



Review article

Collaborations in gynecologic oncology education and research in low- and middle- income countries: Current status, barriers and opportunities



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ABSTRACT

Eighty-five percent of the incidents and deaths from cervical cancer occur in low and middle income countries. In many of these countries, this is the most common cancer in women. The survivals of the women with gynecologic cancers are hampered by the paucity of prevention, screening, treatment facilities and gynecologic oncology providers. Increasing efforts dedicated to improving education and research in these countries have been provided by international organizations. We describe here the existing educational and research programs that are offered by major international organizations, the barriers and opportunities provided by these collaborations and hope to improve the outcomes of cervical cancer through these efforts.

1. Introduction

Globally, cervical cancer affects more women than any other gynecologic malignancy. It is the fourth most common malignancy overall and, in half of the sub-Saharan countries, it is the most common cancer in women (Small Jr et al., 2017). Despite efforts to improve the care of women with cervical cancers in low- and middle-income countries (LMIC), there remain significant treatment access gaps. In order to make meaningful changes, well-organized education and training for gynecologists in LMIC is urgently needed. Examples of such initiatives include the successful implementation of a curriculum for resident education based on the Council for Resident Education in Obstetrics and Gynecology (CREOG) residents in Central America (Schmeler et al., 2013), the training of physicians by The Society of Gynecologic

Oncology of Canada to perform radical hysterectomy for women with cervical cancers through a teaching module in Kenya (Rosen et al., 2017), and a collaborative effort between the Society of Gynecologic Oncology (SGO), American Society of Clinical Oncology (ASCO) and Health Volunteers Overseas (HVO) in the development of education and surgical training in Honduras and Vietnam (Chuang et al., 2014). This paper describes the efforts focused on improving women's cancer care outcomes through education, training and research that are carried out by major organizations around the world.

2. African Organization for Research and Training in Cancer (AORTIC)

The AORTIC's (http://www.aortic-africa.org/page_02_Home.php)

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mission is to reduce the burden of cancer in Africa by promoting and implementing cancer control efforts through research and training in cancer, thereby eliminating pain and suffering for millions of people (Ogunbiyi et al., 2016). AORTIC's plan of action and research agenda serves to encourage, support, integrate, and facilitate evidence-based interventions and innovative projects and initiatives in all areas across the spectrum of cancer control, thus ensuring that cancer in Africa is firmly on the continent's health agenda. AORTIC achieves these goals by working with other international agencies and non-profit organizations, government agencies, health care industries and businesses to advocate for improved resources and access to care.

With these goals in mind, a wide spectrum of activities was instigated by AORTIC. These include developing and implementing National Cancer Control Programs; supporting the development of standardized training programs in all aspects of cancer care and management; facilitating and promoting research in cancer that is relevant to the African continent; providing relevant and accurate information on the prevention, early diagnosis, treatment, and palliative care to health care professionals, media and the public; creating awareness of the extent of cancer in Africa and reducing the stigma associated with the disease. Peripheral activities include support for the management and funding of training programs in oncology with member institutions and elsewhere; organization of symposia, workshops, meetings and conferences. They assist in the formation of cancer research programs that are relevant in Africa; facilitate international collaborations in cancer research; arrange or sponsor periodic lectures by distinguished scholars in oncology. They foster collaboration with existing organizations interested in neoplastic diseases and facilitate the implementation of relevant and appropriate research on cancer. AORTIC is working to establish or assist in the creation of journals and publication of monographs and oncology books for the dissemination of research work on cancer in Africa. The organization provides scholarship and grants to facilitate objectives; and offers technical advice to the World Health Organization, the African Union, and other Governments in Africa on Cancer related issues.

3. ASCO

ASCO International (<https://www.asco.org/international-programs>) was developed with a goal of improving cancer care through the dissemination of knowledge in oncology around the world (Saghir et al., 2013). With regards to LMIC, ASCO has programs focused on improving the quality of cancer care through training, guidelines and quality measurements tools, professional development and research (Hortobagyi et al., 2016). For care delivery, ASCO offers resource-stratified guidelines and trainings in multidisciplinary cancer management course, palliative care and cancer prevention and screening (Chuang et al., 2016a). International education courses including a multidisciplinary cancer management course (MCMC) promote a multidisciplinary effort in cancer management through education. A palliative care course focuses on end of life care for oncology patients, a course in cancer control in primary care provides training for clinicians and nurses in the prevention, screening and survivorships of oncology patients. Many of these trainings are done through ASCO's International Cancer Corps (ICC), created through collaboration with HVO and SGO to send volunteer members to contribute to the improvement of cancer care capacities in LMIC (Chuang et al., 2014). Programs are available in Honduras, Vietnam, Bhutan, and Nepal, with additional sites in Ghana and Uganda expected to start in 2018. and ASCO's Conquer Cancer Foundations offers research funding through International Innovational Grants, which are one-year grants of \$20,000 each to support research projects targeted at low-resource settings. In 2017, the Foundation also launched a new Young Investigator Award for Global Oncology to support novel research in cancer care in resource-limited settings. Scholarships, short (International Development and Educational Awards, IDEA award) or long term

(Long-Term International Fellowships, LTIF), are provided for early-career oncologists to attend ASCO meetings or to conduct research with mentors from North America. A Global Curriculum jointly developed by ASCO and European Society of Medical Oncology provides global education guidelines that are required for physicians to qualify as medical oncologists. An In-training examination (ITE) has been set up to help assess clinical knowledge of the trainees in medical oncology. Many of the courses and opportunities are available at no cost to oncologists practicing in LMIC.

4. Cervical cancer research network (CCRN)

CCRN was established in 2011. This initiative emerged from the state of the art symposium on cervical cancer held in Manchester in 2009 (Suneja et al., 2015). The attendees supported two trial concepts which subsequently led to two Gynecologic Cancer InterGroup (GCIG) international randomized phase III trials in locally advanced cervical cancer. The greatest disease burden is in LMIC where national research groups are yet to be established and are without representation to the GCIG. The CCRN was established as an umbrella for such groups under the overall management of the GCIG to facilitate participation in established GCIG studies.

A multidisciplinary group of international clinicians agreed to a framework for assessing and evaluating potential sites for CCRN accreditation. Radiotherapy (RT) is an essential component in the overall management of many women with this disease and therefore it was mandatory that sites should have access to it. A document for assessment of the RT capabilities was developed and collated by the Radiologic Physics Centre in Houston, Texas. It was deemed essential that all sites participate in a beam measurement program every 2 years. Potential sites are asked to complete a pre-qualifying questionnaire on the disease burden, hematology, pathology and radiology resources and technology support. This information is reviewed by the CCRN executive. Assuming the agreed criteria are met, a site visit with a comprehensive review of facilities and capabilities is arranged.

It has become clear that the barriers to participation in clinical research in LMIC are multifactorial, but not insurmountable, if appropriate monetary funds were available. In addition to the funds required for the basic clinical trial infrastructure, it is necessary to address the reimbursement for the cost of the "standard of care treatment" and the additional costs incurred by the institution in delivering the trial. This prohibits many academic studies from participating in LMIC without a per-patient reimbursement. Many LMIC do not have appropriate indemnity insurance at an institutional and individual level to satisfy many international trial sponsors. The challenge is to develop a mechanism whereby sites could receive assistance to address these issues. This would probably need to be on a competitive basis and for a defined period of time. The criteria could include a proposal to address a particular unmet research need in their geographical area.

It would be naive to assume that all the barriers can be overcome with money, and care should be taken to ensure that cultural and ethical issues are addressed. Overcoming these less visible barriers through education may be the ultimate key to the success or failure of a study. Communication between clinicians from different parts of the world facilitates an exchange of information and ideas and this underpins the annual regional symposia organized by CCRN. These symposia aim to bring together multidisciplinary teams involved in the treatment of cervical cancer in a defined geographical region. Attendees are sponsored by CCRN and actively participate in workshops and tumor boards over a 2-day period. Engagement with local community elders and women's groups is likely to be essential to disseminate the information to those less well-educated members of the community and to win their trust. Such relatively easy and affordable initiatives are essential to compliance with treatment and follow up and are central to the success of clinical trials. The challenge is to assist the local clinicians and policy makers in coming together to improve the outcome for

women with cervical cancer and educating their friends and family on how and when to seek medical advice. The onus is on clinicians to lead the way.

Over the past 6 years CCRN has engaged with many interested clinical groups in LMIC and successfully facilitated participation by non-GCIG groups in 3 international GCIG trials. Our challenge for the future is to build on this success through enhanced recruitment and to encourage and mentor groups in LMIC to design and conduct trials appropriate to their particular needs.

5. European Society of Gynecologic Oncology (ESGO)

ESGO is promoting a common training curriculum/program, setting minimum standards and providing a system of accreditation (and re-accreditation) for gynecological oncology (GO) training centers across Europe. GO remains unrecognized as an independent sub-specialty in many European countries (Manchanda et al., 2013). ESGO offers a number of 3 month Travelling Fellowships to European trainees with particular emphasis being placed on proposals from European countries (UMIC/LMIC), with restricted access to funding and technology. The fellowships aim to improve patient outcomes through training and research, sharing knowledge/technologies and increasing mobility between European countries. International (non-UK/Dutch) trainees who complete training at a UK/Royal College of Obstetrics and Gynecology (RCOG) or Netherlands/Nederlandse Vereniging voor Obstetrie & Gynaecologie (NVOG) accredited centers can apply for the ESGO Certificate of European Accredited Gynecological Oncologist. The European Network of Young Gynecological Oncologists (ENYGO) is a vibrant (<https://enygo.esgo.org/>) network of ~700 European trainees which promotes training, building research competencies, educational needs, engagement and social interaction between European GO trainees. The group has undertaken numerous initiatives to improve the quality of GO training, including workshops, master classes, establishment of web-based resource (e-academy) and involvement of trainees in the accreditation process. The ESGO e-academy serves as an important educational resource for GO trainees and provides regularly updated educational content including CME Accredited Courses in GO (<https://enygo.esgo.org/watch/ecme-courses/>). ESGO promotes and facilitates research activity across European countries through its networks and task forces. These include: ENGOT (European Network of Gynecological Oncological Trial groups); ENTRIGO (European Network of Translational Research in Gynecological Oncology); ENITEC (European Network of Individualized Treatment in Endometrial Cancer); INCIP (International Network on Cancer, Infertility and Pregnancy) and EOTTD (European Organization for Treatment of Trophoblastic Diseases). The RCOG has fellows and members across 106 countries. It supports education, training and research in Women's Health across LMIC, LIC and Upper Middle Income (UMIC) countries through its Global Health Strategy. (https://www.rcog.org.uk/globalassets/documents/global-network/global-health-strategy/rcog_global_health_strategy_2013-17.pdf). The RCOG has held specialist training workshops/courses in several Eastern-European and central-Asian countries. A Medical Training Initiative (MTI) scheme provides training opportunities to International Medical Graduates (IMGs) in the form of the International Doctors' Training Program (IDTP). While the MTI scheme is directed towards general Obstetrics and Gynecology training, the RCOG is investigating opportunities for sub-specialty training and non-clinical internships, sponsored by a doctor's home country and the RCOG. The BGCS (British Gynecological Cancer Society) supports the RCOGs Global Health Strategy and is working with the RCOG towards improving cancer outcomes within this strategy. The BGCS supports the IGCS Gynecologic Oncology Global Curriculum & Mentorship Program (Chuang et al., 2016b). This is running across four pilot sites. A number of UK institutions have expressed interest in mentoring and supporting GO centers in other LIC/MIC countries and implementing this global GO curriculum. As this program expands, other opportunities for

collaborative training and research between the UK and other LIC/MIC countries should grow. Grant funding from UK Research Councils/the UK Government and LIC/MIC national institutions facilitate collaborative research between UK and other LIC/MIC countries (for e.g. the United Kingdom and India Research Initiative, UKIERI). This has led to ongoing collaborations in research and training within the UK and between UK and other countries. These include Barts Health Royal London Hospital /Queen Mary University of London and Gateshead/Newcastle University and Indian Institutions like All India Institute of Medical Sciences, Tata Memorial Hospital Kolkata and AGOI (Association of Gynecological Oncologists of India).

6. International Federation for Gynecology & Obstetrics (FIGO)

FIGO (<https://www.figo.org/>) is the only global organization that brings together professional societies of Obstetricians & Gynecologists. FIGO's vision is for women to achieve highest possible standards of physical, mental, reproductive and sexual wellbeing throughout their lives. For more than 60 years, FIGO has collaborated with the world's top health and donor bodies, and has member societies in 130 nations/territories.

The FIGO Gynecologic Oncology Committee is one of nine committees in FIGO. It has a special interest in gynecologic oncology and comprises 10 members representing the various regions of the world, encompassing gender and ethnic diversity, and a multidisciplinary representation of the various specialties that work hand in hand towards the care of women with gynecologic cancers, situational analyses of cancers, publications and awareness programs.

FIGO was the first to establish the staging system for cancers in 1929. Unlike other cancers that use Tumor/Nodes/Metastasis classifications of malignant tumors (TNM) staging systems, gynecologic cancers continue to be staged by FIGO staging systems. FIGO is sensitive to different resources in various parts of the world and the need to have equal participation and access from less resourced countries. The staging of cervical cancer, mainly a disease of low resource regions, continues to be done clinically with only very basic investigations, while staging of endometrial and ovarian cancers is determined surgicopathologically. From time to time, these systems are updated in the light of new literature and advances. The cervical cancer staging is being reviewed to incorporate modern imaging methods. The FIGO Cancer Report is a three-yearly publication brought out at each FIGO conference and, in order to reach a wider audience, the last issue of Report was available in Spanish and Portuguese.

The Gynecologic Oncology Committee works in close collaboration with other associated committees including the Education Committee, and the Working Groups in improving education and awareness. The Committee has endorsed and contributed to the development of an e-learning course on cervical cancer prevention using HPV vaccines and screening in collaboration with the Catalan Institute of Oncology (ICO). The course is available in English, Spanish, Portuguese, French, Japanese, Chinese, Italian and Greek, and others are in preparation.

Among its forthcoming activities, the Committee will conduct a half-day Workshop at the FIGO Regional Conference in Dubai in April 2018 that will focus on imparting skills in various techniques to gynecologists. The role of obtaining accurate data to inform decisions on staging and management is critical. However, data from LMIC is scarce and incomplete. The FIGO Gynecologic Oncology Committee welcomes suggestions and partnership from like-minded organizations, institutions and donors who can help in systematic data collection on situational analyses of the various cancers as it seeks to further its mission of providing equitable health care for the prevention and treatment of gynecological cancers.

7. International Gynecologic Cancer Society (IGCS)

IGCS (<https://igcs.org/>) was established as a not-for-profit

organization in 1987. IGCS was intended to create an equal partnership of gynecologic, radiation, and medical oncologists, pathologists, and other scientists from around the world who devote their professional lives to the care of women with gynecologic cancer. The mission of the IGCS is to enhance the care of women with gynecologic cancer worldwide through education and training and public awareness. This is achieved through collaborations, meetings, publications, outreach, providing education and training worldwide.

The Gynecologic Oncology Global Curriculum & Mentorship Program (GOGCMP):

In 2017, the IGCS developed and launched the GOGCMP. This program was developed in response to the problem that many regions of the world still do not have specialty training in gynecologic oncology, leaving women without the specialty care they need for the prevention and treatment of cervical cancer and other gynecologic malignancies. The program consists of a comprehensive two-year education and training program designed for those regions around the world that do not have formal training in gynecologic oncology. The program matches institutions and individuals from higher resource settings with partners in lower resource settings wishing to obtain formal gynecologic oncology training (twinning). The specific goals of the program are:

- Develop and maintain a comprehensive two-year web-based curriculum for local gynecologic oncology training and education that can be adapted by each region/program to reflect local needs and facilities.
- Select trainees from lower resource settings (gynecologic oncology fellows) and pair them with local supervisor(s) from their home program as well as gynecologic oncologist(s) from a mentoring institution (international mentor(s)).
- Establish minimum requirements for the gynecologic oncology fellows to complete the program and receive a certificate following an examination and completion of the two-year training program.
- Hold monthly tumor boards using Project ECHO where the fellows, local supervisors and international mentors review cases and participate in ongoing learning and mentoring opportunities.
- Establish a program for the international mentor(s) to travel to the fellow institution at regular intervals for hands-on surgical training and in-person teaching.
- Facilitate and support the fellows' travel to the mentoring institution for up to three months for training and education.

The IGCS has launched four pilot sites (Vietnam, Mozambique, Ethiopia and Kenya) in 2017 to implement the GOGCMP. There are plans to expand the GOGCMP to additional sites around the world interested in accessing specialty training in gynecologic oncology. These include Guatemala, Liberia, West Indies and Fiji. The IGCS is interested in developing similar parallel programs in radiation oncology and in the diagnosis and management of pre-invasive cervical disease.

8. National Cancer Institute (NCI)

The U.S. National Cancer Institute's Center for Global Health (NIH CGH) was established in 2011 to coordinate the response of the NIH to the growing burden of cancer in LMIC (Varmus and Trimble, 2011). The mission of the CGH is threefold: 1) strengthening global cancer research and resource-appropriate cancer control strategies, 2) building a global cancer community, and 3) translating research results into practice. In keeping with these priorities, the CGH works with policy makers and other stakeholders to develop partnerships to support national cancer strategies, including support of the International Cancer Control Partnership and regional Cancer Control Leadership Forums. Other initiatives by the CGH include the Partnerships for Enhanced Engagement in Research (PEER), an implementation science master course, and short courses in research skills and cancer epidemiology. The CGH has

offered funding opportunities that have been effectively applied to gynecologic cancer control projects in LMIC, including the 'Cancer Detection, Diagnosis, and Treatment Technologies for Global Health program in partnership with the National Institute of Biomedical Imaging and Engineering. In addition, there is a recent initiative to support regional centers of research excellence in non-communicable diseases and injuries. The National Cancer Institute partners with the Fogarty International Center to create opportunities for research training and project support for both U.S. and international scholars working in LMIC through competitive opportunities such as the 'Emerging Global Leader Award K43 program'. (<https://www.fic.nih.gov/Programs>). The Fogarty International Center offers specific funding opportunities in areas pertaining to gynecologic cancer control, such as mHealth, informatics, and the non-communicable diseases and injury program. The CGH has been supporting the building of a global cancer research community through collaborative international meetings such as meetings in gynecologic oncology held in Belarus and in Kazakhstan with the IGCS and aligned national and regional cancer centers. The CGH seeks to work through these developing partnerships, such as with professional societies and the newly developing non-communicable disease (NCD) Regional Centers for Research Excellence, which will establish a network of regional hubs in LMIC to coordinate NCD, injury and disability research.

9. Moving forward

International professional organizations are uniquely positioned to lead the education and training in healthcare providers in LMIC for women with gynecologic cancers (Table 1). The strengths of these organizations include their robust infrastructure and experience in delivering clinical training and research over the past few decades. Education has been the primary cornerstone of their programs. These programs exist in the forms of meetings, workshops, on site trainings, research development to clinical trials. Global curricula were established by ASCO, ESGO and IGCS that provide guidance on formal learning and training in gynecologic oncology. One of the barriers to these programs was the development of training programs that are based on these curricula. IGCS has established the formal mentorship program that permits gynecologic oncologists from established centers to travel to LMIC to train clinicians to provide care for women with gynecologic cancers. To supplement these efforts, ASCO and SGO collaborate with HVO to send volunteers to help with capacity building in existing gynecologic oncology programs. In order to further advance the care in LMIC, research capacity building is vital. ASCO, AORTIC, NCI, ESGO, CCRN and AGOG provide research supports in training, projects and funding. While much of the training in research is conducted on sites in LMIC, grants are provided for researchers from LMIC to learn on sites in centers where clinical trials are being conducted. More formal grant opportunities are available through the NCI.

10. Conclusions

Over the years, several key areas have been identified to ensure advancement in gynecology oncology care and research. This includes formalized gynecologic training programs and enhancement of existing training programs, research capacity building through workshops, on-site training and research grant opportunities. LMIC are in need of oncologists who can provide cancer care to women with gynecologic and other cancers. The list of international organizations described in this paper is likely to be incomplete as many other organizations and universities are contributing to the training and research in gynecologic oncology in LMIC. Our review provides a comprehensive description of the existing educational and research programs that are offered by major international organizations. The efforts of these organizations in collaborations with centers in LMIC will help build sustainable programs in LMIC that will enhance the mission of improving education,

Table 1
List of International organizations and opportunities.

International organizations	Purposes	Opportunities
AORTIC	To improve cancer control in Africa through the facilitation of research and training and the provision of relevant and accurate information on the prevention, early diagnosis, treatment, and palliation of cancer	Education, training, meetings and scholarships
ASCO	To provide the highest-quality resources in education, policy, the pioneering of clinical research and advancing the care for patients with cancer	Education, global curriculum, in-training examinations, workshops, meetings, research grants, volunteering through HVO and scholarships
CCRN	To promote high quality research performed in LMIC where there is a significant need with the goal of improving the care of women with cervical cancer worldwide	Education, symposium, research and clinical trial developments
ESGO	To improve the health and well-being of European women with gynecological (genital and breast) cancers through prevention, excellence in care, high quality research and education	Education, workshops, clinical trials, meetings and scholarships
FIGO	To achieve the highest possible standards of physical, mental, reproductive and sexual health and wellbeing through their lives.	Education, training, research, meetings, and guideline developments
IGCS	To enhance the care of women with gynecologic cancer worldwide through education and training and public awareness	Education, global curriculum and mentorship training programs, meetings and public awareness
NCI	To conduct research and provide grants in cancer controls globally	Education, research, grants, fellowships and guideline developments
AOFOG	To promote the science and art of obstetrics, gynecology and reproductive biology	Education, workshops and training.
ASGO	To conduct study, prevent and improve treatment of gynecologic cancer	Education, meetings, scholarships and publications
AGOG	To promote the understanding, prevention and to improve the quality of care in gynecologic cancer in Asia and the world	Education, research and clinical trials
SGO	To promote excellence in the care of women at risk for or affected by gynecologic cancer through advocacy, education, research and inter- disciplinary collaboration	Education, meetings, research, international collaborations, scholarships, international volunteer through HVO and publication

Abbreviations: AORTIC, African Organization in Research and Training in cancer; ASCO, American Society of Clinical Oncology; HVO, Health Volunteer Overseas; CCRN, Cervical Cancer Research Network; ESGO, European Society of Gynecologic Oncology; FIGO, International Federation of Gynecology and Obstetrics; IGCS, International Gynecologic Cancer Society; NCI, National Cancer Institute; AOFOG, Asia and Oceania Federation of Obstetrics and Gynecology (www.aofog.org/about-aofog); ASGO, Asian Society of Gynecologic Oncology (<http://www.asiansgo.org/>); ASGO, Asian Gynecologic Oncology Group; AGOG, Asian Gynecologic Oncology Group (<http://www.agog.org.tw/>); SGO, Society of Gynecologic Oncology.

training and research in gynecologic cancers around the world.

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