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Radiation oncology nursing: Highlights of the first multi-disciplinary pan-Canadian workforce survey

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ABSTRACT

This study examines the Canadian radiation oncology nursing workforce through a Pan-Canadian Radiation Oncology Health Human Resources survey conducted by the Canadian Association of Nurses in Oncology/Association canadienne des infirmières (CANO/ACIO) partnered with the Canadian Association of Radiation Oncologists (CARO), the Canadian Organization of Medical Physicists (COMP), and the Canadian Association of Medical Radiation Technologists (CAMRT). The survey aimed to gather data on workforce capacity, workload, and scopes of practice, providing critical insights for predictive workforce modelling and policy development. The survey revealed significant variability in nursing full-time equivalents across radiation oncology centres, with large centres averaging more nursing staff per linear accelerator than small ones. The study also highlighted challenges in recruitment and retention, influenced by high workloads, prescriptive work schedules, and the need for specialized education. Despite these challenges, the shift toward team-based care models presents an opportunity to optimize nursing roles within radiation oncology, emphasizing the importance of specialized education and workforce planning. The findings underscore the necessity for a standardized approach to workforce modelling, considering patient acuity and other factors to ensure balanced resource allocation and improve care quality in radiation oncology settings.

Keywords: nursing, radiation oncology, workforce, workload, scope of practice, models of care

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INTRODUCTION

In 2023, approximately 29,100 Canadians were diagnosed with cancer, a projected increase of 79% in cancer incidence between 2003 and 2028 (Canadian Cancer Statistics Advisory Committee et al., 2023). As approximately 48% of all cancer patients require radiation treatment at some point (Abdel-Wahab et al., 2021; Delaney & Barton, 2015), understanding the radiation oncology health human resource (HHR) landscape is critical. Additionally, recognizing the specialized practice of oncology nurses and other healthcare professionals in caring for patients undergoing radiation treatment is essential for adequate and appropriate HHR planning, optimizing resource allocation, and informing effective policy making (Pickard et al., 2023; Seixas et al., 2021). Despite HHR pressures exacerbated by the COVID-19 pandemic, the visibility and integration of the sub-specialty of radiation oncology nursing in these settings has been slow and challenging. There is an urgent need to illuminate the evolving practice of the oncology nurse as part of the radiation oncology workforce, and understand better the complexities of measuring their significant contributions to the delivery of comprehensive cancer care.

HHR modelling provides vital tools in understanding the supply of specialized professionals needed to meet both current and future demands. Resulting insights support healthcare systems to manage service demands across geographic regions and specialties, and ensure balanced distribution of workload (Bakker et al., 2006; Canadian Partnership Against Cancer and Canadian Association of Provincial Cancer Agencies, 2010; Loewen et al., 2019; Pickard et al., 2023; Stuckless et al., 2012). Numerous international studies have assessed the radiation oncology workforce (Leung et al., 2019; Schofield et al., 2012; Scuteri et al., 2009; Vichare et al., 2013); and modelling conducted for radiation oncologists (Loewen et al., 2019; Stuckless et al., 2012), radiation therapists (Smoke & Ho, 2015), and medical physicists (Malkoske et al., 2021; Van Dyk et al., 2010) have proved helpful. However, no Canadian study has included the radiation oncology nursing workforce. To the best of our knowledge, this is the first study to contribute to HHR modelling for the Canadian radiation oncology nursing workforce.

Nurses play a critical role in radiation oncology by conducting patient assessments; managing symptoms; addressing physical and psycho-social needs, and filling administrative and leadership positions (Pirschel, 2018; Shepard & Kelvin, 1999; Weber, 2023). Evidence suggests that team-based care models, which include registered nurses (RNs)

and nurse practitioners (NPs) working to their full scope of practice, can improve patient outcomes, streamline workflows, and enhance satisfaction among both patients and team members (Lam et al., 2015; Pickard et al., 2023). Conversely, the unacknowledged increase in complexity of patient treatments with subsequent impacts on professional care requirements and workload negatively impacts work life and wellbeing (Bakker et al., 2006; Blay et al., 2002). Some research suggests that changes in staffing models and outdated views of nursing practice may hinder maximizing nurses' scope and be seen as undermining nursing leadership (Bakker et al., 2006). Such barriers and challenges to nurses' practice are still observed in contemporary clinical settings.

With Canada's shift towards team-based care, examining nursing practice, resources and positioning within cancer organizations is crucial for recommending ways to strengthen workplaces. Key to this is identifying educational opportunities to ensure sustainable practice supports. As radiation oncology nursing practice evolves, predicting and mitigating supply and demand fluctuations and gaining a comprehensive view of the workforce is essential. Data on the number of nurses in radiation oncology outpatient settings, resource allocation, required interdisciplinary practices, and sub-speciality education are vital. Additionally, understanding the impact of interdisciplinary collaboration on patient outcomes and provider satisfaction is valuable (Bosch & Mansell, 2015; Koo et al., 2014).

In 2023, the Canadian Association of Nurses in Oncology/Association canadienne des infirmières (CANO/ACIO) partnered with the Canadian Association of Radiation Oncologists (CARO, the Canadian Organization of Medical Physicists (COMP), and the Canadian Association of Medical Radiation Technologists (CAMRT) on the Pan-Canadian Radiation Oncology Health Human Resources Survey. The survey aimed to assist professional associations understand current workforce capacity, workload, and scopes of practice. Results will support predictive workforce modelling and, with the potential to inform policies and initiatives, be designed to meet the growing demand for radiation oncology services, including a robust workforce.

METHODOLOGY

Development and dissemination

An interdisciplinary working group, comprised of representatives from CANO/ACIO, CARO, COMP, and CAMRT developed the survey instrument, validated the survey distribution list, promoted completion of the survey through association-focused correspondence and direct follow-up, and is leading knowledge mobilization efforts within their organizations and the community.

The survey, which included 186 questions and employed branch logic to tailor paths by profession, was sent to 200 individuals across 50 radiation oncology centres in Canada, including department heads, heads of medical physics, radiation therapy leads, and nursing managers. While responses were confidential, with data aggregated by region, respondent information was collected to allow for thorough analysis and feedback to centres. The survey ran from May 23, 2023, to January 4, 2024, with follow-ups via email, phone calls, and newsletter reminders to boost response rates.

Scope

Nursing-specific questions gathered data on workforce numbers, resourcing, and practices within ambulatory radiation oncology staffing models, covering scopes of practice, educational requirements/opportunities, and recruitment and retention. Similar data were collected for radiation oncologists, medical physicists, and radiation therapists, along with details on patient consults, treatment courses, and fractions delivered. Information on services offered, equipment and technologies at each radiation oncology centre informed workload analysis and geographic access to radiotherapy services. For nurses, data included total staff, full-time equivalents (FTEs) of RNs, NPs, clinical nurse specialists (CNSs), and advanced practice nurses (APNs), consisting of triage coordinators, including telephone triage, clinical nurse educators, and nurse supervisors/managers, working in outpatient radiation oncology clinics. Finally, FTE vacancies and plans to fill vacancies and change FTE levels within the radiation oncology department were collected.

RESULTS

Response rates

The broader survey had an overall response rate of 58% (116/200), and a response rate of 42% (n = 21) for the nursing-focused questions. Centres in Ontario provided almost half (43%) of responses, while centres in Atlantic Canada represented 10% of responses (Table 1). Responses from catchment areas of more than 1,000,000 people (considered large radiation oncology centres) provided 29% of all responses with 71% of responses from small centres in catchment areas of between 100,000 and 1,000,000 people (Table 2).

Table 1

Nursing Response Rates by Region

Regions in Canada	*n* = 21 (%)
Western Coast & Prairies	5 (24)
Ontario	9 (43)
Quebec	5 (24)
Atlantic Canada	2 (10)

Table 2

Nursing Response Rates by Catchment Area Population

Catchment area population	*n* = 21 (%)
100,000–999,999 (small centres)	15 (71)
1,000,000 or more (large centres)	6 (29)

Service organization

Respondents reported on the organization of nursing services (Table 3) as either treatment modality- clinics (e.g., brachytherapy, linear accelerator [linac]) or disease-site-specific clinics (i.e., breast, gynecology, prostate). Respondents selecting the "Other" category indicated nursing services are organized using a team-based care model that includes sharing nurse resources with other non-radiation oncology clinics. Information was also collected on the proportion of nurses who exclusively provided care to radiation oncology ambulatory patients (Table 4), with this group employed only in the large centres. In contrast, nurses in small catchment areas divided their time amongst other oncology or ambulatory services, spending 25% or less time in radiation oncology-specific areas.

Table 3

How Nursing Services Are Organized

Service Organization	*n* = 21 (%)
Treatment modality-specific clinics (i.e. radiation oncology, brachytherapy, systemic therapy)	12 (57)
Other	5 (24)
Disease-specific clinics	2 (10)
Variation of both	2 (10)

Workforce and resourcing

Total nurse FTEs ranged from 2.0 to 24.5, with an average of 8.5 FTEs per centre, with large centres averaging 12.3 nurse (including APNs) FTEs and small centres averaging 6.8 FTEs. Centres where nurses spend 25% or less of their time providing care to radiation oncology patients also had fewer nurse FTEs (average = 7.1) than centres where nurses spend 75% or more of their time in radiation oncology (average = 9.0). All centres relied on RN staffing more than other types of nurses, with an average of 89% of radiation oncology nursing care provided by RNs. Only three centres, all in Quebec, had CNSs working in radiation oncology departments, with an average of 4.0 FTEs spending 75% or more of their time there. Only 40% of centres employed NPs to practice in radiation oncology. Results do not show a difference in NP allocation/resourcing between large and small centres, or in treatment-modality-specific centres when compared with other types of service.

Table 4

Proportion or Nurses Who Spend 100% of Their Time in Radiation Oncology

% of nursing staff that spend all their time in radiation oncology	*n* = 21 (%)
25% or less	6 (29)
26%–50%	2 (10)
75% or more	12 (57)
Unsure	1 (5)

Nine centres (*n* = 20) indicated that their centre had a defined optimal number of radiation oncology RN FTEs per linac, although a high degree of variability in that number was noted, ranging from 0.5 to 6.4 FTEs (mean = 2.4). Large centres indicated a higher number of nursing FTEs per linac than small centres (4.7 FTEs compared with 1.25 FTEs respectively). Responses regarding expectation of work hours for nurses in radiation oncology departments show that 61% (*n* = 18) are required to work extended hours, and 6% are on call for emergencies. Some nurses are afforded flexible shifts (22%) or the ability to self-schedule shifts (11%).

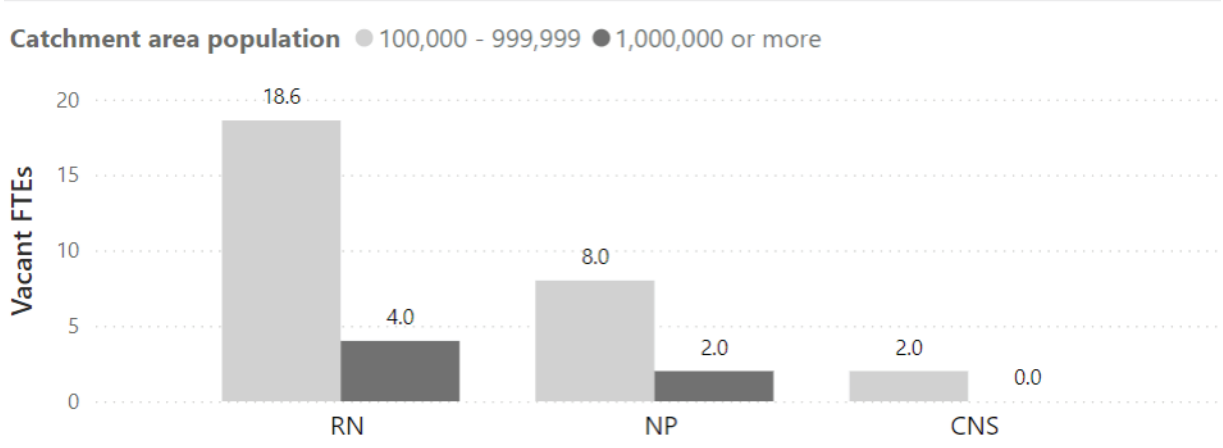
Nurse workforce demand

At the time of survey completion, half of all respondents noted at least one nursing vacancy in radiation oncology, with an average of 2.06 vacancies per centre and a range up to 11.0 FTEs. The findings indicated that 65% of nurse vacancies were for RNs, with vacancies ranging from 1.0 FTE to 6.6 FTEs. Across all responses, the total number of RN vacancies was 22.6 FTEs, which represents 15% of the 147 RNs filled FTEs across all reporting centres (Figure 1).

Seventy-three percent of respondents (*n* = 19) plan to maintain existing staff levels, replacing nurses who retire or depart for other reasons with

Figure 1

Vacancies by Role and Catchment Area Population



an equal FTE. Ten percent indicate that they plan to review current and future resourcing needs before determining if/how to replace the departing staff with a full 10% saying they did not plan to replace departing nurses. Sixty percent (n = 19) of centres anticipate needing more nursing FTEs in radiation oncology departments in the near future and 94% fully expect service volume to increase. Four of the five centres who did not anticipate increasing future nurse FTE nevertheless anticipate an increase to service volume in the coming years. Most respondents (82%) cited an increase in workload and a change in practice (55%) as the primary reasons for needing additional nursing resources. Other reasons to increase nursing FTEs included facility modifications (27%) and changes in other radiation oncology staffing levels (45%).

Scopes of practice and roles in radiation oncology models of care

Seventy-five percent of respondents indicated sub-specialty nurse positions (50% NPs, 25% CNSs) working in radiation oncology. NPs most often were employed to order/interpret investigations (e.g., blood work, imaging), prescribe medications, conduct patient assessments (including follow-up), and assist with consultations. CNSs often attended to emergent demands, such as urgent care activities and unscheduled assessment, managed radiation therapy-related side effects, and contributed to the care of patients currently on treatment and any follow-up assessments (Table 5).

Specialized education

Only half of respondents (n = 18) indicated that they required nurses working in radiation oncology to meet specific educational requirements (e.g., de Souza, ONS). Of the nine centres without established educational requirements or opportunities, some (3) provided either formal courses or radiation oncology-specific orientation or shadowing, and two are considering the introduction of more formal radiation oncology education. While 90% of respondents (n = 19) noted a specific orientation process for nurses in radiation oncology, there was a high degree of variability in the breadth and duration of this orientation, ranging from one week (of a six-week oncology orientation) spent on radiation oncology, to a comprehensive onboarding schedule that included a required radiation oncology course plus 60 shifts in the ambulatory care unit, 10 shifts in acute radiation oncology care, and a culminating exam. An in-house radiation oncology-specific mentorship was reported to be offered by 42% of respondents.

Qualitative responses to the survey's questions related to education requirements suggest a concern that introducing mandatory educational requirements or specialized certification might impact recruitment of nurses to radiation oncology. In addition, there were concerns such certification may limit the established staffing models that require nurses to work across various oncology departments. Sixty-eight percent of respondents indicated that nursing student practicums or rotations occurred in their department (37% inpatient and 63% in outpatient settings).

Recruitment and retention

When asked about the ease of recruitment (0 = extremely difficult and 10 = extremely easy), respondents (n = 18) reported an average score of 6.6, with a wide range from 1 to 10, highlighting significant variability between centres and regions (Figure 2). Recruitment challenges included inflexible work schedules (28%), workplace culture (22%), and high workload (17%). Qualitative responses suggest that these challenges may contribute to longer vacancy periods, difficulties in hiring full-time experienced nurses with additional subspeciality credentials. Some respondents noted radiation oncology clinics that limit services to regular business hours are easier to staff.

Similar responses were also seen regarding retention of existing staff, with an average score of 7.3 (0 = extremely difficult to retain nurses and 10 = extremely easy), although 25% noted that they had no retention challenges (Figure 3). According to respondents (n = 18), the most pressing issues related to retention were the high workload, inflexible work schedules, lack of career advancement, and workplace culture. Qualitative responses suggest that allowing nurses to choose their shifts and offering optional overtime improves retention. Radiation oncology clinics operating during regular business hours, without evening or weekend work, also contribute to higher retention rates.

Table 5

Advanced Practice Nursing Roles in Radiation Oncology

	NP n = 10 (%)	CNS n = 5 (%)
Assistance with consultations to improve workflow	7 (70)	0
Authorizes and provides prescriptions to patients	8 (80)	0
Follow-up care assessments	10 (100)	3 (60)
Inpatient care activities	2 (20)	1 (20)
Orders and interprets bloodwork, imaging, other investigations	9 (90)	0
Unscheduled patient assessment and management of RT-related side effects	6 (60)	2 (40)
Urgent care activities	5 (50)	3 (60)
Weekly on-treatment care assessments	7 (70)	2 (40)

Note. RO = radiation oncology; RT = radiation therapy.

Figure 2

Ease of Nurse Recruitment by Region (n = 18)

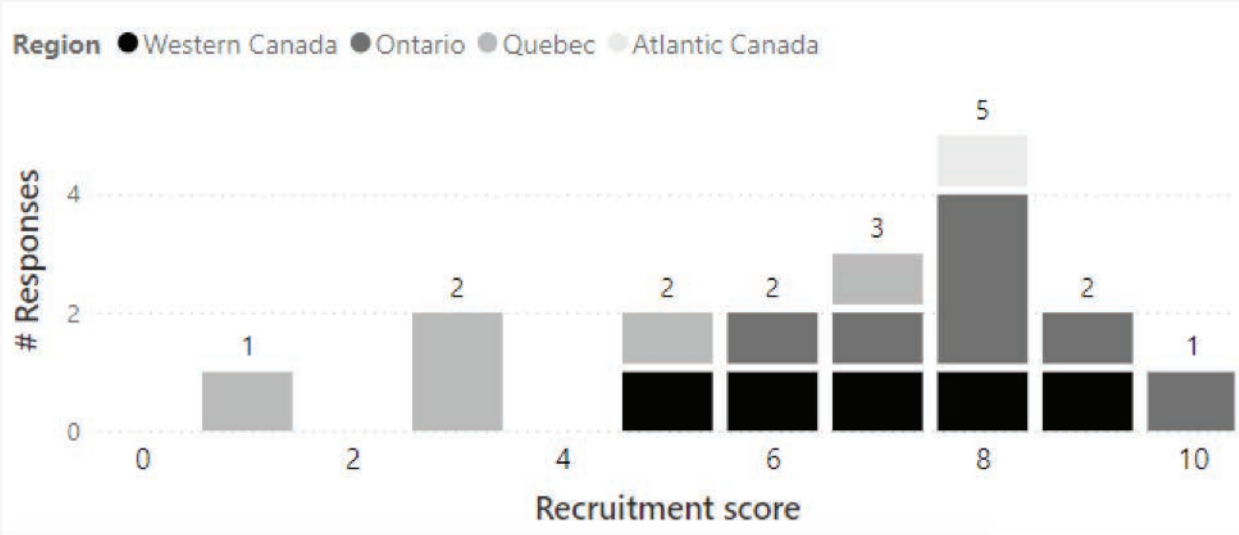
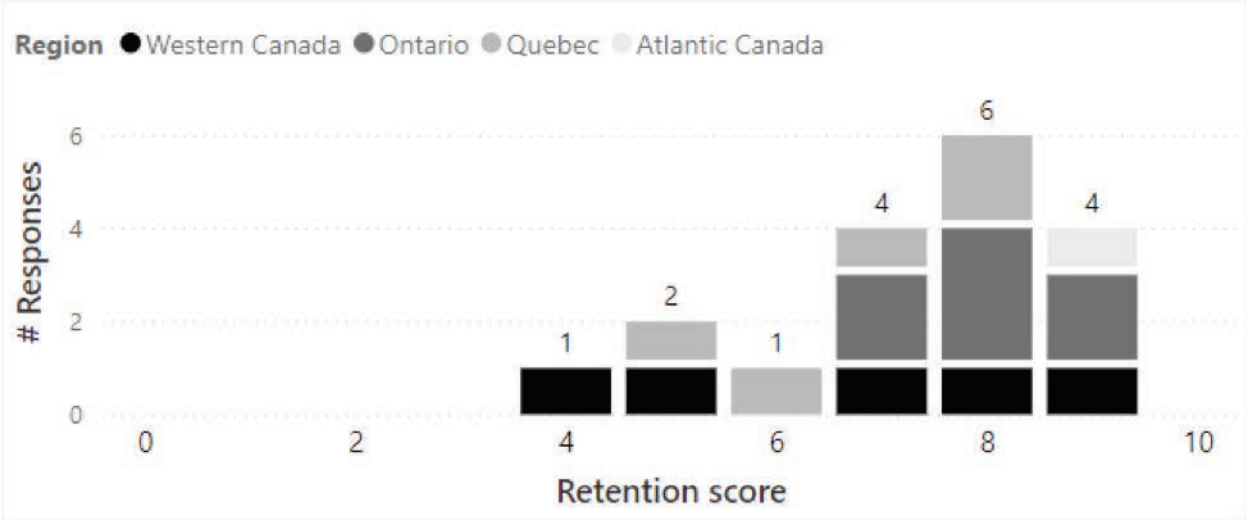


Figure 3

Ease of Nurse Retention by Region (n = 18)



DISCUSSION

The past few decades have included extensive innovation and change in the overall care of oncology patients (Pickard et al., 2023). Yet, our study reveals that evidence-informed models of nursing care have not kept pace with these advancements and, as a preliminary inquiry into the radiation oncology workforce in Canada, emphasizes the importance of further work in this area. As oncology treatment grows more complex, the demand for oncology-specific proficiency and sub-specialty (e.g., radiation oncology) expertise intensifies. How nurses are positioned within cancer care organizations not only reflects their perceived contribution to quality patient care, but also highlights how they are supported to enact such practice. This is particularly evident in workforce modelling, recruitment, retention, and the education of radiation oncology nurses, where gaps in support could impact the quality and timeliness of care.

Workforce modelling

Workforce modeling is crucial in contemporary healthcare, particularly for maintaining the stability of the radiation oncology workforce. Examples demonstrate the value of modelling for medical physicists (Malkoske et al., 2021; Van Dyk et al., 2010), radiation oncologists (Loewen et al., 2019; Stuckless et al., 2012), and radiation therapists (Smoke & Ho, 2015), typically considering the number of linacs or other technologies within the catchment

area. In contrast, nursing contributions to radiation oncology care often lack systematic measurement, leading to ad hoc approaches instead of validated algorithms to predict appropriate nurse FTEs. Nurses often perceive their practice as being wrapped around the patient and not technology, especially in outpatient departments like radiation oncology, where traditional nurse-to-patient ratios do not apply.

One challenge in modelling nursing staff levels is that nursing services are often bundled into overall budgets and not linked to patient outcomes, making them vulnerable to budgetary cuts (Longyear & Mills, 2024; Park et al., 2015). To counteract these cuts and stabilize the Canadian radiation oncology workforce, calculating an RN FTE-to-linac ratio similar to other disciplines could be critical. When registered nurses are routinely pulled away from radiation oncology specialty areas for 'operational needs' created by a lack of HHR or organizational planning, this signals that these nurses are not a consistent and valuable team member. While this study begins to explore such an opportunity, further research is needed to understand how an optimal RN FTE-to-linac ratio impacts patient outcomes, considering the delayed manifestation of radiotherapy side effects (Pirschel, 2018). Although predictions will not provide a complete solution, reducing regional variation could mitigate high nurse workload and promote equitable access to radiation oncology services, particularly in rural areas and smaller centres.

Modelling must also consider the changing demographics of the oncology nursing workforce, including factors like parental leave and an aging workforce. The rapidly evolving practice environment, with the increased use of virtual health, informatics, and machine learning decision support tools, also plays a critical role.

Recruitment and retention

Human resource decisions significantly impact long-term staffing levels. Despite a lack of investment in nursing infrastructure (Welton & Longyear, 2024), and limited data on recruiting and retaining oncology nurses, it is known that insufficient staffing and work-life balance issues exacerbate challenges (Challinor & Oldenmenger, 2020). Recruitment and retention efforts improve when nurses are given opportunities for career advancement, advocacy, and policy development (Health Canada, 2024). Proper orientation and interdisciplinary collaboration are key to professional satisfaction and better patient outcomes (Lam et al., 2015; Pickard et al., 2023).

Data from this survey, though limited, offers insights into recruitment and retention issues across small- and large-sized centres. For instance, a respondent from a small rural centre reported higher than average recruitment and retention challenges due to longer shifts or on-call hours with little flexibility, making it difficult to include specialized educational requirements on job postings. In contrast, a respondent from a large urban centre reported lower vacancies and below-average rating on ease of recruitment and retention. With more radiation oncology nursing FTEs, they could offer more flexible shifts and self-scheduling, and the urban candidate pool allowed them to require more specialized qualifications. While retention challenges may be compounded by recruitment issues and human resource decisions, providing support and opportunities for nurses to contribute their expertise will enhance workforce stability and help address future demands for nurses educated in radiation oncology and other subspecialities.

Education, orientation and mentoring

As the radiation oncology nursing specialty keeps pace with advancements in oncology treatment, opportunities for specialized education and mentoring are crucial. While study results suggest some concern that nursing subspeciality requirements may impede recruitment efforts, it may be argued that increasing the availability of and support for educational opportunities will promote a more stable workforce and reinforce the value of subspeciality expertise. Moreover, the promotion of clinical placement and education for student nurses is key to workforce planning and meeting the anticipated future radiation oncology nursing demand.

In addition to formal education opportunities, orientation to specific aspects of a specialized role (e.g., brachytherapy), while often lost in today's understaffed workplaces, is vital (Key, 2019), especially if coordinated by experienced oncology nurses with specialized radiation oncology education. In this way, education then orientation can seamlessly progress to mentorship, which will create a culture of lifelong learning, promoting safe patient care and collegiality (Key, 2019).

Limitations

Due to the length of the survey and anticipated challenges with data collection, partially completed surveys were included in the analysis, resulting in different denominators across the analyses. Furthermore, the analysis in this paper is limited to the questions asked in the nursing section of the survey. The survey was not conducted for quality improvement purposes, and the instrument used is not a validated tool. Lower response rates, and the lack of representation from all provinces and territories means that the results may not be fully representative of the Canadian radiation oncology landscape. Moreover, since the study captured only ambulatory care data, it does not fully reflect the entire scope of nursing practice in radiation oncology, particularly in inpatient settings. This narrower focus may under-represent the breadth of nursing roles in radiation oncology across different care environments.

CONCLUSION

Addressing the radiation oncology nursing workforce to ensure the increasing needs of oncology patients in Canada are met requires a multipronged approach of modeling, HHR planning including recruitment and retention strategies, and robust education and orientation supports. The results of this study support long-standing HHR and nursing research that have been underutilized and/or ignored. Due to lack of investment, Canada is facing a nursing workforce crisis and

inaction is not an option. Further work is required to understand the unique needs of oncology nurses, and the barriers and facilitators to enabling the full scope of radiation oncology nursing practice. In this way, we can move forward interdisciplinary and collaborative workforce planning that augments previous efforts from Canadian radiation oncologists, medical physicists and radiation therapists. Bold action is required to address research gaps, implement evidence-informed HHR nursing workforce strategies and, ultimately, support Canadian and global radiation oncology workforce efforts to ensure radiation oncology nurses will be available to their colleagues and patients.

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