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Anesthesiologists, surgeons and other members of the surgical team have a long history of providing surgical services in low income countries, often involved in humanitarian outreach from resource rich counties, or through professional partnerships with international colleagues. The humanitarian community hypothesizes that these efforts contribute significantly to the unmet surgical need in many countries and markedly decrease the disability that would otherwise result from untreated surgical conditions.

This chapter examines humanitarian outreach and the role of professional surgical and anesthesia partnerships with international organizations, professional societies, academic institutions and individual volunteers, and considers how such partnerships contribute to long term solutions for these entrenched problems through the delivery of surgical services, education and training of anesthesia and surgical providers, and improved surgical infrastructure in low and middle income countries.
The Impact of Global Anesthesia and Surgery: Professional Partnerships and Humanitarian Outreach

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Abstract

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**Background**

Disparities in surgical services in low and middle income countries (LMICs) have long existed. Until recently however, the global health community did not appreciate the impact that inadequate access to surgical care had on public health. The lack of support for surgery as a public health intervention is likely the result of 1) few sources of available surgical data, non-specific health indicators related to surgery, and inadequate outcome measures, 2) limited surgical infrastructure, education and training, and 3) inaccurate assumptions regarding the cost effectiveness and sustainability of emergency and essential surgery.

With this in mind, how is the case for surgical capacity best made? Limited infrastructure for record keeping makes it difficult to rely on cause of death statistics. And even if such records were reliable, most patients with surgical conditions such as trauma, obstructed labor, post-partum hemorrhage, coronary artery disease, neoplasm and bowel obstructions lack access to hospitals, and die at home with no post-mortem analysis, no diagnosis known to the patient or family, and no death certificate. The result is that few surgical conditions are tracked, and subsequently, little is known about the burden of surgical disease in LMICs.

Inadequate infrastructure, access to medical education and training limit a spectrum of resources, from medical supplies to manpower, available for the provision of surgical care. This resource crisis is further compounded by a brain drain in many LMICs as health care workers are drawn to better compensation and improved quality of life in developed countries. As a result, where emergency and essential surgical services are most needed, there a few surgeons, fewer anesthesia providers, archaic and broken medical equipment, limited medicines, and few if any incentives to practice.

Furthermore, surgical concerns have been marginalized within the grand international and public health agendas such as the 1978 Alma Alta Declaration\(^1\), the Millennium Development Goals\(^2\), and the Gates Foundation’s Grand Challenges\(^3\). In spite of solid and evolving evidence that basic and emergency surgical services are cost effective\(^4\) and sustainable, there is a widely held belief in public health that provision of surgery is just too expensive and doesn’t significantly impact the burden of disease. With little documented in the medical literature on global surgical delivery or outcomes, health indicators for surgery lacking, and misperceptions about the cost and impact of surgery, the true burden of surgical disease is not well understood. As a result,
this component of comprehensive care of a community has been grossly under-resourced and under-invested.

A 2007 publication from the World Bank captured the attention of the international surgical community as well as several economists and public health visionaries. With input from surgeons, a chapter on surgery in Disease Control Priorities reported that as much as 11% of all disease may be treated, cured or palliated with surgical intervention\(^5\). Many scholars, particularly clinical scholars, believe this to be a significant underestimation\(^6\). This estimate of surgery’s role in decreasing disability and premature death has galvanized the surgical community and others passionate about global public health to better define and more properly assess the role of surgery within global public health. Greater resources have begun to be committed, programs developed and awareness improved regarding provision of essential and emergency surgical services worldwide\(^7\). Still, the ability to provide surgical services and safe anesthesia in LMICs does not match need or interest, and lags to the extent that many areas of the world remain without access to surgical care.

Many international organizations (IOs), non-governmental organizations (NGOs) and private volunteer organizations (PVOs) provide surgical services in these settings. The impact of these services on unmet surgical need, as well as on surgical and anesthesia infrastructure and manpower, has not been adequately analyzed. In LICs, it is likely that these organizations have a significant impact on individuals and populations where surgical care is otherwise limited or unavailable.

**Historical Significance of Medical Missions, Humanitarian Aid and Overseas Surgical Provision**

Physicians have traveled to underserved areas within their own countries and overseas to help others for as long as such travel has been possible\(^8\). Small and large scale medical missions, humanitarian aid delivery and volunteerism have been prominent within the medical community throughout the last century and much longer. Since the end of WWII, and again following the Cold War,\(^9\) the role of medical non-governmental organizations (NGOs) has burgeoned. The volume of individuals affected by natural disasters and man-made conflicts results in millions stripped of vital resources, including access
to basic health care\textsuperscript{10}. This at-risk population is increasing as economic and political factors force more people to live in unstable environments\textsuperscript{11}.

While the impact of short term medical teams, including surgical missions, is debated and often criticized\textsuperscript{12}, what is difficult to dispute is the incredible need for emergency and essential surgical services in LICs. This obvious need motivates myriad international and multinational organizations to provide surgical services in LICs. Provision of emergency surgical aid in areas of conflict and following natural disasters is often supported as a key component of disaster response, with hundreds of thousands of life saving operations provided by surgeons of the International Committee for the Red Cross\textsuperscript{13} and Doctors Without Borders\textsuperscript{14}. Surprisingly however, these critical interventions and even emergency obstetrical services do not currently attract funding from some of the most powerful and influential global health organizations and international donors.

Beyond providing services during emergencies, many international organizations provide the only surgical care available, especially for subspecialty services such as plastic surgery, urology and ophthalmology for which locally trained physicians may not exist. Anecdotal examples of the life-changing role of such short term visiting teams are in abundance, but until recently there has been little research on the collective and cumulative outcomes and long term impact of these short term interventions on the populations served. Hundreds of thousands of life-altering procedures have been performed on women with VVF's and children with cleft lips and palate who would otherwise be destined to live lives of isolation and marginalization\textsuperscript{15, 16, 17}. But true effectiveness measures of these efforts are hard to come by and detailed reporting has often fallen victim to limited resources and manpower within these non-profit efforts.

Critics of short term international medical efforts, including humanitarian aid and disaster relief, cite many reasons why dollars and time should be otherwise invested. Recent efforts to prioritize surgical interventions\textsuperscript{18, 19, 20} in LMICs, and to provide models of surgical sustainability and cost effectiveness\textsuperscript{21, 22, 23} may inform this discussion and convince the global community that appropriately applied surgical interventions do improve public health.

However, the dependence of the short-term mission model on individual champions can make sustainability quite fragile. Furthermore, if work is done
in parallel, rather than in concert with local systems and medical professionals, it threatens to undermine and further weaken local systems. These realities further underscore the need for investments in manpower through teaching and training and an emphasis on strategic partnership as being absolutely essential. What needs to be better communicated perhaps is that these issues are well appreciated by most in the surgical humanitarian aid community and that a majority of programs actively address these important factors.

William Easterly cites the dangers of “well meaning compassion” in this sphere.\textsuperscript{24} Unintended consequences are not uncommon and the value of self awareness and self assessment cannot be overstated. There is room for reflection and improvement, and this involves the honest and independent evaluation of the surgical services being provided, including better situational awareness of the burden of surgical disease and what perpetuates it, and the short and long term outcomes of surgical and anesthesia humanitarian efforts.

In addition, the numbers of anesthesia providers and surgeons involved these efforts and the scope of their work is another unknown variable. Limited available reporting in the international literature suggests that surgical aid encompasses a diverse spectrum of services offered\textsuperscript{25}. For many large international organizations, surgical contributions can be tracked through publically available annual reports, while among many small organizations and groups, such information tends to be gathered for internal usage or only anecdotal. These small, committed organizations pose perhaps the greatest challenge in capturing data and tracking outcomes. But they are nonetheless an important component of understanding both the history and the impact of international surgical missions.

**Role of Non Governmental Organizations in Surgical and Anesthesia Delivery and Monitoring Unmet Surgical Need and Outcomes**

Hundreds of organizations provide emergency, essential and specialty surgical care in remote low income areas worldwide\textsuperscript{26}. The US State Department provides a registry for private volunteer organizations\textsuperscript{27} (PVO’s) which includes hundreds of US and UK based medical organizations. It is possible that many more go unregistered and unrecognized, but nonetheless provide valued services to those in need. Similar surgically focused databases exist at the American College of Surgeons through Operation Giving Back and the American Society of Anesthesiologists through the Society for Pediatric Anesthesia.
In LMICs, NGOs compensate for inadequate local infrastructure by delivering surgical services and providing education to local anesthesia and surgical caregivers. Also recognized is the role that these NGOs play in creating or strengthening existing infrastructure through systems and institution building. Beyond education, improving infrastructure is commonly accomplished through properly equipping and supplying partner hospitals in LMICs. As with all humanitarian interventions, the donation of anesthesia and surgical equipment and medications must be thoughtful and appropriate,\textsuperscript{28} Availability of electricity, local voltage, and other practice considerations such as maintenance and servicing equipment must be considered. Stories of store rooms filled with inappropriate medical donations are common in LMICs, and are tragic reminders that donations frequently represented the assumptions of the donor rather than the need of the recipient.

Recently, the first known multi-agency survey of IOs, NGO and PVOs was done to assess the work being done and the data being collected by this cohort that might inform advocacy and future efforts to tackle the burden of surgical disease. The survey suggests that a majority of organizations do track volume of procedures and at least immediate surgical and anesthesia outcomes\textsuperscript{29}. Also examined were whether and how educational support was provided and the manner in which these organizations interact with local health care systems\textsuperscript{30}.

Many IOs and NGOs are sensitive to their limitations and admit that while there is little time and few resources to commit to data collecting and epidemiological activities, they are aware of the importance of recording and measurement of outcomes for purposes of planning, quality improvement and even donor engagement. It is clear that enabling a greater commitment to collection and evaluation of data from short term surgical missions is in order. Evaluation of the topic by the Harvard Humanitarian Initiative\textsuperscript{31} during its 2009 Humanitarian Action Summit suggested that IOs should commit to short and long term follow up of surgical outcomes and recommended collaboration to share such information with the international community in a meaningful way.\textsuperscript{32} If the situational knowledge, outcomes data and impact of these efforts could be captured and leveraged communally, great advances will be possible in understanding the surgical burden and what has been done to address it thus far.
Anesthesia and Surgical Education and Training in LMICs: The Role of Collaborative Partnerships

A critical element in addressing unmet surgical needs is strengthening the surgical and anesthesia workforce in LMICs. Partnerships have the potential to provide appropriate, culturally sensitive and sustainable education, training and delivery of services in LMICs. In the academic realm, recent work by Riviello\textsuperscript{33}, et al, reveals a growing interest among surgical training programs to formalize such international academic partnerships and educational exchanges. Powell\textsuperscript{34} et al has demonstrated the level of interest and engagement among US surgical residents, Jense\textsuperscript{35} demonstrated similar interest among anesthesia residents, and a multitude of studies have demonstrated a growing demand for such educational offerings among medical students.\textsuperscript{36, 37, 38} Such partnerships, by definition, benefit countries in need of additional resources and manpower, as well as equipping a generation of surgeons and anesthesiologists to remain engaged in creating and sustaining international professional relationships and a stake in global health.

Of course training and education must be undertaken in concordance with efforts to develop a reliable and resilient system by providing adequate funding and professional support to prevent attrition, improve and maintain equipment, and ensure access to medications and supplies. A strong argument can be made that this understanding of the system’s impact upon health outcomes is a critical component of the educational process. In addition, there is the potential to further strengthen both educational endeavors and the delivery of care by marrying the resources, skill sets and local knowledge available to the capacity of IOs, PVOs and NGOs through meaningful partnerships. In fact, many, if not most, NGOs consider educational exchange to be a cornerstone of their mission and thus make important contributions to the sustainability of their work in this way.

Professional societies as well, prioritize educational support as manifest through formal international programs such as the American Society of Anesthesiologists’ Overseas Teaching Program (OTP). OTP pioneered training of non-physicians to provide safe anesthesia in Africa beginning in 1991\textsuperscript{39}. As OTP grew, leveraging the support of a volunteer network from the United States and Canada, it eventually merged with the education programs of the World Federation of Societies of Anaesthesia (WFSA.) These unique and sustainable programs educate general anesthesiologists and specialists in LMICs, and responsibly prevent brain drain by teaching in country, rather than supporting training in resource rich countries where individuals are more likely to want to stay at the end of their training. Surgical initiatives such as the Pan African Association of Christian Surgeons, are also structured to prevent the exodus of trained surgeons to resource rich counties, by providing rigorous locally
available surgical residency training designed to increase the indigenous surgical workforce.

Collaboration: Academic Partnerships, IO and NGO Collaboration with National Health Care Systems

An opportunity exists for collaboration among key components of the spectrum of surgical care and safe anesthesia in LMICs. While some may consider this a utopian ideal, recent discussions indicate that many individuals, organizations and initiatives believe that such collaboration is not only possible, but essential to communicating the role of surgery within humanitarian aid and global health\textsuperscript{40}. Each with unique perspectives, IOs such as the WHO, NGOs, academic centers, and national health care systems have collected important data on population health, local infrastructure, access to surgical services, unmet needs, and outcomes of services provided. With such a vast and dynamic surgical landscape that remains to be described, collaboration and cooperation has the potential to expedite and greatly improve the scope and validity of information needed and to create a larger voice for the surgical crisis within the global public health community.

Barriers to collaboration include sensitivity of organizations and nations regarding confidentiality of patient data and transparency of outcomes, the lack of a pooling mechanism to collect and analyze data, and concerns about the implications of publicizing outcomes on funding, reputation, etc. With thoughtful, responsible input, computer databases can be constructed to enable confidential sharing of information between organizations, nations, institutions, and programs. Open and honest dialogue must be at the center of discussions on the responsible and constructive sharing of such information.

The Role of Professional Societies

Professional anesthesia, surgery and public health societies have enormous potential to support international surgical delivery, education and training in LMICs, guide IOs/NGOs and PVOs in delivery strategies and outcome measurement, engage volunteers, and advocate for improvement in the international provision of safe anesthesia and surgical interventions.
While many individuals desire to contribute to international needs, some find it challenging to investigate the myriad opportunities to find the information that they need and the direction they desire. The American College of Surgeons through Operation Giving Back\textsuperscript{41} and the Society of Pediatric Anesthesia\textsuperscript{42} have provided robust databases which connect interested volunteers with reputable organizations and credible opportunities for the better part of the last decade. The American Society of Anesthesiologists\textsuperscript{43} and the International College of Surgeons\textsuperscript{44} have growing interest in the provision of surgical care in low resource settings, and also have programs that encourage and support volunteers in participating in delivering surgery and anesthesia.

Professional societies can and must play a formative role in improving the standards of surgical and anesthesia care through partnerships with surgeons in other countries, by supporting their membership with valid and valuable information on the subject and by advocating for appropriate resources and programs to bring about necessary improvements in safety and access. For example, the WFSA\textsuperscript{45} provides guidelines for the safe delivery of anesthesia in LMICs, and through efforts such as the Global Oximetry\textsuperscript{46} (GO) Initiative and the WHO Safe Surgery Saves Lives\textsuperscript{47} advocate for routine use of pulse oximetry and surgical check lists even in the most remote corners of the world.

**Role of Professional Partnerships, Research, Data collection and Outcomes Analysis**

Available research and statistics to support the value of surgical delivery in LMICs is insufficient. The global health community remains skeptical about the role of surgery within public health, and has yet to endorse the impact of surgical intervention in LMICs or fund efforts to explore it. Data collection and outcomes analysis is critical for this dialogue. But as stated above, few medical organizations functioning in LMICs have the capacity or capability to measure outcomes, and fewer still have the resources or prioritize an interest in analyzing the few outcomes that are collected. Therefore, the role of professional partnerships in this process is pivotal.

Care must be taken, of course, to ensure an ethical approach to research and data collection in LMICs, and to ensure that the results benefit the country from which the data comes and do not merely support an academic agenda. While it is hypothesized that sharing outcomes will support more surgical infrastructure, education and training, this has not yet been tested. But care
cannot be delayed waiting for such “proof”. Instead, delivery of care must proceed, but with an awareness of how such efforts fit into the bigger picture and unbiased mechanisms for collecting needed data.

**Responsible Delivery of Humanitarian Aid**

Cognizant of the valid concerns of critics and the pitfalls that have been described in the delivery of international aid, the need and the potential for a coordinated, collaborative, comprehensive and strategic approach to anesthesia and surgical aid in LMICs is great. The way forward depends upon:

- Assessing the needs of populations served to deliver requested and needed services rather than empiric solutions
- Cultural sensitivity and appreciation for non-medical factors that influence success
- True partnerships among stakeholders, including local health care providers, that extends from delivery of care, analysis of data, and design of needed systematic solutions
- Pooling of data and commitment to outcomes assessment and transparent reporting for the purposes of program evaluation and quality management
- A focus on education and training that sustains a local workforce

**Conclusions**

The role of surgery in global health and the role of anesthesia in safe and improved surgical outcomes must no longer be questioned. In fact, it must be supported, invested in and advocated for at the highest levels of global health, governmental and professional organizations. While the data necessary to convince policy makers and donors may be difficult to obtain, the indisputable need for such data compels increased attention and action. Unmet surgical need must be defined in LMICs, surgical and anesthesia outcomes must be monitored, infection and death rates must be measured, and a commitment to responsible delivery of sustainable surgical and anesthetic care must be made. While many will claim these to be unattainable goals, setting such an expectation is a first step forward.

Access to safe, timely, appropriate surgical care is a fundamental component of a well-functioning health care system and must be recognized as such. A
fundamental element of ensuring such access will come from empowering local medical professionals to become more expert in surgical and anesthesia care.

LMICs are known to have the largest burden of disease and the fewest health care workers\textsuperscript{48}. Little is known specifically about numbers and types of surgical and anesthesia providers in these countries, but it can be assumed from the low number of physicians overall\textsuperscript{49} that there are few, if any, skilled surgeons or anesthesiologists working in these LMICs. With IOs and NGOs providing services in LMICs that partially bridge the surgical gaps of unmet need, these organizations may be well positioned to monitor and report on the burden of surgical disease, workforce data, outcomes data, and key influencers. As more academic partnerships are forged and supported by professional societies, the foundation for robust and responsible research is attainable. It is hoped that the importance of such information and the appropriateness of organizations and institutions contributing to its collection will lead to greater resources being committed to sustainable solutions that build infrastructure and workforce in anesthesia and surgery.

As a bridge to this desired result, global humanitarian outreach and partnerships must be fostered for their contributions to improved infrastructure, education and training. NGOs must be supported in their efforts to provide excellent surgical and anesthesia care, and their education and training initiatives must be bolstered. NGOs and IOs must be empowered to take the next step beyond tracking short and long term outcomes, to publicly sharing their data in order to elucidate the impact of surgical intervention in diminishing the burden of disease. Professional organizations in the developed world can play an important part in bringing about sustainable solutions to these global health care problems and must provide leadership and support for initiatives which will improve anesthesia and surgical delivery worldwide.
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