Advances in Radiation Oncology (2025) **10**, 101734

advances in radiation oncology

www.advancesradonc.org

Scientific Article

Assessment of Approaches Promoting Virtual Radiation Oncology Educational Content to Medical Students

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Received 8 October 2024; accepted 28 January 2025

Purpose: Virtual learning in radiation oncology (RO) has potential to reach medical students who otherwise lack access to RO exposure or mentorship at their school. This study characterized the relative effectiveness of different methods of promoting virtual education content, to inform future efforts to expand access to RO education.

Methods and Materials: A 4-part "Oncology Virtual Series for Medical Students" was developed to emulate an oncology interest group (OIG). All academic RO department chairs and residency program directors were asked to engage their respective Dean's office or OIG to promote to *all* students, especially groups with primarily underrepresented in medicine membership. Promotional emails were also sent to the Diversity, Equity, and Inclusion office of all allopathic United States (US) medical schools, and Student National Medical Association (SNMA) and Latino Medical Student Association (LMSA) regional directors. The American Society for Radiation Oncology (ASTRO) promoted via ASTROgram, social media, and ROhub. Descriptive statistics are reported.

Results: A total of 660 students preregistered, and 140 attended, at least 1 session. Attendees represented 53 allopathic and 2 osteopathic US medical schools, and 18 international schools. One hundred six attendees (87%) were from schools with an affiliated RO department, and 79 (65%) with an affiliated RO residency. Fifteen schools had at least 3 students attend, with the highest number of attendees from the principal investigator's home institution (n = 10). These 15 schools accounted for 52% of all attendees, of which 10 had an affiliated RO residency. Two hundred eighty of six hundred sixty preregistered students (42%) described how they heard

Sources of support: This work was supported by grant ROI2020-9111 from the Radiation Oncology Institute.
Research data are not available at this time.

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https://doi.org/10.1016/j.adro.2025.101734

about the series: 87 (31%) medical school faculty, 75 (27%) social media post or email, 53 (19%) OIG, 16 (6%) SNMA or LMSA, and 15 (5%) ASTRO.

Conclusions: Disproportionately high attendance was from a few schools, suggesting that radiation oncologists' individual efforts and pre-existing relationships with students, Dean's offices, and student groups are most effective for promoting nationwide virtual RO education.

Introduction

Increasing physician workforce diversity in the United States (US) has been identified as a means of producing higher quality care and outcomes,[1,2] particularly in the context of meeting the needs of underserved communities, addressing health disparities, and mitigating historical biases and inequities.[3-7] Compared to other medical specialties, the radiation oncology (RO) workforce has less racial, ethnic, and gender diversity, with limited improvement over the past few decades.[8-12]

Among the variety of barriers to increasing diversity in RO, there is a great amount of variability in students' access to RO exposure and mentorship across US medical schools.[13-16] Access to RO is a particular problem at the 20% of US medical schools that lack an affiliated RO department, and approximately 40% that lack an affiliated RO residency program, an issue occurring more commonly at schools with more diverse student enrollment.[17] Clinical exposure is key for students to develop an interest in a medical specialty. For instance, a recent survey showed that approximately one half of fourth year medical students cited lack of exposure as their primary reason for never considering a career in RO.[18-19] Furthermore, most RO residents graduate from medical schools with a larger affiliated RO department with a residency program,[17] highlighting the importance of exposure and mentorship in students' career decisions. Increasing student exposure to RO within the constructs of most medical school curricula is challenging, given that RO is a small specialty, with educational content that is infrequently tested on the step 1 or 2 US medical licensing exams.[20] Furthermore, unlike the other oncologic subspecialties, RO lacks natural access into the required clinical clerkships through a more generalized specialty (eg, internal medicine for medical oncology).[21]

For all of these reasons, creative approaches have been explored to increase outreach to diverse medical students whose opportunities to access RO have been marginal in the past.[22,23] Virtual learning may be a particularly valuable tool for doing so. However, there is little evidence to guide the promotion of virtual RO content in a way that ensures these efforts reach the intended target audience.[21] For example, individual departments may not have significant experience with efforts at broad outreach among their medical school student body, and organizations such as ASTRO usually have only interacted with a medical student population that is already interested in RO enough to sign up for student membership or submit an abstract to a meeting. The purpose of this study is to characterize the relative impact of different methods of advertising virtual RO education content to US medical students from diverse and historically underrepresented backgrounds, to inform future efforts to expand exposure and access to RO education.

Methods and Materials

A 4-part "Oncology Virtual Series for Medical Students" was developed to emulate an oncology interest group (OIG). The topics of each presentation, as shown in Fig. 1, were intended to have broad appeal to any student interested in oncology, but were presented exclusively by RO faculty and residents from a variety of institutions with an interest in medical education and/or health equity. The selection of topics, speakers, and approach to advertising were intended to attract a geographically, racially, and ethnically diverse audience.

All academic RO department chairs and residency program directors at all 119 allopathic US medical schools were asked by email to engage their respective Dean's office or OIG to promote the event to *all* students, particularly emphasizing student groups with primarily women (eg, American Medical Women's Association chapter) or students underrepresented in medicine (eg, institutional Student National Medical Association (SNMA) or Latino Medical Student Association (LMSA) chapter) membership. A similar email was sent to the Dean(s) of all US allopathic medical schools' diversity offices (or equivalent), all SNMA and LMSA regional directors, and the SNMA newsletter. The American Society for Radiation Oncology (ASTRO) also promoted via ASTROgram, ARROgram, Twitter/X, and student members' ROhub.

Descriptive statistics of preregistrants, and attendees, of the live sessions are reported. A X^2 test of independence was performed to examine the relation between medical schools associated with an RO residency and students who preregistered and those who ultimately attended the sessions. During preregistration, students' full name, email address, medical school, and how they heard about the series were requested. For students who

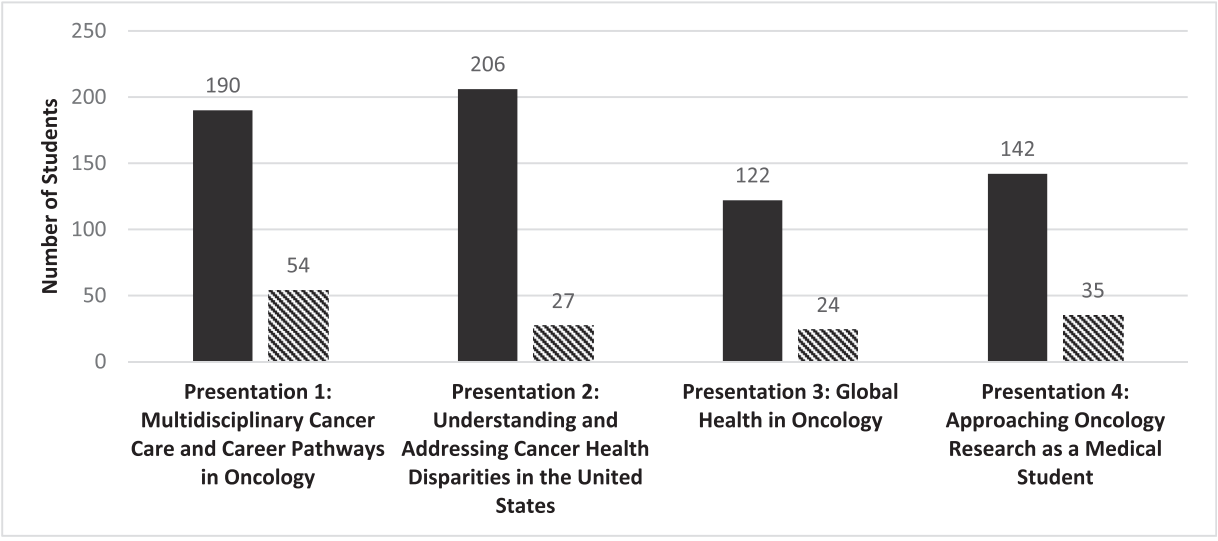

Figure 1 Titles of each presentation, as well as the number of students who preregistered (black) and attended (striped) each.

did not list their medical school on the preregistration questionnaire, their university email address, web searches, online articles, and LinkedIn profiles were used to confirm the medical school they attend. Attendees' names and email addresses were automatically saved on login to the live lecture sessions. The American Medical Association's FREIDA database was used to identify medical schools associated with an RO department and/or residency program. The sessions were recorded and later posted, but information on viewers from this are not included in our analysis, only the live session information. This study was considered exempt by the institutional review board.

Results

A total of 660 unique individuals preregistered, and 140 attended at least 1 of the 4 sessions. The number of students who preregistered and attended each individual presentation are shown in Fig. 1, and the characteristics of the students are shown in Table 1. Most US allopathic medical students were from schools with an affiliated RO department (n = 106, 86.9%) or RO residency program (n = 79, 64.8%). Students from medical schools with an affiliated RO residency program were not any more likely to preregister (X^2 = 1.84, P = .18) or attend (X^2 = 1.94, P = .16) than

Table 1 Characteristics of students that preregistered and attended

	Students preregistered (no. = 660)	Students attended (no. = 140)
Type of student/school		
Medical student (US allopathic)	610 (92.4%)	122 (87.1%)
Medical student (US osteopathic)	11 (1.7%)	9 (6.3%)
Medical student (international)	19 (2.9%)	6 (4.2%)
Premedical student	12 (1.8%)	3 (2.1%)
Other health care provider or researcher	8 (1.2%)	0 (0%)
Affiliated RO department (for US allopathic schools)		
Yes	519 (85.1%)	106 (86.9%)
No	91 (14.9%)	16 (13.1%)
Affiliated RO residency program (for US allopathic schools)		
Yes	404 (66.2%)	79 (64.8%)
No	206 (33.8%)	43 (35.2%)

Abbreviations: RO = radiation oncology; US = United States.

students from medical schools without an affiliated RO residency program. Fifteen schools had at least 3 students attend, with the highest number of attendees from the principal investigator's home institution (n = 10). These 15 schools accounted for 52% of all attendees (n = 73), of which 10 schools (67%) had an affiliated RO residency program. Table 2 summarizes the characteristics of the schools with the largest number of preregistered students, as well as the potential reasons to explain the more successful promotion at these institutions.

Table 2 Medical schools with the highest number of student participation, including RO department and residency affiliations and methods of promotion

Medical school	Students preregistered	Students attended	Radiation oncology department	Radiation oncology residency	Potential reason(s) for increased preregistration or attendance
Michigan State	45	9	Yes	No	• Admin leader sent to all students
Rutgers New Jersey Medical School	41	10	Yes	Yes	• PI has longstanding relationship with students and oncology interest group
New York Medical College	26	4	No	No	• PI gave prior talk to students • PI had relationship with admin leaders, who directly sent info on the series to all students
Emory University	25	5	Yes	Yes	• Shared with students at a RO open house
Rutgers-Robert Wood Johnson Medical School	24	5	Yes	Yes	• Subinstitution of PI • Established relationship with speaking to students and administrative leadership
University of Southern California	24	4	Yes	Yes	• RO department chair shared invitation with oncology interest group, Associate Dean of Curriculum, all RO faculty and residents
University of Cincinnati	17	4	Yes	Yes	• RO department chair forwarded to medical school administrators to disseminate to students
New York University	17	1	Yes	Yes	• RO residency PD forwarded broadly within medical school
University of Kansas	15	7	Yes	Yes	• RO med student coordinator shared with all student groups
University of Vermont	15	2	Yes	No	• PI gave prior talk to students • PI had relationship with admin leaders, who helped share with students
Duke University	12	2	Yes	Yes	• Shared with med school admin • Posted on their department website
University of Louisville	11	6	Yes	Yes	• Admin leader sent to all relevant student groups
University of Texas Rio Grande Valley	10	1	No	No	• PI gave prior talk to students • PI had relationship with admin leaders; Dean of students shared with all students
Kansas City University (Osteopathic)	7	4	No	No	• Uncertain
University of Missouri	5	5	Yes	No	• PI gave prior talk to students • PI had relationship with admin leaders; Associate Dean for Student Programs shared with all medical students
University of Oklahoma	5	3	Yes	Yes	• One of speakers was from this institution
University of California Irvine	4	4	Yes	Yes	• Uncertain

Abbreviations: Admin = administrative; PD = program director; PI = principal investigator; RO = radiation oncology.

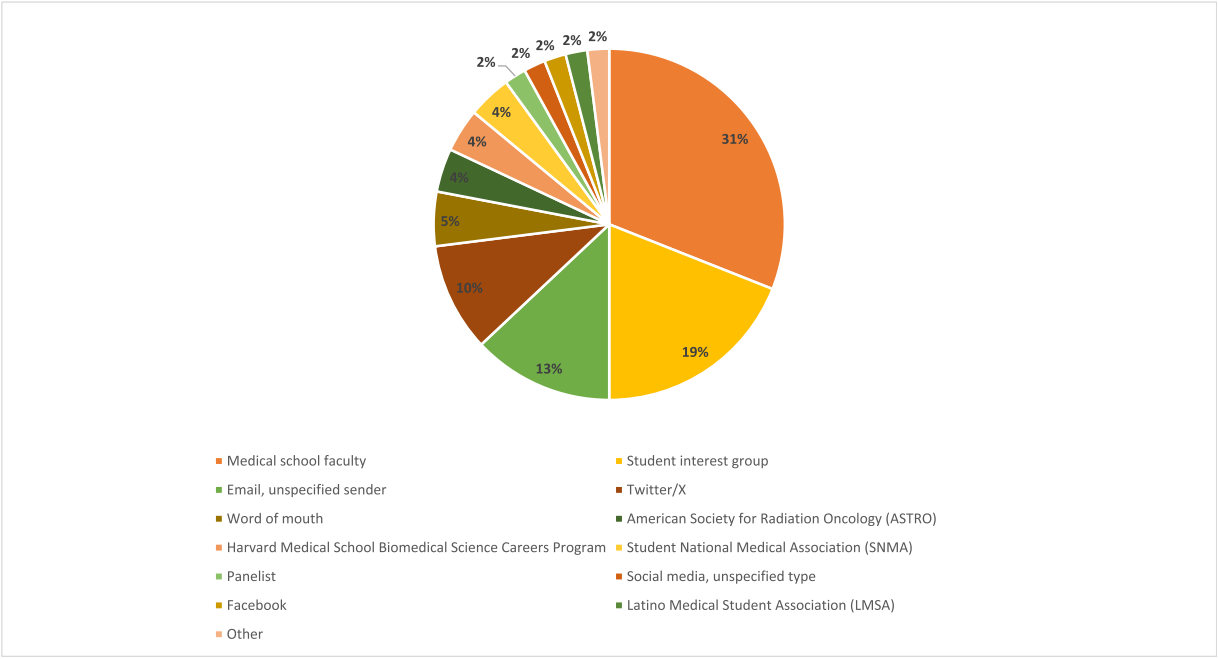

Figure 2 Source and corresponding percentages from which students learned about the virtual oncology series.

A total of 280 preregistered students (42%) described how they heard about the series. Figure 2 shows that the most common referrals sources in descending order included 87 (31%) from medical school faculty, 53 (19%) from an OIG, 37 (13%) from an email, 27 (10%) from Twitter/X, 16 (6%) from SNMA or LMSA, and 15 (5%) from ASTRO. Most attendees from the same school learned about the series from the same 1 or 2 sources. The greatest range of sources noted by attendees was from the medical school with the greatest attendance, with 7 different promotional sources recorded. The international medical students who attended listed their sources as Twitter/X and ASTRO email, but a few also used ASTRO ROhub, word of mouth, Facebook, and social media (unspecified).

Discussion

Small medical subspecialties such as RO face unique challenges in providing medical students the requisite access, exposure, and mentorship that are necessary for them to consider a career in it.[13-16] Although these problems are not new, the recent decline in RO residency applications,[24] and the increased recognition of the importance of workforce diversity in facilitating equitable patient care highlight the need for careful consideration of initiatives to improve on some long held, but inadequate approaches in RO teaching.[9,25,26] Given the imbalanced distribution of radiation oncologists across US medical schools,[17] virtual education content has the potential to reach more students, including those who radiation oncologists have historically been relatively unsuccessful at attracting to the specialty. This study has demonstrated that it is feasible to promote OIG-style presentations on a national level both at schools with and without an affiliated RO department or residency program. In addition, disproportionately high preregistration and attendance was from a small number of schools, suggesting that radiation oncologists' individual efforts and pre-existing relationships with students, Dean's offices, and student groups at their institution are the most effective way to encourage participation. Promotion through national specialty societies like ASTRO, or other organizations like SNMA or LMSA, also had some impact, though to a lesser extent. These findings serve as a starting point in the refinement of best practices for effectively promoting RO learning opportunities to students in the future, with the hope of fostering a more diverse RO workforce.

Several other medical specialties have also identified the need for wide-reaching, virtual outreach to increase medical student exposure. Reported approaches include developing a national task force to support medical interest groups, more targeted use of social media, facilitating interactions between potential mentors with medical students and interest groups, or offering a 2-week preclerkship residency exploration.[27-30] Our findings related to the importance of building longitudinal relationships with student groups and getting medical school leaders involved to advocate for educational programming are also supported by previous efforts across specialties.[31-33] Finally, our study shows the value of social media

platforms, which we found to be one of the more effective modalities used for promoting our series. Medical Twitter/X has been emphasized at recent ASTRO meetings and is used by many RO professional societies such as the Society for Women in Radiation Oncology to promote RO education and diversity.[34]

It is important to distinguish that while other excellent resources exist to teach students about RO, their target audience is generally students who already have pre-existing interest in the specialty.[35-37] In many cases, these students are actively seeking out opportunities to increase their depth of knowledge in RO, and so it is more likely that they will naturally learn of virtual learning opportunities regardless of how they are promoted. Effectively promoting an educational activity to the many US medical students with little prior exposure to it is much more challenging. Although this study evaluated methods of promotion in the context of a virtual lecture series, we believe that our findings are applicable to promoting other types of experiences as well (eg, research opportunities, pathway programs, diversity electives) for students as well. Anecdotally, although many RO departments have developed different types of educational experiences for diverse medical students in recent years, it is common that there are not many applicants, which likely stems from a lack of broad knowledge of the existence of these programs among students, and varying levels of interest/time in promoting them by RO faculty. It is inherently time-intensive for individual RO departments to comprehensively promote their initiatives nationally. However, larger RO specialty societies do have a greater capacity to support their constituents by creating an organizational structure centered on medical student outreach, which could be used to support that society's initiatives, as well as those of individual departments, for the benefit of the specialty. Our findings suggest that ASTRO social media platforms and newsletters (eg, ASTROgram, ARROgram, the medical student section of ROhub) did relatively little to reach students, in large part because there are few students on these lists. As such, new approaches dedicated to reaching medical students should be considered. For example, much like ASTRO has a state captain initiative for advocacy purposes, local networks of individuals could be recruited to help promote RO educational content among a variety of medical schools and other national student groups on a regular basis. Furthermore, a central database of individuals at medical schools and other student groups could be updated with some frequency and used for promotional purposes when needed. Little effort has been made in this area to date, to the detriment of the many individuals striving to improve medical student outreach and workforce diversity.

There are several important limitations to this study. First, among those who filled out the preregistration form, 57% did not report their source where they heard about the online series, which may potentially have introduced sampling and/or nonresponse bias into our findings. Furthermore, some students were not specific about the source from which they heard about the series, for example stating that they heard about the series through "social media," but not the type of social media, or via "email," but not stating from whom the email was sent. The virtual meeting platform we used for preregistration also did not include self-reporting of gender, race, or ethnicity, which would have been useful to better understand the demographics of participating students and the educational impact across diverse populations. Finally, we were not able to assess why the majority of the preregistered students ended up not attending, though we expect it related to competing priorities related to studying, family, or socializing for a nonrequired evening event. Of note, comparable attendance has been seen for the ASTRO's subsequently developed Medical Student Q&A sessions which also take place during weeknight evenings.[38] Further evaluation of ways to maximize attendance would be useful, perhaps by choosing different topics or a time of day that avoids competing priorities, or sending more reminder emails prior to the event. A more qualitative approach that includes discussions with individual students or small groups of students or free text/narrative feedback on a survey is likely to be beneficial to future research on this topic to better understand the nuances driving interest and attendance in extracurricular oncology education.

Conclusions

This study has characterized the relative effectiveness of different methods of advertising virtual learning content in RO to attract a diverse populations of US medical students to participate. Most attendees were from schools with a RO department, and disproportionately high attendance was from a small number of schools, suggesting that radiation oncologists' individual efforts and preexisting relationships with students, Dean's offices, and student groups at their institution are the most effective ways of promoting nationwide virtual RO education. These findings demonstrate the feasibility of promoting OIG-style presentations on a national level both at schools with and without an affiliated RO department or residency program, and may help inform the successful promotion of future initiatives aimed at increasing interest and diversity in RO.

Disclosures

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

Acknowledgments

Malcolm Mattes was responsible for statistical analysis.

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