



## Surgery and global health:

### The perspective of UCSF residents on training, research, and service

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Generations of graduating medical students have been drawn to a career in surgery for various reasons: a love of the operating room, the privilege of a patient's trust, an appreciation for immediate and tangible results in patient care, a reliance on the laying on of hands in a time when great technological advance has physically distanced most medical professionals from their patients, and the opportunity to engineer and translate

Above: Faculty from the UCSF and Makerere University surgery departments and Injury Center Uganda staff at a 2005 Injury Trauma Conference: UCSF surgery faculty advisor Diana Farmer, MD, FACS (third from left), and Makerere surgery professor Stephen Kijambu (behind Dr. Farmer).

advances in basic science to the bedside.

Although these motivations have really not changed significantly over time, the world landscape is shifting on an unprecedented scale. We live in a continuously globalizing world that is integrating across a wide range of disciplines, from expansion of trade in goods and services to the related interconnectedness of the international economy and the increasing movement of people across borders. Moreover, the ongoing revolution in information technology is eliminating preexisting barriers of distance in sharing knowledge.

The fruits of this globalization, however, have not been equally shared. In the health care field, there have been significant improvements in life expectancy and infant mortality rates in indus-

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trialized countries in the last 50 years—but the gap between the quality of life of the world’s rich and poor populations grows in a largely unabated fashion. This is true both between countries and, perhaps to an even greater degree, within countries.

In this shifting and integrating global context, many of us as surgeons and health professionals were drawn to the surgical field for reasons other than the factors cited above. Mindful and disturbed by the growing gap in global health equity, we wanted to develop portable skills that could be used in a wide range of settings to help directly improve access to medical and surgical care to underserved populations in the world community.<sup>1,2</sup> A survey of all residents in our program at the University of California, San Francisco (UCSF), showed that 90 percent of residents have a strong interest in a surgical experience in a developing country during residency. More than 40 percent of entering interns already have some international experience during medical school. This rate is not surprising, given the proliferation of international opportunities offered to students in medical schools across the country and the expanding role of international health in undergraduate medical curricula around the world.<sup>3</sup>

Despite this great interest, until recently our residency program, as in most other programs, had no structured overseas opportunities for residents or faculty members. Those faculty members who do participate in international activities largely do this on a voluntary basis outside the auspices of their formal academic responsibilities. For residents wishing to pursue a career or develop the required skills to integrate surgery and global health, public health, or aspects of health policy, there are few mentors available. But these activities should no longer be sidelined as part of the training process—they should be an essential element of the mission of the leading academic surgical training institutions in this country. These activities directly complement the academic mission of education, research, and service.

### ***Benefits to surgical education***

The multifaceted educational benefits of clinical work in developing countries have been well-documented in surveys of trainees who participate in these activities, including previous reports in

the *Bulletin*.<sup>4-7</sup> First, in these settings with limited resources, there is an increased emphasis on precise history-taking and physical examination. In U.S. hospitals, we take for granted advanced technological diagnostic aids such as computed tomography scan and magnetic resonance imaging in patient management, luxuries unavailable in most environments with only basic resources. As residents, we have endured a host of cases in our weekly morbidity and mortality conferences, which have exhorted the simple principles of closer patient contact and more exact physical exams, and spoken against unnecessary diagnostic tests that have sometimes delayed surgery or misdirected therapy. A limited resource environment fosters creativity in treatment and challenges decision making, and in return makes us more cost-conscious clinicians.

Training in what is called general surgery in the U.S. has been gradually reduced to an increasingly narrow range of surgical conditions, with ongoing debates about the actual viability of the discipline. But a wider perspective that includes the developing world reveals that surgeons still perform a broad scope of truly “general” operations.<sup>8</sup> Indeed, because of limitations in surgical manpower, most of the surgical care provided in developing countries is done not by surgical specialists, but by general medical doctors or paramedical cadres.<sup>9</sup> But work in underdeveloped environments hones our adaptability across surgical disciplines and challenges the notion that we must train to be super-specialist surgeons to care for patients in the modern era. We are also exposed to surgical conditions that we simply do not see in the U.S., such as tropical surgery, and more varied surgical infectious diseases. How many of us are familiar with the presentation and management of buruli ulcer, noma, or obstetric fistula?<sup>10-12</sup> These surgical conditions all preferentially affect impoverished patients in developing countries.

Work in these settings also cultivates our cultural sensitivity as we care for patients and families with dynamics, relationships, and competing priorities that are considerably different from our own and learn from the overall context of poverty and public health in developing countries.

Enrollment in general surgery programs has steadily been in decline across the country, and this has been under great scrutiny over the past

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several years.<sup>13,14</sup> Although lifestyle considerations have been cited as a primary factor in career choice, many promising senior medical students compelled to careers in surgery also have a passion to develop careers in international health. The vast majority of these applicants choose careers in other disciplines such as emergency medicine because of the perception that it is easier to integrate these interests.

### ***The role of surgery and public health***

Surgery has typically been sidelined as a part of the global public health agenda, largely because of the emphasis on primary prevention and community health promotion programs since the 1976 Alma Alta Declaration and because of the notion that in the spectrum of health interventions, surgery is at the curative, “high-tech,” cost-ineffective, individually focused end. Research in the global health community is currently focused on the significant morbidity and mortality imposed by infectious diseases such as human immunodeficiency virus (HIV), tuberculosis, and malaria. Although this focus is warranted, recent evidence shows that surgical conditions account for up to half of the global burden of disease.<sup>15</sup> This burden can only be expected to grow, especially with the increasing share of injury, obstetric conditions, and noncommunicable diseases in developing countries.

By 2020, injury is projected to rank third behind ischemic heart disease and depression in the global burden of disease as developing countries rapidly urbanize and motorize.<sup>16</sup> Only one-third of severely injured patients in rural areas of developing countries ever reach medical care. The Essential Trauma Care guidelines developed by the World Health Organization provide a promising blueprint for trauma systems development in resource-constrained settings and suggest that much can be done at low cost. These guidelines are currently being piloted in Ghana, Mexico, and Vietnam. The substantial burden imposed by perinatal and obstetric emergencies has also been recognized and the reduction of maternal mortality is one of the eight health-related development goals set by the United Nations in 2000.

Disease trends in developing countries also show an increasing trend in noncommunicable diseases such as neoplasms and cardiovascular diseases,

particularly in heavily populated countries in developmental transition such as India and China.<sup>17</sup> These countries and others in epidemiologic transition face the challenge of a “double burden” of disease, of coexisting early childhood mortality, and of chronic disease. Contrary to what might be expected, a number of studies suggest that surgery may be as cost-effective as other population-based public health interventions.<sup>16,18,19</sup>

Although surgery is an essential part of health systems worldwide, there are minimal standards for the organization and delivery of surgical services in developing countries. This is partially because of the neglect of the hospital sector in developing countries, even though often it consumes 50 percent to 70 percent of the health care budget in most countries.<sup>20</sup> The surgical manpower shortage is only part of the increasingly recognized gap in human resources in health.<sup>21</sup> Even for emergency operations such as cesarean section (10% of those in need do not receive one) and strangulated hernia (30% of patients go without surgical treatment), there is tremendous unmet need for surgery.<sup>22,23</sup> Over the years, this lack has been met through various strategies such as overseas volunteers, intermittent outreach programs to rural areas of developing countries, and through training of paramedical cadres to perform surgery. It is still unclear how to determine which strategy is most appropriate in various settings or how more sustainable services can be provided.

Even with the significant burden of disease imposed by surgical conditions, very little is known about the epidemiology and natural history of surgical conditions in developing countries, the efficacy and cost-effectiveness of treatment in various settings, or the development of sustainable surgical services within the health systems of developing countries. The research agenda in global public health is still essentially set by major donor organizations from wealthy countries, as reflected in what is called the “10-90 gap,” which shows that 90 percent of global health research concerns conditions that affect only 10 percent of the world’s population.<sup>24</sup> This also affects incentives for drug development and innovations in medical technologies, which are preferentially geared to diseases that affect industrialized countries. Furthermore, available evidence is published mostly in journals based in northern countries that are often pro-

hibitively expensive for many academic centers in the developing world, even with Internet access. The nascent movement in open access publishing and an associated focus on developing drugs and technologies for neglected diseases is a promising first step in attempting to right this imbalance.<sup>25,26</sup>

Leading academic institutions should support the generation of this knowledge, and skills in epidemiology and the core disciplines of global public health such as health policy, health systems, and economic evaluation should be regarded in the same Halstedian tradition as the requisite skills required in developing surgical scientists. “Translating” the bench to the bedside is a frequent discussion; translating our surgical innovations in the other direction—to population-level interventions that must be creatively adapted in various settings around the world—must also be considered. In many developing countries, surgical research is considered a luxury—U.S. surgeons have the opportunity to share resources and ensure that this is no longer the case.

### **Service**

A wide range of international nonprofit organizations focus on providing essential surgical services to populations in need. Historically, the typical model for these organizations has been short-term volunteer missions—though this has been gradually changing with a greater consciousness of incorporating training and capacity building to promote sustainable service delivery.<sup>27</sup> When most surgeons consider international health, the general focus is still on

volunteerism, though there is a need to move beyond this to consider training and skills development. Perhaps most importantly, there is currently minimal coordination between all of these



Outside Mulago



Operating room at Mulago

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organizations and no consensus on where the greatest needs are (globally) and how these can be met. The academic surgical community should be an integral part of this discussion.

### ***Development programs abroad***

Most other industrialized countries have established programs—both through their national surgical associations and through the efforts of individual academic institutions—to prioritize collaborative programs with developing countries to promote global surgical development.<sup>28</sup> The University of Toronto provides an excellent example of what is possible through its office of international surgery and its close collaboration with the Canadian Network for International Surgery. The University of Toronto hosts the annual Bethune Round Table Conference in International Surgery, which focuses on collaboration and surgical development in developing countries, and runs the Ptolemy project, which has provided free online access to the university's electronic library for surgeons in East Africa.<sup>29</sup> The Canadian Surgical Association has also taken a leadership role in working with the College of Surgeons of East, Central, and Southern Africa in determining priorities in development and in supporting the *East and Central African Journal of Surgery*. The Royal College of Surgeons of England has had a long-standing overseas doctors training scheme, which allows training opportunities for surgeons from developing countries.<sup>30</sup> Increasingly, some surgical training programs in the U.K. are considering mandating overseas work for their postgraduate students; the effect of the work-hour limitations on reducing their breadth of training has also played a part in this. There are similar overseas opportunities for trainees in Scotland, Australia, and New Zealand.<sup>31-33</sup>

Currently, the College has active international programs through the Committee on Trauma, and the recently reported delivery of the Advanced Trauma Operative Management course in West Africa was encouraging.<sup>34</sup> In addition, the launch of Operation Giving Back provides American surgeons with a comprehensive database for volunteering abroad. Nonetheless, although the focus on volunteerism is important, there is much more that can be done in terms of systematic collaboration with other national surgical societies and academic institutions abroad. Our colleagues

in orthopaedics provide a promising example of what is possible through the American Academy of Orthopaedic Surgeons (AAOS). The AAOS has partnered with the not-for-profit organization Health Volunteers Overseas (HVO), which focuses preferentially on training through short-term volunteer missions. The HVO is sponsored by 12 national societies (including Anesthesia Overseas) and has established sites and infrastructure to promote volunteerism in 25 developing countries. The AAOS runs annual courses in orthopaedic surgery in developing countries for interested volunteers.

### ***Surgical collaboration with Uganda***

The evolving surgery and global health program at UCSF was spurred through aforementioned resident and faculty interest. There is already substantial interdisciplinary work in global health at UCSF through the Institute for Global Health and UCSF Global Health Sciences, in hopes of bridging basic science, clinical service, and public health through international partnerships. Almost all of the UCSF senior residents in orthopaedics volunteer for a month of clinical service in South Africa, and more than half of the senior medical residents volunteer at a HIV outreach program in Uganda. In both programs, participating residents report these experiences as the “best” of their residency. Early studies of the orthopaedic elective also show that participants continue to volunteer abroad after completion of their residency.<sup>35</sup>

Building on the preexisting relationships across disciplines, the department of surgery at UCSF initiated a discussion with the surgery department at Makerere University in Uganda to discuss potential collaboration in training and research. To date, we have piloted a visiting clinical experience for several UCSF residents and have developed multiple promising research collaborations. In addition, UCSF is beginning a Cross-Residency Area of Concentration Program in Global Health to foster a community of residents who will study global health issues and conduct a project overseas.

### ***Context of health care in Uganda***

Uganda has a population of 25 million and is one of the least urbanized countries in sub-Saharan Africa with an 80 percent to 90 percent rural population. Life expectancy still lags at 48

years for men and 51 years for women, and overall, Uganda ranks 147 of 175 in the United Nations Human Development Index, a composite aggregated measure of development.<sup>36</sup> Uganda gained independence from Britain in 1962 and had one of the best functioning health systems in Africa until the civil conflict of the 1970s and 1980s. In the international public health community, Uganda has been praised for its progress in controlling HIV and acquired immune deficiency syndrome (AIDS), with a decline in prevalence rates from 32 percent in 1992 to the current 6 percent reported rate, though there is regional variation.<sup>37</sup>

### ***Surgical services/training***

The hospital system in Uganda, like most others in Africa, is based on national, regional referral, and district hospitals. There are approximately 100 specialty-trained surgeons in the country, predominantly concentrated in Kampala, the site of Mulago Hospital, the 1,200-bed national hospital. Uganda produces approximately 150 physicians a year through the medical schools at Makerere University in Kampala and Mbarara University in western Uganda. Makerere University has a rich academic tradition as one of the leading institutions in East Africa, and physicians enter the postgraduate program in surgery usually after several years of independent practice in rural areas. The postgraduate (master's degree) program lasts three years, with one year of didactics and two years of clinical work culminating in a master's thesis. The surgery department encompasses all specialties



Hospital ward at Mulago



Makerere University senior house officers Dr. Moses Ochen (left) and Dr. Caesar Okello (second from right), and Dr. Roayaie (right) with Makerere medical students on the ward.

except orthopaedics, which has its own training program and has produced approximately 10 specialty-trained orthopaedic surgeons. There are no other subspecialty training programs in

this program, so graduates go abroad to acquire further training. For example, Uganda has three pediatric surgeons and two neurosurgeons for the whole country. This proportion is actually greater than exists in most of Uganda's immediate neighbors and counterparts in sub-Saharan Africa.<sup>38,39</sup>

In an effort to improve access to emergency surgery, the Ugandan Ministry of Health is attempting to bring surgical care closer to the rural poor by building operating rooms at the sub-district level. Part of the impetus for this new policy is Uganda's high maternal mortality rate, at 500 per 100,000 births, and the associated need for improved access to emergency obstetric care, including cesarean sections.<sup>40</sup>

### ***Voluntary clinical experience***

At the kind invitation of the department of surgery at Makerere University, several UCSF residents have visited in a clinical capacity, spending a month at Mulago hospital working with our Ugandan postgraduate counterparts, and two weeks at Nsambya Hospital, a 300-bed mission hospital in Kampala. Nsambya is one of several mission hospitals of similar size in Kampala. Residents participating in the program did so during their two years of research, which usually occurs after three years of clinical training in the U.S. Besides assisting in patient care and working with the residents, UCSF residents also conducted medical student teaching sessions in the classroom setting and at the bedside.

At Mulago Hospital, trauma accounts for more than 70 percent of emergent admissions and



All anesthesia in the operating suites was performed by hand-ventilation.



Buruli ulcer

operations, and injuries resulting from road traffic crashes predominate; furthermore, there is a heavy burden of head trauma resulting from motorcycle taxi drivers and their clients traveling without helmets.<sup>41</sup> Burns in children exact high morbidity and mortality rates and are challenging to manage without the benefit

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of a sterile environment. Patients presenting with abdominal pain and peritoneal signs may turn out to have a small bowel perforation from typhoid fever, tuberculous peritonitis, or bowel obstruction—conditions rarely encountered in the U.S. Postoperative fevers are often caused by malaria. Among patients on the surgical wards, 30 percent suffer from HIV, often unmanaged because of the limited availability of antiretroviral medications, though this is slowly changing.<sup>42</sup> In women, cervical and breast cancer are leading causes of cancer death, and it was alarming to see many young women presenting with advanced stages of both, as there is no screening program for either disease. There are only two mammography units in the country and limited capacity in personnel and equipment for cytology departments to develop pap smears. In addition, Uganda also has a high incidence of lymphoma. Furthermore, endemic and AIDS-related Kaposi sarcoma present frequently and require surgical intervention.

Patients often arrive at a significant delay after their injury or their first symptoms because of barriers in transport and the lack of any prehospital care system. Visitors from UCSF witnessed several patients die of appendicitis resulting from extremely advanced presentation and sepsis. Generally, diagnostic radiologic studies are limited to plain films, if film is available, and laboratory studies may similarly not be dependable. Though there is a computed tomography scanner at Mulago, it cannot always be used because of issues of cost and function. Therefore, decisions to operate on patients are often based largely on history and physical examination alone.

Resources in the operating room are austere, particularly in terms of anesthesia. Cases are completed without cardiopulmonary monitoring and pulse oximetry, and patients are hand-ventilated through operations, with halothane used most frequently. Suction and cautery, which we depend on heavily in the U.S., are often not functional and surgical instruments are of the most basic variety. Bowel staplers, which are taken for granted in surgical training, are not available, and all anastomoses must be hand-sewn. We visitors were reminded of the wise words of one of our surgical attendings at home who still sews all bowel anastomoses to provide

residents an experience they may otherwise not encounter in the course of residency training: Don't always depend on technology, and be proficient in basic surgical skills. Economy must always be considered through the sparing use of all supplies generally taken for granted, such as suture. It was important to observe that patients can still have positive outcomes without the dense overlay of technology to which surgeons are accustomed in the U.S.

During the pilot clinical experience, we benefited greatly from the relationships with our Ugandan resident counterparts. We debated dilemmas in patient management and developed strategies around issues of broader collaboration. We were extraordinarily struck by the discipline and commitment of the postgraduate students and other health care staff, especially in the context of extreme resource constraints. In addition, the devotion of families, who assume much of the responsibility of patient care at the bedside on crowded wards, was inspiring.

### ***Ethics and reciprocity***

Working in an environment with limited resources, representative of the surgical resources available to the majority of the world's population, we were forced to revisit fundamental questions about the extreme global imbalance in resource allocation. The most basic emergency surgical care is still not available in most of the world, where undernutrition contributes to millions of childhood deaths worldwide. If access to basic medical and surgical care is a fundamental

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human right, then how can these disparities be allowed to persist? A broader view of the world's surgical needs and sharing of resources through partnerships is a mandatory part of what should be done to correct this gap.

With regard to the UCSF program, it will be critical to develop reciprocity to meet the collaborative needs of the surgery department at Makerere University. We aim to provide similar clinical and research opportunities for the Ugandan trainees in the U.S., and more structured opportunities for faculty exchange. Challenges we face to make this happen currently include funding, legal issues, and licensure. We have already embarked on several areas of collaborative research and training, including training in research for injury prevention and trauma care, as well as another program in breast cancer prevention, diagnosis, and treatment. These programs must be designed carefully with the shared objective of capacity building to avoid exacerbating the "brain drain"—the migration by the highly trained "best and brightest" to more developed countries—that already plagues many developing countries.

### Conclusion

This initiative from UCSF, although in its infancy, is gradually evolving, and the collaboration is met with great enthusiasm from faculty and residents in both the U.S. and Uganda. It is the kind of partnership that should be forged by all leading academic institutions and surgical associations to promote global surgical develop-

ment. The results of such an initiative will only be apparent with time.

As specialists in health care and also as American citizens, surgeons cannot lose track of the current world political climate. The time is ripe for an emphasis on more positive forms of collaboration and sharing of resources with our partners abroad. Our current generation of surgical trainees must take a leadership role to promote a broader perspective in ensuring a more cohesive global community. □

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