

The World of Anesthesia

An International Perspective

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Inaccessibility to basic surgical service is being increasingly recognized as a significant global public health problem. Lack of safe anesthetic care is a contributing factor. This review will outline the extent of the problem, some of the causes, what steps are underway to measure and address it, and how individual SPA members can substantially help improve the availability and safety of anesthesia in resource-poor regions of the globe.

The Unavailability of Essential Surgery

Compounding the challenges of deficient resources among low- and middle-income countries (LMIC) is the disproportionately high burden of disease (both surgical and non-surgical) in those regions. Three-quarters of all the world's surgical procedures are done for the wealthiest 30%, while the poorest third receive only 3½ % of surgical services¹ (put another way, each year in the poorer countries (spending < \$100 per capita annually) fewer than 300 major operations are done per 100,000 population, while in the wealthier ones (spending > \$1000 per capita) over 11,000 are done. Unavailability of anesthesia services contributes to the disparity.

Increasing interest in solving problems of distribution and quality of anesthesia services around the world are evident from increased publications in recent years, such as the dedication of entire issues in *Anaesthesia* (November 2007) and *Pediatric Anesthesia* in (January 2009).

Surgical Disease as a Public Health Problem

Lifetime disability and premature death from untreated surgical conditions accounts for a significant disease burden in many countries. Four groups of diseases amenable to non-complex surgical intervention have been described :

1. Trauma is responsible world-wide for one million childhood deaths each year, with over 95% occurring in the LMIC's³. Also, 95% of motor vehicle-related deaths also occur in LMIC's, although per capita vehicle ownership is less than 1/10th that of the US and Europe. This does not speak to the incalculable disability of survivors who have not had effective timely treatment of burns, fractures, or intracavitary injuries.
2. Obstetric complications such as obstructed labor, postpartum hemorrhage, and incomplete abortion are estimated responsible for the deaths of a half million women annually, many from preventable causes.
3. Emergency non-traumatic conditions, such as peritonitis, appendicitis and abscesses, if treated, would prevent permanent disabilities and deaths.
4. Elective surgical conditions for which treatment would prevent substantial lifetime disability include cataracts, hernias and congenital anomalies such as clubfoot, cleft lip/palate, and anorectal malformations.

As specialists in Pediatric care, we recognize that all four of these categories impact the health and survival of infants and children. Unfortunately, even when available within the LMIC's, sur-

gical services are concentrated almost wholly in capital cities.

Recently, the WHO has recognized that the traditional hierarchy of public health services (water, sanitation, infection control, and primary care) requires the addition of basic surgical care to the list of universally accessible services. The Global Initiative for Emergency and Essential Surgical Care (GIEESC) [<http://www.who.int/surgery/globalinitiative/en/>] is a collaborative effort of internationally recognized organizations and individuals to address unmet need and disability due to emergency surgical conditions.

Parallel with this effort, a working group of NGO's and individuals has begun the fascinating but arduous task of defining the scale of the worldwide burden of surgical disease⁴. While it has been estimated that about 11% of the world's disability (measured as disability-adjusted life years) owe to surgical conditions², detailed knowledge of surgical procedures, outcomes, and of unmet needs is often poorly collected, not readily available, or not shared for external evaluation¹. The BOSD working group seeks to develop common definitions, promote data collection in LMIC's and explore both barriers to access to surgical care and their resolution in low resource settings.

Causes of the anesthetist shortage

One of the most important barriers is the lack of suitably trained health providers. The numbers of health workers - anesthesiologists and surgeons among them - reaches unbelievably low numbers, especially in Africa, South Asia and many island nations. With only 10% of the World's population, Africa bears 24% of the global disease burden, but has only 3% of the World's health force; South Asia, bears a similar disproportion⁵. In rural India, only 22% of hospitals have a qualified anesthetist, and in many African countries, one anesthetist may be available for every million or more population⁶. The availability of physicians per capita in the lowest-development countries is less than 10% of that in the developed countries. Understanding the three components of the "brain drain" might suggest ways of addressing these deficiencies.

The first component is the emigration of trained personnel from middle and low income countries to the US, UK, Australia, Canada, and France. Among the reasons physicians emigrate are limited opportunities in their home countries, poor working conditions, lack of support or supervision, the quest for advanced training, better work environments, and improved life-style. In most underdeveloped countries from which physicians and nurses emigrate, their training is fully supported by free higher education. Thus, the social burden to the home country is two-fold: lost financial resources expended to support medical schooling, and loss of the trained personnel themselves. For 16 Sub-Saharan countries, the WHO estimates that over 50% of their physicians practice outside their country⁷. Seventy-five percent of all Ghanaian medical graduates in the past 10 years have emigrated⁸. Among Tunisian anesthesia residents graduating the past two years, over 70% are now practicing in France⁹. Conversely, in the English-speaking upper income countries (US,UK,Canada, Australia, New Zealand), 20-35% of all physicians are foreign trained¹⁰.

The second component of brain drain is an internal one. In dedicating extensive resources to combating infectious diseases, malnutrition, and other targeted health problems at an accelerated pace

the past five years, international aid agencies have unintentionally drained health providers from their communities¹¹. For example, one of the signature accomplishments of the G.W. Bush administration was the commitment of \$15B to AIDS therapy in Africa¹². An unintended consequence has been that the well-paying jobs created to carry out these programs have siphoned scarce health workers away from more-poorly paying government positions, leaving clinics even further understaffed. In-country maldistribution is also a major problem. Commonly, the richest segment of society receives a disproportionate share of government expenditures for health care, as health workers tend to congregate in the capital cities. In Haiti, for example, a survey done in the 1980's found that in rates of cesarean section in a large area of the country were close to zero, while among the affluent of the country rates were similar to the US.

Finally, attrition of healthcare workers is a major cause of significant loss. The deficiency of national or local political will to support training and clinics, lack of adequate remuneration, lack of professional growth opportunities, inadequate supervision, and unmanageable workload are all factors in driving healthcare workers out of their professions. Attrition due to AIDS itself also has had a significant impact in some regions. In the Lusaka district of Zambia, for example, AIDS-related deaths accounted for 37% of vacancies in nursing positions in 2006, an amount almost equal to the loss due to emigration¹³.

Besides salary, working conditions and having adequate medications and supplies needed to perform professionally also motivate health workers to stay in their own countries. In the Nigerian Ondo State, for example, when the government addressed these issues, along with improved infrastructure, the percent of nursing staff in rural areas more than doubled over three years¹⁴.

Pediatric Anesthesia in Developing Countries

Children represent more than half the total population in many low- and middle-income countries. Thus, untreated simple surgical conditions, leading to lifetime disability or early death, constitute enormous social and economic burdens for those countries. Examples include congenital conditions (club foot, cleft palate, congenital hip dysplasia, anorectal malformations), timely management of burns to prevent contractures of extremities or the neck, proper reduction of long-bone fractures, and simple inguinal herniorrhaphy. Surgery in children may be further hampered by concurrent medical problems such as malaria-induced anemia, malnutrition, HIV, or tuberculosis; by the lack of skilled surgeons and anesthesia providers in many rural areas; and by the lack of suitable equipment and facilities adapted for pediatric use¹⁵.

There is little information on a worldwide distribution of pediatric anesthesiologists, or even on the outcomes of surgery for children. However, there is little doubt that anesthesia-related mortality is a greater risk for children than in adults, and that the risk is higher when care is by an anesthetist who manages children infrequently¹⁶; the disparities may be higher in developing countries than in developed ones¹⁷. Our goal, then, should be to boost the anesthetic skills among our developing country colleagues in managing infants and children in particular.

Bolstering Anesthesia Providers and Their Skills

In order to address the need, several countries in South America, South Asia, and Africa have undertaken aggressive scale-up programs for health workers. While the initial focus has been on community and mid-level workers to manage a high burden of disease in primary care, training programs for specialties have also been developed¹⁸. Throughout Africa and parts of South Asia¹⁹,

nurses and other health workers have trained as anesthetists, to provide care where there are no anesthesiologists. While most of the non-physician specialists are nurses with additional training, in many countries secondary-school graduates are recruited for 3-4 year programs, which help avoid depletion of nursing numbers²⁰. Clinical officers have been successfully trained to provide anesthesia, cesarean sections, cataract extractions, and orthopedic trauma care²¹. Indeed, in many sub-Saharan countries Clinical Officers provide the majority of anesthesia care²⁰.

But non-physician providers require training and supervision (many have had only limited on-the-job experience), so anesthesiology programs are also essential¹⁶. LMIC countries that lack the small critical mass needed to sustain anesthesia training programs require outside assistance to 'prime the pump'. A joint program of the Canadian Society of Anaesthesiologists and the ASA's Overseas Teaching Program began the establishment of a four-year residency training program in Rwanda in 2006, modeled after a previously successful program in Nepal²². Over 10 year's time, the Nepalese program has trained²¹ anesthesiologists from which a core of in-country faculty has emerged²³. Reasons cited for the high rate of retention include high quality of training in all aspects of anesthesia including subspecialty and critical care; increased job satisfaction, parity of status with other faculty colleagues, and reasonable incomes. The Nepalese training program no longer depends on the CSA/ASA for faculty support. As of 2008, the Rwandan program has accepted three classes of residents, with the first expected to graduate in 2010. The undertaking is intensive, requiring regular rotations of volunteers and adherence to a full curriculum. Nearly 40 volunteers have gone so far to Rwanda, some accompanied by residents from North American programs. Teaching addresses basic anesthesia as well as subspecialties, including complex pediatric cases.

WFSA takes a lead

The stated mission of the World Federation of Societies of Anesthesiologists is "to make available the highest standards of anesthesia, pain treatment, trauma management and resuscitation to all peoples of the world and to disseminate the same amongst them." The educational activities are promoted through two committees, Publications and Education²⁴.

The Publications Committee produces a journal, *Update in Anesthesia*, which provides reviews in basic important topics in five languages. It is available in a print edition, as well as online at the WFSA website (www.anaesthesiologists.org - note the British spelling). Also available on the website is the Tutorial of the Week. SPA members are invited to contribute to any of the WFSA publications. In addition, the committee supports publication of a low-cost textbook of anesthesia (authored by Dr. Rebecca Jacob from Vellore, India).

The Education Committee's activities are centered on providing high-level training through several venues. It provides support for regional meetings and courses; provides teachers and speakers for training courses; and, as its flagship program, supports a network of anesthesia training centers. Training centers provide fellowship level experience for 3-12 months at a time in anesthesia specialties close to the home countries of qualified applicants²⁵. Costs are low, as the WFSA scholarship supports transportation, food and housing; fellows are not salaried during training. A Pediatric Anesthesia fellowship inaugurated the program in 1999 in Santiago, Chile. Since then, 30 fellows have completed Pediatric training and returned to their home countries²⁵. In several instances, those fellow are the only specialized pediatric anesthesia trained resources in their country. Fellowships are now offered at 11 centers worldwide

in general, pediatric, neuro- and obstetric anesthesia, pain management, and critical care. Proudly, SPA has committed to support a pediatric anesthesia fellow in Vellore, India.

Anesthesia Safety

Given the austere conditions, paucity of resources, and widespread lack of well-trained personnel, it is not surprising that peri-operative morbidity and mortality is quite high in some regions of the low- and middle-income countries. In a recent survey, Weiser estimated a worldwide surgical caseload of about 200 million per year, with an estimated overall major morbidity of 3% and mortality of 0.5% respectively. This would amount to a million peri-operative deaths and 7 million major morbidities annually worldwide. Published estimates from single hospitals in developing countries in the past decade suggest anesthesia mortality may be 1-2% in some, especially where the most common operations are emergency procedures (e.g. Cesarean)²⁶, so even a small reduction would effect substantially improved survival.

WFSA's Committee on Safety and Quality has recently published the 2008 revision of Standards for the Safe Practice of Anesthesia²⁷, which recognizes different levels of resources and intensity of surgical resources. By promoting a set of universally-applicable standards, the WFSA is expressing an expectation that all providers will strive for the highest levels of safety and quality improvement.

The World Health Organization, too, has recognized that safe anesthesia is a prerequisite to safe surgery. WHO's recent initiative, "Safe Surgery Saves Lives," includes a safety check list to be used in preparing for surgery. The program targets anesthetic safety, infection prevention, and communication errors; its adoption has been endorsed by over 250 international professional societies, health organizations, ministries, and NGO. Besides confirming identity, operative site, permit, and availability of resources (including blood), the checklist includes the application of a pulse oximeter. A recent report on its implementing the checklist eight hospitals around the world showed that intraoperative complications could be reduced by about a third and mortality by half. The effect was most prominent in austere settings²⁸.

Where to get an affordable, robust pulse oximeter? That is the object of a collaborative effort among the WFSA, the Association of Anaesthetists of Great Britain and Ireland, and GE Healthcare. The three main goals of the Global Oximetry Initiative include (1) provide an oximeter for every anesthetic; (2) train providers in its use and interpretation, and (3) design it to standards of quality, durability, and usability "that even you would use it." Presently, trials are underway in India, Uganda, Viet Nam, and the Philippines²⁹.

Safety for short-term voluntary medical missions has also been the focus of several recent publications, both from SPA's Committee on International Education and Service³⁰ and from two plastic surgical societies^{31,32}.

What can you do?

The dual burdens of inadequate access to emergency and essential surgical care, and the high risks of anesthesia in austere surroundings together constitute a significant global health problem which should be of concern to all anesthesiologists, and pediatric anesthesiologists in particular. One of the most pressing needs is for more well-trained anesthesia providers. SPA is already involved in a variety of ways. Anesthesiologists from South Asia and Africa can get fellowship training at the Vellore Hospital under a SPA-sponsored fellowship. Members of the SPA Committee on International Education and Service ("SPACIES") volunteer their

services on short-term trips, as well as the development of educational materials and programs. SPA members are invited to join or sit in on SPACIES discussions at all SPA meetings.

Even without traveling abroad, you can contribute your skills and resources in a variety of important ways:

1. Develop teaching materials for World Anesthesia and for the WFSA's Tutorial of the Week (<http://totw.anaesthesiologists.org/wfsa-education-resources/atot/>).
2. Share PowerPoint presentations on basic topics for the SPACIES lecture library. The goal is to have a collection of topics that could be used by international colleagues, or by itinerant SPA members on their voluntary trips abroad (contact Tae Kim, SPA member).
3. Contribute current educational materials - books, journal subscriptions (not just old journals), CD's etc, for use by providers with little library access. Many agencies are interested. A good site to find recipients is the University at Buffalo Health Sciences Library, (http://libweb.lib.buffalo.edu/dokuwiki/hsl-wiki/doku.php?id=book_donations). Note: you need to type the whole URL, as there are no links on the library's home page.
4. Volunteer to help cover obligations of your colleagues who can travel to help our overseas colleagues.
5. Tell your international colleagues about SPA's international discussion list at spacies-list-admin@pedsanesthesia.org. The site serves as a discussion of the particular issues of anesthesia in austere locations, and for surgical mission groups.
6. Contribute financial support for educational activities for international colleagues receiving in-country training. Excellent examples of programs deserving support include the WFSA Education and Publications Committees' programs (<http://www.anaesthesiologists.org/>) and Health Volunteers Overseas (www.hvousa.org/)

Of course, those who wish to travel have many options. A good place to start is the SPA website on the tab labeled "Volunteer Service Abroad" to find an organization congruent with your goals and needs.

As a leading international resource for pediatric anesthesia and critical care, the Society is in an excellent position to contribute to improving public health through improved access to surgical care and safe anesthesia for children around the world.

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