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# Developing pediatric surgery in low- and middle-income countries: An evaluation of contemporary education and care delivery models

Marilyn W. Butler, MD, MPhil*

*Department of Surgery, Oregon Health and Science University, 501 N Graham St, Suite 300, Portland, Oregon 97227*

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ABSTRACT

There are several different models of education and care delivery models in low- and middle-income countries (LMICs), and many endeavors combine more than one of the described models. This article summarizes the burden of pediatric surgical disease and discusses the benefits and shortcomings of the following: faith-based missions; short-term surgical trips; partnerships, twinning, and academic collaborations; teaching workshops, "train the trainer," and pediatric surgery camps; specialty treatment centers; online conferences, telemedicine, and mobile health; specific programs for exchange and education; and training in high-income countries (HICs), fellowships, and observorships. It then addresses ethical concerns common to all humanitarian pediatric surgical efforts.



## Background

As discussed in detail in the opening chapter, several recent studies including the *Disease Control Priorities*, Third Edition (DCP3) and the Lancet Commission on Global Surgery have outlined the enormous need for surgical care, particularly in low- and middle-income countries (LMICs).[1,2] The latest estimate from the Lancet Commission on Global Surgery is that 5 billion people lack access to safe, affordable surgical and anesthesia care when needed.[1] Many of the shortcomings in surgical care mirror those in other fields of medicine. For example, Africa bears 24% of the worldwide burden of disease, yet it claims only 3% of the world's health care workers and 1% of global health expenditures.[3] In Africa where it is estimated that 46% of the population are children 0–14 years of age, the unmet need for pediatric surgical services is particularly apparent.[4] These needs include not only congenital anomalies but also acquired diseases, blindness, and the sequelae of trauma, including injuries, burns, and fractures.[5,6]

Many factors contribute to delayed clinical presentations and the suboptimal delivery of pediatric surgical care, including poor roads and transportation, undependable power, a lack of safe water, poverty, malnutrition, cultural beliefs, and the inability to pay for surgical services, as well as limited medical facilities, a shortage of diagnostic imaging and laboratories, and the lack of safe pediatric anesthesia.[4–10] In addition, there is a severe shortage of surgeons, compounded by low salaries of health care workers in LMICs and an exodus to high-income countries (HICs) where research funding, hospital facilities, career opportunities, safety, and education for family members are all better.[4,7,11] In the United States, it is estimated that 1 pediatric surgeon is needed for every 100,000 children 0–15 years of age, yet in Africa there are as few as 1 pediatric surgeon for nearly 6,000,000 children 0–14 years of age.[4] Seeking better financial, professional, and social conditions, up to 90% of these African pediatric surgeons practice in large tertiary centers in major cities, rather than in rural areas where two-thirds of the population live.[4,6,8,12] To increase the disparity further, in some instances, an adequate facility might be available but not accessible to the patients who need surgical care.[6,9] For example, in Egypt, up to 80% of pediatric surgery is performed in newly built private children's hospitals, unaffordable to the general public.[7] Importantly, not only is there a shortcoming of surgeons at the current time, but too few pediatric surgeons are being trained to meet the needs in the years to come.[7]

All these facts point to the fact that unmet surgical needs is a public health matter, one that mandates priorities at the international level to address it.[13–15] In 2014, The World Health Organization (WHO) voted to include 3 surgical metrics in the Global Reference List of 100 Core Health Indicators.[16,17] The Global Alliance for Surgical, Obstetric, Trauma, and Anesthesia Care (the G4 Alliance) was launched in 2015 as a multinational organization advocating for neglected surgical patients.[18] Also in 2015, the 68th World Health Assembly of the WHO passed Resolution A68/15, calling for the strengthening of emergency and essential surgical care and anesthesia as a component of Universal Health Coverage.[19] Further advocacy efforts are underway to include surgery in the post-2015 Sustainable Development Goals (SDGs) that will be adopted by the 70th Session of the United Nations General Assembly in 2015.[20]

It is in this context that recent years have seen significant interest on the part of surgeons in HICs to volunteer their services to help

* Corresponding author.
*E-mail address:* mwbutler@gmail.com

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meet demands in LMICs, demonstrated by several surveys of medical students, residents, and fully trained pediatric surgeons.[21–25]

Motivations for volunteering are varied and can include such things as an interest in different cultures, social justice, and an opportunity to learn and teach with colleagues in resource-poor settings.[26] Many see the volunteer work as opportunities to connect with the reasons they entered medicine in the first place.[27,28] Others see chances to operate on conditions they seldom see in their home institutions. Some may even consider global health careers.[29] In the words of Welling and colleagues, "To go to an area where good care is not available, to provide services that can make a huge difference in the health and welfare of a fellow human being, to provide this service freely and without personal gain—surely these sorts of activities can be life-altering for both provider and recipient of care."[30]

Contemporary humanitarian efforts to help meet the high demand for pediatric surgery services and education in LMICs have taken several forms, which will be outlined below, along with their benefits and shortcomings. The list is not comprehensive, and many endeavors combine more than one of the described models. In fact, some simply classify charity work as either temporary or not, claiming that permanent specialty centers in LMICs where care is concentrated have better results, are more cost-effective, are more sustainable, and provide better training of LMIC surgeons than any of the short-term surgical trips.[31]

Regardless of the model of education and care delivery, the primary goal of global surgery should ultimately be to develop local capacity for sustainable surgical care.[10] Some underlying principles should be followed whenever humanitarian work is considered. Based on similar work by plastic surgeons,[32,33] the Global Paediatric Surgery Network Collaborative published a suggested list of guidelines that are summarized in Table 1.[34]

**Table 1**
Suggested guidelines for partnerships fostering pediatric surgical education and training in resource-poor settings (2013).[34]

| |
|---|
| Partners may be private organizations, hospitals, or academic institutions. Ideally, core values should include |
| Education, professional development, and patient safety. |
| Ongoing evaluation of intervention effectiveness and quality of care. |
| Explicit acknowledgment that visiting and host teams can each learn from one another. |
| LMIC hosts and international partners should participate in a needs assessment where strengths and weaknesses, as well as available resources, can be discussed |
| Needs assessments may be performed through group discussions, individual meetings with stakeholders, surveys, or other means. |
| Needs may require prioritization, and goal-setting with specific short- and long-term objectives. |
| Discussion of resources should include ways to maximize local resources and identify ongoing partnerships and initiatives to minimize duplication and maximize collaboration among international partners. |
| A mutually drafted memorandum of understanding (MOU) outlining shared goals and objectives that are regularly reviewed may facilitate the partnership. |
| To maximize chances of success |
| Tasks should be realistic and feasible within the framework of the host institution. |
| The collaboration and project should be endorsed by the authorities of the host institution (e.g., hospital and university management). |
| Partners should agree to become equally involved in the design and delivery of the educational and continuing professional development curriculum, and trainees should be involved in this process. |
| Host surgical faculty and trainees should negotiate a realistic time frame to be released from clinical duties to participate in educational and continuing professional development activities, so that the clinical environment is not depleted of medical staff and patient care is not compromised. The goal should be minimal disruption of ongoing daily work by host physicians, nurses, and other staff who might otherwise abandon scheduled tasks in order to accommodate visiting teams. |
| The focus of any direct clinical care should be to maximize opportunities for education and continuing professional development to the host health care providers, including trainees and ancillary staff. |
| All partners should seek to speak a common language or have translators available to facilitate didactics and one-on-one teaching. |
| Whenever research is being contemplated, a research agenda should be developed and prioritized, and collaborative research should translate to joint-authored publications and presentations. |
| Evaluation tools to assess success of skills transfer and capacity development may be developed. |
| The potential for "brain drain" should be acknowledged, and all efforts should be made to ensure training of surgeons who are committed to continue practicing in the host country. |
| Logistical considerations |
| Logistical issues such as medical licensing and physical safety of all staff should be discussed and arranged in the planning process. |
| Members of international partner groups new to the resource-poor setting should be oriented to clinical, ethical, and socio-cultural challenges of the practice, educational, and professional environment prior to travel. |
| For partnerships that include a focus on short-term trips, criteria should be established for case selection and follow-up, inclusive of safe anesthesia and analgesia. |
| Data and information storage may need to be developed in order to enable adequate evaluations and assessment of the processes and for clinical audit purposes. |
| Both teams should seek techniques that are suitable for the local environment, depending on the resources available and the pattern of existing local diseases. |

## Faith-based missions

For over 500 years, humanitarian medicine has been provided by faith-based missionaries, primarily originating from Europe and based on the Judeo-Christian ethic.[35] One of the earliest examples is the charitable hospital built near a church by Basil the Great of Cappadocia during a famine in fourth century Turkey.[36] Historically, many hospitals have been operated by religious mission groups,[9] and faith-based organizations have long history of providing clinical care and training local health care providers.[12] The history of Christian medical missionaries includes such figures as David Livingstone, Albert Schweitzer and others, who dedicated their lives to providing medical care for indigent and underserved populations, and many surgeons today continue to devote their careers to the care of people in resource-poor areas.

Faith-based hospitals and networks continue to serve a role in LMICs at the present time.[36] A report released by the WHO in 2006 estimated that 30–70% of the health infrastructure in Africa is owned or operated by faith-based organizations.[12,37–39] The CURE hospital network operates 10 hospitals in Africa, Asia, the Middle East, and Central America, focusing primarily on the treatment of neurosurgical and orthopedic diseases, while training local orthopedic residents.[40,41] CBM (founded originally as Christian Blind Mission) provides surgical care for a variety of disabilities in many of the poorest countries of the world.[42] Since 2002 the Pan-African Academy of Christian Surgeons (PAACS) has formed academic partnerships that are dedicated to education, training nearly 40 general surgeons and 6 pediatric surgeons at 10 different hospitals in Africa, including BethanyKids in Kijabe, Kenya.[12,43]

## Short-term surgical trips

Short-term medical humanitarian trips ranging from 1 day to 4 weeks have been the most common form of volunteerism to date, with over $250 million spent annually by hundreds of organizations and individuals.[10,28,35,44,45] Short-term surgical trips range from a single surgeon who may or may not be accompanied by others, to "surgical brigades" comprising large teams of nurses, anesthesiologists, and other medical personnel.[9,45] Some argue that care can be streamlined when fully staffed short-term surgical