ROECSG
RADIATION ONCOLOGY EDUCATION COLLABORATIVE STUDY GROUP

THIRD ANNUAL SPRING SYMPOSIUM

"EDUCATION FOR THE FUTURE OF RADIATION ONCOLOGY"

MAY 15, 2020

CHICAGO, ILLINOIS

2020 SYMPOSIUM CHAIR
EMMA FIELDS MD, VIRGINIA COMMONWEALTH UNIVERSITY

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2020 ROECSG Spring Symposium Program

SYMPOSIUM SCHEDULE

9:00 – 10:00 CDT: Coffee and Zoom Networking

10:00 – 10:10 CDT: Welcome Remarks and Introductions - Emma Fields MD

10:10 – 10:15 CDT: Report on the First Two ROECSG Annual Symposia - David Rosenberg MD

10:15 – 12:00 CDT: Oral session #1 "Tele-Education – COVID and Beyond"

Moderators: Steve Braunstein MD PhD and Jill Gunther MD PhD

12:00 – 1:00 CDT: Lunch, networking, and asynchronous oral presentation viewing

1:00 – 1:05 CDT: Update from ARRO - Chelain Goodman MD PhD

1:05 – 1:10 CDT: Update from ADROP - Emma Fields MD

1:10 – 2:40 CDT: Oral session #2 "Live Education Post-COVID"

Moderators: Rachel Jimenez MD and Raphael Yechieli MD

2:40 – 2:55 CDT: Break

3:00 – 3:30 CDT: Keynote address "Professional Identity Formation"

Speaker: Laura Hirshfield PhD
Assistant Professor of Medical Education and Sociology
University of Illinois at Chicago

3:30 – 3:40 CDT: Keynote Discussion/Break

3:40 – 5:10 CDT: Oral session #3 "The Profession"

Moderators: Erin Gillespie MD

5:10 – 5:15 CDT: Closing remarks - Daniel Golden MD MHPE

Keynote Speaker

Laura Hirshfield PhD

"Professional Identity Formation"

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Laura Hirshfield PhD is an Assistant Professor in the Department of Medical Education and a faculty affiliate in the Department of Sociology at the University of Illinois at Chicago. She received her Ph.D. in Sociology from the University of Michigan and her B.A. from Swarthmore College, where she studied Sociology/Anthropology and Education. In her work at UIC, Laura works closely with a variety of trainees, including undergraduates, medical students, residents, faculty, and graduate students (both in Health Professions Education and in Sociology). A sociologist and ethnographer by training, Laura is broadly interested in social interaction, identity, education, science, work/organizations, and medicine. Her research centers on gender and other forms of inequality in academic and clinical settings, particularly in the natural sciences and medicine. As a result, her workplace is basically her fieldsite! Her main research includes studies focusing on the "hidden labor" undertaken by and expected of members of marginalized groups in the workplace, cultural competence (broadly defined) in medical contexts (particularly related to trans patients), and socialization (especially regarding communication and emotions) in medical school.

Report on the First Two Annual Symposia for the Radiation Oncology Education Collaborative Study Group

Presenter: David Rosenberg
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David M. Rosenberg BS [1], Steve E. Braunstein, MD PhD [2], Emma C. Fields MD [3], Erin F. Gillespie MD [4], Jillian R. Gunther MD PhD [5], Rachel B. Jimenez MD [6], Raphael L. Yechieli MD [7], Daniel W. Golden MD MHPE [8]

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Purpose: The Radiation Oncology Education Collaborative Study Group (ROECSG) is an international collaborative network founded in 2013 with a primary goal of improving radiation oncology education. ROECSG hosted the first two annual spring symposia in Chicago in June of 2018 and May of 2019. This report summarizes the proceedings of these two symposia including an overview of presentations and an analysis of participant feedback.

Approach/Methods: Two one-day symposia were held consisting of oral presentations, perspectives from leadership of national organizations related to radiation oncology education, poster presentations (year two), and a medical education keynote speaker. Post-symposia surveys were distributed and collected from attendees at both symposia. All research talks were recorded, and most were made available online.

Results/Outcomes: In total, there were 112 attendees (36 in 2018 and 76 in 2019) representing 5 countries and 64 institutions at the first two ROECSG symposia. Attendees represented diverse backgrounds including attending physicians (46%), residents (33%), medical students (14%), physicists (2%), nurses (1%), and program coordinators (1%). A total of 55 oral presentations (22 in 2018 and 33 in 2019) were presented. Recordings of 53/55 (96%) presentations were subsequently posted online with a mean of 34 total views per year. On post-symposia feedback surveys, 90% of attendees rate the symposium as improving their knowledge of radiation oncology educational scholarship, 98% feel the symposium provides the opportunity to receive feedback on radiation oncology education scholarship, and 99% feel that the symposium facilitates collaborative radiation oncology education projects. ROECSG was rated higher than professional organizations in fostering educational scholarship ($p<0.001$). All attendees reported that the ROECSG symposium produces new ideas for radiation oncology education scholarship and provides a unique networking opportunity.

Discussion: The first two ROECSG Spring Symposia identified the need for a dedicated venue for the presentation and discussion of radiation oncology educational scholarship subsequently provided one outlet for that need. Post-symposia surveys indicate that many attendees feel that ample opportunities to present radiation oncology education scholarship do not currently exist, and that the ROECSG Spring Symposia successfully helped to fill that gap.

Significance: The first two ROECSG spring symposia drew a diverse population of attendees from a variety of backgrounds while providing unique opportunities for attendees to present education scholarship on topics related to radiation oncology. Based on positive attendee feedback and increasing numbers of attendees from 2018 to 2019, the organizing committee plans to continue to host the ROECSG symposium as an annual event.

ORAL SESSION 1:

TELE-EDUCATION – COVID AND BEYOND

High Yield Physics Video Series (Hi-Phy) Pilot for Radiation Oncology Trainees

Presenter: Gabrielle Peters
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Oral Session #1

Gabrielle W Peters MD [1], Holly Lincoln MS [1], Xaoli Tang PhD [1], Todd Atwood PhD [2], Derek W Brown PhD [2], Jay Burmeister PhD [3], Eric Ford PhD [4], Titania Juan PhD [2], Suzanne B Evans MD MPH [1]

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Purpose: The American Board of Radiology (ABR) radiation physics written exam for radiation oncology (RO) medical residents has been controversial because of a recent substantial failure rate, which is a top concern among trainees (Kahn, 2019). Critics cite the heterogeneous quality of physics education, the lack of preparation materials for this exam, and the high cost of currently available materials. With the ABR's commitment to the ASTRO Physics Core Curriculum as the framework for the exam, the once limited preparation materials for this exam can be meaningfully expanded. The High Yield Physics (Hi-Phy) initiative aims to develop and disseminate a pilot series of free, high value, dynamic, case-based, and illustrative videos specifically for RO residents. Funding is sought from the Yale Poorvu Center for Teaching and Learning and RSNA (decision in Spring 2020).

Approach/Methods: A multi-institutional team of 7 medical physicists, a RO resident and a radiation oncologist, Yale Poorvu Center for Teaching and Learning, and Yale broadcasting department has been assembled. There will be 4 videos in the Hi-Phy pilot with ultimate expansion goal of 10-15 videos. The hosting website's data will track views and posted comments. A combination of validated survey tools (Davis 1989, Persico 2014) to assess the following indicators of user-acceptance of the e-learning: perceived ease-of-use, usefulness, actual use of the e-learning and effectiveness. These questions will be created in collaboration with pedagogical experts at the Poorvu. Likert scale responses on the tool regarding: comprehensibility, format, perceived ease of use, usefulness, and duration will be sought from users. Graphic design experts will ensure that the pilot is visually engaging.

Results/Outcomes: The data collected will be analyzed to evaluate the interface used, depth and scope of material covered. We hypothesize that the Hi-Phy video series will be used by a third of US radiation oncology trainees, whether as a preparatory lesson for institutional lectures or a review for those studying for board examinations. We aim to satisfy the broad audience of radiation trainees, but with radiation physicists as the primary content creators, our primary goal is to provide quality board preparation for the ABR physics examination.

Discussion: Hi-Phy is a unique program that is expected fill a felt need of current trainees. By presenting physics material in a case-based and interactive format stimulating ongoing retrieval practice, we anticipate participants to be more engaged with high rates of concept retention. Using pilot project feedback, Hi-Phy will adapt topic depth and video production.

Significance: The Hi-Phy initiative will address educational, access, and financial barriers to successful ABR physics board preparation.

References:

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RadOncReview.org: Working Toward an Online, "Evergreen" Radiation Oncology Clinical Education Platform: A Collaborative Effort.

Presenter: Jeff Ryckman
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Oral Session #1

Jeff Ryckman, MD MSMP [1], Michael J Baine MD PhD [1], Toms Vengaloor Thomas MD [2]

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Purpose: It is challenging to keep up with the pace of information in cancer care. Until recently, real-time resources were scarce in Radiation Oncology. The development of free, online resources such as QuadShotNews, econtour.org, and RadOncTables have recently emerged to provide dynamic tools to stay abreast of the latest developments in our field. We believe it is possible to maintain an actively updated collection of clinical trials through a contributing audience to place evidence at the fingertips of busy practitioners.

Approach/Methods: From 2016-2019, a process was developed to objectively present findings from clinical trials, while translating commentary and opinions from the thought leaders in our field. Resources such as ASCO and ASTRO guidelines, ASTRO Refreshers, RadOncQuestions.com, Essentials of Clinical Radiation Oncology, and the resources mentioned above were compiled and linked appropriately. A consistent outline format was applied to all disease sites. Summary boxes were written to drive home clinical pearls. Read by QXMD was procured as a critical resource for discovering landmark studies, with journals followed including but not limited to Advances in Radiation Oncology, Annals of Surgical Oncology, British Medical Journal, Brachytherapy, British Journal of Cancer, Cancer, Cancer Medicine, Clinical Oncology, European Journal of Cancer, European Urology, IJROBP, JAMA Oncology, JCO, JGO, JTO, Lancet Oncology, NEJM, PRO, Radiation Oncology, Radiotherapy and Oncology, and Urology. After the backbone of more than 500 pages of Google Documents had been compiled, RadOncReview.org was built the week of ASTRO 2019 to provide a landing page and mission statement. Business cards were then handed out, and a Twitter account (@RadOncReview) was launched for marketing. Collaboration was encouraged by allowing all users to suggest changes on all documents without requiring a login. Google Analytics was utilized to provide data on visitors to RadOncReview.org, which was supplemented by a manual review of commentary on Google Documents to gauge audience participation.

Results/Outcomes: Since launching RadOncReview.org on 9/15/2019 (Tuesday of ASTRO), there have been 797 unique site visitors from 30 countries, averaging 52 individual site visitors per week. Since presenting at ACRO in February, there have been two consecutive record-setting weeks in March of 2020, averaging 100 unique weekly site visitors. Contributions, however, have been limited. Within 13 unique documents, there have been 51 suggested edits that were accepted. Only 8 of these edits added new content, while the remainder focused on syntax and formatting changes.

Discussion/Significance: Capturing unique weekly users appears to be sustainable in the short term. However, a participating audience is difficult to enlist. We welcome input from ROECSG for improving this resource and making it available to all the residents as part of their educational resources.

Assessment of Contouring Practices and eContour Use Among US Radiation Oncologists: A Mixed Methods Study

Presenter: Elaine Cha
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Oral Session #1

Elaine Cha BS [1], Jeffrey Brower MD PhD [2], Michael V. Sherer MD [3], Daniel W. Golden MD MHPE [4], Susan Chimonas PhD [1], Deborah Korenstein MD [1], Erin Gillespie MD [1]

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Purpose: While there are multiple contouring aids and established peer review processes, significant discrepancies in contouring practices remain across the United States [1]. This study aims to understand contouring strategies used by US radiation oncologists, focusing on physician- and organizational-level factors that affect final contour quality. Secondly, we will assess the clinical impact of eContour, a 3D image-based website designed to improve access to evidence-based contouring information. With >50% of US radiation oncologists registered [2], we will explore how and why physicians use eContour to improve it for practicing clinicians.

Approach/Methods: This is a mixed methods study with a sequential explanatory design. A survey was deployed on February 20, 2020 to a random sample of 500 practicing US radiation oncologists recruited from the IQVIA database. Survey items cover demographics, contouring support tools, and contouring quality assurance (QA) practices. eContour users are also asked about platform usage, while non-users provide impressions following a brief introduction. Strategies to improve response rates include mixed modality deployment, prenotification, noncontingent incentives, and personalized correspondence [3]. Post-survey formal qualitative interviews will explore response nuances and quality improvement (QI) tool usability. Quantitative data (including website analytics) will be analyzed with descriptive statistics and logistic regression to assess influencing factors in relation to survey responses. Quantitative and qualitative data will be integrated for significance enhancement.

Results/Outcomes: Preliminary results (n=78) revealed that contouring questions are most commonly addressed with RTOG/NRG atlases, another radiation oncologist, or a radiologist. Respondents who reported no access to disease site specialists (n=22) were less likely to work in academic institutions ($P<0.01$), urban communities ($P=0.01$), or NCI-designated cancer centers ($P<0.01$). Of those with established peer review (n=77), 45% reported having contour-specific processes prior to the rest of treatment planning. The most commonly identified areas for peer review improvement include case selection and reviewer specialization. Limited time was the primary barrier to optimizing contour quality.

Discussion: The cohort provides credible representation of the workforce, as determined via face validity testing against the 2017 ASTRO Workforce Survey [4]. Preliminary results suggest that resource use and access varies by both physician- and organizational-level factors. Most (91%) identified areas in which peer review could improve, displaying a potential need to re-evaluate the current process and its implementation. Completed study results will further illuminate practice variations across the country.

Significance: Findings may provide greater insight regarding contouring strategies employed by US radiation oncologists, highlighting potential obstacles that perpetuate discrepancies in the field. This will guide development of contouring-related QI tools and implementation strategies. As the field moves towards an increased emphasis on QA practices (as evidenced by inclusion of peer review documentation in the RO-APM), a better understanding of current practices will aid in laying a foundation for next steps.

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Development and Feasibility of an Online Anatomy and Radiology Contouring (ARC) Bootcamp for Radiation Oncology Residents

Presenter: Leah D'Souza
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Oral Session #1

Leah A D'Souza [1], Jasbir Jaswal [2], Paige Eansor [3], Zahra Kassam [4], Eric Leung [5], Anthony Nichols [6], Madeleine E Norris [3], Manas Sharma [7], Andrew Warner [8], Katherine Willmore [3], David A Palma [8]

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Purpose: Modern radiation oncology practice relies on three-dimensional, multi-modality imaging for target and organ-at-risk delineation. Cross-correlation between patient anatomy and cross-sectional imaging is now an essential skill for trainees. We previously developed the Anatomy and Radiology Contouring (ARC) Bootcamp - a comprehensive three-day educational "Bootcamp" for radiation oncology residents, to address curriculum gaps resulting from the lag between curriculum adaptation and technological advances in radiation therapy. Acknowledging the importance of accessibility to education, an online version of the course was developed. Herein we describe the ARC Bootcamp curriculum and its adaptation for online learning.

Approach/Methods: The ARC Bootcamp was designed by a multidisciplinary team through an evidence-based approach. Piloted in 2011 - 2012 as a single-institution study (1-3) and guided by the results of a national Canadian survey (4), the inaugural ARC Bootcamp launched in 2013. Each iteration incorporated several modifications adjusted to the needs of learners, informed by residents' quantitative and qualitative feedback (5). Day one encompasses anatomic-site based modules including: thorax, head and neck, and hippocampus. Radiologists and radiation oncologists concurrently review cross-sectional imaging and high yield treatment planning cases. Residents are encouraged to simultaneously practice contouring structures individually using EduCase contouring software, which are combined for consensus discussions and feedback. Residents also interact in small groups with anatomists to review cadaveric prosections tailored for oncological clinical correlates. Day two, structured similarly, covers the base of skull and oropharynx/larynx/hypopharynx. Finally, day three covers the anatomic sites of the abdomen and pelvis, inclusive of contouring principles for cervical brachytherapy. In 2019, the in-person ARC Bootcamp was extrapolated to an online version using 'Teachable' - an online course building platform. The online course offers similar content to the in-person comparator; however, anatomy videos have been newly created to highlight key structures on cadaveric prosections, in place of the in-person kinesthetic gross anatomy component. The online course navigation is structured in a linear progression of locked modules, inclusive of discussion boards, quizzes and EduCase contouring.

Results/Outcomes: Since 2013, the in-person Bootcamp has been attended by over 300 radiation oncology trainees from centers internationally. From November 2019 to March 2020, 134 new participants who had not previously attended the in-person course enrolled in the online Bootcamp, representing 24 countries. When compared to the in-person format, online students complete the course at a slower pace: the average course progress of online students is 22%, with a projected time to course completion of 9-12 months.

Discussion/Significance: Development of an online ARC Bootcamp has been feasible, with high levels of interest internationally. Students complete the online, on-demand course much more slowly than the in-person course. Future studies will assess the levels of knowledge retention (via ongoing pre- and post-testing), comparing the online and in-person Bootcamp, and student satisfaction with each course.

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Development of a Pilot Head and Neck Contouring and Plan Evaluation Telehealth Curriculum for Existing Radiation Oncology Centers in the Philippines

Presenter: Laurence Henson
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Oral Session #1

Laurence Henson MD Candidate Class of 2021 [1], Benjamin Li, MD, MBA [2], Hannah Rees, MD Candidate Class of 2023 [1]

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Purpose: Radiotherapy providers in low-middle income countries (LMICs) face challenging scenarios across disease sites, where cancer cases are far from standard and limited imaging and diagnostic availability may create scenarios not clearly covered with available guidelines. For these cases, access to educational mentorship and specialist perspectives may improve the disease-site specific knowledge of radiation oncologists. The most desired area for improvement in the Philippines is head and neck cancers.

Approach/Methods: Rayos Contra Cancer (RCC) is a non-profit organization that provides support to international radiation therapy programs through networks of experienced radiation oncology professionals throughout the United States. We are piloting a live online Head and Neck Contouring and Plan Evaluation (H&N CPE) curriculum for radiation oncology training programs in the Philippines. The H&N CPE curriculum involves a longitudinal series of 14 mixed didactic/case-based sessions using Zoom video conferencing. Sessions incorporate ProKnow DS™, a cloud-based PACS and data analytics platform, to provide live feedback on contouring and shared cases for plan evaluation, and lectures focused on practical skills. Standardized assessments include confidence on a 5-point Likert scale for contouring (5 questions) and plan evaluation (6 questions), and self- vs. expert-physician critiques on plan quality for self-submitted cases. Assessments are conducted before initiation and after completion of the curriculum.

Results/Outcomes: We recruited seven of eight (87.5%) academic centers that offer radiation oncology residencies in the Philippines to participate. Each center is composed of approximately twelve radiation oncology attendings, five residents, and four medical physicists, managing ten head and neck cancer cases per week. The educator team for the H&N CPE curriculum includes eight head and neck radiation oncology specialist educators, two radiation oncology residents, and three dosimetrists, collectively from nine different United States institutions. Complete pre-curriculum assessment data is currently being collected.

Discussion: In radiation oncology, certain training topics are not globally available among residency programs, necessitating alternative means to accrue adequate knowledge and experience. For clinics where gaps exist, a H&N CPE curriculum is a low-cost and feasible strategy to support specialized skill development and education. Furthermore, for the first time, the incorporation of cloud-based case sharing allows real-time mentoring and feedback, an important step towards developing innovative telehealth models.

Significance: By answering the call for specialized training, we may promote better care for the rising number of cancer cases in LMICs. Whereas radiation oncology fellowships are not available in the Philippines and are expensive to obtain from foreign institutions, longitudinally conducted remote educational sessions can provide high-quality supplementary training to radiation oncology professionals in these settings. The design, implementation, and assessment methods for this radiation oncology education model can be adapted to benefit other contexts.

References:

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A Simulation Based Medical Education Tool for the Advancement of Quality and Safety Training in Radiation Oncology

Presenter: Molly Havard
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Oral Session #1

Molly E Havard [1], Eric Ford [1], Matt Nyflot [1], Jing Zeng [1], Gabrielle Kane [1], Matthew Greer [1], Pehr Hartvigson [2], Patricia Sponseller [1], Ashlee Schindler [1], Meghan Macomber [3], Matthew B Spraker [4]

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Purpose: Though quality and safety activities (Q&S) are an essential part of Radiation Oncology (RO) practice, many RO trainees have limited exposure to important Q&S concepts such as root cause analysis (RCA). According to recent national surveys, many are unsatisfied with their training. Few resources exist to teach Q&S concepts and techniques, which compounds the problem. Simulation-based medical education (SBME) has become popular in medical education and offers interactive and experiential learning. We aim to improve resident Q&S education by developing and testing a SBME platform offering interactive cases of safety events in RO.

Approach/Methods: The simulations developed here consist of guiding the learner through a standardized RCA process, using case studies based on specific events relevant to RO practice. The simulation was implemented on a web-based SBME platform built on ACR Cortex software in partnership with a grant from the ACR (American College of Radiology). The SBME platform and simulation was pilot tested through a group of stakeholders, and plans were developed for a multicenter pilot study to include RO and medical physics residents from 6 US institutions, program directors from participating institutions, and early career practicing Radiation Oncologists. Participants will complete a 2-part case of a misadministration of palliative, 3D conformal spine irradiation. The case guides learners through an incident learning report and root cause analysis using standard techniques, such as a fishbone diagram.

Results/Outcomes: The SMBE platform was tested and refined by the pilot stakeholder group, and will be deployed in a pilot study in Spring 2020. The plan for further testing includes the following endpoints: pre- and post-simulation knowledge-based tests and analysis of learner interactions during the simulated RCA. A subset of participants will be invited to participate in grounded theory structured interview study to obtain participants' evaluations on current Q&S education, the case, and SBME usability.

Discussion/Significance: This innovative SBME platform offers learners in RO an opportunity for interactive experiential learning in Q&S. Since the platform is web-based, it is available to a range of RO providers in academic and community practice with a low barrier to entry. The pilot study will inform future development of the SBME platform and cases. Ultimately, the platform may enhance learning and empower RO professionals to serve as collaborative and innovative leaders in Q&S and patient-centered care.

Virtual Medical Student Elective in Radiation Oncology in the Era of Covid-19

Presenter: Jenna Kahn
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Oral Session #1

Jenna M Kahn MD [1], Emma C. Fields MD [2], Loise Wairiri MBBS [1], Rachel B. Jimenez MD [3], Barb Agrimson [1], Kristi Tonning MS, RT(T) [1], Monica Kishore MS [1], Charles R. Thomas MD [1], Daniel W. Golden MD MHPE [4], Ravi A. Chandra MD, PhD [1]

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Purpose: With the advent of COVID-19 global pandemic, many medical schools ceased or curtailed clinical rotations for students. This left medical students with limited to no access to clinical rotations in the hospital. We sought to create a temporary elective in response to the restrictions on medical students by a virtual elective. The purpose was to allow medical students to obtain some exposure to the field of radiation oncology through a hands-on approach, which included asynchronous lectures, contouring assignments and synchronous educational activities including a presentation and final examination.

Approach/Methods: Medical students in their third and fourth year clinical rotations were enrolled in this 2-week course (average 48 hours total of course related work). The students spent initial time learning from prerecorded Radiation Oncology Education Collaborative Study Group (ROECSG) and Introductory Radiation Oncology Curriculum (IROC) lectures on the field of radiation oncology and its technical basis. Subsequent days focused on de novo sub-discipline lectures targeted specifically to medical students with hands on exposure to contouring of 8-10 patients through discrete cases formulated for this purpose. These contours were reviewed and discussed with the course directors. Students also reviewed online radiology modules and participated in departmental educational meetings such as contour rounds and chart rounds. A final exam and presentation on a subset of radiation oncology concluded the course. Participant questionnaires were administered before and after the 2-week course to assess baseline characteristics and outcomes.

Results/Outcomes: Multiple medical students were able to be reached through this novel instructional mechanism and are currently completing the first virtual rotations. Data is being collected. We expect to have a demonstrable increase in medical student knowledge by the end of the 2-week virtual radiation oncology elective.

Discussion: This virtual medical student elective was initiated in response to COVID-19 and represents an important educational resource for medical students with an interest in radiation oncology. Though this virtual rotation is not intended to replace a formal in-person elective, educational strategies that are necessary due to COVID-19 may be used to augment the educational experience for students completing in-person rotations in the future. Other virtual learning opportunities may be enabled within Radiation Oncology. This experience will help to maintain the number of students interested in oncology and, specifically, radiation oncology.

Significance: This virtual rotation can be readily implemented at any institution and may decrease barriers to learning about radiation oncology at some medical schools without an academic program in radiation oncology. This may also provide a model on which to develop virtual visiting rotations during COVID-19. Virtual visiting rotations may reduce barriers to "away" rotations even after COVID-19 that may contribute to both racial and gender disparities in radiation oncology.

ORAL SESSION 2:

LIVE EDUCATION – POST-COVID

A Hands-on Image Verification Workshop for medical and physics residents - Multi-Institutional Update.

Presenter: Laura Padilla
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Oral Session #2

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Purpose: The purpose of this work is to present the multi-institutional results of an image verification workshop designed to promote interprofessional collaboration between medical physics (MP) and radiation oncology (RO) residents.
Approach/Methods: A curriculum on pre-treatment setup image registration and verification was created based on Dr. Jane Vella's 4Is (Vella, 2008). This two-part training was given at 7 institutions between 2018 and 2020. The format of the workshop, didactic materials, and evaluation tools were consistent between the 7 programs, except for the addition of some free-response questions to the pre and post surveys after piloting the materials at the home institution and one other. The workshop comprised 2 parts, part 1 included a pre-activity survey and a lecture, part 2 included a hands-on portion and a post-activity survey. The hands-on activity consisted of 5 patient cases, varying in treatment site and technique. All participating institutions chose their own patient cases for this portion of the training. Surveys contained both free-response questions on image verification and interprofessional education activities in residency as well as self-reported comfort levels (from 1-least to 10-most) on assessing the appropriateness of imaging orders (A) and independently checking films (B). Participants filled out the surveys, and pre- and post-self-reported comfort ratings were paired for analysis using a 1-tailed t-test with α=0.05. Free-response questions were analyzed using thematic analysis methods.

Results/Outcomes: Fifty residents participated (38RO and 12MP). Self-reported scores for the group ($\mu\pm SD$) significantly increased for (A), 5.5±2.2 pre-activity to 7.1±1.6 post-activity ($p<0.001$), and (B), 5.1±2.3 to 6.8±1.5 ($p<0.001$). Separate RO and MP analysis showed significant increases (Δ) in ratings for both groups ($\Delta A,RO$= 1.8±1.7, $p<0.001$, $\Delta B,RO$= 1.9±1.7, $p<0.001$ $\Delta A,MP$= 1.1±1.4, $p=0.012$, $\Delta B,MP$= 1.2±1.6, $p=0.016$). For ROs, correlation between self-reported ratings and PGY pre-activity was moderate ($rA=0.67$, $rB=0.66$) and decreased post-activity ($rA=0.62$, $rB=0.54$). All correlations for MPs were weak ($r<0.49$). From open-ended responses, prior image verification training was mostly unstructured, with extent of exposure varying by program and attending; some state having received no prior training. Time constraints were identified as the main barrier for learning. The IPE aspect of the workshop was found to be a useful way to incorporate different perspectives into the process. 49/50 participants expressed feeling improved confidence, knowledge and/or skills regarding the topic. Half of the participants indicated wanting more practice on image registration and verification

Discussion: Overall, participants of this workshop found the training useful and it helped them feel more comfortable with the process, although repeat examples are needed to keep confidence levels high. Additionally, this exercise did not allow us to assess competence, which could be addressed with a more comprehensive image verification training platform.

Significance: This curriculum fills the current gap in resident education for image registration and verification.

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Development and Implementation of an Educational Simulation Workshop in Fiberoptic Laryngoscopy for Radiation Oncology Residents

Presenter: Jeremy Price
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Oral Session #2

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Purpose: Fiberoptic laryngoscopy (FOL) is a critical tool for the diagnosis, staging, assessment of treatment response, and detection of recurrence for head and neck (H&N) malignancies. No standardized recommendations exist for procedural FOL education in radiation oncology. We therefore implemented a pilot simulation workshop to train radiation oncology residents in pertinent H&N anatomy and FOL technique.

Approach/Methods: A two-phase workshop and simulation session was designed. Residents initially received a lecture on H&N anatomy and the logistics of the FOL exam. Subsequently, residents had a practical session in which they performed FOL in two simulated environments: a computerized FOL program and a mannequin-based practice. Site-specific attending physicians were present to provide real-time guidance and education. Pre- and post-workshop surveys were administered to the participants to determine the impact of the workshop. Subsequently, postgraduate year (PGY)-2 residents were required to complete six supervised FOL exams in clinic and were provided immediate feedback.

Results/Outcomes: Annual workshops were performed in 2017-2019. The survey completion rate was 14/18 (78%). Participants ranged from fourth year medical students (MS-4) to PGY2-PGY-5 residents. All PGY-2 residents completed their 6 supervised FOL exams. On a 5-point Likert scale, mean H&N anatomy knowledge increased from 2.4 to 3.7 (standard deviation=0.6, $p<0.0001$). Similarly, mean FOL procedural skill confidence increased from 2.2 to 3.3 (standard deviation=0.7, $p<0.0001$). 100% of participants found the exercise clinically informative.

Discussion: A simulation-based workshop for teaching FOL procedural skills increased confidence and procedural expertise of participating radiation oncology residents and translated directly to supervised clinical encounters. Adoption of this type of program may help to improve resident training in H&N cancer.

Significance: Simulation based medical education in radiation oncology may be effectively utilized to teach complex clinical procedures for which training would otherwise be impractical outside of direct patient care. Beyond the scope of this course we are therefore designing additional simulation based medical education activities in the department, in particular for interstitial prostate brachytherapy.

Evaluation of a 3D-Printed-Head Simulation Technique for Teaching Flexible Nasopharyngoscopy to Radiation Oncology Residents

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Oral Session #2

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Purpose: Simulation-based medical education (SBME) is an effective tool for medical teaching, but SBME deployment in radiation oncology (RO) is limited and primarily applies to communication or treatment planning. Flexible nasopharyngoscopy (FNP), an essential skill for RO residents, requires practice that typically occurs in outpatient clinics on volunteer patients, introducing the potential for stress and discomfort. We sought to develop a high-fidelity simulator and intervention that provides RO residents the opportunity to develop FNP skills in a low-pressure environment.

Approach/Methods: CT images were utilized to create an anatomically-accurate 3D-printed model of the head and neck region. An intervention incorporating didactic instruction, multimedia content, and FNP practice on a 3D-printed model was designed and administered to RO residents attending the Anatomy and Radiology Contouring Bootcamp. Participants completed detailed pre- and post-intervention evaluations (5-point Likert scale; range: 1-5) of model fidelity and effectiveness of the training session, and self-assessments (10-point scale) of FNP skill and confidence performing FNP clinically. Participants were video-recorded performing FNP pre- and post-intervention. Videos were scored by a blinded observer based on a pre-defined rubric (10-point scale). Changes in scores self-reported confidence were evaluated using the Wilcoxon signed rank test.

Results/Outcomes: Twenty-four participants from 17 institutions and 4 countries completed both pre- and post-intervention evaluations, 50% were female, and the majority were senior residents (Postgraduate year (PGY)-2 (n=1); PGY-3 (n=6); PGY-4 (n=12); PGY-5 (n=5)). Post-intervention FNP confidence improved significantly (mean ± SD: 1.8 ± 1.8 on a 10-point scale; $P < 0.001$) and FNP performance improved significantly (2.2 ± 2.0; $P < 0.001$). Participants felt the model was helpful (mean ± SD: 4.2 ± 0.6 on a 5-point scale), anatomically correct (4.1 ± 0.9), and aided in spatial comprehension (4.3 ± 0.8). Overall satisfaction with the intervention was high (4.3 ± 0.8). Participants felt a positive learning environment was created (4.8 ± 0.4) and strongly agreed the intervention should be integrated into RO training programs (4.3 ± 0.8).

Discussion: A 3D-printed model and associated intervention were effective at improving FNP performance and the teaching method was rated highly by participants. RO residents may benefit from broader dissemination of this technique to improve trainee performance.

Development and Implementation of an Advanced Medical Student Elective in Oncoanatomy

Presenter: Christina Huang
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Oral Session #2

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Purpose: Radiation oncology is a specialized field, often felt to be too specific or technical for the current medical school curriculum and virtually unrecognizable to many medical students despite the fact that over half of cancer patients require radiation treatment (1) (2). We developed and implemented an oncoanatomy elective that serves as an introduction of radiation oncology through the instruction of anatomic oncology.

Approach/Methods: Based on oncoanatomy courses for Duke University medical students and residents (3) (4), an advanced oncoanatomy elective for third and fourth year medical students at Indiana University School of Medicine was developed with the intent of widely introducing radiation oncology as an important part of cancer therapy. The course depends on the effective delivery of both clinical oncology information through contour rounds, readings, and discussion sessions in addition to the teaching of spatial anatomic relationships through surgical observation and cadaveric dissection. After one month, the medical student should know basic treatment strategies, the natural history of locoregional spread, and anatomic structures at risk due to cancer progression or neoplastic therapy for some common cancers. A post-elective evaluation using 5-item Likert scales and free response to rate curriculum components will be administered to students. On an annual basis, changes to the program structure will be made to improve quantitative measures based on qualitative feedback. Future directions are to design and implement a pre- and post-test assessment of curriculum content.

Results/Outcomes: From 2018 to 2020, fifteen students, from Indiana University (IU, n=13) and Marian University (MU, n=2), completed the oncoanatomy elective. IU students received cadaver gross anatomy instruction; in its place, MU participants observed additional surgeries. As of March 2020, seven IU students are registered for the oncoanatomy elective in the upcoming academic year. Student evaluations of the course are being collected and scored. We hypothesized that students, including those interested in primary care, who take the oncoanatomy elective will find the curriculum useful to their future careers. Preliminary analysis of n=9 IU evaluations revealed that 100% of students rated the overall quality of the elective as ""good"" (n=2) or ""excellent"" (n=7) and 88.9% ""strongly agreed"" (11.1% ""agreed"") that clear learning objectives were received.

Discussion: Given the multidisciplinary nature of cancer patient care, it is crucial that graduating medical students have a basic knowledge of cancer diagnosis and treatment. Based on a nationwide assessment of medical student education, most students receive a fragmented curriculum in cancer with many never taking a clinical rotation in oncology (5); our course may help minimize this educational gap.

Significance: This study is necessary to help elucidate the challenges in teaching medical students the basics of oncology, specifically radiation oncology, and to put anatomy in the perspective of cancer growth and spread."

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Reversing the Radiation Burn(out) in a Radiation Oncology Residency Program: Reflections on the Past Three Years of a Pilot Wellness Program

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Purpose: Radiation burns may be of historical concern, but burnout is a huge contemporary problem. Medical physician burnout in particular has been identified as a major issue, affecting nearly half of practicing physicians in the United States [1]. Burnout is defined as the triad of emotional exhaustion, ineffectiveness, and depersonalization [2]. Radiation oncologists are subject to the same stressors driving physician burnout in general and emotional exhaustion is of particular concern. Thirty-nine percent of oncology physicians reported experiencing symptoms of burnout in 2019 [1]. Residents may be especially vulnerable to burnout due to factors such as inconsistent teams, a steep learning curve, and work hour demands. In the oncology setting, other contributors include the frequent experience of giving bad news and lack of time to grieve patient losses or acknowledge the emotional impact of cancer patient care. The goal of this project was to evaluate the need for and establish a new radiation oncology wellness initiative.

Approach/Methods: Radiation oncology residents at our institution were surveyed to identify interest in a new wellness initiative and gather perspectives on key components of this initiative that would best support resident wellness. Residents and faculty members within our department worked collaboratively to establish key elements of the program.

Results/Outcomes: The tangible outcomes of the residency wellness program thus far include dedicated funding for healthy snacks in the resident room, funding for monthly resident wellness outings, website promotion of resident wellness initiatives, a wellness workshop presented at the Society for Integrative Oncology meeting co-led by a resident and faculty member from our institution [3], and departmental funding for the new "Radiation Oncology Reflection Rounds" series, modeled after the national Schwartz Rounds platform [4].

Discussion: The implementation of the resident wellness initiative at our institution has had a positive impact on the resident culture. The healthy snacks are now a staple part of the resident room. Our monthly wellness events have featured baby showers, holiday gatherings, and sports watching events. These events have allowed us to foster caring relationships among residents. This wellness initiative has positively integrated into the supportive departmental culture.

Significance: It is feasible to establish a new resident wellness program in a radiation oncology department. This ongoing wellness initiative has had a positive effect on resident culture. We hope that this initiative will help address the issue of trainee burnout within the field of radiation oncology and serve as a model for other institutions hoping to implement similar wellness initiatives.

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The Impact of a Multidisciplinary, 3rd-year Oncology Elective Rotation on Decisions to Pursue Oncologic Careers and Oncology Exposure: The University of Cincinnati Experience

Presenter: Bailey Nelson
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Oral Session #2

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Purpose: The majority of multidisciplinary oncologic care is provided in the outpatient setting, yet at many medical schools the dominant means of exposure occurs during inpatient rotations. Given the inherent multidisciplinary nature of the specialty, radiation oncology departments are well positioned to lead multidisciplinary outpatient oncology rotations within medical schools. Since 1992, the University of Cincinnati's Department of Radiation Oncology has administered a two week, 3rd year clinical elective that exposes students to most oncologic disciplines (medical oncology, surgical oncology, radiation oncology, pediatric oncology, and pathology). This study evaluates the impact of this rotation on oncology exposure and ultimate career choice over the last 10 years.
Approach/Methods: A list of medical students who participated in the MS3 clinical oncology-specific elective rotation from 2008 to 2018 was reviewed. A search engine was used to identify all physicians' medical specialty choices and their current location of practice. The American Society for Radiation Oncology's (ASTRO) and American Society of Clinical Oncology's (ASCO) website directories were used to obtain e-mail addresses for all physicians with oncology practice. A survey of six questions was distributed to the physicians to evaluate how the rotation influenced the students' oncology exposure and ultimate career choice.

Results/Outcomes: Two-hundred forty-four medical students participated in the 3rd year Clinical Oncology Specialty Clerkship from 2008 to 2018. Thirty-eight students (15%) ultimately pursued oncologic subspecialties and contact information was found for 32 (84%) for survey. The overall survey response rate was 78% (n=25). Eighty-eight percent of the physicians had a positive to very positive experience with the rotation. The rotation was the first clinical exposure to the field of oncology for 48% of the respondents and the first exposure to the field of radiation oncology for 69% of the physicians. Seventy-two percent of the oncologists attributed their 3rd year rotation as providing a moderate or great deal of early exposure to the field of oncology. The number of students who participated in the clerkship who ultimately matched into radiation oncology is 28 (11.5%). Ten of the 244 students (4.1%) matched into other oncologic specialties.

Discussion: Radiation Oncology Departments should be well positioned to lead multidisciplinary, ambulatory, oncology electives within US medical schools. An oncology-specific rotation introduces third-year medical students to the ambulatory setting of oncology care, which they may not be exposed to otherwise. These rotations provide all students with valuable clinical exposure to oncology disciplines and may shape their ultimate career choice. A majority of participating oncologists viewed the rotation positively and attributed the rotation with their entrance into oncologic subspecialties.

Significance: An ambulatory, multidisciplinary oncology-rotation is feasible to administer within a radiation oncology department and may provide vital clinical exposure to students interested in oncology based subspecialties.

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Recommended ESTRO Core Curriculum for Radiation Oncology/Radiotherapy 4th edition

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Purpose: In 2017 it was decided to revise the European Core Curriculum for Radiation Oncology/Radiotherapy to produce a 4th edition. The aims of the ESTRO 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.

Approach/Methods: A wide range of stakeholders including National Society representatives, trainees, recently appointed specialists, members of the European Union Medical Specialists Radiotherapy section, an RTT, a radiobiologist, a physicist and lay members from ESTRO staff developed and commented on iterations of the curriculum.

Results/Outcomes: The 4th edition is based on the CanMEDS 2015 framework and identifies 14 Entrustable Professional Activities (EPAs) and the competencies required to perform these. The manager role is replaced by competencies related to leadership. The levels of proficiency required for tumor sites is defined as levels of EPAs.

Discussion/Significance: It is hoped that the inclusive method of developing the 4th edition has resulted in a document that will have utility in the wide range of environments in which radiation oncology is practiced in Europe.

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ORAL SESSION 3:

THE PROFESSION

Factors that promote medical student interest in Radiation Oncology: A survey of Canadian Radiation Oncology Residents

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Oral Session #3

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Purpose: The field of radiation oncology (RO) has experienced large fluctuations in the number of applicants to residency programs in recent years. A pan-Canadian recruitment strategy may help cultivate a strong and consistent interest among medical students. Before resources can be allocated, it is important to understand the modifiable factors which influence entry. The objective of this project is to identify factors (i.e. "enablers and barriers") that motivate prospective medical students to apply to RO.

Approach/Methods: A survey was developed to characterize RO enablers and barriers as perceived by current RO residents. A literature review identified factors known or hypothesized to impact medical student choice of specialty. An existing conceptual framework of why medical students choose primary care was used as the backbone of the survey. The framework was modified to remove items specific to primary care, and to add items with particular relevance to RO or specialty medicine. The survey was circulated to Canadian and United States experts in medical education within RO for refinement. The final mixed-methods survey was administered to Canadian RO residents via Program Directors and CARO using the Qualtrics online platform.

Results/Outcomes: Responses were received from 68 of 123 current Canadian RO residents (55% response rate). The majority of respondents were aged 25-29 (68%), male (63%), at the R1-R2 level (51%), and originally from a large urban centre with a population >500,000 (54%). Residents reported most commonly learning about radiation oncology during medical school clinical rotations (21%), from faculty mentors (18%), and from preclinical coursework (16%). Only 23% of students were pre-clerkship when they decided to pursue a career in RO. The factors most strongly motivating interest in RO during medical school were (% rating as very important or extremely important on a 5 point scale): Overall perceived personal fulfillment (95%), clinical rotations in RO (85%), positive feedback from radiation oncologists (85%), perceived commitment to patient care (85%), mentorship experiences (75%), perceived intellectual challenge (68%) and positive feedback from residents (63%). Among lifestyle factors, work hours and schedule were ranked as most important (70%); more than financial compensation (41%), ability to find a job in a location of choice (36%) and prestige (8%).

Discussion: Medical students are most likely to select a career in RO during or after clerkship, suggesting this is a particularly impactful time for exposure to the discipline. Increased preclinical exposure may encourage students to seek clerkship opportunities in radiation oncology. Encouragement and mentorship are particularly important from staff or residents.

Significance: This research will inform potential strategies to both recruit and retain medical students for careers in radiation oncology. The research group intends to conduct the same survey with U.S. medical students and residents to see if similar factors apply.

Qualitative comparison between radiation oncology attending and resident physicians' perceptions of feedback

Presenter: Timothy Sita
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Oral Session #3

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Purpose: Radiation oncology resident education is dependent on one-on-one interactions between attending and resident physicians. We developed and administered a survey to better understand perceptions of feedback within this educational model.
Approach/Methods: Two similar surveys were developed to assess attending and resident perceptions of feedback across multiple domains, including methods of delivering feedback, quality of feedback received, and quality of feedback delivered. The 21-item attending survey and 23-item resident survey consisted of Likert, multiple choice, and true-false questions. Participants at a single institution were invited to participate via email and the survey was administered electronically in REDCap. Descriptive statistics were used to analyze results.

Results/Outcomes: Ten of ten attendings and seven of nine residents completed the survey. Residents most often received feedback verbally during patient encounters while attendings most often received feedback via written performance evaluations. Feedback was most often delivered towards the end of a rotation. Eighty percent of attendings estimated spending anywhere from 15 minutes to more than 1 hour delivering feedback per week; however, only 29% of residents reported receiving more than 15 minutes of feedback per week. Most attendings (70%) also reported conducting a formal verbal feedback session at the end of a rotation, but only 14% of residents reported participating in such a session. The majority of attendings (80%) agreed that residents were more receptive to feedback earlier in training. Most attendings (80%) and residents (86%) agreed that feedback provided was implemented. However, the majority of residents (71%) did not feel their own reflections on performance were incorporated into feedback. Forty percent of attendings and 71% of residents reported inflating written evaluations; reasons frequently cited for this practice included preserving the relationship and limiting distress. Only three of ten attendings (30%) and two of seven residents (29%) believed the current system for feedback is effective, with the majority of both attendings (60%) and residents (71%) in agreement that improvements are necessary.

Discussion: Discordance exists between attending and resident perceptions of feedback. There was marked discrepancy with respect to the amount of time spent delivering feedback and the formal opportunity to discuss rotation performance. Although data are limited in radiation oncology, other residency programs report similar findings [1]. The value of written feedback was undermined by report of inflation among both attendings and residents. To our knowledge, this practice has yet to be fully evaluated and requires further study.

Significance: Feedback is a critical component of radiation oncology education. End-of-rotation performance scores were found to be of questionable integrity, with score inflation common to preserve relationships and limit distress. Potential areas for improvement include integration of residents' reflections on their performance and a better defined system for formal feedback.

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2020 Snapshot of Radiation and Cancer Biology Educators of Radiation Oncology Residents and the Courses They Teach

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Oral Session #3

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Purpose: To characterize today's radiation and cancer biology educators of radiation oncology residents, and the biology courses they teach.

Approach/Methods: A 46 item survey instrument was developed and hosted using the Survey Monkey online platform. An e-mail list of 133 presumptive resident biology educators was compiled and invitations sent to participate in the survey. Survey questions were designed to collect information about the educational and academic backgrounds of the educators, how they self-identify, characteristics of the courses they teach, and the value that they, and their departments, assign to their teaching activities.

Results/Outcomes: A total of 67 survey responses were received. Biology educators range in age, academic rank and years of teaching experience from junior (18%) to senior (45%). Currently, only about 40% self-identify as radiation biologists, biophysicists or chemists, compared to 56% in 2001(1). The majority of the others consist of cancer biologists (15%), radiation oncologists (15%) and radiation oncology physician-scientists (16%). Educators prioritize their teaching as important or very important (average of 4.1 on a 5-point scale), yet devote <20% of their time to resident course development and teaching. While their departments acknowledge their contributions to resident education (average of 3.9 on a 6-point scale), they don't assign as high a value to teaching in tenure, promotion or salary decisions (average of 3.4 on a 6-point scale). Biology courses are widely variable in contact hours and have either remained approximately the same or only increased modestly in length over the past 20 years (1), despite the amount of biology knowledge now required of residents nearly doubling over the same time period. About 75% of the courses are team-taught, including 15% involving multiple training programs. Less than half of the educators recommend the ABR content outline as a study aid for residents, or use it for their own curriculum development. An average biology course consists of about 42% foundational ("classical") radiobiology, 28% clinical radiobiology and 28% cancer biology.

Discussion: This study documents the continued decline in the number of biology educators who identify as radiobiologists. They are being replaced by younger cancer biologists and by increasing numbers of radiation oncologists and radiation oncology physician-scientists. The courses they teach have not changed significantly in contact hours in nearly 20 years, and continue to place more emphasize on foundational radiobiology than on its clinical applications or on modern cancer biology.

Significance: That fewer biology educators are radiobiologists by training and their courses have remained quite variable in length and content over long periods point to the need for a detailed, standardized curriculum for resident education in radiation and cancer biology, and other resources and options to assist those educators who lack a background in radiation biology.

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Are Female Radiation Oncologists Still Underrepresented in the Published Literature? An Analysis of Authorship Trends Over the Past Decade

Presenter: Sondos Zayed
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Oral Session #3

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Purpose: We examined whether female authorship, traditionally underrepresented in the radiation oncology (RO) literature, has improved during the past decade, and whether the introduction of double-blind peer review (where reviewers are blinded to author names and vice-versa) improved female authorship rates.

Approach/Methods: We analyzed authorship lists during a 10-year period (2007-2016) from the 2 highest impact-factor RO journals: The International Journal of Radiation Oncology, Biology, Physics (IJROBP) and Radiotherapy and Oncology (R&O). From each journal, 20 articles per year were randomly selected. Gender trends of the first, second, last, and collaborating authors (defined as all other positions), were analyzed. A one-sample proportion test was used to compare US female senior authorship (2012-2016) with the 2015 benchmark for female US academic radiation oncologists (30.6%).

Results/Outcomes: Across 400 articles, the mean standard deviation percentage of female authors was 30.9% 22.0% with 34.8% of first, 36.7% of second, and 25.4% of last authors being female. The total percentage of female authors per year increased from 2007 to 2016 (P Z .005), with no significant increase in the percentage of first (P Z .250), second (P Z .063), or last (P Z .213) female authors. Double-blind peer review was associated with an increase in the mean percentage of female authors (2007-2011: 27.4% vs 2012-2016: 34.0%; P Z .012). The proportion of US female senior authors in the latter period (27.6%) and the proportion of female US academic radiation oncologists (30.6%) were not significantly different (P Z .570).

Discussion: Although the percentage of female authors in RO has increased during the past decade, this did not correspond to a higher representation of women in high-profile authorship positions. Introduction of double-blind peer review was associated with a rise in female authorship.

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Exploring Globalization in the Construction and Implementation of Global Curricula

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Oral Session #3

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Purpose: There is a growing health human resource crisis in cancer care [1] and a mismatch between the training curricula and the needs of patients, families and the health-care system [2]. Given the global nature of this crises, international organizations have focused on developing harmonized training standards or global curricula [3, 4]. These efforts raise the question of how the process for developing global oncology curricula is aligned with their goals [5]. Despite proposed advantages of global oncology curricular harmonization including physician mobility and improving the quality of care the challenges and unintended consequences require greater study. The aim of this study was to problematize the concept and implementation of a global oncology curricula in postgraduate training. We explored, through interviews with international participants, how global oncology curricula are constructed and implemented and their relationship to local contexts of power and culture.

Approach/Methods: Fourteen international participants involved in the development and implementation of global oncology curricula completed in-depth, one-on-one semi-structured interviews lasting 40-60 minutes. Snowball sampling was employed. The participant sample was representative of different geographic regions, genders and professional scopes of practice to ensure diverse perspectives were sought. Through iterative analyses, using an abductive approach, the study team discussed and reviewed the data and made revisions through collaborative analysis to enhance comprehensiveness and to improve credibility. In the final analysis the meaning and implication of the themes were discussed yielding a conceptual analysis.

Results/Outcomes: Our data have articulated 5 key challenges for global curricula including 1) Ambiguous or conflicting perspectives on the purpose and scope of Global Oncology Curricula 2) Insufficient representation of diverse perspectives and realities in the creation of the final curricula 3) A rigid conceptualization of competency requirements 4) A mismatch between the curricular requirements and local context and 5) The influence of power relationships and decision makers. Leveraging diversity, in all its forms including geopolitical, sociocultural and gender, are an approach to mitigating these challenges. This includes fostering representation, addressing power differentials and factoring local contexts and adaptation may be an approach to mitigating these challenges.

Discussion: Global oncology curricula may serve important advocacy roles within the healthcare system. Leveraging diversity may positively impact the common challenges in the construction and implementation of global oncology curricula including mitigating neocolonial effects.

Significance: This study articulates key challenges in the development and implementation of global curricula. Awareness of these challenges is the first step to mitigating them in future efforts to create global curricula. Further, we provide several practical recommendations, by leveraging diversity, to mitigate these challenges.

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Analysis of the Radiation Oncology In-Training Exam Content Using a Care Path Conceptual Framework

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Oral Session #3

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Purpose: The ACR Radiation Oncology In-Training Exam (TXIT) is an annual examination utilized by radiation oncology training programs to assess trainee progress towards clinical competency. While results are reported by disease site, a "care path" conceptual framework may serve as another way to model radiation oncology education. This study hypothesized that the TXIT content analyzed by a care path conceptual framework would demonstrate an imbalance in content domains relative to the proportion of time spent on routine activities in clinical practice.

Approach/Methods: Questions from the 2016-2019 TXIT examinations were categorized by two independent coders into a primary care path category and, if applicable, a subcategory. A third coder independently assessed questions in the case of inconsistent categorization among the primary coders; if all three were discordant the question was deemed uncategorized.

Results/Outcomes: 1200 questions were categorized using a care path conceptual framework with agreement between two independent raters (primary category kappa coefficient = 0.78, subcategory kappa coefficient = 0.79). 343 questions (28.6%) were evaluated by a third independent rater and 78 (6.5%) were ultimately deemed uncategorized. From largest proportion to smallest proportion, the content on the exam is represented as follows: treatment decision (35%), diagnosis (15%), radiation biology (12%), radiation physics (12%), treatment planning (9%), biostatistics (4%), cancer biology (4%), toxicity and management (4%), brachytherapy (2%), quality assurance (1%), research methods (1%), and uncategorized (1%). Questions assessing medical knowledge related to treatment decisions are most represented, with 43% of them testing knowledge derived from randomized clinical trials. Conversely, questions testing skills often used in practice (treatment planning and toxicity management) are underrepresented.

Discussion: TXIT questions are imbalanced with regards to care path content domains, favoring treatment decision questions over treatment planning and toxicity management questions. There is a need to better assess trainee competency in these frequently employed clinical skills. Furthermore, reporting data on trainee skills categorized by both "care path" and "disease site" conceptual frameworks may improve evaluation of competence for clinical practice.

Significance: National organizations responsible for radiation oncology resident assessment (formative and summative) should consider using both "care path" and "disease site" conceptual frameworks when deciding on an appropriate exam content breakdown.

References: DXIT™ & TXIT™ In-Training Examinations. Retrieved from https://www.acr.org/Lifelong-Learning-and-CME/Learning-Activities/In-Training-Exams

ASYNCHRONOUS ORAL PRESENTATIONS

Expanding Educational Opportunities in Global Health for US-Based Radiation Oncology Residents: Preparing Trainees for A Changing World

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Purpose: Radiation oncology residents in the United States (US) have a strong interest in global health. Yet, few programs offer global health education or career development opportunities [1]. The skill-set necessary for global health collaborations, particularly internationally, includes competencies relevant to all residents. These include epidemiology, practice in resource-constrained settings, and effective utilization of distance-based collaboration tools. Thus, we believe that expanding global health education for US-based radiation oncology residents would result in an oncology workforce better prepared for a changing world.

Approach/Methods: Through a collaboration between the Association of Residents in Radiation Oncology (ARRO) and the Association for Directors of Radiation Oncology Programs (ADROP), we propose the development of a global health curriculum available to all residents. The basic didactic portion would introduce global health history, cancer epidemiology, comparative radiation oncology systems, and global health research and service projects. Then, for interested residents, peer-to-peer collaboration between individual residents in the US and an international residency program would be developed. The paired residents could then follow a schedule to review clinical cases, discuss oncology literature, and compare training experiences. Finally, an elective would be available for either a 4-8 week clinical rotation at the partner institution or a distance-based research collaboration, depending upon travel restrictions.

Results/Outcomes: We expect US-based residency programs will report increased global health educational offerings and residents will report satisfaction with global health education and mentorship opportunities. We also expect that more US-based residents will report an interest in global health and that global health skills are useful beyond a dedicated career pathway. More importantly, we believe that radiation and clinical oncology residents in low- and middle-income countries who are involved in partnerships with US-based institutions will report an increase in knowledge of relevant oncology literature and increased access to research opportunities [2].

Discussion: In radiation oncology, the emergence of a new academic career pathway in global health has been described [3]. The growing demand and interest of clinicians will ultimately lead to an established pathway. Training programs are well-poised to create and support a curriculum that is inclusive of global health interests. We anticipate that programs that systematically support global health involvement will prepare the next generation of residents to practice and lead in diverse oncology settings.

Significance: Telehealth interventions have long been an integral tool for global health. Expanding US-resident access to global health opportunities will result in an oncology workforce prepared for flexibility and innovation in the decades to come.

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A Wellbeing Curriculum for Radiation Oncology Residents: Fostering Relationships and Empathy through Art and Literature (Rad Onc REAL)

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Purpose: To decrease feelings of burnout, work exhaustion, and interpersonal disengagement among radiation oncology residents, while enhancing professional fulfillment.

Approach/Methods: A curriculum was developed focusing on topics in radiation oncology training that induce burnout, including imposter syndrome, depersonalization, and lack of work-life balance. Topics were chosen through an informal needs assessment among radiation oncology residents with a focus on humanities, including artwork, narrative medicine, and literature. The curriculum consists of optional monthly small group sessions facilitated by a clinical psychologist, radiation oncology attending, or a Center for Humanities staff member. Informal feedback is solicited throughout the academic year to enable curriculum modification as needed. At the initiation of the course, participants were given a randomly generated identifier. The Stanford Professional Fulfillment Index (PFI) [1] was assessed at baseline and throughout the year at three months intervals. Trends in the PFI will be analyzed after one year, specifically investigating the effects of this intervention relative to postgraduate year, time point during the academic year, clinical workload, and demographic information. After one year, curriculum participants will be encouraged to answer free response questions and participate in a focus group to evaluate change in work satisfaction and self-reported interactions with both patients and coworkers. This information will be used to improve the intervention moving forward.

Results/Outcomes: We hypothesize professional fulfillment can be enhanced, with decreased burnout, work exhaustion, and interpersonal disengagement through delivery of a specifically tailored wellbeing curriculum addressing topics relevant to radiation oncology residents.

Discussion: Burnout affects approximately 50% of both physicians in training and practicing physicians in all specialties, and can lead to inadequate patient care, ineffectiveness professionally, and harm to physicians, including substance abuse, clinical depression, and suicidality. Among French radiation oncology attendings and residents, 63% and 84%, respectively, met criteria for moderate/severe burnout and noted that many were prone to depersonalization and lower personal accomplishment, resulting in depression and sequelae of depression [2]. Levels of emotional exhaustion, depersonalization, and burnout were found to be 28%, 17%, and 33%, respectively, in a survey among radiation oncology residents in the United States [3]. Prospective studies in internal medicine and oncology have reported small-group and humanities-based curricula resulted in improvement in meaning and engagement in work and reduced depersonalization [4] [5]. To our knowledge there are no published interventions addressing burnout specifically among radiation oncology residents.

Significance: Through prospectively collected PFI data and regular feedback, we hope to create a dynamic curriculum to reduce feelings of burnout, work exhaustion, and interpersonal disengagement among radiation oncology residents. If this intervention is successful, we hope to expand our program to include other radiation oncology programs as well as other specialties.

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Qualitative Study of the Electronic Health Record's Impact on Radiation Oncologists

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Purpose: The impact of electronic health record (EHR) use on physicians has been studied in specialties other than radiation oncology. However, there are limited data regarding the impact of EHR use on the radiation oncologist. This qualitative study examined the impact of the EHR on radiation oncologists to determine how radiation oncologists perceive the impact of the EHR on their practice and their relationship with patients.

Approach/Methods: Using constructivist grounded theory with voluntary sampling, individual telephone interviews were conducted with United States radiation oncologists from June to August 2019. Each of the interviews lasted around one hour for each interviewee, and a standardized interview transcript was used with an additional question which allowed interviewees to make comments that were not covered in the standardized interview transcript. These interviews were recorded, directly transcribed, and de-identified. Qualitative analysis was used to create consensus codes and themes based on these interviews, and these codes were applied to each of the interviews in order to generate the results.

Results/Outcomes: Fifteen radiation oncologists were interviewed (six at academic medical centers, nine in private practice). Radiation oncologists expressed similar views regarding the EHR's impact on their practice and the radiation oncology physician-patient relationship. Seven major themes were elucidated from these interviews: 1) the physician experience as a whole, 2) fatigue/burnout, 3) efficiency, 4) administrative tasks, 5) overall attitude to the EHR, 6) work/life balance, and 7) note writing.

Discussion: The radiation oncologists interviewed stated that they enjoyed their career as a physician, which was made easier by using the EHR, but they were frustrated with the additional work that was required to use the EHR. This additional work primarily involved having to write unnecessarily detailed patient notes for billing purposes which they determined was inefficient and time consuming. Solutions proposed by the interviewees included a more user friendly and efficient EHR with less emphasis on note writing that did not improve patient care.

Significance: Solutions proposed from the interview subjects include creating a more user friendly EHR for radiation oncologists and making documentation of patient care more efficient. Further exploration of the EHR's impact on radiation oncologists work satisfaction and their interaction with patients is warranted.

Twitterquette for Radiation Oncologists and Trainees

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Purpose: The use of social media by healthcare leaders has been steadily increasing in recent years. Best practices on using this freely accessible and influential resource have not historically been taught during medical school; however, a growing number of medical schools nationwide are adding content to the curriculum to incorporate best practices around social media use. [1] Radiation oncologists and trainees must consider many factors when using social media. It is a convenient way to stay well-informed of the latest clinical trials and research along with commentary from study authors. It allows for networking even when contacts are great distances away, particularly in light of widespread "social distancing" behaviors and limited travel in the setting of the ongoing COVID-19 crisis. Involvement on Twitter is also a great way to promote a relatively unknown field to medical students and improve education regarding radiation oncology to patients and the lay public. On the other hand, unprofessional-sounding posts from physicians may be seen by the public and reflect poorly on personal and professional character, even if inadvertent. Considering the positive and negative of effects of social media use, our team has performed an initial review of the literature on etiquette and best practices, with our first focus on Twitter as a forum that bridges some of the more fun features of social media platforms with professional aspects.
Approach/Methods: Our team performed a 5-year review of the contemporary literature from 2015 - 2020 for published articles on radiation oncology Twitter etiquette. Finding no specific published literature on PubMed, we then broadened our search to include Twitter etiquette for health professionals and trainees of any specialty. This revealed multiple articles that we are in the process of sorting through. In our initial analysis, we have drawn together themes from articles on Twitter etiquette that may be most relevant to radiation oncology health professionals.
Results/Outcomes: This was not hypothesis-driven research. However, we anticipate that we will find a broad range of advice including everything from basic account setup, to respecting patient privacy, to more practical considerations of how to engage in nuanced point-counterpoint discussions with experts. Thus far, we have drawn together themes from the existing literature that may be of general interest, which we plan to present as a series of "Do's" and "Dont's" regarding Twitter-specific etiquette for radiation oncologists and trainees. We will feature information from the published article by Bibault et al. regarding social media practices for radiation oncologists [2] as well as from a Forbes article by Dr. Miriam Knoll regarding potential pitfalls and barriers for social media use by health professionals and researchers. [3] We will also ensure that participants are aware of existing guidelines from the American Society for Radiation Oncology (ASTRO) regarding social media best practices as well as other available educational content and webinars on social media use. [4,5]
Discussion: Through our initial work, we have found a broad range of literature (primarily opinion blogs and news articles) regarding the topic of Twitter etiquette for health professionals and trainees. We did not find any published scientific literature pertaining to the specific topic of Twitter etiquette for radiation oncologists and trainees, and therefore endeavored to summarize some of the key findings as they most relate to our field. We are planning to also write this up as an opinion piece in a radiation oncology journal.
Significance: Establishing social media best practices will be helpful for radiation oncologists and trainees when engaging with colleagues, patients, mentors, friends, frenemies, and enemies/competitors on platforms such as Twitter. We hope that this can further the professional development of those who attend this session. We also hope to engage the audience in a discussion surrounding the "Do's" and "Dont's" presented to acknowledge (and perhaps even debate) the nuanced areas, as our team understands that this is a highly variable topic depending on who is behind the keyboard or phone screen. We also hope to touch on the broader topics of cyberbullying, maintaining a professional image and brand, and building a diverse network for our radiation oncology audience members.

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Development of a pilot Intensity-modulated Radiation Therapy (IMRT) telehealth curriculum for existing radiation oncology centers in low and middle income countries

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Purpose: Intensity-modulated radiation therapy (IMRT) is a targeted, organ-sparing radiation therapy technique that can reduce the global cancer burden in low and middle-income countries (LMIC), however many cancer centers in LMIC lack the physics and oncology training support required for effective IMRT treatments. The nonprofit Rayos Contra Cancer (RCC) evaluated the efficacy of a pilot IMRT continuing medical education curriculum presented to selected LMIC regional cancer centers via video-conferencing.

Approach/Methods: RCC recruited a global team of IMRT content experts. They developed a 7-week curriculum and recruited 16 participants from 7 regional cancer center partners in LMICs throughout South America. The curriculum included 9 sessions shared via live Zoom® video conferences conducted in English with Spanish translation provided as needed. A lead correspondent was assigned at each participating center. Clinical capability statistics were collected from each center and attendance was taken during each call. After the completion of the course, a final exam was distributed to each participating center, and qualitative data was collected to evaluate the curriculum efficacy and impact.

Results/Outcomes: Clinical capability statistics were collected from 4 public and 1 semi-private center in Bolivia and Argentina. One center reported having 2 linear accelerators, 3 centers had 1 linear accelerator, and 1 center utilized a TomoTherapy® system. Centers each treat 300-600 patients per year using external beam radiation, and have 1-3 medical physicists per linear accelerator and 2-4 radiation oncologists per linear accelerator. Each cancer center had one or more attendees present for at least half of these sessions. Of the 16 participants, 9 completed the final exam, with an average score of 10.1 out of 26. There was no cost associated with providing this training, as course administration was provided by students, physicians, and physicists who served as volunteer educators.

Discussion/Significance: This novel low-cost telehealth model for IMRT training is a promising vehicle for advancing cancer care in LMICs by providing much needed educational support. Attendance records showed active engagement, while post-course qualitative data demonstrated a positive educational impact. Nonetheless, knowledge gaps still exist as evidenced by low post-exam scores and more work is needed. Developing this new model has shown that connecting expert IMRT providers and physicists with their counterparts in LMICs is a feasible method to directly address the need for educational training worldwide.

Mentorship initiatives in radiation oncology: A systematic review of the literature

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Purpose: While mentorship is described extensively in academic medical literature, there are few descriptions of mentorship specific to radiation oncology. The goal of the current study is to investigate the state of mentorship in radiation oncology through a systematic review of the literature.

Approach/Methods: A search protocol was defined according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Predefined search terms and medical subject headings were used to search PubMed for English Language articles published between January 1, 1990 and January 22, 2020 on mentorship in radiation oncology. Additionally, in-press articles from major radiation oncology and medical education journals were searched. Three reviewers determined article eligibility. Included articles were classified based on year and country of publication, experimental design, sample size, mentored participant, type of mentorship, methods of evaluation, outcomes reported, and any limitations.

Results/Outcomes: 12 publications from 2010-2019 met inclusion criteria. The most commonly described forms of mentorship were the dyad (75%), followed by team (8%); two articles did not specify (17%). The most commonly mentored participants were residents (42%), medical students (33%) and attendings (17%); one study did not specify (8%). Most study designs were cross sectional (50%), followed by before/after studies (25%) and cohort (17%). One study did not include an experimental design (8%). Study sizes ranged from 76-532 (cohort), 20-221 (cross sectional), and 23-49 (before/after). While study outcomes varied, common themes included elevating mentee enthusiasm, increasing academic productivity, promoting program satisfaction, and furthering career goals.

Discussion: While few mentorship initiatives in radiation oncology are currently reported in the literature, the present study suggests that these initiatives are successful in promoting career development and increasing professional satisfaction. The interventions overwhelmingly described mentorship dyads meaning other forms of mentorship are either less common or understudied. Most interventions were not evaluated in a controlled setting, and many were assessed using surveys with low response rates, raising concern for selection bias.

Significance: This review highlights rich opportunities for future scholarship to develop, evaluate, and disseminate radiation oncology mentorship initiatives particularly with consideration of multi-institutional efforts.

Patient Communication Training for Medical Physics Graduate Students

Presenter: Laura Padilla
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Purpose: The role of medical physicists in the clinic is evolving and physicists may soon start interacting with patients more regularly. Currently, patient communication training is non-existent in medical physics graduate programs. In this work, we present a patient communication curriculum for graduate students in medical physics.

Approach/Methods: We developed a patient communication curriculum incorporating Kolb's experiential learning theory. The curriculum consists of preparation, lecture, and practice stages. During preparation, graduate students watch 4 short patient testimonial videos and write a reflective piece detailing what they found surprising, challenging, how they think this may affect how they communicate with patients in the future, and any other thoughts they want to share. To give them hands-on experience prior to the lecture so the concepts presented resonate more, the participants undergo individual simulated patient encounters with a standardized patient, followed by a short group debrief. A rubric developed to assess different factors relating to the material and skills presented during lecture will be used to score the participant's performance to obtain a baseline score. After it, the learners attend a lecture (lecture stage) on patient communication strategies, active listening, and cultural competence given by the social workers. The practice stage consists of a second individual simulated patient encounter to apply everything they have learned, followed by a longer group debrief with the standardized patients present to give the group general feedback. Learners are then asked to write a reflection piece on their experience. Pre- and post-training surveys asking for self-reported comfort on patient communication, and the change in the learners' scores on communication skills during the first and the second patient encounters will be used to assess the impact of the training.

Results/Outcomes: We hypothesize that this training will improve both the confidence and the competence of medical physics graduate students regarding patient communication. We also expect this training to provide them with a foundation upon which to expand their patient communication skills moving forward.

Discussion: We expect students who participate in the training to gain knowledge and acquire a practical framework for interacting with patients in an efficient, clear, and empathetic manner. We expect they may be able to put these skills to practice early if we coordinate our efforts with the clinical rotations course they take during their second year of the master's program.

Significance: This training will be the first of its kind in graduate medical physics education. Along with the training already in place at the University of California, San Diego, for medical physicists, this curriculum, or some adaptation of it, has the opportunity to become a roadmap for other programs across the nation on how to teach graduate medical physics students patient communication skills.

Development of an Image Verification Platform for Resident Training

Presenter: Laura Padilla
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Purpose: Accurate patient setup is crucial to modern radiotherapy techniques, especially ones utilizing tighter margins and higher doses-per-fraction. Most commonly, setup quality is assessed utilizing pre-treatment imaging. Despite this, residents in radiation oncology currently get very limited training on pre-treatment imaging registration and review. A curriculum to address this issue was previously developed and assessed (Padilla, 2019). It demonstrated improvement in resident confidence with independently checking verification images, but also showed that repeated exposure to the training is needed to maintain confidence in these skills. To this end, we set out to develop an image alignment platform that can be used for image registration training.

Approach/Methods: For the platform to be successful, we want it to be: 1-easily accessible, 2- comprehensive (wide breadth of treatment sites/ techniques represented, with relevant treatment documents), 3- interactive (allow residents to shift images, adjust window/level, and see the dosimetric consequences of their shifts), 4- collaborative (allow for multiple institutions to add cases), and 5- user-friendly. To achieve these goals, we are currently working with MIM Software, Inc. (Cleveland, OH) on a cloud-hosted platform that can be accessed through a website browser. Once completed, this platform will contain a database of anonymized patient images representing a wide range of treatment sites/techniques. Each patient will have a clinical vignette and the appropriate documents (simulation note, treatment plan, etc.) available to the user for review. Pre-treatment images including port films, orthogonal and single planar kV images, and volumetric cone-beam CT (CBCT) images will be included when applicable. Users will be able to register the images freely. Once they decide on a registration they deem acceptable for treatment, they can check the estimated delivered dose distribution resulting from the selected alignment using the SureCalc Monte Carlo dose calculation algorithm in MIM. This action will display the dose distribution on the CBCT image as well as create a window with a comparison of the original and "delivered" Dose Volume Histogram (DVH). Hence, one can decide on what the "correct" alignment is based on whether they want to prioritize tumor coverage or critical structure sparing.

Results/Outcomes: We hypothesize that such a training tool will improve the residents' confidence and proficiency in image registration and verification.

Discussion: This software package will provide current residents with an avenue to practice and become more proficient at image registration and verification. It will also allow them to gain a deeper understanding of the dosimetric consequences of image alignment.

Significance: This will be the first tool available for residents to practice image registration and verification in a platform exclusively designed for educational purposes. This platform will fill a current gap in our residency training and help trainees be more comfortable as they transition to independent practice.

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Holman Pathway Graduates in Radiation Oncology: Outcomes of the 2010-2015 Cohort

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Purpose: The Holman pathway was designed by the American Board of Radiology (ABR) in 1999 to support trainees in diagnostic radiology (DR) and radiation oncology (RO) who desire to pursue an academic career in basic science, clinical, or translational research. Data about the career trajectories of Holman pathway graduates in RO are scarce. We report the proportion of the 2010-2015 cohort of RO Holman pathway graduates currently in academic faculty positions and their productivity.

Approach/Methods: All Holman pathway residents successfully graduating between 2010-2015 from Accredited Council for Graduate Medical Education (ACGME) residency programs were identified per the ABR website. Demographic data and pre-residency educational training were recorded. A faculty position at an ACGME accredited residency program at the time of analysis qualified as academic practice. Number of and authorship location on publications indexed on PUBMED were recorded for all graduates. A threshold of at least 1 publication was designated as a surrogate for academic productivity.

Results/Outcomes: 54 RO Holman pathway graduates were identified between 2010-2015. 85% (46) were male, 4% (2) were African-American, 87% (47) entered into the Holman pathway with a PhD, 55% (30) attended a top 20 ranked Medical School per US News 2020, and 65% (35) graduated from a top 10 ranked residency program per Doximity 2020. At the time of analysis (median follow up of 8 years), 78% (42) were in academic faculty positions. 83% (35), 14% (6), and 3% (1) of graduates in academia were assistant, associate, and full professor, respectively. 83% (35), 98% (41), and 100% (42) of the 42 graduates in academic faculty positions had atleast one publication as final author, first author, and any authorship location, respectively. Among the 42 graduates in academia, mean final author, first author, and any authorship location publications were 6, 8, and 42, respectively. During residency through one year after residency graduation, mean final author, first author, and any authorship location publications were 0, 2, and 7, respectively. Beyond one year after completion of residency, mean final author, first author, and any authorship location publications were 6, 2, and 27, respectively. Mean total publications among assistant, associate, and full professor were 35, 72, and 93 for any authorship location, 6, 14, and 9 for first authorship, and 5, 17, and 27 for final authorship, respectively.

Discussion: Most RO Holman pathway graduates obtain academic faculty appointments five to ten years from graduation and are academically productive. A high proportion of publications after completion of residency are non-first, non-final authorship. Females and African-Americans are under-represented among the Holman pathway graduates.

Significance: Continued emphasis should be placed on increasing diversity in Holman pathway training. Progressing in academic ranking often involves collaborations resulting in middle-author publications.

Linguistic biases in letters of recommendation for radiation oncology residency applicants

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Purpose: Letters of recommendation (LORs) are an increasingly important component of the residency selection process and may have even greater weight in an era after USMLE Step I becomes pass/fail. The aim of this study was to investigate whether implicit linguistic biases exist in LORs for applicants to radiation oncology residency with a focus on applicant and letter writer characteristics including gender, race, and professional achievement.

Approach/Methods: All LORs (n=487) written for applicants (n=125) invited to interview at a single large institution's radiation oncology residency program from the 2015-2018 application cycles were de-identified and included for analysis. Linguistic Inquiry and Word Count (LIWC) software was used to evaluate LORs for length and a dictionary of predetermined themes of interest, including grindstone, standout descriptors, desirability statements, knowledge/skill, patient care, research, agentic personality traits, and social descriptors. Additionally, language was evaluated for gender bias using a publically available gender bias calculator (http://slowe.github.io/genderbias/). Non-parametric tests were used to compare linguistic domain scores. Post-hoc Nemenyi testing was applied to significant Kruskal-Wallis test results.

Results/Outcomes: The median number of the LORs per applicant was 4 (range 3-5). No significant differences by applicant gender were detected in LIWC score domains or by the gender bias calculator ($P>0.05$). However, LORs for applicants from racial/ethnic backgrounds underrepresented in medicine (defined as Black/African American or Hispanic/LatinX per applicant self-description) were less likely to include desirability statements ($P=0.008$) and there was a trend for these LORs to more often emphasize strengths in patient care ($P=0.06$). Attributes of letter writers also significantly associated with linguistic differences in LORs. Male writers were less likely to describe applicant characteristics related to patient care ($P<0.0001$) and agentic personality ($P=0.006$). LORs written by radiation oncologists were shorter ($P<0.0001$) and included fewer standout descriptors ($P=0.014$). However, these LORs were also more likely to include statements regarding applicant desirability ($P=0.045$) and research ($P=0.008$). While language was globally male-biased ($P<0.0001$), Assistant Professors were less likely than Associate Professors ($P= 0.0064$) and Full Professors ($P=0.023$) to used male-biased language per the gender bias calculator.

Discussion/ Significance: Significant linguistic differences were observed in radiation oncology residency LORs, suggesting that implicit biases related to both applicants and letter writers may exist. Recognition, and ideally eradication, of such biases are crucial for fair and equitable evaluation of a diverse applicant pool of radiation oncology residency candidates.

Qualitative Study of Interprofessional Collaboration in Radiation Oncology Clinics: Is There a Need for Further Education?

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Purpose: Interprofessional education (IPE) is gaining recognition as a means of improving healthcare delivery and patient outcomes.1 A primary goal of IPE is improved interprofessional collaboration (IPC).2 The multidisciplinary team in the radiation oncology clinic requires effective IPC for optimal delivery of radiotherapy. However, there are limited data on IPE and IPC in radiation oncology.3 This qualitative study aims to characterize IPC and IPE in radiation oncology.

Materials/Methods: Semi-structured phone interviews with radiation oncologists, nurses, dosimetrists, radiation therapists, medical physicists, and medical students across a single academic medical center and affiliated network sites were performed from June to August 2019. Interviews were recorded, de-identified, and transcribed verbatim. Resulting transcripts were analyzed using grounded theory methodology.

Results: Seventeen interviews were performed with four radiation oncologists, two nurses, two dosimetrists, four radiation therapists, two medical physicists, and three medical students. Grounded theory analysis identified four themes: 1) Management of the radiation oncology clinic, 2) Current climate of interprofessional education in radiation oncology, 3) Potential impact of interprofessional training in radiation oncology, and 4) Creating an interprofessional training program in radiation oncology. Each them elicited between 2-7 subthemes.

Discussion: From the analytical themes that emerged, it is hypothesized that misunderstanding professionals' roles can lead to communication breakdown, which creates less efficient clinic management and disorganized patient care. While other radiation oncology professionals shadow physicians during their training, physicians are not learning about these professions in the same way. Interviewees from each professional category recommend a formal shadowing program for radiation oncology trainees at the resident or medical student level. Additionally, interviewed medical students and physicians emphasized the importance of structured opportunities for IPE given competing demands of learners during residency and medical student rotations.

Significance: This study suggests an unmet need for exposure of radiation oncology trainees to IPE with the ultimate goal of improving IPC in the radiation oncology clinic. An IPE curriculum could be structured as a formal shadowing program for medical students or residents where trainees would learn directly from nurses, radiation therapists, dosimetrists, and medical physicists.

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Pilot Study of the Effectiveness of a 360 Video for Pre-Consult Education in Patients with Gastrointestinal Malignancies

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Purpose: To evaluate the effects of implementing an immersive 360 video on patient distress and overall experience prior to initial consultation for patients with gastrointestinal (GI) malignancies.

Approach/Methods: To provide insight into the multidisciplinary pre-consultation workflow involved in coordinating care prior to initial consultation for new patients to our center, we successfully filmed and produced a 360 video that depicts one patient's journey from his cancer diagnosis to his 5-year survivor party. To evaluate the effectiveness of this video in reducing patient distress and providing education, we have designed a single arm pilot prospective trial using three surveys (pre-video, post-video, and post-visit) with responses reported on a Likert scale. All patients with scheduled initial consultation appointments to the GI outpatient clinic are eligible if they have not previously been a patient or accompanied a patient at our institution.

Results/Outcomes: We hypothesize viewing this video will improve the overall patient experience and reduce distress about diagnoses and next steps. In addition to the video, we have also developed a 21-item pre-video survey, an 18-item post-video survey, and an 11-item post-visit survey with validated questions. During initial contact to schedule a new patient appointment, we will solicit interest in participating. A follow-up call from a clinical research coordinator will explain the study to those who are interested. Eligible participants will then receive a secure link via email starting with the consent form, the baseline survey for those who agree, the 360 video, and ending with the post-video survey. A post-visit survey will be sent electronically after completion of the initial visit. Patients will be provided with a gift card after completing each survey. We anticipate an enrollment of 70 patients in this pilot study. The GI clinic at our institution has ten new patient slots per day and we anticipate accrual within two months. Differences in survey responses will be compared between patients using the Mann-Whitney U test and differences between timepoints for the same patient will be compared using the Wilcoxon signed-rank test.

Discussion: Coping with a new cancer diagnosis is a significant source of distress for patients, which may be intensified by visiting an unfamiliar cancer center. We believe this new medium has the potential to be more impactful in providing information and reducing distress for patients in our pilot cohort, even over standard videos. Emotional distress is an oft neglected patient reported outcome metric that could be better evaluated, starting even before treatments are administered.

Significance: If this pilot succeeds in improving patient education and reducing emotional distress, we believe this technology could be effectively harnessed for multiple applications, including specific treatments and treatment modalities, to truly give patients an immersive experience to optimize knowledge and comfort.

Medical education factors influencing student entry into the fields of Radiation Oncology and Oncology

Presenter: Sumi Sinha
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Purpose: In 2019, 192 applicants applied for 192 positions (1.0 applicants per position, APP) in Radiation Oncology through the NRMP resulting in 163 matched positions (84.9% match rate with 29 unmatched positions). Compared to recent years (1.25 APP in 2018, 1.31 APP in 2017, 1.33 in 2016), th lower APP represented a decline in interest from recent years in the field. Thus, we sought to assess pathways of entry for medical students into the field of Radiation Oncology to find methods of enhancing interest.

Approach/Methods: We reviewed survey data from our institution's Radiation Oncology two-week clinical immersion program from 1/2018 to 1/2020 to identify factors influencing interest in the fields of Radiation Oncology and Oncology. At our institution, medical students in their second to third year of training have the opportunity to participate in this clinical immersion program. We performed a PubMed literature review for educational programs targeted for medical students to supplement our findings. International studies, non-specific oncology curricula for medical students, and studies of the Radiation Oncology match were included. Publications pertaining to medical physics, resident education, or non-English reports were excluded.

Results/Outcomes: A total 16 students were surveyed at our institution. Students were asked about their motivations for enrolling. A plurality of respondents (37.5%) reported interest in Radiation Oncology as their motivating factor for entry. Others reported interest in Oncology or another related field (18.8%), interest in a unique learning opportunity (18.8%), and experience with patients treated with radiation (12.5%). Students reported that their primary role was shadowing (87.5%) and that lack of foundational knowledge was a barrier to increased participation (25%). Literature review identified 60 publications reporting programs to encourage medical student entry to Radiation Oncology. The majority of programs were aimed at curriculums for pre-clinical or clinical education (58.3%). Other areas of cultivation were development of interest groups (3.3%), mentoring and shadowing programs (10.0%), multi-level targeted programs (5.0%), and research / gap year / summer / scholarship programs (6.7%). A subset of articles reported on assessments of exposure to, attitudes on, or awareness of Radiation Oncology among medical students (8.3%).

Discussion: Literature review demonstrates a broad spectrum of programs for various entry points. Reports of medical student awareness show a disconnect between offerings and utilization. Our experience suggests that early exposure to Radiation Oncology likely allows for enhanced engagement. Additional study is needed to compare the effectiveness of programs and to develop cohesive education plans for medical students.

Significance: The American medical education system offers many entry points for medical students to engage in Radiation Oncology. Methods for sustaining medical student awareness of Radiation Oncology require further optimization to ensure a diverse and high-quality pipeline for the future.

Financial literacy and interventions among medical students, residents, and fellows in the United States: A scoping review protocol

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Purpose: The objective of this review is to explore existing literature related to financial literacy among medical students, residents, and fellows in the United States and the related interventions and outcomes, to examine and conceptually map the evidence, and to identify any gaps.

Approach/Methods: The proposed systematic review will be conducted per the Joanna Briggs Institute methodology for scoping reviews. The search strategy will aim to locate both published and unpublished studies. The databases to be searched include PubMed (U.S. National Library of Medicine), Embase (Elsevier), the Cochrane Library (Wiley),, Scopus (Elsevier), Academic Search Premier (EBSCOhost), and Web of Science (Clarivate Analytics).and. Mednar (mednar.com), ProQuest Dissertations & Theses Sciences and Engineering Collection (ProQuest), OpenGrey (opengrey.eu), Open Access Theses and Dissertations (oatd.org), Directory of Open Access Journals (doaj.org), and PapersFirst (OCLC) will be used as the source of unpublished studies and gray literature.Two independent reviewers will then screen titles and abstracts for assessment against the inclusion criteria for the review. The results of the search will be reported and presented in a PRISMA flow diagram. Data will be extracted from papers included in the scoping review using the draft data extraction tool. The extracted data will be presented in both diagrammatic and narrative forms. Keywords: Financial education; financial literacy; medical student debt; resident burnout; transitioning from residency training

Results/Outcomes: The review will consider studies about the current status of financial literacy among medical students, residents, and fellows in the United States, any related interventions that attempt to improve financial literacy, and the outcomes associated with the interventions.
The questions of this review are:

- What is the current status of financial literacy among medical students, residents, and fellows in the United States?
- What interventions are used for financial literacy?
- What outcomes are reported with those interventions?

Discussion: Financial wellness and literacy are essential parts of wellness for medical students, residents, and fellows. There are limited available data about the financial literacy among these groups, and the interventions to improve financial literacy.

Significance: This review may help to establish a baseline status of financial literacy among medical students and physicians in training. The findings could assist organizations like the Liaison Committee on Medical Education (LCME), Accreditation Council for Graduate Medical Education (ACGME) and Association of American Medical Colleges (AAMC) future planning and policy changes, to improve financial literacy education during medical school and residency training.

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Bridging The Gap Between Primary Care Education and Radiation Oncology

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Purpose: The purpose of this study is to assess the knowledge base of primary care residents in the state of Oklahoma in regards to radiation therapy as an oncologic treatment modality. Most medical schools are unable to provide students with an introductory block to radiation oncology. Some schools may have a portion of the oncology curriculum dedicated to radiation oncology, but that experience varies widely. The second portion of this study will have radiation oncology study modules as part of our intervention.

Approach/Methods: Study protocol will be submitted to the University of Oklahoma Institutional Review Board (IRB) for approval. Allopathic or osteopathic resident physicians participating in residencies in Internal Medicine or Family Medicine in Oklahoma will be contacted via email in regards to participation. Those who opt to participate will take a pre course survey to assess background knowledge of radiation oncology. Residents will then be provided with radiation oncology study modules. Post course survey will be administered to assess intervention.

Results/Outcomes: First portion of this study will provide us with insight regarding the amount or radiation oncology teaching that is taking place during medical school. One of the expected outcomes is that primary care residents will have a better understanding in regards to training in radiation oncology and how radiation oncologists can help facilitate cancer care.

Discussion: Study is currently in development stages. Our plan is to survey PGY2/PGY3 before June/2020 while surveying incoming PGY1 residents early in the fall.

Significance: Increase awareness of radiation oncology amongst primary care trainees.

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Research Productivity of Radiation Oncology Residents from 2013-2018

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Purpose: Research productivity is an important key metric in an academic radiation oncologist's career and influences employment opportunities. Given ongoing concerns of an increasingly competitive job market, current radiation oncology residents may face increasing pressure to publish during residency if they desire an academic appointment upon graduation. The project hypothesized there would be a positive correlation between resident research productivity and residency program factors, such as program size, number of faculty members, faculty publications, and number of network training sites.

Approach/Methods: Radiation oncology residency programs accredited by the Accreditation Council for Graduate Medical Education (ACGME) prior to 2013 were identified on the ACGME website. Department websites were accessed between 8/9/2018 - 9/3/2018. All faculty members, excluding emeriti, listed on institutional websites were included. Resident names from the graduating classes of 2014-2021 were obtained from department websites, Association of Residents in Radiation Oncology directories, Doximity, and LinkedIn. The Scopus bibliometric database was queried on 9/12/2018 for all radiation oncology-related publications between 1/1/2014 - 9/12/2018 for each institution. The relationship between number of first, second, or senior author publications and variables of interest were evaluated by Pearson's correlation coefficient.

Results/Outcomes: 85 radiation oncology departments, 2537 faculty members, and 1419 residents were included. The median number of faculty members was 23 (IQR 14-33) with a median of 11 (IQR 6-18) MDs, 2 MD/PhDs (IQR 1-5), and 8 PhDs (IQR 6-14). There were 27 programs with <6 residents, 48 with 7-12 residents, and 10 with >12 residents. The median number of first, second, or senior author publications per faculty was 3.4 (IQR 2.3-5.2). The median number of first, second, or senior author publications per resident was 3.1 (IQR 1.8-5.3). The median number of network training sites was 1 (IQR 1-3). Resident first, second, and senior authorship was positively correlated with number of total faculty members ($r=0.25$, $p=0.02$) and number of faculty publications ($r=0.50$, $p<0.01$). There was no statistically significant correlation with program size ($r=0.20$, $p=0.06$) or number of network training sites ($r=0.08$, $p=0.41$).

Discussion: In this bibliometric analysis, resident research productivity was higher at departments with greater number of faculty and publications per faculty member. There was also a trend for increasing productivity with larger residency program sizes.

Significance: Resident research may be facilitated by larger departments which tend to have more specialized faculty, protected academic time, and higher clinical volume, even if distributed among additional network sites. Other factors that may be important and should be explored further include dedicated resident research time and individual faculty mentorship.

Simulation-based learning for enhanced brachytherapy training among Radiation Oncology residents

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Purpose: Brachytherapy is a critical and irreplaceable component of treatment for gynecologic malignancies, but its curricula in residency is highly variable, particularly procedural experience. In surgical fields, simulation-based learning has been shown to improve learner's clinical and procedural competence. Thus, we performed, for the first time, a hands-on simulation-based gynecologic brachytherapy education intervention using a custom 3D pelvic phantom to evaluate the benefit of simulation-based learning on resident brachytherapy education.

Approach/Methods: In this IRB approved study, residents (PGY-2 to PGY-5 with no prior gynecologic rotation experience) (n=9) completed an anonymous qualitative and quantitative survey of baseline brachytherapy knowledge, implant procedural confidence, dosimetry, plan evaluation, and quality/safety protocols. Qualitative questions were graded on a Likert scale. The workshop included both didactic and hands-on components. Instruction was provided by faculty from Radiology (anatomy/imaging), Medical Physics (quality/safety), Dosimetry (treatment planning), and Radiation Oncology (treatment data, implant approach) during the 4 hour lab. Following the lab, the same pre-survey questions were re-collected.

Results/Outcomes: Prior to the lab, 1/9 residents felt that their residency included formal brachytherapy training, no resident felt comfortable performing brachytherapy independently, and 1/9 residents correctly completed all knowledge based questions. Following the lab, 4/9 (P =0.02) felt there was formal brachytherapy training in place, 1/9 residents felt comfortable performing brachytherapy independently, and 7/9 (P= 0.007) residents correctly completed the knowledge-based questions.

Discussion/Significance: Residents participating in a brachytherapy skills simulation workshop demonstrated improvement in theoretical and practical brachytherapy knowledge. Following the workshop, a moderate improvement in perceived brachytherapy confidence was also seen but most residents did not feel that they could practice independently. This supports the hypothesis that, ongoing integrated brachytherapy workshops, supported by adequate patient care experience are necessary to achieve brachytherapy independence during residency.

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