Pediatric Neurosurgery Outreach: Sustainability Appraisal of a Targeted Teaching Model in Kiev, Ukraine

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PURPOSE: This study evaluates the efficacy of operative skill transfer in the context of targeted pediatric outreach missions completed in Kiev, Ukraine. In addition the ability to create sustainable surgical care improvement is investigated as an efficient method to improve global surgical care.

METHODS: Three 1-week targeted neurosurgical missions were performed (2005-2007) to teach neuroendoscopy, which included donation of the necessary surgical equipment, so the host team can deliver newly acquired surgical skills to their citizens after the visiting mission team departs. The neuroendoscopy data for the 4 years after the final mission in 2007 was obtained.

RESULTS: After performing pediatric neurosurgery missions in 2005-2007, with a focus on teaching neuroendoscopy, the host team demonstrated the sustainability of our educational efforts in the subsequent 4 years by performing cases independently for their citizens. Since the last targeted mission of 2007, neuroendoscopic procedures have continued to be performed by the trained host surgeons. In 2008, 33 cases were performed. In 2009 and 2010, 29 and 22 cases were completed, respectively. In 2011, local neurosurgeons accomplished 27 cases. To date, a total of 111 operations have been performed over the past 4 years independent of any visiting team, illustrating the sustainability of educational efforts of the missions in 2005-2007.

CONCLUSIONS: Effective operative skill transfer to host neurosurgeons can be accomplished with limited international team visits using a targeted approach that minimizes expenditures on personnel and capital. With the priority being teaching of an operative technique, as opposed to perennially performing operations by a visiting mission team, sustainable surgical care was achieved and perpetuated after missions officially concluded. (J Surg 69:611-616. © 2012 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: pediatric neurosurgery, international outreach, surgical missions, sustainable surgical care, educational model

COMPETENCIES: Patient Care, Medical Knowledge, Professionalism

INTRODUCTION

As basic surgical services are recognized as an unmet clinical need for underserved populations throughout the world, steps to remedy this situation are becoming more sophisticated. Although elective ophthalmologic and cleft palate surgical cases have the most robust experience, the applicability to surgical fields that must provide emergent and urgent care is lacking. A sustainable approach to improving medical care relevant to pediatric neurosurgery is through advancement of specialist education and training in conjunction with providing the necessary surgical equipment.1-3

To extend a model used in Lima, Peru, we investigated whether this approach could serve as a successful template to construct other small-scale, sustainable neurosurgery missions worldwide. The Ukrainian Institute of Neurosurgery in Kiev houses the Department of Pediatric Neurosurgery, which serves as the central referral site for all pediatric neurosurgery in Ukraine. At present, the country has 5 pediatric hospitals, each with a department of pediatric neurosurgery managed by the Academy of Medical Sciences of Ukraine Institute of Neurosurgery located in Kiev. It is the referral center for all pediatric medicine and surgery within Ukraine with 5 full-time pediatric neurosurgeons, 6 operative theaters, and 288 beds.

The optimal model for neurosurgical outreach should have at its core a mission objective to teach surgical skills such that operations can be performed by local providers after visiting teams depart. We present our 4-year follow-up from targeted pediatric neurosurgical missions to Kiev,
Ukraine, from 2005 to 2007 and provide a critical appraisal of operative skill transfer as the essential feature of sustainable global surgical care.1

METHODS

Mission Objective

Since the inaugural mission in 2004, the objective has been to develop models and systems that will establish sustainable neurosurgical care delivery mediated through dedicated, skilled local providers to underserved populations. Extending our experience at Maria Auxiliadora Hospital in Lima, Peru, we sought to collaborate with a charity hospital in a different geographic, political, and cultural area. The Institute of Neurosurgery, Department of Pediatric Neurosurgery (Fig. 1), was identified after correspondence with Eastern European neurosurgical societies to identify a charity hospital staffed by local neurosurgeons that provides emergency and some elective care to the local population. Three targeted 1-week missions were performed from 2004 to 2006.

Pedagogical Approach

To create the greatest positive human impact and use resources efficiently, the surgical education effort focused on less invasive pediatric neurosurgery employing endoscopic techniques that are potentially more amenable to teaching during limited mission trips. Host pediatric neurosurgeons were facile with general and trauma based care, and, given the significant incidence of hydrocephalus from diverse etiology (infections, tumors, and congenital conditions), it was a clinical priority to reduce the number of ventriculoperitoneal shunting procedures. Fitting the clinical objective of treating hydrocephalus, most cases were endoscopic third ventriculostomies. In addition, the endoscope was used to perform tumor biopsies, cyst fenestrations, and septum pellucidotomies when indicated. The surgical teaching approach would need to be successful during the course of three 1-week visits over the course of 3 years. Accordingly, the constraints of the mission duration and frequency, complex cranial and spinal operations were not feasible as teachable skills.

Site Evaluation

After corresponding with several departments providing care in Eastern Europe, we chose the Institute of Neurosurgery for in-person site evaluation. This site evaluation was used to evaluate whether the host team was genuinely committed to use the resources solely for underserved poor children in their city. Furthermore, it allowed for assessment of equipment, operating theater conditions, and feasibility of an inaugural visit.

Inaugural Visit

The first visit established the mission foundation and demonstrated the ability of the host team to successfully coordinate and execute the logistics of patient selection, operative schedule, and postoperative care—including obtaining hospital administrative support for anesthesia, nursing, and beds. During this visit, case selection was primarily endoscopy cases, with the visiting team performing the operations interspersed with grand-rounds style case presentation and discussion (Fig. 2). This visit was also used to evaluate and ensure functionality of the operative theater and equipment. Four operative days (Days 3-6 of the mission) were scheduled with the more complicated cases first to maximize time of postoperative observation. The inaugural visit was used to establish “ground rules” related to ethical considerations, including consent issues, optimal use of limited resources, and ability of patients/families to obtain extended medical and surgical postoperative care.

Subsequent Visits

The second mission was increasingly collaborative, focusing more on educational elements. The host neurosurgeons and visiting faculty were paired for the duration of the trip. Over time, the host played a more significant role in operative cases and began to function as primary surgeon on some, in accordance with his/her skill level. On the third mission, the host team was primary on all cases. By the end of the week of the last visit, visiting neurosurgeons functioned solely as observers. During the second and third visits, 4 total complications occurred with 2 being cerebrospinal fluid leaks, 1 ventriculitis requiring antibiotics, and 1 a hemorrhage requiring extended external ventricular drainage (Fig. 3). In the final visit, the mission team evaluated the host team’s performance in increasingly challenging specialty cases.

Sustainability Evaluation

The host team used e-mail to report the total number of cases performed annually. In parallel, the volume of ventriculoperitoneal shunts was also recorded with reduction of shunt volume in years 2008-2011 by 21, 19, 18 cases respectively, when com-
pared with 2007. Resident physicians were also asked whether they felt they were benefitting from neuroendoscopy training; the utility of this is limited because no formal surveys were performed during mission visits. This provides an area of improvement during future missions to other institutions.

RESULTS

By completion of 3 targeted missions, 1 senior and 2 junior faculty neurosurgeons had been trained in basic neuroendoscopy. As part of the educational mission a portable endoscopy unit and disposable endoscopes were provided. The general surgeons in the host institution facility kindly allowed use of their monitors, which provided excellent clarity for performing and teaching the operations. In 2005, 11 operations were performed with the visiting team as both primary and assisting surgeons. In 2006, 12 operations were performed with the visiting team as primary surgeon and 5 with the host team as primary surgeon. The host team was the assisting surgeon in all 17 cases. In 2007, the host team was primary and assisting surgeon in all 21 cases performed (Fig. 4).

After departure of the visiting team, host surgeons armed with the provided equipment, training, and experience continued to independently perform neuroendoscopic procedures in subsequent months. For the rest of 2005, the host team completed 2 procedures independent of the 11 operations performed with the visiting team. This number increased to 9 independent cases in 2006, and 17 in 2007. Since the last targeted mission of 2007, neuroendoscopic procedures have continued to be executed by the trained host surgeons. In 2008, 33 cases were performed. In 2009 and 2010, 29 and 22 cases were completed, respectively. In 2011, local neurosurgeons accomplished 27 cases. To date, a total of 111 operations have been performed over the past 4 years independent of any visiting team, illustrating the sustainability of educational efforts of the missions in 2005-2007 (Fig. 5). In parallel with the increased use of neuroendoscopy the host team treated children with fewer shunts. No children were brought to United States for transferred care.

DISCUSSION

Surgical disciplines in international outreach missions can be differentiated partly based on whether the pathology addressed by surgical intervention can be done electively. Short visits by neurosurgeons do not significantly impact unmet clinical needs in pediatric neurosurgery, simply because care is rarely needed on an elective basis. Furthermore, this approach is not cost-effective for charitable organizations with limited resources. The optimal model for neurosurgical outreach must have the core goal to teach surgical skills such that local providers can continue to perform operations after the mission is complete. To achieve this goal, it requires careful selection and deployment of effective mission teams, with a continual focus on careful spending of limited funds. Indeed, existing organizations performing elective plastic and reconstructive surgery have been criticized for suboptimally using millions of dollars that could be put to better use by local authorities. Also, not every underserved region presents an educational opportunity.
Differences in the medical needs of populations, the skills of local health care providers, and the level of interest in international collaboration present a challenge. We believe that the key to success for fiscally responsible and effective operative skill transfer is to collaborate with academic neurosurgeons in capital cities who can perpetuate the newly acquired techniques to surgeons in training as well as provide postoperative care when the mission teams depart.

Building on our experience in Lima, Peru, we applied our surgical education outreach model to the pediatric neurosurgery department at the Ukrainian Institute of Neurosurgery in Kiev. A major goal was to create a model system that would empower host neurosurgeons to deliver necessary but previously lacking pediatric neurosurgical care to their own citizens. After three 1-week missions from 2005 to 2007 the objective of teaching local neurosurgeons to facilitate sustainable surgical care was achieved. The host team demonstrated excellent technical skill, knowledge of disease processes, postoperative management and an ability to perform simple neuroendoscopic cases in the time between mission visits. On the last mission they performed 21 cases independently with the visiting team playing an observational role only.

FIGURE 4. The educational structure of the three 1-week missions was focused on rapid and safe transfer of operative skills for sustainable surgical care after mission visits concluded. With progressive visits, the host team assumed greater responsibility for the case load and ultimately demonstrated the ability to function as both primary and assisting surgeons, while the visiting team played an increasingly observational role.
To optimize the educational model, language barriers were considered. For these missions a junior member of the host team was fluent with English and served as the communication bridge. Given the host team’s limited command of English, we prioritized the inaugural visit to include teaching sessions, including presentations. Most significant were actual videos of cases and complication management giving the teams an opportunity for “virtual” operative collaboration before performing cases in the operative theater.1,4,13,14 Effectively, with only 1 host team member serving as translator, we were able to effectively collaborate on didactic and operative responsibilities.15-17

The operative skill that we chose to teach can be performed with minimal capital investment on equipment, is typically unavailable to underserved children in less industrialized nations, and can make a significant impact on a clinically unmet and relevant need. Neuroendoscopy can be used to avoid the placement of shunts in children, a procedure fraught with problems, including infection risk, expense, and the time required for the procedure. Shunts also can malfunction, with 1 large prospective multi-institutional study reporting that 40% of patients required shunt revision within 2 years of initial placement.18,19 By contrast, neuroendoscopy is minimally invasive and avoids infection, shunt dependency, potential shunt malfunction, and shunt expense. Also, recent robust investigations from Uganda concluded that untreated hydrocephalus in infants exacts an enormous price, neurosurgical intervention has a cost averted comparable with other surgical interventions that have been evaluated, as well as a favorable benefit–cost ratio, and the prevention and treatment of hydrocephalus should be recognized as a major public health problem.18,19

Since the last mission, the local neurosurgeons have shared data on the volume of endoscopy cases performed. Before delivery of education and equipment in 2005, no endoscopic cases were done, but since then an average of 27.75 cases have been performed per year from 2008 to 2011. The lack of neuroendoscopy before our targeted outreach was similar to the operative environment found in Lima, Peru, where the teaching model was first executed.1 Similar to our experience there, in the Ukraine we achieved effective operative skill transfer to host neurosurgeons with very few international team visits. This targeted approach minimizes personnel and capital expenditures. With the goal of teaching a technique rather than performing it perpetually on repeat visits, we believe that in the niche of minimally invasive pediatric neurosurgery, sustainable surgical care was achieved. Short-term surgical missions have been suggested to be inappropriate when they provide temporary solutions that do not address the root causes of health problems.10,20 Our data demonstrate sustainable transfer of operative skill in the most rigorous and challenging medical discipline, neurological surgery.

Given the evolving geopolitical and economic climate of the Ukraine, challenges remain. First, as faculty retire or move to other hospitals their operative skills must be transferred to junior faculty. Second, as equipment needs to be refurbished, funds may not be available and dialogue must remain active between visiting, and host teams to ensure alternative strategies could be implemented to avoid attrition of the acquired equipment and skill set. Although the 4-year follow-up results are promising, the real test of whether sustainable operative skill transfer has been achieved will be data collected over the next 5 years. During this period the host neurosurgeons must evolve entirely within their own geopolitical and medical ecosystem without our influence.

REFERENCES


