Technical Innovations & Patient Support in Radiation Oncology 32 (2024) 100288

Contents lists available at ScienceDirect

Technical Innovations & Patient Support in Radiation Oncology

journal homepage: www.sciencedirect.com/journal/technical-innovations-and-patient-support-in-radiation-oncology

The status quo of global geriatric radiation oncology education: A scoping review

Lucinda Morris [a,b,*], Sandra Turner [c,d], Jane L. Phillips [a,e], Anamika Parmar [f], Meera Agar [a]

[a] University of Technology Sydney (UTS), Faculty of Health, Improving Palliative, Aged and Chronic Care through Clinical Research and Translation (IMPACCT), Ultimo, NSW, Australia
[b] St George Cancer Care Centre, St George Hospital, Sydney, NSW, Australia
[c] Sydney Medical School. The University of Sydney, Sydney, Australia
[d] Crown Princess Mary Cancer Centre, Westmead Hospital, Sydney, New South Wales, Australia
[e] Queensland University of Technology, Faculty of Health, Brisbane, Queensland
[f] Bradford Teaching Hospital NHS Trust, Yorkshire, United Kingdom

ARTICLE INFO

Keywords:
Geriatric radiation oncology
Specialty training
Post-graduate education
Medical education

ABSTRACT

Purpose: To identify potential gaps in geriatric radiation oncology (RO) education worldwide, as measured by geriatric oncology (GO) content within postgraduate RO training program (TP) curricula across 8 focus countries.
Methods and materials: The need for improved education around GO is internationally recognized and is a key strategic priority of the International Society of Geriatric Oncology (SIOG).
Two reviewers undertook a systematic scoping review from March to September 2023. Focus countries were selected using predefined selection criteria based on national radiation therapy (RT) service provision, RT access and post-graduate specialty training standards. This review is in accordance with evidence-based curriculum design methodology and represents the initial phase i.e., problem identification and needs assessment.
Results: Overall RO TP and curriculum elements varied by jurisdiction. Common elements included length of training, summative assessments and prerequisite requirements. Considerable variability exists across TPs around identified learning outcomes, content, TP organization, training networks and accreditation.
Across 6 TPs, only 2 had any documented GO curriculum content. Of these, only one contained geriatric RO content scoring moderate to high based on accepted quality benchmarks. Outside official RO TPs, there is considerable GO online education content, including face to face courses, peer-reviewed articles, learning materials and resources relevant to RO postgraduate training worldwide. However accessibility to these learning interventions may be region specific and content is not standardized.
Conclusions: As expected, this systematic scoping review has identified significant gaps in GO education within RO TPs worldwide. These findings represent an essential step in the development of evidence-based recommendations for updating standards for GO training within RO training programs and establishing a globally accepted, standardized benchmarks for minimal geriatric RO education. In turn, this will ensure future radiation oncologists are able to deliver a high standard of care to and improve outcomes for older people with cancer.

Introduction

As the global population ages, the incidence of cancer among older adults is expected to continue to rise [1,2]. Managing cancer in older adults represents a significant challenge as individual patient factors including comorbid conditions, personal and family preferences, life expectancy, age-related issues, frailty, and psychosocial well-being can all influence decision making around treatment strategies, prognosis and quality of life [3–5]. While there is a paucity of robust clinical trial data to inform optimal management of individual older cancer patients [6–9], the integration of routine frailty screening, comprehensive geriatric assessment, and multidisciplinary collaborative efforts with geriatric specialists is recommended but remains uncommon [4,10–12]. Research indicates that older adults with cancer tend to experience poorer outcomes compared to their younger counterparts, even after accounting for existing health conditions [4,13,14]. Addressing the

* Corresponding author at: St George Cancer Care Centre, St George Hospital, Gray St, Kogarah 2217, Australia.
E-mail address: lucinda.morris@health.nsw.gov.au (L. Morris).

https://doi.org/10.1016/j.tipsro.2024.100288
Received 5 August 2024; Received in revised form 31 October 2024; Accepted 8 November 2024
Available online 10 November 2024

unique needs and disparities faced by older adults with cancer presents is widely acknowledged to be a growing challenge in cancer care worldwide.

Radiation therapy (RT) is an important treatment modality for older adults with cancer. Recent advances in RT technology and treatment delivery, including hypofractionated schedules and stereotactic ablative body radiation therapy (SABR) have revolutionised the management of many cancers occurring in older adults, providing a shorter, non-invasive, well tolerated, potentially curative treatment approach [15–18]. RT has the further potential advantage of avoiding the risks and toxicity of surgery and/or chemotherapy for older adults.

There is increasing recognition that RO trainees must be equipped with sufficient knowledge, skills and confidence around geriatric RO to provide optimal care for older adults with cancer [19–22]. The need for improved education around GO is internationally recognized and is a key strategic priority of the International Society of Geriatric Oncology [23]. Despite this, there are currently no existing recognized published guidelines or consensus statements to guide national and regional organizations on the ideal geriatric oncology curricula components for RO trainees. Studies performing targeted needs assessments of learners have shown that RO trainees receive minimal training and experience in geriatric oncology [20,24–26].

Numerous national and regional specialist RO TP currently exist worldwide. These programs are typically delivered by overarching organizations and/or institutions based within various regions and jurisdictions. It is noted that RO specialist training is overseen across Australia, New Zealand and National University Hospital Centres in Singapore by RANZCR, Faculty of Radiation Oncology. In the UK, training via the RCR (Royal College of Radiologists) includes comprehensive training in both RO and the delivery of systemic therapy, called Clinical Oncology (CO) and graduates of such programs are called Clinical Oncologists. Other programs worldwide limit their scope to RO and as such graduates are known as Radiation Oncologists.

There is a large degree of heterogeneity across these programs relating to design, curriculum content, organization, oversight and assessment [27]. Key components of RO TPs include: curriculum framework and content; length of training and prerequisites; organization; governance and accreditation; recruitment and selection of trainees, training networks and trainee rotations; financial costs and government funding; and assessment and evaluation of progress [27].

The application of proactive, evidence-based curriculum enquiry within the field of RO education research is essential in maximising benefit to patients undergoing RT [28,29]. A crucial methodological stage in the curriculum design process in accordance with the initial phase of Kern's six-step medical education curriculum design framework is "problem identification and needs assessment", in which gaps or deficiencies in existing educational programs are systematically identified and addressed [30]. Several previous studies have already undertaken a learning needs assessment of the target audience, demonstrating that RO and CO trainees receive little to no formal training in caring for older adults [20,24–26]. This study therefore represents a fundamental step towards setting a globally accepted, standardized benchmark for geriatric RO education to ensure future ROs and COs are able deliver a high standard of care and improve outcomes for older people with cancer.

Aim: To map the current state and identify potential gaps in post-graduate geriatric RO education worldwide, as measured by GO content within RO TP curricula across 8 predefined focus countries.

Methods: A systematic scoping review of the available literature was performed to identify existing GO educational content within RO TPs across 8 predefined focus countries. The online Google search identification, screening and eligibility were conducted by two reviewers and

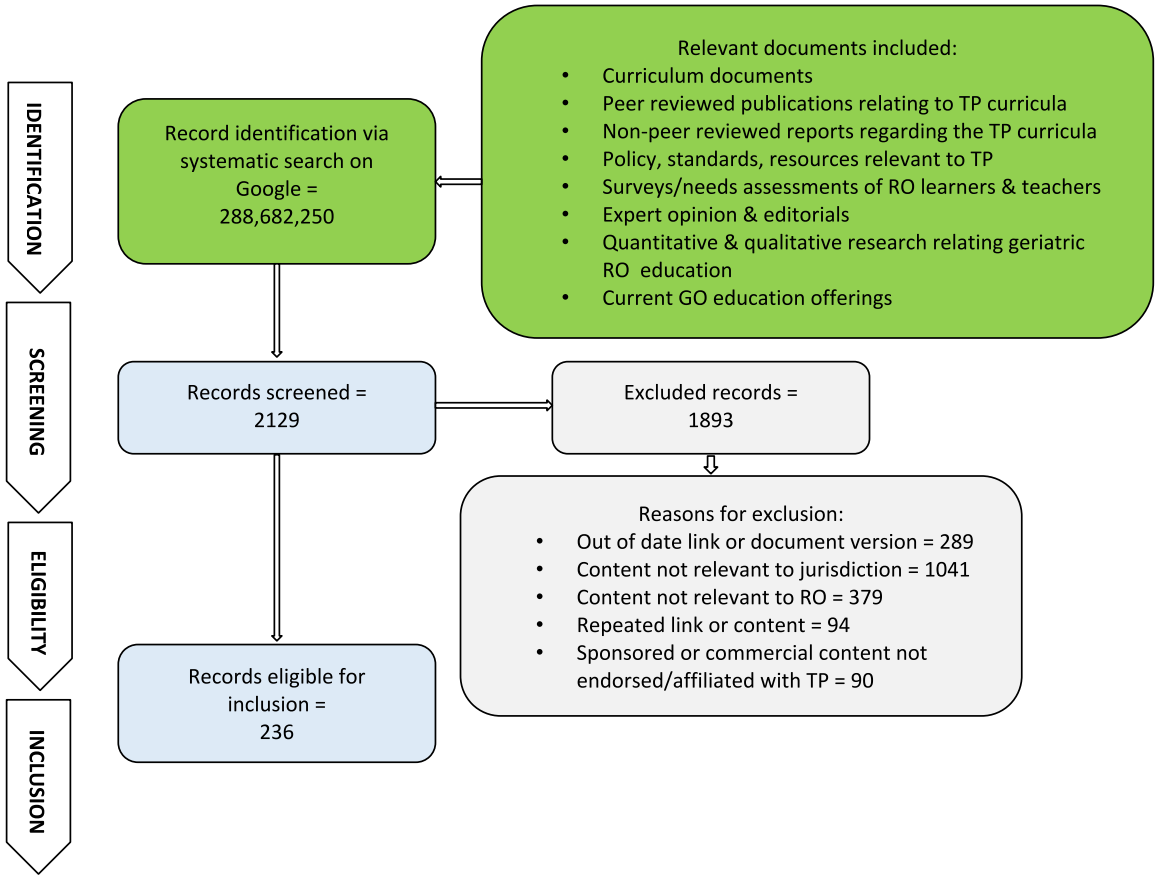

Fig. 1. PRISMA flow chart of google search results.

reported as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist, as outlined in Fig. 1 [31,32]. Inclusion and exclusion criteria applied were according the PICo model (Population, Intervention, Context) and is outlined in (Table 1) [33]. Low Risk Ethics approval was provided by the XXX Human Research Ethics Committee (ETHXX-XXXX).

Inclusion and exclusion criteria

The inclusion criteria for selection of focus countries were: 1. National access to RT services; 2. An ageing population hence a rising cancer incidence based on World Health Organization data; 3. The presence of an endorsed peak body or organization fully or partially responsible for delivering RO or CO training; 4. An RO/CO training program underpinned by a recognized competency-based curriculum framework; and 5. Relevant educational and training documents available entirely or partly in English and published since 2017 [27,34]. The countries that met criteria were Australia, Canada, Ireland, New Zealand, Singapore, South Africa, United Kingdom (UK) and United States of America (USA), Canada, United Kingdom (UK), Ireland, Australia, New Zealand, Singapore and South Africa.

Eligible documents included curriculum documents, peer-reviewed publications relating to program structure and delivery, non-peer reviewed reports about TPs and curricula, policies and standards, surveys and needs assessments of learners and teachers, expert opinion pieces, editorials and other current GO continuing professional development (CPD) education resources and offerings relevant to RO and CO trainees.

Content containing no actual information about current RO TP curricula were excluded. GO content specifically designed for other HCPs and content from non-recognized sponsored and/or commercial education providers were excluded.

Search strategy

A systematic web search using Google using predefined search terms was performed. Search terms used in combination included "radiation oncology" (and "clinical oncology" for relevant countries), "geriatric oncology, "cancer older adults", "cancer in elderly", "post-graduate training", "specialist training", "board certification", "training program".

These terms were coupled with the formal name (both acronym and expanded form) of the peak recognized RO training body for each focus country. This included the Royal Australian and New Zealand College of Radiologists Faculty of Radiation Oncology (RANZCR FRO), United Kingdom Royal College of Radiologists (UK RCR), Royal College of Surgeons in Ireland (RCSI) Ireland Faculty of Radiologists and Radiation Oncologists Ireland (FoR), Royal College of Physicians and Surgeons of Canada (RCPSC), Canadian Association of Radiation Oncology (CARO), College of Radiation Oncologists, College of Medicine South Africa (CRO CMSA), American Board of Radiology (ABR) and Accreditation Council for Graduate Medical Education (ACGME) in the USA.

Hand searching through retrieved documents and individual organizations' websites identified additional sources for review. Specifically, the data extracted included descriptions or identification of GO education that is (or is not) currently incorporated into any element of training. Details of curricula content, including volume, learning domains, accessibility, nomenclature and quality were recorded, and quality of content assessed against evidence-based geriatric RO education global consensus benchmarks [21].Reviewers examined search results to assess for validity and relevance before selecting for inclusion or exclusion. Cross peer review of search results was undertaken to ensure consistency in the application of these criteria.

Table 1
Inclusion and exclusion criteria used for screening items.

	Inclusion	Exclusion
Population	Content relevant to RO and CO TP and trainees in focus countries Written in English	GO content specifically designed for other HCPs Content from outside focus countries Not available in English
Concept	RO TP Curriculum Elements RO TP GO curricula content GO learning materials and resources	Non GO or RO education and training related content
Context	RO TP Curriculum documents Peer-reviewed publications relating to TP structure and delivery Non-peer reviewed reports about TPs and curricula TP Policies and standards Surveys and learner/teacher needs assessments Expert opinion pieces and editorials Quantitative or qualitative research relating geriatric RO education Current GO education offerings (face to face courses, peer-reviewed articles, learning materials and resources)	Content from non-recognised sponsored and/or commercial education providers Content not meeting validity or relevance criteria

Data extraction

All elements relating to the TPs of these countries were extracted into a pre-defined MS Word data extraction tool, which captured information across seven key areas, as developed by Turner et al [27].

The MS Word template also captured the specifics of Google search itself (date, search terms used, document category, number of results included) and information regarding any description or identification of GO education and training that is currently incorporated into the TP. Details of the GO curricula content identified were recorded, including volume of content, quality (i.e. domains captured of geriatric RO content as per the published Morris et al Delphi study), visibility and accessibility (number of clicks or downloads required to access documents) and nomenclature (use of terms "elderly", "older", "geriatric") [21].

Results

A total number of 2129 search items were screened, with 236 documents identified for inclusion, outlined in Fig. 1. Search item numbers and types associated with each country and TP are outlined in Table 2.

Key elements of focus country TPs

Overall, 66 official TP curricula documents and 61 policies and resources about key TP elements from all focus countries were identified. Information reviewed in these items regarding key TP elements demonstrates significant variation across jurisdictions. In terms of curriculum framework and content, identified learning outcomes (LO) differed greatly in terms of number, scope and content across TPs. All TP had evidence of curricula content being reviewed within the last 5 years. Considerable variability exists across TP organization, training networks and accreditation. Length of training commonly ranged from a minimum of 4–5 years. All TPs, except in the USA, stipulate prerequisite requirements to gain entry into specialist training with a compulsory period of post-graduate, pre-specialty general medical clinical experience. All TPs include exam-based "barrier" evaluation of progress at various stipulated time points, in both written and oral format. All TPs require an "exit exam" in the later stages of training to achieve full certification to practice independently as a RO or CO. Multiple other

Table 2
Search item type by country and TP organisation.

Country & TP Organisation	Official TP curriculum documents	Non-peer reviewed articles about TP	Policies, information resources about TP key elements	Peer reviewed articles regarding TP	Geriatric RO courses, learning materials, articles
Australia, New Zealand & Singapore *Royal Australian College of Radiologists, Faculty of RO (RANZCR FRO)*	6	1	5	5	5
United Kingdom *Royal College of Radiologists (RCR)*	14	4	13	1	25
United States of America *American Board of Radiology (ABR) Accreditation Council for Graduate Medical Education (ACGME)*	6	4	18	2	24
Canada *Royal College of Physicians and Surgeons of Canada (RCPSC)*	2	0	9	5	9
South Africa *College of RO, College of Medicine South Africa (CRO, CMSA)*	19	1	14	5	5
Republic of Ireland *Faculty of Radiologists and Radiation Oncologists, Royal College of Surgeons in Ireland (FoR, RCSI)*	19	1	2	10	2

assessment tools are variably listed by TPs, including Work-Based Assessments (WBAs), such as Case Based Discussions (CBD), Mini-Clinical Evaluation Exercises (Mini-CEX), Multi-Source Feedback (MSF), Direct Observation of Clinical Skills (DOPS), plus clinical supervisor reviews and trainee learning portfolios.

GO curricula content

Across all focus countries, only three TPs had any documented GO content, as outlined in Table 3 [35–37]. Of these, one TP references the "elderly" as a curriculum driver but contains no further specific GO learning outcomes or curricula content [38]. Two other TPs have published GO focussed learning outcomes, with the most common domain of the learning outcomes being frailty [35,36]. Only one TP's GO content scored moderate to high based on accepted quality, volume and domain benchmarks [21,36]. No TP identified a lower age cut off for the defining "geriatric" patient populations. All published TP GO content was easily accessible and able to be located within two clicks from the TP main navigation page.

Other GO learning resources

Outside official RO TPs, there is considerable GO online CPD education content relevant to RO trainees, including face-to-face courses, peer-reviewed articles, learning materials and resources relevant to RO postgraduate training worldwide. The highest quality content in terms of RO learning outcome benchmarks [21] was published by peak RO or GO organizations, the most visible and frequent being SIOG, the Clinical Oncology Society of Australia (COSA) and American Society of Clinical Oncology (ASCO) [39–41]. However, accessibility to these learning interventions may be region specific; content is not standardized and not tailored specifically to RO trainees. No official TP documents list or recommend these resources to their in-country trainees. Most content was free to access, however membership or subscription fees is required to access some "member only" content for various organizations or academic publications. The SIOG Advanced GO course lists a fee to attend. Several peer reviewed geriatric RO articles had consistent visibility across all jurisdictions [21,42,43]. One item contained information about a GO fellowship in Canada available to RO trainees.

Discussion

To our knowledge, this systematic scoping review is the first to successfully examine and identity the extent, range and nature of geriatric RO curricula content across TPs worldwide. It confirms that significant education gaps around geriatric RO exist and provides a comprehensive stocktake of current approaches to geriatric RO postgraduate education globally. Robust evidence-based research methods have been applied, consistent with PRISMA-ScR, PICO reporting and Kern's 6 Step research methodology for medical education curriculum development [30,31,33].

This scoping review sits within a broader body of research around postgraduate geriatric RO being conducted by this investigator group. Previously published studies have successfully identified RO and CO self-reported learner needs and established evidence-based internationally applicable geriatric RO learning outcomes [21,24]. The results of this study demonstrating existing education gaps will be used to inform the next phase of investigation by this group, in which an

Table 3
GO curricula content across TP.

Organisation	Volume & Nature of Curricula Content	Quality of Learning Outcomes*	Usability (# of clicks)	Nomen-clature / Key Terms	Geriatric Age Cut Off Identified (Y/N)
FoR, RCIS (Ireland)	• 2 LO regarding concepts around frailty	Low-Mod	2	"Frailty"	N
RANZCR (Australia, New Zealand, Singapore)	• 10 LO regarding various key GO concepts	Mod- High	2	"Older Person / people with cancer"	N
RCR(United Kingdom)	• Reference to "Elderly" as a curriculum driver No GO specific LO in curriculum	Low	N/A	"Elderly"	N

*as per published geriatric RO learning outcome consensus benchmarks [21].

environment scan via semi-structured interviews with key RO education experts worldwide will be conducted. (UTS Ethics XXX). This will seek to identify barriers and facilitators to the provision of geriatric RO training.

Strengths and limitations

A strength of this study is the application of rigorous evidence-based curriculum enquiry, which is increasingly being recognized as critical to maintaining education quality and standards in the specialty of RO worldwide [28,29,44–47]. This approach is particularly relevant to the evolution of geriatric RO focussed curricula, which in the context of exponentially rising numbers of older adults with cancer, must evolve in parallel with the already considerable technical and research innovations within the field of RO. Proactive geriatric RO curricula designed utilising robust methodology has numerous potential benefits for all stakeholders. It will ensure RO trainees are provided positive learning experiences and environments, in which they gain appropriate "fit for purpose" skills, knowledge and attitudes around geriatric RO [28,29,48,49]. Evidence suggests this can in turn translate into improved clinical performance and patient care [28,49]. Methodically sound curriculum enquiry also has the potential "to advance the field" by facilitating connections within and across disciplines [50]. This is particularly relevant to geriatric RO in fostering the much needed interdisciplinary faculty development across geriatric medicine and other oncology specialties and optimising multi-disciplinary teamwork in caring for older adults in the clinical setting [19,51].

A potential limitation of this study is that the scoping review was restricted to 8 focus countries. Notably, all are predominantly English speaking and upper middle- or high- income countries. Therefore, this study may not have captured important information relating to geriatric RO education and training from other regions of the world. However, the justification in applying selection criteria to identify the key focus countries was to snapshot jurisdictions representing the highest current standards, in terms of RT service provision and post-graduate speciality training delivery. It is also reasonable to assume that given the significant lack of resources that exist for the education and training of RO professionals in many LMICs, any education gaps occurring in the 8 focus countries are almost certainly to exist in these resource challenged environments as well. Given RO is a relatively small specialty with a highly interactive international community, the global approach taken by this study offers potential efficiencies and improved standardisation in producing and disseminating the final results across numerous jurisdictions, which then may be adapted as needed to suit local learning environments [27].

We acknowledge that the online content reviewed may not be up to date or reflective of current practices within each TP jurisdiction and there may well be more geriatric RO focussed education occurring formally and informally at the point of care (e.g. action learning or academic detailing). Further, other GO resources and learning materials potentially may exist and be in use but not be available online, or may be contained behind paywalls or accessible to members only and hence not publically available. Thus the existence and availability other potentially unidentified geriatric RO learning content and opportunities in each TP jurisdiction will be intentionally explored and defined in the upcoming environment scan.

Conclusion

This systematic scoping review has identified significant gaps in GO education within RO TPs worldwide despite the need for education around GO being a key strategic priority of SIOG. These findings represent an essential first step in the development of evidence-based recommendations for updating standards for GO training within RO training programs and establishing a globally accepted, standardized benchmarks for minimal geriatric RO education. In turn, this will ensure future radiation oncologists are able deliver a high standard of care and improve outcomes for older people with cancer.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

No funding sources or organizations to declare. Dr Morris acknowledges NSW Department of Health and UTS IMPACCT for software, computer and library services support.

References

[1] Pilleron S, Soto-Perez-de-Celis E, Vignat J, Ferlay J, Soerjomataram I, Bray F, et al. Estimated global cancer incidence in the oldest adults in 2018 and projections to 2050. Int J Cancer 2021;148(3):601–8.
[2] World Health Organisation. World report on ageing and health 2015 [Available from: https://www.who.int/publications/i/item/9789241565042.
[3] Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet 2012;380(9836):37–43.
[4] Wildiers H, Heeren P, Puts M, Topinkova E, Janssen-Heijnen ML, Extermann M, et al. International society of geriatric oncology consensus on geriatric assessment in older patients with cancer. J Clin Oncol 2014;32(24):2595.
[5] O'Donovan A, Mohile S, Leech M. Expert consensus panel guidelines on geriatric assessment in oncology. Eur J Cancer Care 2015;24(4):574–89.
[6] Scher KS, Hurria A. Under-representation of older adults in cancer registration trials: known problem, little progress. J Clin Oncol 2012;30(17):2036–8.
[7] Bertagnolli MM, Singh H. Treatment of older adults with cancer—addressing gaps in evidence. N Engl J Med 2021;385(12):1062–5.
[8] Hutchins LF, Unger JM, Crowley JJ, Coltman Jr CA, Albain KS. Underrepresentation of patients 65 years of age or older in cancer-treatment trials. N Engl J Med 1999;341(27):2061–7.
[9] Murthy VH, Krumholz HM, Gross CP. Participation in cancer clinical trials: race-, sex-, and age-based disparities. JAMA 2004;291(22):2720–6.
[10] Hamaker ME, Jonker JM, de Rooij SE, Vos AG, Smorenburg CH, van Munster BC. Frailty screening methods for predicting outcome of a comprehensive geriatric assessment in elderly patients with cancer: a systematic review. Lancet Oncol 2012;13(10):e437–44.
[11] Rostoft S, O'Donovan A, Soubeyran P, Alibhai SM, Hamaker ME. Geriatric assessment and management in cancer. J Clin Oncol 2021:JCO. 21.00089.
[12] Garcia MV, Agar MR, Soo W-K, To T, Phillips JL. Screening tools for identifying older adults with cancer who may benefit from a geriatric assessment: a systematic review. JAMA Oncol 2021;7(4):616–27.
[13] Dickstein DR, Powers AE, Vujovic D, Roof S, Bakst RL. Clinical and therapeutic considerations for older adults with head and neck cancer. Clin Interv Aging 2023;409–22.
[14] Castelo M, Sue-Chue-Lam C, Paszat L, Scheer AS, Hansen BE, Kishibe T, et al. Clinical delays and comparative outcomes in younger and older adults with colorectal cancer: a systematic review. Curr Oncol 2022;29(11):8609–25.
[15] Morgan SC, Hoffman K, Loblaw DA, Buyyounouski MK, Patton C, Barocas D, et al. Hypofractionated radiation therapy for localized prostate cancer: An ASTRO, ASCO, and AUA evidence-based guideline. J Urol 2018.
[16] Brunt AM, Haviland JS, Wheatley DA, Sydenham MA, Alhasso A, Bloomfield DJ, et al. Hypofractionated breast radiotherapy for 1 week versus 3 weeks (FAST-Forward): 5-year efficacy and late normal tissue effects results from a multicentre, non-inferiority, randomised, phase 3 trial. Lancet 2020;395(10237):1613–26.
[17] Chen H, Laba JM, Boldt RG, Goodman CD, Palma DA, Senan S, et al. Stereotactic ablative radiation therapy versus surgery in early lung cancer: a meta-analysis of propensity score studies. Int J Radiat Oncol Biol Phys 2018;101(1):186–94.
[18] Harrow S, Palma DA, Olson R, Gaede S, Louie AV, Haasbeek C, et al. Stereotactic radiation for the comprehensive treatment of oligometastases (SABR-COMET): extended long-term outcomes. Int J Radiat Oncol Biol Phys 2022;114(4):611–6.
[19] Morris L, Turner S, Thiruthaneeswaran N, Agar M. Improving the education of radiation oncology professionals in geriatric oncology: where are we and where should we be? Semin Radiat Oncol 2022;32(2):109–14.
[20] Leifer R, Bristow B, Puts M, Alibhai S, Cao X, Millar B-A, et al. National survey among radiation oncology residents related to their needs in geriatric oncology. J Cancer Educ 2019;34(1):9–13.
[21] Morris L, Turner S, Thiruthaneeswaran N, O'Donovan A, Simcock R, Cree A, et al. An international expert Delphi consensus to develop dedicated geriatric radiation oncology curriculum learning outcomes. Int J Radiat Oncol Biol Phys 2022;113(5):934–45.
[22] Extermann M, Aapro M, Audisio R, Balducci L, Droz J-P, Steer C, et al. Main priorities for the development of geriatric oncology: a worldwide expert perspective. J Geriatr Oncol 2011;2(4):270–3.
[23] Hsu T, Soto-Perez-de-Celis E, Burhenn PS, Korc-Grodzicki B, Wildes TM, Kanesvaran R, et al. Educating healthcare providers in geriatric oncology–a call to

accelerate progress through identifying the gaps in knowledge. J Geriatr Oncol 2020;11(6):1023–7.
[24] Morris L, Thiruthaneeswaran N, Lehman M, Hasselburg G, Turner S. Are future radiation oncologists equipped with the knowledge to manage elderly patients with cancer? Int J Radiat Oncol Biol Phys 2017;98(4):743–7.
[25] Kalsi T, Payne S, Brodie H, Mansi J, Wang Y, Harari D. Are the UK oncology trainees adequately informed about the needs of older people with cancer? Br J Can 2013;108(10):1936–41.
[26] Akthar AS, Hellekson CD, Ganai S, Hahn OM, Maggiore RJ, Cohen EE, et al. Interdisciplinary oncology education: a national survey of trainees and program directors in the United States. J Can Educ 2018;33(3):622–6.
[27] Turner S, Eriksen JG, Trotter T, Verfaillie C, Benstead K, Giuliani M, et al. Establishing a global radiation oncology collaboration in education (GRaCE): objectives and priorities. Radiother Oncol 2015;117(1):188–92.
[28] Golden D, Mel M, Turner S. Scholarship in radiation oncology education. technical innovations and patient support. Radiat Oncol 2023;25.
[29] Golden DW. United States radiation oncology curriculum development: The tail is wagging the dog. Int J Radiat Oncol Biol Phys 2020;106(1):e1–4.
[30] Kern D, Thomas P, Hughes M. Curriculum Development for Medical Education: A Six-Step Approach. 20092nd ed Baltimore. MD: Johns Hopkins University Press [Google Scholar].
[31] Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med 2018;169(7):467–73.
[32] Peters MD, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evidence Synth 2020;18(10):2119–26.
[33] Institute JB. Joanna Briggs Institute reviewers' manual: 2014 edition. Australia: The Joanna Briggs Institute; 2014.
[34] Atun R, Jaffray DA, Barton MB, Bray F, Baumann M, Vikram B, et al. Expanding global access to radiotherapy. Lancet Oncol 2015;16(10):1153–86.
[35] Faculty of Radiologists and Radiation Oncologists RCoSI. Clinical Radiation Oncology Syllabus [Available from: https://radiology.ie/images/Radiation_Oncology_Syllubus_V2_1.pdf.
[36] Royal Australia and New Zealand College of Radiologists FoRO. Radiation Oncology Learning Outcomes 2021 [Available from: https://www.ranzcr.com/component/edocman/ranzcr-ro-learning-outcomes-july21-v1/viewdocument/1531?Itemid=424.
[37] Royal College of Radiologists UK. Clinical Oncology Specialty Training Curriculum 2023 [Available from: rcr-curriculum-clinical-oncology-updated-31-may-2023 (1).pdf.
[38] Royal College of Radiologists UK. Specialty training curriculum for clinical oncology. [Available from: https://www.rcr.ac.uk/clinical-radiology/specialty-training/radiology-curricula.
[39] International Society of Geriatric Oncology. Education Courses 2023 [Available from: https://siog.org/programmes/education/advanced-geriatric-oncology-courses/.
[40] Clinical Oncology Society of Australia. Geriatric Oncology Group Activities 2023 [Available from: https://www.cosa.org.au/groups/geriatric-oncology/activities/.
[41] American Society of Clinical Oncology. Geriatric Oncology News and Activities 2023 [Available from: https://society.asco.org/news-initiatives/current-initiatives/cancer-care-initiatives/geriatric-oncology.
[42] Amini A, Morris L, Ludmir EB, Movsas B, Jagsi R, VanderWalde NA. Radiation therapy in older adults with cancer: a critical modality in geriatric oncology. J Clin Oncol 2022;40(16):1806–11.
[43] O'Donovan A, Morris L. Palliative radiation therapy in older adults with cancer: age-related considerations. Clin Oncol 2020.
[44] Jeans EB, Brower JV, Burmeister JW, Deville Jr C, Fields E, Kavanagh BD, et al. Development of a United States radiation oncology curricular framework: a stakeholder Delphi consensus. Int J Radiation Oncol Biol Phys 2023;115(5):1030–40.
[45] Turner S, Benstead K, Millar B-A, Morris L, Seel M, Leech M, et al. A new wave of leaders: Early evaluation of the interdisciplinary Foundations of Leadership in Radiation Oncology (FLiRO) program. Tech Innovat Patient Support Radiat Oncol 2022;24:94–100.
[46] Turner S, Seel M, Trotter T, Giuliani M, Benstead K, Eriksen JG, et al. Defining a leader role curriculum for radiation oncology: a global Delphi consensus study. Radiother Oncol 2017;123(2):331–6.
[47] Turner S, Janssen A, Chan MK, Morris L, Martin R, Mackenzie P, et al. Can radiation oncologists learn to be better leaders? Outcomes of a pilot foundations of leadership in radiation oncology program for trainees delivered via personal electronic devices. J Med Imaging Radiat Oncol 2018;62(6):847–53.
[48] Strasser RP. Will Australia have a fit-for-purpose medical workforce in 2025? Med J Aust 2018;208:198–9.
[49] Frank JR, Snell LS, Cate OT, Holmboe ES, Carraccio C, Swing SR, et al. Competency-based medical education: theory to practice. Med Teach 2010;32(8):638–45.
[50] E Fincher RM, Work JA. Perspectives on the scholarship of teaching. Med Educat. 2006;40(4):293-5.
[51] Morris L, O'Donovan A, Hashmi A, Agar M. Older adults and the unique role of the radiation therapist: Future directions for improving geriatric oncology training and education. Tech Innovat Patient Supp Radiat Oncol 2022;23:21–6.