



## Surgical outreach and microvascular surgery in developing countries

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### ABSTRACT

Due to the discrepancy between surgical demand and resources in Low-Middle Income Countries (LMIC), surgical outreach programs (SOP) have increased in popularity. In these resource-constrained healthcare environments, the resources necessary to perform basic head and neck procedures are often lacking, and offering microvascular reconstruction adds yet another level of complexity. Here we discuss the difficulties and challenges in establishing a SOP abroad and more specifically some of the challenges specific to microvascular reconstruction – including patient selection, burden of cost, lack of infrastructure and equipment, and patient follow up and outcomes. Although challenges certainly exist, we present the feasibility and the benefit for patient care as well as the role it can play in the foundation development of a low-resource region. The goals of the SOP must be well-defined, and incorporating microvascular surgery can be used as an adjunct to enhance the development of many aspects of the LMIC healthcare system. We present a model of care in which the initial focus is centered on providing safe care to these patients undergoing complex procedures, but after the development of a strong foundation, the focus can begin to include program sustainability and education.

### Introduction

Global Health collaborations between resource-poor and resource-rich health systems can have bidirectional benefits [1]. For the resource-rich participants, medical outreach can fulfill personal philanthropic goals and provide a service that may be otherwise unattainable by the recipients. It may also allow them to fulfill academic goals such as training domestic and international learners, developing relationships for research collaborations, and creating programs and infrastructure abroad. From an academic, service and infrastructure point of view, the resource-limited participants also benefit from these services. Global Health program development has inherent challenges and pitfalls. Nonetheless, short-term medical missions continue to increase in popularity [2]. The number of participants, overall mission, total cost (financial and resource), duration and frequency of trips by established groups have considerable variation.

Although several studies have tried to estimate the overall need, it is difficult to fully characterize the true burden of surgical disease in developing countries [3]. Resource-poor areas within developing countries are even more affected due to concentration of surgical services in large cities [4,5]. Even if basic surgical services are available, they are typically limited to patients that are able to afford surgery [4].

Despite the surgical need, the lack of surgeons is significant. One study looking at the surgical workforce in East, Central, and Southern

Africa reports a ratio of 0.53 surgeons per 100,000 population. Only 8% of the 1690 practicing surgeons in this region represent otolaryngologists, and they are not evenly distributed across the 10 countries participating in the study. For example, Ethiopia does not have a single otolaryngologist for its population of over 96 million people. Kenya has the highest number of otolaryngologists (66) serving a population greater than 45 million people (a ratio of 1:682,000 people) [5]. Approximately 10,000 otolaryngologists were in practice in the United States in 2009 (3: 10,000 people), more than 300 times the ratio in Kenya.

Head and neck surgeons commonly treat both benign and malignant neoplasms. Head and neck cancer (including oral cavity, pharynx, and larynx) represents the sixth most common cancer in the developing world, and two-thirds of the 650,000 cases of head and neck cancer diagnosed every year occur in developing countries [6,7]. Head and neck fellowships offer advanced training in complex ablative procedures and many include microvascular tissue transfer and other reconstructive methods. While there are over fifty fellows trained in the United States every year, there is only one head and neck surgical fellowship program offered in Sub-Saharan Africa, although a second one in recent years is in development [8,9]. In 2005, there were no subspecialist-trained head and neck surgeons in Sub-Saharan Africa. Since the establishment of the head and neck fellowship program in South Africa, each of the ten fellows trained through this program have

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returned to their respective countries to practice and develop head and neck surgical programs [8]. These fellows are well trained in management of complex ablative procedures of the head and neck with loco-regional reconstruction; however, they do not receive formal microvascular training. Even if they did receive microvascular training, many of them are returning to low-middle income countries (LMIC) with limited infrastructure that may not be able to support the increased demand on resources inherent to microvascular reconstruction.

Due to the discrepancy between surgical demand and resources, many American Academy of Otolaryngology- Head and Neck Surgery (AAO-HNS) members have partnered with sister institutions abroad to develop surgical outreach programs (SOP) as well as educational workshops [10,11]. Balancing the goals of providing otherwise non-existent services, creating a self-sustaining head and neck program, and educating local surgeons and ancillary staff remains a challenge for those who lead these surgical trips. Offering microvascular reconstruction in the setting of a SOP in a LMIC adds yet another level of complexity. The objective of this paper is to discuss difficulties and challenges in establishing a SOP abroad and more specifically some of the challenges specific to microvascular reconstruction. Although challenges certainly exist, we will discuss the benefit for patient care as well as the role it can play in the foundation development of a low resource region.

#### Goals of surgical outreach programs utilizing microvascular techniques

Traditionally, outreach programs have taken either a vertical or horizontal model in regard to program development. “Vertical models” offer services but do not necessarily integrate into the local healthcare system and are most frequently used by surgical outreach programs. For example, many cleft palate programs have taken this approach by bringing the necessary equipment and ancillary services required to perform these procedures in various locations all over the world [4]. An even more extreme example is Mercy Ships, the largest non-governmental hospital ship in the world. Mercy Ships provides all of the necessary resources, including its mobile platform, and has the capacity to conduct 2000 surgeries over a ten-month period on the vessel. Outreach programs that adopt the “horizontal model” make broader investments in equipment, supplies, public health infrastructure, and training personnel to measure outcomes of the medical intervention they are investigating. Medical programs that treat communicable diseases have long utilized the “horizontal” model. Developing adequate infrastructure to support a SOP utilizing this model is very challenging. Obtaining and maintaining the necessary equipment, training anesthesia personnel, acquiring necessary medications, and training nursing personnel and ancillary services like speech therapy are all considerations when trying to create a surgical head and neck outreach program that is safe and sustainable.

The primary goal when developing a SOP that involves microvascular surgery in a resource-challenged environment is to develop a program with the depth necessary to perform the procedure safely and reproducibly. The secondary goal is to enhance existing infrastructure (“hybrid model”). Maximizing the impact of outreach programs that incorporate microvascular surgery require two key components. First, regular trips to the same location that have some degree of existing infrastructure is paramount. This element helps with overall efficiency and safety in performing these complex procedures, and it also provides the ability to monitor surgical outcomes and the impact of the camps on host healthcare infrastructure [12]. Additionally, a hybrid model allows programs to begin the journey towards sustainability through teaching. Building strong relationships with local physicians takes time, and involvement in any aspect of microvascular surgery increases the breadth of their surgical experience.

Utilizing the “hybrid model” has resulted in development of a Head and Neck Outreach program in Uganda by the senior author that focuses on basic head and neck cases in addition to a limited number of

microvascular free flap reconstruction cases. This model has allowed the focus to be on patient care, teaching surgical skills, and enhancing existing host infrastructure.

#### Surgical outreach programs utilizing microvascular techniques: Challenges and considerations

There are a number of potential challenges that could arise when creating and carrying out microvascular surgery in a LMIC, whether by local or visiting teams, that have been previously described by others in the literature [13–16]. Here, we discuss the major challenges and considerations that the senior authors have encountered when leading a surgical outreach program with a microvascular focus.

#### Patient selection

Surgery remains the only treatment option for the majority of head and neck cancer patients, as well as those with very advanced benign tumors, in Sub-Saharan Africa due to the limited access to adequate radiotherapy facilities [17]. Due to time constraints inherent in surgical outreach programs, patient selection typically happens on the first day of the camp with the help of local otolaryngologists to evaluate new patients. Careful evaluation of the new patients, available resources, and all planned procedures allow the SOP to formulate a schedule that will maximize the number of patients they can treat safely. Patients travel from across the country and from neighboring countries through referrals and word of mouth seeking treatment. Cultural factors often contribute to their late presentation, where patients do not seek out medical treatment until their disease process is fairly advanced whether it is benign or malignant.

From our experience, more patients are evaluated during the first day of the surgical camp than can reasonably undergo surgery with the limited time and resources available. For example, as demonstrated in Table 1, over the four most recent trips, there are nearly double the number of total patients evaluated than surgical cases performed. Limited transportation and resources may also lead to cancellations and schedule changes. Attempts at prescreening and tentative surgical scheduling by local surgeons may be a benefit, but our experience and evaluation of those patients often leads to significant changes in the original surgical plan. This puts the burden on the team leaders: what patients will benefit most from surgery? Knowing that surgery is often a patient’s only option in the treatment of their disease, the surgeons attempt to maximize the number of cases they perform with limited resources (operating time, supplies, personnel etc.) to increase their overall impact. Microvascular free tissue transfer procedures have long operative times, require more intraoperative resources (time, supplies, anesthesia), and are associated with longer inpatient stays. The host hospital has a finite number of beds available to the visiting team (typically 8–10) so free flap patients will dictate how many other patients can remain inpatient following surgery. Thus, a limited number of microvascular procedures can be performed each trip, and the schedule is usually balanced with procedures that require shorter operative times

**Table 1**

The number of Ugandan patients assessed and treated during an ongoing surgical outreach program.

Trip	Total Patients	Consults	Surgical Cases	Flap cases
Fall 2014	19	12	7	2
Spring 2015	45	6	41	5
Fall 2015	53	14	29	2
Spring 2016	49	24	26	3
Fall 2016	52	31	24	2
Spring 2017	67	30	38	3
Fall 2017	58	44	14	2
<b>Total</b>	<b>343</b>	<b>161</b>	<b>179</b>	<b>19</b>

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