a physician trained in emergencies ultimately with oversight of the EMTs (Sasser et al., 2005). However, some of the interviewees did not see this as a concern. Since there is only so much an EMT can do in the field with the resources he has, it may not be helpful to call a physician but rather more imperative to get the patient quickly to where he can receive medical care. Additionally, many of the EMS providers perceive that the physicians do not understand pre-hospital care and have no passion for EMS or emergencies. For this reason, they would rather call a fellow EMT than a physician for assistance. This perception may not be far from reality, since Kenya has yet to train physicians in Emergency Medicine (EM) or establish an EM residency or specialty. This means most Accident and Emergency physicians are general practitioners or clinical officers (Wachira & Martin, 2011).

There is no established system for EMS to notify hospitals that they are bringing a patient. Occasionally, EMS will call their own dispatchers who will then call the hospital. This, however, is more of a theoretical reality than an actual reality, especially for patients who are being brought to KNH. As one interviewee said, “*Most of the time the hospitals are caught by surprise, they have no heads up.*” If it’s a mass casualty event, the hospitals will sometimes hear about the incident on TV or through media before any casualties arrive. In this case, they prepare for casualties based upon the assumption that patients are on their way. Otherwise, Good Samaritans will sometimes notify a hospital that patients are en route. However, for the daily emergencies that warrant an EMS response, the ambulances just show up to the hospitals and deliver the patients. If it's a mass casualty, then the first ambulance will notify the hospital that there are more casualties on their way. Interviewees from both St. John and KNH described a system that worked exceptionally well in the past. They had a radio between the two that allowed for good communication. Unfortunately, this radio has been non-functioning now for a few years and they have been forced to revert to just showing up with casualties. However, some questioned if it even matters that the hospitals know that patients are coming. One interviewee described the process of a hospital receiving a patient, "*They walk in. They determine then if you can afford care. There is no referral system, even with the referral patient. When the patient walks through the door, knowing the patient is arriving doesn't change anything. They treat them as a brand new patient. It's no different for an ambulance patient. They are wheeled in and treated like a new patient. Don't even ask about what care was given. There are no preparations for ambulances."*

<u>*Childline: An Exemplar of Communication*</u>

Although thus far, the picture of communication during emergencies in Kenya has been painted as a dismal picture, there is an exceptional example of a system that has worked in establishing almost every aspect of the kind of communication system that EMS would need. This organization is called Childline. Childline, a non-profit organization in Kenya, was established in 2004 with the goal of reaching out and protecting the rights of children, particularly children suffering abuse. Their ultimate goal was to create a toll free help line that could be accessible to all children in Kenya. Initially, they were granted a toll free number through one of the telecom agencies, but it was composed of 11 digits, and Childline feared that children would not be able to remember this number (Childline Kenya, 2012). Through a long and arduous process of advocacy, they were eventually able to partner with the Government of Kenya and the CCK. This partnership granted them a short code, toll free number, that could be dialed for free from any landline or mobile phone (Childline Kenya, 2012). This number, 116, is still operational, and Childline counselors receive an average of 40,000 calls per month in Childline's 24-7 fully operational call centers (Childline Kenya, 2012). Childline made it clear that although the number itself is free, it did not come easily, and took years to bring CCK and all of the mobile partners on board. Additionally, the technological infrastructure to support this free number was extremely expensive to install and remains expensive to maintain. Despite this obstacle, Childline has shown that through advocacy, constant fundraising, and persistence, they now have a living example of a very successful and robust emergency call center utilizing a short code, toll free number. This exact idea is what all EMS key stakeholders envision for emergencies in Kenya, and Childline has shown that it is possible. Childline also spoke wisely on the process of setting up the call centers. They entirely use the internet for their technology, with all phones being soft phones using online software, with all their calls recorded and logged into a system and statistics are generated automatically. In order to ensure internet access in a country that frequently experiences communication outages, Childline invested in their own fiber optic cables and therefore are self-sustaining.

An important lesson that Childline learned, and most EMS stakeholders realize, is that partnership with CCK is absolutely essential in order to have any kind of sustainable and efficient communication system to use for emergencies. CCK, as the name implies, has oversight of all manner of communication technology in Kenya that pertains to phones, internet, landlines, electronic broadcasting, and electronic transactions (CCK, 2013). In CCK's latest quarterly report, it shows that there are 30 million registered mobile phone subscribers in the entire country (CCK, 2013). It also showed that internet growth increased 42% in the past year, while landline users decreased by 50% in the same time frame (CCK, 2013). In a country of 40 million, even with the difficult to reach rural regions, communication technology is making its way to the far corners or Kenya, and this incredible technology and way to reach people must be harnessed and used to positively contribute to the development of EMS in Kenya.

As the Childline story highlighted, the biggest challenge in developing a communication system is that it is incredibly expensive. One interviewee discussed a bid that had been given to the Government of Kenya for developing a comprehensive emergency communication system, saying, *"The cost is 80 billionksh [$913 million USD]. We are looking at it now. It will bring police, fire, EMS all to the same place to share. The idea is to develop a centralized call center- it will be all over the country. It will coordinate communication."* The technology is there, but the cost is prohibitive. EMS providers have designed incredible work-arounds to ensure the highest quality care for their patients within the resources they have. Still, the need for a comprehensive and coordinated communication system is obvious, and the interviewees shared several recommendations for making this possible.

Recommendations

- Establish a central dispatch and call center that has a plan for sustainability through funding and human resources, and that can coordinate communication between EMS, fire, police, and the receiving hospital.

- Establish a toll free, short code emergency number that can be accessible to everyone, easily remembered, and supported by CCK and all major mobile phone companies. Do this by enhancing and reviving 999 or 112.
- Technology to track calls should be used so that dispatch can pinpoint the location of an emergency and not have to rely on directions given by the caller.
- CCK and major telecom companies should take responsibility to ensure that emergency numbers are established and calls can be made through their networks.

Ambulance and Transport Services Capacity

Background

In general, emergency transport is a huge barrier in the provision of effective pre-hospital emergency care for the majority of the world's population. In Kenya, less than 2% of injured victims are transported via ambulance, and over 75% are transported by lay persons, or "Good Samaritans" (Macharia et al., 2009). These statistics are consistent with many countries of the world. A disproportionate number of low income countries do not have ambulance access, and rely on private or commercial vehicles, carts or bicycles for emergency transportation (Sasser et al., 2005). Even in low income countries that are fortunate enough to have some ambulances, such as Kenya, there are consistent challenges with coordination between ambulance agencies, limited supply in comparison to high demand, inadequate roads and bad traffic, and lack of standardization in the definition of an ambulance vehicle, the care offered, and the training of those providing care (Sasser et al., 2005). This section will comprehensively address emergency transportation in Kenya, with a focus on ambulances.

Results from Key Informant Interviews

Counting Ambulances in Kenya

The distinct lack of regulation and lack of standardization and policy has made the tracking of ambulances and the evaluation of Kenya's current ambulance capacity nearly impossible. However, interviewees provided great insight into the capacity of their organizations and the perceived capacity of the other organizations, both public and private, around them. One key question in this assessment was to determine the number of functioning ambulances that currently exist in the entire country. However, ambulances are not registered as "ambulances" in Kenya. They are registered as duty free vans, along with all other vehicles that qualify for this type of registration status, and so therefore, it is not possible to see how many ambulances are registered in Kenya. Upon questioning all of the major EMS carriers in Kenya about the number of ambulances owned and operated by their companies, the number of ambulances, excluding ambulances provided by the Government of Kenya (GOK), came to 60 for the entire country, and 3 fire trucks for the city of Nairobi. Of the 60 ambulances, a little less than half are considered advanced life support (ALS) ambulances, and the rest are basic life support (BLS) units. Most of these are privately owned ambulances and the vast majority, well over half, of them are stationed in Nairobi, the second highest number are in Mombassa, and there are a few sprinkled throughout the rest of the country in places like Garissa, Daadab, Eldoret, and Kisumu. According to some interviewees, the GOK donated 3000 ambulances to the public hospitals and counties in Kenya. According to other interviewees within the government, that number was 1000 ambulances, 300 of which were water ambulances stationed on main waterways such as Lake Victoria. However, one comment was common to every interviewee: the GOK ambulances are not utilized as ambulances. One official guessed that less than 25% of the GOK donated ambulances are used as ambulances. Others have been stripped of their medical capacity and converted into vans and common vehicles for general hospital use, such as hauling supplies or personnel. As one interviewee stated, "*The ambulances purchased by the ministry of health are a loss.*" Regardless of whether the 3000 or 1000 figure is accurate, the common consensus is that GOK or "public" ambulances are ubiquitous, poorly managed, and are not a reliable source of quality pre-hospital emergency care.

Capacity of Key EMS Players in Kenya

The main EMS players in Kenya are predominantly headquartered in Nairobi. The largest EMS provider is Red Cross's E+. E+ is the division of the larger company, Kenya Red Cross, which specifically provides EMS services with ambulance response to emergencies. St. John is the oldest EMS provider in Kenya, as it was established in 1928 when Kenya was still a British colony. It is often perceived to be the largest EMS company, with the greatest capacity, but in reality, E+ has more ambulances than St. John. What St. John does have, however, is a roster of thousands of first aid trained volunteers that can be called upon if a disaster strikes. This roster is definitely a strength for the company, and the amount of training St. John provides has capacity to improve the public's knowledge of emergency response. Both St. John and E+ are technically established as public services by an act of parliament in the new 2010 national constitution. However, no funding clause was added so they are still required to privately fund all their own services. Apart from E+ and St. John, there are a couple other smaller high quality private EMS services. AAR and Avenue both provide high quality EMS care to people who pay membership fees into their organization. These membership plans can be likened to a form of health insurance. E+ also has a membership plan. The City Council of Nairobi has two ambulances, and the airport also has two. These are all considered public ambulances. One organization, AMREF's Flying Doctors, provides the only air evacuation and intensive care air capacity in the entire country of Kenya and for most of the African continent. The Kenya Air Force and police also have air capacity, and have teamed with Flying Doctors on occasion to extract and treat sick patients, using Flying Doctors' equipment and medical expertise. This kind of collaboration between the private and public sector is encouraging. Flying Doctors has amazing capacity with equipment, training, and personnel. They also have a membership program where individuals, families, or corporations can pay a flat fee ahead of time for all air evacuation and associated medical services. The Flying Doctors is the only EMS organization in Kenya that carries an internationally recognized accreditation.

Number of Trained EMTs in Kenya

There is no national registry for EMTs or no official EMT certification in Kenya. As a result, it's difficult to ascertain how many trained EMTs are in Kenya. Kenya Council of Emergency Medical Technicians (KCEMT) has been instrumental in taking the lead in policy, standards, and training for EMS. According to KCEMT, 312 EMTs have been trained since 1998, but almost half are no longer in Kenya or are no longer working as EMTs. Therefore, there is a lack of trained personnel to provide quality pre-hospital emergency care. Of note, E+ has a robust training and certification program, but also reported difficulty retaining their trained EMTs. St. John also conducts training but does not certify EMTs.

Ambulance Standards for Equipment, Medications, and Vehicle Specifications

There are no standards for equipment or medications on ambulances. The policy draft addresses this but until it's approved, this will likely continue to be an issue. Each EMS company has their own standards of what should be on an ambulance, and it varies widely. The Flying Doctors' transport ambulances are almost the equivalent of a rolling intensive care unit, with the ability to ventilate patients and conduct cardiac monitoring and defibrillation. Additionally, they have a variety of medications that could be found in a Western emergency department or intensive care unit. On the other side of the spectrum, many public ambulances have no equipment or just an AED (automated external defibrillation) and basic or no medications. Importantly, many of them do not carry oxygen on their ambulances either. In the middle of these two extremes lie most private ambulance organizations. Many of them have written standards for their own organizations that include necessary equipment and medications for BLS or ALS ambulances. Most of these carry an AED or defibrillator and monitoring piece of equipment, basic ACLS drugs for resuscitation, basic analgesics, emergency cardiac medications, and equipment to stabilize bleeding. In summary, there is no minimum standard for what an ambulance must have available in order to be considered an ambulance. It is possible for an individual to purchase a van, put a bench in the back of it, paint the word "ambulance" across the front, and start transporting patients.

As there are no standards for equipment or medications, there are also no standards for vehicle specifications. Some companies import already-made ambulances that can be ready for immediate use. Others purchase vans and convert them to ambulances. This in itself is not a negative thing, considering that Kenya is so widely varied in its geography and terrain, and a small van that might serve a crowded urban metropolis such as Nairobi would not be able to navigate the terrain of rural Kenya, especially during the rainy season. For this reason, some private companies such as E+ have vehicles ranging from the Toyota HiAce to Land Cruisers. As previously mentioned, ambulances are registered as "Duty Free Vehicles" and so there is no regulation on registration or vehicle specifics. This is something KCEMT and others are hoping to remedy with policy. The consensus from the interviewees is that there should be a basic minimum standard in terms of vehicle specifications in order to be called an ambulance.

Standards for Personnel Operating and Attending an Ambulance

There are no current standards for personnel operating an ambulance. Anyone who has a driver's license can drive an ambulance. In the public sector, non-medically trained people are hired to drive. In the private sector, it is preferred that the driver is a trained EMT. KCEMT's standard is that drivers are all EMTs, and this standard is reflected in the draft EMS policy that has not yet been adopted by Parliament.

There is no official current standard for personnel providing care and attending to patients in the ambulance. Each organization differs drastically. In the public sector, the attempt is made to hire an EMT who has already been trained somewhere. However, this is not required always, and sometimes a person trained only in first aid is utilized for this job. For public hospital based ambulances, a nurse who is working is told to accompany patients on transfers as the ambulance attendant. These nurses typically have no training in pre-hospital or out of hospital care. One interviewee familiar with the public ambulance sector described this, *"They put a nurse who has no idea of what to do and who sits in the front of the ambulance and doesn't even do anything."* In the private sector, typically the attendant has to be at least an EMT. EMT training varies between institutions, but they all incorporate weeks to months of pre-hospital emergency care training. Some institutions hire A&E or ICU nurses and train them in pre-hospital care. These are called "paramedics" although there is not any official training for paramedics in Kenya. The general consensus from the interviewees is that attendants should be at minimum a trained and certified EMT.

<u>The Public's Access to Emergency Care</u>

In discussing the capacity of ambulance services in Kenya, it is important to also include access to emergency care. If there are incredibly well staffed and well-equipped ambulances everywhere, but no one can access them, then the emergency needs of the public will not even begin to be met. Interviewees described emergencies as specifically trauma. This includes car accidents, building collapses, natural disasters, slum fires, and the like. Medical emergencies such as heart attacks or strokes were not included in their description of an emergency but rather in their description of a transfer. This is important because it shows that trauma is priority for the EMS system as a whole, and considered widely as an appropriate reason for utilizing the EMS system. In the new national constitution that was promulgated in 2010, Kenyans were given access to emergency care as a constitutional right. St. John and E+ were listed in this mandate as established public emergency providers. With this, however, came no funding clause, meaning that the GOK did not establish a means to fund St. John or E+. Therefore, they still consider themselves to be private ambulance companies that wish to help everyone, even those who cannot pay, but cannot afford it without their businesses going bankrupt. This is important, because many of the other private EMS and ministry of health interviewees perceived that St. John is getting government funding and therefore should be providing emergency services to all without charging. As a result of this lack of funding, not everyone in Kenya gets access to emergency care. As one interviewee described, "*Ambulances are only accessible now to middle and high class.*"

There are several ways that people may financially secure their ability to receive emergency care. Almost every private EMS company has a membership plan that, for an annual fee, guarantees you unlimited access to EMS services. The general public considers the fee prohibitive. However, in comparing the various corporate, family, and individual plans, most unlimited EMS services can be purchased for around 2000-3000ksh per year, or roughly USD $24-36 per year per person, and packaged family plans for about 6000ksh per year, or about USD $72. Some are even cheaper, and most interviewees who worked for EMS companies said that they reduce fees for those living in slums. For the Kenyan living in abject poverty, this still may be utterly unattainable. However, for many lower-middle class Kenyans, this might be doable. Further research needs to be conducted to determine why more Kenyans have not bought into these programs. Is it that the perceived risk or need for EMS services is lacking? Is the cost truly prohibitive considering other costs of living? Are most Kenyans unaware of these programs or what they cost? If more people bought in and the cost could be lowered, what would be a reasonable annual fee that people would buy into? Regardless of the reasoning, the vast majority of the population has not paid into EMS membership, and do not consider themselves candidates for EMS services.

Geography is another huge barrier to EMS access. Most of the services mentioned in this section are located in Nairobi, with some satellite services in Mombasa, Eldoret, and Kisumu. As one interviewee summarized, "*There are a high concentration in towns but other areas are omitted. They are concentrated on main highways and there are inadequate services in rural areas.*" To add to the problem, the overwhelming response from interviewees was that rural hospitals are ill equipped to handle emergent patients. As one interviewee described, *"If outside of Nairobi and Mombasa, then the ambulance is more resourced for an emergency than the A&E. Once we had to transport greater than 250km because the facilities were not equipped for the patient."* In essence, those living in rural settings not only don't have ambulances nearby, but lack adequate medical facilities even if they are lucky enough to arrive at one alive. This is a seriously underserved part of the country that needs to be addressed in any comprehensive EMS development plan. Fortunately, the new constitution divides the country into 47 counties, and all are supposed to have at least one ambulance. If this ever comes to pass, it will greatly improve the access for rural populations.

Recommendations

- Establish and enforce a minimum standard for proficient vehicles to serve as ambulances, medications, equipment, and trained EMS drivers and providers.
- Recognize an official body that will regulate and enforce EMS standards. This body should be given credibility and administrative power by the Government of Kenya.

- Educate the public on access to EMS services.
- Establish EMS capacity in all 47 counties in Kenya, with numbers of ambulances and EMTs based on per capita population statistics and hazards specific to the region.
- GOK should fund the organizations that it has established in the constitution in order to truly create a public service.
- Establish vehicle registration specific to ambulances, so they can be tracked and accounted for. This includes private ambulances, water ambulances, and ambulances donated to hospitals by the GOK.

Training and Curriculum for EMS Providers

Background

Establishing a standardized curriculum, training, and method of certification for EMS providers is one of the foundational elements necessary to provide effective pre-hospital emergency care. Different countries around the world, with top tiered EMS systems, have different models for training and curriculum. In the Anglo-American model embraced by the USA and Australia, EMTs and paramedics are used in a "scoop and run" type system where these trained technicians can perform interventions based upon treatment algorithms with the idea that the patients will be transported to the nearest emergency department, and a higher level of care, with great expedience (Al-Shaqsi, 2010). In contrast, the Franco-German model that is embraced by much of Europe, has more of a "stay and stabilize" system, where highly trained providers, often physicians, with advanced technology are deployed to the patient, and sometimes the emergency department can then be bypassed and the patient can even be directly admitted to the hospital (Al-Shaqsi, 2010). Research has not proven one of these systems to be superior to the other, and most developed countries in the world utilize some form of either. Since Kenya currently does not have Emergency Medicine (EM) training for physicians, it does not make sense to use the Franco-German model, but with the challenges endemic to a developing country like Kenya, cultural context will have to be considered before developing a training program.

The WHO guidelines on EMS development suggest that training should start simple and be built upon (Sasser et al., 2005). Basic first aid being taught to citizens in rural areas has been more lifesaving than teaching advanced life support (ALS) to few (Sasser et al., 2005). In fact, there have been several international studies that have shown that there are few patients that ALS would actually benefit, and there were mixed results on whether or not advanced techniques, such as intubation and aggressive resuscitation in the field, actually improved patient outcomes (MacFarlane & Benn, 2003). The exception to this is early defibrillation for cardiac arrest victims, which has been proven over and over to be beneficial (Sasser et al., 2005). In some developing countries, and rural Kenya would be included in this, the time to transport a patient to a major hospital might be hours and hours, even in a vehicle. In the meantime, ALS might be nearly impossible and often does not have a positive impact on the patient’s ultimate outcome (Sasser et al., 2005). For this reason, the WHO guidelines focus on a more simplistic technique in training EMS providers, and suggest that the best way to begin EMS training is to train motivated community members, public servants, taxi drivers, and community leaders in basic first aid (Sasser et al., 2005). Research has shown that the odds of survival for trauma victims is increased if bystanders promptly initiate first aid

(Sasser et al., 2005). Next, there can be a second tier of trained individuals, such as EMTs, that are trained in more advanced care techniques such as extrication and rescue, immobilization, administration of oxygen and basic medications, and who are trained to do a more comprehensive patient assessment (Sasser et al., 2005).

Results from Key Informant Interviews

History of EMT Training in Kenya

The interviews revealed that EMT training and curriculum development is a priority for most of the EMS stakeholders in Kenya. Since there is currently no official EMT certification in Kenya, there is no way to officially count the number of EMT trained individuals working in the country. One trainer who is actively involved in EMS development reported that so far, 312 EMTs have been trained since the bombing of the US Embassy in Nairobi in 1998 (commonly just referred to as "the bomb blast"). Of these, he guesses that over half are no longer in Kenya but have gone to the United States to work. Prior to the bomb blast, there was a one-week "ambulance service course" based on UK curriculum and offered by St. John. This course was based more on customer service than on developing knowledge and skills for pre-hospital patient care. After the bomb blast, USAID channeled more resources into Kenya and funded EMT curriculum and training that was based upon American standards. Many of the first EMT class to graduate after the bomb blast are still actively engaged in an EMS career and most are currently active in the development of EMS systems in Kenya. However, once USAID money was gone, the trained EMTs were left to contemplate how to grow in their profession and continue their education. The Kenya Council of Emergency Medical Technicians (KCEMT) was eventually established, and trained the first fully trained

Kenyan group of EMTs around 2007 using a Kenyanized version of the US curriculum. KCEMT continues to train EMTs today, as does E+, the EMS company that falls under the Kenya Red Cross (KRC). Both organizations certify EMTs through their training programs, although their programs vary in content, requirements, and length.

Establishing a standardized training program for EMTs is considered one of the top priorities in EMS development for the key stakeholders interviewed. One stakeholder expressed the urgency in this matter by saying, *"It's a project that has to be. It's an emergency. We can't operate without a standard curriculum. This fragmented approach is taking us nowhere."* Additionally, the training of the masses in first aid was mentioned several times by interviewees as a necessary public health program to decrease morbidity and mortality from emergencies. Emergencies often happen at home or on the roadways. Ideally, if more of the public knew basic first aid, then lifesaving measures could be adequately provided while waiting for an ambulance to arrive. One interviewee stated, *"I believe fatalities would decrease by 60% if negligence didn't occur. People don't know how to respond to choking, bleeding, and movement is causing fatalities. We need public awareness for common knowledge."* In essence, too many people are dying in Kenya from emergencies that could be treated with adequate education and care. One interviewee summed it up nicely, *"If people know what to do they will want to bring change, and not just accept people dying."*

First Aid Training for Lay People

Policy in Kenya reflects the need for lay people to be trained in first aid. The majority of the interviewees mentioned the Occupational Safety and Health Act, which requires every work place with over eight employees have at least one person trained in first aid. There can be up to a 500,000ksh (over $USD 6,000) fine for not complying with this policy. However, the majority of the interviewees also discussed how this policy is not enforced. Since first aid training costs money, many are not incentivized to participate unless someone like their employer is paying for it. Police and firemen are all trained in first aid, and St. John is one of the main first aid trainers in the country. The KRC also trains to Red Cross international standards that are recognized worldwide. Aside from first aid, the KRC and St. John also offer a variety of training courses in fire awareness, lifesaver for babies, and sports injury classes. For those who sign up to volunteer with St. John, the training is free. Currently, they have over 18,000 volunteers who have been trained. This is an excellent start, but still a small percentage of the overall population of Nairobi and Kenya. St. John has seen lives changed as a result of their training programs, but they lack funding. One interviewee relayed a success story of St. John, *"We are training prison groups- inmates- and are starting with hardcore criminals. We are teaching them first aid. This has had a positive impact on the transformation of character. This has been reported by the prison officer who reported the positive impact. They realize they can be helpful in society. This is being assessed by top prison officers and they are thinking it started late- and they want it to expand. When inmates are trained to save lives, they become an advocate of life- of saving not taking. They have thanked authorities because it's life changing. The initial objective was to treat injures but it has been greater than this, it has changed their lifestyles. The challenge is that we can't fund- the inmates can't pay but it takes resources to train them. Some people are supporting this but we need to train them as trainers for a sustainable way forward. We need funds. This is much greater than expected."* In essence, the value of a trained public should not be underestimated. It could empower the public and transform lives.

Current EMT Training Programs

Currently, there are two main EMT training programs in Kenya that certify EMTs. One is through KCEMT, that trains for many of the private EMS companies as well as holds classes that the public can attend, and the other is through E+, which primarily trains for their own organization. Both are well-respected programs, but they vary in many ways. Ultimately, there is no national certification for EMTs, so anyone could train someone to whatever standards they wish, and then call them an EMT. To attempt to gain credibility to their certifications, KCEMT has partnered with the Ministry of Health (MOH) to have their logo and signatures on their certificates. Additionally, KCEMT is an American Heart Association (AHA) training center, which means they can train people to AHA standards for basic life support (BLS) and advanced cardiac life support (ACLS). E+ has gained credibility by training to Red Cross standards and providing their EMTs with the Red Cross logo, which is internationally recognized and respected. Additionally, their EMT course is longest at 9 months. An interesting aspect of EMT and EMS training in Kenya, is that often nurses are the ones being trained and providing care in ambulances. E+ and AAR both train A&E or ICU nurses in EMT curriculum and pre-hospital emergency care, and then give them the label of paramedic. There is technically no paramedic training or curriculum anywhere in Kenya, so any person called a paramedic is actually a nurse with EMT training. However, in the public hospitals, often public hospital based ambulances will pull nurses from the hospital to ride along and attend to patients. These nurses are not trained in pre-hospital care and do not have the same training and qualifications that the nurse-paramedics do.

Development of a Standardized Curriculum

Stakeholders in EMS development have realized that it can be problematic to have a profession of EMTs but no standardized training or certification. As a result, many key stakeholders have made it their mission to develop a standardized certification and curriculum for EMS providers. There are two primary schools of thought on how to accomplish this. One that seems most popular amongst interviewees is to establish a standardized curriculum endorsed by the government that will become a requirement for EMT trainees to complete. The other idea is to develop a certifying exam and standards for training, and schools can then develop their own curriculum to meet those requirements. Students would then have to pass the exam to be an EMT. One stakeholder described the current progress on curriculum development, *"There is a department within KCEMT that is being tasked with curriculum development. It's evolving. In 1998 we were trained by DOD American standards. We discovered there are limitations. When in the field, the timing isn't realistic because we aren't always just 10 minutes away from the hospital. We also transport from far away towns. We combined EMT-B and EMT-I and call it EMT-1. We had to introduce ALS components. Currently they are working on a paramedic curriculum but they are saying they need trainers for paramedics. EMT-1 has some shortcomings so we want to scale down or break down and make different levels of EMTs. This is still in the development stage."* Currently, the Kenya Institute of Education (KIE) has developed an entire EMT curriculum that KCEMT and the MOH are hoping to adopt and make standard. The problem is that KIE's price tag on the curriculum is prohibitive. Right now, they are attempting to garner financial support in order to make this a reality. Red Cross curriculum reflects more of international standards mixed with Kenyan context, and is also very good. Either curriculum would likely suffice, but ideally they would be agreed upon and there would be a standard. The ultimate goal is that if someone presents as an EMT, it would signify a certain level of education and evidence that they have passed a certifying exam.

Recommendations

- Approve and implement a nationally standardized curriculum and certification requirement for EMTs.
- Curriculum should be at a national level so it is adhered to by all organizations.
- Implement a standardized licensing process for EMTs.
- Make it priority to train as much of the general public as possible in general first aid, and include first aid training as part of common education in both primary and secondary school.
- Establish an agreed-upon and sustainable funding source for training and curriculum, whether it is the GOK, private organizations, or a combination of both.

Research, Data Collection and Sharing for EMS

Background

Documentation and record keeping are an essential part of pre-hospital care. It allows for continuity of care between the pre-hospital and hospital environments, as well as can be used for quality assurance and if done right, as basic public health surveillance (Sasser et al., 2005). The WHO guidelines suggest that at a minimum, the 4 Ws and H should be documented for all EMS calls. These include 1) Who was injured and who provided care? 2) What caused the injury and what was done to treat it? 3) When did it occur? 4) Where did the injury occur? 5) How did the patient respond to treatment (Sasser et al., 2005)? As data systems improve, they can ideally be aggregated at a national level, and valuable information ascertained.

Results from Key Informant Interviews

Research guides actions, and in the medical field this is especially true. However, the subject of research and documentation was the least discussed of all aspects of the interviews. Every interviewee mentioned the importance of conducting good research and documentation, but all also agreed that research in emergencies and trauma rarely occurs in Kenya, is almost never funded, and documentation is fragmented, if it happens.

Currently, there are no central data points for emergencies and trauma. Therefore, there is no trauma registry in the country. Aga Khan is the one hospital in the country that is known for conducting research, but the data collected is not EMS specific. Many of the interviewees reported that master degree students often conduct research on emergencies, but this information does not get disseminated to the public or to the MOH. Every interviewee that commented on research said that there is no grant funding for research on trauma and emergencies either. Part of the reason for this might be that Emergency Medicine is not a recognized specialty in Kenya. Doctors are placed in A&Es coming directly out of their general medical training with no specific emergency training. Also, as one interviewee said, *"People don't respect research or want you to* *collect data. It's a hard thing, to collect data."* There are also very few publications specific to disaster and emergency medicine.

Documentation on the ambulances has the potential to also be used for key data points later on. Additionally, it should be included as an important part of the patient's medical record. Most interviewees identified documentation of the EMS call as extremely important and something that should be done for all patients. Most interviewees also considered documentation to be a rich source of research data. Each private EMS company interviewed reported that they have a documentation system. Usually the document, or run report, gets left with the hospital and a copy is brought back to the company and filed. Some of them input certain data into a computer for the purposes of tracking patients, demographics, and for training their staff. Most, however, get filed somewhere and are never looked at again. In general, trained EMTs have documentation included in their training, and those working for private companies incorporate it into their practice. Additionally, dispatchers with private EMS companies create logs of patients and collect valuable demographic data. EMTs interviewed in the public sector say that documentation doesn't often occur, however, even though they report they know how to document and see the importance of it. Of note, each EMS company uses a different documentation form with different information on it. There is no standard information that is collected. Recently, a few of the private EMS providers and the MOH have gotten computers. They reported that their hope is to input and collect data from their respective organizations for more accessible and usable data management.

Recommendations

- Make available grant funding to fund research in trauma and emergencies.
- Incentivize data sharing between EMS companies.
- Incorporate research training and implementation into EMT, nursing, and medical training in Kenya.
- Train all EMTs in standard documentation process.
- Kenya collects a lot of data on infectious disease, so it has surveillance systems intact. Start surveillance for emergencies and traumatic injury.
- Standardize key data points that need to be included by each EMS company on their documentation forms that can be shared with the MOH.
- A minimum documentation standard should be set and adhered to by public and private providers.
- Students should start submitting their research for publication. Data needs to be shared to develop evidence-based practices.

Chapter 5: Discussion and Conclusion

Introduction

This research project brought together people from all aspects of the Kenyan health sector, with a common goal of developing EMS in a coordinated and sustainable manner. The use of qualitative research added a rich depth of quality, as it truly represents the voices of those who have dedicated years of work to emergency response and the pre-hospital care system. This chapter will discuss the findings, significance, and limitations of the study, as well as recommendations for future research.

Discussion of Findings

EMS has been steadily gaining momentum from the bomb blast in 1998, and leaders all over Kenya desire that emergency response be a priority public health issue. With increases in drivers, vehicles, and roads, the need for EMS has never been so great. With increases in natural disasters, fires, floods, and terrorism that has been spilling over from Somalia, a foundational EMS system is essential to provide comprehensive and effective disaster management and response. Kenyan health initiatives should be directed towards decreasing morbidity and mortality associated with trauma and medical emergencies. Having a quality emergency medical services (EMS) system can play a vital role in reducing the number of deaths occurring from both large-scale emergencies and traffic accidents. This document serves as the first comprehensive baseline assessment of the EMS system in Kenya, and utilizes evidence based published material in addition with key stakeholder interviews to establish recommendations for the best way forward in EMS development for Kenya.

A summary of the basic tenants of EMS development as they pertain to Kenya will be offered in this section, to include EMS policy and funding, EMS communications systems capacity, ambulance and transport services capacity, training and curriculum for EMS providers, and research and data collection and sharing in the pre-hospital environment.

Policy and funding are critical to the success of all the other aspects of EMS development. Unfortunately, these are grossly underdeveloped in Kenya. A comprehensive EMS policy was drafted in 1999 and has been since revised, but has never been enacted into law, despite being in Parliament for years. Additionally, the new national constitution in 2010 designated emergency care as a right for all Kenyans, but unlike other designations, there was no funding clause attached to this, and therefore funding for EMS development has been completely from the private sector, making EMS access impossible for most Kenyans. The key recommendations are that the EMS policy draft be enacted into law swiftly, and that a funding clause be attached to designate how each aspect of EMS will be able to financially operate.

Communications are essential to any well functioning EMS system, and this starts from the initial contact that the patient has when he or she activates the emergency system and calls for help. This continues as the EMS responders communicate with one another and with the receiving hospital, often through a dispatcher, and ends with the delivery of the patient to the appropriate receiving facility with a well-communicated patient hand off. Currently, the first step of activation of the emergency system is not functional. There is no short code toll free number, like 911 in the USA, which can be called to activate an emergency. There is no central dispatch, and each company runs their own phone numbers and own dispatch center. Additionally, there is no medical control, and therefore no physician resource that EMTs can call to assist with medical decisions, and there is no communication with receiving hospitals, so ambulances just show up unannounced. There are multiple pieces that fall under the broad spectrum of communication, and most of them could be resolved by implementing a government and CCK sponsored short code toll free emergency number that is routed to a centralized dispatch center that is responsible for activating EMS and then relaying messages between EMS and hospitals. This should be priority.

There are very few ambulances in Kenya in comparison to its population. Transport often happens by "Good Samaritans" as well as taxis and private vehicles. There are no regulations for ambulances, so the definition of what qualifies as an ambulance, to include vehicle specifications, equipment and medications on board, and trained personnel operating the vehicle and treating patients, varies widely. According to the new constitution, Kenya is now divided into 47 counties, and all should have at least one operating ambulance. To build capacity in this realm, the public needs to be educated on EMS services, an ambulance service needs to be established in all 47 counties, and minimum standards need to be set and enforced to guarantee quality care from EMS providers.

Training and curriculum for EMTs in Kenya is primarily carried out by both E+ and KCEMT. Both have robust training programs, but they vary in length and content. Neither have certifications that fall under a national recognition. Therefore, there is no nationally certified EMT program. There have been different attempts at changing this, and most agree that there needs to be either a nationalized EMT curriculum, or a national certifying exam that is required in order to be an EMT. Either way, in order to progress in EMS development, this key piece needs to be put into place. Additionally, research has shown that the most effective lifesaving intervention is to train the general public in first aid and basic safety. While EMTs have an extremely valuable role in EMS, EMS development in Kenya should be expanded to include mass training of the public in first aid.

Lastly, research, data collection, and data sharing is currently the most underdeveloped part of EMS in Kenya. Although widely considered important, it is not often done. Many of the private EMS companies do keep records, but there is no standardization of data and often these records are filed away and never seen again. At a minimum, each EMS provider should document all their calls, the record should be part of the patient's permanent medical record, and the EMS stakeholders should agree on the minimum material that needs to be documented. Ideally, this information could be nationally aggregated and a robust data set could be formed. This data set should be computerized and routinely analyzed for the purpose of distributing it in a report.

Significance

There has been no baseline assessment of the current EMS system in Kenya prior to this study. However, stakeholders and policy makers have been increasingly interested in the subject over the past decade, and particularly in the recent years since there has been an increase in individual emergencies and wide spread disasters, such as terrorism. The qualitative research conducted provides the first comprehensive picture of the current state of EMS in Kenya and a road map for the way forward. It represents Kenya's first step towards EMS policies and a widespread reform of its EMS system. It addresses one of the most under-researched problems that afflict Kenya today. If the recommendations from the research become widely implemented, there should be a significant reduction in morbidity and mortality from emergencies in Kenya, and Kenya will become the second African nation to have a developed EMS system.

Limitations

The study was limited by a few factors. Time and travel limited the geographical area that could be sampled. Nairobi's EMS was well covered. Nairobi is the largest city in Kenya, representing a dense urbanized population of 3.75 million residents (CIA, 2012) and an estimated 1 million or more slum inhabitants that are not accounted for in regular census reports. The interview process produced an exhaustive list of topics that were repeatedly confirmed by numerous participants. Because interviewees worked in Nairobi, information regarding other cities or rural areas was either second hand knowledge or personal, but from past experience. Additionally, there are huge complexities in emergency response associated with the hundreds of thousands of refugees in the Eastern part of Kenya. These issues were not addressed in the interviews. Kenya has some very rural areas that are very hard to reach with near impassable roads and lack of airplane landing strips. Emergency response in these areas has different challenges than in Nairobi. Therefore, the baseline assessment and recommendations obtained through the interviews could not be generalized to the entire country, although many of the broad policy and funding issues if remedied, would benefit all of Kenya.

Another limitation is that the interviews were recorded with pen and paper. This method increases the potential for mis-copying of interviews, and not every single word could be recorded. Additionally, there was no way to go back and verify that the words recorded were in fact the exact words used during the interview. Sending the analysis back to the original interviewees for their review and approval helped to alleviate this issue.

Lastly, no one from the Kenya military was interviewed. Although the Kenya military does not work day to day with EMS response, they are occasionally utilized in large disasters. Information gathered on the military and their EMS resources and response was from interviewees who had either worked with the military during disasters or had personal military experience prior to their current positions.

Despite these weaknesses, the consistency of comments and themes gathered between interviewees strongly suggest that the information analyzed is representative of the current status of EMS in Kenya today. Additionally, there were some advantages that helped offset some of these disadvantages. For one, I, the interviewer, had some personal credentials that helped me gain credibility with my sample. First, I am an emergency (ER) nurse and was an EMT prior. My personal knowledge of emergency clinical care, and particularly pre-hospital care, often made the interviewers feel like they were talking to a colleague. I feel strongly that this helped immediately put my interviewees at ease, and allowed us to rapidly build a trusting relationship. Additionally, I am a prior military officer. There were some of my high-ranking NDOC interviewees who were prior military officers in Kenya before they assumed their NDOC positions. This connection helped gain credibility, helped with communication, and likely played a role in my success.

Recommendations for Further Research

Although the research fills a significant gap in knowledge and literature on EMS in Kenya, there is still more work to be done. Progress reports on the ongoing status of EMS should be completed each year, and similar projects should be conducted among populations that were not well represented in this study. These populations include Kibera, Africa's largest slum located within the Nairobi city limits, rural areas, and refugee populations. Additionally, more research should be conducted to explore why Kenyans, even those of middle and upper class, do not routinely buy into the affordable plans offered by the private EMS companies. There is still a gap in knowledge about factors that prevent access to emergency care.

Conclusion

Although the current state of EMS in Kenya may appear discouraging right now, Kenya is at a distinct advantage to have motivated and dedicated EMS personnel that are passionate about EMS. The hard work and dedication of these individuals is inspiring and their work will pay off. No successful EMS system in the world was built overnight. In the 1960s, the US EMS system was very similar to the current Kenyan system. Through intersectoral work, it is now one of the leading systems in the world. Kenya is progressing rapidly and with coordination and effort, the EMS system can become one of the most robust EMS systems in all of Africa.

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Appendix

Research Tool

My name is Michelle Siemens, and I am a Master of Public Health (MPH) and Masters of Science in Nursing (MSN) student at Emory University in Atlanta, GA. I am currently working with the International Emergency Preparedness Team at the Center for Disease Control in coordination with Moi University Eldoret, Kenya on the process of development of a comprehensive and coordinated emergency medical services (EMS) system in Kenya. My role in accomplishing this important task is to develop a comprehensive report on the current status of EMS in Kenya and the recommended ways forward. You have been identified as a key stakeholder in EMS in Kenya, and therefore I am asking for your participation by answering some questions regarding the capacity of your organization in terms of EMS in Kenya. You have the right to stop the interview at any time as well as to refuse to answer any questions you do not feel comfortable with. Although we are collecting some demographic information in the interview, no identifiable information will be used in the final report. All material gathered from the interview will be organized into themes in conjunction with interviews from other key stakeholders, and this information will be presented as a whole, not in individual pieces. You will have the opportunity to review the report and provide feedback before it is presented in a public manner.
Thank you for your participation in this important task.
Regards,

Michelle Siemens, RN, BSN
MSN-MPH Candidate 2013, Emory University
International Emergency Preparedness Team
CDC- Kenya

Section A: *General Information*

Demographic Information

1. Name:
2. Age:
3. Gender:
4. Organization:
5. Job Title:
6. How many years have you worked in your current organization?
7. What kind of job do you do in your organization?

Burden of Emergencies and Trauma in Kenya

1. What is the greatest issue contributing to mortality from emergencies and trauma in Kenya?
2. Is there a regulating body for occupational, road, or vehicle safety in Kenya?
3. What are your recommendations for the way forward for decreasing the burden of emergencies and trauma in Kenya?

Accident Prevention

1. What is in practice for road safety?
2. What is in practice for vehicle safety?
3. What is in practice for accident prevention?
4. What is in practice for occupational safety?
5. How are traffic and vehicle safety laws enforced?
6. What are your recommendations for the way forward in accident prevention?

Disaster Management and Response

1. Is there any preparation in place for mass casualty events?
2. Are there disaster plans for response and victim management?
3. Is there research and surveillance in disasters?
4. Who declares a disaster at a national or regional level?
5. What are your recommendations for the way forward in disaster management and response?

Section B: *Information Specific to Emergency Service Providers*

Capacity of EMS Communication Systems

1. How does your ambulance attendant receive notification of an emergency?
2. How does dispatch communicate with drivers?
3. How does the ambulance communicate with the hospital?
4. How does communication work between key emergency responders: fire, police, ambulance, hospitals, and other relevant entities?
5. Can and do physicians advise ambulance attendants en route? How does this happen?
6. Are there radio channels that are held specifically for emergencies?
7. Do people consider 999 a number to call for emergency response? Why or why not?
8. What are your recommendations for the way forward in EMS communication systems development?

Capacity of Ambulance Services

1. Who provides the initial care and transport for a trauma or emergency patient?
2. How is transport efficiently done to ensure fastest movement of vehicle to injured patient and injured patient to hospital?
3. What are the standards for your ambulances in terms of equipment /medications?
4. What are the standards for your ambulances in terms of vehicle specifications?
5. What are the standards for your ambulances in terms of personnel driving and attending the vehicle?
6. Who can access care with an ambulance service?
7. How many ambulances does your company own?
8. Who works on your ambulances and what are their qualification requirements?
9. What medical services are offered on your ambulance (BLS, ACLS, PALS)?
10. What is the furthest distance your ambulance company has or will travel to pick up a patient?
11. What is the shortest distance you've had to travel?
12. How is triage decided both from the initial call to the dispatcher and in the field?
13. How do you decide where to take a patient?

14. Can hospitals be bypassed if they don't have the capacity to provide the services the patient will need? What is the procedure for this?
15. Who provides training for your ambulance attendants and what courses are provided for them?
16. What exists for air evacuation in Kenya?
17. What is your biggest obstacle to effective pre-hospital EMS response?
18. Do you have a way to track the number of disabling injuries, burden of accidental deaths, accidents, or injuries for all of Kenya?
19. How many calls do you receive and respond to daily, on average?
20. How many calls that you respond to are fatal for the patient?
21. Is there a peak period of incidents, areas, times, or dates where you receive more calls?
22. What are the most common cases you get called to respond to?
23. What is the worst case you have ever responded to?
24. What are your recommendations for the way forward in building ambulance capacities?

Capacity of Hospitals and Emergency Departments (EDs)

1. How does the hospital receive the patient? What if it's a patient flown in by helicopter?
2. At what point in the process does the patient see a physician?
3. Are there standardized emergency departments (EDs) depending on the level of the health facility?
4. Are there standards or a system in place for classifying an ED or hospital based upon capacity?
5. Do private hospitals fall into this classification system?
6. Does the classification or capacity of a hospital determine where a patient is transferred for inter-hospital transfers?
7. Are there designations for specialty centers in hospitals? I.e. Trauma, heart, burn, stroke, or pediatric centers?
8. What level of care is provided in your ED? Hemodynamic monitoring? Intensive care?
9. Who staffs your ED? Who is in charge of running it?
10. How is the ED prepared to receive trauma and emergency medical patients?
11. What are the minimum standards of straining for a doctor or nurse to work in an ED?
12. Is your ED staffed 24 hours a day and is staff permanently assigned to EDs?
13. Is there an accreditation process for EDs and hospitals?
14. What is the system used to transfer patients between hospitals?
15. What supports EDs 24 hours a day? Lab? Radiology? ICU?

16. What are your recommendations for the way forward in building the capacities of EDs?

Current Practice of Patient's Care from ER to ICU and OR or in Case of Death

1. How does the ED work with the ICU and OR? What is the communication process between these locations for continuity of patient care?
2. What happens if a patient dies either in or outside a hospital? What is the communication process?
3. Where are trauma and emergency patients primarily resuscitated?
4. Is there mandatory medical examination if a patient dies?
5. Are there standards for autopsy?
6. Are there standards for forensics?
7. How is the cause of death agreed upon and how is it recorded?
8. Are certain deaths reportable to authorities?
9. What are your recommendations for the way forward in coordinating care between the ED and the patient's location of disposition?

Section C: *Information Specific to Key Informants and Policy Makers*

Training and Curriculum for EMS providers

1. Are there training programs for lay persons (such as basic first aid)?
2. What are the training programs in place for EMS providers?
3. Is there mandatory first aid training for any job in Kenya? Teachers, police, fire, etc?
4. How is it determined which individual ambulance attendant will receive which training?
5. What is being done to develop EMS curriculum?
6. What are your recommendations for the way forward in EMS curriculum and training development?

Appraisal of Research and Data Collection in Shock, Trauma, and Resuscitation

1. Is there research being done in EDs or in trauma?
2. Does documentation occur on ambulances?
3. What is done with these records?
4. How are records kept in the ED?
5. Are there trauma registries at your facility?
6. Is there specific trauma data that must be collected from trauma patients? If yes what is done with this data?
7. What is included in documentation for a trauma or emergency patient who presents to the ED?
8. Is there any standardization to documentation between the hospitals or EMS carriers?
9. Who reviews trauma records?
10. Are there grants available for research in trauma and emergency medicine?
11. Are there current studies ongoing in trauma, emergency, or accident prevention?
12. What are your recommendations for the way forward in research and data collection in shock, trauma, and resuscitation?

Policy

1. What policy currently drives EMS?
2. What policy for EMS is being developed under the new constitution?
3. What is the governing body responsible for EMS regulations and policy?
4. Are there ordinances for ambulances?
5. What are your recommendations for the way forward in EMS policy?