

# Global Surgery: Effective Involvement of US Academic Surgery

## Report of the American Surgical Association Working Group on Global Surgery

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There is an unacceptably high burden of death and disability from conditions that are treatable by surgery, worldwide and especially in low- and middle-income countries (LMICs). The major actions to improve this situation need to be taken by the surgical communities, institutions, and governments of the LMICs. The US surgical community, including the US academic surgical community, has, however, important roles to play in addressing this problem. The American Surgical Association convened a Working Group to address how US academic surgery can most effectively decrease the burden from surgically treatable conditions in LMICs. The Working Group believes that the task will be most successful (1) if the epidemiologic pattern in a given country is taken into account by focusing on those surgically treatable conditions with the highest burdens; (2) if emphasis is placed on those surgical services that are most cost-effective and most feasible to scale up; and (3) if efforts are harmonized with local priorities and with existing global initiatives, such as the World Health Assembly with its 2015 resolution on essential surgery. This consensus statement gives recommendations on how to achieve those goals through the tools of academic surgery: clinical care, training and capacity building, research, and advocacy. Through all of these, the ethical principles of maximally and transparently engaging with and

deferring to the interests and needs of local surgeons and their patients are of paramount importance. Notable benefits accrue to US surgeons, trainees, and institutions that engage in global surgical activities.

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A significant proportion of the overall global burden of disease is addressable by surgical care. The majority of the world's population, especially those living in low- and middle-income countries (LMICs), has inadequate access to surgical care. The resultant large burden of death and disability from surgically treatable conditions can be reduced with timely, accessible, and affordable surgical care. Barriers to achieving this include shortages and maldistribution of surgeons, anesthesiologists, and other providers (eg, pathologists, perioperative nurses); inadequacies of physical resources (equipment, supplies, infrastructure); and inadequacies of administrative and financial support.

The major actions to improve on this scenario need to be taken by the surgical communities, institutions, and governments of the LMICs. The US surgical community, including the US academic surgical community, however, has important roles to play in addressing this problem. There is enthusiasm among students, surgical residents, and faculty members to participate actively in global surgery. Departments of surgery in many US institutions have also become, or are interested in becoming, active in the evolving field of global surgery. There is no consensus on the most effective roles that US academic departments of surgery can play in global surgery, including roles in clinical care, capacity building (including training), research, advocacy, and ethics.

### PURPOSE OF THE AMERICAN SURGICAL ASSOCIATION STATEMENT

The American Surgical Association convened a Working Group from its membership to develop a consensus statement on the most effective future directions for the involvement of US academic departments of surgery, and the US academic surgical community more widely, in global surgery. The primary goal of the Working Group was to address how US academic surgery (departments and academic professional organizations) can most effectively contribute to decreasing the burden of death and disability from surgically treatable conditions globally, especially in LMICs. The secondary goal of the Working Group was to identify the main benefits for US institutions in undertaking work in global surgery.

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This statement is intended to provide a framework with input and advice from senior academic leaders in the United States (many of whom have spent decades working in and with LMIC institutions) and to address key points that would add value to the existing scenario and to existing published material. It is not intended to be a comprehensive guide nor a review article. The Working Group primarily considered what could more optimally be accomplished within existing institutions (primarily universities and hospitals) in terms of day-to-day work. However, longer-term activities, not yet underway or that might involve wider organizational arrangements not yet in existence are also discussed. The recommendations in this statement should be adjusted based on the needs, resources, interests, and priorities of the LMIC institutions involved.

We note that several other groups are undertaking similar work. We seek to be synergistic with rather than duplicative of their efforts. The Society of University Surgeons Committee on Academic Global Surgery has recently published several articles on topics related to the current statement: guidance to young surgeons who wish to undertake careers in global surgery, including how best to conduct research as part of this career.<sup>1,2</sup>

## OVERARCHING CONCEPTS

Efforts to decrease the burden of surgically treatable disease in LMICs will be most effective if they take into account the epidemiologic pattern in a given country by focusing on those surgically treatable conditions with the highest burdens and if they promote wide availability of those surgical services that are most cost-effective and most feasible to scale up. Several notable global initiatives have addressed these points, including the World Health Assembly (WHA) resolution on surgical care, the Lancet Commission on Global Surgery, and the World Bank's Disease Control Priorities (DCP) project. Efforts by US academic institutions would be most effective if they consider the findings and recommendations of these initiatives and, where possible, harmonize their efforts with them. Each of these initiatives is briefly summarized below.

WHA Resolution (WHA68.15): "Strengthening emergency and essential surgical care and anaesthesia as a component of universal health coverage."<sup>3</sup> The WHA is the governing board of the World Health Organization (WHO). It consists of every minister of health in the world (or their designees). It meets periodically at WHO Headquarters in Geneva, Switzerland to set WHO's agenda and to make recommendations to country governments. One of the main methods used for both of those activities are resolutions. In 2015, the WHA adopted the first resolution specifically on surgery. This urged all governments to "identify and prioritize a core set of emergency and essential surgery and anesthesia services" and to assure that they are "accessible to all who need them" (among other suggested actions).<sup>3</sup>

Lancet Commission on Global Surgery: "Global surgery 2030: evidence and solutions for achieving health, welfare, and economic development."<sup>4</sup> The Lancet occasionally convenes commissions that address major health issues. The findings of the first ever Lancet commission to address surgical issues facing LMICs were published in 2015. It developed several landmark estimates, including that 5 billion people do not have access to safe, affordable surgical care when needed and that only 6% of the 313 million surgical procedures performed annually occur in countries where the poorest third of humanity live. To rectify these deficiencies, the Commission defined 6 indicators to monitor and suggested targets for each. Notable are the targets for minimum number of surgeons and minimum number of operations per population, at which LMICs can achieve most of the population-wide benefits of surgery. Most LMICs do not yet meet these targets:

- (1) Twenty specialist surgical, anesthetic, and obstetric providers per 100,000 people (compared with current estimates of 100 in high-income countries).
- (2) A total of 5000 procedures per 100,000 people per year (compared with 10,000–20,000 in high-income countries).

The commission also recommended development of national surgical plans and provided a template for such.

DCP3 is a comprehensive effort to evaluate the cost-effectiveness and population-wide effect of almost all health interventions. It has involved the World Bank (which published the 9 volume series), the WHO, the Bill and Melinda Gates Foundation, and other prominent stakeholders in global health. It, along with prior versions (DCP1 in 1993 and DCP2 in 2006), has been influential in setting the health agenda for many international agencies, country governments, and donors. DCP3 devoted one of its volumes specifically to surgery and several of the other volumes (eg, cancer, cardiovascular disease) also address surgical services.<sup>5–7</sup> DCP3 identified a group of 44 procedures (or sets of procedures) that: address conditions that have large health burdens and for which there are surgical procedures (and related care) that are highly cost-effective and feasible to promote globally. These procedures primarily cover high-burden conditions such as injury, surgical emergencies (eg, appendicitis), and complications of pregnancy. Many of these services are deliverable at rural hospitals, which improve access especially in the poorest countries.

The above initiatives primarily address basic and intermediate surgical capabilities. Such an emphasis is especially warranted in low-income and lower-middle-income countries, where surgical services are mostly at lower levels of development. Nonetheless there are still gains to be made in lowering the burden of surgical conditions by addressing more complex surgical capabilities, such as those needed for treatment of cancer and vascular disease and for transplantation. These are especially relevant for upper-middle-income countries, but also for wherever the epidemiologic pattern of disease warrants. The same basic principles of addressing the biggest burden and promoting wide availability of the most cost-effective and most impactful services still apply. An additional point on addressing disease burden is that, due to their age structure (with lower average ages), there is a higher percentage of children in most LMICs, compared to high-income countries. Hence, strengthening pediatric surgery takes on an even greater significance.

The following sections will address how US academic surgery can use the above principles to most effectively impact global surgery, through the usual tools: clinical care, training and capacity building, research, and advocacy. These are overlapping and clinical care and training/capacity building are especially intertwined.

## CLINICAL CARE

Up until the past few decades, US surgeons' efforts in LMICs were primarily focused on direct provision of clinical care. This involvement ranged from short-term missions (often termed volunteerism) up to a few US surgeons who lived and worked in LMICs for years or decades. Although we will emphasize the other tools (eg, capacity building and research) more, there is still a need for such direct provision of care, especially in situations in which the local capacity is very limited or interrupted by conflict or natural disasters. Foreign surgeons (including United States) often play major roles in delivery of surgical care in disaster situations, through groups such as the International Committee of the Red Cross and Medecins Sans Frontieres. There are also situations in poorer countries, where local capacity is limited, where outside surgeons perform a significant proportion of clinical care. For example, foreign surgeons often work at faith-based hospitals. Approximately 40% of all surgery in Kenya is performed at such faith-based hospitals.<sup>8</sup> Likewise, 22% of all

surgery in Ghana, but 35% of all surgery done at rural hospitals, is done at faith-based hospitals.<sup>9</sup> These clinical services are important in and of themselves. They, however, can be leveraged for increased effectiveness by providing a foundation for capacity building and research as noted below.

### CAPACITY BUILDING

Capacity building encompasses several related activities. These include building the surgical work force through increasing the numbers of surgical providers (surgeons of all specialties, anesthesiologists, and other members of the surgical team, such as perioperative nurses) and through training to increase the skills of existing surgical providers. Capacity building also encompasses improving management skills and increasing the physical capacity (equipment, supplies, and infrastructure) and the functioning of the hospitals in which the providers work. In the following text, we highlight several priorities for capacity building including increasing the size of surgical workforce, increasing representation of women in the surgical workforce, maximizing the effectiveness of training whether conducted on site in LMICs or in the United States, and developing effective and respectful partnerships for capacity development.

A useful target to keep in mind is the Lancet Commission's recommendation of 20 specialist-level surgery, anesthesia, and obstetric providers per 100,000 population. Some of the poorest countries in the world have levels of less than 1 provider/100,000 population.<sup>10</sup>

It is also useful to keep in mind that several groups, especially women, are under-represented in surgery globally. It will be impossible to achieve adequate work force levels without promoting greater sex equity and increase the representation of women in the surgical work force. Representation of women in the US workforce is rapidly changing, currently only 18% of surgical attendings are women but almost 50% of resident applicants in general surgery are women, but less so in some of the other specialties. Inclusion of women in the LMIC surgery workforce, especially in Africa and South East Asia, is notably lower. For example, out of 371 surgeons in Ethiopia, only 8 (2%) are women.<sup>11,12</sup> Sex diversity in the surgical workforce is especially vital in many parts of the world where women may be more comfortable in seeking health care from other women due to cultural norms.

Increasing representation of women in the surgical work force globally will require proactive steps. For example, Women in Surgery Africa was formed with the support of the Royal College of Surgeons of Ireland, COSECSA (the College of Surgeons of East, Central, and Southern Africa), and the Association of Women Surgeons.<sup>13</sup> It seeks to encourage and promote surgery as a career for women and to address barriers to their participation. One barrier is financial. Many women who train in sub-Saharan Africa cannot afford to take the fellowship examinations. Targeted scholarships by the Association of Women Surgeons and the American College of

Surgeons have been initiated to address this need and to support sex equity in the region.

Training that is conducted by or involves input from US based (or other outside) faculty is best done on site in the LMIC. This emphasizes local capabilities, provides training specific to the needs of the local environment, and minimizes potential for brain drain.<sup>8</sup> It allows training of the entire surgical team and developing multidisciplinary teams.

LMIC surgical trainees can also benefit from international rotations to foreign sites (including the United States). Such rotations provide exposure to other systems of care. The goal should always be to tailor training efforts to meet the needs of LMICs and not to replicate the care in US institutions.<sup>14</sup> Such fellowships have been primarily observational. One major barrier to hands-on training is United States Medical Licensing Examination regulation that forbids foreign trainees from hands-on surgical care. Some relaxation of these requirements (without compromise of patient safety) would greatly improve the experience of the foreign trainees. Another barrier is the potential compromise in the volume of index procedures for residents. This may be obviated by the program director's attention to the procedures with which LMIC surgical trainees are involved.

For any type of training, it is important to avoid emphasis on costly technology that might not be feasible in LMICs or that would detract from other more beneficial aspects of the training. Likewise, outside faculty should keep in mind the possibility that their efforts might increase the risk of outmigration of the trainees.

The training effectiveness of short-term US visitors to LMICs can be maximized in several ways. If several outside visitors periodically come to the same site, their contributions can be maximized if there is 1 full time equivalent, spaced evenly through the year.<sup>15</sup> When visitors can only come for minimal time, it is important to maximize the skills transfer that their visits offer. This type of capacity building is most likely to be successful when there is a clear goal for the visit, especially one whose genesis is from the field. One visit from a urologist to a rural hospital in Nigeria trained that hospital's general surgeons in open prostatectomy, which was a high need identified by the site. The local surgeons were able to provide this service safely and sustainably thereafter.<sup>16</sup>

When US departments of surgery create partnerships with LMIC counterparts, the principles of developing equal and respectful relationships and deferring to local needs are an important foundation, as delineated in further detail in Table 1. From the US side, such partnerships are more likely to be successful when a clear leader is identified, especially someone with experience and interest in global surgery, with close connections with the sites involved, and who is willing to spend significant time in the country. This person should monitor activities of other faculty and trainees in the program. Programs should be structured with clear goals, expectations, timelines, and plans for assessment. A plan for sustainability should be part of any program, with the ultimate goal of having the program completely supported by local faculty and local trainees.

**TABLE 1.** Considerations for Successful Partnerships for Capacity Building

<p>Long-term mutually beneficial institutional partnerships promote trust and can enable strategically and sustainably planned projects and programs. Determine at the outset the stated needs and wishes of the local surgeons, who must be actively involved in all stages of any project or program. Curriculum development should be adapted for the local environment, not only the specific LMIC, but also the specific hospital or institution. Understand and incorporate priorities defined by local institutions, such as the ministry of health, when those priorities have been defined. Use formalized needs assessments, when those are available. Priorities may vary considerably among countries. Development of measures of success at the time of initiation of each program. Also, if possible, the development of an exit strategy when the measures of success have been achieved.</p>
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In addition to the important work of building the training capacity of LMIC universities and hospitals, it is important to consider the broader context of training and credentialing of surgeons and to contribute, where possible, to the growth and robustness of LMIC institutions, such as local surgical colleges. For example, the College of Surgeons of East, Central, and Southern Africa (COSECSA) has trained 1164 surgeons over the past 40 years, 93% of whom are still working in Africa.<sup>17</sup>

It is important to also address the physical component (eg, supplies, equipment, infrastructure) of capacity building. WHO has created several widely used tools for this purpose. These tools are useful in identifying deficiencies that can be addressed affordably and in stimulating corrective action.<sup>18</sup>

The above discussion describes ways to strengthen activities that are currently ongoing. Several other potential avenues should also be explored. One is to create more in-depth linkages among surgical colleges and other institutions that credential surgeons. For example, the American Board of Surgery has considerable expertise in curriculum development and examination methods that can be shared globally. In addition to capacity building, there is a need for exchange of information to better understand what different surgical colleges (national and international) do for credentialing. This would also assist with credentialing surgeons who move across borders. It would also facilitate hands-on educational exchanges, which are currently limited by regulatory requirements, as noted above. The American surgical workforce could learn from the actions of other international surgical colleges particularly those in the United Kingdom. Likewise, the American College of Surgeons Committee on Trauma has unparalleled training programs, such as Advanced Trauma Life Support, and organizational skills to develop trauma systems of care.

There is a great opportunity for the general surgical community outside of academic centers to participate. Many international surgical graduates cannot participate in US fellowships programs because of the requirement to have 5 years of surgical training. Many LMIC surgical training programs are of 3 years in duration. When subspecialization is required (eg, vascular, plastics, urology), there is a great opportunity for large community-based practices to embrace 1 year senior resident-level appointments for international surgical trainees. Although there are legal and regulatory barriers, the opportunity for an international surgical trainee to participate in large surgical practices in which residents do not exist is an untapped opportunity.

The above points represent the consensus of the Working Group members, along with several documented examples.<sup>8,14–17</sup> It is, however, important to acknowledge that the objective evidence base for what works best for capacity building is slim, especially as regards activities conducted by surgeons from the United States or other high-income countries. Research is needed to identify what are the most effective and cost-effective methods of capacity building. Creation of a clearing house cataloguing the efforts, providing a database repository of ongoing and future US-LMIC academic center partnerships, and intervention outcome evaluation would be a useful contribution.

## RESEARCH

Although community hospitals, individual practitioners, non-government organizations, and mission organizations are active in clinical care and clinical capacity building, the US academic surgical community is uniquely positioned to engage in research and capacity building for research.<sup>2</sup> Priority research topics include defining the health burden (death, disability, costs) of conditions treatable by surgery, establishing the evidence base for what methods (surgical techniques, delivery methods) are most cost-effective, and defining minimal resources needed to deliver the most cost-effective procedures. Service delivery issues include optimizing surgical services in high need (especially rural and impoverished) areas, removing barriers to access to surgical care, and improving quality of care.

Research should take into account the global surgery initiatives mentioned earlier. Efforts should be made to gather and use the 6 indicators recommended by the Lancet Commission.<sup>4</sup> Likewise, the recommended targets of the Lancet Commission (especially for optimal levels of surgical providers and operations per population) were based on modeling. Empirical evidence should be collected to validate these models. WHA 68.15 recommended that countries “carry out regular monitoring and evaluation of the emergency and essential surgical care and anaesthesia capacity” of country’s health facilities and “collect and compile data on number, type, and indications of surgical procedures.”<sup>3</sup> These recommendations present important priorities for research, such as what specific elements of capacity have the most impact on surgical volume and outcomes.

All 3 of the global surgical initiatives noted above discuss the role of task sharing. Research is especially needed to define what types of task sharing work best in what circumstances and what elements of monitoring and supervision need to be put in place to assure its safety.

In addition to health service delivery research, relevant basic science investigation can be impactful on surgical care at both local and global levels. For example, a comparison of patients with colorectal cancer between Nigeria and the United States revealed different patterns of metastases, which have significant implications for clinical care.<sup>19</sup> Other important basic science opportunities include better understanding the biological mechanism that underlay the current global epidemic in noncommunicable diseases and how chronic and recurrent infection affect surgical outcomes.<sup>20</sup>

There is also an important role for utilization of and development of new technology, including information technology.<sup>1,14</sup> Several priorities in this regard include:

- (1) Inexpensive models for teaching minimally invasive surgery, anesthesia, obstetrical procedures.
- (2) Smaller, portable, durable equipment for minimally invasive surgery (eg, camera, light source, monitor).
- (3) Small, portable, inexpensive ultrasound machines that can be used to guide regional anesthesia, and breast, endocrine, and gynecological surgery.
- (4) Technological opportunities to advance education, such as through telemedicine, remote virtual assistant, and so on. These could also decrease the cost incurred by travel for international exchange work.
- (5) Standardized registries for surgical conditions (eg, trauma, cancer).

For any type of research, involvement of local collaborators is of paramount importance. Not only is it ethical, it is usually a *sine qua non* for meaningful research. Although researchers from high-income countries may bring significant methodologic expertise, they often lack understanding of local ground realities, which only local partners can provide.<sup>2</sup> Research should be fully collaborative and involve local partners at the outset in planning, to address issues that are of direct relevance to them. Such fully equal collaboration should extend from the planning through all stages of the work to publication.<sup>21</sup> Publications should, at a minimum, include at least 1 author from the LMIC in which the data were gathered, and preferably more and preferably as first author. Surgical journals should require, or at least strongly encourage, this.<sup>22</sup>

Capacity building for research should be interwoven with the research itself. There is a particular need for long-term mentoring. Such capacity building should address the full spectrum of research methods, but there is a particular need for academic surgeons with public policy research experience, both in the United States and LMICs.

**TABLE 2.** Important Guiding Principles for Ethical Engagement in Global Surgery by US Academic Institutions

Domain of Activity	Ethical Principles
Local priority	Local counterparts should equally set priorities for all work. The interests of the local surgeons and their patients should be the primary objective, for any work including clinical care, capacity building, and research. When there are differing opinions, local priorities should take precedence. The final decision should be made by local counterparts, without undue pressure from international partners.
Resources	Any program established should augment and not destabilize existing infrastructure and programs. Any engagement must have a plan for how it will aid the local community and build local resources, as the ultimate goal is to build local resources and strengthen local institutions. When US resources are obtained, as much as possible of these resources should be steered toward the LMIC sites. This includes obtaining funding for bilateral exchanges, not just travel for faculty and trainees from high-income sites to LMICs.
Clinical care	Visiting surgeons should have a plan for the management of complications, for long-term follow-up, and for the coordination of postsurgical care with local providers.
Capacity building (including training)	Outmigration of trained personnel is a serious impediment to capacity building. The US partners should be sensitive to this problem and minimize the possibility of “brain drain.” This can be accomplished in part by selecting potential trainees already committed to return to the country of origin. Avoid emphasis on costly technology that might not be feasible or might detract from other more beneficial elements of training. Training should be focused on the needs of the community to which the LMIC trainees are to return. For procedural training, priority should be given to the local surgery residents over visiting surgical residents.
Research	Research should be fully collaborative and involve local counterparts through all stages of the work. Publications should, at a minimum, include at least one author from the LMIC in which the data were gathered, and preferably more. Research should be set up so that it is appropriate to have LMIC authors as first or senior authors.
General	The same standards for clinical care, education, and research that are adhered to in United States should be duplicated. Health and safety of visitors should be assured. Avoid paternalism. Understand the culture of the community in which you are working. In some cases, especially when multiple short-term visitors are coming to a site, it is important to offer for cultural sensitivity training.

Research consortia can be useful, especially when there is not a critical mass of research expertise at any individual institution. Good examples of these collaborations include the African Research Group for Oncology<sup>23</sup> and the Consortium of Universities for Global Health.

### ADVOCACY

Advocacy is an often underutilized tool of academic surgery.<sup>2</sup> Advocacy can target institutions, governments, society at large, donors, and/or international agencies.

On an institutional basis, advocacy could (depending on local needs) include promotion of quality improvement programs, including creation of databases, or use of existing systems to track complications (eg, site-specific infections) and other patient outcomes.<sup>1</sup> For example, the Panamerican Trauma Society has created a free international trauma registry for hospitals in countries in the western hemisphere to contribute data for benchmarking and quality improvement purposes.

On a larger scale, advocacy should address removal of barriers to access to surgical care. A frequent barrier is financial. This includes need for payment before service delivery, which precludes people who cannot pay from accessing services. It also includes fear of impoverishment from medical expenses, which can dissuade many from attempting to access care. Two of the 6 metrics recommended by the Lancet Commission addressed such financial issues. Removing barriers also implies advocating for greater attention to access for surgical care among poor and marginalized groups, as well as greater access in areas that have geographic barriers, such as more remote rural areas.

Efforts at advocacy should reinforce the recommendations of the global initiatives mentioned above. In addition to these more

general sets of recommendations, efforts to advocate for priorities in subspecialty care should reinforce other existing resources such as WHO's List of Priority Medical Devices for Cancer Management, the Breast Health Global Initiative's resource stratified guidelines, and other resource stratified guidelines for cancer care.<sup>24–26</sup> Likewise, the Lancet Oncology Commission on Global Cancer Surgery built on and extended the work of the Lancet Commission on Global Surgery and published recommendations to improve access to quality cancer surgery globally, using some of the same tools noted above (eg, training, international exchanges), as well as through corresponding improvements in pathology and imaging.<sup>27</sup> To advance the training aspect, the Society of Surgical Oncology and European Society of Surgical Oncology have published model global curricula in surgical oncology and related research.<sup>28,29</sup> Patient and community education are important components of these efforts to address the global burden of cancer. These advances in global surgical oncology represent a useful model to consider for other surgical subspecialty care.

### ETHICAL ISSUES

The areas of work noted above (clinical care, capacity building, research, advocacy) generate ethical issues. Guidelines for addressing these ethical issues vary depending on the type of engagement.<sup>30</sup> Some clinical topics have their own particular issues to address, such as transplantation. Nonetheless, there are some general principles that should be born in mind in most situations, which are summarized in Table 2. This list is not meant to be comprehensive and other important ethical principles could reasonably be added to it. The underlying principles are, however, those of respect for LMIC needs and the importance of respectful and equal relationships.

**TABLE 3.** Benefits of Academic Global Surgery Engagement for US Institutions, Faculty, and Trainees

In general and for faculty	<p>Provide platform for US trainees and faculty to realize their humanitarian passion.</p> <p>Expanded opportunities and new perspectives for research.</p> <p>Intellectual stimulation and academic enrichment which can limit clinical burnout.</p> <p>Adopting lessons learned in low-resource environment to high-resource environments: reverse innovation/reverse engineering.</p> <p>Provide an alternative financial perspective on appropriate use of health care funds.</p> <p>Prompts innovation and alternative thinking.</p>
For trainees (medical students and surgery residents)	<p>Develop trainees' humanitarian values and sense of service, altruism, and humility.</p> <p>Greater degree of supervised autonomy than in United States.</p> <p>Exposure to diagnosis and treatment of diseases not seen commonly in United States, including more advanced pathology and better understanding of natural history of diseases.</p> <p>Improved clinical judgment, including ability to put emphasis on physical examination and low-cost investigations.</p> <p>Learn how to work with limited resources and become more cost conscious.</p> <p>Seeing medicine practiced in a different format/system.</p>
For departments and institutions	<p>Global surgical activities can be a useful recruiting tool, given the current high level of interest of students, residents, and young faculty.</p> <p>Institutional branding and global presence.</p>

### ACADEMIC GLOBAL SURGERY AS A BONA FIDE CAREER PATH AND ITS BENEFIT TO US INSTITUTIONS

Academic global surgery activities offer notable benefits to US academic surgery as a whole, as well as to US institutions, their faculty, and trainees (Table 3). For faculty the intellectual stimulation and academic enrichment can limit clinical burnout. They also have expanded opportunities for research. Trainees learn to put more emphasis on physical examination and learn to work with limited resources and become more cost conscious. Skills and experience requisite for a career in global surgery can be effectively and widely provided to US trainees through a structured program during surgical residency.<sup>31</sup>

The field of surgery as a whole benefits from the possibility of expanded innovation, including reverse engineering, which refers to discovery of low-cost technology in low resource settings, with secondary practical applicability in both LMICs and high-income countries. For example, due to the prohibitive cost of ventriculoperitoneal shunts for treatment of infant hydrocephalus, the technique of endoscopic third ventriculostomy and choroid plexus cauterization was developed in Uganda. This has now been used successfully in North America and offers benefits over shunting for several categories of hydrocephalus.<sup>32</sup>

Given the contributions of global surgery to advancing the mission of academic surgery, academic global surgery should be recognized as a valid career path. Academic productivity in global surgery, including development and implementation of partnerships, should be viewed as legitimate activities for promotion and tenure.

### PUTTING IT ALL TOGETHER: EXAMPLE OF A GLOBAL SURGERY SUCCESS—LOWERING MATERNAL MORTALITY

In putting together all of the above elements to make the biggest difference in lowering the burden of surgically treatable conditions, one useful example to consider is the field of “safe motherhood” or lowering maternal mortality. Improving access to and quality of Cesarean section, surgery for ruptured ectopic pregnancies, and other procedures in emergency obstetrical care are important components of global surgery.<sup>33</sup> Several important steps used to address maternal mortality have been:

- (1) The burden of maternal death has been well defined and monitored, using vital registry data, when they are available, or validated statistical methods when they are not.
- (2) The most cost-effective procedures needed to address the problem have been identified and promoted globally. These include the dual pillars of assuring a skilled attendant (eg, nurse midwife) at every birth and access to emergency obstetrical care for obstructed labor or postpartum hemorrhage.
- (3) The field of surgery has been combined with the public health approach to address barriers to care and to assure increases in population-wide coverage of essential services.
- (4) Capacity building: concerted efforts have increased the numbers of formally trained obstetricians and midwives, especially in the highest need areas such as sub-Saharan Africa. Cautious use has also been made of task sharing, including using general medical doctors and in parts of East Africa, nondoctor providers, to provide frontline emergency obstetrical surgery (eg Cesarean section) when fully trained obstetricians are not available.
- (5) Strong advocacy for safe motherhood has led to the adoption of several WHA resolutions on this topic, as well as incorporation of maternal issues in the Millennium Development Goals and now the Sustainable Development Goals.

These steps have born considerable fruit, with well-documented decreases in the number of maternal deaths, from 390,000 in 1990 to 275,000 in 2015.<sup>34</sup> This is probably the most successful example of a global effort to address a surgical problem and it contains useful lessons for other aspects of global surgery.

### CONCLUSIONS AND RECOMMENDATIONS

There is an unacceptably high burden of death and disability from conditions that are treatable by surgery, worldwide, especially in LMICs. The major actions to improve this situation need to be taken by the surgical communities, institutions, and governments of the LMICs. The US surgical community, including the US academic surgical community, can be valuable partners to support the surgical efforts of their LMIC counterparts. In this statement, the American Surgical Association Working Group on Global Surgery has developed broad recommendations on ways in which the US academic surgical community can most effectively engage in global surgery. Efforts to decrease the burden of surgically treatable disease in LMICs will likely be most effective if they: (1) take into account the epidemiologic pattern in a given country by focusing on those

surgically treatable conditions with the highest burdens; (2) promote wide availability of those surgical services that are most cost-effective and most feasible to scale up; and 3) harmonize their efforts with local priorities and existing global initiatives, such as the 2015 WHA resolution on essential surgery. This statement gives recommendations on how to achieve those goals through the tools of academic surgery, including: clinical care, capacity building, research, and advocacy. Through all of these, the ethical principles of maximally engaging and deferring to the interests and needs of local surgeons and their patients are of paramount importance. Notable benefits accrue to US surgeons, trainees, and institutions that engage in global surgical activities.

To accomplish the above agenda, the current minimal collaboration among the different groups engaged in global surgery work should be increased. Going forward, the American Surgical Association should pursue mechanisms and processes to collaborate with and support the work of other groups, such as the American College of Surgeons with its Operation Giving Back and the recently formed Consortium of Academic Global Surgery Programs, as well as with other surgical organizations in high-income countries and in LMICs, and with academic departments of surgery globally.

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