# INVITED PAPERS

## EMERGING MODELS FOR GLOBAL HEALTH IN RADIATION ONCOLOGY

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*Abstract*— **Global health is an emerging cross-disciplinary field, bringing together the best of science, medicine and humanity. It is a field which recognizes that in today's world "Global Health is Local Health and Local Health is Global Health", a field where everyone can participate, and where collaborations are crucial. Highlighting urgency for collaborations, the recent World Health Organization Cancer Report describes the growing global burden of cancer as alarming, a major obstacle to human development and well-being, with a growing annual economic cost of ca. US$ 2 trillion. The report also highlights major global cancer disparities, with over 60% of 14 million new cases and 70% of 8.2 million deaths per year occurring in low and middle income countries (LMIC), some of which, sadly, are the least capable of dealing with cancer without some form of collaboration. With the growing scourge of cancer costing millions of lives and trillions of dollars across the world each year, people are increasingly coming together across institutions, cultures, countries and continents to work together with a greater sense of purpose, and urgency to stop this scourge and reduce the disparities. Medical Physicists are no exception; they are increasing reaching out beyond the bunker to impact the world and collaborate to close the cancer divide. Many yet are interested but do not know how or where to participate or collaborate. A recent Institute of Physics (IOP) book by Ngwa and Ngoma, recognizes this gap and the need for an educational resource that can serve as a useful reference for the emerging field of global health in radiation oncology. This article reviews the content of this book, with a particular focus on Medical Physics, and emerging models in global health, or greater effective international collaborations that will save lives, eliminate global cancer disparities.**

*Keywords*— **Physics, Global Health, Radiology, Oncology**

### VI. INTRODUCTION

In 2013, the International Organization for Medical Physics (IOMP) and the American Association of Physicists in Medicine (AAPM) joined other medical physicists around the world to recognize the inaugural International Day of Medical Physics. This celebration recognizes the critical role medical physicists play in providing quality health care for millions of people around the world every day and ensuring the safety and efficacy of radiation. However, in many Low and Middle Income Countries (LMIC) round the world, no one joins the celebration, because there are still few or no Medical Physicists in these countries. This sad reality epitomizes the major global health disparities that currently exist in radiology (diagnostic and therapeutic). For example, radiotherapy, which is needed in the treatment of over 50% of cancer patients, is not available in 31 of Africa's 54 countries. 55 out of 139 LMIC, reportedly have no radiation therapy services at present. In LMIC, the range of radiotherapy needs which are currently covered vary from 0% and 3% - 4% in low income countries up to 59–79% in upper-middle income countries in Europe and Central Asia [1]. According to Zubizaretta et al., [1] the estimated number of additional medical physicist, radiation oncologists, dosimetrists and radiation therapists needed is over 43000 professionals.

In parallel to the growing cancer burden, there has been a major upsurge of global health interests in radiology, including Medical Physics, with a growing number of initiatives and activities highlighted at different Medical Physics conferences and Symposia. Appurtenant to this upsurge in global radiology interest, a common issue expressed at global health summits, seminars, or symposia is that people really want to participate in global health but do not know how. This tacitly expressed need for a book that can serve as a one stop reference for the emerging area of global health and facilitate participation as well as education and training efforts, in global radiation oncology. Cognizant of this, Ngwa and Ngoma published the e-book titled "Emerging Models for Radiation Oncology Global Health" (figure 1). This article reviews this book, which has been of great interest to Medical Physicists and others looking to reach beyond the bunker to impact the world, in ways still few and far between.

## VII. GLOBAL HEALTH IN RADIATION ONCOLOGY RISES

Chapter 1 of the book "Emerging Models for Global Health in Radiation Oncology" introduces global health and the rational for greater active involvement by Medical Physicists in global health action. A major rationale is the level of disparities that currently exist in global radiation oncology care, education and research. The book recalls the different meetings, symposia and conferences where there have been a consistent call for greater international collaborations to close the cancer divide. These calls [2], recognize that such collaborations will benefit both LMIC and high-income countries. For example, until now, hundreds of millions of people in LMIC with tremendous potential are essentially left out of research efforts to find a cure for cancer. Empowering these potential laden people through collaborations provides opportunity to unleash greater human resources, and brainpower in the global war on cancer, and facilitate the development of new globally beneficial technologies for cancer care or cure, which will benefit people from all countries. This proffers global health as local health, or vice versa.

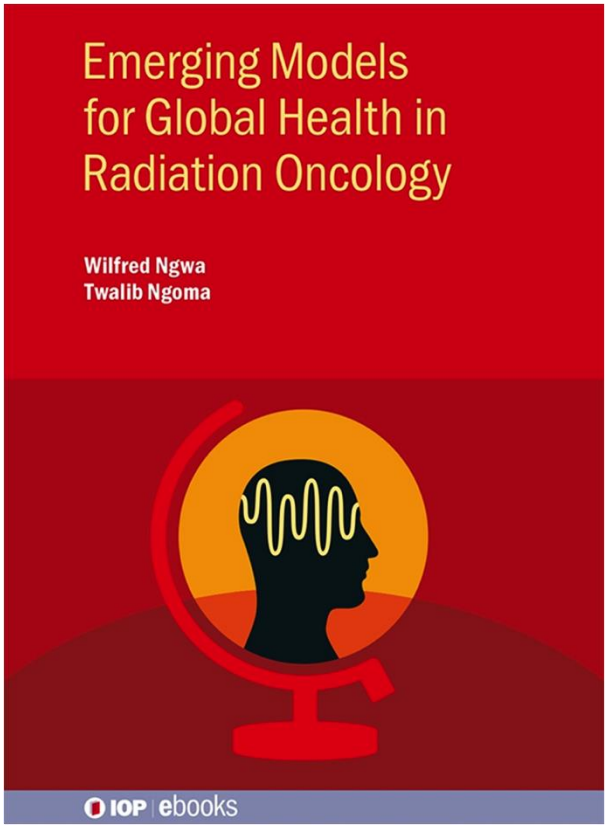


Figure 1: First book in IOP e-book series on global health

One area, where collaborations are greatly needed is in the development or deployment of lower cost technologies for cancer care, research and education. Capacity building programs to address the drastic shortage of Medical Physicists and other oncology professionals is also examined as an area of great need. Capacity building is also in demand in high-income countries like the USA, where about 90% of residents surveyed [3] would like to have a global radiation oncology experience, which could prepare them to be the next cadre of global health leaders. As Anthony Zietman, Editor of the Red Journal puts it, [4] "Bringing radiation therapy to LMIC is an increasingly global need or responsibility…". A recent Lancet study [5] demonstrates the substantial health and economic benefits that can be derived by investing in radiotherapy, especially in LMIC. Medical Physicists are greatly needed in this effort.

AAPM symposia, yearly summits at Harvard, and other conferences continue to show that there is great interest and enthusiasm amongst Medical Physicists for global health. It is increasingly evident that this field will see major growth in the coming years. A key focus going forward is on how to facilitate participation.

Chapter 1 closes by highlighting different models for participation and action at all levels, from the individual volunteer, through institutional to supra-national level organizations like the International Atomic Energy Agency.

## VIII. CHALLENGES AND NEW OPPORTUNITIES IN GLOBAL RADIATION ONOCOLGY

At the 2015 Global Health Catalyst cancer summit at Harvard University, global health leaders were asked about the major challenges in the emerging field of global radiation oncology.[6] In response, some of the main issues highlighted included: lack of political will, infrastructure, funding for research/collaborations, dearth in human capacity/resources, space-time, culture, bandwidth for use of information and communication technologies, commitment, no pellucid career advancement path in global radiation oncology, lack of access to care, adverse perceptions about radiotherapy among other things.

In chapter 2 of the book, these major challenges are examined, along with possible solutions and associated opportunities for advancing global radiation oncology. Examples of opportunities include the IAEA internship program, Radiating Hope, Seed Global Health amongst many others. More opportunities continue to emerge and are becoming a major feature of the yearly global health events.

## IX. CURRENT MODELS OF GLOBAL RADIATION ONCOLOGY

Collaborations are a central component of global health, and this is no different in global radiation oncology. At the fundamental level, global health collaborations constitute a mutually beneficial relationship between two or more entities working toward common goals, by sharing responsibility, authority, and accountability for achieving results. Chapter 3 examines the different models of collaborations, with illustrative examples. This is designed to help those entering the field to learn about what is

working, what can be adopted or scaled or further adapted/optimized for maximal impact and sustainability. Models under which most current collaborative activities in global radiation oncology fall include: twinning partnerships, consortium partnership model, and non-profit models.

The book covers the anatomy of successful collaborative partnerships from the planning phase, bonding phase, implementation and evaluation phase, dissemination and finally the scaling phase.

## X. ICT-POWERED MODELS OF GLOBAL RADIATION ONCOLOGY

In today's hyper-connected world, Information and Communication Technologies (ICTs) will increasingly play an integral role in healthcare. Here, ICTs refer to devices or systems that allow the storage, retrieval, manipulation, transmission and receipt of digital/electronic information. Examples include, smart phones, personal computers, digital television, email, social media platforms, radio, Skype, etc. Following a 2014 AAPM symposium on ICTs and Medical Physics, Ngwa and co-authors published a Red Journal article highlighting the tremendous potential of ICTs in global radiation oncology. This chapter builds on this article, showing how ICTs can make it easier for Medical Physicists and other Radiation Oncology health professionals to participate in global health more effectively or without physically travelling. From telemedicine (remote consultations, remote treatment planning support, remote quality assurance, etc) to online learning and e-research, ICTs are shown to be becoming an indispensable part of global health with potential to elide some of the spatio-temporal or financial barriers to global radiation oncology. This chapter delves into examples of ICT-powered approaches or models currently being deployed in global radiation oncology. This includes remote treatment planning platforms, platforms based on CERR for clinical oncology trials, online learning platforms, and cloud computing platforms for ICT-powered research collaborations. Successful programs in global radiation oncology powered by ICTs are also described. A sample of these is shown in table 1.

Table 1: Sample of ICT-powered global radiation oncology programs

| Model programs | ICT-powered activities |
|---|---|
| BOTSOGO | Tumor boards using ICT platforms like Adobe Connect |
| Chartrounds.com | Bringing disease specialists to discuss patient cases by teleconference |
| Radiating Hope | Remote treatment planning using screen-sharing software |
| IAEA PACT VUCCnet | Online learning Platform |
| AAPM | International Education Committee, AAPM online learning Center |
| The Global Cancer Project Map (GCPM): | Provide resources to view and better understand international efforts in cancer research |
| QARC | Remote review in support of cancer clinical trials |

The Sprawls Education Foundation (www.sprawls.org) has also emerged as an exemplary online learning platform with focus on utilizing technology to enhance human performance in medical physics education and training. A recent e-book on the pioneering of e-Learning in Medical Physics by Tabakov and Tabakova chronicles 7 international projects, which are among the first to develop and introduce original e-learning in the teaching process, among a growing number of online learning and ICT-powered programs.

## XI. LOW COST TECHNOLOGIES FOR GLOBAL RADIATION ONCOLOGY

Given the vast disparities in disease burden between developed countries and LMICs, researchers are also working to accelerate the development of new health technologies that may help to bridge this gap. The National Cancer Institute Center for Global Health in the USA and others are increasing funding mechanisms to promote the development of lower cost technologies that can make treatments including radiotherapy more affordable in LMICs. In chapter 5, some of the lower cost technologies by radiotherapy equipment suppliers are highlighted as well as a number of promising emerging technologies that could help increase affordability and access to radiotherapy services. Example technologies include: 1) NanoX, A compact radiotherapy system intended to lower the costs of building and operating a radiotherapy center being developed by Keall et al.; 2) low-cost enabling technology for image-guided photodynamic therapy of oral cancer; 3) RO-ILS, an online portal that allows radiation oncology centers to provide non-patient-specific data about the radiation therapy near-misses and safety incidents that have occurred at their facility in a secure, non-punitive environment. Many other examples are highlighted in the book that inspire greater efforts for research by Medical physicists in this direction

## XII. PRACTICAL GUIDE AND RECOMMENDATIONS FOR HIGH IMPACT RADIATION ONCOLOGY GLOBAL HEALTH

Chapter 6 includes recommendations culled from feedback by global health leaders for facilitating high impact global radiation oncology. This includes recommendations on working to secure funding, cross-cultural interaction, diaspora involvement, professional development pathways,

crowdsourcing and crowdfunding, advocacy and other important aspects.

The authors asked a number of global health leaders about what they would recommend based on their experience in collaborating or working with partners in LMIC. Some of the recommendations included:

- Equal partnership with high functioning organizations in the LMIC
- Cultural differences be respected and taken into account
- Keeping ICT implementation simple
- Significant investment in local capacity
- Encouraging at least short duration site (exchange) visits by collaboration partners
- Being flexible and ensure regular communication
- Engage with LMIC community, build local contacts, build a network, work together
- Establish trusting human relationships
- Need to focus on how to create a sustainable model with Education and training at the core.

It is evident as new initiatives emerge on global health that we continue to update recommendations and learn from the experience of those who have gone before, not to re-invent the wheel or repeat the same mistakes.

## XIII. GLOBAL RADIATION ONCOLOGY: QUO VADIS

At the start of the 21st century, when the global health community rose up to confront the challenge of HIV/AIDs, it looked like an impossible task. The remarkable global progress that has been made in confronting HIV/AIDS provides hope and confidence that similar success can be achieved in cancer control and global radiation oncology efforts. The Lancet Oncology Commission report on expanding global access to radiotherapy has set key goals or targets that could be met to help curb the growing global burden of cancer and end needless suffering and deaths in this frontier. The commission has made an explicit call for greater action to work towards meeting these targets. These targets provide measurable goals for the future of global radiation oncology. Chapter 7 looks at the role of collaborations in meeting these goals, and examines how to better leverage the upsurge in activity and interest in global radiation oncology for high impact action.

Many years ago, President John F. Kennedy stood before a joint session of the United States Congress and said, "I believe we should go to the moon." It was a call to mankind that inspired a generation in pursuit of science and innovation, where they literally pushed the boundaries of what was possible. In 2016, another USA President, Obama, also stood before congress to announce the 'moonshot to cure cancer' initiative. The USA government followed this announcement with a two point execution plan: first for increased resources, both private and public—to support cancer work, and secondly to break down silos and catalyze collaborations and sharing of information to "end cancer as we know it". This execution plan is also relevant in advancing global radiation oncology, and physicists will be central to its success, just as they were in successfully putting man on the moon. In conclusion, the book "Emerging Models for Global Health in Radiation Oncology' provides a one-stop reference educational resource in this field. It has seeded a new IOP e-book series on global health that will indubitably be a major driver of knowledge sharing and education in this emerging field towards improved healthcare outcomes, saved lives, and the elimination of global cancer disparities.

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