THE IMPACT OF SHORT-TERM SURGICAL MISSIONS ON HEALTH CARE SUSTAINABILITY IN LOW-INCOME AND DEVELOPING COMMUNITIES: A COMPREHENSIVE REVIEW AND SYSTEMATIC REVIEW

A thesis submitted to the University of Arizona College of Medicine – Phoenix in partial fulfillment of the requirements for the Degree of Doctor of Medicine

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Chapter 1: A Comprehensive Review

Introduction

Short-term medical missions provide a means by which the global health care community can address the health care needs of developing world communities. In the past, these volunteer missions were directed toward public health initiatives that confronted communicable diseases, such as smallpox and AIDS. The global health care landscape is changing, however, as mortality from communicable diseases is decreasing while mortality from non-communicable disease (NCD) is increasing. This shift in global pattern of disease calls for new types of health care interventions that can alleviate the burdens of NCDs. One such intervention is surgery, which had previously been neglected as a global health initiative for a number of reasons. Most surgical diseases are not communicable; therefore they were not of primary concern for public health initiatives\(^1\). Additionally, there is a scarcity of surgeons in developing regions that further complicates the complexity of delivering surgical care to those regions\(^1\).

Surgical interventions are complex and, while short-term surgical missions (STSMs) are not new phenomena, there is limited research regarding their long-term impact on the health care sustainability of the developing community they aim to serve. Most assuredly, the short-term goal of a surgical intervention program is to provide effective and quality care to patients. The long-term goal of an ideal STSM is to establish a sustainable surgical or health care system that can eventually provide comparable care without the need for the volunteering organization. The long-term impact of STSMs on local health care sustainability, as well as the program qualities that influence it, is the subject of this review. Although many organizations that participate in STSMs have published data and recommendations based on their observations and experiences, the means by which STSMs impact long-term health care sustainability requires further study.
Interest in Short-Term Surgical Missions

Historically, global health initiatives were concerned with public health while surgical interventions were neglected. Global health is changing as societies become more industrialized, and mortality from communicable disease, such as diseases of pestilence and infection, is decreasing while mortality from NCD is increasing\(^1\). According to the World Health Organization’s Global Health Estimates summaries, cause of death from NCDs increased from 59.6% in the year 2000 to 66.4% in 2011\(^2\). Current analysis projects this number to rise to 68.4% in 2015 and 73.9% in 2030\(^2\). This shift in disease pattern associated with economic growth and industrialization of societies calls attention to the importance of surgical intervention as a means to improving health globally\(^1\). Surgical disease is among the top 15 causes of disability and surgical conditions account for up to 15% of total disability adjusted life years (DALYs) lost worldwide\(^1\). For example, traumas from accidents, long-bone fractures, and congenital anomalies such as cleft palate become debilitating conditions with life-long repercussions to the livelihood and productivity of those afflicted\(^1\). In 2004, low-income countries accounted for 35% of the global population but only 3.5% of annual surgical procedures performed\(^5\). The need for surgical intervention in low-income countries is apparent, but addressing the shortage of this type of specialty care is a complicated endeavor. The growing interest in surgical volunteerism, specifically in the form of short-term medical missions, is a reflection of the changing global health landscape and an acknowledgment that surgical intervention can be an effective means to addressing global health concerns.
The Long-term Impact of Short-term Surgical Missions

Research from STSMs that have conducted self-assessments and collected long-term data cite a number of qualities of the STSM that can either undermine or promote the establishment of long-term health care sustainability in a developing community.

Barriers to establishing sustainable health care

Current research acknowledges that surgical volunteer missions, while they undoubtedly have altruistic intentions, can introduce significant financial, political, social, and ethical risks to the health care sustainability of a developing community. Short-term interventions can increase financial burdens on local systems and foster economic instability in a developing health care system. The Volunteers in Plastic Surgery Committee states that “supplies for a mission should be provided by the volunteer organization.” If this is not feasible, the volunteer organization should replace supplies used or compensate the local hospital for the cost of supplies used. The committee observes that financial burdens extend beyond supplies and also include time and personnel. For example, visiting surgical missions may prevent “local surgery from being performed” or require “local physicians to provide postoperative care for patients after the team has left.”

Short-term surgical interventions that lack integration and collaboration with local providers and health systems risk causing infrastructural harm and undermining the local health care systems. The International Hospital for Children (IHC) published a model for neurosurgical humanitarian aid based on research and observations from nineteen mission trips over a 12-year period to Central and South America that takes this subject into consideration. They propose that a surgical mission trip should only occur “after an invitation from the host country.” An invitation from the host country is supportive evidence of a need for surgical assistance and ensures an interest in a collaborate relationship.

Additional detrimental qualities of STSMs are the social and ethical complications generated by the introduction of a foreign group of health care providers with more advanced skills
and technology. Examples include reinforcing health care disparities, providers practicing beyond their scope of practice, and negatively influencing cultural opinions of medical care, both foreign and domestic.

**Building and supporting sustainable health care**

Research recognizes a number of health care-sustaining qualities of STSMs and guidelines they can follow to mitigate potential risks to establishing a sustainable surgical or health care program. Collaboration with and education of local providers is typically cited as the most effective way to establish long-term health care sustainability and promote surgical capacity. Collaboration with local health care providers not only aids in establishing a long-term professional relationship, but also can reduce costs and create a more efficient program. Smile for Children, a South Korean-based NGO, organized short-term surgical missions to Vietnam to collect cleft lip and palates and collected data over a 15-year period. The group found that collaboration with their Vietnamese partner institutions, specifically by delegating to them pre-operative screening and surgical preparation prior to the mission, optimized efficiency and reduced costs. Collaboration is necessary for optimal postoperative care as well. The IHC states that “it is of critical importance to collaborate with local health workers so that each patient’s postoperative progress can be tracked; such follow-up data can also be used to improve future medical aid trips.” Collaboration with local providers is closely tied to the educational component that many short-term surgical missions provide with their counterparts. A proverb that has been cited as a guiding principle states, “to teach a man how to catch fish is more important than giving him fish to eat if he is to feed himself for the rest of his life.” The long-term goal of these programs is to educate and train local providers and build a sustainable system that can eventually function without the volunteer organization. A study of a cleft lip/cleft palate program in East Asia associated with Smile for Children found that collaboration, education, and training through short-term missions strengthened local capacity. The volunteer team “contributed to lowering the age at first operation and reduced the number of adult patients with this condition over an 11-year period.”
Conclusion

“Despite millions of dollars and the donated time of surgical team volunteers, sustainable surgical care continues to elude much of the world”⁵. With global health efforts adjusting to meet the shifting pattern of disease from communicable to non-communicable diseases, it is logical to assume that there will be a greater need for surgical interventions and volunteers. Identifying a set of guidelines offers potential volunteers a means by which to assess volunteer missions. Realizing the impact of short-term surgical mission and the barriers associated with them provides an opportunity for volunteer programs to conduct a self-critique and assess their ability to deliver effective care.
References


Abstract

**Purpose:** Short-term surgical missions (STSMs) provide an opportunity for the global health care community to address the surgical needs of developing communities worldwide. Conditions that require a one-time intervention, such as cleft lip and palate, clearly demonstrate the positive impact these short-term missions can have on the individual patient. However, the long-term impact on the local health care system, economy, and community is less clear. Many in the global health care community believe that STSMs should seek to have a long-term impact by establishing sustainable health care programs. Information regarding the impact of STSMs is scarce, however, due to limited regulation, research, and data from short-term missions.

**Research question:** This study investigates how short-term international missions impact health care sustainability in low-income and developing communities.

**Methods:** This study uses a systematic review to investigate the impact of STSMs on health care sustainability. Additional outcomes included education and skills-transfer, cost-effectiveness, and cultural awareness.

**Results:** 15 articles were included in the study. The following outcomes were found: sustainability in 9 studies, education and skills-transfer in 5, cost-effectiveness in 4, and cultural awareness in 3.

**Conclusion:** STSMs can successfully establish sustainable programs abroad. Factors that contribute to this success include education and training of host providers, cost-effective services, and cultural awareness. Understanding the complex dynamic between STSMs and developing communities is key to developing effective and sustainable programs that offer long-term benefits to those communities.
Introduction

Short-term medical missions (STMMs) provide an opportunity for the global health care community to address the medical needs, especially the surgical needs, of developing world communities. Surgical disease is among the top 15 causes of disability, and surgical conditions account for up to 15% of total disability adjusted life years (DALYs) lost worldwide. Despite the significant need for surgical services in developing countries, the necessary volume of surgical interventions is lacking. Surgical procedures are costly and often times only available in larger cities that have the resources to maintain surgical programs. In many resource-poor communities, remote location, lack of transportation, and inadequate health care coverage make obtaining surgical services nearly impossible. Furthermore, the scarcity of surgeons in developing communities complicates the delivery of surgical care to these regions. The short-term surgical mission (STSM) has been a response to this deficiency of surgical services worldwide, however these types of missions have been met with many criticisms.

In the literature, short-term international missions are accused with a number of faults, including a lower standard of care, inadequate patient follow-up, limited collaboration with the local health care community, poor cost-effectiveness, and no long-term impact. Critics attribute these faults to the generalized lack of regulation of international missions. “Without proper evaluation standards, issues of patient safety, quality control, and impact assessment are easily overlooked since STMMs are often locally organized and privately funded without restrictions.” This limited regulation, research, and data of short-term missions make conducting a concise evaluation of their impact difficult. Conditions that require a one-time intervention, such as cleft lip and palate, clearly demonstrate the positive impact of these short-term missions on the individual patient. However, the long-term impact on the local health care system, economy, and community is less clear.

Surgical interventions are complex and, while STSMs are not new phenomena, there is limited research into how they affect health care sustainability. Most assuredly, the short-term goal of a surgical intervention program is to provide effective, quality care to patients. Within the literature, the long-term goals are less clear or, frequently, not reported. Many in the global health care community believe that the long-term goal of a STSM should be to establish
sustainable health care programs. These programs would eventually provide comparable care without the need for the volunteering organization. A STSM, for example, would provide surgical services while simultaneously supporting and training the local health care institution to eventually provide those same services independently.

Establishing a sustainable health care program in a developing community is undoubtedly a challenge that is complicated by significant financial, geographic, and cultural barriers. While a dynamic process, building a sustainable program requires key, static elements. Many factors contribute to health care sustainability, including collaboration with the local health care community, education and training of local health care personnel, cost-effectiveness, and cultural awareness. Particularly with STSMs, collaboration with and education of local providers is generally cited as the most effective way to promote surgical capacity and establish long-term health care sustainability. For example, a group of pediatric neurosurgeons developed a sustainable surgical program in minimally invasive pediatric neurosurgery through collaboration and training. Their primary objective was “teaching of an operative technique, as opposed to repeatedly performing operations.” Over three one-week missions that focused on teaching and building surgical capacity, a sustainable surgical program was established and maintained for at least 5 years following the volunteers’ intervention.

Collaboration with local health care providers fosters long-term professional relationships and can also reduce costs and create a more efficient program. Smile for Children, a South Korean-based NGO, organized STSMs to Vietnam to correct cleft lip and palates and collected data over a 15-year period. The group found that collaboration with their Vietnamese partner institutions, specifically by delegating to them pre-operative screening and surgical preparation prior to the mission, optimized efficiency and reduced costs. Furthermore, collaboration with local health workers is necessary for optimal postoperative care, patient safety, and program adjustment. Tracking postoperative progress and collecting follow-up data helps identify program deficiencies and provides information that can be used to improve future missions.
STSMs impact health care systems, and understanding this complex dynamic is key to developing effective and sustainable programs that benefit the community. This systematic review investigates the relationship between STSMs and key elements of health care sustainability, including collaboration, education, cost, and cultural understanding.
Methods

A literature search of PUBMED and COCHRANE was performed using the MeSH terms “medical missions, official NOT United States.” The National Library of Medicine MeSH heading defines “medical missions, official” as “travel by a group of physicians for the purpose of making a special study or undertaking a special project of short-term duration.” By definition, then, short-term medical missions led by physicians are included under this heading. “NOT United States” was used to restrict the search to international medical missions. A PUBMED search with these terms, filtered for articles in English published between 2005 and 2015 on human subjects yielded 546 articles. The same search through COCHRANE yielded 2 results. Articles to be included were studies of short-term surgical missions or short-term international missions with a procedural focus. Included articles provided qualitative data relating to the following outcomes: sustainability, skills-transfer or education, collaboration, cost or cost-effectiveness, and care or training-recipient perspective. Exclusion criteria included editorials, news pieces, biographies, emergent military operations, disaster or epidemic responses, and non-physician projects relating to dentistry, optometry, pharmacy, physical or occupational therapy, nursing, midwifery. Articles that did not specify a timeline or length of mission were also excluded. Articles that only provided medical data, such as perioperative mortality rates, complication rates, or surgical outcomes, without mention of the aforementioned outcomes were also excluded. After reviewing the abstracts and/or introductions for inclusion and exclusion criteria, a total of 15 articles remained [Figure 1].
Citations identified in PubMed & Cochrane databases n=548

Inclusion criteria: English, non-US studies, medical missions, sustainability, skills-transfer or education, collaboration, cost or cost-effectiveness, cultural awareness, and care or training-recipient perspectives

Relevant abstracts and full-text article introductions reviewed n=548

Excluded n=494

Full-text articles reviewed with formal data extraction n=54

Excluded n=39

Studies included in final analysis n=15

Exclusion criteria: editorials, news pieces, biographies, emergent military operations, disaster or epidemic responses, and non-physician projects relating to dentistry, optometry, pharmacy, physical or occupational therapy, nursing, midwifery. Articles with mission length not specified or offering only medical or operative data.

Figure 1. Study eligibility flow diagram
RESULTS

The results of this study discovered outcomes that measured sustainability directly or indirectly through one of its contributing factors. The following outcomes were found: sustainability, education and skills-transfer, cost-effectiveness, and cultural awareness [Table 1].

Outcome 1: Sustainability

9 out of the 15 studies included sustainability as a major outcome. In general, the metric used to measure sustainability was the number of procedures performed independently by the local health care team after intervention from the volunteering organization. One study that aimed to advance an already established program considered sustainability as an increase in case load and/or case complexity following intervention. Each program had an educational component in the form of courses, lectures, and hands-on skills training at the bedside or in the operation room. Our analysis showed that 100% of the studies established sustainable programs as evidenced by a stable increase in the number of procedures performed independently by the local team following intervention [Figure 2].

Study 1.

A Canadian volunteer group traveled to an institution in Botswana over a 7-year period with the goal of improving and increasing the use of laparoscopic techniques. Specifically, the group aimed to increase the proportion of laparoscopic cholecystectomies performed compared to open cholecystectomies. From 2006 to 2012, the volunteer surgeons provided annual training workshops along with a one-time course in laparoscopic surgery. Throughout the program, the number of laparoscopic cases increased while the number of open cholecystectomies decreased. Furthermore, the proportion of laparoscopic cholecystectomies completed independent from the volunteer surgeons increased from 31% in 2008 to 98% in 2012.
Study 2.

A pediatric neurosurgery group organized missions to Lima, Peru, from 2004 to 2006 in order to establish a surgical program capable of addressing the unmet needs of emergent and urgent pediatric neurosurgical conditions. The group completed 3 one-week neurosurgical missions that included a neuroendoscopy educational component as well as donation of supplies. Neuroendoscopy case follow-up was obtained for 5 years after completion of the missions in 2006. After 5 years, a total of 196 operations had been performed independent of any visiting team.

Study 3.

The same pediatric neurosurgery group in Study 2 organized another group of neurosurgical missions to Kiev, Ukraine, at the Ukrainian Institute of Neurosurgery from 2005 to 2007. Similarly to Study 2, the group donated supplies and completed 3 one-week missions with neuroendoscopy education. The Ukrainian host institution progressively increased the number of cases performed without the visiting team during the three-year program and after its completion. In 2005, the Ukrainian host team completed 2 additional neuroendoscopic procedures after the 11 performed during the one-week mission. They performed an additional 9 and 17 in 2006 and 2007, respectively. Four years after completion of the program in 2007, the host team had performed 111 operations independent of any visiting team.

Study 4.

A group of cardiac surgeons made frequent visits to a host site in order to establish a sustainable cardiac surgery program. From June 2002 to December 2007, they made monthly visits of one-week duration to a hospital in Tbilisi, Georgia. Investment of equipment and materials was made by the local hospital administration. The Georgian team began operating without the visiting team in February of 2007 and, during the remainder of that year, performed 127 operations independently.
Study 5.

Operation Airway conducted a study of four missions over four years to Quito, Ecuador, to establish a sustainable program to treat aerodigestive abnormalities. Prior to the first mission, the host surgeons from Ecuador traveled to the Massachusetts Ear and Eye Infirmary to observe procedures. Throughout the missions, the host team participated in clinical training, attended over 25 hours of lectures, and received training in airway surgeries, including laryngotracheal reconstructions (LTRs). One year after the final mission, the local team in Ecuador had performed three LTRs independently.

Study 6.

The International Children’s Heart Foundation, an organization specializing in pediatric cardiac surgery, assessed the sustainability of programs they implemented at 12 institutions over the course of 14 years. Pediatric cardiology services were already established at these institutions, but the organization aimed to advance both the case load and case complexity. They found that 9 out of 12 institutions had both an increase in the number and complexity of cases since the team intervened.

Study 7.

A study by Operation Smile International reviewed the organization’s 15 years of experience with short-term missions to Vietnam performing and teaching microsurgical procedures. In terms of sustainability, they reviewed microsurgical procedures performed independently by Vietnamese surgeons at a hospital in Hanoi. There was no microsurgical program at the hospital prior to Operation Smile’s intervention. Since the start of their missions, however, the Vietnamese host surgeons independently performed 474 microsurgical operations with an overall failure rate within the expected and acceptable range.
**Study 8.**

Kybele, a nonprofit humanitarian organization that promotes childbirth safety, established teaching programs to improve obstetric anesthesia practices in Croatia. Nine hospitals hosted the Kybele team in Croatia for two-week periods and reported data for obstetric anesthesia practices for 1 year before and after the visit. The rate of regional anesthesia for cesarean section increased from an average of 20% to a statistically significant 34% after the Kybele visit. Rate of use of labor epidurals for analgesia increased from 3 to 5%.

**Study 9.**

Kybele established a similar anesthesia teaching program in Ghana. Kybele volunteers traveled 2 to 3 times per year from 2007 to 2011 and provided 1-2 weeks of neuraxial anesthesia training for obstetric care. The use of spinal anesthesia increased from 6% to 89% from 2008 to 2011. The rates continued to increase and were reported at 95% in 2011 and 98% in 2012.

**Outcome 2: Education and Skills-Transfer**

5 out of the 15 studies contained education and skills-transfer as a major outcome. Most commonly, the metric used to assess this outcome was the proportion of procedures completed without assistance from the visiting surgeon or provider. This was not always the case, however, and will be outlined in further detail below. All 5 studies reported successful education and training by documenting the host team’s newly acquired skills.

**Study 1.**

The short-term mission to Botswana measured skills-transfer or technical independence as the proportion of laparoscopic to total cholecystectomies completed independently by local surgeons without the visiting surgeons’ present. The majority of cholecystectomies at this institution prior to the visiting team's laparoscopic training program were performed by the open route, so the proportion of laparoscopic cholecystectomies after the training program was considered a measure of education and newly acquired skills. They found that the proportion of
completed laparoscopic cases increased from 31% to 98% over 4 years. Twelve surgeons were trained in this program.

Study 2.

The pediatric neurosurgery outreach mission to Lima, Peru, measured skills-transfer as the proportion of host surgeons acting as primary and assisting surgeons during the mission. Two local, senior neurosurgeons received training during this program. During the first mission, all 14 operations were performed with the visiting surgeons functioning as both primary and assistant surgeon. In the second mission, all 14 operations were performed with the visiting team as primary, however the host team acted as assisting surgeon in all cases. During the final mission, the host team acted as both primary and assisting surgeons in all 13 cases.

Study 3.

The pediatric neurosurgery outreach program to the Ukrainian Institute of Neurosurgery Department of Pediatric Neurosurgery in Kiev, Ukraine saw similar results as the mission to Peru. In this program, one senior and two junior neurosurgeons received training. In the first year, 11 operations were performed with the visiting team as both primary and assisting surgeon. In the second year, the visiting team was primary in 12 operations, the host team was primary surgeon in 5 of the cases, and the host team assisted in all 17 cases. During the final mission, 21 cases were performed, and the host team acted as primary and assisting surgeons in each case.

Study 4.

The cardiac surgery mission to Tbilisi, Georgia, measured skills-transfer to the local team by the reduction in visiting team members over the course of the mission. The number of required volunteers was reduced as local health care personnel were trained and deemed capable of providing comparable care. From 2002 to 2007, the visiting staff was reduced from five members to one. The first team members withdrawn was the visiting nursing staff followed by the perfusionist and the anesthetist, leaving just the visiting surgeon for the final 2 years of the project. The specific proportion of procedures performed independently by the host surgeons
was not given, however a description of the transition was provided. “The surgeons were put in charge of patients and performed surgery progressively with the assistance of the visiting surgeon, or only in the passive presence of the (non-scrubbed) visiting surgeon.”

**Study 5.**

Operation Airway’s mission to Quito, Ecuador, trained 1 pediatric otolaryngologist, 1 pediatric surgeon, 3 anesthesiologists, 7 intensivists, 16 nurses, and 2 speech-language pathologists. Skills-transfer was measured in their study by the proportion of procedures performed by the local surgeons. In year one of the three-year mission, local surgeons only observed the procedures. In year two, they assisted in 100% of the cases. In the final year, the local surgeons were the primary surgeon in 100% of the cases.

**Outcome 3: Cost-effectiveness**

Short-term mission cost and/or cost-effectiveness was a major outcome in 4 out of the 15 studies. Each study reported that the short-term missions were cost-effective according to the WHO guidelines, meaning that the cost per DALY averted was less than the region’s GDP. Two studies comparing the cost-effectiveness of short-term missions to permanent, locally-run care centers found that the care centers were more cost-effective [Table 2].

**Study 1.**

One study compared the cost-effectiveness of short-term medical missions to a comprehensive care center, which was an established, locally-run center providing continuous care. The missions and the care center were both projects by Operation Smile. Cost-effectiveness was measured as cost per DALY averted. The study found that the cost-effectiveness of a medical mission was $247 U.S. dollars (USD) per DALY averted and $190 USD per DALY averted for the comprehensive care center approach. Both the medical mission and the comprehensive care center averaged about 6 DALYs averted per patient. The incremental cost-effective ratio (ICER), which accounts for the cost of local staff voluntarism, was also calculated. The ICER of a medical mission compared to no intervention was $466, while the ICER of a comprehensive
care center to no intervention was $190. The study concluded that CCC is more cost-effective than a medical mission, however both are more cost-effective than no intervention at all.

Study 2.

Another study compared the financial differences between Operation Smile’s short-term mission trips and comprehensive care center in Assam, India. This study, however, assessed how the money was spent and the impact on the local microeconomy. For the mission trips, 33% of expenses were spent locally. Nearly 75% of mission trip expenses were spent on airfare, travel, and lodging. For the care center model, 94% of expenses were spent locally, including 46% towards salaries and 20% towards infrastructure. More money was dispersed into the local macroeconomy in the comprehensive care center model than the mission trip model. The study found that transitioning from the mission model to the care center also resulted in a 40% decrease in cost per surgery.

Study 3.

Smile for Children, a South Korean-based NGO, analyzed the cost-effectiveness of their short-term cleft lip and palate missions to Vietnam. The results represented an average of missions carried out over a 4-year period. Cost-effectiveness was measured as cost per DALY averted. The average discounted cost per DALY averted was $68 USD. Vietnam’s GDP per capita is $1051 USD. Smile for Children spent 29% of the mission expenses on travel to Vietnam.

Study 4.

Project Shunt conducts annual pediatric neurosurgery missions to Guatemala City, Guatemala. The organization collected data from a single mission to evaluate its cost-effectiveness. 17 neurosurgical procedures were performed during this short-term mission. Complete mission costs were $53,152, and cost-effectiveness was $385 per DALY averted. With a GDP per capita in Guatemala of $5,629 USD, the mission was considered highly cost-effective according to WHO criteria. Travel expenses to Guatemala comprised nearly 50% of total mission costs.
Outcome 4: Cultural Awareness

3 out of the 15 articles addressed cultural awareness by identifying patient and community concerns through interviews and surveys.

Study 1.

Operation Walk, a philanthropic organization providing orthopedic care abroad, surveyed patients in order to identify and quantify their concerns about receiving surgery and foreign aid. The study included patients from two different countries, Nicaragua and Guatemala, and also attempted to identify any cultural nuances between their concerns. The survey used a Likert scale from 1 (not concerned at all) to 4 (extremely concerned) and included 56 questions. 41 questions addressed general concerns relating to surgery while 15 questions were specific to receiving care during short-term mission trip composed of foreign health care providers [Table 3]. The 5 lowest scoring concerns were the same in each country and, interestingly, were those specific to short-term mission trips. Patients in both countries were least concerned about being treated as part of a mission by surgeons that were not certified in the home nation. They were least concerned about the quality of other hospitals, that they might be treated differently, and that they lacked choice in their implant. The top 5 concerns for the Guatemalan patients did not include any of the 15 mission trip-specific concerns. The top 5 concerns for the Nicaraguan patients, on the other hand, included 2 of the mission trip-specific concerns. These included follow-up care if a complication arose and the ability to see the surgeon again after the procedure. These differences between the two patient groups were statistically significant.

Study 2.

Medical Ministry International (MMI), a group organizing short-term medical trips to the Dominican Republic, conducted semi-structured interviews of patients in order to explore their experiences, concerns, and suggestions. The interviews of 47 patients were analyzed for major themes. Major themes included access to care, identified needs, student involvement, and MMI improvements. Patients specifically mentioned an improvement of access to medications and medical care after MMI intervention, however they suggested more frequent and extended
visits. Another requested that MMI involve volunteers from the community who “know the problems of the community.”

Study 3.

The Medical Readiness Training Exercise (MEDRETES) is a service organized by the U.S. Department of Defense to train active duty personnel in providing medical aid to remote, low-resource communities. This was a qualitative study that utilized focus groups and semi-structured interviews of direct and indirect beneficiaries of MEDRETES in four remote Amazon communities. The study assessed local perspectives about health and humanitarian aid. With respect to health care support from foreigners, participants’ opinions were positive. However, requests were made for more transparency with respect to mission trip objectives, increased collaboration with community leaders, and more comprehensive and sustainable interventions over time.
## Table 1. Articles and Outcomes

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<td>Pediatric neurosurgery outreach: sustainability appraisal of a targeted teaching model in Kiev, Ukraine.</td>
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<td>4</td>
<td>The development of cardiac surgery in an emerging country: a completed project.</td>
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<td>5</td>
<td>Operation airway: the first sustainable, multidisciplinary, pediatric airway surgical mission.</td>
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<td>Paediatric cardiac assistance in developing and transitional countries: the impact of a fourteen year effort</td>
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<td><strong>Outcome 2: Education and skills-transfer</strong></td>
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### Outcome 3: Cost-effectiveness

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### Outcome 4: Cultural awareness

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</tbody>
</table>
Figure 2. One-Sample Test of Proportion assessing Sustainability between independent populations prior to and after intervention. *Denotes statistically significant differences.
Table 2. Assessing Cost between Short-Term Missions vs Comprehensive Care Centers.

<table>
<thead>
<tr>
<th>Cost Per Surgery</th>
<th>Short Term Missions</th>
<th>Comprehensive Centers</th>
<th>P-Value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>1489.62</td>
<td>1133.32</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Study 2</td>
<td>677.00</td>
<td>400.0</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<sup>1</sup> Independant T-Test to compare costs between Short Term Missions and Comprehensive Centers. No Standard deviations were reported thus assuming SD is half of the respective means.
### Table 3. Assessing differences in Mean Likert Scores of Cultural Awareness.

<table>
<thead>
<tr>
<th>Survey Questions</th>
<th>Guatemala</th>
<th>Nicaragua</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>See the surgeon again after they leave for home.</td>
<td>1.78</td>
<td>2.57</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Receive proper care if a complication arises after the team leaves.</td>
<td>1.68</td>
<td>2.6</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Not having met the surgeon before operation.</td>
<td>1.43</td>
<td>2.11</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Surgeon comes shortly before and leaves shortly after procedures.</td>
<td>1.38</td>
<td>2.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>That you do not understand what is going to happen.</td>
<td>1.43</td>
<td>1.77</td>
<td>0.032</td>
</tr>
<tr>
<td>Surgeon does not speak Spanish.</td>
<td>1.35</td>
<td>1.74</td>
<td>0.014</td>
</tr>
<tr>
<td>Not receiving same level of care as patients in the U.S.</td>
<td>1.28</td>
<td>1.6</td>
<td>0.017</td>
</tr>
<tr>
<td>Not properly involved in decisions</td>
<td>1.48</td>
<td>1.5</td>
<td>0.85</td>
</tr>
<tr>
<td>About not having all the necessary equipment.</td>
<td>1.38</td>
<td>1.43</td>
<td>0.70</td>
</tr>
<tr>
<td>Not being fully in control of care received.</td>
<td>1.38</td>
<td>1.58</td>
<td>0.11</td>
</tr>
<tr>
<td>Surgeon has not been trained or certified in home nation.</td>
<td>1.23</td>
<td>1.32</td>
<td>0.49</td>
</tr>
<tr>
<td>Did not choose implant being used.</td>
<td>1.18</td>
<td>1.23</td>
<td>0.60</td>
</tr>
<tr>
<td>Treated differently than patients in surgeon’s own country</td>
<td>1.18</td>
<td>1.27</td>
<td>0.31</td>
</tr>
<tr>
<td>Receiving treatment as part of medical mission trip</td>
<td>1.15</td>
<td>1.16</td>
<td>0.91</td>
</tr>
<tr>
<td>Treatment is not as good as other hospitals in home nation</td>
<td>1.13</td>
<td>1.18</td>
<td>0.57</td>
</tr>
</tbody>
</table>
Discussion

Sustainability.

Understanding the sustainability of a medical program as a quantifiable and measurable objective is complex, as it is influenced by a number of factors. Surprisingly, the 9 studies reviewed here used similar definitions for sustainability. The metric used to capture sustainability was the number of procedures performed independently by the local health care team after intervention from the volunteering organization. This definition describes sustainability as the ability of a program or health care system to maintain new, learned practices. A complication of this definition is that it does not specify a length of time or number of procedures sufficient to qualify a program as sustainable. With this broad definition, each study can use different criteria to prove it achieved sustainability.

All 9 studies reported having successfully established sustainable programs, however the data collection periods and number of procedures performed varied significantly. For example, the pediatric neurosurgery mission to Lima, Peru, collected data for 5 years following the intervention and reported a total of 196 procedures independently performed by the host team. Operation Airway, on the other hand, published data for only 1 year following its intervention and reported 3 LTRs independently performed during that year. Although both studies were successful, measuring and comparing their degree of success is more complicated. Additional factors are present that should be considered when assessing these studies. The complexity of each intervention must be taken into account since the type of procedure affects the case load during each mission. Furthermore, some of the missions were introducing new procedures while others were advancing an already established surgical program. Despite the variables noted in these short-term missions, each was able to establish sustainability according to their metric. The missions introduced new procedures or techniques that were maintained for a length of time after the mission was complete.
**Education and Skills-Transfer.**

Education and skills-transfer has been considered the most important factor to establishing a sustainable program and was valued considerably in these studies. Education and training of the host team was often the top priority of the mission with many resources donated to lectures and teaching. Most commonly, the metric used to measure this objective was the proportion of procedures completed without assistance from the visiting surgeon or provider. Studies used operative data to track who the primary and assisting surgeons were during each procedure. Presumably, the local surgeons or hosts began as observers and graduated to assisting and primary surgeons as they acquired more knowledge and skills. Education and skills-transfer was considered successful when the host teams were able to act as primary surgeons.

Out of the 5 studies that assessed this objective, 100% reported successful skills-transfer to the host team. Similarly to the studies assessing sustainability, measuring the degree of success is a complicated task. There was significant variability between the studies, specifically with the types of skills taught. One group, for example, introduced the laparoscopic technique to surgeons already performing open cholecystectomies. In this case, education and skills-transfer was measured as the percentage of cholecystectomies performed laparoscopically as opposed to the open technique. Operation Airway, however, trained host surgeons in laryngotracheal reconstructions, which was a new procedure for the hosts.

Another differentiating feature between these studies was the number of surgeons receiving training during the mission trips. In the first study, twelve local surgeons received laparoscopic training. The neurosurgery outreach missions to Peru and Ukraine, on the other hand, trained two and three surgeons, respectively. Operation Airway and the cardiac surgery mission team in Georgia took a multidisciplinary approach by training surgeons, intensivists, anesthetists, nurses, and other local health care personnel.

Missions focused on education and skills-transfer through a variety of methods. Some programs made annual visits while others made more frequent, monthly visits. Education and training was accomplished through lectures, bedside teaching, observation, and operating
room experience. In some instances, the host teams traveled to the volunteer’s home institution for additional training. For example, Operation Airway sponsored the Ecuadorian surgeons’ travel to the Massachusetts Ear and Eye Infirmary to observe procedures prior to the start of the mission in Quito, Ecuador.

Despite the many differences, the host teams developed independence and were able to care for and manage their patient population locally, which was the primary goal of the missions.

_Collaboration_

Collaboration was not a measured outcome in any of the studies, however collaboration with local providers is closely tied to patient care, including postoperative follow-up, and the educational component that many short-term surgical missions offer. Education, skills-transfer, and coordination of care may certainly be considered a type of collaboration. Although collaboration itself was not quantified, education and skills-transfer was a measured outcome in 5 of the studies and many more studies addressed the importance of collaborating with local health care for growth and sustainability.

_Cost-effectiveness_

The comparison of two Operation Smile projects, the short-term medical mission and the comprehensive care center, demonstrated that the more cost-effective option was the permanent, locally-run care center. An encouraging finding was that the short-term mission and comprehensive care center were both more cost-effective than no intervention at all. With the comprehensive care center being the more effective and sustainable solution, however, an argument can be made for supporting the short-term mission whose goal is to build a long-term program such as a comprehensive care center.

The WHO describes cost-effective interventions as those with a cost per DALY averted that is less than the GDP per capita. In Vietnam, the GDP per capita is $1051. Therefore, Smile for Children’s short-term missions with a cost per DALY averted of $68 is considered highly cost-


effective as it is much less than the GDP per capita. Cost-effectiveness, however, is not the only factor to consider when assessing a mission’s financial expenses.

It is important to note where short-term mission finances are being spent and how those expenses are affecting the local health care system and community. Travel expenses, for example, are a contentious subject, as much of short-term mission funding is spent transporting and housing the volunteer team along with their equipment and supplies. Study 2 found that 56% of short-term mission funding was spent transporting the volunteer team and equipment. The comprehensive care center spent only 5% on travel. Study 3 found that nearly 30% of Smile for Children’s mission expenses were spent solely on travel. Study 4 found that nearly 50% of funding was spent transporting the foreign medical team. These travel expenses, which make up a significant portion of short-term mission budgets, limits the amount of funding that can be spent locally.

Cutting travel expenses would free up short-term mission funding, allowing for more resources to be spent within the local economy. One way to limit travel expenses is to reduce the number of people and items being shipped. Relying more on local health care workers and, whenever possible, purchasing equipment and supplies locally are some methods to help reduce travel costs. Study 4 believed that “training local neurosurgeons and ancillary staff…is the recognized long-term solution to providing neurosurgical care in the developing world, and can dramatically lower the associated cost.” Establishing a locally-run comprehensive care center is one way to accomplish these financial goals. Study 2 found that the comprehensive care center was more effective than the short-term surgical mission in conserving costs and contributing to the local economy. Study 2 found that 30% of the short-term mission expenses were spent locally. The comprehensive care center, on the other hand, spent 94% of expenses locally, with 46% dedicated to salaries of local workers and 20% to infrastructure costs. This study noted that a side benefit of the comprehensive care center’s investment into surgical capacity and surgical independence was increased economic distribution throughout the community.
Cultural Awareness

Identifying community and patient needs is a crucial component of planning a successful short-term mission, especially because these needs differ between locations and cultures. Study 1 demonstrates how patient concerns regarding similar medical encounters can differ between two cultures. This study found that Nicaraguan patients had more concerns specifically related to being part of an international short-term mission compared to their Guatemalan counterparts.

The interviews conducted by Medical Ministry International and affiliates of MEDRETES revealed a generally favorable attitude toward short-term missions, however requests were made for more long-term interventions. Suggestions were also made for increased community involvement so that the volunteers could better understand and address the community’s needs. These studies highlight the importance of communication with community leaders and patients receiving care from short-term missions.
Conclusion

The studies presented in this review demonstrate that short-term missions can contribute to long-term health care sustainability. Sustainability, however, is a complex subject that may have been oversimplified in many of the studies that tried to capture it as a single outcome. The metric used in the studies presented here neglects many of the components that influence a program’s long-term sustainability, including the social, economic, and political environment of the community. For this reason, measuring additional outcomes such as education and skills-transfer, cost-effectiveness, and cultural awareness can help provide a more comprehensive assessment.

Each study acknowledged that the environment was favorable to establishing a sustainable program. Local health care personnel, including physicians and other ancillary staff, were trainees responsible for learning new skills and maintaining long-term success of the programs. The local health care systems demonstrated an investment in the programs by purchasing equipment and supplies or by contributing to infrastructure changes and maintenance. Having medical, political, economic, and social support from the community is vital for program sustainability.

This review identifies a need for more research into the organization, execution, and outcomes of short-term missions. If the techniques and successes of short-term missions could be compared more directly, more specific guidelines could be made to help advise and regulate short-term missions. In an ideal setting, an outline or set of guidelines could be made to aid short-term missions in establishing sustainable programs.
References


