WEBSITE OF OPEN RESOURCES FOR LEARNING AND DEVELOPMENT OF MEDICAL PHYSICISTS (*WORLD of MP*)

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Abstract— **Accessing high-quality educational resources can be challenging for trainees in low- and middle-income countries aiming to achieve competency in medical physics. This work aims to develop a new online open access resource called the Website of Open Resources for Learning and Development of Medical Physicists (WORLD of MP) created by Medical Physics for World Benefit. The framework (learning objectives, modules, and training topics) was derived from International Atomic Energy Agency report TCS-37. The website consists of 7 modules and 50 sub-modules with over 500 links to open access resources (digital documents, presentations, videos, etc). This platform lives at: https://mpwb.org/resources/Documents/OpenSyllabus/output.html.**

Keywords— **education, global, radiotherapy, open access, medical physics residents**

I. INTRODUCTION

A significant challenge for medical physics trainees in low- and middle-income countries (LMICs) is access to quality educational content and resources [1]. Achieving competency in medical physics practice must include exposure and mastery of medical physics standards, most of which are encapsulated in curricula defined by bodies such as the Commission on Accreditation of Medical Physics Education Programs (CAMPEP) [2] and the International Atomic Energy Agency (IAEA) [3]. The use of online learning in medical physics is a long-established idea [4, 5]. While there is a wealth of freely accessible educational content and syllabi [6-10] no generalized hierarchical syllabus directly links core medical physics competencies with online content.

One example digital resource is the IAEA's online Learning Management System which provides select resources on dosimetry, medical physics, and radiation oncology [11, 12]. The IAEA has also established the Radiation Oncology Virtual Education Resources (ROVER) [13], which provides several links to open-access resources focusing on the radiation oncology workflow and cancer treatment sites. Additionally, there are other global organizations that provide online video training on specific radiation oncology topics (e.g., external beam radiation therapy) such as Rayos Contra Cancer [14]. The South Asia Centre for Medical Physics and Cancer Research has also created a virtual lecture series focusing on different medical physics topics, including brachytherapy and quality control for medical imaging [15]. Our web platform includes links to such educational content and hundreds more, with a clear educational framework geared towards radiation oncology medical physics trainees.

Vetted online resources curated by experts, such as the Living Physics Portal, can serve as a dynamic and up-to-date educational resource repository [16]. This work aims to share and demonstrate a new resource, Website of Open Resources for Learning and Development of Medical Physicists (WORLD of MP), developed by Medical Physics for World Benefit (MPWB) volunteers [17], based on the IAEA TCS-37 report Clinical Training of Medical Physicists Specializing in Radiation Oncology [3]. The *WORLD of MP* supports the United Nations Sustainable Development Goals (SDGs), particularly SDG 4 on quality education [18].

Such efforts are particularly important, given the global shortage of medical physicists in the medical physics workforce, with 73% of responding medical physics organizations worldwide reporting a shortage in an International Organization of Medical Physics survey [19]. Additionally, with the rate of new cancer cases predicted, the global demand for the radiotherapy workforce is expected to increase by over 60%, including a need for more than 47,000 medical physicists [20]. Furthermore, a survey conducted by the Global Needs Assessment Committee of the American Association of Physicists in Medicine found that clinical training and continuous education were significant needs for radiotherapy institutions in LMICs [21]. Capacity building in education is vital, and this learning platform aims to support this endeavor.

II. METHODS

Since 2018, a team of MPWB volunteers, with a vast range of experience (ranging from retired medical physicists, academics, residency program directors, clinical medical

physicists, medical physics residents, and graduate students specializing in radiation oncology medical physics) has generated a compendium of medical physics resources. The learning objectives, core competencies, and training topics for each of the seven major learning modules (Clinical Introduction, Radiation Safety and Protection, Radiation Dosimetry, Radiation Therapy, External Beam Treatment Planning, Brachytherapy, and Professional Studies/Quality Management/Research/Teaching and Development) were derived from Appendix IV of the IAEA TCS-37 report [3] and compiled into a master spreadsheet. Training topics were then linked to freely accessible resources, which include digital documents (PDFs), presentations, websites, videos, and podcasts.

To fill resource gaps in the syllabus, internal content needed to be created or obtained. This has been achieved by requesting experts to share presentations, videos, and other media that cover a training topic. Creators were encouraged to license their work and upload their content to MPWB servers. MPWB then registered the creator's content and licensing, using a license condition equal to or less restrictive than CC BY-NC-ND. 4.0 (Attribution-NonCommercial-NoDerivatives 4.0 International).

In July 2023, we conducted a beta test of the website by distributing a brief informal survey to a sample of medical physics trainees through five medical physics program directors. Four CAMPEP medical physics programs were in North America, and the other was the Master of Advanced Studies in Medical Physics program offered through the International Centre for Theoretical Physics (ICTP). The survey responders included program directors, medical physics radiation oncology residents in CAMPEP programs, and students enrolled in the ICTP program, which consists of graduate students in either their first year of didactic training or their second year of clinical placement (i.e., clinical residency). The survey consisted of two Likert-type items asking respondents to rate the usefulness of the resource for residency training and their likelihood of recommending it to other medical physics residents. A third open-ended item asked for comments on how the resource could be improved. This survey was designed to gather descriptive and exploratory feedback on the perceived value of the resource.

III. RESULTS

Webpage

The IAEA TCS-37 report contains approximately 780 unique training topics of which approximately 490 link to open access external resources (hosted on the World Wide Web) and 100 link to internal resources (accessible via local server) through *WORLD of MP*. The webpage is hosted through the MPWB: https://mpwb.org/WorldOfMedicalPhysics [22]. The standard version of the *WORLD of MP* platform may be found at: https://mpwb.org/resources/Documents/OpenSyllabus/output.html [23]. There is also a filterable version of the platform available at: https://mpwb.org/resources/Documents/OpenSyllabus/Filterable/output.html [24]. Using the filter options, you can search for specific content types (e.g., videos).

The website presents medical physics content in a manner consistent with the arrangement of modules, sub-modules, and training topics as per the TCS-37 report, allowing for ease in navigation of the content. For example, the first module, "Clinical Introduction," has several sub-modules, including "Introduction to Radiation Oncology", "Clinical Aspects of Radiobiology", etc. (Figure 1). The sub-module

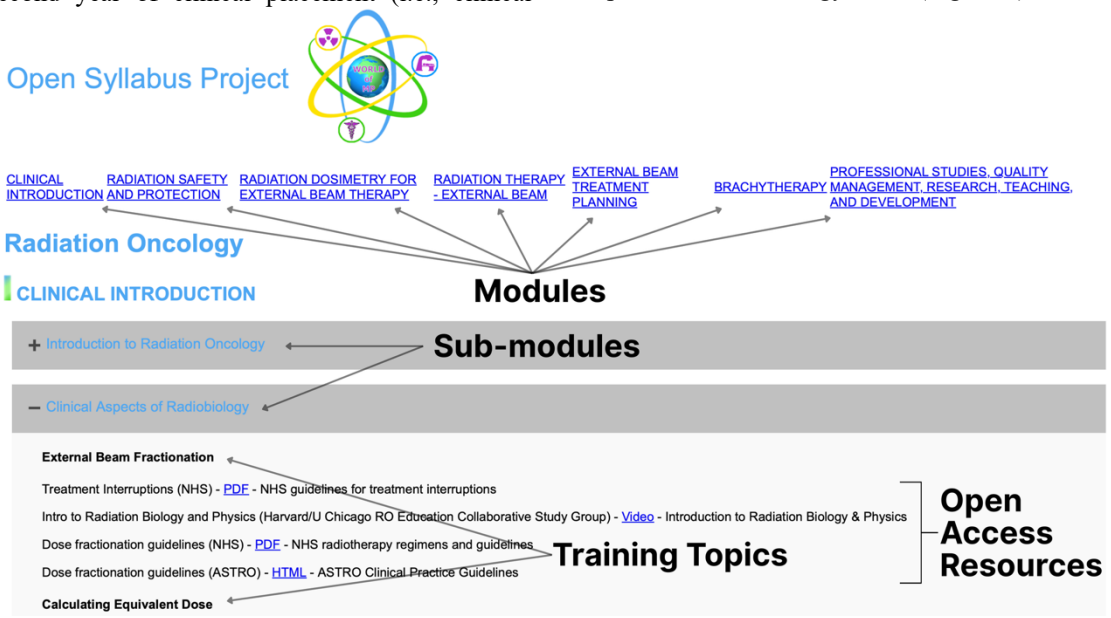

Figure 1: Snapshot of WORLD of MP webpage. Note the "+" symbol identifies the submodule that can be expanded or collapsed for ease of navigation. Users can either scroll down the list for different modules or select hyperlinks on the topic to jump to that module.

"Clinical Aspects" consists of specific training topics with learning objectives. These specific training topics and learning objectives were reviewed by MPWB volunteers, and open-access resources were identified.

Each module has submodules that can range in breadth and depth (Figure 2). In total, there are 50 sub-modules. Training topics in different modules can also overlap with each other. Thus, each training topic required careful association with an open-access resource, which was achieved through volunteers' expertise. This range of knowledge of the volunteers ensures the content links' appropriateness, timeliness, and usefulness. All training topics, links to the resources, and associated metadata are managed through a single, editable, and living spreadsheet. This allows the platform to ever-evolve and be easily updated by the MPWB. Additionally, users can submit missing resources or broken links to medphyswb@gmail.com.

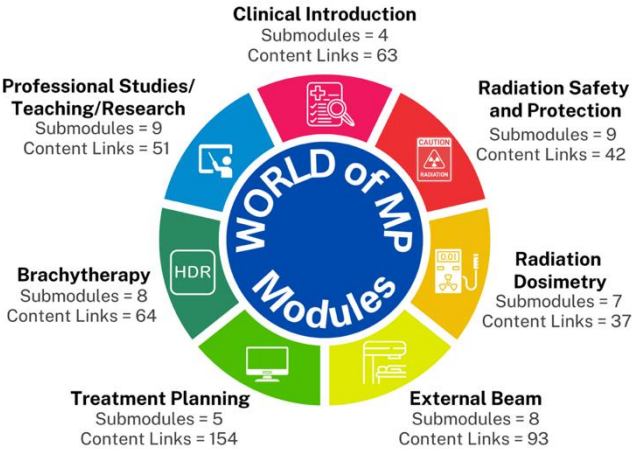

Figure 2: The distribution of submodule topics and total number of open access links generated within the WORLD of MP platform.

The *WORLD of MP* webpage went live in September 2023 and was advertised to MPWB members, select audiences, including attendees at the African Organisation for Research and Training in Cancer (AORTIC) conference in Senegal (2023), the International Conference on Medical Physics (ICMP) in Mumbai (2023), and ESTRO Meets Asia meeting in Kuala Lumpur (2024). Internet traffic to the MPWB website and the *WORLD of MP* webpage has increased steadily since the release of *WORLD of MP*, with many viewers from LMICs. During the initial six months of the *WORLD of MP* launch (September 2023 to February 2024), the MPWB page was viewed over 1,000 times by approximately 600 unique users. From June to July 2025, the *WORLD of MP* page had over 100 viewers in over 30 countries (Figure 3). While this resource is primarily intended for those in LMICs, it is proving to be of global value for medical physics residents and graduate students in radiation oncology.

Beta Test

Fourteen responses were received from the "beta test" survey: one from a director and the remaining 13 from residents or trainees in the ICTP program. The responses were highly favorable (Figure 4). All respondents chose "Would Recommend" to "Please rate how you would recommend this resource to other medical physics residents." Additionally, most respondents chose "Very useful" (n=12) when asked, "Please rate how useful this resource could be in residency training." All other respondents chose "Somewhat useful" (n=2). Responses to "Please comment on how you think we can improve the usefulness of this resource" included a need for similar sites for diagnostic imaging and nuclear medicine, better advertising, and completing missing resource links. Additional comments include: "I am very grateful may this good work continue to

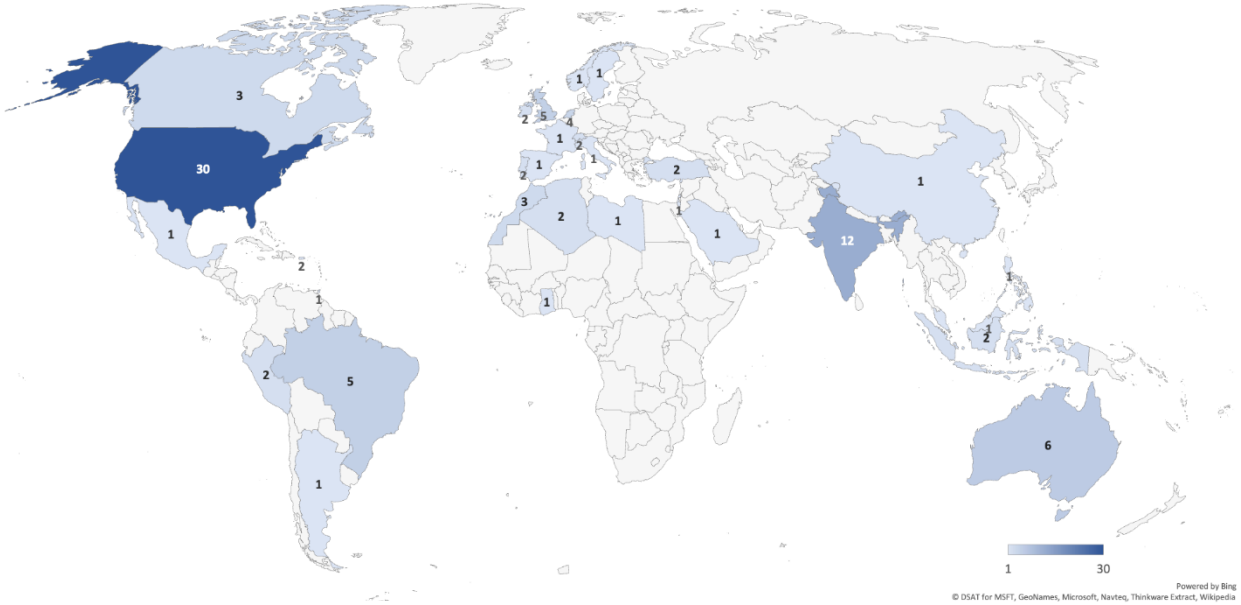

Figure 3: Visitor Map for WORLD of MP Webpage for June and July

reach the world" and "The teaching resource I think will be the most useful for us from developing nations."

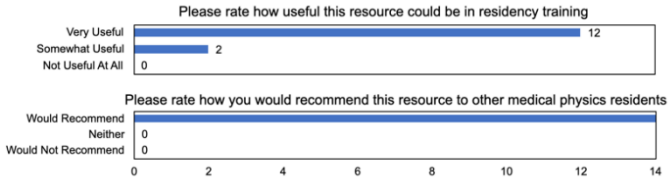

Figure 4: Beta-test survey results.

IV. DISCUSSION

Access to reliable and comprehensive medical physics education remains a challenge for those in developing parts of the world, particularly in regions where there are limited training programs, equipment, and educators. The *WORLD of MP* provides access to hundreds of freely accessible online resources and aims to assist medical physics residents, particularly in LMICs. While this platform was originally developed for LMICs, it also serves as a useful educational tool for all medical physics radiotherapy trainees. The *WORLD of MP* is a dynamic and living web resource. There remain many training topics presented on the platform that have missing resources: submissions of suggested available content to medphyswb@gmail.com are highly encouraged. Furthermore, IAEA TCS-37 is 16 years old. Undoubtedly, resident subject matter needs to be updated as the procedures and technologies evolve.

One limitation of this work is that resources were collected by members of MPWB, who are primarily from the US and Canada, which may result in a disproportionate amount of content resources originating from these countries. Another shortcoming of this work is that the survey results were based on a small, convenience sample of program directors and residents, which limits the generalizability of the findings. Responses may be influenced by selection bias and social desirability bias, and the distribution method meant that the number and characteristics of resident respondents could not be controlled. Future work may involve a more rigorous evaluation of the efficacy of this tool in meeting educational objectives in radiation oncology residencies.

Increased involvement from international physicists could lead to useful resource discovery and an improved database. One submodule particularly limited in content relates to radiation protection regulations as these vary by country. Additionally, due to the nature of the platform it cannot address the essential hands-on experience that all medical physics trainees must have. Future directions include website modifications to improve operability, finding and generating open-access resources to fill gaps in the syllabus, updates to address changes in procedures and technologies, and expanding this platform for other medical physics disciplines, such as diagnostic imaging and nuclear medicine. Additionally, while there are a number of open access resources, there are still areas where content generation is needed and producing such content requires high quality educators. Such efforts, which require a coordinated approach, could benefit from collaborations with professional medical physics organizations.

V. CONCLUSION

The *WORLD of MP* platform is still in its early stages but has immense potential in improving access to critical educational content for trainees, particularly given its organizational simplicity and reference to the IAEA TCS-37 training document. This freely accessible database allows medical physics trainees in LMICs (and worldwide) to have access to necessary resources for training in radiation therapy. This work aims to assist capacity building initiatives in medical physics education as well as support the UN's Sustainable Development Goals.

ACKNOWLEDGMENTS

We would like to acknowledgment all volunteers who supported the creation of this web platform: Tomi Nano (Web Design), Stefano Peca, Indra Das, Muthana Al-Ghazi, Surendar Rao, Humza Nusrat, John Schreiner, Jenny Bertholet, Tomas Janssen, Garry Grogan, Curtis Caldwell, Mirel Palamaru, Deivis Errada, Ferney Diaz Molina, Jerry Battista, Satish Jaywant, and Stephanie Marcie.

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