

Elective Courses in Global Surgery for Undergraduate Medical Students: A Narrative Review and a Proposal for European Universities

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Abstract

Global surgery (GS) is the discipline of improving health by expanding universal access to surgical care. GS is an essential part of the global health (GH) concept, but it is almost invariably neglected in academic settings. This review assesses the engagement of undergraduate medical students in the field of GS. PubMed, Embase, and Web of Science were searched with focus on electives organized by universities and only eight results were found. The scientific literature on this topic is scarce and uneven, and the number of students involved in these experiences is considerably low. Although few, the existing electives prove that building sustainable and useful GS projects is possible and that both students from high-income countries (HICs) and low-income and middle-income countries (LMICs) can extensively benefit from these experiences. Given the currently low involvement of European universities and medical schools, of which the authors are part, this review aims at encouraging European universities to organize GS electives for their students. In addition, this review suggests key activities to undertake in such electives including theoretical sections, research projects, and bilateral international rotations between HICs and LMICs.

Key Words: Medical Student; General Surgery/education; Global Health; International Cooperation; Curriculum (Source: MeSH-NLM).

Introduction

Global surgery (GS) is an area of study, research, practice, and advocacy that places priority on reducing surgical inequities and on addressing surgical conditions, which constitute a third of the global burden of disease worldwide.^{1,2} GS aims to ensure adequate, quality, safe, timely, and affordable surgical care universally, with a special emphasis on underserved populations and populations in crisis.¹ These are often those living in low-income and middle-income countries (LMICs), although high-income countries (HICs) are also hosting marginalized populations that can benefit from equitable access to surgery.^{3,4} Aligned with the principles of global health (GH), GS is a multidisciplinary approach incorporating obstetrics and gynecology, perioperative care, anesthesia, palliative care, rehabilitation, emergency medicine, nursing, and other health-related practices, such as public health, population-level preventive strategies, economics, data sciences, digital technology, social sciences, and pharmacy.¹

No one had ever considered surgery as a major international health issue until 1980,⁵ when World Health Organization (WHO) General Director defined it as the “most serious manifestation of social inequity in health care”.⁶ However, surgery remained “the

neglected stepchild of global public health”,⁷ at least until 2006, when it was first included in the second edition of the Disease Control Priorities Project.⁸ A key turning point was the establishment of the Lancet Commission on Global Surgery (LCoGS) in 2014,⁹ which drew up guidelines and goals to be achieved by 2030 to reduce the global surgical burden. These were soon adopted within the World Health Assembly (WHA) resolution no. 68.15,¹⁰ and were later revised and updated.^{11,12} Since the report of the LCoGS, GS has extensively grown in consensus within the GH community.¹³ Nevertheless, the goal of ensuring universal access to surgical care is yet to be achieved.¹⁴

To increase the specialist surgical workforce density and the surgical volume in every country by 2030, as advocated by the LCoGS,⁹ it is essential to engage future surgeons. They are none other than the current undergraduate medical students.¹⁵ This paper assesses the role that European students can play in GS and how they can already contribute to addressing GS challenges. The lack of exposure to GS during the standard medical student curriculum is common around the world,¹⁶ and especially among European students as the authors' experiences show. Literature on this topic is scarce and disorganized.

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The purpose of this paper is to review existing GS initiatives undertaken by medical schools that support the practical involvement of undergraduate students. Ultimately, the article aims to create opportunities for European universities and to encourage them to engage in such a way that European students can be exposed to – and consider – GS as one career option, thereby contributing to the universal access goal promoted by GH.

Methods

This review adheres to the Scale for the Assessment of Narrative Review Articles (SANRA) for JIMS guidelines.

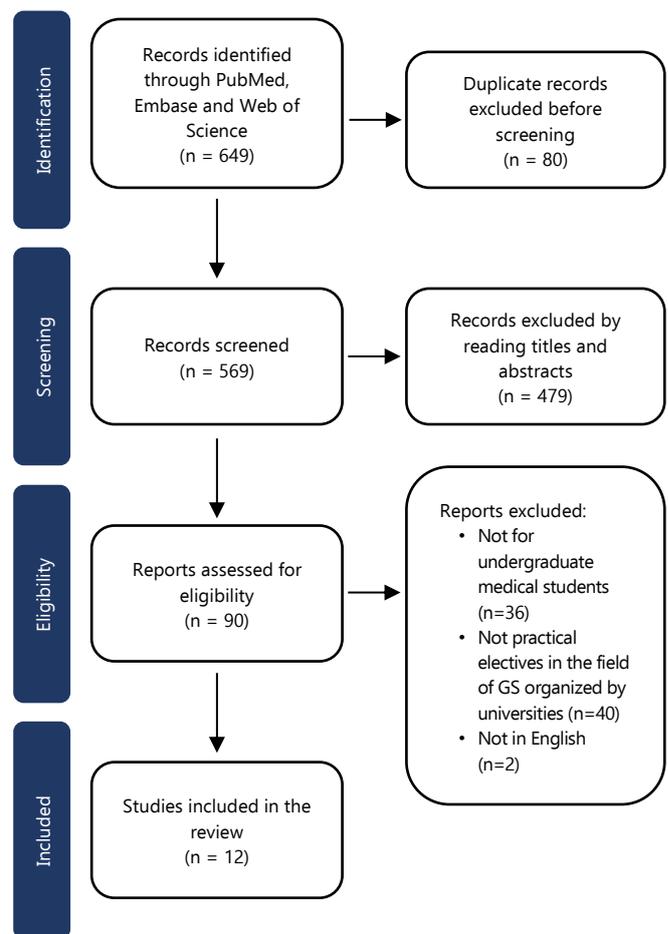
We designed a search strategy to identify peer-reviewed articles focused on electives for undergraduate medical students in the field of GS, which included practical involvement and that were organized by universities. We included articles written in the English language only. We searched PubMed, Embase, and Web of Science, to identify articles published from 1950 to 2022. Additional articles were identified from the retrieved articles' references. The literature was last checked on 30th June 2022.

The search strategy and keywords are as follow. PubMed search strategy: (general surgery[MeSH Terms]) AND ((education, medical, undergraduate[MeSH Terms]) OR (faculty, medical[MeSH Terms]) OR (schools, medical[MeSH Terms]) OR (students, medical[MeSH Terms]) OR (curriculum[MeSH Terms])) AND ((Global Health[MeSH Terms]) OR (international cooperation[MeSH Terms]) OR (international educational exchange[MeSH Terms]) OR (medical missions[MeSH Terms])). Embase search strategy: ('general surgery'/de OR 'surgery'/de) AND ('medical student'/de OR 'medical school'/de OR 'medical education'/de OR 'clinical education'/de) AND ('global health'/de OR 'international cooperation'/de OR 'rural health care'/de OR 'middle income country'/de OR 'low income country'/de OR 'developing country'/de). Web of Science search strategy: ("global surgery" OR "general surgery" OR "surgery") AND ("medical student" OR "medical school" OR "medical education" OR "clinical education" OR "undergraduate medical students") AND ("global health" OR "global surgery" OR "international cooperation" OR "rural health care" OR "middle income country" OR "low income country" OR "developing country" OR "high income country").

GR and GF independently read titles and abstracts to identify eligible and appropriate articles. Disagreements were solved by TS. Data extraction from the assessed articles was performed by GR, GF, and TS independently in their entirety.

Data extracted focused on the practical organization of projects described in said articles. Categories of analysis include location and setting, participants, program structure, formative objectives, and costs and funding. The outcome of these projects is also highlighted, and both positive results, as well as limitations, are assessed.

Figure 1. Flow Diagram of the Articles' Screening and Inclusion Process.



Results

The search strategy retrieved 649 results, of which 12 studies were included in this review (Figure 1).¹⁷⁻²⁸ In total there were eight projects – labeled alphabetically from A to H – in GS were been offered worldwide by universities to undergraduate medical students (Table 1), as five articles referred to project A.¹⁷⁻²¹ While five projects (from A to E) were explained in detail, information on the remaining three was superficial and fragmented (projects from F to H).

Organization of the Projects Location and Settings

All electives included were organized by a university in a HIC of the "Global North": four in the United States of America (projects A, B, D, and F), two in Sweden (projects D and E), two in the United Kingdom (projects G and H), and one in Canada (project C). Sister institutions involved in these courses were either universities (n=5), hospitals (n=6), and/or non-governmental organizations (NGOs) (n=2). Academic institutions from LMICs were in Haiti (one in project C), Rwanda (one in project C), Zimbabwe (one in project D), and Colombia (two in project F). Hospitals directly involved were in Haiti (one in project A), India (one in project B), Rwanda (one in project H), Tanzania (one in project H), and

Table 1. Characteristics of Elective Courses in Global Surgery for Undergraduate Medical Students Organized by Universities Available in the Literature.

Institutions involved	Reported period	Students involved	Structure of the elective
Project A¹⁷⁻²¹ <ul style="list-style-type: none"> - Emory University School of Medicine (USA). - Project Medishare for Haiti (NGO). - Hôpital St. Thérèse in Hinche (Haiti). 	2008-2013, every year. From 2013, until unspecified data.	Each year, a team of 10 3 rd year HICs' students is selected. 2 nd , 3 rd , and 4 th year students.	Pre-departure part: Suture labs. Basic surgical skills. Sterile technique. Abroad part: <ul style="list-style-type: none"> - An elective week of the mandatory surgical clerkship. - Students can evaluate patients, propose a treatment plan to the attending surgeon, order the necessary laboratory tests and imaging studies for the potential surgical operation, and take care of patients' postoperative care. Pre-departure part: <ul style="list-style-type: none"> - 4th year students are involved in peer-tutoring activities and support younger students in raising funds and materials. Abroad part: <ul style="list-style-type: none"> - 4th year students spend 3-4 weeks in Haiti; during the first week, they are involved in setting up the operating rooms and other logistical issues of the elective. - 2nd and 3rd year students spend 1-week of practical internship in Haiti (as before 2013). Back home: <ul style="list-style-type: none"> - Students must examine clinical cases observed in Haiti and elaborate reviews, supporting their work with references to the scientific literature.
Project B²² <ul style="list-style-type: none"> - Oregon Health and Science University (USA). - Sanjay Gandhi Postgraduate Institute of Medical Sciences (India). 	2009-2015, every year.	Multi-year project (only HICs' students): <ul style="list-style-type: none"> - 1st and 2nd year: junior seminar course (open to all students of the course). - 3rd year: senior clinical lecture (open to all students of the medical school). - 4th year: global clinical elective in India (open to a selected few). 	Theoretical part (pre-departure): <ul style="list-style-type: none"> - Lectures, lessons, and seminars. - Topics: global burden of surgical disease, financial and societal costs, ethics of international volunteerism and research, disaster response, logistical challenges of building emergency, surgical and obstetrical capacity in developing world. Practical part (abroad): <ul style="list-style-type: none"> - 1-3 months of internship in general surgery in India. - Students participated in morning rounds, and in scheduled and emergency operations.
Project C²³ <ul style="list-style-type: none"> - McGill University (Canada). - Université Quisqueya (Haiti). - University of Kigali (Rwanda). - Medical student 4 Haiti (no-profit). 	2012-2016, every year.	Multi-year project: <ul style="list-style-type: none"> - Near-peer teaching approach. - Rwandan and Haitian students in Canada for 3 weeks. 	Activities for LMICs' students in Canada: <ul style="list-style-type: none"> - Structured near-peer teaching sessions: lectures and lab demonstrations. - Research methodology. - Anatomy dissection. - Clinical simulation activities. - Clinical shadowing with pathologists and trauma surgeons. Since 2016 the project has expanded: <ul style="list-style-type: none"> - Extended theoretical-educational curriculum. - Involvement of French students (which French university is not specified).
Project D²⁴ <ul style="list-style-type: none"> - Lund University (Sweden). - Harvard University (USA). - University of Zimbabwe. 	2015-2017, every year.	<ul style="list-style-type: none"> - Final year medical students. - Total of 50 students in 3 years (14-18 students each year): 42 from Sweden, 4 from the USA, and 4 from Zimbabwe. 	Theoretical part: <ul style="list-style-type: none"> - 2 initial weeks of didactic coursework: lectures, case studies, and small group discussions, held by international guests. - HICs' and LMICs' students all together in Sweden. Practical part: 2 weeks. <ul style="list-style-type: none"> - Swedish and American students traveled to Zimbabwe, where they joined surgical, Ob/Gyn, anesthesia, and pediatric (only in the 2nd and 3rd editions) teams; there was 1 accompanying faculty member for every 4 international students. - Zimbabwean students had a clinical experience in a Swedish hospital. Capstone project: 1 final week. <ul style="list-style-type: none"> - Only for American and Swedish students. - In order to synthesize practical experience and expand knowledge on a specific topic in GS.
Project E²⁵ <ul style="list-style-type: none"> - Karolinska Institutet (Sweden). - Soroti Hospital (Uganda). - Mulago National Referral Hospital (Uganda). 	2016-2020, biannually.	<ul style="list-style-type: none"> - 4th year medical students. - Only from Sweden. 	Theoretical part (pre-departure): Lectures and seminars in Sweden. Practical part (abroad): <ul style="list-style-type: none"> - 2-week clinical rotation in Uganda. - Supervision and tutoring from both Swedish and Ugandan surgeons. - Observation and, possibly, assistance in ward rounds, in ward duties and in OR of general surgery, obstetrics, surgical oncology, cardiothoracic surgery, burns and plastic surgery, pediatric surgery, and orthopedic surgery.
Project F²⁶ <ul style="list-style-type: none"> - Rutgers Robert Wood Johnson Medical School – RWJMS (USA). - Universidad del Valle Medical School (Colombia). - Universidad de Antioquia (Colombia). 	2015-2016.	<ul style="list-style-type: none"> - Students interested in GS in two general programs on GH. - Over 2 years, 6 out of 16 selected students have chosen to investigate issues related to GS. - 1st program: "Distinction in Global Health" (DGH): 1st year students, no previous GH experience required (only 1 GS student). - 2nd program: "Chancellor's Global Scholars" (CGS): accepted medical students, prior to matriculation, with previous GH experience required (the remaining 5 GS students). 	<ul style="list-style-type: none"> - One local or transnational practical experience in the DGH program, or two transnational practical experiences, during the first and graduating years of medical school, in the CGS program. - American students collaborate with Colombian students, faculty tutors, and international teachers (RWJMS assistant professors of surgery and Colombian university surgeons) in identifying areas of GS research implementation need. - Field research, together with local partners, takes place in the summer, for one month. - Upon their return to the USA, students have to carry out their research through abstracts, posters, podium presentations at national/international conferences, and manuscripts.
Project G²⁷ <ul style="list-style-type: none"> - Cambridge University (UK). - National Institute for Health Research Global Health Research Group for Neurotrauma (UK). - LMICs' partners not defined. 	Before 2018 (not better specified).	<ul style="list-style-type: none"> - HICs' students travel to LMICs, where they can work with local students. - Students' university year not specified. 	Online "Research for Publication" courses: <ul style="list-style-type: none"> - In collaboration with the British Medical Journal. Open to both HIC and LMIC students. Research project on neurotrauma: <ul style="list-style-type: none"> - Active involvement in the planning and management of the project. - HICs' and LMICs' students learn to manage the different stages of the development of a research project.
Project H²⁸ <ul style="list-style-type: none"> - Oxford University (UK). - Hospitals in Tanzania and Rwanda. 	2017-now.	<ul style="list-style-type: none"> - HICs' students travel to LMICs, where they can work with local students. - Students' university year not specified. 	Participation in research projects on pediatric surgery epidemiology (Oxford Paediatrics Linking Oncology Research with Electives – OxPLORE): <ul style="list-style-type: none"> - Cross-sectional observational study. - Analysis of the variation, in contexts with different resources, of incidence, management and postoperative outcomes of pediatric patients with Wilms tumor, neuroblastoma, or rhabdomyosarcoma. - Scientific publications,^{29,30} and presentation of results at international conferences.

Uganda (two in project E). Projects A and C had NGOs involved, of which the one operating in project C was a non-profit student association.

Participants

Five projects had detailed information on the year of attendance of participants (projects from A to E). Projects B, C, and F involved the same students in multi-year projects; projects A, D, and E involved students attending one of the last years of their education for only one year. Students from the "Global North" were participating in all projects and a field trip to LMICs was always planned except for project C. Only in projects C, D, and G, students from the "Global South" were offered to attend field trips to the "Global North"; project G lacked clarity on the role and activities performed by said students.

Program Structure

Electives from A to E were structured in an academic module, organized at HIC's institutions, followed by a period on the field. The first learning module consisted of either lectures or seminars held by GS experts (projects A, B, D, and E) and a practical course on basic surgical skills (project A). In projects C and, partially, A, this module was organized following a near-peer teaching model. The on-field module was organized as a rotation of students in hospitals either in LMICs (projects A, B, D, and E) or HICs (electives C and D) with roles ranging from simple observation to surgeon assistance. Electives from F to H focused on GS research, where students were actively involved in the design and management of a research project (elective G) and in the production of scientific literature (projects F and H).

Formative Objectives

With regards to projects A to E, formative objectives for students from HICs were aimed to improve their clinical skills, to educate them in the context of GS, to expose them to the possibility of pursuing a career in this field, and to raise awareness of the social, cultural, and economic aspects underlying healthcare. Formative objectives for students from LMICs were only reported for projects C and D and they were limited to involving students during university lessons and clinical rotations in HICs' facilities. In project A, attention was paid to the assessment of the needs and possible benefits that HICs' medical students could bring in LMICs' context, thanks to a preliminary inspection at the LMICs' institutions carried out by physicians with proven experience in the GH field.

Electives from F to H focused their objectives on research to allow both LMICs' and HICs' students to acquire the ability to organize and manage research projects (especially in the GH field), produce scientific literature, and present it at international contests, thereby improving their communication and public speaking skills. In addition, these electives intended to provide students with the opportunity to start a career in the context of GS and to weave international relations. Only project H had the objective to implement and support research in LMICs.

Costs and Funding

Data about costs and their coverage is provided only for projects A, D, and F. Transport accounted for the largest share of the costs, e.g., 24,000 USD corresponding to 2/3 of the total budget of project A. Expenses were, generally, covered by funds obtained through donations, independent fundraising, and/or solicitation of family and friends. For example, for elective D, costs were covered by grants from the Swedish Foundation for International Cooperation in Research and Higher Education and by reimbursements from Lund and Harvard University (also for Zimbabwean students). Instead, elective F yielded two inner projects, the Chancellor's Global Scholars (CGS) program and the Distinction in Global Health (DGH) program. For the CGS program, institutional funding support of 5,000 USD was provided for each student, derived from a 40:60 split between the Health Sciences Chancellor's Office, and the United States Agency for International Development – Research and Innovation Fellowship Program. For the DGH program, no funds were earmarked, and students were guided in applying for grants from external and intramural sources and were ultimately awarded a total of 1,000 USD through the Rutgers Intelligence Community Center for Academic Excellence Scholarship.

Outcomes of the Projects

Positive Results

Data regarding the benefits acquired by students from these experiences are available only for electives A to E. Even if all participants declared to be satisfied, the evaluation of the impact on the students' careers is relatively complex. Regarding influence on career, project B suggested that this experience was a determining factor in the choice of participating students' careers. Instead, project D stated that the data obtained are not yet sufficient to declare the role of the elective in the career choices of the students involved. In terms of the evaluation of theoretical learning, project C proposed a test to evaluate theoretical training. Electives D and E proposed a test before the elective and one thereafter, with the aim of comparing the results. Project A reported considerable difficulties in acquiring data on students' learning. In general, evaluation outcomes were positive. In the assessment of relational and practical skills acquired, electives A and B reported major improvements in interpersonal skills acquired by participating students. Study C investigated these improvements through an interview, while projects D and E did the same through questionnaires. In addition, positive results of elective H can be found directly in the literature, as this project led to the publication of a few papers.^{29,30}

Limitations

The main limitations recognized were poor or incomplete experience-based data in projects from A to D, and difficulties in raising funds in project D. In addition, the existence of negative implications related to the decision to involve students and non-doctors for the host countries should be evaluated, i.e., projects A, D, and E.

Discussion

This review shows that projects dedicated to medical students in the field of GS are few and uneven, with a small number of HICs' students involved, especially from Europe, and even fewer LMICs' students. Nonetheless, these electives can be strategic starting points to develop new and more effective ones. Upon these instances, European institutions should promote similar projects and should foster European students' involvement in GS, which is now particularly scarce.

European Universities

While in the reviewed electives, NGOs and single hospitals occasionally took part in organizing the projects. We propose that universities and related academic institutions should be the ones to develop electives in GS, in close collaboration with LMICs' institutions. In Europe, student associations, which are active in the field of GS and organize initiatives for medical students, such as the American InciSioN,^{31,32} and GSSA,³³ are less common. At the same time, both European students and universities are already familiar with, and inclined to, international collaboration as a result of the decenary Erasmus+ project.^{34,35} Therefore, universities are the institutions that could better define uniform educational objectives for these electives and appropriate training paths for both HICs' and LMICs' students.^{19,36,37}

Benefits for HICs' students

There seems to be a favorable consensus in the general GH literature regarding the usefulness of these electives for students from the "Global North".³⁸⁻⁴⁰ First, students participating in international electives in the field of GH show improvements in clinical skills and knowledge, reporting greater self-confidence in their ability to collect medical history and in conducting physical examinations.^{38,39} Furthermore, the electives help to bring about significant attitudinal changes in the participants, such as the acquisition of a human approach to the patient and his illness, a greater sensitivity to cultural differences, and an awareness of the impact of surgery on the patient's private and social life, as "the most profound lessons of a surgical trip abroad [...] come less from within the walls of the operating room and more from the patients themselves".⁴⁰ Finally, these electives are crucial in influencing and directing the career of doctors and surgeons of the future towards GH and GS.^{4,39} This would mean not only having surgeons trained to support projects in LMICs, but also having professionals sensitive to the realities of the poorest people in HICs' societies, who do not access the same healthcare as their fellow citizens.^{41,42} In conclusion, there will be no future global surgeons suited to the challenges that LCoGS has highlighted without adequate exposure of undergraduate students to GS.

Benefits for LMICs' Students

Unlike the case of HICs' students, the advantages described for the students of the "Global South" appear more uncertain. Although the learning methods proposed to LMICs' students during their stay in the "Global North" were adequate, there was a definite numerical disparity between HICs' and LMICs'

participating students. In general, LMICs' students claim to have benefited from the project as far as it concerns their personal and professional growth. This includes the acquisition of new skills, the creation of an international network of relationships, and increased motivation to help their own community.²³ However, only two of the projects assessed involve LMICs' students, and they do so in a limited way. For instance, only 4 out of 50 total participants of project D came from LMICs. The limited engagement of LMICs' students is a fundamental problem in the whole sphere of GH electives.⁴³⁻⁴⁵ There are significant impediments, such as costs,^{24,44} the brain drain from rural areas to richer ones (be they in HICs or in the more affluent centers of the LMICs),^{46,47} and the limited applicability of the knowledge acquired in resource-rich settings in resource-poor ones.⁴⁴ However, "offering opportunities for students and trainees from institutions that are commonly on the receiving end of such collaborations is a necessary step in the achievement of equitable and mutually beneficial institutional partnerships".⁴⁸ Doing the opposite means contradicting "the spirit of training in global health".⁴⁸

Global Surgery and Decolonization

Rejecting a heritage of colonialism among the causes of the unbalanced involvement of LMICs' students in GS programs would not do justice to the spirit of GH. Indeed, one needs to acknowledge the frequent persistence of a paternalistic attitude that leads to power imbalances with benefits to individuals at HICs' institutions at the expense of their LMICs' partners.⁴⁹ Several proposals have been formulated in the literature on how to decolonize GH.^{50,51} In the reviewed electives, there are both positive and negative elements in this sense. Among the latter, there is the lack of long-term planning. Instead, longer-term electives, less scarce and more continuous over time, would sound less like an "honorable vacation" for HICs' students,⁵² because they would guarantee useful collaborations within the realities of the "Global South".⁵³

In elective D, the staff of the host structure reported a significant increase in work burden due to the presence of HICs' students, while at the same time claiming to be in favor of repeating the experience. This suggests that these electives are not intrinsically perceived as colonialist or paternalistic in attitude; rather the problem lies in the lack of strategies to make them sustainable and mutually helpful. Sustainability can be obtained through shared, continuous, and harmonized planning between involved institutions. In this sense, the experience of project A is significant as HICs' physicians with proven experience in GH have carried out an inspection at the LMICs' institutions (involving the hospital and the ministry of health), to probe their real needs and to plan adequate measures of intervention. This allowed a clear definition of the students' role and adequate training prior to the visit, thereby avoiding unnecessary or harmful activities, or activities they would not otherwise have permission or possibility to practice in their home country.⁵⁴ Other positive examples were electives F, G, and H, which involved LMICs' students in research activities, thus enabling them to overcome challenges caused by a lack of infrastructure and resources.

Proposed Structure of the Electives

Based on the results of this review and the need to make GS projects equitable, a GS elective should focus on the following key-points ([Table 2](#)).

A multi-year approach should be encouraged, such as the one adopted by electives from A to C, as it allows a deeper and a more organic training. This would also guarantee a constant generational change among students, thereby enabling long-lasting bilateral exchanges. In addition to the concrete surgical practice, studying theory and research plays a major role to give a truly global meaning to the surgical elective. They can guarantee a more complete and contextualized education from a socio-cultural, epidemiological, and economic point of view, more than in terms of clinical skills. Therefore, gradual training courses that start from the preclinical years of university should be evaluated.

To introduce the students to the subject, we strongly support the widespread model of lectures and seminars held by experts in the sector, both from LMICs and HICs. Possible topics for a comprehensive curriculum should include the global burden of surgical disease, associated financial and social costs, barriers to access to surgical care, inequality of access to care, essential surgical care, Bellwether procedures and basket of essential procedures, ethics and decolonization of international collaborations, application contexts (e.g., civil trauma, assistance in times of war, disasters response), National Surgical Obstetric Anesthesia Planning, logistical challenges to build emergency surgical and obstetric skills in disadvantaged countries, surgical assistance for marginalized/migrant/poor populations in EU, climate change, and emerging infectious diseases. Theoretical lectures should be delivered via videoconferences and webinars to ensure mutual benefits and sharing of knowledge.⁴⁵

Thereafter, students should be introduced to GS research (as in electives from F to H) by working in groups at their own institution. Each year, they should focus on a specific aspect of the surgical epidemiology of their country of origin. This increases the chances of future strengthening of the scientific workforce and enriches the scientific literature about GS, it teaches students how to conduct research in this field, and it allows them to start building a career in GS and to advocate for greater and more equitable access to essential surgery in their specific region. Moreover, the knowledge obtained can then be transmitted to students of sister institutions during their visits and rotations, according to a near-peer tutoring model (as shown by electives C and, partially, A). This model has been already adopted in various fields of medical education.⁵⁵ In particular, it has been shown to be useful in the transmission of socio-cultural issues in medicine,⁵⁶ an aspect that makes this choice even more significant in this context.

Concerning rotations at sister institutions, students – both from HICs and LMICs – should have acquired some clinical competence prior to traveling and be exposed to pre-rotation testing to help identify the acquired skills justifying a GS rotation. They should also be attending the last years of university training. On site,

Table 2. Key Points of Proposed Structure of Possible Electives in Global Surgery for Undergraduate Medical Students Organized by Universities.

Pre-clinical years	Lectures and seminars (1 st year of university)	<ul style="list-style-type: none"> - Held by experts in the sector, both from LMICs and HICs. - Via videoconference, so that all students both from LMICs and HICs can participate at the same time. - Possible topics: <ul style="list-style-type: none"> • Global burden of surgical disease; • Financial and social costs associated; • Barriers to access to surgical care; • Inequality of access to care; • Essential surgical care; • Bellwether procedures and basket of essential procedures; • Ethics and decolonization of international collaborations; • Application contexts (civil trauma, assistance in times of war, disasters response); • National Surgical Obstetric Anesthesia Planning; • Logistical challenges to build emergency surgical and obstetric skills in disadvantaged countries; • Surgical assistance for marginalized/migrant/poor populations in the EU; • Climate change; • Emerging infectious diseases.
	GS research (2 nd year)	<ul style="list-style-type: none"> - Conducted by students working in groups at their own institution. - Each year, focus on a specific aspect of the surgical epidemiology of the home country.
Multi-year elective	Near-peer tutoring (3 rd year)	<ul style="list-style-type: none"> - Lectures given by students at this point in the elective to visiting students of the sister institution. - Topic: the research they themselves conducted in accordance with the previous point.
		<ul style="list-style-type: none"> Near-peer tutoring <ul style="list-style-type: none"> - According to the previous point. - One session per week.
	Abroad at the sister institution (4 th or 5 th year)	<p>Rotation in the surgical ward</p> <ul style="list-style-type: none"> - 1-3 months. - Possible tasks of the students: <ul style="list-style-type: none"> • Medical history, physical examination, and case presentation; • Compilation of medical, hospitalization, and discharge records; • Proposal and discussion of adequate drug therapies; • Preparation of the sterile field; • Assistance at the operating room; • Monitoring of parameters; • Change of dressings in the postoperative period; venous sampling; • Placing catheters in arteries; • Care and suture of small wounds; • Removal of drains and sutures; • Assistance in the non-bloody reduction of fractures and in the placement of plaster casts; • Quality control (review of complications and mortality).
Clinical years	GS publication (5 th or 6 th year)	<ul style="list-style-type: none"> - Ponder on the experience. - Detailed description of all acquisitions and inform the evolution and improvement of future electives.

students can be foremost taught local surgical epidemiology by native colleagues still in the early stages of the elective, through their own research, according to the near-peer model previously described. These classes could be held once a week throughout the rotation. This will allow visiting students to have a complete and in-depth understanding of the situation in the host country, in order to conduct their work with appropriate knowledge.

Students' roles in the ward must be clear and well-defined. Based on this study, students should take up the following tasks at host institutions: medical history, physical examination, and case presentation, individually; compilation of medical, hospitalization and discharge records, individually; proposal and discussion of adequate drug therapies; preparation of the sterile field, and assistance at the operating room; monitoring of parameters, and change of dressings in the postoperative period, individually; venous sampling, individually; placing catheters in arteries, under supervision; care and suture of small wounds, under supervision; removal of drains and sutures, individually; assisting in the non-bloody reduction of fractures and in the placement of plaster casts; and quality control (review of complications and mortality). The assumption of these responsibilities can only be gradual and contextual to the student's integration into the ward. An adequate length of stay, i.e., one to three months, can ensure that students undertake all set-out tasks while also learning how a LMIC's surgical ward operates and how it is different from an HIC's one, and vice versa. This duration is in principle sustainable also considering the private life and academic record of the student, but it still depends on the specific projects.

The experience does not end after returning from the host institution. Upon returning to their respective countries, students can ponder on the experience and, perhaps, contribute to filling scientific literature gaps on GS. This could produce in a detailed report of all acquisitions and inform the evolution and improvement of future electives (similar to the capstone project in elective D). It will also help to address those shortcomings in the literature that justified this article. It goes without saying that in any paper produced thanks to these electives, co-authorship by all contributors, professors and students coming from both HICs and LMICs, will consolidate and sustain collaboration among institutions.

Conclusion

Global surgery is an intrinsic component of GH and a fundamental discipline aimed to alleviate the global burden of disease. Developing undergraduate courses to educate and train those who will become health professionals, medical doctors, and surgeons is strategic to further address the global surgical health challenges. However, only some are exposed to this topic during medical school, and even fewer are directly involved in GS. Although positive experiences exist, they require extensive enhancement both quantitatively and qualitatively.

The goal of this review was to collect existing examples of projects on GS designed by universities and dedicated to undergraduate students with the ultimate aim of identifying best practices and issuing a call to intensify didactic efforts addressing

GS. We, therefore, call upon European universities to engage assertively in GS by organizing electives and exposing students to this multidisciplinary field, together with institutions of LMICs so that equitable access to these courses and to corresponding benefits is fully shared. In the same way, we appeal to all students worldwide to read, learn, and engage in GS projects. The hope is that our review is a starting point to encourage universities and students to responsibly contribute to the further development of the field, thus allowing all to approach and appreciate the benefits of GS.

Summary – Accelerating Translation

Title: Perché le università europee dovrebbero organizzare corsi elettivi di Chirurgia Globale per i loro studenti

Qual è il problema

Per Chirurgia Globale, o meglio Global Surgery (GS), si intende una branca della Salute Globale con la priorità di ridurre le disuguaglianze nell'accesso alle cure chirurgiche a livello mondiale. Si stima infatti che un terzo del Global Burden of Disease – che è una descrizione dello stato di malattia della popolazione mondiale – sia dovuto all'impossibilità di accedere a trattamenti chirurgici adeguati, sicuri e tempestivi. Ciò è particolarmente vero per le popolazioni svantaggiate, specialmente nei Paesi a basso e medio reddito (LMICs), ma anche in alcuni contesti dei Paesi ad alto reddito (HICs).

Si tratta di una problematica di rilievo mondiale, ma se si chiedesse a uno studente di medicina di un'università europea che cosa sia la GS, probabilmente non saprebbe rispondere. Questo perché, nel campo della Salute Globale, la GS è sempre stata messa in secondo piano e solo dal 2014 è stata veramente portata al centro del dibattito grazie al lavoro e alle proposte della Lancet Commission on Global Surgery. Tuttavia, ancor oggi, la GS viene citata raramente nelle università. La vera conseguenza? Che, se nessuno parla di GS ai futuri medici, nessuno di loro potrà scegliere di impegnarsi in questo campo e non sarà possibile ridurre il peso globale delle malattie chirurgiche.

Però esistono alcune università che riconoscono l'importanza di formare gli studenti in questa disciplina e che hanno così organizzato dei corsi elettivi in GS. Gli autori di questo articolo, studenti di medicina europei, hanno analizzato la letteratura scientifica su tali elettivi, per creare una recensione approfondita delle esperienze esistenti, mettendo in luce punti di forza e di debolezza e stilando le caratteristiche che un corso elettivo di GS dovrebbe avere. L'obiettivo finale è un appello alle università europee perché realizzino un'offerta di esperienze di GS per i propri studenti.

I risultati della ricerca

Gli autori hanno messo a punto una strategia di ricerca per identificare la letteratura scientifica in lingua inglese riguardante corsi elettivi di GS, per studenti di medicina non ancora laureati, con coinvolgimento pratico e organizzati dalle università. I database utilizzati sono stati PubMed, Embase e Web of Science. Alla fine, sono stati selezionati 12 articoli, per un totale di 8 progetti riscontrabili nell'intera letteratura scientifica.

L'analisi di questi risultati ha mostrato che i corsi elettivi in questione sono pochi e frammentari, con la partecipazione di un basso numero di studenti provenienti da HICs ed uno ancora più basso da LMICs. Pochi corsi esistenti significa pochi dati basati sull'esperienza da cui trarre conclusioni. Nonostante questo, sono presenti svariati elementi che consentono di riconoscere che gli elettivi in GS sono esperienze valide e significative.

Degli 8 elettivi, 5 sono organizzati in due fasi distinte: una prima parte, didattica, svolta nelle università dei paesi HICs tramite lezioni frontali, esercitazioni pratiche e/o peer-tutoring; e una seconda parte, basata sulla mobilità internazionale in un contesto svantaggiato e/o diverso da quello di appartenenza, che porta gli studenti sul campo con ruoli osservazionali o di assistenza chirurgica. I restanti 3 elettivi, invece, si sono focalizzati sulla ricerca scientifica su tematiche di GS: gli studenti hanno realizzato collaborazioni internazionali con altri studenti e/o medici, al fine di produrre nuova letteratura.

In generale, i partecipanti da HICs sono stati soddisfatti e hanno tratto benefici sia in termini di apprendimento clinico che di formazione personale e relazionale; spesso, questo si è tradotto in scelte di carriera orientate a un impegno nelle discipline associate alla GS. Più limitati sono invece i dati riguardo i benefici tratti dagli studenti provenienti dai LMICs, tra cui la creazione di una rete di relazioni internazionali e un'intensificata motivazione ad aiutare la propria comunità.

Bisogna però considerare anche i lati negativi, per cercare di migliorarli. Tra questi, anzitutto i costi, specialmente per i trasporti, cui alcuni degli elettivi hanno fatto fronte grazie a donazioni, raccolta fondi a carico dei singoli studenti e fondi istituzionali. Poi, la fuga di cervelli dalle aree rurali verso quelle più ricche. Infine, il colonialismo, ossia un atteggiamento paternalistico in cui le istituzioni HICs rischiano di incorrere, con squilibri di potere a scapito dei loro partner LMICs: in parte anche a questo va ascritta la squilibrata partecipazione di studenti HICs e LMICs. Risolvere questo fenomeno è di primaria importanza per la Salute Globale e, per

quanto riguarda questo articolo, è certamente fondamentale una partecipazione continua e condivisa tra le istituzioni in gioco nel definire scopi e organizzazione degli elettivi.

La nostra proposta

Le università europee, da anni coinvolte nel progetto Erasmus+, poiché riconoscono l'importanza formativa degli scambi studenteschi, sono istituzioni privilegiate per attuare corsi elettivi in GS con solide ed autentiche partnership internazionali. L'analisi dei risultati ha portato gli autori a formulare una proposta completa di elettivo, che coinvolga equamente studenti da paesi HICs e LMICs durante l'intero arco della loro carriera universitaria, con obiettivi specifici per ogni anno.

Durante il primo anno, gli studenti seguono seminari e lezioni, in videoconferenza, su temi legati alla GS. Al secondo anno, fanno ricerca su uno specifico tema di epidemiologia chirurgica del proprio Paese. Al terzo, diventano peer-tutor per gli studenti partner in visita (i quali sono già ad uno step successivo del percorso), illustrando proprio i risultati delle loro ricerche dell'anno precedente. Al quarto/quinto anno, avviene l'esperienza di scambio internazionale, di 1-3 mesi, durante i quali gli studenti sono sotto la supervisione di medici dell'istituzione partner, che aiutano e da cui sono formati su compiti specifici e definiti, come l'assistenza in sala operatoria, la confezione di piccole suture, medicazioni e gessi... Infine, l'ultimo anno è dedicato alla verifica dell'esperienza vissuta e alla produzione di letteratura scientifica sui risultati di ricerca derivati dall'esperienza di collaborazione internazionale.

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