Reflections on developing pediatric neurosurgery in Sub-Saharan Africa

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In 2011, the World Bank estimated the population of Sub-Saharan Africa (SSA) to be 874,841,049, with 44% of the population being 1–14 years old (http://www.tradingeconomics.com/sub-saharan-africa/population-total-wb-data.html). Millions of children in SSA have hydrocephalus, spina bifida, and other common pediatric neurosurgical conditions.

Kijabe, Kenya, is a village of approximately 5000 people located 65 km northwest of Nairobi, at an altitude of 7220 feet within the Rift Valley Escarpment. It is home to Kijabe Hospital and was founded at that site by missionaries in 1915, because its elevation was too high for malaria-bearing mosquitoes. The hospital is a 283-bed general hospital under the auspices of the Africa Inland Church. Its consultant staff consists of approximately 20 Kenyan physicians and 20 expatriate medical missionary physicians.

Dr. Dick Bransford, a career missionary general surgeon, initiated pediatric neurosurgery (PNS) in Kijabe in 1997, when he began treating children with hydrocephalus and spina bifida. The number of those children increased steadily, and in 2001, Dr. Bransford inserted 119 ventriculoperitoneal shunts and closed 61 myelomeningoceles (MMCs). In 2002, he sent an email to me with the subject “Neurosurgeon Needed,” requesting help in the management of such children. I began going to Kijabe for 2–3 weeks most Januaries thereafter to teach and to perform PNS. Our intent was to teach them how to evaluate patients, to identify therapeutic options, to read scans, to operate, to do clinical research, and to publish manuscripts—basically, how to be neurosurgeons.

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When we moved to Kijabe, my main teaching hope was to train pediatric neurosurgeons. The Medtronic Foundation provided grant support for 3 years for PNS fellowships. The first fellow was Ugandan neurosurgeon Dr. Humphrey Okechi, who had just completed his neurosurgical residency in China and who began his fellowship in November 2010. His fellowship was similar to those offered in the US, with daily rounds, evaluation of outpatients, daily operations, presentation of a paper at the International Society of Pediatric Neurosurgery meeting, and publication of manuscripts. During the year, Dr. Okechi did or assisted on some 750 cases. He was given written examinations every 4 months, based on the second edition of the textbook Principles and Practice of Pediatric Neurosurgery, and he authored or coauthored 7 manuscripts. After working with me for 2 years, he became a...
consultant on the Kijabe Hospital staff and my colleague. Accreditation for the fellowship was requested from the University of Nairobi—such certificates are highly valued in Africa—but was not received. Accreditation of the fellowship from the College of Surgeons of East, Central and South Africa (COSECSA) may be possible in the future.

It was a principle of mine to not offer the fellowship to applicants I had never met or to those whose visits to Kijabe indicated they would probably not become reasonably good pediatric neurosurgeons. The second fellowship was discontinued after a few months because it seemed that goal would not be met. The third fellowship was completed under the tutelage of Dr. Okechi in August 2015.

Research

It was possible to do both retrospective and prospective clinical research in Kijabe, particularly research into disorders such as MMCs that are far less common in developed countries. My wife, Susan, kept a prospective database on every patient, which provided information for multiple publications. The main impediment to clinical research was the difficulty in obtaining follow-up. Although mobile clinics staffed by nurses and therapists for patient follow-up were held at 15 sites across Kenya, many patients never returned to clinic and many of their cell phone numbers became nonfunctional.

In January 2013, we began a randomized clinical trial, comparing infection rates and shunt complications of Codman Bactiseal shunts and Chhabra shunts. The study was interrupted in June 2014 after 100 patients were enrolled. Although every patient was given a date to return for postoperative follow-up, 13 patients were lost to follow-up; they either came only once or never returned and their cell phone numbers were either disconnected or incorrect. It seems that such research can only be done successfully if study coordinators are hired to obtain data from home-visit follow-ups.

Equipment and Supplies

Because the mission of Kijabe Hospital is to provide good quality medical care for poor people, its budget for neurosurgical supplies and equipment was zero. If the hospital had to pay for supplies and equipment, its charges would necessarily increase to levels that poor people could not pay. Thus, nearly all our neurosurgical equipment and supplies were donated, used, from colleagues and hospitals in the US and Canada. The hallmark of used equipment is that it breaks. When breaks occurred, repairs were rarely available in Kenya and had to be done—if they were done—in the US. Our only new equipment was a Storz endoscope and monitor purchased with a grant from the Medtronic Foundation, and a Myriad tissue resector donated by the NICO Corporation. Supplies needed for previous procedures, such as Ioban, cottonoids, Dermabond, and microscope drapes, were brought every 2–3 months by short-term visiting pediatric neurosurgeons or neurosurgery residents. Kijabe Hospital, like many if not most hospitals in SSA, had no CT scanner while we were there. A single-slice scanner was donated in 2013, but it broke after 4 months and was not repaired because of cost. CT and MR scans are available in Nairobi, but at prices most patients cannot afford, approximately $75 for a CT scan and $200 for an MR image.) A CT scanner was procured within a few months after we left Kijabe.

As the work began, I sought to obtain several higher-tech instruments that are routinely used in the States, rather than the instruments that would be available to Kenyan neurosurgeons after their training—instruments such as a brace-and-bit, Gigli saw, and rongeurs. It took approximately 1.5 years to get an adequate, donated, used operating microscope, a functional used Midas Rex drill, and a new endoscope for endoscopic third ventriculostomies (ETVs). Whether such equipment will remain available and functioning in Kijabe in coming years is unknown.

Aspects of Clinical Care in Kijabe

It was helpful to have practiced PNS for many years before moving to Kenya. I used to tell residents in the States that even after doing PNS for many years, I continued to see a child once a month with a condition I had not seen before. In Kenya, that occurred more than once a week. Children presented for care late, partly because their families could not pay for transportation to the hospital, partly because they were taken first to the practitioners of traditional medicine, and partly because they were kept for days or weeks in hospitals that received daily reimbursements from the government for the hospitalization even though no neurological treatment was given.

When we arrived in Kijabe, the average daily PNS census was 15–20 patients. During our 4 years there, the daily census increased to 25–30 patients and on a few occasions, 40 patients. We did an average of 5 operations per day, 100 per month. Although Dr. Okechi and I each operated only 4 days a week, that level of operations, approximately 5000 in the first 4 years, turned out to be unsustainable, from both a personal standpoint and from a financial standpoint. Near the end of our service, we limited the census to 20 patients and developed guidelines about cases that would not be admitted or operated on because of poor prognoses.

Treatment decisions about many patients were difficult, particularly the treatment of hydranencephaly, which some readers would consider to be unethical. Treatment was offered primarily to improve the quality of life for the family, so that they did not have to take care of an infant with a 60-cm, 10-lb head that needed to be manually turned every few hours to prevent scalp necrosis, ulceration, infection, and draining pus. In my 32-year practice in the US, I encountered fewer than 20 cases of hydranencephaly. In the 4 years in Kijabe, we saw 54 cases. They were treated with ventriculoperitoneal shunts (n = 11), endoscopic choroid plexus coagulation (n = 18), choroid plexus resections (n = 15), and “comfort care” with medications (n = 10). Outcomes of the different treatments will be evaluated in the coming year, but decisions at the time were made on an individual basis that took into account factors such as parent preference about treatment, costs, and the functional status of the endoscope, monitor, and Bugbee wire.

We admitted approximately 2 children with hydrocephalus every day. The most common cause of hydro-