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Attitudes Towards Research During Residency Training: a Survey of Canadian Radiation Oncology Residents and Program Directors

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Abstract
Radiation oncologists require clinical appraisal and research methodology skills, yet it is unclear how to develop these competencies during residency. We sought to attain a deeper understanding of the barriers that limit, as well as the factors that promote, engaging in research/scholarly activity during radiation oncology residency training in Canada. Following ethics approval, online surveys were circulated to all Canadian Radiation Oncology program directors and residents. Unidentifiable demographics, prior research experience, and descriptions of current research environment and barriers to engaging in research and scholarly activities were collected. Thirty-three percent (35/105) of residents and 71% (10/14) of program directors responded. Ninety-seven percent of residents, and 90% of program directors, agreed or strongly agreed that research/scholarly activity was an important part of residency training. While 66% of residents felt that there was a lack of protected time for research/scholarly activity, only 20% of program directors agreed this was a barrier ($p = 0.011$). While 94% of residents thought mentorship was important to completing high-quality research/scholarly activity, only 48% of respondents had a mentor. The highest barriers to completing research/scholarly activity projects were lack of protected time (for both residents and faculty), high resident clinical workload, and lack of experience in research skills. Canadian Radiation Oncology residents expressed strong enthusiasm to participate in research/scholarly activity, yet lack of protected time and competing demands were identified as major barriers. We suggest programs offer more protected time for research/scholarly activity, provide optional research methodology training, and support meaningful mentorship relationships.

Keywords Research · Curriculum · Residency · Radiation oncology · Barriers

Introduction

Participating in research and scholarly activity during residency has many benefits, such as promoting evidence-based medicine and quality patient care and allowing the development of analytical and critical thinking skills that support life-long learning [1]. In addition, residents who engage in research have been shown to have a higher level of satisfaction with their residency training [2]. It is critical that radiation oncologists are trained in research competencies in order to appropriately use evidence to guide their management decisions and incorporate new technologies into their practice. It is currently a requirement of the Royal College of Physicians and Surgeons of Canada that each resident completes at least one research or scholarly activity project by the end of residency training. Scholarly activity is a broader term meant to encompass the full scope of academic work which may not be classically defined as research (i.e., quality improvement studies, curriculum development, etc.) [3]. With Canadian Radiation Oncology programs transitioning to a new format where residents progress through training as they meet the competencies required of a radiation oncologist (Competence By Design, CBD), programs must consider how research and scholarly activity will be incorporated.

While we know that research exposure is an essential part of residency training, and that protected time increases research output, we do not have a comprehensive understanding of how residents and program directors feel research should fit into residency training. Previous research needs assessments in a variety of residency specialties have highlighted the need for protected time, improved research methodology training, and mentorship [4–12]. However, simply knowing the needs is not adequate as residency programs are constantly pressured

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to squeeze more content into training without additional time or resources. It is important that we gain a more comprehensive understanding of the attitudes towards research during radiation oncology training, how research contributes to career development, and how needs in the research/scholarly activity realm can be balanced with other demands in an already busy residency training.

The primary objectives of this study are to determine the level of importance placed on engaging in high-quality research and scholarly activity during residency by Canadian Radiation Oncology residents and program directors, as well as the barriers they perceive to limit participation in these activities. The secondary objectives are to assess the current landscape of research/scholarly activity in Canadian Radiation Oncology residency programs as well as the impact that mentorship has on research/scholarly activity. Another secondary objective is to determine what changes to the research/scholarly activity curriculum program directors intend to implement with the transition to CBD.

Material and Methods

Following Research Ethics Board approval, two anonymous, voluntary, online surveys were circulated to all Canadian Radiation Oncology program directors and residents from January 2019 to February 2019. The links to both surveys were sent to radiation oncology program directors who were then asked to forward the resident survey to their residents. Three reminder emails were sent to program directors. Completion of the survey implied consent was given. Subjects were excluded if they did not complete the survey before the study closed. Participants were informed that they could stop the survey at any point without any consequences. The resident survey collected unidentifiable demographics (year of training), prior research experience (number of publications, prior graduate degrees), description of current research environment (amount of time dedicated to research/scholarly activity), and perceived barriers to engaging in research and scholarly activities.

The program director survey collected information regarding the programs' research/scholarly activity requirements, their intended modifications with CBD implementation, and perceived barriers to residents engaging in research and scholarly activities. All respondents were prompted for qualitative suggestions on how best to incorporate and support research/scholarly activity into residency curricula. There was an opportunity for respondents to both surveys to write comments at the end of the survey and provide feedback.

Quantitative data was analyzed using basic statistical tools such as mean, standard deviation, Student's t test, and Fisher exact test. A p value of < 0.05 was deemed significant. Qualitative results were collected, and key themes were aggregated and analyzed using thematic analysis.

Results

The response rate was 33% (35/105) for residents and 71% (10/14) for program directors. 22.9% (8) and 11.4% (4) of resident respondents had a master's degree and a PhD, respectively. There were respondents from all postgraduate year (PGY) levels (11.4% PGY5–28.6% PGY1). Graduating PGY5 residents had published an average of 2.25 first-authored papers during residency. Residents of all PGY levels with a PhD prior to residency had published an average of 0.25 first-authored papers so far during residency compared with an average of 1 for non-PhD residents, although this was not significantly different ($p = 0.47$). 60% (21) of respondents expressed interest in working in an academic practice, 17% (6) wished to work in the community and 23% (8) were unsure.

Interest in Research/Scholarly Activity

Residents' perspectives on various statements pertaining to research/scholarly activities can be seen in Fig. 1. The statements are displayed in descending order of agreement with the statements most highly agreed upon at the top. Ninety-four percent of residents, and 90% of program directors, agreed or strongly agreed that research/scholarly activity is an important part of residency training. Seventy percent of residents would engage in research/scholarly activity even if it wasn't a required curriculum activity. Seventy-seven percent of residents intend to be involved in research/scholarly activity as a principal investigator as a staff radiation oncologist. Forty percent of residents agreed or strongly agreed that they would prefer to participate in a scholarly activity project that wasn't traditionally considered research, such as curriculum development, creation of a radiation treatment guideline, or participation in incident reporting.

Protected Research Time

Sixty-six percent of residents agreed or strongly agreed that the lack of protected time for residents for research/scholarly activity is a barrier to engaging in these activities, but only 20% of program directors feel this is a barrier ($p = 0.011$). Only 2 (5.7%) residents feel there was too much time in their program dedicated to research/scholarly activities. Thirty-one percent of residents stated that their program does not have a research/scholarly activity curriculum. Sixty percent of responding programs allow 1 month or less of protected research/scholarly activity time with 30% offering up to 6 months and 10% offering up to 10 months. Residents spend an average of 19.25 h a month (IQR 6–24.5) on research/scholarly activity (a combination of protected and unprotected time) with 8 (23%) spending more than 30 h a month.

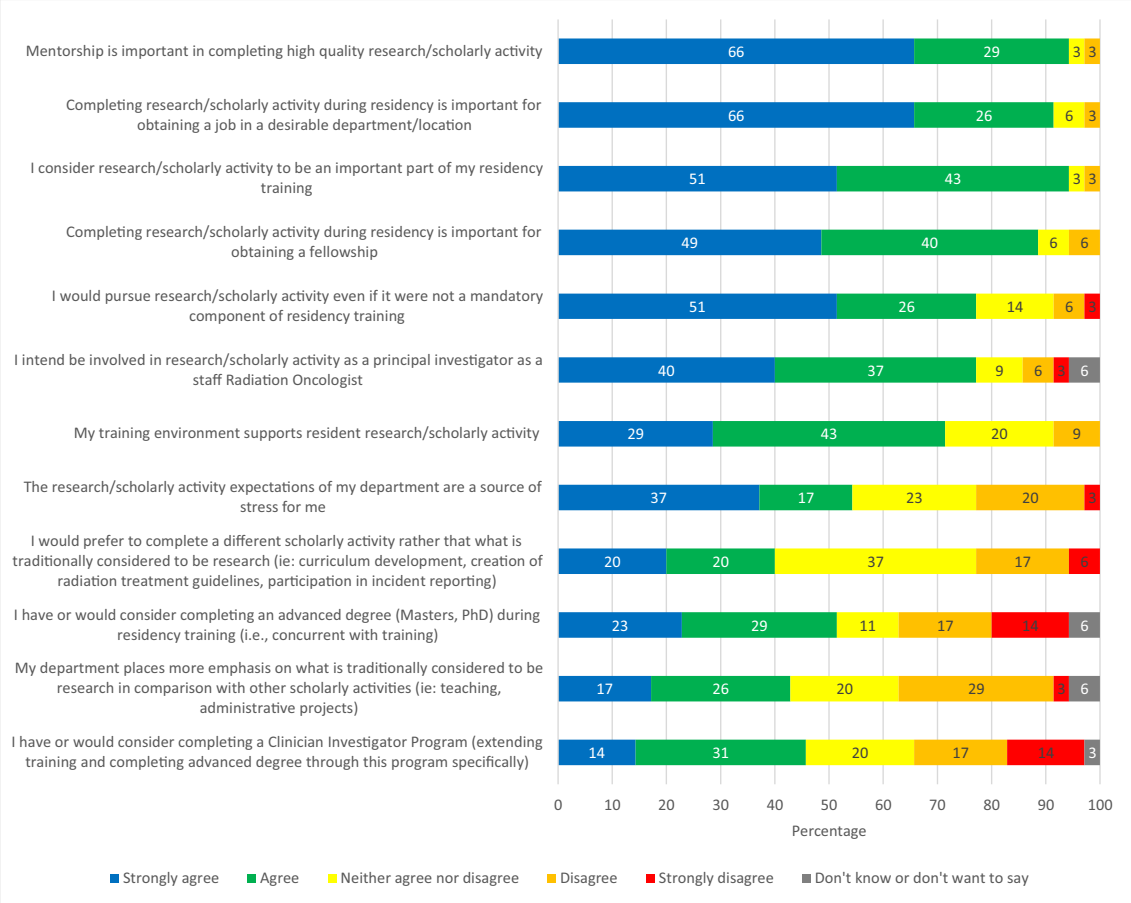

Fig. 1 Residents' level of agreement with various statements pertaining to research/scholarly activities

Mentorship

Ninety-four percent of residents and 80% of program directors agreed or strongly agreed that mentorship is important in completing high-quality research/scholarly activity. However, only 48.6% (17) of residents have a research/scholarly activity mentor. Seventy percent of program directors feel that residents in their program receive adequate support from their research/scholarly activity mentor. Twenty-eight percent of residents felt that lack of encouragement from their mentor is a barrier to performing research/scholarly activity.

Stress Associated with Research/Scholarly Activity Expectations

Thirty-seven percent (13) of residents strongly agree and 17% (6) agree that the research/scholarly activity expectations of their department are a source of stress. No program director strongly agreed with this statement but 60% agreed. The highest program-imposed research/scholarly activity requirement is to have presented an abstract at a national conference, which is a requirement of 50% of programs. No programs require a peer-reviewed publication during residency. Ninety-five percent of residents and 90% of program directors agreed or strongly agreed that completing research/scholarly activity during residency was important for obtaining a job in a desirable department/location. Eighty-nine percent of residents and 60% of program directors agreed or strongly agreed that completing research/scholarly activity during residency was important for obtaining a fellowship in a desirable department/location.

Barriers to Performing Research/Scholarly Activities

Perceived barriers to performing research/scholarly activities as reported by residents and program directors are shown in Figs. 2 and 3, respectively. The barriers are displayed in descending order of importance with the most impactful barriers at the top. Residents reported that a lack of protected time for residents, high clinical workload, and lack of protected time for faculty were the most significant barriers to performing research/scholarly activity. Program directors reported a lack of protected time for faculty and high clinical workload as significant, as well as having too many other educational activities. Forty-

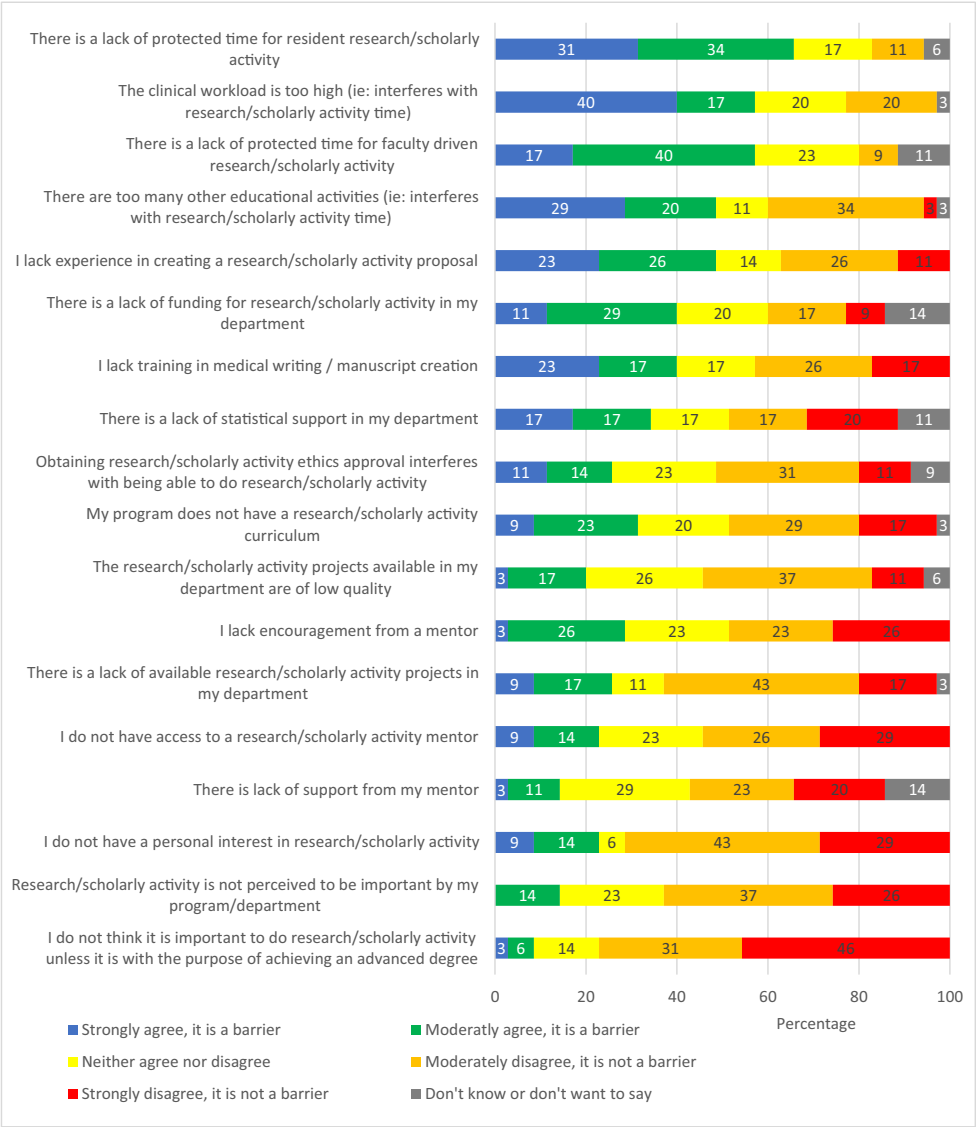

Fig. 2 Perceived barriers to performing research/scholarly activity as seen by residents

eight percent and 40% of residents feel that their lack of experience in creating research/scholarly activity proposals or training in medical writing/manuscript creation were barriers, respectively. Lack of funding and lack of statistical support was felt to be a barrier for 40% and 34% of residents and 30% and 40% of program directors, respectively ($p = 0.25$ and $p = 0.27$). Forty-eight percent of residents felt that too many other educational activities interfered with research/scholarly activity time.

Areas of Interest in Research/Scholarly Activity

The most popular topics of research/scholarly activity were "clinical trials for new or novel treatments" (65.7% of residents interested) followed by "patient quality of life/satisfaction" (60%) and "patient-reported outcomes" (54.3%). A total of 45.7% of residents were interested in "medical education". Forty-three percent were interested in "population-based research". Thirty-seven percent, 29%, 29% 8.6%, 5.7%, and 2.9% were interested in "radiation physics", "radiation biology", "basic sciences", "incident reporting", "global health", and "quality improvement", respectively.

Factors Likely to Improve Participation in High-Quality Research/Scholarly Activity

Residents were asked what factors would improve the likelihood of performing high-quality research/scholarly activity and were given the opportunity for qualitative free-form responses. Residents commonly identified more protected time, access to motivated, accessible mentors, research science

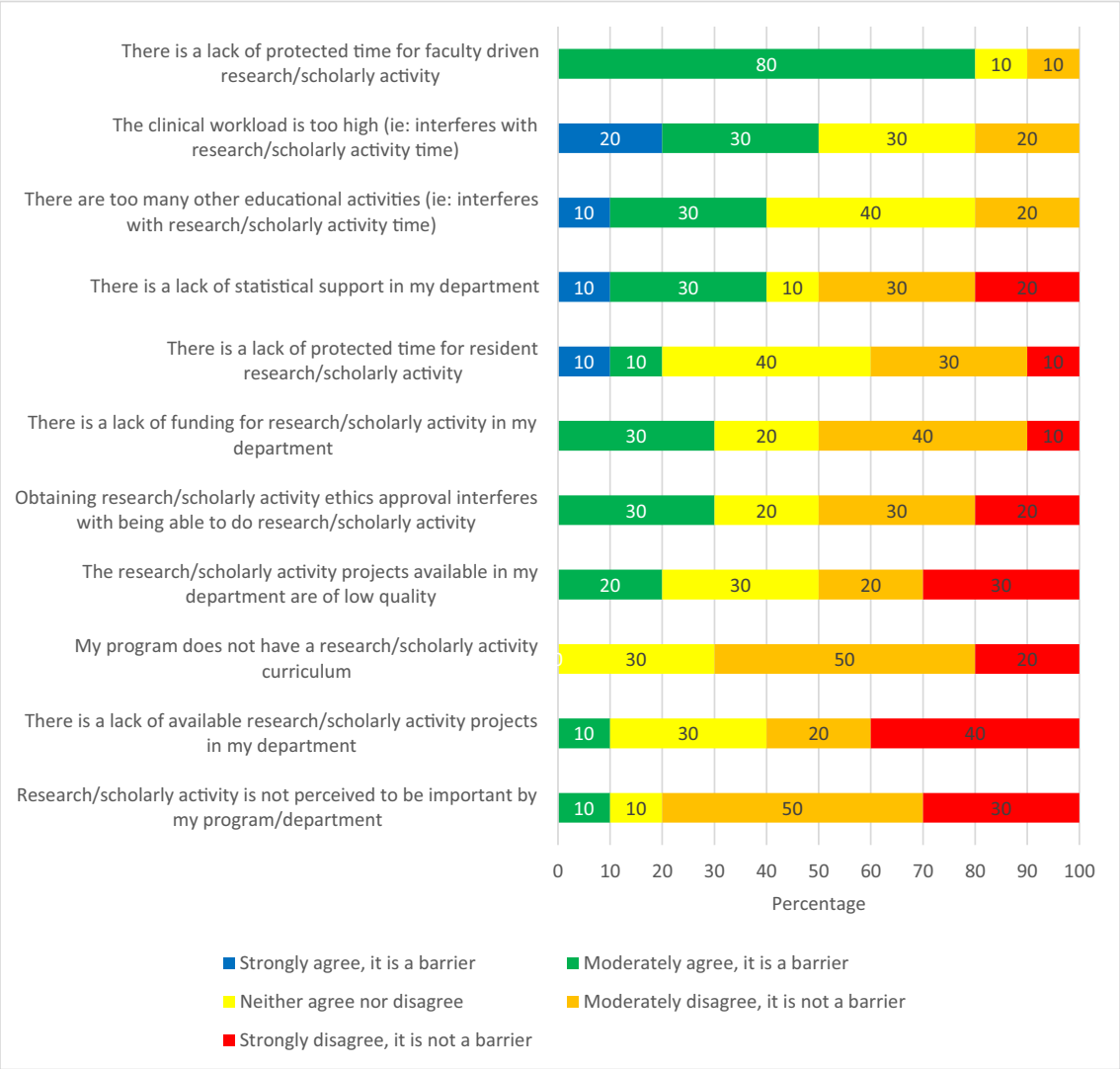

Fig. 3 Perceived barriers to performing research/scholarly activity as seen by program directors

curriculum (assistance in creating proposals and manuscript composition), and departmental statistics support, all of which were also addressed in quantitative questions. When asked how their program could better support residents to perform research/scholarly activity, in addition to the above topics, 2 residents mentioned providing a list of available projects and mentors. When program directors were asked the same qualitative questions they stated that more effective mentorship, less clinical load for research/scholarly activity mentors, and more protected time would likely improve the quality of research/scholarly activity performed by residents.

Planned Changes to Research/Scholarly Activity Curriculum with Transition to CBD

Forty percent of program directors plan to make changes to the structure of their programs' research/scholarly activity curriculum with the transition to CBD, and 20% are unsure if they will make changes. Two programs plan to increase research/scholarly activity time available for all residents, and 3 programs plan to determine research/scholarly activity time on a case by case basis. Five programs plan to integrate research/scholarly activity longitudinally at various phases of training.

Discussion

To our knowledge, this is the first published report to comprehensively explore attitudes and barriers regarding research and scholarly activity for radiation oncology residents. It is also the first study to examine the role of research in radiation oncology residency training in Canada. Despite the importance of engaging in research and scholarly activity during

residency training, curricula across Canada is not standardized and varies in terms of protected time and program expectations. There is genuine interest in participating in research and scholarly projects, with 74% of residents stating they would engage in these projects even if not mandated, which is higher than reported for other specialties. Sixty-one percent of Canadian Ob/Gyn residents agreed they only participated in research because it was mandated by their program [13]. Eighty-five percent of American Otolaryngology residents reported their main rationale for pursuing research was due to it being a program requirement [12].

A key finding from this study was that 65% of residents feel that lack of protected time is a barrier to engaging in research and scholarly activities. Protected time has been found to be a critical determinant of research/scholarly activity engagement in other radiation oncology residency studies. A study of 96 German Radiation Oncology residents found that 58% of them felt that more free time for research would improve the quality of their residency training [11]. A survey of American senior radiation oncology residents found that the amount of designated research time was the sole determinant of number of first-author papers completed during residency [10]. The median amount of protected time for research/scholarly activity during radiation oncology residency in the USA is 6 months as compared with Canada which is currently 1 month [14].

Despite residents identifying protected time to be the top barrier to engaging in research/scholarly activity, only 20% of program directors felt the same. Rather, protected time for faculty was the most frequently identified barrier by program directors. A similar discrepancy was found in a study of Canadian Anesthesia residents and program directors where residents regarded lack of protected research time as a top barrier to undertaking a research project, but program directors did not see it as an important barrier [15]. This discrepancy perhaps explains why there is no more protected time for research/scholarly activity in Canadian Radiation Oncology residency programs since program directors are responsible for final curricular decisions and do not feel that more protected time is needed. While many program directors plan to integrate research longitudinally into training, it is unclear if the total time allotted for research/scholarly activity will change. Further research into why the discordance exists could help inform future research/scholarly curricula to ensure the needs radiation oncology residents are met.

The majority of respondents (94% of residents and 70% of program directors) feel that mentorship is an important support to conducting high-quality research/scholarly activity. Mentorship is associated with higher academic productivity for both residents and staff radiation oncologists in prior studies [16]. Only 48.6% of residents have a mentor, which is comparable to a study of early career radiation oncologists in North America who had a mentor rate of 50% [17]. Lack of available mentorship in radiation oncology residency may be due to competition with other medical learners, paucity of active researchers, and lack of training/interest in available mentors [1, 17]. Our study showed 28% of residents felt they lacked encouragement from their mentor, indicating that the presence of a mentor alone is insufficient and that effective mentorship skills may need to be encouraged or even taught to faculty, as suggested in the literature [17]. Dhami et al. found that valuable radiation oncology mentor traits included approachability, availability, ability to provide opportunities, and being a clinical role model [18]. Mentorship can and should include a diverse group of mentors not limited to RO faculty [14].

Other barriers to performing research/scholarly activity identified in our study included knowledge and support in research methodologies including statistics, writing manuscripts, and creating research proposals. A study of anesthesia residents found that the top research skills required included basic biostatistics, study planning, manuscript writing, and publication and grantsmanship [5]. A study of American Radiation Oncologists found 98% reported receiving 10 h or less of statistics training in residency [19]. These skills should be incorporated into a formal research/scholarly activity. However, considering the diverse research background of residents and the limited space most programs face with respect to adding more to their formal curricula, individualization of training may be more feasible. There may also be an opportunity for programs to collaborate by developing and sharing teaching at a national level.

Analysis of the qualitative responses to how programs could better support resident research/scholarly activity revealed one suggestion not addressed in the quantitative questions which was providing a list of ongoing projects and supervisors. Identifying a research question has been highlighted as a particularly difficult step in the research/scholarly activity journey, and it has been suggested that providing a list of important and reasonable projects from which the resident can choose is an excellent way to help expedite this step [1].

With radiation oncology residents in Canada having difficulty finding work in recent years, research productivity is an objective way for residents to distinguish themselves [20]. Residents typically go beyond the minimum expectations of programs in terms of research output. The highest requirement for research/scholarly projects during residency in Canada is to present a project at a national conference. No programs require residents to publish a first-authored manuscript. Graduating PGY5 residents published an average of 2.25 first-authored papers (range 0 to 8) indicating a wide range in research productivity. The average number of first author publications amongst American Radiation Oncology residents during residency increased from an average of 1.0 between 2002 and 2007 and 2.0 in 2016 [21, 22]. This indicates that in order to remain competitive among peers, residents should be publishing at least one, if not more, peer-reviewed manuscript during residency.

The perceived importance of publications is reflected in our data as 92% of residents and 90% of program directors either strongly agreed or agreed that research/scholarly activity involvement will impact their ability to obtain a job at a desirable center. Research productivity and departmental research/scholarly expectations is a perceived source of stress for residents, as reported both by residents (54%) and program directors (60%). This stress may reflect the perception that research/scholarly activity will impact the ability to find a position in a desirable location. This has been shown to be a valid concern, as McClelland et al. found that only 10% of radiation oncology graduates without a first or second-author article secured academic jobs [23]. Given the current job climate, we suggest that programs encourage and support research/scholarly activity with an awareness of the national research productivity averages.

Strengths of this study include the multicenter respondents, data from quantitative and qualitative questions as well as from both residents and program directors. One limitation of our study is the low response rate of 33% which may have generated selection bias. It is conceivable that the enthusiasm for research in those responding may not be representative of the resident population as a whole. However, our response rate was comparable to the response rate (30%) of a prior Canadian Radiation Oncology resident survey [24]. The program director response rate of 71% likely meant that the 4 program directors who did not respond also did not forward the survey to their residents leading to a group of residents who were not given the opportunity to complete the survey. In addition, the survey was only offered in English which may have impacted the response rate from francophone residents. The program directors who participated in the study may have been from departments that are more supportive of research/scholarly activity. The specifics regarding the size of programs and departments were not captured as this could have been an identifying feature when combined with the PGY level. Program and department size may impact a resident's exposure to high-quality research/scholarly activity either negatively due to too many residents or positively due to more faculty engaging in research/scholarly activity. Other unforeseen barriers and concerns with research/scholarly activity may be masked due to the primary use of a quantitative survey.

Conclusions

Research and scholarly activity is identified by residents and program directors alike as being very important to radiation oncology residency training. This study has identified several key elements to supporting high-quality research and scholarly activity during radiation oncology residency: increased protected time for residents and staff mentors, access to available, supportive mentors and more statistics/research methodology training and support. There were important differences between residents and program directors regarding the adequacy of the current provision of protected time for scholarly activity. With the implementation of CBD, we suggest programs offer more protected time for research/scholarly activity, provide optional research methodology training, and support meaningful mentorship relationships. It is essential that programs and their residents come to a shared understanding of how scholarly activity is integrated into residency training and how it relates to and impacts long-term career planning.

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