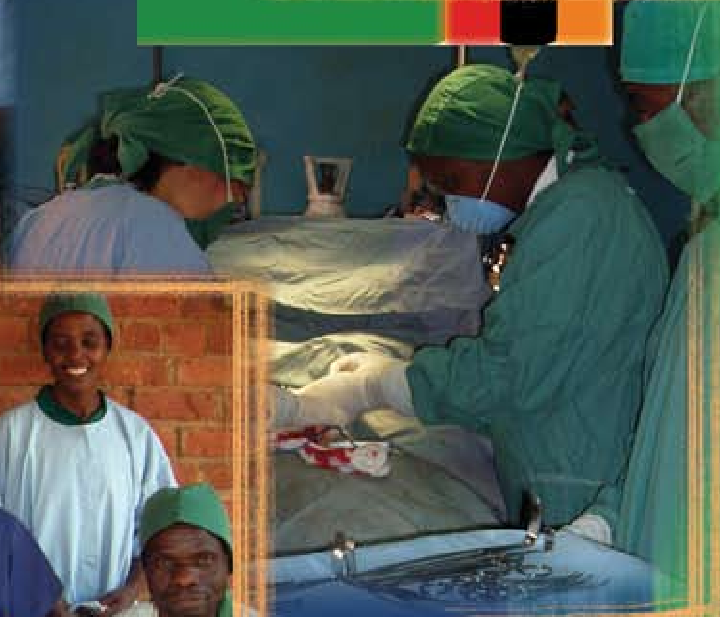
SURGERY IN RURAL ZAMBIA:



The rewards and challenges of treating patients in a resource-poor setting

by KATHRYN M. CHU, MD, MPH

The evening heat was stifling as I slept in my modest mud house enveloped in my mosquito net. I was awakened by the nightwatchman knocking at the door to summon me to the hospital. In rural Zambia, we did not have telephones; therefore, I did not know what type of surgical problem had arrived. As I followed the light of the nightwatchman's flashlight, I scanned the tall grass along the dirt path on the walk to the hospital, anxiously looking for snakes. On my arrival, I discovered a young boy who had been gored by a cow and now had an obvious evisceration. His small intestines, which were covered in dirt and leaves, were wrapped in a towel.

Macha Mission Hospital, founded in 1906.

In fall 2006, I volunteered as a general surgeon for three months at Macha Mission Hospital (MMH) in rural Zambia, a southern African country. Zambia has a population of 11 million and is landlocked, bordered by eight countries. It is one of the poorest nations in the world, with a per capita income of $360 a year. Like its neighbors, Zambia suffers from a human immunodeficiency virus epidemic, with an estimated 16.5 percent of the population infected. The average life expectancy is 33 years, the lowest of any country in the world.[1] Infrastructure is poor in Zambia, and few paved roads exist. The trip to MMH is a bumpy, dusty, six-hour adventure on poorly maintained dirt roads from the capital, Lusaka.

Macha Mission Hospital

MMH was founded in 1906 by two American female missionaries. Faith-based institutions support 50 percent of rural health care and 30 percent of health care overall.[2] MMH serves a rural population of 140,000 and has more than 200 beds (see photo, this page). The hospital is divided into four wards: male, female, obstetrics, and pediatrics. Each ward holds approximately 75 patients in one large room (see photo, page 24). Overflow patients sleep on mattresses on the floor or the veranda. There are no dividers or curtains between beds, but if a patient is dying, a moveable screen is set up around him or her to allow for some privacy.

Opposite, top left: An operating room nurse is cutting gauze to be sterilized. Right: In the operating room, cloth gowns with heavy aprons were worn in the sweltering heat. Bottom left: The operating theater staff. Dr. John Spurrier (front middle) was a long-term missionary doctor. Dr. Chu (back left) was a short-term volunteer surgeon.

Operating room conditions

The surgical burden of disease was highly varied and included trauma, urologic, abdominal, and obstetric/gynecology cases. There are three operating rooms, although only one is equipped to perform major surgery. Each morning, patients sit outside the theater on wooden benches and wait their turn. I never heard a complaint, though some patients had to return several days in a row until they received treatment. Rubber sheets were placed on the operating table to protect it from bodily fluids.

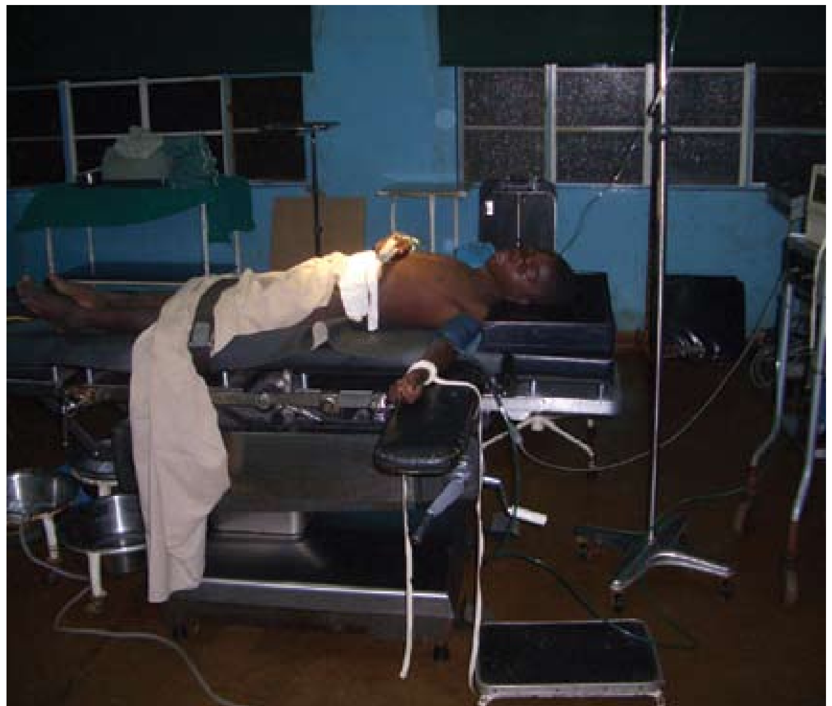
For most procedures, I administered the an-

esthesia and performed the operation. Ketamine and spinal anesthesia were most commonly used. Pulse oximetry and an automatic blood pressure cuff were available. Supplemental oxygen was used only if absolutely necessary. Normal saline intravenous fluid was prepared by our laboratory and sterilized in reusable bottles. Abdominal surgery was ideally performed under spinal anesthetic, which gave moderately good relaxation (see photo, this page). This limited the amount of time for the procedure to approximately 90 minutes.

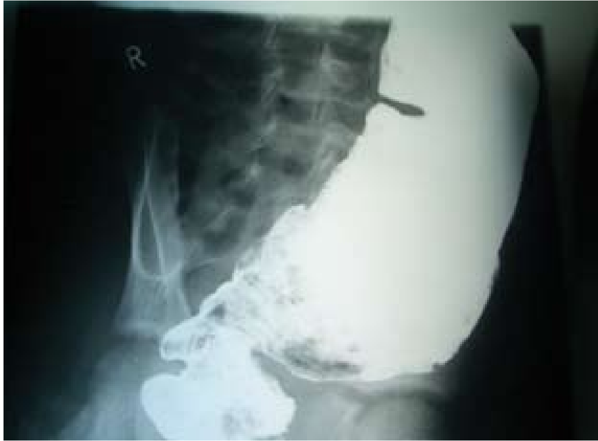
Gowns were made from heavy cloth and not waterproof, and a heavy rubber apron was worn underneath. In the midday heat, this became quite unbearable and I learned to operate quickly in order to keep from fainting. Sterile gloves were always in short supply and often only one size was available. Instruments were sterilized in an autoclave machine. Gauze was cut from large rolls and then sterilized. Hundreds of pieces were prepared daily for dressing changes on the wards. Sutures were donated from overseas and the supply was variable and limited. No surgical staplers were available. A few pieces of polypropylene mesh had been donated just before I arrived, and they were useful for inguinal herniorrhaphies.

While these donations were appreciated, much of what was sent was not useful. Cardiac pacing wires and an argon beam coagulator were among donations that could not be used. Many kindhearted indi-

The men's ward at Macha.



An operating room at Macha Mission Hospital.



Hirschprung's disease in a 12-year-old boy. This barium enema demonstrates a large dilated proximal colon and a narrowed distal rectum.

viduals from resource-rich countries had sent costly equipment such as a laparoscopy tower and a video monitor. This type of equipment could not be properly maintained and once a single part was broken, the equipment as a whole was rendered useless. Disposable equipment was helpful but limited in supply. Monetary donations were the most practical because funds could be spent on medications and supplies manufactured locally, which were cheaper and supported the local economy.

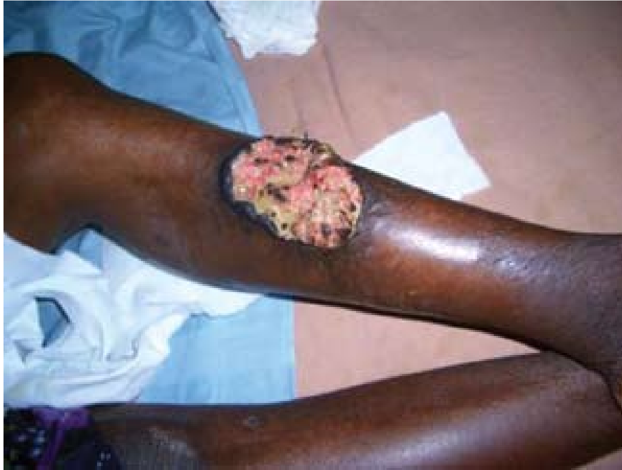
Surgical burden of disease

Falls and injuries were common. During mango season, I cared for many young boys who had fallen out of trees while picking the ripe fruit and sustained ulnar or radial fractures. Patients paid 10,000 kwacha ($3) to be admitted to the hospital. In addition, they paid for supplies such as plaster and surgical procedures. Many waited days before undergoing closed reduction because their families could not find the money to pay. Femur fractures from motor vehicle accidents were also common. In developed countries, these fractures would be treated with intramedullary rods; however, in most of Africa, the definitive treatment is traction and bed rest. After 10 weeks, if the fracture site is not tender and a palpable callus confirms bony union, the traction is removed and weight bearing slowly initiated. Neither pneumatic compression boots nor subcutaneous heparin were available for deep vein thrombosis prophylaxis.

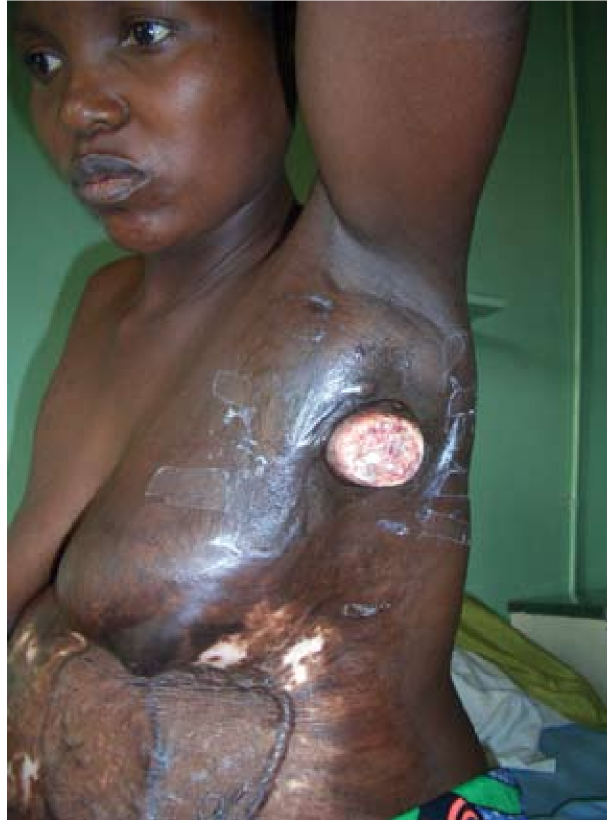
I diagnosed a 12-year-old boy, small for his age, with Hirschprung's disease after he was brought in for intermittent abdominal distention and obstipation since birth. On abdominal X ray, his colon was dilated with paucity of air in the rectum. Like most rural African hospitals, MMH only had a radiology technician. Together, we performed the first (and probably the last) barium enema at MMH and confirmed a short segment of narrowed distal rectum and a dilated proximal colon (see photo, this page). A full thickness rectal biopsy demonstrated aganglionosis. In the U.S., this boy would have had a pull-through procedure. In rural Zambia, however, the options were limited. We were not equipped to perform a definitive operation at MMH. A diverting colostomy was impractical to care for in his village, nearly a day's walk from any clinic. In my last few weeks, I learned that a pediatric surgeon was visiting from China and paid for the boy and his father to fly on a missionary plane to the University Teaching Hospital in Lusaka to receive care.

Burns were a common surgical problem. For several weeks I cared for an 18-year-old woman who had sustained burns over greater than 50 percent body surface area after being set afire by the first wife of her husband. (Polygamy, as well as extramarital relations, especially by men, are common in this part of Zambia.) Her infant daughter was also burned to death. We debrided and dressed the woman's wounds in the operating room daily. I found a central line kit in the donation bin and placed a subclavian line for intravenous access and fluid resuscitation. In the U.S., this patient would have been intubated and placed on a narcotic drip for pain relief. We could do neither, however, and her constant crying in the ward was difficult for all. The patient succumbed to bacterial superinfection and dehydration within a few weeks.

Another complication arising in previously burned skin is the Marjolin's ulcer, a type of squamous cell carcinoma. Women kneel over open fires to cook and suffer chronic burns in the pretibial area, which can develop into



Squamous cell carcinoma of the pre-tibeal area.

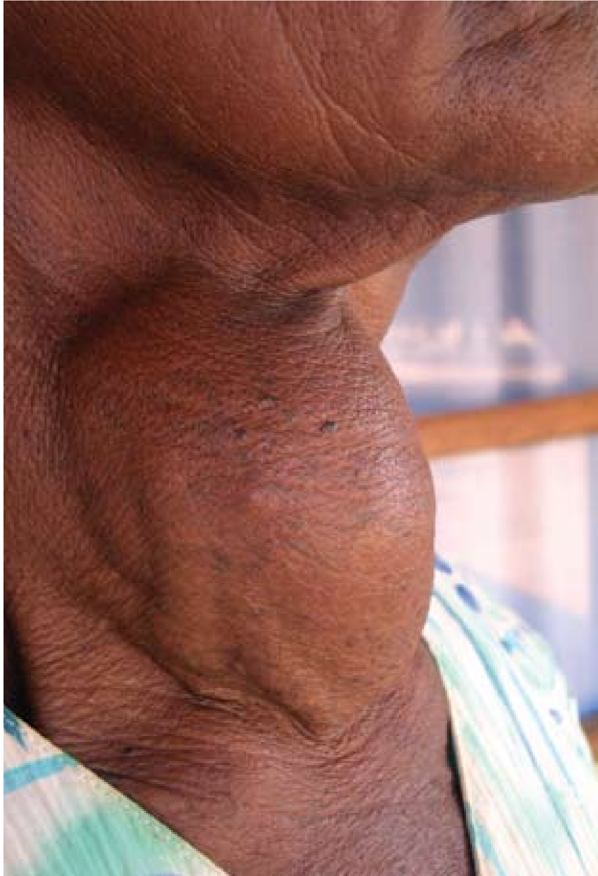


Squamous cell carcinoma that had developed in a previously burned section of this woman's chest wall. The cancer was now metastatic to her lymph nodes.

squamous cell carcinoma (see photo, this page). One patient developed a Marjolin's ulcer on a previous forearm burn. She underwent an arm amputation but was readmitted a few months later with recurrent tumor fungating from the amputation stump. Another woman developed a chest wall squamous cell carcinoma that was widely excised but then metastasized to her axillary lymph nodes. The nodes had grown so large she was unable to lower her arm beyond 90° (see photo, this page). I performed a metastasectomy but her tumor grew back within months. In the end, we were unable to provide any more treatment for either of these women except to palliate their pain. Chemotherapy was available at one hospital in the entire country and these women could not afford the journey, let alone the treatment.

I also cared for a young woman with a rectovaginal fistula. One year earlier, after a prolonged labor, her infant died during delivery. Shortly afterward, the woman began to pass stool through her vagina. This condition was socially devastating, as she could not keep herself clean. Her husband left her; her family forced her to stay in a separate room because of the smell. Obstetric fistulas are almost exclusively a problem of the developing world. They can develop from the bladder or rectum to the vagina. Obstetric fistulas are a result of inadequate obstetrical care and tend to occur in poor, rural women who are young primigravidas. After her repair, she returned to her village; however, I do not know if she was able to return to her husband or family. The success of social reintegration of former fistula patients is essentially unknown.

Endemic thyroid goiters were common (see photo, page 27). Many of these goiters were very large and cosmetically disfiguring. Given the lack of airway control in the operating room, I was reluctant to perform a lobectomy unless the goiter was causing airway symptoms. Also, if both lobes were enlarged, I did not perform a total thyroidectomy. Because thyroid function tests could not be performed at MMH and thyroid hormone replacement was not readily available, I did not



Woman with a large thyroid goiter.

want to leave patients profoundly hypothyroid.

Zambia has been identified by the World Health Organization as having a critical shortage of health care professionals.[3,4] Volunteers fulfill a valuable purpose by giving temporary relief to those who serve long term. However, we volunteers are not a good solution for the long term. Recruiting more physicians who are Zambian nationals to the rural areas is a challenge. Many emigrate to Europe and North America for further training, improved salaries, and a better standard of living. A rural retention scheme—which offers increased salary, improved housing, and a car—has been implemented to encourage new medical graduates to practice for at least three years in rural Zambia.[3]

Challenges in resource-limited settings

MMH is staffed by only three physicians: two young Zambian doctors and a U.S. missionary physician. Each of these doctors tends to medical, pediatric, obstetric, and surgical patients in the clinics and on the wards. They perform all emergency surgery as needed; and before and after my stay, complicated elective surgical problems were referred to another district hospital that was difficult to access because of poor roads and infrequent transport. The nursing staff is extremely skilled and many have excellent clinical judgment. However, the patient-to-nurse ratio, especially at night, could be 50 to one. Family members often sleep underneath patients' beds in order to care for them. They assist with feeding, bathing, and dressing changes. They also are essential in alerting the nursing staff to any acute change in status of their family member or any of the patients near them.

Infrastructure is poor and medications frequently out of stock. For example, one morning, two babies had been born prematurely. One was cyanotic and gasping; the other was very cold and lethargic. The ward had an oxygen tank and an incubator. Unfortunately, both babies required electricity, which had been cut that day for power line repairs. MMH had a generator, but it was broken. When I returned for evening rounds, both babies were dead. One mother sobbed silently as she rocked the dead infant. Although death is more common in this part of the world, the event reminded me that all people suffer from the loss of a loved one, regardless of how common its occurrence.

Health care in Zambia is directly limited by the patient's ability to pay. There is no national health care system and private insurance is essentially nonexistent. Patients are not turned away for emergencies; however, they do not receive other services if they do not have money to pay. Many are also limited by lack of transport to a health care facility. Many people do not even have access to a hospital such as MMH and have to rely on a local clinic staffed only by a clinical officer with one to two years of training beyond secondary school or be treated by a local medicine man. MMH is one of the larger well-equipped hospitals; however, it still only provided basic surgical and medical services.

Mothers waiting with their children outside a local clinic.

Specialty surgical care, pathology, and diagnostic radiology beyond X ray and ultrasound are only available in Lusaka and therefore not accessible to most of the population.

Working at MMH as a general surgeon was a humbling experience. My skills as a surgeon were limited by available resources. In the U.S., I might be able to perform complex abdominal surgery, but only with a qualified anesthesiologist; excellent nursing staff; and the latest assortment of sutures, staplers, and bipolar and monopolar devices. I am also accustomed to calling on the expertise of surgical subspecialists, such as plastic surgeons, orthopaedic surgeons, gynecologists, and urologists. In Zambia, I had to rely on my own training and knowledge.

Like so many other countries in sub-Saharan Africa, access to health care in Zambia is limited by a lack of human resources, infrastructure, and finances. The training of more health care professionals is imperative. Currently, a cadre of Zambian clinical officers is participating in a three-year surgical residency training program to learn to perform basic surgical procedures. Long-term investments are likely to be most beneficial. Missionary doctors from resource-rich countries provide an invaluable service and give up lucrative lives in their home countries. However, most volunteers are not able to give such a lengthy commitment. Short-term volunteers should work through international or academic institutions to provide training and teaching, which will have a more sustainable impact on the health care system of resource-poor countries. Ω

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