Surgery in the Horn of Africa

A 1-Year Experience of an American-Sponsored Surgical Residency in Eritrea

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Objective: To describe the 1-year experience of a unique postgraduate medical education program set in Eritrea, a recently war-torn country.

Design: The Partnership for Eritrea, a cooperative between The George Washington University Medical Center, Physicians for Peace, and the Eritrean Ministry of Health, formed a surgical residency program, launched January 2, 2008, in Asmara, Eritrea, to train native Eritrean surgeons. No prior residency program (to our knowledge) had existed in Eritrea.

Setting: Eritrea, a country in the Horn of Africa.

Patients: Five Eritrean physicians participated in the surgical residency.

Main Outcome Measures: The number of operations performed, length of stay, antibiotic use, and intravenous fluid use.

Results: The number of operations increased and resource use decreased because of improved and standardized clinical management.

Conclusions: The Partnership for Eritrea established a general surgical residency program that improved clinical care in a resource-poor country that previously had lacked postgraduate training. The program experience suggests a model that can be reproduced in other developing countries.

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The surgical burden of disease rests disproportionately in the developing world, largely in sub-Saharan Africa, as noted in the article “The Surgical Workforce Crisis in Africa: A Call to Action.” Coupled with a critical dearth of trained health care personnel, especially surgeons, the burden of disease becomes even more insurmountable. Today, no country can develop its health care system in isolation without considering the global ramifications, as illustrated by the phenomenon of "brain drain," or the migration of trained professionals from the developing world for further training, better wages, and more favorable working conditions. International recognition of the importance of this crisis and its human effect is growing. At the Global Forum on Human Resources for Health held in Kampala, Uganda, a call was put forth to the world’s health care community to address the striking health care needs of the poorest countries, especially their workforces. In response to this call to action, The Partnership for Eritrea program, the first general surgical residency program in the Horn of Africa, to our knowledge, hopes to help.

OVERVIEW AND BACKGROUND OF ERITREA

Tucked away in the Sahel region of the Horn of Africa, Eritrea is the youngest country on the African continent. Despite its culture’s ancient history, Eritrea became independent in 1993 after a grueling 30-year war with its neighbor, Ethiopia. After gaining their freedom, the Eritrean people began building their nation. This process involved, in part, revamping a overwhelmed health care system, including addressing the pressing and extreme shortages in human health care resources. The population of Eritrea is approximately 4 million people, with 20% in the capital city of Asmara and 80% in the rural areas. In the rural areas, 60% of the population does not have access to safe water and only 1% has access to adequate sanitation facilities. Life expectancy in Eritrea is 52.7 years compared with 74 years in the United States.

Currently, the health care system consists of 6 national referral hospitals, 20 re-
regional and subzone hospitals, 107 clinics, and 182 health stations, which offer basic health care. The referral hospitals have approximately 200 beds each. The rural hospitals have 15 to 20 beds each and are staffed by 1 to 3 physicians each. There is no emergency medical service system in Eritrea.\(^3\) Health care expenditure in Eritrea amounts to 4.4% of the gross domestic product, or $4 to $23 per person per year, in contrast to 15.2% of the gross domestic product in the United States, or $5000 per person per year.\(^3\)

In 2004, there were only 215 physicians in Eritrea, or 4.5 physicians per 100,000 people. By contrast, the physician density in the rest of sub-Saharan Africa is 21.7 per 100,000; in the United States, it is 293 per 100,000. In 2004, Eritrea had 5 formally trained general surgeons, 3 otolaryngologists, and 2 orthopedists, all of whom had obtained their higher degrees from medical schools in Ethiopia or Europe.

Eritrea’s first medical school, the Orotta School of Medicine, opened in 2003. At that time, there were no residency programs and no source for continuing medical education. Eritrean general practitioners, especially in the periphery, were left to handle surgical cases beyond their training. Patients often received poor or no care and died of surgically curable conditions and diseases, such as ruptured appendicitis and sigmoid volvulus. The lack of access to advanced medical education also contributed to brain drain.

THE PARTNERSHIP FOR ERITREA SURGICAL RESIDENCY

The Partnership for Eritrea was founded in 1991 in response to Eritrea’s shortage of human health care resources. The Partnership is a collaboration among The George Washington University Medical Center, Physicians for Peace, and the Eritrean Ministry of Health. The George Washington University Medical Center provides academic support and administration. Physicians for Peace, a Virginia-based, nonprofit organization with a history of funding short-term international surgical missions, provides financial support. The Eritrean Ministry of Health provides in-country coordination. The Partnership’s mission is to develop postgraduate residencies in several fields of medicine. The first residencies were in general surgery and pediatrics, launched January 2, 2008.

The surgical residency is modeled after an American surgical program, with basic and clinical science lectures along with daily operative and weekly outpatient clinic experience. The academic program was designed to be realistic for the developing world, in which resources and technology are limited, while providing an overview of US and European practice standards. Monthly morbidity and mortality rate conferences were introduced to foster continuous quality improvement. In addition, quarterly reports are written to update the faculty, residents, and Ministry of Health of the program’s progress and to examine the areas of deficiencies and need for further development.

Yearly written in-service examinations are given. Final assessment of the residents will consist of a written and oral examination conducted by external examiners from the United States or Europe. As a work in progress, details of the accreditation process have yet to be finalized, but the residents will pass on and carry out George Washington University Medical Center’s standard of surgical excellence, although their licenses will only permit them to practice in Eritrea.

Operative exposure is provided at 2 hospitals in the capital city of Asmara. The first is Halibet Hospital, a public general hospital with 208 beds, of which 45 are surgical. The 2 full-time Partnership-affiliated general surgeons perform an average of 1000 operations per year. The second is Orotta Hospital, a 164-bed tertiary referral center. Orotta Hospital offers general surgery and pediatric, maxillofacial, and neurosurgical services. Five full-time surgeons performed approximately 2500 operations in 2007 and 3330 operations in 2008. Orotta Hospital is linked with the Orotta School of Medicine and provides the training ground for the students’ clinical surgical experience.

Each clinical rotation lasts 3 months. The first-year curriculum focuses on general surgery and basic urologic procedures performed by general surgeons, which comprise approximately 25% of the case load, including open prostatectomies, nephrolithotomies, and ureterolithotomies. The second year includes subspecialty surgery, including orthopedics, otolaryngology, neurosurgery, endoscopy, and limited vascular and maxillofacial surgery. Also, the curriculum includes exposure to limited laparoscopy (mostly diagnostic), which in the absence of computed tomography or ultrasonography can be helpful and timely tools for diagnosis. In the final year, there are community surgical rotations designed to give the residents a semiautonomous surgical experience and the opportunity to enrich surgical care by educating regional staff as well.

Subspecialty exposure is provided by visiting faculty from the United States and elsewhere. Selected by a visiting faculty application process, visiting faculty provide extensive pediatric and urologic exposure to residents. To date, visiting pediatric surgeons and urologists from Rome, Italy (San Camillo Hospital), and a US vascular surgeon (Howard University, Washington, DC) have enriched the academic environment.

The first surgery residency class consisted of 5 Eritrean physicians, all of whom are general practitioners with varying degrees of surgical experience and who have 6 to 13 years of post–medical school experience. Subsequent classes will be drawn from among graduates of the Orotta School of Medicine. The faculty consists of 5 Eritrean surgeons and visiting surgeons from the United States, Europe, and Cuba. The Eritrean faculty attended a development seminar designed and delivered by The George Washington University Medical Center faculty. The seminar’s purpose was to provide continuing medical education for Eritrean physicians, who may have had outdated information regarding teaching theory and technique owing to a lack of opportunity for further education since the completion of their training. One of us (F.M.K.) served as in-country surgical residency program director.

DATA COLLECTION

The total number of operations in each hospital was tallied for 2007 and 2009, the years before and after the resi-
dency started. The number of operations the residents performed per month for 1 year, from January 1, 2008, through January 31, 2008, was also tracked. Resource use in Orotta Hospital was tracked by hand counts of the number of antibiotic vials and intravenous fluids used for the same 2-month periods of May and June in 2007 and 2008. Length of stay was tracked in Orotta Hospital for the same amount of time.

RESULTS

The number of operations increased by 17% and 16% at Orotta Hospital and Halibet Hospital, respectively, after the residency started (Table 1). The residents covered 70% of the cases at Orotta Hospital and 77% at Halibet Hospital. Each surgical resident averages approximately 35 major cases per month. Resource use decreased after the residency started. Length of stay decreased by 15%. Antibiotic use decreased by 42%, and use of one-L intravenous fluid bags decreased by 44% (Table 2).

We calculated rates in nakfa (ERN), the Eritrean currency, with a 2008 conversion value of ERN15= $1. The absolute decrease in the number of antibiotic vials used between 2007 and 2008 was 4214. At a cost of ERN4 to ERN10 per vial, a savings of ERN16 856 to ERN42 140 ($1123-$2809) was shown. If this trend were to hold for a year, the annual savings would be ERN101 136 to ERN252 840 ($6742-$16 856). The absolute decrease in the number of antibiotic vials used between 2007 and 2008 was 4214. At a cost of ERN4 to ERN10 per liter, a savings of ERN48 128 ($3208) was shown. If these savings were to be projected to a year, the annual savings would be ERN288 768 ($19 251) ($6742-$16 856). The absolute decrease in the number of antibiotic vials used between 2007 and 2008 was 4214. At a cost of ERN4 to ERN10 per liter, a savings of ERN48 128 ($3208) was shown. If these savings were to be projected to a year, the annual savings would be ERN288 768 ($19 251) ($6742-$16 856). The absolute decrease in the number of antibiotic vials used between 2007 and 2008 was 4214. At a cost of ERN4 to ERN10 per liter, a savings of ERN48 128 ($3208) was shown. If this trend were to hold for a year, the annual savings would be ERN101 136 to ERN252 840 ($6742-$16 856).

Overall length of stay in Eritrea is long because of socioeconomic factors. Patients come from remote and extremely poverty-stricken areas, even from the border of neighboring countries such as Sudan, and often require long hospital stays to recover completely before being able to journey home. Even under these circumstances, the residency program led to decreased length of stay by emphasizing evidence-based care; phasing out older, inefficient practices; and instituting regular daily ward rounds, which had not been performed previously. These practices led to decreased recovery times and faster discharges.

Other benefits to the surgical program included improvements in the consultation process, especially between surgery and pediatrics departments, because a concomitant pediatric residency program was initiated with in-house residents on call. The process was standardized; timely responses have become the norm. In many cases, especially of the neonatal type, this resulted in earlier detection of life-threatening emergencies, earlier surgical intervention, and perhaps improved outcomes, although there are no data to substantiate this possibility yet. The availability of in-house residents during off hours also enhanced the ability to respond to and comprehensively evaluate true surgical emergencies.

COMMENT

The surgical residency has had a positive effect on the number of operations performed and on resource use. Although multiple factors affect these parameters, the residency program contributed to these positive results in specific ways. Having more surgical staff obviously means more operations can be performed. However, the long wait time for an elective operation, days to weeks, is also highly dependent on surgical bed availability. The residency program improved practice standards, which improved postoperative care, decreased complications, and expedited discharges. These results yielded more vacant surgical beds; thus, more operations could be performed.

Clinical instruction also led to decreases in antibiotic and intravenous fluid use. Because of inconsistent record-keeping and the lack of electronic medical records, data were not available for the entire 2007-2008 period. However, the snapshot data support the experience of the authors, who led ward rounds with a specific emphasis on evidence-based medicine criteria regarding when use of antibiotics and fluids could be discontinued. Previously, orders for both would be written and not reassessed for days. Institution of regular ward rounds in which these orders were scrutinized led to decreased use of these supplies.

Table 1. Number of Operations Performed Before and After Initiation of Residency

<table>
<thead>
<tr>
<th>Hospital</th>
<th>2007 (Before Residency)</th>
<th>2009 (After Residency)</th>
<th>Increase, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orotta</td>
<td>1792</td>
<td>2095</td>
<td>17</td>
</tr>
<tr>
<td>Halibet</td>
<td>873</td>
<td>1009</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>2665</td>
<td>3104</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 2. Resource Use Before and After Initiation of Residency

<table>
<thead>
<tr>
<th>Resource</th>
<th>2007 (Before Residency)</th>
<th>2008 (After Residency)</th>
<th>Decrease, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay, d</td>
<td>16.8</td>
<td>14.5</td>
<td>15</td>
</tr>
<tr>
<td>No. of antibiotic vials per patient</td>
<td>49.5</td>
<td>28.5</td>
<td>42</td>
</tr>
<tr>
<td>No. of IVF liters per patient</td>
<td>33.9</td>
<td>19.9</td>
<td>44</td>
</tr>
</tbody>
</table>

Abbreviation: IVF, intravenous fluid. *Data are from May and June 2007 and 2008.

CONCLUSIONS

Although seemingly unrealistic given the precarious financial and political situation of the country, the Partnership for Eritrea surgical residency program was successfully established, to the benefit of Eritrean patients and physicians. The unique combination of resources from a US university, a nonprofit financial base, and the Eritrean Ministry of Health helped the program overcome significant barriers to create a medical education program in a developing country to address a formidable health care crisis. The Partnership continues to expand: an obstetrics-gynecology residency program was launched on July 1, 2009, with plans for residencies in anesthesia and internal medicine.
Active recruitment of Eritrean physicians to lead the Partnership in the future continues. When the program is self-sufficient, The George Washington University Medical Center team plans to transfer administrative control to the local staff, ideally in 5 years’ time. Perhaps, once the program has proved its merit, this model can be used in other parts of the world with similar needs to establish tertiary medical education.

For correspondence or information about how to volunteer for The Partnership for Eritrea, please contact Huda Ayas, MHSA, MBA, EdD, executive director of the Office of International Medicine Programs at The George Washington University Medical Center at partnershipforeritrea@gwumc.edu; Haile Mezghebe, MD, medical director of Postgraduate Medical Education for The Partnership for Eritrea at hailemez@yahoo.com; or check the Operation Giving Back section of the American College of Surgeons Web site at http://www.operationgivingback.facs.org.

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Author Contributions: Study concept and design: Khambaty, Ayas, and Mezghebe. Acquisition of data: Khambaty and Mezghebe. Analysis and interpretation of data: Khambaty. Drafting of the manuscript: Khambaty, Ayas, and Mezghebe. Critical revision of the manuscript for important intellectual content: Khambaty and Ayas. Statistical analysis: Khambaty. Administrative, technical, and material support: Khambaty, Ayas, and Mezghebe. Study supervision: Mezghebe.

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Table 3. Resource Savings Before and After Initiation of Residencya,b

<table>
<thead>
<tr>
<th>Resource</th>
<th>2007 (Before Residency)</th>
<th>2008 (After Residency)</th>
<th>Cost per Unit, ERN</th>
<th>Money Saved (Projected Annual), ERN ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic vials, total</td>
<td>9916</td>
<td>5702</td>
<td>4-10</td>
<td>101 136-252 840 (6742-16 856)</td>
</tr>
<tr>
<td>IVF liters, total</td>
<td>6788</td>
<td>3780</td>
<td>16</td>
<td>288 768 (19 251)</td>
</tr>
</tbody>
</table>

Abbreviations: ERN, nakfa; IVF, intravenous fluid.

a Data are from May and June 2007 and 2008.

b Per the 2008 rate of ERN15= $1.


INVITED CRITIQUE

The Need for Sustainability in Contemporary Global Health Efforts
Missions vs Mission

Until recently, response to the surgical global health burden has been largely through short-term volunteer surgical missions. With a few exceptions, most of these missions are time limited and unpredictable. A visit to any operating room in the developing world reveals a landscape littered with the detritus of well-meaning missions: unrepaird ventilators, incubators, and anesthesia machines labeled with the name and date of the mission can be found in the most remote parts of the world. Although short-term missions have no doubt improved the lives of many individuals, their ability to make a meaningful and lasting effect in the developing world is limited.