



The Growth of Neurosurgery in East Africa: Challenges

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As the second of 3 articles in this series, the aim of this article is to provide readers with an understanding of the development of neurosurgery in East Africa (foundations), the challenges that arise in providing neurosurgical care in developing countries (challenges), and an overview of traditional and novel approaches to overcoming these challenges and improving health care in the region (innovations). Recognizing the challenges that need to be addressed is the first step to implementing efficient and qualified surgery delivery systems in low- and middle-income countries. We reviewed the major challenges facing health care in East Africa and grouped them into 5 categories: 1) burden of surgical disease and workforce crisis; 2) global health view of surgery as “the neglected stepchild”; 3) need for recognizing the surgical system as an interdependent network and importance of organizational and equipment deficits; 4) lack of education in the community, failure of primary care systems, and net result of overwhelming tertiary care systems; 5) personal and professional burnout as well as brain drain of promising human resources from low- and middle-income countries in East Africa and similar regions across the world. Each major challenge was detailed and analyzed by authors who have worked or are currently working in the region, providing a personal perspective.

INTRODUCTION

In recent years, there has been a sharp increase of interest in global health, as evidenced by the number of publications focusing on improving healthcare services in the developing world. Public interest in global health has soared after disasters such as the recent earthquake in Haiti, which inspired millions of people from around the world to get involved and contribute to support efforts. Tragic events and natural disasters will always inspire a surge of interest to contribute, but it is challenging to sustain a successful effort to improve health care in a society faced with constant crises and shortages at all levels. This is the current situation in East Africa.

As stated in a series of articles on this topic published in **WORLD NEUROSURGERY** by authors from Weill Cornell Medicine and others: “... neurosurgical diseases have a dramatic impact on society and on economic conditions in developing countries but, unfortunately, are not on the radar screen of governmental or private health or support organizations. Traumatic brain injuries (TBIs), congenital malformations, and infections relating to the central nervous system affect children and the most productive part of society, and these patients are currently not treated effectively or are simply ignored.”¹ The purpose of this article is to portray the specific challenges of developing surgical systems in sub-Saharan Africa (SSA), using Tanzania as a paradigm (Table 1). This article is part of a series that seeks to provide readers with a comprehensive understanding of the current state of neurosurgery in East Africa (foundations), the challenges that arise in providing surgical care in underdeveloped countries

Key words

- Brain drain
- Burden of disease
- East Africa
- Global neurosurgery
- Workforce crisis

Abbreviations and Acronyms

BMC: Bugando Medical Centre
CT: Computed tomography
DALY: Disability-adjusted life year
EES: Emergent and essential surgery
LMICs: Low- and middle-income countries
MOI: Muhimbili Orthopedic Institute
SSA: Sub-Saharan Africa
TBI: Traumatic brain injury
USD: U.S. dollars
WHO: World Health Organization

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(challenges), and what is being done to overcome these challenges and to improve health care in these areas (innovations).

The goal of global health coverage is to ensure that all people obtain the health services they need—prevention, promotion, treatment, rehabilitation, and palliation—without risk of impoverishment, now and in the future.² Health care should be affordable, timely, and safe to ensure good coverage, utilization, and outcomes.³ Although the burden of surgical disease in low- and middle-income countries (LMICs) has been growing commensurate with their industrial development and surgery has been shown to be cost-effective, global health policies have historically prioritized communicable diseases.⁴⁻⁶ Now that policy-makers recognize the need for efficient and qualified surgery delivery systems in LMICs and accept that their implementation is feasible, the next step is to identify and describe the challenges that must be overcome.⁷

CHALLENGE 1: BURDEN OF SURGICAL DISEASE IN LMICs AND WORKFORCE CRISIS

The most updated inpatient list from the Neurosurgery Department of Bugando Medical Center (BMC)—a tertiary referral center—contained 65 patients, 25 of which were waiting for surgery, sometimes for weeks or months (Figure 1). The referral area of BMC is over 13 million people, for which there is only 1 licensed local neurosurgeon and 2 local anesthesiologists. Elective surgery is done only 1 day per week.

—Maria Santos, M.D. (Dr. Santos is a pediatric neurosurgeon from Portugal who spent 12 months in Tanzania as the first Weill Cornell Medicine Global Neurosurgery Fellow.)

Burden of Surgical Disease and Relevance of Traumatic Brain Injury and Spinal Cord Injury

About 6 million people die each year as a result of trauma, accounting for 10% of worldwide deaths—32% more than deaths from malaria, tuberculosis, and human immunodeficiency virus/acquired immunodeficiency syndrome combined. Furthermore, according to the 2010 report on the global burden of disease study, 89% of these deaths occur in LMICs.⁸ Considering the predicted increase in the incidence of cancer, road traffic injuries, and cardiovascular and metabolic diseases in LMICs, the requirement of surgical services in these regions will continue to increase exponentially from now until 2030.

Nevertheless, 5 billion people do not have access to safe and affordable surgical and anesthesia services. It is estimated that of the 313 million surgical procedures provided worldwide each year, only 6% occur in the poorest countries. Furthermore, a quarter of people who have a surgical procedure will incur financial ruin from the cost of medical care.³

Within the scope of trauma-related injuries, TBI and spinal cord injury are the most common causes of death and disability, impacting not only the patient but also the family and society. As there are no surveillance or obligatory reporting systems in LMICs, global data of TBI epidemiology is not readily available. Furthermore, neurotrauma registries from high-income countries show approximately 5.3 million people in the United States and nearly 7.7 million people in Europe are living with TBI-related disability, and every year 250,000–500,000 people sustain a spinal cord injury.⁹⁻¹¹ The expansion of the use of motorized vehicles in LMICs without concomitant improvements in road infrastructure or prehospital emergency and trauma care has resulted in higher mortality rates from less severe trauma compared with high-income countries.^{12,13} These numbers may be underestimated owing to lack of organization in collecting and keeping patient records and data. Implementing research in developing settings is the only way to establish neurologic surgery and preventive measures as a priority for funding (see *Surgery in Global Health: The “Neglected Stepchild”*).

Surgical Workforce Crisis

Countries in a workforce crisis were defined by the World Health Organization (WHO) as having <228 physicians, nurses, and midwives per 100,000 people (Figure 2).¹⁴ According to WHO, in SSA, there is approximately 1 surgeon per 2.5 million people living in rural areas (WHO guideline: 1 surgeon per 20,000 people), 1 trained anesthesiologist per 25 million people,¹⁵ and 1 neurosurgeon per 10 million people.^{15,16} A 1988 review of 40 hospitals in SSA that addressed the provision of rural care determined the average rural hospital performed 5 operations per week, of which 40% were considered emergent.¹⁷

Tanzania is a low-income SSA country that has been independent since 1964 with 53.5 million inhabitants, a gross domestic product of 44.9 billion in 2015, and a minimum governmental salary of 310,000 Tanzanian shillings per month (approximately 140 USD). It is ranked as the 25th poorest country in the world. Almost half of its population is <15 years of age, and 80% of the population lives in rural areas.^{18,19} In 2015, the mortality rate of children <5 years of age was estimated to be 48.7 per 100,000 live births. There are 8215 health facilities in Tanzania, of which 6882 are public (83.8%) and 1333 are private. Only 3.9% of the public health facilities are hospitals, and 87% are dispensaries. The fraction of the government budget allocated to health care is 10% of the total annual government budget.²⁰

As of 2006, only 3 formally trained neurosurgeons were licensed in Tanzania, all of whom practiced in the capital city Dar es Salaam, under the auspices of the Muhimbili Orthopedic Institute (MOI), and all had completed their neurosurgical training abroad. In 2016, the country had 9 licensed neurosurgeons (Medical Council of Tanganyika. <http://www.mct.go.tz>) (neurosurgeon-to-population ratio $\frac{1}{4}$ 1:6.1 million); 6 worked at MOI, 1 worked at Bugando Medical Centre (BMC) in Mwanza, and 1 was exclusively

Table 1. Challenges in Neurosurgery in Tanzania

Burden of surgical disease and workforce crisis
Global health view of surgery as “the neglected stepchild”
Need for recognizing the surgical system as an interdependent network and importance of organizational and equipment deficits
Lack of education of the community, failure of primary care systems, and net result of overwhelming of tertiary care systems
Personal and professional burnout as well as brain drain of promising human resources from LMICs in Eastern Africa and similar regions across the world
LMICs, low- and middle-income countries.

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