

**Modeling the Malawi Surgical Initiative:
A Program and Evaluation Plan for
Postgraduate Surgical Training in Sierra Leone**

By

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Abstract

The high burden of surgical conditions in Sierra Leone is unmatched by a low surgical workforce. Currently, there is no advanced level postgraduate surgical training program in Sierra Leone. This paper proposes a possible solution by presenting a program and evaluation plan for a twinning postgraduate surgical training program in Sierra Leone. The overall structure of this proposed program and evaluation plan is based on other similar programs such as the Malawi Surgical Initiative and also on the perspectives voiced by potential stakeholders in Sierra Leone. There is currently a strong interest in the development of such a program in Sierra Leone. As a result, this document is intended to serve as an additional resource and guide for future program directors and stakeholders in Sierra Leone and abroad.

Introduction

It has been estimated that 11% of the global burden of disease can be attributed to surgical conditions; of these, 38% are due to injuries and other major causes include malignancies, congenital anomalies and pregnancy complications (Ozgediz, Jamison, Cherian, & McQueen, 2008). In some developing countries, surgical diseases are among the top 15 causes of disability and 15% of total disability adjusted life years (DALYs) lost worldwide are attributable to surgical conditions (Farmer & Kim, 2008). Sierra Leone is an example of a developing country in sub-Saharan Africa with a high surgical disease burden that also lacks the human resources to meet this increasing public health burden.

The surgical capacity in Sierra Leone has been described as severely lacking in terms of infrastructure, personnel and supplies (Kingham et al., 2009). With a population size of approximately 6 million people, it is estimated that a minimum of 1.5 million Sierra Leoneans currently require a surgical consultation (Groen et al., 2012; WHO, 2009). However, there are only 10 fully trained active Sierra Leonean surgeons working in the government hospitals and their specialties include general surgery, orthopedic surgery and urology (Kingham et al., 2009; Statistics Sierra Leone, 2008). To put these numbers into perspective, there is only 1 surgeon for every 600,000 Sierra Leonean as compared to the ratio of about 6 general surgeons per 100,000 people in the United States (Center for Workforce Studies - Association of American Medical Colleges, 2012).

In this paper, I will devise a program and evaluation plan for a full-length postgraduate surgical training program in Sierra Leone. The primary goals of the

program are to develop a postgraduate surgical training program in Sierra Leone that shares a mutual partnership(s) with an international academic center (s) and to locally develop and increase the surgical workforce and hence the number of practicing surgeons in Sierra Leone. The first section of this paper is a literature review for existing postgraduate surgical training programs located in sub-Saharan Africa that share a partnership with an international academic center(s). The purpose of the review is twofold. One, it will offer some insight into the planning, implementation and monitoring & evaluation process of these types of surgical training programs. Two, it will provide a framework or, at the least, useful components to be integrated into this program and evaluation plan for a postgraduate surgical training program in Sierra Leone. The second section of this paper provides details of the program plan, rationale and implementation components. The third section of the paper provides the evaluation plan that describes the overall approach, methods and detailed strategy for evaluating the Sierra Leonean postgraduate surgical training program. The last section of this paper culminates with a discussion, which brings all the components together, analyzes the program plan and evaluation, and considers the future outlook for this postgraduate surgical training program in Sierra Leone.

Literature Review

Introduction

There has been a recent surge of interest in the global burden of surgical diseases. This interest has been backed by the emerging evidence, which suggests that surgical services may be just as cost-effective when compared to other health interventions. As part of the awareness of recognizing surgical diseases as a public

health dilemma, the WHO expanded their priorities to include surgical care; which led to the development of the Emergency and Essential Surgical Care program (EESC) (Bickler & Spiegel, 2010). Additionally, surgical care has been described as an essential component for achievement of the United Nations Millennium Development Goals (MDGs) 4, 5, and 6, which are to reduce childhood mortality, improve maternal health and combat HIV/AIDS, respectively (Johnson, 2013).

This increased global attention of addressing the high surgical disease burden in LMICs (low- and middle-income countries) has sparked a growing interest to increase the surgical delivery capacity within these countries (Johnson, 2013; Leow, Kingham, Casey, & Kushner, 2010). As a long-term solution to increase the number of local surgeons in these countries, a modern yet rapidly emerging approach, described in the literature is “academic twinning” (Johnson, 2013; Riviello et al., 2010). Academic twinning is when an academic center in a developed country establishes a partnership with the government and/or a similar institution in a LMIC (Johnson, 2013; Riviello et al., 2010). Often, the goal of this partnership is to develop a reciprocal academic relationship for the sharing of resources such as human personnel, knowledge, technology and research experiences (Johnson, 2013; Riviello et al., 2010).

The purpose of this literature review is to identify postgraduate surgical training programs that are based in sub-Saharan Africa that have partnered with an international academic institution with the goal of increasing the number of active local surgical personnel. By analyzing such existing programs, I will identify key components of the individual designs that may be essential to incorporate in my program and evaluation plan. Also, the data collected about these programs may provide insight on possible

challenges or pitfalls that will be important to consider as I develop a similar postgraduate surgical training program and evaluation plan for Sierra Leone.

Methods

Research Question

Are there formal postgraduate surgical training programs in sub-Saharan Africa that also have an international academic partnership? If so, 1) what are the characteristics of the current programs and what can be learned from their development, implementation and/or evaluation process?

Search Strategy

After conducting a preliminary literature search to identify key terms to use, I searched PubMed using the following search terms: africa AND surgery AND residency. This search strategy yielded 79 results. I reviewed all of the titles for appropriateness to the research question. I then read all the abstracts for any study that had an appropriate title and selected 3 final articles based on their relatedness to the research question. I excluded any article that 1) did not describe an existing formal postgraduate surgical training program and/or 2) was sub-specialty specific.

Results

MSI: Malawi Surgical Initiative (Qureshi et al., 2011; Qureshi et al., 2013)

The Malawian Ministry of Health (MMOH), University of North Carolina in Chapel Hill (UNC) in the United States and the University of Bergen in Norway collaborated to develop the MSI in order to address the surgical workforce shortage in the country, especially in the central region. Prior to the establishment of the MSI, there were 4 general surgeons, 4 out of 5 of them were expatriates, and 1 urologist working at the

hospital. Additionally, the only accredited Malawian clinical postgraduate surgical training programs at the time were located at Queen Elizabeth Central Hospital in Blantyre, Southern Region. The MSI was initiated in 2006 at the Kamuzu Central Hospital (KCH) in Lilongwe, Malawi that serves approximately 5.5 million people. This surgical partnership was formed largely due to the long-standing presence of the international parties at KCH; UNC through its infectious disease efforts since the 1990s and Norway since 2006. The program's key characteristics are described in the summary table.

Rwanda-Canada Partnership (Deckelbaum, Ntakiyiruta, Liberman, Razek, & Kyamanywa, 2012)

A partnership was created between the Faculty of Medicine at the National University of Rwanda and McGill University Health Center in Canada to enhance the country's only surgical residency training program in Rwanda. Prior to the partnership, a needs assessment revealed that the service based type structure had few academic activities with an overwhelming clinical workload and substantial staff shortages. As a result, there had been a lack of interest in pursuing the program among the medical graduates. The partnership fostered the development of a system-based curriculum that was divided into 2-week modules that cover locally relevant topics of general surgery. The program's key characteristics are described in the summary table.

The Partnership for Eritrea (Khambaty, Ayas, & Mezghebe, 2010)

The Partnership for Eritrea is a collaboration between the George Washington University Medical Center (GWUMC), Physicians for Peace, and the Eritrean Ministry of Health that was founded in 1991 to improve the shortage of human health care

resources. On January 2, 2008, the country's first residency programs, pediatrics and general surgery, were launched in Asmara, Eritrea. The purpose of the general surgery training program was to train native Eritrean physicians. The program's key characteristics are described in the summary table.

Summary

These three surgical training programs are similar to my program by location, partnership dynamics and goal to increase and empower the local surgical workforce in each of the respective countries. Some of the unifying themes that the three programs share include emphasizing the local institution's accountability and ownership of the program, substantial involvement of local partners for program development, presence of a strong partnership, understanding the local environment, curriculum development based on the local needs and a focus on physicians who are at the early stages of their career. However, there is limited published data on the actual program plan and evaluation structure for these programs and the evaluation outcomes. As more programs continue to be developed with similar frameworks, the dissemination of this data will be critical to help guide the development of new programs such as the Sierra Leone Postgraduate Surgical Training Program.

Summary Table.

Postgraduate Surgical Training Programs with Academic Twinning in sub-Saharan Africa

Program	Malawi Surgical Initiative (MSI)	Rwanda-Canada Partnership	The Partnership for Eritrea
Authors	Qureshi et al. (2011, 2013)	Deckelbaum et al. (2012)	Khambaty, Ayas, and Mezghebe (2010)
City, Country	Lilongwe, Malawi	Rwanda	Asmara, Eritrea
Main Teaching Hospital	Kamuzu Central Hospital	Not mentioned	Halibet Hospital and Orotta Hospital
Partnership(s)	Malawian Ministry of Health, University of North Carolina in Chapel Hill (USA), University of Bergen in Norway	Faculty of Medicine at the National University of Rwanda and McGill University Health Center in Canada	Eritrean Ministry of Health, George Washington University Medical Center (USA), Physicians for Peace
Accreditation	COSECSA	None reported	In line with GWUMC standards but no formal accreditation has been established yet
Cost	\$75,000 for 5 years of training per resident	None reported	None reported
Identified Challenges	<ul style="list-style-type: none"> • Sustainability, especially its financial viability • Methods of measuring the program's short and long-term success. 	None reported	None reported
Program Characteristics	<ul style="list-style-type: none"> • An open line of communication and frank discussion of each partner's needs and responsibilities • Offers incentives such as career-enhancing opportunities to residents, improving the overall hospital system and providing an academic environment • A strong commitment to research at KCH • Local ownership is strongly emphasized and the program is self-governed and locally-run • Utilizes pre-existing resources such as UNC volunteers and visiting surgeons from individual 	<ul style="list-style-type: none"> • The modules contain lectures, resident case presentations, journal club, morbidity and mortality rounds and module evaluation by the residents • A Canadian surgeon, dependent on his/her sub-specialty, is matched to the module topic, and participates on a rotating basis in the daily academic and clinical activities • Most activities are implemented by the local faculty and residents and all activities are supervised by the local faculty • Local motivation and accountability • Establishment of strong partnerships • Understanding the local environment • Curriculum development based on local 	<ul style="list-style-type: none"> • A curriculum designed to reflect the realities of a developing country, in which resources and technology are limited, but provides an overview of US and European practice standards • Monthly morbidity and mortality conferences and quarterly reports to update the faculty, residents, and MoHS of the program's progress and to examine the areas of deficiencies and the need for further development • Regularly competency monitoring of the residents conducted by external examiners from the US or Europe • Operative experiences for the residents are provided at 2 hospitals in Asmara, one a 208-bed public hospital, Halibet Hospital, and the other a 164-bed tertiary referral center, Orotta Hospital

	<p>universities or governments</p> <ul style="list-style-type: none"> • Long-term commitment from all partners to achieve a level of self-sustainability • Achieved and maintains its accreditation status through the College of Surgeons of East, Central and Southern Africa (COSECSA) • A curriculum structured according to the COSECSA guidelines and supplemented with local skills workshops when specialty surgeons are present • Prepares the residents for their COSECSA exams and the program is responsive to the resident's educational needs and success • Biweekly morbidity and mortality conferences and weekly resident-led conferences • Opportunities for leadership within the program for residents • A program director that is a COSECSA-trained surgeon and is responsible for the educational activities of the program 	<p>needs and not on western models</p> <ul style="list-style-type: none"> • Early program assessment • Substantial involvement of local partners for program development • A recruitment focus on physicians who are at the early stages of their career because this is a time that their clinical skills and academic interests are shaped 	<ul style="list-style-type: none"> • Faculty consists of 5 Eritrean surgeons and visiting surgeons from the US, Europe and Cuba. The visiting faculty plays a large role in providing sub-specialty exposure training. • One of the Eritrean surgeons serves as the in-country surgical residency program director • The GWUMC faculty provided a continuing medical education development seminar for the Eritrean faculty to re-freshen their teaching and knowledge skills
Evaluation Method	None reported	None reported	comparison of the number of operations, resources used, average length of stay of patients one year before and one year after the residency started in 2008
Outcomes	None reported	None reported	<ul style="list-style-type: none"> • Increased total number of surgeries performed • Each resident performed an average of 35 operation/month • Decreased use of hospital resources • Budget savings

Program Plan

Overview of Surgery in Sierra Leone

Background and infrastructure

Sierra Leone is an English-speaking country located on the west coast of Africa. The land area is about 72,300 km² (~28,000 mi²) and home to about 6 million people (United Nations Statistics Division, 2014). The country is divided into 12 districts and the capital, Freetown. The country's health service delivery system is made up of 4 major sectors: government, religious missions, local and international non-governmental organizations (NGOs) and private organizations (GoSL - Ministry of Health and Sanitation, 2009). The majority of the Sierra Leonean population depends on the government hospitals and health centers for care (Kingham et al., 2009). Within these four sectors, there are three levels of the public health delivery system: 1) the peripheral health units (PHUs) which serve as the first point for primary health care, 2) the district hospitals provide secondary care and 3) the regional and national hospitals provide tertiary care (GoSL - Ministry of Health and Sanitation, 2009).

There are 17 government-run hospitals in Sierra Leone and the main tertiary referral center is located in Freetown at Connaught Hospital (Kingham et al., 2009; Kushner et al., 2012). Of the remaining 16 hospitals, only 8 are described as providing substantial surgical care (Kingham et al., 2009; Kushner et al., 2012). Of these hospitals, 3 are located in Freetown and one in each in the following 5 districts: Bo, Tonkolili, Port Loko, Magburaka and Moyamba (Kingham et al., 2009; Kushner et al., 2012). The hospital in Bo District has 450 beds, much larger than Connaught, which has only 267 beds (Kingham et al., 2009).

Kingham et al (2009) estimated that there are 2,481 total surgical admissions per year at the 9 government hospital, with 18.5% occurring at Connaught and 40% at the other 3 hospitals in Freetown. Of the districts, Bo carries the most surgical admissions at 16% (Kingham et al., 2009). Commonly performed surgical procedures were appendectomies and inguinal hernia repairs (Kingham et al., 2009). Although the data reported by Kingham et al (2009) offer some insight, they may not be robust given that the data were collected either from personal interviews or a surgical log-book over a 5-month period. The low surgical case load may also be explained by patients not seeking timely care and/or not undergoing a surgical procedure. A recent study conducted in Sierra Leone estimated that only 29% of the study participants with a possible surgical condition actually received surgical treatment (Kwon et al., 2013).

In terms of the infrastructure of the existing facilities, the 9 hospitals had at least 1 functional operating room, Bo and Connaught each had 2 (Kingham et al., 2009). All the hospitals had limitations with basic amenities such as oxygen supply, running water and electricity. Additionally, across all the hospitals, there were inadequacies with the availability of essential surgical supplies such as resuscitator bags, examination gloves, sterile gloves, sterilizers, nasogastric tubes, intravenous fluids & infusion sets and eye protection (Kingham et al., 2009).

Personnel

There are only 10 fully trained, native surgeons working within the governmental sector of the country. The average age of these surgeons is 57 years; many of them are retired and therefore contracted by the government for their services and most of them work in Freetown (Kingham et al., 2009; Statistics Sierra Leone, 2008). As a result,

surgical care in the districts are primarily performed by community health officers, a trained mid-level care provider, and/or medical officers, a medical graduate that has completed his/her 2 year housemanship (or internship) requirement.

Education and Training

Since opening its doors in 1988, the College of Medicine and Health Sciences (COMAHS) at the University of Sierra Leone has been the only medical school in Sierra Leone. In 2013, they graduated a class of 37 medical doctors (Kamara, 2013). To our knowledge, no public data is available to show the number of COMAHS graduates that go on to pursue a surgical training program and where they elect to do so. Historically, Sierra Leonean educated medical graduates interested in pursuing postgraduate training in any specialty, including surgery, traveled abroad to earn their credentials. This out-of-country training process can be a contributing factor to the medical brain drain commonly experienced by many developing countries (Deckelbaum et al., 2012; Raufu, 2002; Tebeje, 2005; Wright, Flis, & Gupta, 2008).

A collaboration among CapaCare, a Norwegian medical humanitarian organization, other partner hospitals and the Sierra Leonean Ministry of Health and Sanitation (MoHS) brought about the implementation of a 2 year postgraduate surgical training program in 2011 (Bolkan, 2012; Van Duinen et al., 2013). The goal of this initiative is to use task-shifting to increase the surgical workforce capacity, especially in the rural parts of Sierra Leone, by 2016 (Bolkan, 2012; Van Duinen et al., 2013). Medical doctors and community health officers are being trained to perform basic life-saving emergency, surgical and obstetrical care (Bolkan, 2012; Van Duinen et al., 2013). This program is currently the only form of formal postgraduate surgical training in

Sierra Leone. However, this initiative is a short-term solution designed for mid-level providers and the content is not comprehensive compared to a full-length postgraduate surgical training program.

Context of Program Plan

The political environment

Sierra Leone is a developing sub-Saharan African country that is recovering from a brutal decade-long war that ended in 2002. The majority of the country's health infrastructure was decimated during that time period, including the loss of many of its healthcare providers who fled the country and never returned (Desai, 2010). Since 2001, Sierra Leone has been politically stable and witnessed its second peaceful, democratic, presidential election last year.

Consistency with national priorities

The MoHS in Sierra Leone outlined its major priorities in its 2010-2015 national strategic plan report (GoSL - Ministry of Health and Sanitation, 2009). One of their primary objectives is to increase the number of available human resources for health. In addition to other specialties in the health workforce, they specifically address the shortage of surgeons in the country and propose the need for 26 more surgeons, with a current shortfall of 81% from achieving their target goal (GoSL - Ministry of Health and Sanitation, 2009).

Acceptability to providers and recipients

Local community leaders, hospital administrators and key employees and government officials will be consulted and invited to be involved early on in the planning process in an attempt to promote synchrony in achieving short and long-term goals.

Additionally, the program planning and implementation will be designed to give majority control to the locals in order to create a more acceptable and sustainable program. Surgeons in Sierra Leone, especially those employed at the targeted teaching hospital, will be interviewed about their interest in participating as potential educators and administrators in the program. We will also meet with other hospital healthcare workers within partnering departments such as anesthesiology, laboratory and radiology, nursing and pharmacy to broaden our perspectives on the interdisciplinary aspects of our program and how we can all work together to be successful. Existing non-governmental organizations (NGOs) and private organizations that have similar surgical interests will be identified in an attempt to unify resources and prevent competition and conflicts.

The success of the program will also heavily depend on the availability of ambitious and dedicated medical students interested in pursuing a surgical career. A survey will be conducted at the medical school to identify their interests and barriers to choosing surgery as a specialty. The survey will also gauge their interest in wanting to participate in an in-country Sierra Leonean surgical training program.

Possible financial resources

As discussed earlier, there is a high global burden of surgical conditions with associated high DALYs (Farmer & Kim, 2008; Ozgediz et al., 2008). For instance, five million people die annually worldwide due to injuries, of which, a significant proportion could have been averted with the provision of surgical care (Bae, Groen, & Kushner, 2011). These injuries commonly occur in individuals aged 15-44 years, the population's most economically productive unit and, often, their families' main income provider (Bae et al., 2011). As a result, the high morbidity and mortality caused by untreated or poorly

treated surgical conditions may be a significant contributor to the loss of economic growth within a country (Bloom et al., 2011).

Emerging evidence shows that surgical interventions may be just as or more cost-effective as other non-surgical interventions such as vitamin A distribution, measles immunization or oral rehydration solution treatment for diarrhea (Gosselin, Thind, & Bellardinelli, 2006). However, there is a large disparity in access to life-saving and disability-preventing surgical services, especially in the LMICs (Bickler & Spiegel, 2010). High- and middle-health expenditure countries account for 30.2% of the world's population and receive 73.6% of the total surgical procedures performed annually; whereas, 34.8% of the population resides in poor- and low-expenditure countries, but receive only 3.5% of the surgical procedures that are performed annually (Weiser et al., 2008). This enormous gap can be explained by the limited surgical workforce and infrastructure that currently exist in these countries (Bae et al., 2011).

In order to successfully address this public health problem, increased advocacy and funding for surgical care, delivery and education is required. Funding programs such as the Sierra Leone Postgraduate Surgical Training Program will wholly contribute to this effort by increasing access to safe and affordable surgical care in poor, developing countries. Additionally, securing adequate funding will be vital for the proper implementation and sustainability of the program.

Currently, there is a lack of public data indicating the allocation of financial resources for developing the healthcare system, such as the hospitals, medical, nursing & pharmacy schools and postgraduate education & training programs. Avenues for funding will be sought out through local and international collaboration. Grants from

organizations such as the WHO, Pan African Association of Surgeons, Clinton Foundation, Bill and Melinda Gates Foundation, academic university and medical centers with a global interest such as UNC and Duke, and other similar sources will be identified to assist with funding. Internal funding will also be requested from the MoHS and the Ministry of Education, Science and Technology (MoEST). Fundraising events will be held in Sierra Leone as well to promote the program among the local Sierra Leoneans and businesses in order to encourage local interest and ownership.

Technical feasibility

The MoHS, the targeted teaching hospital and key surgical educators will be consulted to obtain expert opinion on the project's feasibility and gain a better insight on the current infrastructure of the country's overall health and surgical system. A comprehensive needs assessment of the targeted teaching hospital will be required to determine the needed supplies, equipment and basic resources to ensure that the program will function efficiently and to develop a short-term and long-term program budget. Other major issues to address will be obtaining full program accreditation from the West African College of Surgeons (WACS), establishing reasonable salaries for the local educators and the surgical residents and determining the extent of involvement from surgical educators from international partner institutions.

Relevant Program Theories

The development of the first formal postgraduate surgical training program in Sierra Leone will be a community level initiative. There are two primary theoretical models that inform this type of program plan and evaluation, the community organization model and diffusion of innovations theory. The community organization

model uses community-driven approaches to assess and solve health and social problems (National Cancer Institute, 2005). The diffusion of innovations theory deals with the spread of new ideas, products, and social practices within an organization, community, or society, or from one society to another (National Cancer Institute, 2005).

Community Organization Theory

Using the community organization theory, we identify the need to increase the local surgical workforce in Sierra Leone. The adoption of the following theoretical concepts will be useful for the success of this program plan and evaluation: empowerment, community capacity, participation, relevance, issue selection and critical consciousness (National Cancer Institute, 2005). The problem of high surgical disease burden in the country, coupled with a lack of human resources has been documented in the literature (Groen et al., 2012; Kingham et al., 2009) and outlined as a health priority by the Sierra Leonean MoHS. This demonstrates that there is already a sense of awareness and interest within the local community to improve the stated health problem and the development of the training program is relevant to address their current needs. However, there will be a need for increased community empowerment and local participation for the overall development of this program to ensure its success and sustainability.

Diffusion of Innovations Theory

The diffusion of innovations theory allows us to determine the practicality of our program plan. There are four concepts to this theory: innovation, communication channels, social system and time (National Cancer Institute, 2005). Innovation utilizes five constructs: relative advantage, compatibility, complexity, trialability and observability

(National Cancer Institute, 2005). Currently, there is no advanced level postgraduate surgical training program, so our program plan is a unique initiative and will be advantageous. We can deduce the complexity, observability and trialability of implementing this program in Sierra Leone by assessing other similar programs that have been implemented in sub-Saharan Africa. Direct input from the stakeholders and participants will contribute to the overall design and implementation of the program, which will attempt to address the issues of compatibility. Additionally, their receptiveness and involvement will largely determine how long it will take for this plan to be adopted. Finally, the creation of this document is an example of the use of an effective communication channel. If the program is successful, further dissemination through scholarly publications may also serve to spread this innovation and increase its adoption in other communities.

Goals and Objectives

Goal 1

Develop a locally sustainable postgraduate surgical training program in Sierra Leone that shares a mutual partnership with an international academic center(s).

Short-Term Objectives (1-3 years):

Objective 1. By months 1 to 6, perform a comprehensive community needs assessment of the targeted teaching hospital(s) and center(s), a survey to gauge the perceptions and interests of the major stakeholders', potential educators, administrators and residents for the development of this program.

- **Activity 1** – Meet with the local surgical leaders and administrators at the medical school to identify potential local stakeholders, educators, program administrators, surgical residents, etc.
- **Activity 2** – Survey the identified potential local stakeholders, educators and program administrators to learn about their interests and perceptions, the potential challenges, etc. to developing this program.
- **Activity 3** – Survey the identified potential surgical residents individually and/or through focus group discussions to determine their interest and challenges to enrolling in this program.
- **Activity 4** – Identify and visit the potential training site(s) and complete a comprehensive needs assessment.

Objective 2. By month 6 to year 2, seek and establish a dependable partnership with an international academic center(s).

- **Activity 1** – Identify and meet with current academic center(s) that are already established in Sierra Leone and also have an affiliated surgery department.
- **Activity 2** – Attend global health and global surgery conferences and meetings to network.
- **Activity 3** – Define and describe roles, expectations and contributions of all stakeholders, locally and internationally.
- **Activity 4** – Recruit and assign the leadership roles for the program (ex. directors, faculty, staff, etc.).

Objective 3. By years 1 to 3, design a West African College of Surgeons (WACS) accreditation-eligible curriculum.

- **Activity 1** – Contact WACS to learn about the accrediting requirements and process and the standard curriculum (see Appendix)
- **Activity 2** – Local and international stakeholders, local surgeons, potential residents, etc. will provide input on the structure of the program while referencing similar existing programs such the Malawi Surgical Initiative at Kamuzu Central Hospital.
- **Activity 3** – Address the problems identified in the needs assessment surveys.

Objective 4. By month 0 to year 3, secure short-term (at the least) financial support for the program.

- **Activity 1** – Develop a comprehensive 4 to 6-year budget plan.
- **Activity 2** – Secure funding from Sierra Leone government (i.e. MoHS), target local private companies, by hosting fundraisers, to encourage civic involvement and increase financial support.
- **Activity 3** – Identify other local and international grant-writing and/or funding opportunities.

Long-Term Objectives (3-5+ years):

Objective 1. By year 3, launch the program's first year.

- **Activity 1** – Obtain WACS accreditation.
- **Activity 2** – Recruit and enroll eligible residents (ex. medical students, recent medical graduates).

Objective 2. By year 4+, maintain sustainability of the program.

- **Activity 1** – Obtain and/or maintain WACS accreditation.
- **Activity 2** – Continue to seek and apply for funding to maintain financial sustainability.
- **Activity 3** – Maintain partnership(s).
- **Activity 4** – Annually recruit and enroll new eligible residents into the program.
- **Activity 5** – Implement an internal monitoring and evaluation process of the program and annually review it to determine recommendations and strategies for improvement.

Goal 2

To develop the local surgical workforce by increasing the number of locally trained and practicing surgeons in Sierra Leone.

Short-Term Objectives (1-4 years):

Objective 1. By year 3+, annually recruit new residents and retain all enrolled residents.

- **Activity 1** – Revise the curriculum, as needed, to cater to the residents' needs and facilitate their success in the program.
- **Activity 2** – Address challenges and concerns identified by eligible participants in the survey that was administered early on in the program development process.

Long-Term Objectives (4-8+ years):

Objective 1. By years 7 to 8, increase the surgical workforce capacity in Sierra Leone.

- **Activity 1** – Successfully graduate, at the least, the first cohort of residents.
- **Activity 2** – Encourage the retention of these residents in the country by offering faculty positions within the program and/or with the MoHS.
- **Activity 3** – Collaborate with MoHS to institute a minimum in-country service requirement after program completion.

Goal 3

To reduce the burden of surgical conditions in Sierra Leone.

Short-Term Objectives (1-5 years):

Objective 1. Improve the documentation/record-keeping of surgical personnel, admissions, procedures, etc.

- **Activity 1** – Conduct a comprehensive surgical assessment at the teaching hospital(s) and center(s) to gather case loads, procedure types, referral patterns, etc.
- **Activity 2** – Establish an electronic database for enhanced and dependable record-keeping.
- **Activity 3** – Train staff to continuously update and maintain the database.

Long-Term Objectives (4-5+ years):

Objective 1. Increase the number of practicing surgeons in the rural areas.

- **Activity 1** – Actively recruit potential residents from rural parts of Sierra Leone and/or interest in working in the rural regions.
- **Activity 2** – Collaborate with MoHS to develop incentives to encourage the program graduates to practice in rural parts of the country.
- **Activity 3** – After the first cohort graduates from the program, recruit them to practice in rural Sierra Leone and incorporate into the curriculum mandatory surgical rotations sites in the rural parts of the country.

Objective 2. Increase the knowledge, availability and accessibility of basic and complex surgical procedures.

- **Activity 1** – Recruit and encourage the involvement of general surgeons and sub-specialists, locally and abroad, to teach residents.
- **Activity 2** – Recruit and encourage the involvement of general surgeons and sub-specialists, locally and abroad, to host regular workshops for the surgical faculty as a continuing education initiative.

Objective 3. Increase the collaboration between the first point of patient care contact (i.e. primary care providers) and surgeons.

- **Activity 1** – Increase the knowledge and awareness level of surgical conditions among the primary care providers and at the centers.
- **Activity 2** – Develop a referral algorithm and distribute to the primary care providers and centers.

Some of the elements of the design and implementation of the Sierra Leone postgraduate surgical training program is modeled after the Malawi Surgical Initiative (MSI) at Kamuzu Central Hospital (KCH). This is a postgraduate surgical training program based in Malawi that shares a partnership with the Malawian Ministry of Health, University of North Carolina in Chapel Hill and the University of Bergen in Norway. The MSI program at KCH embodies the concept of increasing the number of

local surgeons in a developing country, while maintaining an effective partnership. To our knowledge, it is the only program of its kind, with an available program plan and evaluation that informs and guides other surgical training program developers (Kim, 2013).

Program Implementation

Activities

There are three primary program goals: 1) to develop a sustainable postgraduate surgical training program in Sierra Leone that has an international academic partnership, 2) to increase the number of Sierra Leonean trained WACS accredited surgeons, 3) to reduce the burden of surgical conditions in Sierra Leone. In order to accomplish these goals, several objectives with corresponding activities will be implemented. Additionally, adhering to the proposed timeline and budget will be critical for a successful program implementation.

For the first goal, the activities for the first short-term objective include recruiting the local senior surgical consultants and professors at Connaught Hospital and the College of Medicine & Allied Health Sciences (COMAHS), identifying the local stakeholders, identifying house officers and medical officers who are interested in specializing in surgery and completing a comprehensive needs assessment. The second short-term objective will be achieved by establishing a partnership with an international academic surgical center, defining the roles and expectations for all participating stakeholders and assigning leadership positions for the program. The activities for the third short-term objective are to address the inadequacies determined by the needs assessment, to fulfill the requirements and standards set forth by WACS

to obtain full accreditation status and to design the curriculum and structure of the Sierra Leone surgical training program. To achieve the fourth short-term objective, a 4-to-6-year budget plan will be drafted and grants and donations will be sought to secure financial stability.

For the first goal, the activities for the first long-term objective include obtaining full WACS accreditation and enrolling the first cohort of surgical residents into the program. The second long-term objective activities are to maintain full WACS accreditation status and an effective international partnership and financial sustainability. To annually recruit a new cohort of surgical residents and to implement a monitoring and evaluation process.

For the second goal, the short-term objective activities are to annually review and revise the surgical training curriculum. The long-term objective activities are to graduate the first cohort of residents. Also, they will be integrated into the local system to become productive members of Sierra Leone's surgical workforce.

For the third goal, the short-term objective activities are to conduct a comprehensive surgical assessment at the teaching hospital(s) and center(s) in order to gather case loads, procedure types, referral patterns and other related data. Once completed, an electronic database will be created for enhanced and dependable record-keeping and staff will be trained to continuously update and maintain the database.

There are three long-term objectives for the third goal. The activities for the first long-term objective are to actively recruit potential residents from rural parts of Sierra Leone and/or an interest in working in the rural regions of the country. We will also collaborate with MoHS to develop incentives to encourage the program's graduates to

practice in rural parts of the country. With the increased presence of these graduates in rural Sierra Leone, mandatory surgical rotations will be incorporated into the program's future curriculum. The activities for the second long-term objective are to recruit and encourage the involvement of general surgeons and sub-specialists, locally and abroad, to teach residents. General surgeons and sub-specialists, locally and abroad, will also be encouraged to host regular workshops as a continuing education initiative for the local surgical faculty. The activities for the third long-term objective are to increase the knowledge and awareness level of surgical conditions among the primary care providers and to develop a referral algorithm that will be distributed to the primary care providers and centers.

Personnel

There are two main categories of personnel that will be involved in this program. They are the local surgical residents and the stakeholders and their affiliates. Potential local surgical residents will be recruited during year 2 of the program plan. Recruitment will be based on interest in surgery, commitment to becoming a productive member of the Sierra Leonean surgical workforce, medical school performance and strength of housemanship and/or medical officer performance evaluations. The selected residents will be provided with free supplemental instruction for preparation of the WACS Primary examination and they will receive a one-time free financial voucher to cover the examination fees. Failure to pass the examination on the first attempt will result in an obligatory repayment of the WACS examination fee. Upon successful completion and passing score of the primary exam, the residents will be enrolled into the surgical training program the following year. The first cohort of residents, a total of 3,

will be enrolled during year 3 of the program plan. The admission number will annually be increased by one until there are a total of six incoming residents, which will occur by year 6 of the program plan. Each first year resident will receive a monthly salary of \$600 and each year thereafter will be increased by \$50 until the completion of the program. As part of the WACS curriculum, residents must complete a Part I and Part II final exams in order to receive their FWACS (Fellow of WACS) certification. In addition to their annual salary, each eligible resident will also be provided with supplemental instruction for preparation of the WACS Part I and II final exams and will receive coverage of their exam fees (see Appendix).

The primary stakeholders that will be involved in the program development and sustainability are the MoHS in Sierra Leone, Connaught Hospital, COMAHS and partner(s) from an international academic center. Within the MoHS, the key participants will be the Permanent Secretary, Chief Medical Officer and Director of Hospitals and Laboratory Services. The key participants at Connaught Hospital will be the Hospital Manager, Head of the Surgery Department, Director of Postgraduate Surgical Training and surgical attendings/consultants. The international academic partner(s) will select a director that will serve as a liaison between his/her own institution and the local stakeholders. Additionally, the international partner(s) may provide visiting attendings and residents to assist with teaching and the daily functioning of the program.

Timeline and budget proposal

A 4-to-6-year timeline and an estimated budget proposal are presented to substantiate the necessary funding and resources for the program.

Timeline

Activity	2014	2015	2016	2017	2018	2019	2020
Identify and meet with local surgical leaders and stakeholders							
Conduct interview surveys and needs assessment study and analyze data							
Conduct a comprehensive surgical assessment at teaching hospital(s) and centers(s)							
Establish and maintain international partnership							
Define and describe roles of stakeholders							
Address inadequacies identified in needs assessment study							
Obtain and maintain WACS accreditation							
Design initial curriculum and program structure							
Review and revise curriculum and structure							
Develop a proposed budget and secure financial stability							
Gauge surgery interest and recruit residents							
Enroll residents							
Conduct annual M&E							
Graduate first cohort of residents							
Establish and maintain an electronic surgical record database							
Include mandatory surgical rotations in rural regions in the curriculum							
Develop incentives to increase the graduates' interests in practicing in the rural regions							
Increase collaborative efforts between primary care and tertiary care levels							

Expenses

Activities	FY1	FY2	FY3	FY4	FY5	FY6	Total short-term budget
consultant(s) fee for development and analysis of interview surveys and needs assessment study	\$5,000.00						
volunteer compensation for travel and necessary administrative supplies for the conduction of the interview surveys and needs assessment study	\$2,000.00						
addressing the identified inadequacies of the training facility to meet accreditation requirements	\$100,000.00	\$100,000.00	\$100,000.00				
WACS accreditation			\$1,000.00				
Supplemental Preparation for Primary Exam		\$300.00	\$400.00	\$500.00	\$600.00	\$600.00	
WACS Primary Exam		\$945.00	\$1,260.00	\$1,575.00	\$1,890.00	\$1,890.00	
Residents' salaries			\$21,600.00	\$52,800.00	\$94,800.00	\$148,800.00	
Supplemental Preparation for Part I			\$300.00	\$500.00	\$600.00	\$600.00	
WACS Part I Exam				\$1,230.00	\$1,640.00	\$2,050.00	
Supplemental Preparation for Part II					\$300.00		
WACS Part II Exam						\$2,250.00	
Total	\$107,000.00	\$101,245.00	\$124,560.00	\$56,605.00	\$99,830.00	\$156,190.00	\$645,430.00

Logic Model

Assumptions

- There is a high burden of surgical conditions in Sierra Leone and the surgical capacity in Sierra Leone, including personnel, is inadequate (Groen et al., 2012; Kingham et al., 2009).
- Increasing the number of locally trained surgeons will help to alleviate this public health problem.
- Increasing the number of workforce personnel, including surgeons, is a national health priority of the Sierra Leonean MoHS.
- A local postgraduate surgical training program with an international partnership will be an acceptable and effective approach to solve the high burden of surgical conditions in Sierra Leone.
- The local surgeons and administrators will be interested and will want to be involved developing this program.
- The medical students and graduates will be interested in enrolling in an in-country surgical residency training program.
- There are international academic centers that will be interested in partnering for the development of this program.

INPUTS	ACTIVITIES	OUTPUTS	OUTCOMES (1-3 YEARS & 3-5 YEARS)	IMPACT (5+ YEARS)
<p>People</p> <ul style="list-style-type: none"> • Program leaders • Local and international faculty • Local hospital staff • Eligible and/or enrolled surgical residents • Surgical patients/cases 	<ul style="list-style-type: none"> • Stimulate interest among the local and international surgeons and recruit them to become faculty for the program • Identify and assign the program's directors, faculty, etc. • Identify extent of involvement in the program for the local hospital staff • Recruit and maintain interested potential residents • Treat surgical conditions in Sierra Leone 	<ul style="list-style-type: none"> • A completed survey of the perceptions and interest in the development of this program • Widespread interest and acceptability of the program • A dependable partnership with an international academic center(s) • Regular faculty and staff for the program • Active surgical residents • Program graduates who will become active surgeons • More surgical cases are seen and addressed 	<p>Short-Term</p> <ul style="list-style-type: none"> • Positive interest from 90% of the stakeholders • Long-term interest and significant contribution by the international partner • Recruitment of 95% of the needed faculty and staff needed to launch and maintain the program • 70% interest from eligible potential residents based on survey and/or focus group results • Secure sufficient funding to start and maintain the program for at least the first 3 years after its launch (with at least 50% provided by the MoHS) 	<ul style="list-style-type: none"> • Increase the number of local practicing surgeons in Sierra Leone • Increase the number of surgeons in rural Sierra Leone • An overall decrease in surgical disease burden in Sierra Leone • Establishment of a long-term mutually beneficial international partnership
<p>Organizational</p> <ul style="list-style-type: none"> • College of Medicine and Health Sciences (COMAHS) • Department/Faculty of Surgery in Sierra Leone • Department of Surgery at international academic center • West African College of Surgeons • MoHS and MoEST 	<ul style="list-style-type: none"> • Conduct a survey to identify perceptions and interest in the development of this program • Establish a dependable international partnership 	<ul style="list-style-type: none"> • Regular faculty and staff for the program • Active surgical residents • Program graduates who will become active surgeons • More surgical cases are seen and addressed 	<p>Long-Term</p> <ul style="list-style-type: none"> • Initial WACS approval by the inaugural period and maintenance of the accreditation • Well-equipped and functional training hospital • 100% of the available spots filled annually by new eligible residents • After the inaugural year, retain 100% of all previously enrolled residents until their completion of the program • Graduate 100% of residents annually starting 2020 • Treat 10% more surgical cases during the inaugural year with a steady incremental increase thereafter • Increase presence of local surgeons in rural Sierra Leone by 50% 	<ul style="list-style-type: none"> • Establishment of a long-term mutually beneficial international partnership
<p>Funding</p> <ul style="list-style-type: none"> • Sierra Leone government (especially MoHS, MoEST) • International partner(s) • Local donations • Grant funding 	<ul style="list-style-type: none"> • Develop a short-term and long-term budget plan • Outline all stakeholders monetary and non-monetary contributions • Apply for local and international funding • Host fundraisers 	<ul style="list-style-type: none"> • A comprehensive budget • Defined and described roles and contributions of all stakeholders • Available funding 	<ul style="list-style-type: none"> • Well-equipped and functional training hospital • 100% of the available spots filled annually by new eligible residents • After the inaugural year, retain 100% of all previously enrolled residents until their completion of the program • Graduate 100% of residents annually starting 2020 • Treat 10% more surgical cases during the inaugural year with a steady incremental increase thereafter • Increase presence of local surgeons in rural Sierra Leone by 50% 	<ul style="list-style-type: none"> • Establishment of a long-term mutually beneficial international partnership
<p>Materials and Resources</p> <ul style="list-style-type: none"> • Hospital training center (including supplies, equipment and staff) • International partnership • WACS accreditation 	<ul style="list-style-type: none"> • Conduct a needs assessment of the training site(s) • Design a curriculum with the input of all stakeholders and participants that is in accordance to the WACS requirements 	<ul style="list-style-type: none"> • A completed needs assessment survey of the training site(s) • A WACS approved curriculum and program 	<ul style="list-style-type: none"> • Graduate 100% of residents annually starting 2020 • Treat 10% more surgical cases during the inaugural year with a steady incremental increase thereafter • Increase presence of local surgeons in rural Sierra Leone by 50% 	<ul style="list-style-type: none"> • Establishment of a long-term mutually beneficial international partnership
<p>Time</p>	<ul style="list-style-type: none"> • Launch the program 	<ul style="list-style-type: none"> • Achieve all objectives 		

Evaluation Plan

Rationale and Approach to Evaluation

The implementation of this type of postgraduate surgical training program in Sierra Leone will be the first of its kind in the country and to our knowledge, the first in the West African region. Although this program is in the pre-development stage, establishing a written evaluation strategy early in the planning process will be beneficial for the program's future success. A written evaluation plan also promotes transparency and ensures that there is uniform agreement on the purpose, use and users of the evaluation results among the stakeholders (CDC, 2013a).

Currently an evaluation plan for this postgraduate surgical training program will be essential for key three reasons. One, the evaluation strategy will serve as a medium to assist the stakeholders in tracking the progress of the program and to ensure that the three primary aforementioned program goals are met. Two, since this program is a long-term educational initiative, it will be subject to constant changes that will range from the needs of the residents, technological advances, accreditation requirement changes and so forth. Therefore, an evaluation plan will help to identify the operational processes that work and should be continued and those that failed and should be improved or terminated. Third, the success of this program will depend on continued financial support. As a result, the availability of tangible data will be necessary to establish the program's legitimacy and secure future funding.

As a founding member of the development of this program, my role as an evaluator will simply be to provide my perspectives on the operations of the program. Given my strong interest and investment in the program, another internal evaluator who

is not a major stakeholder will be more suitable to perform this task. The need of an internal evaluator(s) will be important because they understand the purpose and functioning of the program and will be knowledgeable at identifying the appropriate elements to include in the evaluation (W.K. Kellogg Foundation, 2004). However, to ensure that the evaluation process is completed accurately, efficiently and equitably, the internal evaluator will work closely with an external consultant throughout the process.

The evaluators for this program will ideally need to have an educational background and work experience in the surgical field. The internal evaluator will need to be a local staff of the program and this will be their primary role in the program. Given the varying dynamics of this program the internal evaluator will need to have several skills. They include team-building and being a team-player, public speaking, expressing cross-cultural sensitivity, speaking and/or being familiar with the local language(s), offering constructive criticism, being flexible and a quick learner (W.K. Kellogg Foundation, 2004). The external evaluator will especially need to have an expertise, formal education and work experience, in conducting evaluations, preferably for similar types of programs.

In order to ensure that multiple perspectives and potential evaluation questions are collected on all the important issues related to the program, as many stakeholders as possible will need to be involved in the initial evaluation discussions (W.K. Kellogg Foundation, 2004). In this situation, stakeholder refers to anyone employed by or affiliated with the program, including residents and funders. This will prevent a monopoly of perspectives that only come from the major stakeholders (W.K. Kellogg Foundation, 2004). At this stage of the program's development, many of the potential

evaluation questions will be geared towards assessing the effectiveness and efficiency of the program's activities and tracking if the program's goals are being attained. When the program is actually implemented and the first cohort of residents enrolls, the questions from all the stakeholders will likely cover a broader scope. It will also be important to gather baseline data evaluation data before the program starts to be able to make useful comparisons in the future (Bamberger, Rugh, & Mabry, 2011).

In the evaluation process, some challenges may arise that are unforeseen and/or inevitable. These include a limited pool of national evaluation and surgical expertise, political and/or cultural complexities, lack of funding and time constraints (Bamberger et al., 2011). The lack of evaluators with evaluation and surgical expertise may be unavoidable, but efforts will be made to hire the best that is available within the local community. The external consultant may be hired from abroad if necessary. Several stakeholders will be encouraged to be involved in both the program development and evaluation process of this postgraduate surgical training initiative. This collaborative effort will help us to reduce and/or understand how to deal with the political and/or cultural complexities. An advantage of still being in the pre-development stage of this program plan allows us to incorporate funding and seek resources for the evaluation plan early on in the process. Time is another factor that we do not have control over. However, the internal evaluator's primary role in the program will be to conduct these evaluations, so there won't be an overload of other job responsibilities. This will also allow the evaluator to be more flexible in meeting the constrained time schedules of the busy stakeholders such as the residents, faculty, members of the MoHS and financial donors.

Evaluation Study Design

The goal of comprehensively evaluating the Sierra Leone Postgraduate Surgical Training Program is to determine how effectively the program is meeting its goals and objectives (W.K. Kellogg Foundation, 2004). The evaluation should include measures of both implementation and outcomes, and it must also be feasible to conduct (Issel, 2013). To evaluate the program's implementation and outcomes, we will use a mixed approach of quasi-experimental and observational designs.

Quasi-Experimental Design

A unique feature of this program is that an evaluation strategy will be in place before the program is implemented. As a result, pre-implementation data, such as information gathered from the needs assessment, will be available for future use. The primary purpose of the quasi-experimental design will be to track quantitative changes that have occurred as a result of the implementation of the surgical postgraduate training program (Issel, 2013). These changes include the number of residents and program graduates, number of active surgeons in Sierra Leone and type and quantity of surgical disease burden.

Observational Design

The quasi-experimental design will also incorporate qualitative components such as observations, focus groups and open-ended interviews (CDC, 2013b). The observational study design will be used to assess important factors such as program acceptability, success of program implementation and challenges faced during implementation. An observational design will also be useful to identify and collect recommendations for improvements from the stakeholders.

Evaluation Methods

To assess the Sierra Leone Postgraduate Surgical Training Program, we will collect both qualitative and quantitative data. Qualitative methods include open-ended interviews, focus groups, surveys, observations, and document review. Quantitative analytical methods include assessment of the resident recruitment, retention and graduation rates based on the program's records, number and type of surgical cases performed annually based on OR case log-books and surgical disease burden in the country based on MoHS' and program's document reviews.

Evaluators will conduct open-ended interviews, focus groups and surveys with all the stakeholders and employees of the program, including the residents. The purpose of these assessment methods is to evaluate the acceptability of the program to the affiliates and beneficiaries, their experiences with the program, barriers to full program implementation and areas for program improvement.

Review of program documents and program observation will be vital approaches to determining the efficiency of the program's processes. This will allow evaluators to determine measures such as the educational competencies being achieved by the residents, curriculum structure, accreditation status and the program's financial inputs and outputs. Additionally, review of the OR log-books will help to determine the changes in surgical case type and number pre- and post-implementation of the program.

Evaluation Planning Tables

The following are evaluation tables with potential implementation and outcome evaluation questions aligned with each goal and objective of the program. The evaluation question will be incorporated into the interviews and surveys.

Goal 1: Develop a locally sustainable postgraduate surgical training program in Sierra

Leone that shares a mutual partnership with an international academic center(s).

Short-Term Objective #1: By months 1 to 6, perform a comprehensive community needs assessment of the targeted teaching hospital(s) and center(s), a survey to gauge the perceptions and interests of the major stakeholders, potential educators, administrators and residents for the development of this program.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
After 6 months, was a comprehensive community needs assessment of the teaching hospital(s) and center(s) completed? If so, what were the results?	Surgery residency program stakeholders and affiliates	Organizational records
After 6 months, was a survey completed that gauged the perceptions and interests of the major stakeholders and affiliates for the development of this program? If so, what were the results?	Surgery residency program stakeholders and affiliates	Organizational records
Were there any problems in conducting the assessments/surveys?	Surgery residency program stakeholders and affiliates	Interviews Focus groups
What changes or modifications were made to the program plan as a result of the assessments/surveys?	Surgery residency program stakeholders and affiliates	Interviews Focus groups Organizational records Observation
Have the problems identified in the assessments/surveys been addressed at the teaching hospital(s) and center(s)?	Surgery residency program stakeholders and affiliates, hospital/center directors	Interviews Focus groups Observation
What have been the barriers to addressing the identified problems?	Surgery residency program stakeholders and affiliates	Interviews Focus groups
Are there any data that were not gathered from the baseline assessments/surveys that are now pertinent?	Surgery residency program stakeholders and affiliates	Interviews Focus groups

Short-Term Objective #2: By month 6 to year 2, seek and establish a dependable partnership with an international academic center(s).

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Did the local stakeholders establish a partnership with an international academic center(s)?	Surgery residency program stakeholders and affiliates	Interviews Organizational records Observation
What is the projected time (i.e. # of months/years) commitment of the international partner(s)?	International partner(s)	Interviews Organizational records
What were the roles and contributions of the local and international stakeholders that were agreed upon and assigned?	Surgery residency program stakeholders and affiliates	Interviews Focus groups Organizational records Observation
Who are the program's leaders (i.e. directors, faculty, etc.)?	Surgery residency program stakeholders and affiliates	Interviews Organizational records Observation
What features of the partnership(s) has been successful so far?	Surgery residency program stakeholders and affiliates	Interviews Focus groups Organizational records Observation
What challenges are the international and local partner(s) facing?	Surgery residency program stakeholders and affiliates	Interviews Focus groups Organizational records Observation
What improvements can be made on the existing partnership(s)?	Surgery residency program stakeholders and affiliates	Interviews Focus groups Organizational records Observation

Short-Term Objective #3: By years 1 to 3, design a West African College of Surgeons (WACS) accreditation-eligible curriculum.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Has a WACS accredited curriculum been designed and implemented? If so, what type of WACS accreditation does the program have (i.e. partial, full, etc.) and for how long?	Surgery residency program directors, WACS	Interviews Organizational records WACS guidelines
What are the barriers to implementing or maintaining a WACS accredited curriculum?	Surgery residency program directors, WACS	Interviews Organizational records WACS guidelines
What competencies (i.e. knowledge, skills) are the residents achieving?	Surgery residency program directors, faculty, residents	Interviews Organizational records Observation
How many surgical cases is each resident performing annually? What are the types of cases?	Residents	OR case log-book
How are the residents performing on the WACS Part I and II exams?	Surgery residency program directors, faculty, residents, WACS	Interviews Organizational records WACS records
Is there an existing feedback/evaluative process for residents and surgeons?	Surgery residency program directors, faculty, residents	Interviews Organizational records
What improvements can be made in the existing curriculum?	Surgery residency program directors, faculty, residents	Interviews Focus groups Organizational records Observation

Short-Term Objective #4: By month 0 to year 3, secure short-term (at the least) financial support for the program.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
By year 3, did the program secure financial support for at least the short-term period?	Surgery residency program stakeholders and affiliates	Interviews Organizational records
How much more funding is needed to reach the program's short and long-term budget goals and how do you plan to achieve them?	Surgery residency program stakeholders and affiliates	Interviews Organizational records
What have been the barriers to secure adequate funding?	Surgery residency program stakeholders and affiliates	Interviews Organizational records
What are the expectations/requirements from the program's current financial donors?	Surgery residency program stakeholders and affiliates, donors	Interviews Organizational records
How have the existing funds been spent or allocated so far and what improvements can be made?	Surgery residency program stakeholders and affiliates, donors	Interviews Organizational records
What oversight process is in place to ensure proper utilization of the program's funds?	Surgery residency program stakeholders and affiliates, donors	Interviews Organizational records

Long-Term Objective #1: By year 3, launch the program's first year.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Was the training program launched by year 3?	Surgery residency program stakeholders and affiliates	Interviews Organizational records
How many residents enrolled in the inaugural year? How many thereafter?	Surgery residency program directors, faculty, residents	Interviews Organizational records Observation
Are there regular evaluative processes in place to review and revise the program's structure as needed?	Surgery residency program stakeholders and affiliates	Interviews Organizational records
What improvements can be made to the existing program structure?	Surgery residency program directors, faculty, residents	Interviews Focus groups Organizational records Observation

Long-Term Objective #2: By year 4+, maintain sustainability of the program.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Has the program been sustainable since it launched?	Surgery residency program stakeholders and affiliates	Interviews Focus groups Organizational records Observation
What improvements can be made to ensure the program's sustainability	Surgery residency program stakeholders and affiliates	Interviews Focus groups Surveys Organizational records Observation

Goal 2: To develop the local surgical workforce by increasing the number of locally trained and practicing surgeons in Sierra Leone.

Short-Term Objective #1: By year 3+, annually recruit new residents and retain all enrolled residents.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Since the launch of the program, have new residents been recruited annually? If so, how many?	Surgery residency program directors, faculty, residents	Interviews Organizational records Observation
Are potential candidates interested in enrolling in the program?	Residents, medical students/graduates	Interviews Surveys
What has been the resident retention rate in the program?	Surgery residency program directors, faculty, residents	Interviews Organizational records
What is the process for recruiting and enrolling new residents?	Surgery residency program directors, faculty, residents	Interviews Organizational records Observation
How are the residents' needs, complaints, etc. heard and addressed?	Surgery residency program directors, faculty, residents	Interviews Focus groups Observation
How can the recruitment methods and retention rates be improved?	Surgery residency program directors, faculty, residents, medical students/graduates	Interviews Focus groups

Long-Term Objective #1: By years 7 to 8, increase the surgical workforce capacity in Sierra Leone.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Has there been an increase in the surgical workforce capacity in Sierra Leone?	Surgery residency program stakeholders and affiliates, MoHS	Interviews Organizational records MoHS records
How many residents have graduated from this residency training program?	Surgery residency program directors, faculty, residents	Interviews Organizational records WACS records
Where are the program's graduates practicing? What types of specialties?	Surgery residency program directors, faculty, residents, MoHS	Interviews Organizational records MoHS records Observation
What faculty positions are available within this program for the graduates? Are any currently employed? If so, what are their roles?	Surgery residency program directors, faculty, residents	Interviews Organizational records Observation
What other ways can this program contribute to increasing the surgical workforce capacity in Sierra Leone?	MoHS	Interviews
How many more surgeons are needed to achieve the MoHS goals?	MoHS	Interviews

Goal 3: To reduce the burden of surgical conditions in Sierra Leone.

Short-Term Objective #1: Improve the documentation/record-keeping of surgical personnel, admissions, procedures, etc.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
What changes have been made so far to improve the documentation/recording-keeping system?	Surgery residency program stakeholders and affiliates, MoHS	Interviews Organizational records MoHS records
Are the databases being maintained regularly? If so, how?	Surgery residency program stakeholders and affiliates, MoHS	Interviews Organizational records MoHS records
What types of surgical cases are referred, admitted and taken to the OR at the teaching hospital(s) and center(s)? Also, how many?	Surgery residency program stakeholders and affiliates, MoHS	Interviews Organizational records MoHS records
Has there been an increase in the complexity and number of surgical cases being treated?	Surgery residency program directors, faculty, MoHS	Interviews Organizational records MoHS records
Has the burden of surgical conditions declined in Sierra Leone?	MoHS	Interviews MoHS records
What are the challenges to effective and efficient documentation/record-keeping?	Surgery residency program directors, faculty, residents	Interviews Focus groups Observation
What other improvements can be made to the record-keeping/documentation system?	Surgery residency program stakeholders and affiliates, MoHS, residents	Interviews

Long-Term Objective #1: Increase the number of practicing surgeons in the rural areas.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Has the number of practicing surgeons in the rural areas increased?	MoHS, district hospital(s)/center(s), community residents	Interviews MoHS records Observation
What incentives are available or should be available to encourage increased rural employment among the graduates?	MoHS, residents/graduates	Interviews Focus groups MoHS records
Has there been a decline in the burden of surgical conditions in the rural regions of the country?	MoHS, district hospital(s)/center(s)	Interviews MoHS records
Have rotations in the rural areas been incorporated into the curriculum?	Surgery residency program directors, faculty, residents, district hospital(s)/center(s)	Interviews Observation
What other approaches or improvements can be applied to increase the presence of surgeons in the rural areas?	MoHS, residents/graduates	Interviews Focus groups MoHS records
How many more surgeons are needed to adequately staff the rural areas?	MoHS	Interviews

Long-Term Objective #2: Increase the knowledge, availability and accessibility of basic and complex surgical procedures.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Have the local surgeons' knowledge and skills increased?	Surgeons (faculty and residents)	Pre- and post-test simulations Interview Survey Observation
Have the availability and accessibility of basic and complex surgical procedures increased?	Surgery residency program directors, faculty, MoHS	Interviews Organizational records MoHS records Observation
How many sub-specialists surgeons (local and international) are involved in teaching within the program?	Surgery residency program directors, faculty, residents	Interview Observation
Have the visiting faculty and international partner(s) provided regular skills workshops/seminars for the local faculty?	Surgery residency program directors, faculty, international partner(s)	Interview Observation
How can the continuing education process be improved?	Surgery residency program directors, faculty, international partner(s)	Interviews

Long-Term Objective #3: Increase the collaboration between the first point of patient care contact (i.e. primary care providers) and surgeons.

EVALUATION QUESTIONS	PARTICIPANT(S)	EVALUATION METHOD(S)
Has the collaboration between the primary care level providers and the surgeons increased?	MoHS, hospital(s)/center(s), community residents	Interviews MoHS records Survey
Is there a current referral algorithm for suspected surgical cases?	MoHS, hospital(s)/center(s), local primary care providers	Interviews Focus groups MoHS records Observation
How can the current referral system be improved?	Hospital(s)/center(s), local primary care providers, local surgeons	Interviews Focus groups Observation

Institutional Review Board Considerations

Given the nature of the Sierra Leone Postgraduate Surgical Training Program, two or more different institutional review board (IRB) and/or ethical review boards may be involved. The Sierra Leone Ethics Committee may require a formal approval before the evaluation process commences; as a result, they would need to be contacted in advance for clarification. The other review boards would depend on the country of origin for the partnering international academic institution. Given the nature of the program and the reason for the evaluation, an exempt status IRB application will be submitted.

An exempt status may be appropriate because there will be minimal risk to the participants. The participants in this case are essentially all stakeholders and affiliates who will answer the questions posed by the internal and external evaluators. Although the evaluators will also have access to sensitive information such as the program's reports and OR log-books, efforts will be made, when possible, to remove all identifiers

from the data, including the interviews and OR log-books. If required, the evaluators will use a written and/or verbal consent process before interviewing participants. The evaluative findings will largely be used for program improvement and thus will be dispersed and used internally. For the IRB application for this situation, the internal and external evaluators will serve as the co-Principal Investigators (PIs). However, if the data and/or findings are to be distributed through other mediums such as peer-reviewed journals, then a more informative, full-review IRB application will be necessary to achieve those specific goals. The main inquiring personnel for that particular research would be the PI. However, the final decision on the application requirements and status would be made by the respective review committees.

The rights and welfare of all those involved in the evaluative process should be respected and protected; the involvement of an external ethical review board helps to ensure that this is met (UNC Office of Human Research Ethics, 2014). It is important to acknowledge that ethical dilemmas may arise over varying reasons such as financial agreements, role descriptions, conflicts of interest and data ownership (Calleson, 2014b; Issel, 2013). Similarly to the evaluation process, it is just as important for the evaluators and the stakeholders to discuss these matters in advance to minimize the discord.

Dissemination Plans

Once the evaluation results are available, it is important for the evaluators to synthesize the information and make it useful for the program stakeholders and affiliates that they are working with (Calleson, 2014a). There are two primary purposes for the evaluation process of the Sierra Leone Postgraduate Surgical Training Program. One,

the evaluation results will largely be used for program improvement and internal decision making across all spheres of the program's operations. Two, the evaluation findings will serve as an informative resource for interested external parties with either a similar existing program or those considering the development of such a program. With these stated goals, it is vital for the evaluators to have continuous, frank and collaborative dialogue with the program stakeholders and affiliates and this discussion should include expectations of the evaluative process, timelines and information dissemination (Bamberger, 2006; Calleson, 2014a).

In terms of the actual dissemination plan, there are four essential steps for effective dissemination: identifying the audience; determining what information the audience needs to know; sharing the evaluation results; and assessing the quality and effectiveness of dissemination activities (CDC, 2013a). The Sierra Leone Postgraduate Surgical Training Program audience includes: the faculty, staff, residents, financial and non-financial donors, the MoHS and other interested external parties (i.e. program directors, surgeons, academic institutions). Given the diverse audience, the delivery method for the information would have to be adapted appropriately for each group (Issel, 2013). For the major stakeholders such as the MoHS, the program directors, academic institutions, financial donors and partners, a full written report, brief executive report and oral PowerPoint presentations will be provided. The oral presentations and brief summaries will highlight outcomes based on the program plan objectives and the program's financial inputs and outputs. Accompanying recommendations will also be provided to the stakeholders. In order to promote program inclusion and accountability, brief reports will also be provided to the faculty, staff and residents. The overall

effectiveness of the dissemination activity will greatly depend on their feedback because they are involved in the daily operations of the program. Finally, the evaluation findings and the program plan description will be submitted for publication in a relevant peer-reviewed journal, such as the World Journal of Surgery. This distribution approach will allow dissemination at a broader scale such as to international external parties and will also contribute to the dearth of existing literature on this type of program and evaluation plan (Issel, 2013).

Discussion

The establishment of a twinning postgraduate surgical training program in Sierra Leone, like that outlined above, is a much needed long-term solution towards addressing the surgical disease burden in Sierra Leone. This type of in-country training program in Sierra Leone will also mitigate the problem of a low surgical workforce and minimize the losses traditionally caused by the medical brain drain. However, as outlined in the systemic review, there are salient features that portend a successful program implementation and positive evaluation outcomes.

Several repeating themes were identified in the Malawi Surgical Initiative, Rwanda-Canada Partnership and Partnership for Eritrea. They include the promotion for local accountability and ownership of the program, substantial involvement of the local partners for program development, long-term and formal partnerships, an understanding of the local environment and a curriculum designed to address the local needs. These characteristics have been incorporated into the program and evaluation plan for the Sierra Leone Postgraduate Surgical Training Program and it is of utmost importance that all stakeholders are involved in the program development from inception.

Given the novelty of such a program in Sierra Leone, I conducted a preliminary survey in Freetown in March 2014 to assess the perspectives of the local stakeholders on the development of a twinning postgraduate surgical training program in Sierra Leone (Cole, 2014). The survey was comprised of one-on-one interviews with key local stakeholders such as the chief of surgery and hospital care manager at the main tertiary hospital, members of the MoHS and a representative from an existing international partner. The results from the study highlighted a positive alignment of priorities among the local stakeholders, including the Sierra Leonean MoHS, in terms of improving surgical care and the workforce. There was also a resounding desire and enthusiasm for international partnerships especially for complementing areas with deficiencies such as surgical sub-specialties, academic research and information technology exchanges. However, a larger needs assessment survey is still essential especially to identify the program's teaching hospital and develop the program's curriculum

With the growing interest in global surgery, there will be an increased demand for the development of more programs such as this one (Riviello et al., 2010). However, there is currently a scarcity of program and evaluation plans and outcomes for such programs in the literature. These resources can serve as valuable guides for future stakeholders and program directors planning to develop future programs like the Sierra Leone Postgraduate Surgical Training Program. More discussions about these types of surgical training programs are needed in the global surgery community.

The development of the Lancet Commission on global surgery is one initiative that is moving in the right direction. The commissioners are comprised of clinicians, scientists, educators and policy leaders from around the world with a background in

different allied health specialties related to surgical care delivery. Their primary objective is to set the global health agenda for surgery with plans to target care delivery, workforce, information and finance (Meara, Hagander, & Leather, 2014). The first meeting was hosted in Boston at Harvard University in January 2014 and the next is set to take place this summer in Sierra Leone (Meara et al., 2014). With the backing of the Sierra Leonean MoHS and the long-term commitment of the international surgical community, programs such as the one proposed in this paper have a bright future.

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Appendix

WACS Accreditation Process

This information has been adapted from (Bode, Olatosi, & Ademuyiwa, 2012).

- Written application from a training institution seeking a visitation by the College for a specific *specialty* training program (required for first visits or a reaccreditation at the expiration of a previous one).
- The written application includes a comprehensive, standard accreditation form that should be submitted with the required fees to the College Secretariat. The application form requests information such as:
 - the profile of the hospital
 - the structure of its residency training program in the discipline(s) for which accreditation is sought
 - its bed capacity and utilization
 - library and internet facilities
 - surgical facilities
 - caseload
 - laboratory, radiological and other investigative facilities
 - other ancillary components of a fully functional residency training center
 - departmental weekly academic activities
 - extant manpower and facilities in the core specialty and relevant, supportive areas such as hematology, pathology, anesthesia, microbiology, radiology, radiotherapy, physiotherapy etc.
- Once the application is submitted, a visitation date is scheduled by the relevant Faculty.
- A visitation team of 4-5 Fellows is chosen from within the Faculty to represent the international and geographical diversities of the College. On the agreed date, the visitation commences with a courtesy call on the Chief Medical Director of the institution visited where the purpose of the accreditation is explained to the hospital's management team. The accreditation team goes on a comprehensive tour of the facilities to:
 - observe the daily activities of the surgical out-patient departments, operation suites, wards, accidents and emergency department, side-laboratories, library, radiology, pharmacy, blood bank, medical records, pathology department and other ancillary services.
 - At each station, details of facilities are confirmed from service records and hospital personnel. Ancillary facilities and equipment such as resuscitation trays, training modules, infrastructural layout, call rooms, conveniences, scope and volume of procedures are also inspected and critiqued.
 - A meeting is held with residents (trainees) and a separate one with consultant staff.
 - A final meeting is conducted to obtain the management's response to issues raised at the previous meetings with staff and residents.

- A comprehensive report is submitted to the relevant Faculty Board of the WACS which then deliberates on the report in February or July before the report is forwarded to Council for ratification or amendments.
- The institution is then formally notified of the visitation outcome by the College Secretary General. The letter is a comprehensive summary of major findings with commendations on laudable areas of performance and details on aspects in need of corrections. These may range from lack of equipment and personnel to system lapses.
- At that time, the accreditation type is awarded:
 - **Full accreditation** is given for a period of 4 years to a program that has satisfied the minimum training criteria. Also, the report includes the number of trainees approved for each program, the date by which a new visit is due, any areas in need of improvement and commendations.
 - A 2-year **Partial Accreditation** is awarded where the program is deemed worthy but falling short of the minimum criteria. During this period, the institution is expected to put in place all the recommendations of the College and seek reaccreditation thereafter. A partial accreditation also means that the trainees may only complete their program up to the Part I level in that institution after which the Part II training must be done in another institution approved and certified for this aspect.
 - **Non-accredited or not recommended for accreditation** programs are those that do not meet majority of the stipulated training conditions and such institutions may reapply after one year within which the perceived defects must have been corrected.
 - **Revoked accreditation** is given when an institution persistently refuses to remedy obvious lapses in their performance after a series of warnings. The revoked status report is provided to the institution and is also made public.
- The College allows a maximum ratio of 1 consultant to 2 registrars and 2 senior registrars (i.e. 1 attending surgeon to 2 junior residents and 2 senior residents). A registrar is a resident completing the first 2 years of the program and a senior registrar is one that has passed the Part I examination and is now completing the last years of their training within their specialty of choice (i.e. general surgery, urology, orthopedic & trauma surgery, pediatric surgery)
- The report is provided to the College Council and the General Assembly and is also published on the College website, stating the type of accreditation awarded as well as the number of trainees allowed for each program.

Sierra Leone Postgraduate Surgical Training Program: Curriculum

This is a preliminary curriculum based on the current WACS requirements (Bode, Nwawolo, & Giwa-Osagie, 2008; West African College of Surgeons, 2011)

Year 1 – Year 2

- Trauma (accident and emergency or casualty) – 6 months
- General Surgery – 6 months
- Urology – 3 months
- Orthopedics – 3 months
- Anesthesia – 3 months
- Elective (Cardiothoracic Surgery, Neurosurgery, Pediatric Surgery or Plastic and Reconstructive Surgery) – 3 months

Registrars (i.e. junior residents) keep a daily log-book of all their operative procedures they participate in during the first and second years of their program training, according to the WACS guidelines.

Completion of Part I Examinations

Year 3 – Year 4 (must be a minimum of 24 months)

Senior registrars (i.e. senior residents) select their specialty of training in either general surgery, urology, orthopedic & trauma surgery, plastic & reconstructive surgery, pediatric surgery, cardiothoracic surgery and neurosurgery.

Depending on the specialty chosen, the curriculum for senior registrars is tailored to address a wide variety of principles, cases and conditions within the sub-specialty.

Senior registrars keep a daily log-book of all their operative procedures they participate in during the 24+ month period of their training, according to the WACS guidelines.

Completion of Part II Examination (4 components)

- Written exam
- Clinical exam
- Written dissertation
- Oral defense of dissertation

Pertinent Documents

The following WACS documents can be found at: <http://www.wacs-coac.org/>

- Accreditation Form
- Surgery Curriculum
- Primary Examination Form
- Part 1 & 2 (Final) Application Form