1 Disparities in Global Surgical Access and Outcomes: Current Estimates and Models of Global Engagement

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In this chapter, we will briefly outline some of the current initiatives in global surgery that focus on surgical care for vulnerable populations primarily in low and middle-income countries (LMICs).

In recent years, global disparities in surgical access and outcomes have gained greater attention. In 2015 specifically, a number of related initiatives have launched and may provide a template for further work in various surgical specialties. In this chapter, we will outline some of these initiatives within the context of global health initiatives, discuss models for global engagement, and propose possible areas of consideration to increase vascular surgery capacity in resource-poor areas.

Recent Global Health Initiatives

In the past 15 years, global health initiatives have been led by the eight United Nations Millennium Development Goals (MDGs), with several of these goals impacted by treatment of surgical conditions [1]. As the time frame of the MDG's have come to an end, significant debate in the last year has surrounded the adoption of a new set of seventeen Sustainable Development Goals (SDGs) as a guide for low and middle-income countries. Great controversy has surrounded the metrics for the SDGs, with few metrics directly dealing with surgical care, although many of the thirteen targets within the SDG focused on health, require surgical and anesthesia care [2].

Within the broader context of global health, there has also been great debate around the approach of programs, with the emergence of a predominance of "vertical" health initiatives—initiatives focused on a single disease, or group of diseases with a high burden in low-income countries. The best example of this approach has been initiatives such as the Global Fund for HIV, tuberculosis, and malaria, and other programs directed at these three infectious diseases. Simultaneously, there has been recognition that while infectious diseases do pose a significant burden on poor countries, the burden of non-communicable diseases (NCDs) is steadily growing and the burden is currently greater than that of infectious diseases [3]. NCDs include diabetes, coronary disease, and cerebrovascular disease, as well as cancers.

Many of the risk factors that contribute to coronary disease also predispose populations to vascular disease. Many LMICs are seeing a undergoing an epidemiologic transition from primarily infectious diseases, and vaccine preventable illnesses, to a double burden of communicable and non-communicable diseases. Thus a growing emphasis has also been on the development of programs directed at these conditions. In addition, there has

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been concern that programs directed at vertical initiatives have failed to improve the "system" as a whole, with surgical programs, those that depend on a functioning health system, failing to develop as readily. Numerous recent initiatives have attempted to raise the profile of surgery in global health, and the following section will address some of those that emerged in the last year.

Lancet Commission on Surgery (LCOS)

The Lancet Commission on Global Surgery assembled a large group of global experts and through a series of meetings and an extensive research program made numerous estimates about the global burden of surgical disease, and global capacity for surgery. Estimates from the LCOS were that approximately 30% of the global burden of disease is amenable to surgical intervention [4]. The five key messages of the LCOS were:

- *an estimated five billion people globally lack access to surgical* care—The Commission proposed a group of three "bellwether" procedures (caesarean section, laparotomy, treatment of open fracture) as those that signify a system operating at a sufficient level of complexity to do most other surgical procedures; efforts to validate this group of procedures are underway.
- *33 million people face impoverishing expenditure related to surgical care yearly*; modeling work based on smaller studies confirms that many patients pay high out-of-pocket expenditures for surgical care, and are not protected from financial risk.
- *Investment in surgical and anesthesia services is affordable, saves lives, and promotes economic growth*—much of this data has been based numerous analyses of the cost-effectiveness of surgical care that have demonstrated favorable estimates especially for emergent conditions.
- *Surgery is an indivisible, indispensable part of health care*—specifically, universal health coverage is an essential component of the global health agenda post-2030, but the roadmap to achieve this coverage, especially across the various surgical disciplines, is less-well defined.

One of the early priorities since the Commission launch has been the promotion of surgical indicators amongst other health-related development indicators, and the documentation of country-level "dashboards" to profile these priority areas above as a component of public health, as has been done in Zambia.

Disease Control Priorities, 3rd Edition (DCP-3)

As another guide for policymakers, health planners, and donors, a third edition of the Disease Control Priorities in Developing Countries was launched earlier in 2015, including a volume on Essential Surgery [5]. The group, as previous groups had done, defined a group of essential surgical procedures based primarily on burden and cost-effectiveness of treatment. Key messages from this group also have direct implications for surgical development globally:

- *1.5 million deaths could be averted each year through essential surgical procedures*; a majority of these essential procedures cover trauma and emergency general and obstetric surgery.
- *essential surgical procedures are cost-effective, and 28 of 44 procedures can be provided at a first-level hospital*. While this specific "package" of conditions and required procedures has not been evaluated in LMICs, several studies have examined the capacity of selected facilities in LMICs to treat these conditions, showing numerous gaps and a limited coverage for both emergency and elective procedures. Gaps cover human resources and infrastructure required to deliver care.
- *Strategies such as "task shifting" (performance of a range of procedures by a cadre of non-physicians) have expanded coverage, especially in rural areas, for numerous countries that have*

adopted this policy (such as Malawi, Mozambique, Tanzania, Zambia). Some countries have chosen not to adopt such a policy due to concerns within their medical community.

- *Substantial disparities remain in perioperative mortality rates between HICs and LMICs, thus underscoring the need for safe perioperative care*. The provision of safe anesthesia care remains a critical step for any scale-up effort. Numerous groups such as the World Federation Societies of Anesthesiologists (WFSA) are critical in this regard, as are programs such as the Global Pulse Oximetry Initiative, and those training more providers for safe anesthetic care.
- *The cost-effectiveness of essential surgical procedures supports the need to invest in surgical care to achieve universal coverage*—a very similar message to the LCOS and one that highlights the need for providers of children's surgery to continue estimating the cost-effectiveness of the interventions we currently provide or scale up (by adding providers, infrastructure, services, etc).

World Health Assembly (WHA) Resolution on Emergency and Essential Surgical Care

Another recent critical development is the passage of the WHA Resolution 68.15 to "Strengthen Emergency and Essential Surgical Care as a component of universal health coverage" [6]. This was a key event in terms of advocacy for surgical providers and groups focused on care in LMIC settings. The resolution suggests many critical areas of action, including the integration of emergency and essential surgical care within primary care facilities and first-level hospitals as a key element to reaching universal health coverage. This resolution thus lends even greater urgency to adapting locally endorsed "packages" of surgical care that can be integrated through health facilities and other elements of the health system. Within other surgical specialties, the Global Pediatric Surgery network has also proposed a similar capacity guideline for a broader group of pediatric surgical conditions [7]. In the trauma community, basic resources at various levels of the health system have been proposed and used as capacity guidelines [8]. This type of approach is critical at national and regional levels, detailing resource needs and gaps, based on evidence of local outcomes. Such a process will most likely be successful if driven by local stakeholders, and supported by the donor community and other groups engaged in global surgery provision. This type of approach could be tailored to any surgical specialty and integrated into local surgical development plans depending on local priorities.

The type of work done through these initiatives may inform the approach that could be taken for vascular surgery. For example, some of the questions below may highlight an approach that could be useful:

- What is the burden of conditions amenable to vascular surgery in LMICs and how are they distributed geographically?
- What are the "essential" vascular surgery conditions that are prevalent, and treatable, and how cost effective are they in LMICs?
- How many lives could be saved and how much disability averted if the needed care could be provided?
- What are key components of vascular surgery capacity in LMICs in terms of workforce and infrastructure and what are the capacity deficits?
- How can the diagnosis and treatment of these conditions be integrated into existing surgical and other health initiatives?
- How have these services been scaled up in resource-poor areas and what lessons can be learned?
- What is the estimated cost of scale up and are there low cost alternatives to diagnosis and management (compared to high income settings)?
- Are there skills in diagnosis and treatment that could be provided by non-physicians or general doctors, especially in rural parts of LMICs?

Models of Global Surgery Engagement

Numerous models of global surgery engagement have been used to augment capacity and increase access to surgical care in LMICs. This may be relevant to groups with an objective to attempt this for vascular surgery.

Most charitable programs primarily address elective conditions. They range from free standing faith-based hospitals such as CURE that provide neurosurgery and other specialized children's surgical care in low-income countries; to groups such as Operation Smile and Smile Train that treat craniofacial anomalies [9]. While the former funds teams from high-income countries to travel and provide care in LMICs, the latter funds local providers to perform operations for specific conditions such as cleft lip and palate. Many primarily service-based surgical charities such as the above have in recent years shifted more to a model of capacity building, as exemplified by Operation Smile that created a specialty hospital India. Others, such as Mercy Ships and The Comfort, that provide surgical care on ships for populations in need, remain primarily service-based. Other organizations such as the Red Cross and Doctors Without Borders, provide primarily surgical care to populations in conflict settings.

Specialty hospitals have been shown to be cost-effective in treating niche conditions, but a bigger question and challenge for global surgery has been about how surgical systems can be developed as a whole. For example, the types of systems in place to treat injuries and abdominal emergencies require a certain level of development across the entire range of hospital services and cannot be addressed as readily through models that focus exclusively on elective conditions.

In addition to these charitable platforms, academic partnerships between HICs and LMICs have also proliferated in recent years with a focus on collaborative capacity building activities [10]. These activities have included a wide range of activities such as

- visiting faculty from HICs to LMICs for various time periods;
- collaborative research activities;
- development of training courses suited to the resource poor area;
- clinical training opportunities for LMIC faculty and trainees in HICs.

In addition, faith-based groups such as the Pan-African Academy of Christian Surgeons have established post graduate training programs in LMICs and have made major contributions to the surgical workforce in these countries [11]. A unique program in Rwanda is midway through a 7-year grant from the United States Agency for International Development to the Rwandan Ministry of Health to fund post-graduate training mainly through visiting American faculty. The outcomes of this program may also inform future efforts. In addition, academic societies and professional organizations in HICs have increasingly devoted segments of their scientific programs devoted to LMIC surgical care, and have assisted LMIC surgeons to attend their conferences and visit selected institutions.

Other areas of focus include programs to innovate technology appropriate in resource-poor areas. The last several years have seen an increase in device development such as prosthetic limbs, ventilators, and anesthesia machines, to name a few designed for "extreme affordability" [12]. The concept of reverse innovation—i.e. harnessing the economy of care in resource poor areas to inform more efficient surgical care in HICs, is also gaining traction. However, much more work is needed to identify and promote innovation of technology appropriate to the resource poor setting.

Conclusion

Global surgery has gained great momentum in the last several years, especially in 2015, with great opportunities to integrate with the changing context of global health initiatives and priorities. The burden of surgical conditions is gaining greater

recognition in global health, as are the substantial disparities in access and outcomes for surgical care. There is a substantial need for scholarly work relevant to the resource-poor setting to augment surgical capacity in these areas. Many models of global surgical collaboration exist, all with varied areas of focus, but most successful collaborations depend on the presence of "local champions" or "change agents" to move the agenda forward. Surgeons must take the lead, through collaborative teams, to ensure that progress in the surgical specialties reaches those in greatest need.

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