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COVID-19 Effects on Medical Education: A Viral Transfer of Knowledge to Radiation Oncology

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Introduction

The COVID-19 pandemic has been transformative with broad effects across international health care systems. Medical education, and specifically education in radiation oncology, has not been spared. The effects have spanned the continuum of education on all disciplines including radiation oncologists, radiation therapists, medical physicists, and all educational phases from undergraduate medical education (UME) to graduate and postgraduate education (GME) and continuing medical activities (CME).[1-3]

In the early days of the pandemic medical schools were closed, lectures transitioned to online delivery, clinical rotations were halted, radiation oncology residents and practicing oncologists were redeployed, residency interviews were converted to a virtual format and medical conferences were delayed or even cancelled. Broad effects have been seen in both formal and informal or hidden curriculums (ie, those curricula that impart knowledge, attitudes, and behaviors implicitly).[4]

Although the past 2 years have been wrought with change, they have been ripe with lessons that may be transformative in medical education. The literature specific to the effects of the pandemic on radiation oncology is evolving, but by noting the landscape in other areas of medical education we can draw this knowledge into our specialty. There has been a push for medical education to "share stories; share practice," learning from each other through the pandemic.[5] In this oncology scan we review the literature regarding effects of the pandemic on medical education in a broad sense, discuss potential roles for e-learning in radiation oncology, and highlight adaptations of 1 radiation oncology residency training program and the effects of the pandemic on the well-being of learners.

As we bring educational lessons into radiation oncology, we must draw on best practices with educational rigor. It is not enough to simply report on experiences, but there must be a foundation in educational pedagogy that is built on.[6] The first 2 articles in this scan summarize Best Evidence Medical Education (BEME) systematic reviews. The BEME collaboration is a well-established international educational consortium dedicated "to the development of evidence informed education in the medical and health professions."[7] BEME reviews are key to the work of the collaboration and systematically synthesize the best available evidence in medical education. The BEME initiative could be considered analogous to the Cochrane Collaboration in clinical medicine and the reviews likened to the gold standard of systematic reviews in medical education.[8]

In both BEME reviews there is an emphasis on evaluation. Throughout the medical education literature there is a continuous push to rigorously evaluate outcomes using established frameworks.[9] One of the most common frameworks for evaluation is Kirkpatrick's reaction to learning.[10] The Kirkpatrick model is commonly displayed as a 4-level pyramid. The base, level 1, is demonstrating a reaction to learning. This includes "Were the learners satisfied?" Level 2 asks if learning took place with a change in knowledge,

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skills, or attitudes. Level 3 demonstrates a change in behaviors and effect on clinical practice, and level 4 evaluates the effect on the system, patients, or organizational practice.[11] Although it may be difficult for programs to develop an evaluation to address all 4 domains, many programs stop at level 1 without consideration of more robust levels of evaluation.[12] The key to a robust educational evaluation is in clearly defining the educational evaluation to be used at the outset and striking a reasonable balance between the evaluation and feasibility.[9,13] Although reading the articles in this oncology scan, we challenge the readers to think about the evaluation frameworks used here and within their own research to advance the rigor of radiation oncology education studies.

An Update on Developments in Medical Education in Response to the COVID-19 Pandemic: A BEME Scoping Review: BEME Guide No. 64[14]

Summary

This BEME review was a "rapid" systematic review designed to highlight the response of medical education community to the COVID-19 pandemic, the effect of this response, and collate lessons learned by implementation of these changes.[14] The review built on a previous BEME review with the same search strategy and objectives completed early in the pandemic (December 2019-May 2020).[15] This review followed the Arskey and O'Malley stages of a scoping review[16] and examined literature published between May 1 and September 19, 2020. Four databases (MEDLINE, Embase, CINAHL [Cumulative Index to Nursing and Allied Health Literature], and PsychINFO) were included in the study, searched using PubMed and a hand search of MedEdPublish. Studies in any language were included if they described medical education interventions related to COVID-19 and involved any level of medical learner from medical student to physician and the continuum of undergraduate to continuing medical education. Studies without evaluation or studies included in the prior systematic review (BEME 63) were excluded.

In the study, 12,627 records were identified by search of the databases and 31 from the hand search. After screening and application of inclusion criteria, 127 reports were identified. In addition, 50.4% of the studies were from North America (46.5% United States, 3.9% Canada), and 5 of the studies were international collaborations. Of the 127 studies, 51 (40.2%) were in UME, 41 (32.3%) in GME, and 22 (17.3%) in CME. There was a broad number of participants in the studies ranging from 5 to 30,000, with one-third of studies having 100 or more subjects. Reports covered a wide range of disciplines with the most common being surgical subspecialties (17), general surgery (10), pediatrics (10) emergency medicine (8), and 22 spanning multiple disciplines. Only 1 study included discussed an educational intervention in radiation oncology in the UME setting.[17]

Nine focus areas were identified (number of studies in parentheses); a description of pivot to online learning (58), simulation or training for patients with COVID-19 (24), assessment (11), well-being and metal health (8), telehealth (5), clinical service changes to support pandemic response (4), medical school and residency application process changes (4), service provision (2) and faculty development (2). A pivot to online learning was the most topic reported on in UME (31/51) and GME (20/41) studies. The majority of CME studies focused on simulation or training for care for patients with COVID-19 (14/22).

With respect to the evaluation of intervention on learning outcomes (effectiveness) the overwhelming majority (99/127) focused on level 1 Kirkpatrick outcomes (reaction to learning/learner satisfaction) and 73 of 127 on level 2, with 26 describing a change in attitudes and 47 changes in knowledge or skills. Changes in behaviors (Kirkpatrick level 3) were reported in 2 papers, with 7 noting level 4 outcomes (6 change in organizational practices, 1 change in clinical outcomes). Only 1 simulation article reported on all 4 levels of Kirkpatrick's outcomes.[18]

Commentary

BEME review 64 builds on BEME review 63,[15] a similar review earlier in the pandemic both with the shared purpose of describing medical education research related to COVID-19 and highlighting strengths and gaps to direct future scholarship. Not surprisingly, there was an increase in COVID-19 educational scholarship between May and September 2020 (127 articles identified with approximately 30 articles/month) compared with the earlier review completed between December 2019 and May 2020 (49 articles total, with the first articles appearing in March and approximately 20 articles/month in April and May). As noted by many, academic productivity expanded through the past 2 years, and undoubtedly, if this review was repeated in 2022, there would be an exponential increase of research in this field.[6,19,20]

This review identified a paucity of articles in radiation oncology with only 1 article describing a virtual radiation oncology elective in radiation oncology.[17] Three additional articles highlighted the effect of the pandemic on surgical oncology fellowship application and interview processes,[21-23] and 1 article highlighted the pivot of a medical oncology curriculum to online delivery.[24] This is not to say there has been an absence of radiation oncology scholarship in COVID-19 medical education literature, but does reflect trends early in the pandemic. Many journals devoted full or part of issues to articles related to the pandemic, and in October 2020, the *International Journal of Radiation Oncology • Biology • Physics* published a COVID-19–focused issue, with a number of medical education articles ranging from UME to CME.[1-3,17,19,25] Medical education literature

in radiation oncology is growing but still has significant room to expand compared with other disciplines,[26-28] and the effect of the pandemic on medical education research in radiation oncology represents a significant scholarly opportunity.

This review highlighted several gaps in research. First, although a significant number of articles discuss a transition to online learning, many only report on the pivot from in-person learning to online synchronous formats and few detailed novel approaches to delivery. As we move forward and transition to sustained online learning, educators should challenge themselves not to just pivot but to consider if unique educational approaches are required to address learning needs and rigorously evaluate the outcomes. In this review the bulk of articles were within the realm of UME or GME. Less research was done in CME, and where CME was explored, most studies were related to COVID-19 training and simulation. With the prolonged duration of the pandemic, many CME events and conferences went online and the need for novel approaches to delivering CME was heightened.[3] Several professional societies, including ASTRO, capitalized on social media platforms for delivery of CME content.[29] A silver lining of virtual meetings is improved flexibility of conference attendance, at reduced cost of time and money, improving diversity of attendees. There may be unique areas of research on the effect of these changes in the realm of diversity, equity, and inclusion. Additionally, virtual CME has led organizers to explore novel ways to recreate networking virtually which may be another opportunity for scholarship. There was a notable absence of articles (2 in total), focusing on faculty development. Although faculty have been charged during the pandemic to pivot their instruction and assessment very little research has been done in this realm. To empower faculty to continue to address the challenges of the pandemic we must not only note best practices but evaluate the best methods for education and disseminate this knowledge broadly.[5] Finally, the pandemic has had a profound effect on the well-being of health care professionals.[30] Only 8 of the 127 articles looked at related educational research in this domain and hence represents a unique and untapped opportunity. Taken altogether, this review identified at least 4 unmet research needs that could be explored with application to radiation oncology including implementation and evaluation of novel online learning approaches, effects of virtual CME, pandemic effects on faculty development, and learner and faculty well-being.

With respect to evaluation, the vast majority of studies only looked at level 1 of Kirkpatrick's hierarchy. The phenomena of only examining a reaction to learning is noted throughout the medical education literature.[12] Although acknowledging that all 4 levels of evaluation are not always feasible, or even desirable, pushing forward through the pandemic, medical education researchers should work to purposefully develop evaluation strategies that move beyond a sole reaction to learning. The article by Cheung et al[18] highlighted within this review expertly reflected on all 4 levels and could serve as a template for radiation oncology researchers looking to advance educational evaluation.

Pivot to Online Learning for Adapting or Continuing Workplace-Based Clinical Learning in Medical Education After the COVID-19 Pandemic: A BEME Systematic Review: BEME Guide No. 70[31]

Summary

In this BEME analysis authors performed a rapid, high-quality review of literature focusing on adaptation to online learning for continuing workplace-based clinical learning in medical education as a result of the pandemic.[31] This analysis builds on BEME Guide 63 and 64.[14,15] There are 2 additional follow-up publications that focus on adaptation of traditional classroom learning to an online format,[32,33] whereas here the focus is on transition of education delivered in the workplace or clinical setting, analogous to the effect on clerkship students and residents in radiation oncology.

This analysis followed similar search strategies as reported in BEME 64.[14] Databases were searched for records between January and December 2020. In addition, 11,111 records were identified by search of the databases and 23 from the hand search. After screening and application of inclusion criteria, 55 reports were identified addressing learning adaptations deployed to continue workplace-based clinical learning, the effect of these innovations on learners, and why these specific methods were used by educators. The publication of these articles increased significantly throughout 2020, with only 10 studies from January to June and 45 studies published July to November. Most publications were original research articles (60%) or brief reports or innovations (27%), and they were largely (69%) published in specialty-specific journals over education focused journals (30%). Most of the articles detailed interventions in UME (69%) with GME noted in 27%.

Eight focus areas were identified. These included a description of the following (number of articles in parentheses): adaptation to online learning (33), online simulation (9), remote clinical interactions mostly orientated to telehealth (8), remote multidisciplinary ward rounds (6), remote adaptation of multidisciplinary team meetings (2), and live-streaming of surgery or procedures (1). There was 1 radiation oncology specific article which reviewed the Radiation Oncology Virtual Elective Rotation (ROVER) program using remote image contouring and case review using archived images.[17] The vast majority of studies (86%) focused on Kirkpatrick level 1 outcomes, 27 % noted level 2a (change in attitudes) and 31% of studies documented level 2b (changes in knowledge or skill). No studies noted level 3 or 4 outcomes.

Commentary

In this systematic review the authors performed a detailed review of all published literature pertaining to the pivot to online learning for traditional workplace delivered education, highly pertinent to radiation oncology. Due to the rapid production of this work throughout the pandemic the authors executed this project from inception to completion over 15 weeks ensuring this publication remained relevant and contained the latest publications.

The vast majority of articles were noted in the UME setting. Although senior medical students have been affected by the pandemic with a transition away from workplace learning, residents spend most of their education in such settings. Unique adaptations of programs, specifically radiation oncology residency programs to meet the needs of clinical learning during the pandemic would be a potential untapped area for research.

As online learning has become widely accepted, we must focus to ensure not only is the formal curriculum encompassed but seek to incorporate informal teaching and that from the hidden curriculum. This includes unstructured time for free-flowing inquiries, engaged discussion, and learning that happens as a result of active feedback. Learners reported in several studies the advantage of feedback in virtual encounters, including live confidential feedback, which allowed them to adapt during an encounter, in addition to standard debriefing. When using online platforms, a main barrier to learning is limited interactivity between teacher and student as found by Bastos et al[33] in a review evaluating solutions, enablers, and barriers in clinical medical education. In the virtual format, an authentic learning environment needs to be created which stimulates the student to think critically and communicate effectively to adequately prepare them for in-person encounters.

The majority of articles identified in this study were a reaction to the pandemic and not purposeful planned educational interventions. Likewise, similar to BME 64, with respect to evaluation, most research focused on learner satisfaction and evaluation rather than higher levels of evaluation. Although the single radiation oncology experience identified in this study made efforts to evaluate both the reaction to learning and learners' perceptions of knowledge acquisition, a robust description of curriculum design and educational underpinnings was absent.[17] The trends noted were likely secondary to the rapid adoption of online learning with ongoing evaluation and adaptation, in contrast to the standard evidence-based development of medical education resources before implementation. Although this was understandable given the circumstances of the pandemic, it is critical moving forward that we do not assume our current online-learning models represent best practices but seek to critically evaluate and continue to improve.[6]

In summary, there has been a significant increase in the publication of learner experience in the online pivot to previous workplace-based education, but there is a critical need to publish more in-depth research pertaining to the methodology and framework of the virtual learning environment to maximize engagement and effectiveness. The full details of materials, educational content and methods are needed so others can effectively recreate these learning environments, as online learning will continue to grow far beyond the pandemic days.

Effect of Transitioning to an Online Course: A Report From the ESTRO Gyn Teaching course[34]

Summary

With the evolution of magnetic resonance imaging–based image-guided adaptive brachytherapy for the treatment of cervical cancer, European Society for Therapeutic Radiology and Oncology (ESTRO) created a teaching course in 2004 to support training and dissemination of this technique. In 2011 the program was expanded to also include advanced external beam radiation therapy techniques.[34] From 2004 to 2018 this program evolved into a 5-day live program containing 41 hours of educational content. This was 80% synchronous activities with participants and faculty engaging in person (2/3 lectures and 1/3 hands on) and an additional 20% including contouring and treatment planning homework.

The 2020 course, planned for September in Portugal, was converted to an online format due to the pandemic. The online course was composed of 38 hours total, not significantly different from 41 hours in 2019. The synchronous sessions were decreased from 33 hours to 12 hours, largely as a result of previous lectures (21 hours) switched to the "homework" category. Of the now 26 hours of homework done at the participant's convenience, there were 8 hours of mandatory lectures, 8 hours of optional lectures, and 2 hours of clinical videos. The 8 hours of contouring and treatment planning homework was unchanged between the in-person and online course. The interactive sessions of the program were only decreased by 1 hour in the online format, from 11 hours to 10 hours, largely preserving the interactivity between faculty and participants.

Results of participant pre- and postcourse questionnaires from the in-person programs between 2013 and 2019 were compared with participants from the 2020 online course. In the first year of the online program participant numbers were similar to previous years but there was a high proportion from outside of Europe (28% vs mean 18%). There were 6 webinars included in the online program, of which 69% of registrants attended at least 5 webinars. Fifteen percent of registrants (n = 14) attended 0 to 1 webinar, of which 6 of these registrants were radiation therapists. Of the mandatory lectures before interactive webinars, 21% of participants viewed all lectures, and

an additional 22% viewed at least 75% of the required content. With respect to optional lectures, 86% of participants viewed at least one of them, with the mean number being 7. Almost all participants rated the online course as excellent (43%) or good (53%) and the overall satisfaction was similar between online and in-person courses (4.4/5 for online and 4.6/5 in-person).

Commentary

This article details a practical transition to online learning specific to radiation oncology. The transition to an online course resulted in not only comparable attendance in year 1 midpandemic, but expanded the geographic diversity of attendees and also increased the number of nonphysician participants. This demonstrates the opportunity for future online courses to improve accessibility of training in advanced radiation therapy techniques for learners in a wide variety of settings.

A number of alterations to the prepandemic course format were made to facilitate online learning. The movement of traditional in-person lectures to work before interactive sessions used the flipped classroom model.[35] This was also used by Kim et al[35] for medical student education in radiation oncology during the pandemic. When lectures, which often contain one-way dialogue, are completed in advance, this frees "in-person" time for more collaborative and interactive learning sessions. Here participants can actively engage educators to discuss and build upon educational content reviewed in advance. Although integrating the concept of flipped classroom, the authors do little more to highlight the underlying educational principles that resulted in the altered online curriculum. This points to the need for robust descriptions of purposeful educational interventions so work can be translated to other programs.

Although a decrease in lecture attendance in a virtual environment may not be surprising, the additional 20% increase in homework completion for the online course is notable. This is likely related to participants' self-assessment that information provided in recorded lectures was already known, as they had prior experience with brachytherapy; however, completed homework was used in interactive sessions and permitted feedback with opportunity for improvement. Participants' ability to prioritize the learning objectives important to them and tailor lectures to new information may lead to improved engagement.

Evaluation of this program was by means of user satisfaction. Promisingly, the online format resulted in the same overall satisfaction as did the live course. As with the prior articles in this oncology scan it is notable that this speaks to evaluation at an entry level. Experiences of other programs that have transitioned from in-person to online learning such as the anatomy and radiology contouring bootcamp, note expanded evaluation frameworks including reaction to learning and acquisition of knowledge.[36] Application of more rigorous evaluation is laudable and could be expanded in future online courses.

An important component to courses similar to this include simulation learning with hands on experience. Although simple skills such as suturing may be feasible for medical students from home, advanced techniques such as brachytherapy for radiation oncologists have limitations. Although hands on learning can never be completely replaced, this is a space in which learning using virtual reality technology can maximize the effect of an online course.[37]

In conclusion, the transition of the ESTRO advanced radiation technique course for cervical cancer to an online format resulted in increased accessibility to a more diverse group of learners and allowed participants to tailor asynchronous content to their needs and maximize learning in synchronous sessions. The flipped classroom model has been used to some degree in radiation oncology residencies as trainees' study topics independently and then have interactive sessions with their faculty following patient encounters. However, little targeted research has been done to explore the benefits of such transitions using established educational evaluation frameworks.

A Framework for Assuring the Safety, Training, Evaluation, and Wellness of Radiation Oncology Residents During the COVID-19 Pandemic[38]

Summary

The pandemic has dramatically altered the delivery of radiation oncology residency education. The Assuring the Safety, Training, Evaluation, and Wellness of Radiation Oncology Residents During the COVID-19 Pandemic (ASTEROiD-COVID19) framework describes a stepwise shared decision-making model involving radiation oncology faculty and residents that was used to develop policies to define modified roles and expectations during the pandemic.[38]

The 5 components of this implementation framework model are discussed in detail:

1. Identify: In this component, changes in the phase of the pandemic are ascertained. This relies on clinical judgment, public health directives, and hospital guidance.
2. Discuss: This involves congregation of the steering committee to assess current risks, identify priorities for response, and develop policies.
3. Document: In this component, a comprehensive policy draft is created and uploaded to the online repository for reference.
4. Implement: The committee considers how to communicate changes for maximum uptake, uses multiple modalities to increase effect, and seeks out feedback.

5. Revise: The steering committee ensures that policies reflect shifting priorities as dictated by the present clinical situation and ensures that feedback is incorporated.

The model was implemented across various phases of the pandemic, which the authors characterized as the presurge phase, the peak phase, and the postsurge or plateau phase. The presurge phase described the increasing risk of health care provider exposure or infection secondary to increasing case numbers and heightened uncertainty. The peak phase was the volatile peak of infections, during which uncertainty in the expected total number of cases and the effect on the local health system is highest. Maintaining the integrity of clinical care while ensuring provider safety is prioritized during the peak phase. The postsurge or plateau phase was a subsequent decline and plateau in the number of new cases, allowing for a careful resumption of clinical services that had initially been curtailed.

These framework components are discussed through various practical considerations. These include clinical responsibilities and safety of residents, a description of the team-based model used at the center, aspects of training and evaluation and resident wellness and accountability. Throughout this publication, the authors describe how use of the ASTEROiD-COVID19 framework at their center allowed for continued resident output, adaptation of educational programs, and maintenance of a zero COVID-19 infection rate among their residents.

Commentary

The authors of the ASTEROiD-COVID19 framework thoughtfully articulate their own experience at the London Health Sciences Centre in Ontario, Canada to assist radiation oncology residency programs in modifying clinical and educational duties to ensure the safety, training, evaluation, and wellness of their residents during the pandemic. A key aspect of this framework is the ability to rapidly redirect and implement activities in parallel with the ever-changing pandemic landscape. This fluidity enables a more restrictive approach to be taken during periods of heightened uncertainty, while a relaxation of measures can be implemented during times of infection decline or plateau.

An additional strength of this publication stems from attention to the empirical aspects of implementation. Useful insights regarding execution are presented throughout the article such as considerations regarding vacation restrictions, technical approaches, and methodologies for intradepartmental communication. For example, they describe the use and maintenance of an online central repository to allow for access to up-to-date pandemic policies as well as communication across multiple platforms to facilitate improved policy awareness and uptake. These "pearls" provide other programs with necessary insights regarding framework implementation.

An underlying theme of this framework lies in fostering a sense of community within the department inclusive of residents, faculty, and departmental leadership. Prior studies have identified matters of isolation and vulnerability as being central to the wellbeing of trainees during the pandemic.[39] This framework attempts to address these risks and ensure that all members of the department are included in each component of the framework, with a priority for inclusion of opinions. Additional study is required to refine approaches to maintain resident well-being through the ongoing pandemic and any future disruptions in resident education.

At a high level, this article exemplifies the use of a conceptual framework and its role in medical education research. Conceptual frameworks represent the theoretical underpinnings of a study.[9] They can be used to thoughtfully define research and illuminate concepts while allowing others to apply and expand on research.[40] Many articles fall short in educational rigor when these frameworks are absent and are conversely strengthened with their presence.[9,40] By outlining a clear framework, this article provides a thoughtful, step-wise approach to mitigate the effects of the pandemic and lessons that can also be extrapolated to other sources of resident education disruption.

Professional and Psychological Effects of the COVID-19 Pandemic on Oncology Residents: A National Survey[41]

Summary

A French national prospective survey was developed in response to training and administrative disruption as rapid hospital reorganization was implemented in response to the pandemic.[41] A working group composed of residents, senior clinicians, and psychologists organized and validated a novel questionnaire targeting residents in medical and radiation oncology to better understand the potential professional and psychological effects on training and wellbeing. Thirty-nine questions were constructed covering 3 distinct themes: respondent demographics (n = 11), professional effect (n = 15), and psychological effect (n = 13). Anxiety and depression symptoms were assessed using the Hospital Anxiety and Depression Scale,[42] and subjective quantitative variables were assessed using a virtual visual analog scale[43] from 0 to 100. Multiple subgroup analyses were additionally conducted with respect to gender, year of residency, medical specialty, hospital type, and geographic COVID-19 incidence area.

The completed survey was administered online using the *SondageOnline* (Zurich, Switzerland) survey platform. It was accessible for 10 days between May 4 and May 14, 2020, approximately 2 months after COVID-19 was officially declared a pandemic by the World Health Organization on

March 11, 2020.[44] Outreach and recruitment for participation was conducted via email, website, and social media.

Two-hundred and twenty-two respondents (range, 24-33 years of age) participated in the questionnaire, representing approximately one-third of the medical and radiation oncology residents training in France at the time. Of the respondents, 55.9% identified as female, and 52% of respondents were medical oncology trainees, 31% radiation oncology, and 16% specified oncology without subspecialty. Five survey participants practiced outside of oncology. Distribution across year in residency was nearly balanced but slightly weighted toward mid- or senior-level trainees with 66.7% of respondents in years 3 to 5 of the 5-year training schedule. Respondents primarily served in cancer center (44.6%) or public university hospital (31.1%) settings. Also, 36% of respondents were geographically designated within 1 of the 3 most affected regions within France, although it is not explicitly indicated how those regions were geographically defined or the threshold designating high- versus low-incidence as applied.

Furthermore, 31.5% of residents had been reassigned to provide clinical care in a different department, the majority (82%) of whom reported doing so voluntarily. Also, 64.8% of respondents managed patients having COVID-19 in some capacity. Although 94.4% of respondents reported having access to personal protective equipment (PPE), 30.5% described the equipment as inadequate in type or quantity. In addition, 41.8% of respondents received hygiene training regarding their PPE, and 41.3% of respondents experienced decreased research activity due to the pandemic, while research activity remained unchanged for half (50.2%). In contrast, 88.7% of respondents experienced decreased training activity. Also, 70.4% or respondents reported being confronted with ethical issues during the pandemic, 60.7% of whom cited suboptimal cancer care as the underlying context. When asked about the quality of supervision received during the pandemic, mean and interquartile range visual analog scale scores were 61.0 (interquartile range, 35) with 0 being lowest quality and 100 being highest quality.

In addition, 23.3% of respondents indicated feelings of psychological distress. Nearly identical proportions of respondents reported feeling exhausted from work (36.1%) or felt that work had been emotionally overwhelming (36.4%). Among those reporting prior use of tobacco, alcohol, and/or psychostimulants, 31%, 24%, and 29% indicated increased consumption, respectively, during the pandemic. Also, 24.8% reported that during the pandemic their physical health affected the ability to work. Hospital Anxiety and Depression Scale analysis classified 32% of respondents as anxious and 17% as depressed. Only 4.4% of all respondents indicated seeking out psychological support during this early phase of the pandemic.

On subgroup analysis, medical oncology residents were more frequently reassigned, faced longer working hours, more frequent night shifts, and reported less free time for personal life. Radiation oncology residents reported greater effect on research activity and greater discomfort managing patients with COVID-19. Residents training in a cancer center environment were more frequently reassigned and more frequently increased alcohol consumption compared with other home organization types. Residents in the last 2 years of training were more frequently reassigned, were more comfortable handling COVID-19 patients, felt they had better adapted to the pandemic disruption, and had more time in their personal life compared with trainees in their first 2 years.

Commentary

Hilmi et al[41] provide early accounting of the multidimensional effect of the pandemic on wellbeing in clinical oncology residents across France. In describing the work explicitly as pertaining to the first peak of the pandemic, the authors provide rapid and proactive recognition of both the scope of unprecedented burden on resident trainees in medical and radiation oncology, as well as the prolonged scale of the pandemic yet to unfold. The study investigators probe potential professional and psychological effects on resident wellbeing amid major administrative reorganization and disruption to the clinical training experience, including reduced educational activity, and the necessity for greater flexibility in sustained practice outside of one's specialty area.

Professional effects described in the French national survey are echoed in similar works concerning oncology residents in the United Kingdom[1] and the United States,[25] and similar multinational initiatives are ongoing to better understand individual perceptions of the pandemic effect on postgraduate medical training.[45] A consistent underlying theme across the professional considerations most frequently identified reflects an unmet need for adequate preparation or available sustained mechanism for guidance as resident trainees take on new roles and responsibilities in clinical care, both inside or outside the setting of their primary specialty. The majority of respondents in Hilmi et al reported inadequate training regarding proper PPE hygiene, ethical conflict primarily regarding suboptimal cancer treatment and caregiver support, and majority perception of potential negative effects affecting patient care, research, and training. These novel pandemic-driven concerns are a significant burden to bear, conceivably having disproportionate effect on earlier-cycle clinical trainees. The consequent direct toll on psychological wellbeing is evident. Yet, despite noted incidence of psychological distress, emotional exhaustion, physical health effects at work, and increased consumption of tobacco, alcohol, and/or psychostimulants, only 4.4% of all respondents indicated seeking out psychological support during the early phase of the pandemic.

These findings suggest utility for a broader programmatic support system designed to not only provide resources for self-health and wellbeing, but to ensure awareness of such resources and proactively encourage their adoption.

Additionally, proactive individual-level engagement in mentorship capacity should be considered the most effective means to facilitate a supportive environment and stabilizing presence to mitigate progression from at times unpreventable professional upheaval to damaging physical, emotional, and psychological distress. It is further incumbent at individual, programmatic, and organizational levels to instill a culture in which trainees are emboldened and encouraged to raise immediate issue via well-defined and accessible channels when ethical conflicts or concerns over suboptimal care arise.

These data represent a valuable snapshot capturing some of the earliest effects of the pandemic on clinical training in the oncology setting. The study highlights several troubling effects on resident psychological wellbeing, but nevertheless informs a growing body of knowledge to guide corrective and mitigating strategies moving forward. Innovations specifically targeting resident wellbeing are an important silver lining that should ultimately serve both in preparation for managing future large-scale disruptive events as well as serve to enhance individual wellbeing in the normal course of training.

Conclusions

The COVID-19 pandemic has brought a transformative opportunity to draw disciplines together and learn from each other, to embrace new technologies, capitalize on learning networks and highlight new areas of research. This oncology scan has highlighted the response of the medical education community to the pandemic, noting areas of potential new research including online learning, CME, faculty development, and learner and faculty wellness. By noting oncology specific examples, we have highlighted the need for new upcoming initiatives to commit to best practices in medical education integrating conceptual frameworks and robust evaluation strategies. As the pandemic settles into new phases, educators are encouraged to purposefully design interventions in a proactive as opposed to a reactive fashion. By building on the work of others we can use this moment as a catalyst for new educational scholarship within radiation oncology, and beyond.

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