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COMMENTARY

# A Roadmap for a New Academic Pathway for Global Radiation Oncology

**Adam C. Olson, MD,* C. Norman Coleman, MD,† Stephen M. Hahn, MD, FASTRO,‡ Theodore L. DeWeese, MD,§ Lawrence N. Shulman, MD,‖ Bruce A. Chabner, MD,¶ Nelson Chao, MD, MBA,# Yehoda M. Martei, MD,** Arno J. Mundt, MD, FASTRO,†† and Surbhi Grover, MD‡‡**

***Department of Radiation Oncology, Duke Cancer Institute, Durham, North Carolina; †The International Cancer Expert Corps, Chevy Chase, Maryland; ‡Division of Radiation Oncology, M D Anderson Cancer Center, Houston, Texas; §Department of Radiation Oncology and Molecular Radiation Science, Johns Hopkins Medical Institute, Baltimore, Maryland; ‖Abramson Cancer Center, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania; ¶Dana-Farber Cancer Institute, Boston, Massachusetts; #Division of Hematologic Malignancies and Cellular Therapy, Bone Marrow Transplant and Global Cancer, Duke Cancer Institute, Durham, North Carolina; **Division of Hematology-Oncology, Department of Medicine, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania; ††Department of Radiation Medicine and Applied Sciences, University of California, San Diego, San Diego, California; and ‡‡Department of Radiation Oncology, Abramson Cancer Center, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania***

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There is an emerging acknowledgement of the burden of cancer in low- and middle-income countries (LMICs) (1), where two-thirds of the world's cancer cases occur. Radiation oncologists are well suited to make a significant impact on cancer outcomes in resource-limited settings due to the versatility and efficacy of radiation therapy as well as the positive cost-benefit ratio once it is implemented (2). Radiation oncology trainees are showing increased interest in global health and in health disparities for remote populations in high-income countries (HICs) (3, 4). However, the transition from a trainee interested in global oncology to junior faculty is not well established. This report summarizes areas of need for research, potential funding pathways, and milestones that can be used to measure academic advancement.

## Potential Areas of Global Radiation Oncology Research

### Cancer epidemiology

Estimates of the worldwide cancer incidence and mortality rates are contained in the GLOBOCAN report (5). These data would ideally rely on cancer registries at a national level. In reality, many of these registries frequently only capture a subnational area and/or selected urban areas. Figures for many countries are estimates based on population demographics and may not reflect true cancer incidence. Thus, there is potential for underreporting the true number of cancer diagnoses and cancer-related deaths in

Reprint requests to: Adam C. Olson, MD, Department of Radiation Oncology, Duke University Medical Center, DUMC Box 3085, Durham, NC 27710. Tel: (919) 246-7981; E-mail: adam.olson@duke.edu

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LMICs. An accurate cancer registry is the starting point for planning cancer care and cancer control. More robust cancer registries can better document the local cancer burden and inform policy decisions. Many other types of research can flourish once the degree and scope of the cancer burden is fully understood.

### Radiation therapy outcomes

The response of tumors in patients in LMICs to established radiation therapy treatments (eg, hypofractionated radiation therapy for breast cancer, high-dose-rate brachytherapy for cervical cancer) is not well characterized. Enrollment of patients in LMICs on resource- and stage-appropriate clinical trials would provide the highest level of evidence. While there are attractive benefits of such an undertaking—reduced costs, assessment of safety and efficacy in multiple world regions—there are logistical (cost, implementation) and ethical considerations (informed consent) that must be considered. In addition, novel combinations of radiation with systemic therapy utilizing cost-effective therapies can produce useful comparative effectiveness research.

### Technology implementation

For radiation oncologists, external beam radiation therapy remains the primary means of improving outcomes. Although the initial capital investment of a linear accelerator is significant, the benefits are long-lasting and sustainable (2). Effective implementation of linear accelerator–based radiation therapy in LMICs requires (*1*) appropriate implementation; (*2*) stable electricity sources; (*3*) training of skilled physicists, engineers, physicians, and technologists; (*4*) availability of service and equipment when repairs are needed; and (*5*) partnership with facilities in HICs, either through visits or telemedicine.

### Basic and translational science

Opportunities abound for investigation into genetic alterations, infections, and environmental agents on cancers of the developing world. These may yield important findings of the etiology and progression of many common cancers to both LMICs and resource-rich countries, particularly when risk factors such as HIV infection, smoking habits, nutrition, and access to screening may differ. Such undertakings could breed an exciting form of translational research: from LMIC to HIC and back to LMIC for application and benefit to the local population.

### Implementation science

As defined by the Fogarty International Center at the National Institutes of Health (NIH), "implementation science is the study of methods to promote the integration of research findings and evidence into healthcare policy and practice" (6). Examples of implementation science projects in radiation oncology include training in brachytherapy techniques, radiation safety protocols, and development of cancer guidelines and multidisciplinary clinics. Implementing these practices has improved the quality of patient care in LMICs (7). A critical distinction must be made between medical missions and capacity building. Although the former is typically characterized by short duration and teaching a discrete skillset, the latter creates high-quality patient care with a goal of autonomy and independent leadership by local health care practitioners.

## Potential Funding Pathways

Table 1 provides a list of selected resources for junior faculty for global research initiatives.

The National Cancer Institute's Center for Global Health, directed by Dr Edward Trimble, was established in 2011. It supports initiatives and collaborates with other NCI divisions, NCI-designated cancer centers, and countries to support capacity-building and cancer research in LMICs. Their newly launched Global Cancer Project Map (http://gcpm.globalonc.org/map/?limit=10) catalogs international cancer research, cancer care, and cancer outreach programs.

The Fogarty International Center supports research and training for American and foreign investigators working in the developing world. The K01 International Research Scientist Development Award provides support and protected time for scientists for a mentored research experience. Awardees must spend at least 50% of the grant period (3-5 years) in-country conducting research at an institution in an LMIC.

The American Society for Radiation Oncology (ASTRO) and the American Society for Clinical Oncology (ASCO) have career development awards that could be applied to global health research. The ASTRO Junior Faculty Career Research Training Award is an award of $100,000 annually for 2 years. The awardee must receive the award during the first 3 years of faculty appointment, and at least 75% effort must be devoted to the award. The ASCO Career Development Award is a 3-year grant totaling $200,000 to establish an independent clinical research program. The ASCO Young Investigator Award is a 1-year research grant totaling $50,000. The American Cancer Society, World Health Organization, Bill and Melinda Gates Foundation, Doris Duke Charitable Foundation, and other organizations have funding opportunities for global oncology research.

The global shortage of treatment machines represents an opportunity for innovative business models and new technologies. Junior faculty can cultivate relationships with industry to improve radiation therapy access in LMICs. The International Agency for Atomic Energy has a long history

**Table 1** Selected resources for junior faculty for global oncology career development

| Resource | Web site |
|---|---|
| Funding | |
| Fogarty International Center | www.fic.nih.gov/ResearchTopics/Pages/chronicdiseases-cancer.aspx |
| Fogarty International Research Scientist Development Award | www.fic.nih.gov/Programs/Pages/research-scientists.aspx |
| NIH Career Development (K-level) Awards | www.grants.nih.gov/training/careerdevelopmentawards.htm |
| Yamagiwa-Yoshida Memorial International Study Grants | www.uicc.org/programmes/geti/our-activities/study-grants |
| ASTRO Junior Faculty Career Research Training Award | www.astro.org/Research/Funding-Opportunities/ASTRO-Supported-Grants/Junior-Faculty/Index.aspx |
| ASCO Conquer Cancer Foundation Young Investigator Award | http://www.conquercancerfoundation.org/young-investigator-award |
| Varian Medical Systems Research Grant | www.varian.com/us/corporate/research_programs/research_grants.html |
| Elekta Research Grants | www.elekta.com/company/programs/elekta-research-grants.html |
| General Information | |
| International Cancer Expert Corps | www.iceccancer.org |
| Consortium of Universities for Global Health | www.cugh.org |
| NCI Center for Global Health | www.cancer.gov/aboutnci/organization/global-health |
| Global Task Force on Radiotherapy for Cancer Control | www.gtfrcc.org |

*Abbreviations:* ASCO = American Society for Clinical Oncology; ASTRO = American Society for Radiation Oncology; NCI = National Cancer Institute; NIH = National Institutes of Health.

of purchasing treatment machines for LMICs. The Varian Medical Systems Research Grant provides research funding for a recommended duration of 1 year. Elekta also has a research grant program with similar terms and duration.

## Milestones for Academic Advancement

That the global health impact of noncommunicable diseases and the shortage of cancer care in LMICs are recognized by the World Health Organization makes the need to establish a career pathway an imperative (8). Because of the efficacy and cost-effectiveness of radiation therapy, this specialty is presented with a leadership opportunity for this effort. Radiation oncologists starting a career in global health or in remote health disparities settings require a start-up period and academic investment on par with traditional clinical and basic researchers. Home institutions should be cognizant of this fact. In that this is a nascent effort, efforts in radiation oncology will likely emphasize capacity-building. This can take the form of education, infrastructure implementation, and training. Thus, the traditional pillars of academic advancement—scholarship, teaching, clinical duties, community outreach—should be augmented to accommodate academic progress for this developing field. This scenario is not without precedent. In the mid-1990s, there was a large influx of clinicians interested in a clinician-educator role in academic medicine. To standardize the promotion process, the Society of General Internal Medicine Education created a set of consensus guidelines for promotion of clinician-educators. Such a set of guidelines for global health could simplify the career advancement process to nurture and then sustain an emerging field.

A pathway for global radiation oncology as a viable career is a core vision of the newly formed International Cancer Expert Corps (9). A set of criteria for academic advancement could include the following:

- **Scholarship.** As detailed above, numerous opportunities exist for high-impact basic, translational, and clinical research in LMICs. Competitive funding mechanisms exist and are proliferating, but are still inadequate. Nontraditional funding sources, such as foundations and private philanthropy, may be important contributors.
- **Education.** Over the long term, cancer care in LMICs will likely not come from radiation oncologists from HICs. Building local capacity and capability are essential. Whether through broad-based collaborations or institutional "twinning" programs, educating local oncologists and support staff should be a primary determinant of success for global oncologists.
- **Policy and Infrastructure Development.** An effective campaign to address the rising cancer burden in LMICs requires a multilevel approach. The ecological model of health behavior emphasizes the interactions between health determinants at individual, community, and policy levels. Such a model entails that cancer care involves both clinical interaction as well as developing policy changes to effect sustainable improvement.
- **Metrics.** The importance of establishing metrics to guide implementation and investment and to assess success is recognized, especially as the field of global oncology matures (10).

- **Mentorship.** Limited numbers of experienced mentors are available in global oncology. Sources of mentorship traditionally come from senior faculty, but private practitioners with flexibility beyond that available in traditional academia could also become involved. Should private practitioners participate, career opportunities might dramatically increase.

## Conclusion

Global health initiatives in radiation oncology are in their infancy, but interest is rising (3). There is a growing group of young investigators and senior faculty with the attributes and enthusiasm that inspire a new faculty track for global health. The challenges in LMICs are significant, but the potential benefits are worth the effort. Indeed, the cancer care gap is so large that for a variety of health care, social, political and moral reasons, such an effort is an imperative.

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