

Exploring implementation of the ESTRO Core Curriculum at the national level

Citation for published version (APA):

Giuliani, M., Martimianakis, M. A., Benstead, K., Eriksen, J. G., Verfaillie, C., Van Egten, V., Umakanthan, B., Driessen, E., & Frambach, J. (2020). Exploring implementation of the ESTRO Core Curriculum at the national level. *Radiotherapy and Oncology*, 147, 118-122. <https://doi.org/10.1016/j.radonc.2020.03.028>

Document status and date:

Published: 01/06/2020

DOI:

[10.1016/j.radonc.2020.03.028](https://doi.org/10.1016/j.radonc.2020.03.028)

Document Version:

Publisher's PDF, also known as Version of record

Document license:

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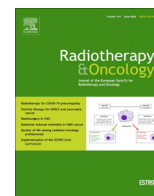
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Original Article

Exploring implementation of the ESTRO Core Curriculum at the national level



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ARTICLE INFO

Article history:

Received 23 January 2020

Received in revised form 17 March 2020

Accepted 22 March 2020

Available online 30 March 2020

Keywords:

ESTRO Core Curriculum

Curriculum implementation

Globalization

Medical education

ABSTRACT

Background and purpose: Global curricula exist across medical specialties however, the factors which influence their implementation are not well understood. The purpose of this study is to report the perceived factors that impact the implementation of the ESTRO Core Curriculum.

Methods: An anonymous, 37-item, survey was designed and distributed to the Presidents of the National Societies who have endorsed the ESTRO Core Curriculum ($n = 29$). The survey addressed perceptions about implementation factors related to context, process and curriculum change. The data was summarized using descriptive statistics.

Results: Twenty-six (90%) National Societies completed the survey. One respondent perceived that the values of the training system of their country would be incompatible with the proposed ESTRO Core Curriculum. The most common contextual barriers to implementation was a lack of support from the government (57%), a lack of internal organizational support (35%) and a 'poor fit' between the ESTRO Core Curriculum and the broader political and economic context (35%). Perceived implementation process barriers included insufficient numbers of faculty (44%), poor coordination between the government and training institutions (48%), and a lack of an influential person leading the implementation (44%). Two barriers related to curriculum change were a lack of funding and lack of assessment tools.

Conclusions: The content and values espoused in the ESTRO Core Curriculum are endorsed across diverse geopolitical and sociocultural regions. Barriers to curricular implementation are identified at the organizational and systems level and include insufficient teaching faculty, lack of coordination and the need for influential leadership.

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Global or core curricula, conceptualized as a text, which intends to use a common vocabulary and shared philosophy, and which describes an outcome, including competency items, that are intended to be applicable across nations, exist in many medical specialties and represent a significant investment of time and resources to create [2,3]. The motivation to create these curricula is often reported as an opportunity to define standards for a specialty, harmonize training or improve the quality of training across countries [4]. However, we do not understand well the real-world implications of such curricula, including factors influencing implementation and unintended effects they may create [5]. In addition, their applicability in diverse geopolitical and sociocultural settings is unknown [6]. It is possible that these curricula, which often re-

present consensus statements obtained through social group processes [4], may reflect the priorities and values of certain dominant groups which may either limit uptake or, in some settings, may require significant adaptation for which there may not be adequate resources. The influence of such curricula in reproducing dominant perspectives on curricular content and pedagogical practices is a concern [7,8]. In addition, misalignment with local healthcare systems, representing diverse geopolitical and sociocultural views, are potential aspects limiting the utility of global curricula. Intercountry variation and socio-cultural differences are a potential area requiring particular attention in the implementation of global curricula as they can be challenging aspects [4]. These curricula may play important advocacy roles, such as ensuring resources for training or teaching faculty, within the healthcare system [9]. Thus, it is important to consider how to mitigate their limitations related to implementation and uptake in diverse

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geopolitical contexts, in order for all countries to benefit from their advocacy potential

The health workforce gaps in oncology are projected to grow over the next decade [10,11]. To address these gaps there are efforts to increase the supply of oncology healthcare providers [12]. One such effort is through the development of common curricula which may increase supply by facilitating physician movement or assisting in the creation of new training programs. However, the effectiveness of these curricula in resolving workforce concerns is unclear [5,12]. Previous work in Europe has reported that there is poor awareness of the existence of these curricula and potentially limited uptake [13]. In 2019, the European Society for Radiotherapy & Oncology (ESTRO) published the fourth edition of the European Core Curriculum for Radiation Oncology/Radiotherapy (the ESTRO Core Curriculum) [14]. The aim of the ESTRO Core Curriculum are to “develop comparable standards for training across Europe and to facilitate free movement of specialists across borders. It is also hoped that it will improve the level of training across Europe and will make the non-“medical expert” roles more explicit [14]. The ESTRO Core Curriculum has also been adopted by the European Union of Medical Specialists as the European Training Requirement for Radiation Oncology/Radiotherapy [15]. The publication of this new version of the curriculum presented an opportune time to explore factors which promote or hinder the implementation of this curricula across different countries. Understanding the factors that impact implementation may inform future efforts in creating these curricula to improve the fit for purpose. This information may also provide guidance to enhance the impact of existing curricula which represent a significant investment of resources to create. The purpose of this study is to report the perceived factors that impact the implementation of the European Core Curriculum for Radiation Oncology/Radiotherapy (the ESTRO Core Curriculum) from the perspective of the national oncology societies.

Materials and methods

Questionnaire development

This study involved a cross-sectional online survey completed at a single time-point. Following a comprehensive literature review to identify existing empirical work and surveys addressing curriculum implementation at the global or international level, the survey was adapted from a curriculum implementation survey on the World Health Organization’s (WHO) patient safety curriculum [1]. The adaptation included changing the survey language to focus on radiotherapy and specifically the ESTRO Core Curriculum and built on our previous work in this area [4,16] and the existing literature on global curriculum implementation to address barriers commonly identified in the implementation science literature. The survey captured details, at the national level, of the current state of radiation or clinical oncology education and explored factors which may impact implementation of the ESTRO Core Curriculum including the curriculum itself, the context and the implementation process. Prior to distribution the survey was circulated to experts in oncology education for peer-review for clarity, underwent cognitive pretesting and was iteratively revised [17]. For the purposes of this study, Europe was defined as the members or associated members of the European Union of Medical Specialists (UEMS) from the European continent [16].

Survey content

The final survey included 37 items. The survey was conducted in English. Questions instructed respondents to “select one best response” or “select all that apply” and open-ended questions were

also used. Some questions incorporated a 5-point Likert scale with a response scale of “strongly disagree” to “strongly agree” with an option for no response. Survey questions could be omitted or skipped by the respondents if they chose not to answer a particular question. The full survey is available in [Supplementary File 1](#).

Survey distribution

A research ethics board waiver (UHN 19-0388) was obtained for this study. The survey was distributed electronically to the Presidents of the National Societies for each country that endorsed European Core Curriculum for Radiation Oncology/Radiotherapy in 2011 [18] and/or in 2019 [14]. The National Societies are the organizations that lead on the regulation of the practice of and education in radiation oncology in individual countries. The survey was therefore sent to 29 individuals from 29 countries. These countries included: Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, Turkey and The United Kingdom. The Survey was distributed in October 2019 with follow-up reminder emails and was closed in December 2019. The names and countries of the National Societies invited to participate in this survey are listed in [Supplementary File 2](#).

Analysis

Survey data was summarized using descriptive statistics. Missing data due to non-response to an item was low and missing data due to nonresponse is reported. Countries were classified into Lower-Middle Income Countries (LMIC), Upper-Middle Income Countries (UMIC) and High-Income Countries (HIC) based on the World Bank Criteria [19]. All data is reported as an aggregate to ensure the anonymity of respondents.

Results

Twenty-six of the 29 country representatives completed the survey for a response rate of 90%

In 18 responses (69%) the national speciality was radiation oncology and in 8 (31%) it was clinical oncology. The duration of specialist training was 4 years ($n = 6$; 23%), 5 years ($n = 18$; 69%) and 6 years ($n = 2$; 8%). Twenty (73%) countries reported having a national curriculum. Training was regulated on a national basis in 20 (77%) countries. Of the 26 countries who had a respondent 4 (16%) are UMIC and 22 (84%) are HIC. No country is LMIC.

We probed barriers to curriculum implementation on three dimensions: context, process and curriculum content. 23 responses were received for this section. One (4%) respondent reported that “Belief by leadership that the European Core Curriculum for Radiation Oncology/Radiotherapy will NOT improve oncology care” was a barrier and 5 (22%) report that “Belief by leadership that the European Core Curriculum for Radiation Oncology/Radiotherapy is NOT implementable” was a barrier. One respondent perceived that the values of the training system of their country would be incompatible with the proposed ESTRO Core Curriculum.

The most commonly reported contextual barriers thought to hinder implementation of the ESTRO Core Curriculum included a perceived lack of support from the government ($n = 13$; 57%), a lack of internal organizational support ($n = 8$; 35%) and a ‘poor fit’ between the ESTRO Core Curriculum and the broader political and economic context ($n = 8$; 35%). With respect to the implementation process barriers 10 (44%) reported insufficient numbers of faculty, 11 (48%) poor coordination between the government and

training institutions, and 10 (44%) reported a lack of an influential person leading the implementation. All implementation factors related to context and process are summarized in Table 1.

Representatives from thirteen countries (50%) reported that they had adapted some aspects of the ESTRO Core Curriculum and that they were comfortable in doing these adaptations. The most common elements reported to require adaptation were the basic science aspects (radiobiology) or the ‘high-end’ radiotherapy techniques. Others reported a greater focus in their country on the Medical Expert aspects of the ESTRO Core Curriculum with less focus on the intrinsic roles such as Communicator, Leader or Pro-

fessional. With respect to factors which influence curriculum change a lack of funding and assessment tools were perceived to be common barriers across countries. Fig. 1 describes the implementation factors related to curriculum change.

Discussion

This study is the first to report the perceived factors that influence the implementation of the ESTRO Core Curriculum from the National Oncology Societies. We have shown that the values and curricular content presented in ESTRO Core Curriculum are perceived to be largely compatible with the healthcare education and practice settings of the participating countries despite the diverse nature of the health care systems of these countries. However, there remain several important barriers to implementation. These barriers are most commonly include insufficient teaching faculty, funding, coordination challenges between governments and training institutions and the lack of an influential leader for implementation.

Common challenges with the implementation of global or core curricula include “a mismatch between the curricular requirements and the local context” and “insufficient representation of diverse perspectives and realities in the creation of the final curricula” [9]. The data presented in this study demonstrates the curriculum development process utilized for the European Core Curriculum for Radiation Oncology/Radiotherapy has been largely successful in mitigating these challenges. First, with respect to the mismatch of requirements the majority of respondents in our study support the values, length of training recommendations and assessment system espoused in the ESTRO Core Curriculum. This is a laudable achievement as the participants in this study represent disparate geopolitical regions with vastly different sociocultural practices and health care systems with differing resources according to the WHO [20]. Secondly, with respect to insufficient diversity of perspectives, with each iteration of the European Core Curriculum for Radiation Oncology/Radiotherapy the number of authors engaged in developing the curricula has grown as has the diversity of representation of countries across Europe [14,18]. In addition to expansion of country representation other key

Table 1
Implementation factors related to context and process.

Context	Yes (n = 23; %)
Lack of support from stakeholders <i>internal</i> to the organization	8 (35%)
Lack of support from stakeholders <i>external</i> to the organization	6 (26%)
Poor fit between the ESTRO Core Curriculum and the broader political & economic context	8 (35%)
Lack of governmental commitment to the ESTRO Core Curriculum	13 (57%)
Lack of organization-level commitment to implementation of the ESTRO Core Curriculum	4 (17%)
Belief that the ESTRO Core Curriculum is NOT compatible with the values of the training system	1 (4%)
Belief that the ESTRO Core Curriculum is NOT compatible with the length of training of our system	2 (9%)
Poor fit between the ESTRO Core Curriculum and the assessment system in training settings	1 (4%)
Implementation process	
Insufficient faculty members to teach the ESTRO Core Curriculum	10 (44%)
Faculty are not trained on the topics to teach the ESTRO Core Curriculum	4 (17%)
Poor coordination between the government and institutions around implementation of the ESTRO Core Curriculum	11 (48%)
Poor communication channels among stakeholders regarding implementation of the ESTRO Core Curriculum	7 (30%)
Lack of an influential person leading implementation of the ESTRO Core Curriculum	10 (44%)

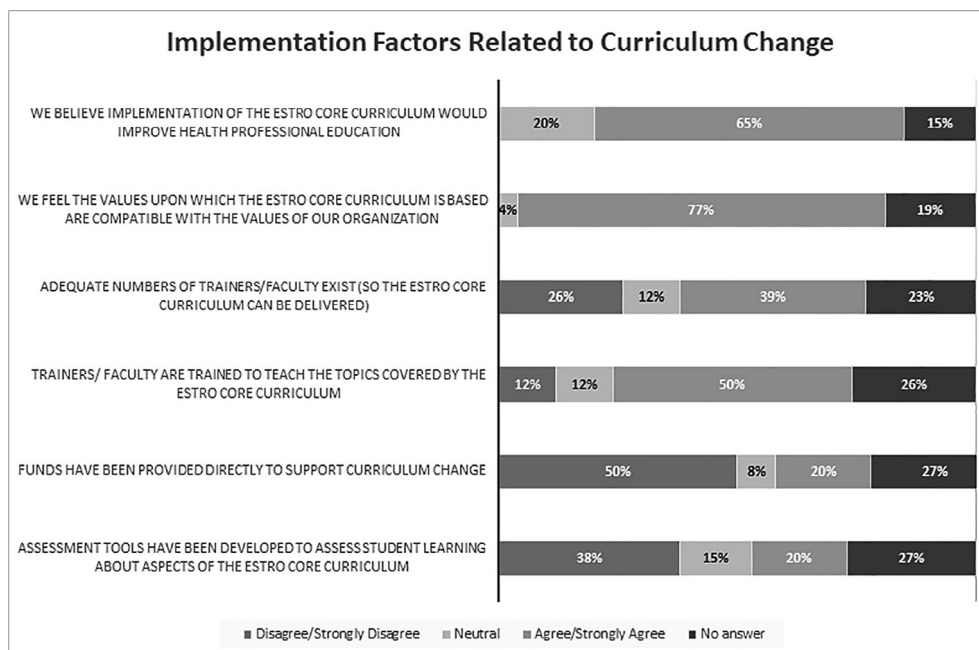


Fig. 1. Implementation factors related to curriculum change.

stakeholder groups, including trainees, have been included in the development process [14,18]. These strategies are aligned with recommendations to enhance diversity in the development of global curricula with the aim to mitigate common challenges [9]. However, while the ESTRO Core Curriculum process appears to have addressed diversity in representation and have aligned values on the existing content more study is required to determine where the limits of the agreement on the values of the curriculum are. For example if the majority of the content focuses on clinical expertise, with the values attributed to these aspects being aligned, does this alignment hold true in areas of content that are often underrepresented in global curricula such as communication skills or competencies aligned with humanism [21]. When asked about adaptation locally we have data supporting a focus on the Medical Expert aspects of the curriculum versus the non-Medical Expert roles. It is not clear what the reason for this is but this would be a rich area for future study. The ESTRO Core Curriculum group is perhaps well positioned to explore more deeply other facets of oncology training including communication, approaches to end of life care and concepts such as the role of Artificial Intelligence on a multi-national level.

Our data has demonstrated that in the context of the ESTRO Core Curriculum the Presidents of the National Societies that took part in the study accept the applicability of the values and content of the curriculum. However, challenges in implementation have been identified in the areas of funding, assessment tools, a lack of teaching faculty and leadership locally. We have previously reported that there has been a growth of efforts across oncology specialties in the last two decades to create or revise global curricula. However, building on the data from this study, future efforts in the area of global curriculum in oncology may benefit from focusing on these barriers to implementation. Outside of securing additional funding for curriculum change other opportunities for efficiency, such as promoting educational global public goods, in the form of freely available educational tools and resources, may be strategies to lessen the financial burden of curricula change. Global public goods are available world-wide [22]. Future work may articulate areas in radiation oncology training which are amenable to becoming global public goods. Our data identified the need for assessment tools and this is perhaps one avenue to explore for sharing resources. Another example in the radiation oncology context is the challenge of delivering the required radiobiology content at local institutions. Our data has also endorsed this as a challenge. National or international courses for radiobiology exist in several jurisdictions including through the ESTRO School [23] or within Canada at the University of Toronto [24]. These courses are a first step in addressing this challenge however barriers to access remain including cost and time to attend. Future efforts to increase access to radiobiology education may explore online, asynchronous options which may increase access to those without the funding to travel or who are working a context with limited leave for such training. The inadequate supply of teaching faculty has been previously identified as a challenge for the implementation of global curricula [9,25] and is reinforced in this study. Global curricula serve important roles as advocacy tools for education at the national level [9]. In areas where clinical demands for care are high this may occur at the expense of the availability of teaching faculty. With the projected rise in cancer cases over the next decade [10] this risk to educational resources is critical and is not limited to low-middle income countries [26]. It is possible this could create a negative cycle which further threatens the workforce where there is inadequate clinicians to meet the demands for clinical care. It may also lead to reduced availability of teaching faculty and ultimately less graduates which diminishes the inflow of resources to the workforce [25]. Finally, perhaps there

is a role for skill building in the areas of implementation sciences and change management for those tasked with curricular change on a national level.

This work has several limitations. First, we did not ask the respondents to examine each recommendation or competency item within the ESTRO Core Curriculum to determine its feasibility nor fit within their local environment. We are able to report that overall the respondents perceive the values of the curriculum, as well as the recommendations for length of training and assessment, to be a good fit with their national system. A significant number of countries do report that they have adapted the ESTRO Core Curriculum to fit their national environments. Future studies should explore in detail the nature and process of these adaptations as this data may be critical to inform future iterations of the curricula and highlight areas where more time should be allocated for discussion in the development phase. Due to the methodology of this study we were not able to address one of the major challenges in global curriculum development and implementation which is the influence of power relationships and implicit biases in the development process [9]. This is a critical area of study but is better suited to alternative methodologies such as critical ethnography. Future efforts to revise and update the ESTRO Core Curriculum may be an opportune time for such a study. Finally, this survey was sent to the Presidents of the National Societies for each country that endorsed the ESTRO Core Curriculum. We acknowledge their responses are one, albeit an influential, perspective in the discussion around curriculum implementation. We do not purport to have identified all perspectives from the multiple groups involved in curriculum implementation on a national level. In addition, we have not attempted to access data from countries who may be using the ESTRO Core Curriculum, beyond those who have endorsed the ESTRO Core Curriculum, and believe this would be an important focus of future studies. A particular focus may be on LMIC countries whose perceptions are not reflected in the data presented in this study.

The content and values espoused in the European Core Curriculum for Radiation Oncology/Radiotherapy are endorsed across diverse geopolitical and sociocultural regions by the National Societies. Barriers to curricular implementation are identified at the organizational and systems level and include insufficient teaching faculty, poor coordination between governments and training institutions and the need for influential leadership.

Acknowledgements

The authors would like to thank Dr Liane Ginsburg for permission to adapt their survey [1]. We also wish to thank all of the National Societies who participated in this study.

Conflict of interest

Dr Meredith Giuliani reports AstraZeneca, Eli Lilly and Bristol Meyer Squibb unrelated to this work. JF, TM, ED, VE, BU, JE, KB and CV report no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radonc.2020.03.028>.

References

- [1] Ginsburg Liane R, Dhingra-Kumar Neelam, Donaldson Liam J. What stage are low-income and middle-income countries (LMICs) at with patient safety curriculum implementation and what are the barriers to implementation? A

- two-stage cross-sectional study. *BMJ Open* 2017;7: e016110. <https://doi.org/10.1136/bmjopen-2017-016110>.
- [2] World Directory of Medical Schools -- WFME Projects. The World Federation for Medical Education, wfme.org/world-directory/. [Accessed 10 January 2019].
 - [3] The Institute for International Medical Education. World Health Organization, World Health Organization, 23 July 2011, www.who.int/workforcealliance/members_partners/member_list/iime/en/. [Accessed 8 January 2019].
 - [4] Giuliani M, Martimianakis M, Broadhurst M, Papadakos J, et al. Motivation and challenges in the development of global medical curricula: a scoping review. *Acad Med* 2019.
 - [5] Patel Shilpen et al. The International Core Literature Consensus (ICLC): an alternative curriculum for oncologists. *J Cancer Educ* 2011;26:420.
 - [6] Giuliani M, Frambach J, Broadhurst M, Papadakos J, Driessen E, Martimianakis T, A critical review of representation in the development of global oncology curricula and the influence of neocolonialism, *BMC Med Educ* February 2020.
 - [7] Hartzband Pamela, Groopman Jerome. Keeping the patient in the equation—humanism and health care reform. *N Engl J Med* 2009;361:554. <https://doi.org/10.1056/NEJMp0904813>.
 - [8] Whitehead Cynthia. Scientist or science-stuffed? Discourses of science in North American medical education. *Med Educ* 2013;47:26–32. <https://doi.org/10.1111/j.1365-2923.2011.04136.x>.
 - [9] Giuliani M, Frambach J, Driessen E, Martimianakis M. Exploring globalization in the construction and implementation of global curricula. *J Cancer Educ* 2020. <https://doi.org/10.1007/s13187-020-01705-5>.
 - [10] Atun Rifat et al. Expanding global access to radiotherapy. *Lancet Oncol* 2015;16:1153–86.
 - [11] Wilson Brooke E et al. Estimates of global chemotherapy demands and corresponding physician workforce requirements for 2018 and 2040: a population-based study. *Lancet Oncol* 2019;20:769–80.
 - [12] Arthur Jr Garson. Perspective: leveraging the health care workforce: what do we need and what educational system will get us there?. *Acad Med* 2011;86:1448–53.
 - [13] Bibault JE, Franco P, et al. Learning radiation oncology in Europe: results of the ESTRO multidisciplinary survey. *Clin Transl Radiat Oncol* 2018;9:61–7. <https://doi.org/10.1016/j.ctro.2018.02.001>.
 - [14] Benstead, Kim, et al. Recommended ESTRO core curriculum for radiation oncology/radiotherapy 4th edition. *Radiother Oncol* 141 (2019): 1–4. <https://www.doi.org/10.1016/j.radonc.2019.08.013>.
 - [15] Training Requirements for the Specialty of Radiation Oncology. European Union of Medical Specialists, 2013, https://www.uems.eu/_data/assets/pdf_file/0015/44430/UEMS-2013.20-European-Training-Requirements-in-Radiation-Oncology.pdf [Accessed 14 Jan 2020].
 - [16] Benstead, Kim, et al. Multidisciplinary training of cancer specialists in Europe. *Eur J Cancer* 83 (2017): 1–8. <https://www.doi.org/10.1016/j.ejca.2017.05.043>.
 - [17] Fowler F. *Survey research methods*. Thousand Oaks, CA: SAGE Publications; 2013.
 - [18] Eriksen Jesper G et al. The updated ESTRO core curricula 2011 for clinicians, medical physicists and RTTs in radiotherapy/radiation oncology. *Radiother Oncol* 2012;103:103–8.
 - [19] “World Bank Country and Lending Groups.” World Bank Country and Lending Groups – World Bank Data Help Desk, datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups. [Accessed 13 December 2019].
 - [20] World Health Organization. The world health report 2000: health systems: improving performance. World Health Organization, 2000. [Accessed 5 December 2019].
 - [21] Giuliani M, Broadhurst M, Papadakos J, Driessen E, Frambach J. Humanism in global oncology curricula: an emerging priority. *Curr Oncol* 2019.
 - [22] Kaul I, Grunberg I, Stern M. *Global Public Goods: International Cooperation in the 21st Century*. NY Oxford University Press Inc.; 1999.
 - [23] Basic Clinical Radiobiology 2020. ESTRO – European Society for Radiotherapy & Oncology. [www.estro.org/Courses/Basic-Clinical-Radiobiology-\(1\)](http://www.estro.org/Courses/Basic-Clinical-Radiobiology-(1)). [Accessed 18 December 2019]
 - [24] Clinical and Experimental Radiobiology Course 2020. *Clin Exp Radiobiol Course* [Radiat Oncol, www.radonc.utoronto.ca/clinical-and-experimental-radiobiology-course]. [Accessed 18 December 2019].
 - [25] OECD. Publishing. The Looming Crisis in the Health Workforce: How Can OECD Countries Respond? Organisation for Economic Co-operation and Development, 2008. https://www.who.int/hrh/migration/looming_crisis_health_workforce.pdf [Accessed 9 December 2019].
 - [26] Fundytus, Adam et al. Delivery of global cancer care: an international study of medical oncology workload. *J Glob Oncol* 4 (2017): 1–11. <https://www.doi.org/10.1200/JGO.17.00126>.