

International Issues: Expanding neurologic education to resource-poor countries

Lessons from Moi Teaching Hospital

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It is well-recognized that there is a disparity in health care resources and availability in low- and middle-income countries, often due to a combination of poverty, lack of clean water, inadequate nutrition, and political conflict. Yet it seems less attention is given to challenges specific to the provision of medical education in such developing nations. Besides war, famine, drought, and the AIDS epidemic, eastern African nations carry a heavy burden of neurologic disease¹ and insufficient infectious disease programs,² coupled with a paucity of subspecialty-trained providers. Over the past decade, there has been increasing concern over the so-called “brain drain”—the ongoing relocation of African doctors to more profitable parts of the world,³ presumably due to the challenges inherent to practicing in resource-limited settings. This is exemplified by the estimated 0.03 neurologists per 100,000 people in low-income African countries (compared to 1 to 10 per 100,000 in Western countries), and further by the lack of neurologists in all of sub-Saharan Africa.⁴ Similar estimates in sub-Saharan Africa suggest that there is only 1 neurosurgeon for every 4,000,000 people, with dedicated neurologic and neurosurgical services available in only a few private centers—institutions that are financially inaccessible to 90% of the population due to the nonexistence of health insurance systems.⁵

In Kenya (estimated population >30 million), there are only 6 adult and 3 pediatric neurologists, most of whom are based in the capital city of Nairobi.⁶ This leaves the overwhelming majority of neurologic care to be provided by non-neurologists. Moreover, regarding formal postgraduate medical education throughout Africa, there is little information available about the content and availability of neuroscience curriculums. The World Federation of Neurology survey found only 26 neurology residencies documented in the entire continent of Africa, all located within 4 countries. These residencies have inadequate access to the Internet and neurology literature, as well as insufficient training in neuroradiology, neurophysiology, psychiatry, rehabilitation, and neuropathology.⁷ The goal of this report is to outline specific challenges faced by neurologic education

and care in Africa by using the example of Eldoret, Kenya, at the Moi Teaching Hospital, as reflected by our personal experience.

Over the past 10 years, residents at the University of Utah have participated in an international elective in tropical and infectious neurology in several international locations, including Kenya, Ghana, and Morocco. The Kenya program is conducted in concert with AMPATH, which is a consortium of North American academic centers, partnering with Moi Teaching Hospital and the government of Kenya to decrease the burden of HIV/AIDS on individuals and communities. This elective focuses on both the provision of education to Kenyan medical trainees as well as patient care activities in the clinics and wards of Moi Teaching Hospital. Contributions are made to the development and administration of an ongoing clinical neurology curriculum for Kenyan registrars (equivalent to US postgraduate medical residents) and pre-ward medical students (MS 4 and 6) at Moi Teaching Hospital, one of only 2 medical teaching institutions in the country. Apart from the several weeks a year that University of Utah neurology staff are on site, Kenyan trainees have no formal exposure to neurologists and typically obtain the bulk of their neurologic training from independent reading and general practitioners on the teaching wards. Focused training and practice of the complete neurologic examination is nearly nonexistent, as is dedicated pediatric neurologic training.

In addition to teaching trainees, consultations are received from primary care physicians, neurosurgeons, and infectious disease satellite clinics. In Eldoret, a majority of the neurologic patients from the region are referred to one internal medicine physician, whose interest has been directed toward a neurologic specialization, and a local neurosurgeon, who often sees non-surgical neurologic cases that are beyond the expertise of local general practitioners.

At Moi Teaching Hospital, despite the absence of neurologic specialists, there is no shortage of patients with neurologic disease. Ward teams are led by the chief registrar and consist of first-year registrars, clinical officers (mid-level providers), numerous medical students, and rotating “consultants.” Consultants are the

From Mayo Clinic Arizona (M.M.C.), Scottsdale; and the University of Utah (J.J.W., D.R.R.), Salt Lake City.

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equivalent to attending physicians in the US system and tend to have backgrounds ranging from general practice to internal medicine subspecialties and even surgical fields. Consultants change daily and supervise patient care over several minutes spent at the bedside on daily rounds. Teaching on rounds varies widely, depending on the interests of the consultant, with the primary responsibility lying on the chief registrar. Additionally, the chief registrar is also responsible for the supervision of the entire ward and coordination of didactic conferences for the students and registrars.

As a public health service institution, challenges at Moi Teaching Hospital include limited resources within the hospital for appropriate diagnostic testing, bolstered by the requirement of prepayment for a majority of laboratory tests and procedures. Additionally, nursing shortages, limited medical supplies, inadequate intensive care facilities, and recent physician strikes further strain the system. CSF analysis is particularly difficult to obtain, as there is generally inadequate and unreliable reporting of CSF studies—commonly, Gram stains are processed by registrars, and cell counts and protein are rarely reported through the facility laboratory. Additionally, the difficulty of obtaining neuroimaging beyond CT not only directly affects patient care but also affects the training of physicians. When diagnostic equipment is unavailable, physicians must rely solely on clinical examination, with the inability to confirm a suspected diagnosis, which innately limits prerequisite portions of the adult learning process within medical education.⁸ Limited medical supplies include medications, with the short list of available medications punctuated by unreliable accessibility. A patient on an anticonvulsant can be stopped abruptly due to pharmacy shortages, leaving him or her at risk for further seizures, injury from those seizures, and future hospitalizations to treat such injuries. Similar shortages of anticonvulsants and antibiotics are not uncommon in the inpatient setting, and medication selection is often guided more by availability than evidence-based practice or judicial pharmacology.

Without the usual arsenal of diagnostic tests and treatment modalities, one's management style is whittled down to a bare-bones history and physical examination approach. Registrars take the most likely diagnoses into account and often administer empiric treatment in both an effort of therapeutic trial and as a means of diagnosis. While it is nearly impossible to estimate the actual prevalence of certain conditions on wards, one begins to develop a concise list of clinically evident entities: protein-energy malnutrition, cognitive impairment related to parasitosis, iron deficiency anemia, pellagra, ischemic and hemorrhagic stroke, epilepsy, advanced neuropathy, traumatic

head injuries, consequences of birth asphyxia/trauma, sequelae of polio and polio-like viral infections, and traumatic nerve injuries. The mantra on wards consists of essentially 3 questions: "What is the immune status?" "Do we have a chest x-ray?" and "Can the patient afford testing and/or treatment?"

Taken together, the regional health threats that carry neurologic sequelae combined with a host of mitigating nutritional deficits and other risks underscore the urgent need for improvement of neurologic training in countries such as Kenya. It is with this objective that we continue to work to establish a sustainable curriculum for Kenyan trainees that focuses on the neurologic examination, localization, and algorithm-based teaching materials for the most common neurologic diagnoses. The ultimate goal of this program is to transfer this curriculum to a faculty of nationals, keeping with the sustainability mission of all AMPATH programs. While efforts to address health care disparities, risk factor modification, and treatment gaps at the population level are essential and ongoing,^{9,10} the importance of neurologic education and training must not be forgotten. It is our hope that programs such as this will continue to grow and that through an international effort we can work together to educate the national physicians to combat the brain drain in Africa and similar underserved countries.

AUTHOR CONTRIBUTIONS

Melissa M. Cortez was responsible for submitting the manuscript and for all communications with the journal throughout the review process. Jana J. Wold made substantive intellectual contribution to the submitted manuscript, including content, conceptualization, and revisions. David R. Renner made substantive intellectual contribution to the submitted manuscript, including content and conceptualization.

STUDY FUNDING

No targeted funding reported.

DISCLOSURE

The authors report no disclosures relevant to the manuscript. Go to Neurology.org for full disclosures.

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Neurology 2014;82:e18-e20

DOI 10.1212/WNL.0000000000000029

This information is current as of January 20, 2014

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