

## A New Model for Global Surgical Aid: The Moore Pediatric Surgery Center in Guatemala City

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### Introduction

To date, medical aid to the developing world has largely focused on infectious diseases such as tuberculosis, malaria and HIV/AIDS; malnutrition; and maternal-neonatal care. Only recently has surgical disease gained recognition as an important component of the public health paradigm.<sup>1</sup> Yet, the burden of disease that is treatable by surgery is significant. One landmark report estimated that surgical diseases resulted in an 11% decrease in total world disability-adjusted life years (DALYs).<sup>2</sup> In other words, more than one-tenth of the years of productive life lost worldwide could be improved with surgery.

While current efforts are being undertaken to characterize the surgical burden of disease around the world, it is well recognized that the toll of disease is significantly worse in developing nations. Because surgery is often the definitive treatment for many disease states, global surgical aid is becoming a more commonplace endeavor for both academic and community physicians wishing to provide humanitarian support abroad. While there is growing awareness and activity, surgery in the global health arena is still in its infancy. Indeed, surgery has been referred to as “the neglected stepchild of global health [efforts]”.<sup>3</sup>

There are myriad reasons why surgery has taken longer to become a priority in global health efforts. Foremost is the complexity: surgery requires a sterile field and instruments, anesthesia, a reliable source of electricity, and highly trained personnel. Many surgeons are uncomfortable working in an environment that they consider to be substandard, even if the facilities meet or exceed local norms. While human and material resources are one limiting factor, several additional limitations hinder the efficacy and sustainability of the surgical missions currently performed.

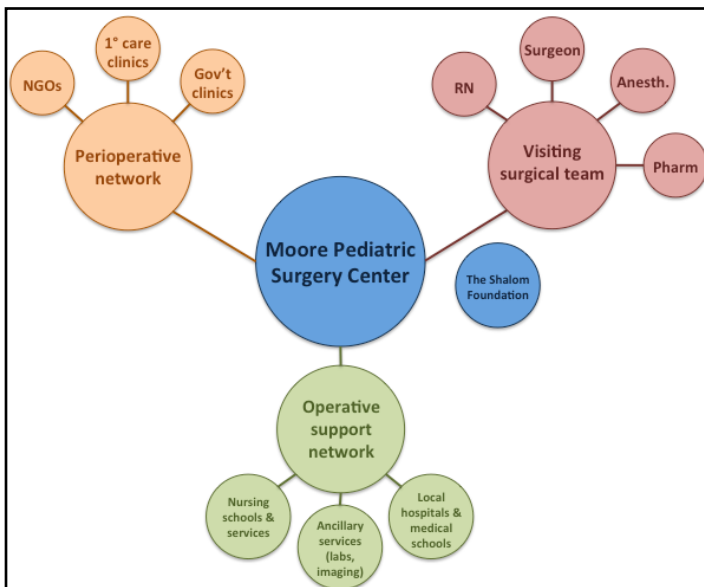
The most common form of surgical aid is the short-term medical mission, usually a “fly-in, fly-out” mara-

thon of procedures and operations with surgeons, nurses, and staff volunteering their time and efforts. While this strategy can deliver a high volume and skill level of surgery, it is problematic for the following reasons: (i) low capacity to provide quality postoperative care; (ii) high cost of purchasing and importing surgical equipment, anesthesia and medications; (iii) frequently poor conditions for surgery; and (iv) cultural discrepancies (e.g., the notion of obtaining informed consent).<sup>4-6</sup>

Thus, a successful global surgical aid program would be one that is well orchestrated and focused on the provision of safe and effective patient care. Such an enterprise would ensure not only a quality surgery, but also thorough pre-operative evaluation and post-operative follow up. It would provide a steady source of human and material resources. It would operate in a dedicated space with modern technology and a consistent source of electricity and water. Finally, an ideal global surgical initiative would be foundationally integrated within the host country’s *infrastructure* as to provide a culturally sensitive and nation-specific quality of care.

### The Moore Pediatric Surgery Center

The Moore Pediatric Surgery Center (MPSC) in Guatemala City attempts to address the aforementioned limitations by offering an independent space for patients, visiting surgeons and local physicians to coordinate peri-operative and operative care, as well as embed visiting specialists into local networks and contexts (**Figure 1**). The MPSC’s mission is to deliver specialized surgical care to children in need in Guatemala. In Guatemala, 80% of the population lives below the poverty line,<sup>7</sup> and 59% of people lack access to modern healthcare services. The average Guatemalan spends \$259 per year on healthcare,<sup>8</sup> one of the lowest values in Central and South America. After the Guatemalan Civil War (1960-1996), children now compose a dis-



**Figure 1.** Schematic map showing connections of providers interfacing with the Moore Pediatric Surgery Center (MPSC). The MPSC serves as a hub for the patient and a variety of providers from the United States (“visiting surgical team”) and Guatemala (“perioperative network” and “operative support network”). The visiting surgical team is comprised of surgeons, anesthesiologists, OR and PACU nurses, and pharmacists to provide operations during the mission. The perioperative network is comprised of primary care centers that can both refer patients for surgery and provide long-term follow-up care. The operative support network is composed of temporary Guatemalan providers (including floor nurses, medical and surgical residents, and laboratory and radiology services) who aid in care during the missions.

proportionate 50% of the Guatemalan population, making the pediatric population an especially vulnerable component of the healthcare landscape.

The MPSC’s mission requires coordinated efforts to ensure not only the surgical procedure itself, but also the care and follow-up surrounding the operation. The MPSC addresses this by providing a centralized facility that is designed for continuity of care. As a structure, the center has 12,000 square feet of space and functions as an independent surgical hospital. It has 3 modern and fully functional operating rooms, 4 pre-operative holding beds, 21 post-operative recovery beds, a nursing station, and a stocked pharmacy. While visiting surgical teams bring with them most of the medications needed for their specific perioperative protocols, the pharmacy is equipped with the anesthetics, analgesics, and antibiotics necessary to treat potential complications. The hospital also has a conference room, administrative offices, waiting areas, laundry facilities, a kitchen, residents’ quarters, 24-hour security and wireless Internet capacity.

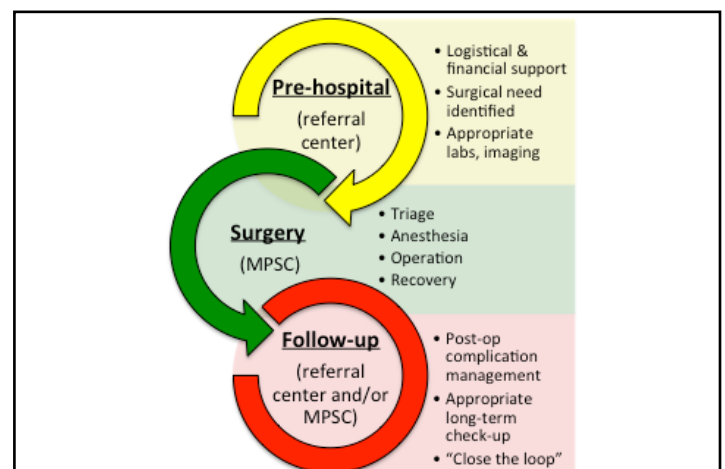
The MPSC’s focus on continuity of care embedded in local networks is reflected not only in the architecture but also in the processes through which the cen-

ter is managed and operated. The center allows for the complete care of the patient despite a relatively short length of stay of the surgical team. For the visiting team, this functions as it would for any other short-term international humanitarian trip: teams come for one week and provide as much quality surgery as they can safely and effectively. This results in many patients getting much needed surgery in a high-throughput fashion. What makes the MPSC different is the experience from the patient’s point of view. Because an attending pediatrician and medical personnel staff the MPSC year-round, patients can be pre-screened, get any pre-operative labs or imaging, and be followed post-operatively for complications.

### A typical mission

A typical mission to the MPSC proceeds in three phases: pre-mission, mission and post-mission (**Figure 2**). Before a mission can take place, the Shalom Foundation staff coordinates with teams from various universities and surgical centers to plan dates and the types of surgeries to be done. The MPSC is then booked for a one-week period of time during which surgery will take place. During the pre-mission phase, surgical teams will work with the Shalom Foundation/MPSC staff to coordinate what specialty supplies and/or medications the team needs to bring with them, lodging, travel, and all other necessary arrangements. It is also during this time that patients are recruited for surgery.

Once the team touches down in Guatemala City,

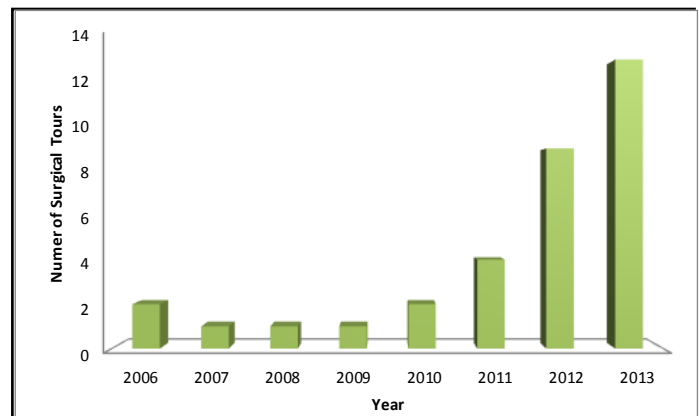


**Figure 2.** Normal flow of a surgical mission at the MPSC. Prior to the mission (yellow), patients are referred to the MPSC for surgical evaluation; surgical teams are recruited. During the mission (green), patients are triaged based on surgical need, surgical risk, and resource availability; an operative marathon is performed. After the mission (red), patients are followed-up either by the MPSC or a member of the perioperative network in their hometown; post-operative complications are managed.

the mission phase begins. On the first day, the team is brought to the MPSC for a tour and to set up for the first day of the mission. This first day is triage day: when all the patients and families show up to be screened by the surgeons and anesthesiologists. During this day, up to one hundred potential patients may be evaluated and triaged for surgery. The triage process takes into account all of the routine evaluation for surgery (e.g., safety for surgery, safety for anesthesia, patient co-morbidities) as well as the available human and material resources, a case-by-case assessment of disease burden and severity, and available time. Once the patients have been triaged, the team prepares for the surgical marathon. The teams work for the rest of the week to perform all surgeries that need to be done. Surgery is performed from the early morning to late in the evening, turning over an average of 15-20 cases per day depending on complexity of the procedures. After surgery, the patients are either kept in house (if the patient needs post-operative monitoring) or in a shelter close by. On the last day of the mission, all patients are re-evaluated to make sure they are doing well in the immediate post-operative period. It is at this time that an additional follow-up date may be scheduled, should that be deemed necessary by the surgical team. In this way, patients are able to benefit from complete care before, during, and after their operation.

## Results

The MPSC began collecting systematic data about their missions in 2012. Since then, 27 missions have taken place (**Figure 3**). During this two and a half year period, 1,770 patients were screened for surgery with 1,124 of these receiving operations. 56.5% of the patients were from within the Guatemala City limits, and 43.5% were from other parts of the country. 351 of the patients received non-procedural support, including medical laboratory tests, diagnostic imaging, pathologic evaluation, transportation and shelter. Specialties have included general surgery, urology, plastic surgery, dentistry, otolaryngology (ears, nose and throat), ophthalmology, and orthopedics (**Figure 4**). The most common procedures varied depending on the specialty performing the mission. General surgeons performed hernia repairs, splenectomies, cholecystectomies, appendectomies, and mass/cyst removals. Urologists performed hypospadias repair, cryptorchidism repair, and phimosis repair. Plastic surgeons performed scar revisions, cyst/mass excision, and microtia repair. Dentists attended to dental caries, fillings, extractions and root canals. Otolaryngologists performed cleft lip/palate repairs, tonsillectomies, adenoidectomies, thyroglossal



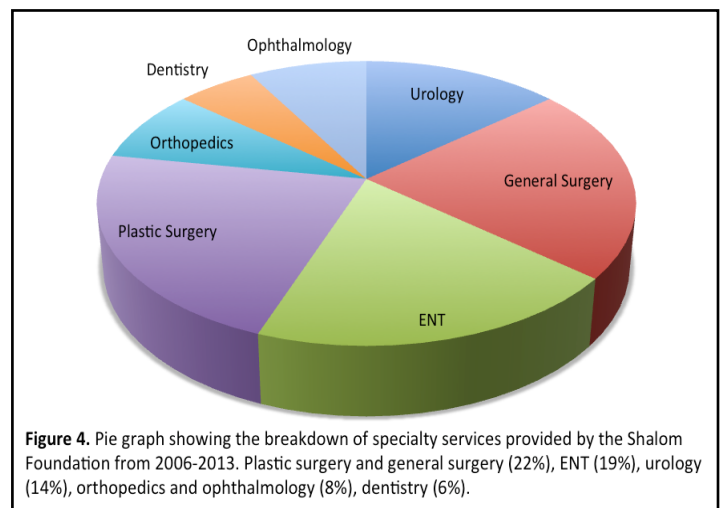
**Figure 3.** Graph showing the number of surgical tours coordinated by the Shalom Foundation between 2006-2013. Note the significant increase in surgical tours beginning in 2011 after the opening of the Moore Pediatric Surgery Center.

duct cyst removals, and tympanoplasties. Ophthalmologists performed strabismus repair, ptosis repair and chalazion removal. Orthopedic surgeons performed repairs of clubfoot, congenital dislocation of the hip, nerve injuries of the hand, polydactyly and syndactyly.

Overall, the complication rate has been 1.07% for all cases performed. These complications have included surgical wound site infection, bleeding/hematoma formation and wound dehiscence. Because Guatemalan physicians staff the MPSC when the primary team returns home, and because the center is stocked with medical supplies, patients were able to return to the center to have their complications attended to. All patients with wound site infections were given the appropriate course of antibiotics, and all incidents of bleeding and wound dehiscence were addressed by the MPSC physicians.

## Future directions for surgical aid in Guatemala

The MPSC represents a new model of surgical



**Figure 4.** Pie graph showing the breakdown of specialty services provided by the Shalom Foundation from 2006-2013. Plastic surgery and general surgery (22%), ENT (19%), urology (14%), orthopedics and ophthalmology (8%), dentistry (6%).

care in the developing world because it allows for the complete care of the patient with very little extra work required of the visiting medical team. The Shalom Foundation provides an intersection via which American and Guatemalan teams can collaborate. This centralization allows for a coordinated effort that results in efficient recruitment of patients, recruitment of surgical teams to treat the patients, and appropriate follow-up with patients after their operation. Because of this centralized structure, the MPSC is able to provide a wide array of care that draws from many specialties within the surgical arena. If the current trend continues, we can expect that many more children requiring surgeries will be attended to, potentially in a multidisciplinary fashion (e.g., plastic and ENT surgeons working together for complex reconstructive procedures).

With the increased capacity for surgery that the MPSC provides, a primary effort is currently being made by the staff to expand services outside of Guatemala City, as there is a large unmet need in the more remote regions of the country. These areas often have little to no medical care, much less an operating room for which to provide surgery. Because of this, it is important that the MPSC create strong partnerships with healthcare NGOs and government-run clinics (“Centros de Salud”) operating in the smaller villages throughout Guatemala. These relationships can constitute a robust network, with the rural clinic working in concert with the MPSC to provide complete perioperative care to the patient. The MPSC would provide the surgery while the rural clinics would serve a dual role to refer patients and monitor the post-operative status of the patient.

## Conclusions

Surgery has occupied only a marginal role in global health programs because of the complexity of procedures, difficulty providing the proper peri-operative care, cost and transportation of specialized materials, and cultural discrepancies. By providing the correct infrastructure, however, one can overcome many of these limitations. The Moore Pediatric Surgery Center serves as a replicable model for providing integrated clinical care by partnering local healthcare providers with visiting surgical teams. Rather than competing, providers compliment each other’s care, with local teams offering peri-operative services (patient screening, pre-operative labs and imaging, follow-up appointments, and post-operative care) and visiting teams providing the specialized procedural interventions. By coordinating care months prior to a surgical team’s arrival, the MPSC is able to recruit, screen, and triage

patients more effectively and appropriately than traditional surgical missions. Similarly, patients are able to follow-up with these physicians at the MPSC weeks to months post-operatively for routine visits or should complications arise. This creates a cooperative environment that is ultimately better for the patient in that it offers the entire continuum of care - a key factor lacking in many global surgical endeavors. The MPSC does all of this in a state-of-the-art facility with equipment and resources similar to operating rooms present in the United States. In so doing, the Center represents a hybrid model for providing safe and effective surgical care that combines the operative expertise of surgical subspecialists for a relatively brief timeframe with the longitudinal care patients require in the pre-operative and post-operative periods.

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