

# Surgery in Developing Countries

## Essential Training in Residency

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**Hypothesis:** A surgical elective in a developing country setting is an essential new component of academic residency training.

**Design:** A survey of residents and faculty within the Department of Surgery at the University of California, San Francisco, and a collaborative program piloted between the Department of Surgery at the University of California, San Francisco, and Makerere University in Kampala, Uganda, including a 6-week clinical elective.

**Setting:** Mulago and Nsambya hospitals in Kampala, Uganda.

**Participants:** Two residents and 3 faculty advisors at the University of California, San Francisco.

**Intervention:** Development of a 6-week pilot clinical surgical elective.

**Main Outcome Measures:** Assessment of the level of interest in international health in an academic surgery program; pathology and case variety, diagnostic methods, and surgical and anesthetic resources and techniques in a pilot developing country.

**Results:** Forty percent of residents enter residency with prior international health experience whereas 90% ex-

press interest in a developing country elective. Twenty-five percent of faculty participate in voluntary international surgical service and research projects. As a result of the survey and the level of interest in our program, 2 visits to Uganda were made and a residency elective rotation was successfully created. This resulted in exposure of residents to the educational benefits of learning in a resource-constrained setting; a broader scope of surgical conditions and pathology, greater reliance on history-taking and physical examination skills in a low-technology environment, and sociocultural aspects of care provision. Greater questions about global health equity, access to information, and the role of surgery in public health are raised along with potential challenges in international collaboration.

**Conclusions:** A developing country surgical experience complements the academic mission of service, training, and research and should be an essential component of surgical training programs. There is interest among residents and faculty in such a program as well as a need for greater commitment to north-south collaborations among academic surgical institutions and societies, as has been successfully implemented abroad. More generally, surgery is an integral part of public health and health systems development worldwide.

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**O**UR WORLD TODAY IS BECOMING increasingly interconnected at an astonishing pace. Globalization is intensifying our interaction across physical, intellectual, and temporal dimensions. Specifically, the economic aspects of globalization with trade liberalization and the rise of the private sector have resulted in unprecedented flows of goods and services across borders. Technological innovation has accelerated biomedical research and revolutionized access to information. In the health sector, advances in the last half century have increased life expectancy and decreased infant

mortality rates in even the poorest of countries. In the context of a rapidly integrating world, international programs have also become an essential part of undergraduate and graduate medical education in the United States.

Many institutions in the United States have well-established international programs in nonsurgical graduate disciplines (eg, internal medicine, pediatrics, family practice). These programs have had broad effects for residents in areas of training, medical practice, and career choices. Participants cite marked improvements in physical examination skills and development of more cost-conscious medical care

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on return to their home institutions.<sup>1</sup> Graduates of international health electives are more likely to pursue careers in academic medicine and public health, have enhanced proficiency in cross-cultural health care, and possess an increased commitment to caring for underserved populations.<sup>1,2</sup> The availability of an international experience also influences medical student selection of residency programs.<sup>2</sup>

### SURGICAL EDUCATION AND DEVELOPING COUNTRIES

While very few US surgical training programs offer established electives in developing countries for their own trainees, many programs in the United Kingdom and New Zealand have done this successfully.<sup>3,4</sup> Other national surgical associations<sup>5,6</sup> and academic institutions have assisted in the training of surgeons in developing countries or have established other international programs: for example, the University of Toronto, Toronto, Ontario, has established an Office for International Surgery; McMaster University, Hamilton, Ontario, has clinical programs for overseas trainees; the Royal College of Surgeons of England, London, has an Overseas Doctors' Training Scheme that provides clinical training and research opportunities for surgical trainees from developing countries; and the Royal College of Surgeons of Edinburgh, Edinburgh, Scotland, has partnered with the College of Surgeons of East, Central, and Southern Africa, Arusha, and Tanzania in establishing qualifying examinations for trainees. Program evaluations have emphasized that collaborations must be tailored to the needs of developing countries to be most effective and especially to avoid the specialist "brain drain" that has further exacerbated human resource constraints in the developing world.<sup>7</sup>

There are very few academic surgical programs in the United States with structured voluntary experiences for their trainees in developing countries. This is likely owing to a range of reasons, including the breadth of training required in the United States, the opportunity cost and logistical challenges of sending trainees abroad, and a perceived difficulty in verifying the educational value of such programs. These concerns exist despite unique opportunities for surgical education in settings with limited resources.<sup>8-11</sup>

In resource-constrained settings, treatment decisions must be firmly based on history and physical examination, a vanishing art in an era of high-technology medicine. While the ethos of *Cope's Early Diagnosis of the Acute Abdomen* is preached to medical students in the United States, in reality, results of an abdominal computed tomography scan are provided in surgical consultation before the surgeon has ever laid hands on the patient. In the United States, this is only exacerbated by the defensive medicine practiced in an increasingly litigious health care climate. Moreover, treatment strategies in developing countries must be adapted to available resources. There is a need for economy and creativity in the use of supplies, in contrast to the extensive medical waste in our institutions. While algorithms change, critical analytic thinking is fostered.

In the United States, residents encounter a spectrum of surgical disease common to industrialized countries that have undergone the "epidemiological transition" from communicable diseases and early childhood mortality to more chronic conditions such as diabetes mellitus, hypertension, and lung disease. Much of the surgical training is in surgical oncology, vascular surgery, transplant surgery, and bariatric surgery—the fastest growing surgical subspecialty in America. In developing countries, many surgical conditions are due to tropical infectious diseases never seen in the United States that provide unique challenges in diagnosis and treatment. Furthermore, developing countries offer exposure to more traditional general surgery, a seemingly evaporating discipline in the American academic surgical environment with its emphasis on subspecialization.<sup>12</sup>

The sociocultural context of health care in developing countries also provides valuable lessons in the art of patient care, our collective humanity, and teamwork with local health professionals in facing concepts of health, healing, and life priorities very different from our own.

Finally, stark resource constraints in developing countries pose compelling and seemingly insurmountable challenges to health. In the relatively insulated world of academic general surgery, it can be easy to forget that more than half of the world's population lives in extreme poverty on less than \$2 per day and that governments in some regions, such as sub-Saharan Africa, support their health sector with an average of \$5 per capita per year.<sup>13</sup> A basic minimum package of health services to developing countries, on the other hand, has been costed by the World Health Organization at \$34 per capita per year.<sup>13</sup>

### GLOBAL HEALTH AT THE UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

Several residency programs at the University of California, San Francisco (UCSF) have international voluntary opportunities for residents. For the past 5 years, senior orthopedic surgery residents have had an option to work at Bedford Orthopedic Center, an orthopedic hospital in Umtata, South Africa.<sup>14</sup> Residents spend a month providing services to the local population, and in partnership with the nonprofit organization Health Volunteers Overseas, Washington, DC, these residents help train local health care providers. In an early review, 13 of 17 residents participated, and many of these residents have continued international volunteer work after residency.

In response to strong resident interest, the UCSF Department of Medicine has also developed an elective based at Makerere University in Kampala, Uganda, building on preexisting university collaboration. Senior residents complete a month-long clinical elective involving primarily outreach medical care for patients infected with human immunodeficiency virus. As with the orthopedic program, residents frequently cite this as one of the best learning experiences in their residency.

The University of California, San Francisco, has created an Office for International Programs directed to the needs of medical students, an Institute of Global Health partnered with the University of California, Berkeley, School of Public Health, and a nascent Global Health

Sciences program led by Professor Emeritus of Surgery, Dr Haile Debas.

## METHODS

To assess the experience and level of interest in international programs in the surgery department at UCSF, surveys were conducted among residents and faculty. Given the positive response to these surveys and the preexisting UCSF partnership with Makerere University in Kampala, a proposal was developed in discussion with the surgery department at Makerere University and 2 visits were made to Uganda as part of a pilot phase of collaboration between the departments. This includes a 6-week clinical elective for UCSF residents at Mulago and Nsambya hospitals in Kampala. Makerere University has a rich academic tradition and is one of the premiere teaching institutions of East Africa. One to 2 UCSF residents per year will participate in this program during the research component of their training.

During the visits to Uganda, the structure of surgical and medical education was explored within the context of health care in Uganda. Several areas were also investigated clinically, including pathology and case variety, diagnostic methods, and surgical and anesthetic resources and techniques.

## RESULTS

### SURVEYS

Surveys among UCSF residents (response rate, 28 [70%] of 40 categorical residents) showed that 40% of the residents have international health experience before residency and 90% express interest in a developing country elective during residency. For many residents, an awareness of increasing disparities in global health complements a commitment to learning portable skills to serve humanity—for some, this commitment fueled the motivation for a career in surgery. However, in most postgraduate surgical programs, there are limited opportunities to develop these interests during residency through mentorship, research, or clinical experience.

Surveys among faculty showed that 25% of faculty members already participate in voluntary international surgical service and research projects. Many faculty members express an interest in greater structured exchange, such as participation in a visiting scholars program to promote training and education as well as research with collaborating institutions in developing countries. This experience for faculty may also reinforce the basic altruistic impulse of medicine that, for some, has been worn away by working in a health care environment increasingly focused on profit margins, high volume, and efficiency.<sup>15</sup>

### CONTEXT OF HEALTH CARE IN UGANDA

Uganda gained independence in 1962 from the United Kingdom, had one of the best functioning health systems in Africa, but then suffered greatly during the 1970s and 1980s owing to civil strife. There is still an active civil conflict in the north, with more than 1.6 million internally displaced people in one of the world's most significant current humanitarian crises.<sup>16</sup> The country has a total

population of 25 million people, 80% of whom live in rural areas. It is one of the least urbanized countries in Africa. In 2001, its gross national income per capita was \$250<sup>17</sup> with health expenditure per capita of approximately \$18 compared with a health expenditure of \$4887 per capita in the United States.<sup>18</sup> Uganda has some of the poorest health indicators in the world, with life expectancy at 48 years for men and 51 years for women, an infant mortality rate of 88 per 100 000 births, and a maternal mortality ratio of 500 per 100 000 births.<sup>18</sup> It is a predominantly young population, with approximately 50% of people being younger than 18 years, and the fertility rate is 6.9 children per woman, one of the highest fertility rates in the world.<sup>17,18</sup> Adult illiteracy is approximately 31%.<sup>18</sup> Human immunodeficiency virus prevalence rates have been reported to be in decline from a high of 32% in 1992 to 6% currently, and Uganda has been lauded worldwide for its commitment to controlling human immunodeficiency virus.<sup>19</sup>

### HOSPITAL ORGANIZATION, SURGICAL DISEASES, AND THEIR MANAGEMENT

Mulago Hospital, the national referral hospital, is a massive 1200-bed complex in Kampala. The general surgery department also oversees urology, neurosurgery, pediatric surgery, and plastic surgery, while the orthopedic department has a more independent organizational structure and its own residency program. The 3 general surgery services manage a wide variety of conditions and perform a majority of emergency (as opposed to elective) cases.

Traumatic injuries compose a significant proportion of emergent admissions. In the absence of a prehospital care system, patients often arrive at the emergency department hours, and sometimes days, following a serious injury. Patient assessment is further hampered by limited access to diagnostic studies. Radiology is largely limited to plain radiography, provided the film is in supply. There are 2 computed tomographic scanners in the country, 1 being at Mulago Hospital, but cost and functionality often limit access to this modality. Likewise, many laboratory studies considered to be routine in the United States are not available in Uganda owing to high cost or a lack of necessary reagents. Thus, the decision to perform a laparotomy for abdominal trauma or a craniotomy for head trauma can depend on a careful history taking and physical examination alone.

While road traffic injuries predominate in this urban setting,<sup>20</sup> burns are also common and are challenging to manage in a nonsterile environment. Differential diagnoses for abdominal pain broaden, and exploratory laparotomies reveal typhoid perforation of the distal small bowel, tuberculous peritonitis, and bowel obstruction. Postoperative fevers are often caused by malaria. The varied oncological epidemiology includes a majority of lymphomas (Dennis Burkitt's seminal research was performed here), Kaposi sarcoma (both AIDS and non-AIDS related), and, in women, advanced breast cancer.<sup>21</sup> Breast cancer is the second leading cause of cancer death in Uganda, the first being cervical cancer.<sup>22</sup> While there is no screening program for either of these cancers (there

are 3 mammography units in the country), there is a national initiative promoting breast self-examination.<sup>22</sup>

In the operating room, all ventilation is performed by hand, with halothane used most frequently. Pulse oximeters are in short supply; heart rate and blood pressure are monitored manually by the anesthetist with no cardiac electrical monitoring. Suction and cautery as well as surgical instruments cannot always be relied on. Coming from our heavily monitored, technologically dense environment, it was interesting to see that patients could still have positive outcomes in this setting.

### MEDICAL AND SURGICAL TRAINING

Makerere University graduates approximately 100 physicians per year from a 5-year program that follows high school. It is 1 of 2 medical schools in the country. After a 1-year postgraduate internship covering a flexible combination of medicine and surgery or pediatrics and obstetrics/gynecology, many of these physicians are subsequently posted to rural areas for 2 years. In the rural areas, they are general medical officers often working independently, and in this setting they perform emergency general surgery. Those who desire further postgraduate training enroll in a master's program with tuition for which many require sponsorship. The general surgery department graduates approximately 10 surgeons per year after a 3-year program that is exclusively didactic in the first year and requires residents to complete a research thesis at the completion of the program.

### DIALOGUE AND EXCHANGE

During the pilot clinical experience, the residents enjoyed a close working relationship with our Ugandan resident counterparts. Diagnostic and therapeutic strategies were debated on one hand and global development priorities on the other. With great candor, the UCSF residents who went to Uganda described their rural experiences, including, for one, a posting in the north, dealing with war casualties, and an *Ebola* outbreak in 2002.<sup>23</sup> We described urban poverty and violence in the United States, necrotizing fasciitis, and the exertional challenges of our bariatric cases. We found the work ethic, can-do attitude, and perseverance of the Ugandan residents to be extraordinarily inspiring in the face of blatant resource constraints. Likewise, the dedication of families, who are responsible for the bulk of patient care in crowded public wards, was humbling. Besides assisting in patient care and working with the residents, we also conducted medical student teaching sessions in the classroom setting and at the bedside.

### ACCESS TO INFORMATION AND SURGICAL RESEARCH

As at academic centers in the United States, there are well-organized teaching conferences for residents presided over by demanding, knowledgeable attending physicians. Generation of and access to information, however, are challenges to evidence-based discussion and practice in Uganda. As with other medical disciplines, much of the

published surgical literature is generated by northern institutions, published in northern journals, and concerns diseases affecting primarily industrialized countries. Thus, there is scant literature concerning the epidemiology, natural history, and cost-effective treatment of surgical conditions in the African context as well as research evaluating the delivery of surgical services.

Though international attention currently is appropriately focused on the AIDS epidemic and other infectious diseases such as tuberculosis and malaria, a significant portion of the burden of disease in developing countries is amenable to surgical intervention.<sup>24</sup> Road traffic accidents alone are projected to rank third in the burden of disease worldwide by 2020<sup>25</sup>; maternal mortality figures have never been more disparate, with more than 1800 deaths per 100 000 births in some developing countries compared with 10 deaths per 100 000 births in North America.<sup>26</sup> The scarcity of surgeons and the unmet surgical need in developing countries have been well described,<sup>27,28</sup> and human resource constraints and capacity building are increasingly acknowledged as critical public health issues in health systems development.<sup>29</sup> Moreover, there are documented, cost-effective surgical interventions in emergency obstetric care,<sup>30</sup> injury care and trauma systems,<sup>31</sup> and ophthalmology.<sup>32</sup> Once considered the extreme therapeutic intervention following the 1978 "Health for All" primary care movement initiated by the World Health Organization, surgery is now recognized by public health professionals as an essential component of basic health services—even in settings with limited resources.

The *East and Central African Journal of Surgery*, the journal of the Association of Surgeons of East and Central Africa, Kampala, is developing with the goal of advancing evidence-based surgical practice. Nonetheless, for many residents and faculty, accessing international journals is difficult owing to delays in receiving hard copies, limited reliable Internet access, and the cost of subscriptions to electronic journals. Some of these equity issues in global health research have been highlighted by the "10/90 gap": 90% of the world's biomedical research concerns the health needs of only 10% of the world's population.<sup>33</sup> The University of Toronto models what can be done by providing access to their online electronic library free to surgical faculty in East Africa,<sup>34</sup> and the greater movement to improve information access in developing countries is long overdue.<sup>35</sup>

### ETHICS

We believe in a universal right to access basic surgical care. However, any notion of a universal "standard of care" gives way to the stark difficulties of resource allocation in the setting of poverty. There are deeper questions of global health equity—at UCSF, there is an approximately 1-year waiting list for gastric bypass surgery for obesity, the leading cause of preventable morbidity and mortality in the United States. Abdominoplasty to correct the redundant skin associated with subsequent rapid weight loss is in equally high demand.

Meanwhile, basic emergency surgical care is still not available in most of the world. While populations in de-

veloped countries die of obesity, undernutrition contributes to the majority of 10 million preventable child deaths worldwide yearly.<sup>36</sup> Indeed, malnutrition was synonymous with undernutrition until the recent epidemic of obesity occurred. The Brigham and Women's Hospital at Harvard University, Boston, Mass, has just announced their intention to start a residency program in Global Health Equity, which, as they stress, is an issue inclusive of all medical disciplines, including surgery.<sup>37</sup>

It is important to develop reciprocity to meet the collaborative needs of the surgery department at Makerere University with the goal to provide similar clinical and research opportunities for the Ugandan trainees in the United States. Challenges include funding, legal issues with malpractice, and licensure. Other possible mutual benefits to our international partners include exchange of information, sharing of resources, longitudinal research partnerships, and alliance in medical and surgical education. Importantly, this program will foster an atmosphere of mutual understanding, intellectual generosity, and respect. More concrete results on both sides, though, will only be apparent with time. The potential sustainability of academic collaboration is encouraging, particularly with regard to bilateral capacity building and horizontal system-wide development—especially when compared with more vertical, disease-specific, service-oriented programs.<sup>38</sup>

Nationally, the American College of Surgeons, Chicago, Ill, could prioritize international surgical development in a similar fashion, taking guidance from our colleagues abroad and going even further to coordinate with and learn from these potential partners.<sup>39</sup> Twinning programs between other national societies have been very fruitful, with each side learning from the other.<sup>26,38,40</sup>

## CONCLUSION

The mission of the UCSF general surgery residency, similar to most other academic surgery programs, is to train the future leaders and teachers of surgery. A broad vision is critical for the future in today's globalizing world where glaring health disparities coexist with great opportunities for human development. There are compelling, sustained benefits of a surgical educational experience in the developing world during training. In addition to clinical service, there are extensive opportunities for teaching and an acute need for research relevant to these settings. Surgery has been neglected as an integral part of public health and health systems development worldwide. Some of the same ethical issues noted abroad must also be confronted locally by addressing national problems such as access to surgical care for the 15% of the American population without health insurance and those in underserved areas. The development of rural surgery programs abroad, and more recently in the United States as part of general surgery training, are encouraging.<sup>41</sup> Although there are significant challenges for programs considering an international experience, including addressing the logistics of expense, appropriate immunizations, health risks, housing, health insurance, and safety and security concerns, these experiences will, nonetheless,

develop conscientious students, teachers, and world citizens. The next generation of surgeons, while meeting needs locally, must also take a leadership role globally—the need for international partnership has never been more important.

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