

# CHAPTER 128

## PAEDIATRIC SURGERY EDUCATION IN SUB-SAHARAN AFRICA

Maurice Mars

A major problem with paediatric surgery care in developing countries is that there is a general lack of knowledge regarding the care of children with surgical disease.<sup>1</sup>

Paediatric surgery is part of the far greater problems facing health care and delivery in sub-Saharan Africa. The World Health Organization (WHO) World Health Report of 2006 summarises these:

The WHO Region of the Americas with 10% of the global burden of disease, has 37% of the world's health workers spending more than 50% of the world's health financing, whereas the African Region has 24% of the burden but only 3% of health workers commanding less than 1% of world health expenditure. The exodus of skilled professionals in the midst of so much unmet health need places Africa at the epicentre of the global health workforce crisis.<sup>2</sup>

Despite the ravages of tuberculosis (TB), malaria, and human immunodeficiency virus (HIV), the population of Africa is forecast to increase from 967 million people in 2008 to 1,998 billion people in 2050.<sup>3</sup> That means more than 1 billion children will be born in Africa over the next 42 years. This will place an additional strain on the continent's already overburdened and underresourced health services. With an estimated cumulative risk of 85% for all surgical conditions by age 15 years, the demand for surgical care of children will continue to increase.<sup>4</sup>

Who will provide this care? Currently, 44% (426 million people) of sub-Saharan Africa's population are 14 years of age or younger.<sup>3</sup> In 2002, only 39 paediatric surgeons were reported to be in sub-Saharan Africa. That number is probably now nearer 100, with the majority in Nigeria and South Africa. This gives a rough ratio of about 1 paediatric surgeon to 5 million children. Few African children will directly benefit from the services of a paediatric surgeon unless a large number of paediatric surgeons are trained. There is the unfortunate paradox: the developed world, with an aging population and falling birthrate, having a relative oversupply and overproduction of paediatric surgeons, and sub-Saharan Africa, with its fast-growing young population, not being able to service its paediatric surgical needs.<sup>5</sup>

The need for subspecialty training in paediatric surgery in Africa has been questioned. There is a strong argument for the general surgeon

to return to being a true "general" surgeon with additional training in paediatric surgery. In the overall context of Africa, this additional training should also include neuro-, plastic, and obstetric surgery. This approach makes the assumption that there are or will be enough general surgeons, but there are not (Table 128.1).

Most sub-Saharan African countries have less than one surgeon per 100,000 people; in contrast, the United States has 5.7 general surgeons per 100,000 people.<sup>6</sup> It is estimated that the availability of surgical services in sub-Saharan Africa is "at least ten times below the minimal needs".<sup>7</sup> Just as for paediatric surgeons, production of general surgeons in sub-Saharan Africa is not keeping pace with demand and migration, nor is the production of doctors.<sup>8,9</sup>

The shortage of doctors in sub-Saharan Africa is acute. WHO suggests that at least 20 doctors per 100,000 people are required to provide minimum basic health services.<sup>2</sup> Thirty-five sub-Saharan African countries fail to meet this criterion, and 28 countries have 10 or fewer doctors per 100,000 people.<sup>10</sup> For comparison, the number of doctors per 100,000 people in other countries is: Germany, 350; USA, 270; England, 210; Brazil, 170; and Australia, 100. The African shortage is largely due to undersupply and migration to the developed world.<sup>2</sup>

One solution is to produce more doctors. It is often forgotten that when there is a shortage of doctors, there is also a shortage of doctors to train doctors. Africa has 121 medical schools, a ratio of 1 per 7.6 million people, compared to the developed world norm of 1 per 2 million people. Of the 121 African medical schools, 87 are in sub-Saharan Africa, and four countries do not have a medical school.<sup>11</sup> Although there is a trend for medical schools to increase their output, they are not meeting needs. Producing more doctors, however, is not always a solution; Kenya has trained more doctors than it can afford to hire in the public sector.<sup>7</sup> The need to return to practical surgical training at African medical schools has been suggested, with students being expected to "have performed numbers of simple, frequently required operations".<sup>12</sup>

Even were the human resource deficiencies to be corrected, the problem of under-resourced facilities remains. Fifty-three percent of people in sub-Saharan African countries live on less than US\$1 per day.<sup>10</sup> Poverty is extreme. The gross national income of these countries is low, and governments budget a smaller percentage of an already

Table 128.1: Total number of general surgeons, number of general surgeons and doctors per 100,000 population, and the percentage of doctors who are surgeons, for some sub-Saharan African countries.

Country	Number of surgeons	Number of surgeons per 100,000 population	Number of doctors per 100,000 population	Percentage of doctors who are surgeons
Kenya	230	0.7	13.2	5.3
Malawi	9	0.1	1.1	9.1
Mozambique	35	0.2	2.4	8.3
South Africa	954	2.1	69.2	3.0
Tanzania	105	0.3	2.2	13.6
Uganda	63	0.4	4.7	8.5
Zambia	50	0.5	6.9	7.2

small national budget on health, compared to developing countries. The cost of providing minimum health care in Africa is estimated at about US\$34 per capita per annum. Nevertheless, 29 countries spend less than US\$20 per capita per annum, with an average expenditure for all of Africa of US\$34 and a median of US\$14.<sup>10</sup> As a result, district hospitals and rural clinics are poorly equipped, and staff are poorly remunerated. To add to the problem, power supply in many countries, and more particularly in the rural areas, is sporadic.

Despite all these obstacles, surgery continues in the rural and district hospitals in the absence of surgeons and paediatric surgeons. Although not specific to paediatric surgery, a recent study from Uganda reported 1,505 general surgical operations were performed in a year in four public general or district hospitals at which there were no general surgeons or anaesthetists.<sup>9</sup> A similar report from a rural hospital in Nigeria indicates that 95% of the surgical procedures were considered simple enough to be performed by general practitioners with general surgery experience. There are no data on the percentage of these patients who were children.<sup>12</sup> Loeffler, citing personal experience, noted that about half of the patients he had operated on in peripheral hospitals around Africa were children.<sup>12</sup> Even with surgery being performed by medical officers and general practitioners, the demand for surgery is not being met. In rural areas of developing countries, only an estimated one-third of injured patients are seen at a health facility.<sup>7</sup>

The problem of the shortage of human resources is not new, and the comments of Wasunna, made in 1987, are still relevant:

There is a shortage of surgical manpower all over Africa. ... Current training and recruitment programmes are inadequate in correcting existing manpower deficiencies. The situation is further aggravated by a gross maldistribution of available manpower in favour of large urban centres. In many parts of rural Africa, minor surgical procedures are carried out by suitably trained, non-physician health workers, but facilities and resources for surgery outside urban centres are generally inadequate.<sup>13</sup>

Some countries—notably, Mozambique, Tanzania, and Malawi—have successfully trained nonphysicians in surgery, and these individuals perform up to 90% of the surgery undertaken outside the major cities. The standard and duration of training differs among countries. In Mozambique, the nonphysician surgeons (*tecnicos de cirurgia*) undergo a three-year training programme leading to a bachelor's degree, followed by two years of supervised work in a major teaching institution.

Other countries reject this approach. Although Kenya does not train nonphysician surgeons, it relies heavily on nurse anaesthetists and registered clinical officer anaesthetists.

## Issues Facing Paediatric Surgery Education and Training

- What is the role of the paediatric surgeon in sub-Saharan Africa?
- Which health care workers should be trained of those who make up the surgical team: surgeons, anaesthetists, nurses, laboratory technicians, and radiographers, among others?
- What should be the scope of their training in and practice of paediatric surgery?
- Where should they be trained, and by whom?

### The Role of the Paediatric Surgeon

A paediatric surgeon has been defined as a surgeon “whose practice is largely or wholly concerned with the diagnosis and management of the diseases and disorders of childhood and who has received special training in the management of these diseases and disorders”.<sup>5</sup> The role of the paediatric surgeon in Africa is to set the standards for the surgical

care of children, to teach, and to undertake research. Teaching should include training general surgeons and other health care workers in aspects of paediatric surgery and perioperative care.<sup>5</sup> Setting standards of care should also include (1) developing protocols for the management of uncomplicated cases; (2) setting criteria for referral; and (3) determining which procedures are appropriate at different levels of health care and which should be performed by the different cadres of practitioner.

### Who Should Be Trained

For the foreseeable future in sub-Saharan Africa, there will be a need to train different levels of doctors and health care workers. Despite the misgivings of some that subspecialisation has been detrimental to surgery in Africa,<sup>14</sup> there is a need to train paediatric surgeons. Without them, who will train the general surgeons, manage those conditions that would not normally be handled by a general surgeon, and maintain and improve the standards of surgical care of children? General practitioners and medical officers wishing to perform routine low-risk surgery should also be required to undergo further training and initial practice under supervision.

The nonphysician surgeon is anathema to many medical practitioners and especially to surgeons. In well-regulated and controlled environments, nonphysician surgeons appear to play important roles in the provision of surgical services, which should include basic procedures on children. Less contentious is the training of nurse or clinical assistant anaesthetists.

The surgical management of a child depends on a large team, all of whom require training. These include the midwife or birth attendant; the clinic- and district-level primary care team of doctors and nurses who diagnose, treat, or refer paediatric surgical conditions; those responsible for neonatal and infant transportation; and those responsible for anaesthetic and perioperative care.

A major role player who is often ignored is the traditional healer. There is a need to engage with, and raise awareness of, traditional healers with regard to paediatric surgical conditions. They are the primary practitioners of many patients. Some medical schools are beginning to acknowledge the role of these health providers, which is heartening.<sup>5</sup>

Training in paediatric surgery should not occur in isolation. Training to ensure adequate provision of ancillary services, such as radiography and basic laboratory services, needs to be addressed, if necessary.

### Scope of Training and Practice

Ideally, training in any developing country should be relevant to the disease patterns specific to the region and should take into account late presentation, advanced pathology, available services, infrastructure, and resources such as the availability of medicines, while keeping abreast of the management of conditions not commonly seen. It is not generally useful to send trainees from Africa to the developed world for surgical training because they will meet a different patient and disease profile, different resource base, and different organisational structure. Furthermore, attempts to duplicate services provided in the developed world have led to the impression that the surgical care of children is too expensive to be supported.<sup>1</sup>

Few data are available about the burden of disease attributable to the surgical conditions seen in sub-Saharan Africa and the spectrum of paediatric surgical pathology seen in different regions. Reports of surgery on children in the rural setting include activities that might not necessarily be performed by a paediatric surgeon in the developed world, such as minor wound toilet and suture, incision and drainage of minor soft tissue infections, treatment of osteomyelitis, and sequestrectomy.

Bickler et al. identified the need to define an “essential package of paediatric surgical services for developing countries”.<sup>1</sup> From available data, this would include management of trauma, surgical infections, congenital abnormalities, malignancy, circumcision, and inguinal hernias. Training should be relevant to the level of the trainee and the environment in which the trainee will practice.

### Where and by Whom Surgeons Should Be Trained

This topic may seem to be irrelevant to those in the developed world. As has been stated, there is not only a shortage of doctors in Africa, there is a shortage of doctors to train doctors. In an address to the Association of Surgeons of East Africa in 1999, Loeffler noted that the most successful surgeons are in major cities and that not enough use has been made of their skills in surgical training. He contended that the best hospitals, including mission hospitals, are not used for training; he said, “environments of the teaching hospitals are not conducive to learning of high standards”, and called for the reintroduction of practical surgery in the undergraduate medical curriculum.<sup>12</sup>

The growing requirement of medical schools in sub-Saharan Africa that clinical faculty must have a PhD or equivalent degree is a barrier to the appointment of skilled surgeons who do not have a research background; this restrictive requirement should be reconsidered. Another obstacle at some teaching hospitals is lack of equipment. Training should take place at a site where there is adequate supervision and the spectrum of clinical practice is appropriate. Training at medical schools may be supplemented with training by surgeons in private practice and take place in private or nongovernmental hospitals, where facilities and equipment often are better, and completed with training in district and regional hospitals with experienced staff.

In some countries, training and examination for accreditation of surgeons and paediatric surgeons has been controlled by medical schools through master of medicine in surgery programmes; in others, it has been controlled by colleges. The West African College of Surgeons serves five Anglophone countries in West Africa and offers a fellowship in general surgery. The College of Surgeons of East, Central and Southern Africa (COSECSA) offers fellowships in general surgery and orthopaedics for 10 member countries. The Colleges of Medicine of South Africa, through its various colleges, offer fellowships in general, paediatric, cardiothoracic, neuro-, orthopaedic, and plastic surgery as well as in ophthalmology and urology. All colleges identify suitable training institutes, determine curricula, and examine candidates for registration as specialist surgeons.

### Educational Initiatives in Sub-Saharan Africa Based on Information and Communication Technologies

Surgery in Africa is an initiative of the Office of International Surgery at the University of Toronto and COSECSA. Surgery in Africa offers an online, journal-based course for candidates preparing for the fellowship examination, with monthly review articles relevant to the African setting, and Fellow of the College of Surgeons (FCS) degree syllabus and full text, book, and journal references.<sup>15</sup> The Ptolemy Project, a partnership of the University of Toronto, the Association of Surgeons of East

Africa, COSECSA, and the Canadian Institutes of Health Research, aims to foster both research and research capacity development in East and Central Africa through access to and dissemination of information over the Internet.<sup>16</sup>

Since 2000, the RAFT (Resau en Afrique Francophone pour la Telemedicine) Project, based at the Hopitaux Universitaires de Geneva, has been offering two-hour-long weekly education programme using V-Sat satellite technology. The project involves interactive webcasting at low bandwidth to 18 sites in Francophone West Africa.<sup>17</sup> In Kenya, the African Medical and Research Foundation (AMREF) has commenced a large project to improve the skills of up to 22,000 nurses, some of whom are receiving their education as e-learning from compact disc (CD)-based material.<sup>18</sup> The National School of Public Health in Rwanda offers modules in an asynchronous format using Adobe® Presenter.

The University of KwaZulu-Natal in South Africa has been providing videoconferenced seminars in a range of specialties since 2001. In paediatric surgery, the weekly seminar, which is part of the academic training programme at the University of KwaZulu-Natal, started in the second semester of 2005 and has been shared with up to three other sites by interactive videoconference by using Integrated Services Digital Networks (ISDN) links. Only three paediatric surgeons and on average 10 trainees and medical students are present in the teaching hospital at each teaching session. Videoconferencing extends the sessions to three other sites: a satellite teaching hospital, a medical school in another province, and a regional hospital in another province.<sup>19</sup> Over the first four and a half years of the programme, 217 sessions have been held, with an average of 76 people participating in each session, 63 of whom are at distant sites. Surgeons from several other African countries have requested to be included in the videoconference programme. In the absence of videoconferencing infrastructure at other medical schools in Africa, the videoconferenced seminars in Durban have been recorded to digital video disc (DVD) and mailed to four medical schools in Central and East Africa. They have been incorporated into the postgraduate training programmes of surgeons and paediatric surgeons and also used in undergraduate medical training. An additional 140 people have access to the seminars through this programme.

### Key Summary Points

1. Africa's population will increase by more than 1 billion by 2050.
2. The existing shortage of health care professionals in Africa will not be redressed in the near future.
3. A need exists to develop an essential package of paediatric surgical service for developing countries.
4. The role of paediatric surgeons in sub-Saharan Africa needs to be defined.
5. The majority of surgical procedures on children in sub-Saharan Africa are performed by general surgeons and medical officers. These providers require further training by paediatric surgeons in paediatric surgery and the perioperative needs of children.
6. Paediatric surgery cannot take place without anaesthetic and other basic laboratory services, and the training needs of these ancillary services must be considered concurrently with training in paediatric surgery.
7. The place of the “nonphysician surgeon” needs to be considered.
8. Information and communication technologies offer promise for decentralized and shared education programmes in the future.

## References

1. Bickler SW, Kyambi J, Rode H. Pediatric surgery in sub-Saharan Africa. *Pediatr Surg Int* 2001; 17(5-6):442-447.
2. World Health Report 2006. Available at: <http://www.who.int/whr/2006/en/> (accessed 23 November 2010).
3. 2008 Africa population data sheet. Population Reference Bureau and African Population & Health Research Center. Available at: <http://www.prb.org/pdf08/africadatasheet2008.pdf> (accessed 23 November 2010).
4. Bickler SW, Rode H. Surgical services in developing countries. *Bull World Health Organ* 2002; 80(10):829-835.
5. Hadley GP. The paediatric surgeon in Africa: luxury or necessity? *East Cent Afr J Surg* 2004; 9(2):103-109.
6. Lyng DC, Larson EH, Thompson MJ, Rosenblatt RA, Hart LG. A longitudinal analysis of the general surgery workforce in the United States, 1981-2005. *Arch Surg* 2008; 143(4):345-350.
7. Bellagio Essential Surgery Group. Increasing access to surgical services in resource-constrained settings in sub-Saharan Africa. 2007; 1-13. Available at: [http://www.google.co.za/#hl=en&source=hp&biw=926&bih=831&q=Increasing+Access+to+surgical+services+in+resource&btnG=Google+Search&aq=f&aqj=&aqi=&oq=Increasing+Access+to+surgical+services+in+resource&gs\\_rfai=&fp=dbc0fb07035912d4](http://www.google.co.za/#hl=en&source=hp&biw=926&bih=831&q=Increasing+Access+to+surgical+services+in+resource&btnG=Google+Search&aq=f&aqj=&aqi=&oq=Increasing+Access+to+surgical+services+in+resource&gs_rfai=&fp=dbc0fb07035912d4) (accessed 23 November 2010).
8. Mahande M, Tharaney M, Kirumbi E, Ngirawamungu E, Geneau R, Tapert L, Courtright P. Uptake of trichiasis surgical services in Tanzania through two village-based approaches. *Br J Ophthalmol* 2007; 91(2):139-142.
9. Ozgediz D, Galukande M, Mabweijano J, Kijjambu S, Mijumbi C, Dubowitz G, Kaggwa S, Luboga S. The neglect of the global surgical workforce: experience and evidence from Uganda. *World J Surg* 2008; 32(6):1208-1215.
10. World Health Organization. World Health Statistics 2010. WHO Press, 2010.
11. Institute for International Medical Education, Database of Medical Schools. Available at: <http://www.iime.org/database/africa/index.htm> (accessed 23 November 2010).
12. Loeffler I. The future of surgery in East Africa. Association of Surgeons of East Africa. Available at: [http://www.asea.org.mz/Future\\_Surgery\\_East\\_Africa.htm](http://www.asea.org.mz/Future_Surgery_East_Africa.htm) (accessed 8 November 2008).
13. Wasunna AE. Surgical manpower in Africa. *Bull Am Coll Surg* 1987; 72(6):18-19.
14. Loeffler IJ. The drawbacks of overspecialisation. *J R Coll Surg Edinb* 1999; 44(1):11-12.
15. Office of International Surgery, University of Toronto. Surgery in Africa. Available at: <http://www.utoronto.ca/ois/SIA.htm> (accessed 23 November 2010).
16. Office of International Surgery, University of Toronto. The Ptolemy Project. Available at: <http://www.ptolemy.ca/> (accessed 23 November 2010).
17. Geissbuhler A, Bagayoko C, Ly O. The RAFT network: 5 years of distance continuing medical education and tele-consultations over the Internet in French-speaking Africa. *Intl J Med Informatics* 2007; 76(5-6):351-356.
18. Train health workers. African Medical Research Foundation. Available at: <http://www.amref.org/what-we-do/train-health-workers/> (accessed 23 November 2010).
19. Hadley GP, Mars M. Postgraduate medical education in paediatric surgery: videoconferencing—a possible solution for Africa? *Pediatr Surg Int* 2008; 24(2):223-226.