



## Global Neurosurgery: The Unmet Need

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Globally, the lack of access to basic surgical care causes 3 times as much deaths as HIV/AIDS, tuberculosis, and malaria combined. The magnitude of this unmet need has been described recently, and the numbers are startling. Major shifts in global health agenda have highlighted access to essential and emergency surgery as a high priority. A broad examination of the current global neurosurgical efforts to improve access has revealed some strengths, particularly in the realm of training; however, the demand grossly outstrips the supply; most people in low-income countries do not have access to basic surgical care, either due to lack of availability or affordability. Projects that help create a robust and resilient health system within low- and middle-income countries require urgent implementation. In this context, concurrent scale-up of human resources, investments in capacity building, local data collection, and analysis for accurate assessment are essential. In addition, through process of collaboration and consensus building within the neurosurgical community, a unified voice of neurosurgery is necessary to effectively advocate for all those who need neurosurgical care wherever, whenever.

The concept of global health includes addressing a wide range of health issues encompassing the developed and the developing world. Such endeavors highlight the inequalities in health services around the globe. Although these

disparities are real, and it is essential that they be addressed, the disparities in surgical care often are even more significant. When taken to the realm of specialty care such as neurosurgery, services often go from being a disparity to a complete absence. The cost in lost lives, quality of life, impact on families, and financial burden is enormous.

Traditionally, global health responses have emphasized basic medical needs, conceptualizing that surgical needs were in some way costly and resource-intensive, and would build upon the resolution of the medical needs. A significant change in thought is taking place at this time as several forces have come together to understand that surgical care, including neurosurgical, is an “indivisible, indispensable part of health care.”<sup>1</sup>

2015 is a watershed year for surgery with the realization of surgery as a global health priority. The crescendo began a decade ago as isolated articles, editorials, and comments appeared calling for the global health community to address the “neglect” of surgery in global health priorities.<sup>2-5</sup> The recent wave of excellent research has produced an understanding that we must address the billions who lack essential surgical services and millions that will die as a result.

In subspecialties of surgery such as neurosurgery, the deficits are profound. Although areas of the developed world may expect a ratio of 1 neurosurgeon per 80,000 patients, large areas of the world suffer ratios of 1 to 10 million.<sup>6</sup> This finding assures that care is not delivered except in the very fortunate happenstance where people are able to come to the front of the line for such care, almost always based on ability to pay—leading to further disparities in accessibility on top of availability. The fact is, surgery—particularly subspecialties such as neurosurgery—is

### Key words

- Essential surgery
- FIENS
- Global neurosurgery
- Global surgery
- Health disparity
- Health inequality
- LMIC
- WFNS
- WHO

### Abbreviations and Acronyms

**FIENS:** Foundation for International Education in Neurological Surgery  
**HIV/AIDS:** Human immunodeficiency virus/ acquired immunodeficiency syndrome  
**LMICs:** Low- and middle-income countries  
**UN:** United Nations  
**WFNS:** World Federation of Neurosurgical Societies  
**WHO:** World Health Organization

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a luxury in low- and middle-income countries (LMICs). According to some estimates, 74% of all major surgeries worldwide were performed in the wealthiest third of the world's countries.<sup>7</sup>

To give an idea of the “neglect” of surgical services in global health, the United States, the largest single global health donor, will spend 79% of its global health funds on human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS), tuberculosis, and Malaria in 2015.<sup>8</sup> Indeed, infectious disease historically has dominated global health priorities. In 2000, the United Nations (UN) Millennium Development Goals were agreed on by all 191 member states at the UN Summit. Of the 8 goals, number 6 specifically named HIV/AIDS, malaria, and tuberculosis as priorities.

Billions of dollars have been channeled in a coordinated effort to combat these diseases with gratifying results: death rates for all 3 diseases are declining.<sup>9</sup> Concurrently, the importance of noncommunicable conditions such as trauma, stroke, diabetes mellitus, cancer, and lung diseases is increasing. Because surgery per se is a form of intervention rather than a clearly definable diagnosis, it has been relatively overlooked as a public health priority. When the lack of access to surgery is examined as a public health issue, however, the impact is staggering.

The Lancet Commission on Global Surgery was established 2013 to “develop and assemble the best evidence on the state of surgery worldwide.” The findings of their report, summarized to follow, are alarming:

- 5 billion people worldwide do not have access to “safe, affordable surgical, and anesthesia services when needed”;
- In LMICs, 9 of 10 people have no access to basic surgical care;
- 18.6 million people die each year due to lack of essential surgical care, more than 3 times the number of deaths due to HIV/AIDS, tuberculosis, and malaria;
- 143 million additional surgical procedures are needed in LMICs each year;
- 2.2 million more surgeons, anesthetists, and obstetricians are needed;
- The cost of addressing this need is estimated at US \$350 billion by 2030; and
- The cost of not responding to this need will result in losses estimated at US \$12.3 trillion over next 15 years.<sup>10</sup>

The Disease Control Priorities Project examines the global burden of disease and cost-effective interventions. The third edition of the Disease Control Priorities, released earlier this year, devotes the entire first of 9 volumes to *Essential Surgery*. The highlights include the following:

- 5 million people died of injuries in 2012;
- 44 “essential” procedures were identified as highly cost-effective; and
- Implementation of these procedures would save 1.5 million lives/year.<sup>11</sup>

The figures highlight that a global health strategy must recognize that addressing this unmet surgical need is a moral, health, and financial necessity.

The nearly simultaneous release of these works earlier this year built a groundswell of support at the annual World Health Assembly of the 194 Ministers of Health of UN member states for the passage of Resolution 68.15 calling for “Strengthening of Emergency and Essential Surgical and Anesthesia Care as a Component of Universal Health Coverage.”<sup>12</sup> The resolution mandates the World Health Organization (WHO) and the ministries of health of all member states to implement policies congruent with the resolution. This resolution has significant implications for funders, including governments and the mega-private foundations such as the Gates Foundation.

Global neurosurgery can be defined as an area for study, research, practice, and advocacy that places priority on improving health outcomes and achieving health equity for all people worldwide who are affected by neurosurgical conditions or have a need for neurosurgical care. (modified from Dare et al).<sup>13</sup> It requires investing in each of the interdependent components of a health system. Anesthesiologists, operating room personnel, biomedical engineers, critical care services, and nurses need to work closely with surgeons from various specialties. Alliances that bring the various stakeholders together are necessary to build consensus through a collaborative process and to respond collectively to this unmet need and inequality.

A committed global neurosurgical community can transform the current landscape by training surgeons, advocating for the patients, and facilitating the delivery of essential and emergency neurosurgery to all those that need it. One bright spot is in the area of training. The Foundation for International Education in Neurological Surgery (FIENS) has been training neurosurgeons around the world since 1969. Some of the current projects in its 27 country sites include the Tanzania Neurosurgery Project, the Duke East Africa Neurosurgery Program, and the Cambodia Neurosurgery Support Project.<sup>14</sup> The World Federation of Neurosurgical Societies (WFNS) has an active program in postgraduate fellowship training in 21 programs in 13 countries specifically for LMIC graduates.<sup>15</sup> This program is complemented by a plethora of educational and training conferences and workshops that are co-organized with the host country neurosurgical societies. It should be noted that not only is the WFNS actively engaged in these conferences but the continental societies such as the Asian Australasian Society of Neurosurgery, Asian Congress of Neurological Surgeons, and the European Association of Neurosurgical Societies are regionally active in supporting training. The authors acknowledge there are other programs and projects dedicated to strengthening neurosurgical capacity, such as Project Africa One Hundred, All India Institute of Medical Sciences Neurosurgery Education and Training School, Cure Uganda, and many more. One of the key messages of this article is to illustrate the importance in identifying all of these projects and facilitating information sharing and coordination and collaboration not just amongst neurosurgical stakeholders but with the larger global surgery community.

As more neurosurgeons are being trained, attention is being shifted toward solving the problem of maldistribution of surgeons

usually in favor of large cities. FIENS and WFNS are simultaneously building infrastructure and decentralizing care for patients beyond the traditional concentration in the capital cities.<sup>16,17</sup> FIENS elevates a local system to a training program with outside support for the infrastructural needs; WFNS, through its Neurosurgical Equipment program, offers deeply discounted basic neurosurgical instruments and equipment. This plan ensures an ongoing stream of trainees working in the conditions in their own country. At the same time, development of regional centers can be facilitated by selecting resident trainees from regions without neurosurgical services and returning them to establish programs in their home region. This decentralizes the health care out of the capital and elevates those regional centers to treat head and spine trauma, benign brain tumors, congenital anomalies, hydrocephalus, and brain abscesses where it was previously not possible. In doing so, the infrastructure will raise the bar for anesthesia, critical care, and general surgery. A program such as this in Uganda has shown benefits throughout the health care system, not just to neurosurgical care.<sup>18</sup>

These worthy efforts deserve to be lauded and encouraged, and yet they are insufficient to address the current unmet need. Nine of 10 people in LMICs do not have access to lifesaving, disability averting surgeries.<sup>10</sup>

There is a global need, and indeed right, for access to essential neurosurgery such as trauma surgery, evacuation of hematoma, removal of benign tumors, and treatment of hydrocephalus. Compared to high income countries, essential and emergency neurosurgical care in LMICs are relatively inexpensive: the cost of evacuation of an intracranial hematoma in a government hospital in Cambodia is US \$300. The facility requirements are similar to an appendectomy. More can and should be done to increase access to essential and emergency neurosurgery at the district hospital levels by revamping the training of essential neurosurgery and developing innovative ways to deliver care where and when it is needed to whoever needs it. This requires neurosurgeons to act.

Disproportionate attention to “modern” and “high-tech” neurosurgical techniques—certainly a necessity for advancement of neurosurgery—may unintentionally subordinate basic operations, e.g., craniotomies for evacuation of hematomas. Ergo, training of essential and emergency neurosurgical capabilities and capacity at the district hospital level has been relinquished to non-neurosurgeons. Two examples follow:

The previously noted third edition of the Disease Control Priorities volume on *Essential Surgery* contains a chapter on Surgery and Trauma Care. Of the chapter’s 7 authors, 3 are trauma surgeons, and 4 are orthopedic surgeons. Despite acknowledging that head trauma is the leading cause of death from injuries in the developing world, only a single page is devoted to “Head, Neck, Face, and Spine” trauma whereas several pages are devoted to orthopedic injuries.<sup>11,19</sup> This may reflect the fact that the overall volume of relevant neurosurgical articles from resource-limited settings remain scant.<sup>20,21</sup> It is time we turned our attention to this educational need.

The *Surgical Care at the District Hospital* published by WHO is a manual for practitioners and for use in undergraduate and postgraduate programs, in-service training, and continuing medical education programs. The only neurosurgical procedure—“cranial burr holes”—appears under the section on orthopedic procedures.<sup>22</sup> Unless neurosurgeons organize and collectively

produce high-quality recommendations that are appropriate at the district-level hospitals in LMICs, this disturbing trend may continue.

The global neurosurgical community may consider the following suggestions:

- Increase the buildup of human resources. Additional neurosurgeons, nurses, operating room personnel, and anesthesiologists need to be trained by building capacity at current training centers and starting new programs. The concept of task-sharing—training of non-neurosurgeons in essential and emergency neurosurgery—should be explored to meet the current shortage quickly as possible. The Australian experience has shown this model to be safe and effective.<sup>23,24</sup>
- Encourage neurosurgical research from LMIC. From epidemiology to impact assessment of ongoing projects, locally collected data is critical in understanding and addressing the needs appropriately. FIENS projects have recently initiated collaborative research not only in clinical aspects of neurosurgical care but also in the public health issues such as access, inequalities, and economic burden. Removing the financial barriers to publishing should be considered for submissions originating from LMICs.
- Promote innovations that are practical and cost-effective. Procedures such as endoscopic third ventriculostomy along with low-cost shunts help reduce the barriers to hydrocephalus treatment in LMICs and simple stereotactic systems coupled with smartphones and tablets can bring benefits of surgical safety and accuracy at a fraction of the cost of the premium systems.<sup>25</sup>
- Advocate for addressing the unmet neurosurgical need. Raising awareness within the global neurosurgical community is one of the goals of this article. It is hoped that like-minded neurosurgeons will come together to build consensus, issue statements, and make recommendations that will influence the leadership of neurosurgery to make global neurosurgery a priority.
- Position neurosurgery as a key member of the global surgery community by fostering direct relationships with key organizations e.g., WHO and the World Bank, and by partnering with other specialties and stakeholders through global alliances such as the G4 Alliance. As projects aimed at implementation of the resolution 68.15 commence as anticipated, a common surgical database platform and a diagnosis/procedure classification system for monitoring is required. Neurosurgical compatibility and relevance requires representation.

The surge of surgical care as a global health priority this year has been referred to as “the surgery spring.”<sup>26</sup> The vision of safe surgical care accessible to all who need it is tantalizing. The momentum is palpable as similar themed articles appear not only in medical journals but also in lay publications such as the *New York Times*.<sup>27</sup>

Just as a handful of passionate and like-minded researchers and advocates have brought about this historical debut of surgical care in global health, the authors urge like-minded neurosurgeons to

convene and start the process of consensus building within the global neurosurgical community and collaborating with other stakeholders in global surgical care. A global problem requires a global response with shared vision and goals. As a key stakeholder,

our presence at the inner table is imperative as we join the global effort to ensure safe surgery to all who need it, whenever and wherever. This is an admirable goal, an achievable goal, and justifies a global neurosurgical call for action.

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