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METHODS

Coaching for impact: successful implementation of a multi-national, multi-institutional synchronous research course in Ethiopia

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Abstract

Purpose Under the American College of Surgeons' Operation Giving Back, several US institutions collaborated with a teaching and regional referral hospital in Ethiopia to develop a surgical research curriculum.

Methods A virtual, interactive, introductory research course which utilized a web-based classroom platform and live educational sessions via an online teleconferencing application was implemented. Surgical and public health faculty from the US and Ethiopia taught webinars and led breakout coaching sessions to facilitate participants' project development. Both a pre-course needs assessment survey and a post-course participation survey were used to examine the impact of the course.

Results Twenty participants were invited to participate in the course. Despite the majority of participants having connection issues (88%), 11 participants completed the course with an 83% average attendance rate. Ten participants successfully developed structured research proposals based on their local clinical needs.

Conclusion This novel multi-institutional and multi-national research course design was successfully implemented and could serve as a template for greater development of research capacity building in the low- and middle-income country (LMIC) setting.

Keywords Research education · Global surgery · Capacity building · LMIC

Introduction

The Lancet Commission on Surgery estimated that over five billion people lack access to surgical care and over 90% of the affected population lives in low- and middle-income countries (LMIC) [1]. While this is likely a more accurate estimate than earlier reports [2], it is still heavily dependent on mathematical modeling. In reality, there remains a paucity of data examining the burden of surgical disease in many LMICs. Since publication of the Lancet Commission report [3] and the adoption of Resolution 68.15 by the World Health Assembly in May 2015 which declared surgery as an integral component to universal health care coverage, there has been increasing awareness and resources dedicated to addressing the large inequities in the provision of surgical care. Many countries, including Ethiopia, have developed National Surgical Obstetric and Anesthesia Plans (NSOAPs) to focus on improving surgical capacity and access to care [4]. Specifically, Ethiopia's "Saving Lives through Safe Surgery" initiative, established in 2016 by the Ministry of

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Health, sought to reform care to improve surgical access [5, 6]. Two components of this initiative called for partnership with international organizations and for monitoring and evaluation of data to assess outcomes through strengthening of research capacity.

Strengthening research capacity is a core component of improving care, which can help provide data to guide both practice and policy decisions [7]. Additionally, programs aimed at advancing research capacity in Africa lead to sustainable scholarly activities among in-country trainees [8–10] and improvement in overall healthcare delivery. The reason for the current lack of research capacity is multifactorial. Recent studies have found that lack of mentorship [11], poor remuneration for research [12], limited research training curricula [12], lack of funding and poor infrastructure [13, 14], and time constraints from other clinical duties all contribute to the low rate of research in the LMIC setting [15, 16]. This is further exacerbated by high-income country (HIC) partnerships that have been historically inequitable and extractive [13, 17, 18], that have led to distrust and an imbalance of funding from HICs that drive the research agenda rather than local priorities.

Recently, there have been growing efforts to improve general research capacity in LMICs including international collaborations like the European and Developing Countries Clinical Trial Partnership (EDCTP), and Consortium for Advanced Research Training in Africa (CARTA), international courses, such as the Structured Operational Research and Training IniTiative SORT-IT, and national implementation programs such as Intermediate Operational Research Training Course (IORT) in Rwanda, and the Malawian Research Support Centre in Malawi [10, 19, 20]. These programs serve as good models for research skill development in the LMIC setting. They are limited, though, in their application, as most rely on international funding and expertise. Locally owned and led research initiatives are becoming the gold standard for capacity development because they better align with cultural norms, political priorities and have greater clinical impact [21]. Furthermore, none of these research collaborations focus on surgical disease. Programs that address improving surgical research capacity within the context of surgical training are lacking.

In 2018, the American College of Surgeons under Operation Giving Back (ACS-OGB) began a long-term collaboration with Hawassa University Comprehensive Specialized Hospital (HUCSH) in southern Ethiopia with the goal of improving training and infrastructure at a regional surgical hub in a low-income country (LIC). HUCSH is the tertiary referral center for southern Ethiopia and serves a population of 20 million individuals. It supports one of Ethiopia's 17 surgical residency training programs. Despite the large catchment, the hospital suffers from a paucity of research-related infrastructure. Thirteen academic institutions pledged time and resources, providing 365 day-per-year on-site coverage to aid in improving clinical and operative skills, enhancing the education curriculum, establishing a center for research, and strengthening trauma systems. Workgroups made up of initiative members from both the United States (US) and Hawassa were established to address these specific areas.

Based on a needs assessment, the research workgroup identified providing research-related skills and mentorship as a local priority with 85% of respondents reporting a "significant interest" in research education. An introductory research curriculum was designed and implemented with the input of local leadership, staff, and residents. The course additionally provided individualized coaching for each participant. The efficacy of the course was then assessed with post module tests, post-course feedback, and completion of a structured research proposal. To our knowledge, this is the first publication detailing the methods, challenges encountered, and assessments of an international collaboration to establish a surgical research education course in an LMIC.

Materials and methods

The research workgroup first identified local partners at HUCSH, including an orthopedic surgeon who has significant clinical research experience, as well as faculty from the University's School of Public Health. The course curriculum was created based on input from other research methodology courses, such as the Association of Academic Surgery Fundamentals of Surgical Research Course and the World Health Organization's SORT-IT Course. However, the workgroup customized the curriculum based on the initial needs assessment and worked to ensure that all content and examples used were applicable to surgeons in a low resource setting. A 15-question pre-program needs assessment was administered to the HUCSH surgery department. The tool identified the participant's position (attending, resident, etc.), and gathered information regarding research training to date, research interests, research priorities, ideal research timeline, and research mentorship. In addition to the Hawassa-based faculty, additional US-based ACS-OGB faculty were recruited to teach the course and serve as coaches for the course participants.

The lecture topics were arranged to provide the participants the knowledge needed to design their own research questions, choose a study design, perform a literature review, and write a research proposal (Table 1). This introductory course, as part of a larger three-part course, was initially planned with in-person lectures provided by ACS-OGB faculty who would travel to the site in addition to Hawassa University surgical and public health faculty. This was converted to a virtual, 7-weeks course after it

Table 1 Curriculum syllabus

Weeks	Topic	Class type
	Send Pre-test, PICOT format for participant, and reading materials via common platform	Orientation
	Orientation how to use zoom for small group discussion for Faculties and Participants, over all introduction about the course	Orientation
Week 1	Guidelines and regulations of good clinical practice	Lecture
	Role of IRB and principles of consent	Lecture
	How to identify a clinical problem for research question	Lecture
	Research question development from daily clinical activity with summary	Zoom small group discussion
Week 2	Formulating structured clinical research questions (Lecture)	Lecture
	Concept of PICOT (Lecture)	Lecture
	Develop and refine the PICOT for their research question that they develop (small group discussion)	Zoom small group discussion
Week 3	Major clinical study design part (Lecture)	Lecture
	Factors affecting selection of study design (Lecture)	Lecture
	Select appropriate study design for their research question (small group discussion) with summary	Zoom small group discussion
Week 4	Bias and how to minimize Bias in study (Lecture)	Lecture
	Data collection tool (Lecture)	Lecture
	Develop data collection tool for their research question (small group discussion)	Zoom small group discussion
Week 5	Proposal component and how to write up prototype proposal (Lecture)	Lecture
	How to search literature from PubMed and google scholar (Lecture and Online demonstration)	Lecture
	Practice on searching literature on their research question (small group discussion)	Zoom small group discussion
Week 6	Sampling Techniques and sampling error (Lecture)	Lecture
	Sample size calculation (Lecture and demonstration)	Lecture
	Calculate sample size with online sample size calculator (small group discussion)	Zoom small group discussion
Week 7	Critical appraisal of paper (Lecture)	Lecture
	How to use reference manager (Lecture and online Demonstration)	Lecture
	Practice on selected reference manager: how to site and create library (small group discussion)	Zoom small group discussion

became clear that international travel and in-person meetings would remain suspended for an indefinite amount of time due to the COVID-19 pandemic. After the conversion to a virtual format, both ACG-OBG and HUCSH faculty were still able to participate in the course, both giving lectures and leading weekly coaching sessions.

The research course was open to all HUCSH surgical faculty and residents. The residency program director and hospital chief executive director in Hawassa granted time away from clinical duties for interested faculty and residents to participate in the course.

The seven-week course consisted of two 30-min lectures on Tuesdays and Thursdays and small group coaching sessions on Saturdays for 90 min to focus on individual projects. Meeting times were scheduled for early mornings in the US, correlating with mid-afternoon in Hawassa to optimize participation despite a substantial time difference. The lectures and coaching sessions were conducted live using an online teleconferencing application. A pre-course survey was administered to participants to collect demographics, level of training, and evaluate their research fund of knowledge.

A web-based platform was used as a virtual classroom. The classroom served as a communication tool to send reminders and share assignments. In addition, it served as a repository for recorded lecture videos and lecture slides. Course participants were able to submit assignments and project updates to the virtual classroom.

Prior to the weekly coaching sessions, assignments were distributed using the virtual classroom to document participant engagement and aid in the progression of research ideas. Examples of assignments include formulating a research question in the PICO format, performing a

Table 2 List of assignments completed by research training program participants

Pre-test
List of research ideas
Small group feedback questionnaire
How to identify a research question
Your PICO question
Search terms for literature search
Research presentation

literature search, and defining the study outcomes (Table 2). Assignments were reviewed by the coaching faculty prior to sessions and allowed for targeted discussion to address any perceived areas of misunderstanding. This methodology allowed for specific feedback relative to the research interest and knowledge of the participant.

The weekly coaching sessions were used to facilitate each participant's progress through the course. The sessions consisted of several small groups of 3–5 participants, led by 1–3 course faculty. The surgical research knowledge of the ACS-OGB faculty combined with the local expertise of the public health faculty provided valuable insight to the participants, allowing them to create and refine study ideas pertinent and feasible in the local context. The course concluded with participants presenting their research topics to their classmates and faculty, receiving feedback on their ideas and recognition of their hard work.

The research course faculty met weekly to discuss the progress of the course, review the participants' assignments, identify gaps in knowledge that needed to be addressed, and adjust the curriculum accordingly. Lecture orders were modified, or topics were added based on real-time feedback and assessment by the course faculty. Participants who were struggling with attendance or assignments were identified, allowing for the HUCSH faculty to reach out and facilitate their re-engagement.

A post-course survey was also administered to participants to identify strengths and weaknesses of the course, gage interest in the next level of research education and gather overall feedback from participants. In addition, informal solicitations were disseminated intermittently throughout the course to determine barriers to participation, such as internet connectivity or scheduling conflicts, which could then be addressed with the hospital and residency administration.

Results

Twenty-six individuals participated in the initial needs assessment. Of respondents, 65.4% reported no current research activities. Interest in career development focused on research was reported as "very interested" (84.0%) or "somewhat Interested" (16.0%) by 100% of participants. When asked about their preferred timeline for initiating research activities, 54% identified building research collaborations as an immediate need with an additional 22.7% of participants desiring a timeline within "the next year or two." Out of 21 free text responses regarding highest research priorities (multiple answers allowed) 90.5% reported clinical research, 38% reported outcomes research, 14.2% reported epidemiology, and 0.5% reported data management. When asked the most important contributions a partner organization could make to promote research priorities, 57.7% of respondents answered general research training or methodology, 47% answered financial support, 23.5% answered mentorship, 17% answered publication support, 11.7% answered data collection/analysis, and 11.7% answered technology support. These data were then utilized to structure the curriculum.

Eighteen participants completed the pre-course survey. The majority of participants were general surgeons or residents in their second through fourth years of training (Table 3). The research course included 3 (16.6%) females and 15 (83.3%) males. The mean participant age was 30.8 ± 2.9 and most came from a governmental undergraduate school. Participants had a mean knowledge score of 7.2 ± 1.9 out of total 13. Of the respondents, 10 (56%) had not presented any research and 8 (44%) had presented research at the institutional level only. None had presented regionally, nationally, or internationally.

Twenty participants, including ten residents and ten faculty, started the course. Eleven participants completed the curriculum, but only ten were available to give a final presentation. Research topics are included in Table 4.

After completion of the course, ten participants completed a survey regarding their course experience, and all rated the course as a 5 (very helpful) on a scale from 1 to 5. Nine of ten (90%) participants reported problems with internet connectivity and estimated missing 10–30% of the course. All ten participants reported that they planned to continue working on their research projects and planned to engage in the subsequent modules of the course. Reasons to continue the research project included filling the gaps in health care and improving clinical practice with better outcomes for the patients.

Table 3 Participant demographics

Characteristic	
Age	Mean
Mean	30.8 ± 2.9
Range	26–35
Sex *n* (%)	
Female	3 (16.6%)
Male	15 (83.3%)
Position *n* (%)	
Resident, year 2	3 (16.7%)
Resident, year 3	2 (11.1%)
Resident, year 4	2 (16.7%)
General Surgeon	7 (38.9%)
Orthopedic Surgeon	2 (11.1%)
Neurosurgeon	1 (5.6%)
Undergraduate program *n* (%)	
Government	17 (94.4%)
Private	1 (5.6%)

Table 4 Participant research topics presented at course completion

Research topics
Pattern of Urinary Stones in Hawassa
Incidence and Associated Factors for Surgical-Site Infection following Abdominal Surgery in Adult Patients at HUCSH
Age and Sex Distribution in Colonic Cancer Patients and Their Treatment Outcome in HUCSH from January 2017 to January 2020
Post-operative Adhesion as a Cause of Mechanical Small Bowel Obstruction, Prevalence and Management Outcomes in HUCSH Adult Patients
Environmental Risk Factors Associated with Breast Cancer Diagnosed in Patients Visiting Hawassa Referral Hospital
Pattern, Clinical Characteristics, and Outcomes of Head Injury at HUCSH
Incidence of Infection in Patients with Open Tibial Fibular Fracture Above the Age of 14 Treated with Surgical Implant Generation Network (SIGN) Intramedullary Nail
Prevalence and Treatment Patters of Breast Cancer at Hawassa Referral Hospital
Prevalence of Peripheral Arterial Disease and Associated Factors at Hawassa Referral Hospital
Surgical-Site Infection and Antibiotic Resistance at Hawassa Referral Hospital

Discussion

Research capacity strengthening, a critical component to improve surgical care, is one of the core missions of the ACS-OGB and HUCSH collaborative. This introductory research course was designed and implemented to provide the foundational skills for local research. The necessary transition from a traditional in-person training program to a virtual platform provided several unforeseen advantages. For example, the elongated timetable for the curriculum with small group sessions allowed for participants to move through the various aspects of creating a research question and proposal in real time. The format allowed them to absorb the lecture materials during the week, apply it to their own project, and then discuss their ideas with experts in a small group setting, troubleshooting issues ranging from design integrity to study feasibility.

As we engaged with the learners in the small group coaching sessions, we identified some topics that had not been part of the original curriculum that required clarification. For example, proper citation and issues of plagiarism were poorly understood by the participants. As a result, this was added into the following weeks' lectures. The virtual platform and course timeline allowed for this real-time adjustment.

Mid-course, it became apparent that some participants were struggling more than others with certain steps of their study design. To best delineate their progress, we added a student presentation where they provided a brief presentation to explain their question, the background for the topic, its relevance to the patient population in Hawassa and their proposed study design. Through this exercise, participants had an opportunity to showcase their hard work while course organizers identified those students in need of additional support. To address this need, we established weekly office hours, staffed by an ACS faculty, at which participants could drop into a virtual meeting room to receive clarification on aspects of their project proposal.

The virtual platform also allowed for the engagement of additional ACS faculty who would not have been able to travel to Hawassa for the proposed in-person course. The expanded faculty complement not only gave lectures but served as small group facilitators, bringing their unique clinical and academic expertise to the discussions. These varied perspectives were valuable to the course attendees and led to the pairing of individual mentors and mentees at the end of the course to help with fine-tuning of their project ideas. We expect that these relationships will lead to future research collaborations in HUCSH. We hope that the virtual platform will allow for experts in surgical research to participate in future courses as well.

There were some disadvantages to the virtual platform. First, computer-based interactions are more impersonal and can, at times, be awkward. However, as so many of the interactions in all aspects of our lives became virtual, both course leaders and participants became more comfortable and embraced the opportunity to engage in an intellectual exchange. We were aided by the previously formed in-person relationships, as the majority of the involved ACS faculty have spent time in Hawassa and, therefore, know the place and the people. However, even those that have not been to HUCSH were able to build relationships with the participants during the seven-week course.

The eight-hour time difference between Hawassa and the central time zone added a logistical obstacle to course planning. Lectures were planned for the end of the workday in Hawassa, which coordinated with the beginning of the workday for ACS faculty. In addition, 4 h per week over 7 weeks was a significant time commitment for both faculty and participants. However, it was felt that the benefits of this course layout made the investment worthwhile.

An additional issue resulted from poor internet connectivity at HUCSH. Many participants had issues of connectivity

that resulted in missed lectures. While nine out of ten post-survey participants reported internet issues, it is likely that many of those that dropped out also struggled with connectivity. To address the issue of connectivity, we uploaded recordings of all the lectures to the virtual classroom to allow viewing at alternate times. We also encouraged participants to identify the most reliable internet connection for Saturday's coaching sessions. Often video was kept off by the participants to preserve the internet connectivity for audio connection. To address this moving forward, we will partner with the hospital to purchase Wi-Fi hotspots for use during the course sessions.

Due to political unrest in the country and internet shutdown, the course was forced to take a hiatus. The 3-weeks interruption necessitated a brief review of earlier lectures and concepts to ensure participants were prepared to move forward with new topics. The hiatus led to attrition of several course participants as their schedules no longer allowed for the significant weekly time commitment. Future courses will be offered to these participants with the hope that they will be able to re-engage.

Several lessons were learned by the course organizers in the creation and implementation of this course. Performing a needs assessment was a key piece of our success as it allowed us to not only delineate the priorities of the faculty and residents at HUCSH, but to also identify local resources that we could utilize. It was through this thorough asset mapping that we identified the School of Public Health as a partner. The public health instructors were instrumental in providing lecture content and offering their insights during the small group sessions. The establishment of this relationship, strengthened by this course, is a key component to the sustainability of the research program at HUCSH.

As we augment the course, we hope to address issues of participant retention. This may include troubleshooting local struggles with connectivity, adjusting lecture/small group times to accommodate schedules and offering formal training to lecturers in how to better engage participants virtually, particularly those who are introverted or uncomfortable with language barriers.

Creating a dedicated and knowledgeable team is the most critical piece in the success of this research course. The six core faculty involved committed approximately 60 h of their time to execute the 7-week course. Their consistent presence and engagement were essential. The identification of a local champion and support of the surgical leadership were also key parts of our success.

The 7-weeks course serves as the first of three installments, with future courses to teach data collection and analysis, manuscript writing, oral presentations and how to obtain grant funding. Since completion of the first course participants have been assigned an individual mentor who has served to answer questions, review and edit their proposal and provide accountability. The mentor will partner with the participant throughout the lifespan of their project from inception to completion. We believe that this individual attention is key to success as a clinical researcher and should be a central piece of any future research courses.

Future plans for this initial course include creation of more polished lecture videos with the goal of providing these as an open access curriculum. We will evaluate the effectiveness of such a course in increasing publications for the participants and academic productivity of the surgical department in Hawassa. We also hope to support local faculty to develop sufficient comfort with research instruction to enable their transition into the role of local mentors for junior faculty and residents.

Conclusion

This novel multi-institutional and multi-national research course design was successfully implemented utilizing a virtual format. The longitudinal structure allowed for concurrent study design by participants, allowing them to complete the course prepared to finalize and submit a research proposal to the local ethics board. This model may serve as a template for greater development of research capacity building in the LMIC setting.

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Declarations

Conflict of interest On behalf of the authors, the corresponding author states that there is no conflict of interest.

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