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QUALITY IMPROVEMENT

Enhancing Radiation Oncology Training for Advanced Practice Providers Through a Standardized Online Curriculum: A Quality Improvement Initiative

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Author's disclosures of conflicts of interest are found at the end of this article.

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Abstract

Background: Rising cancer incidence and increasing survivorship continue to strain the radiation oncology workforce. Most advanced practice providers (APPs) entering radiation oncology receive predominantly on-the-job, non-standardized instruction, resulting in variability in preparedness, confidence, and satisfaction. Evidence supports structured online education to supplement clinical learning. **Purpose:** This quality improvement project was designed to guide iterative refinement of the Advanced Practitioner Radiation Oncology (APRO) curriculum by evaluating its effectiveness in improving APP knowledge, disease site familiarity, confidence in managing radiation-related toxicities, and satisfaction with radiation oncology training. **Methods:** As no validated tool for radiation oncology-specific APP education existed, survey items were adapted from comparable online medical education evaluations and reviewed for face and content validity by 10 radiation oncology APP experts. A pre- and post-survey design embedded within the APRO 18-module online curriculum assessed self-reported radiation oncology knowledge, familiarity with disease-site treatment paradigms, confidence in toxicity management, and satisfaction with prior training among a national cohort of APP learners. Outcomes were measured on three- and five-point Likert-type scales, with pre- and post-survey differences analyzed using Wilcoxon rank sum tests. **Results:** A total of 140 participants completed the pre-survey, and 72 (51%) completed the post-survey. Significant improvements were observed across all domains, including radiation oncology knowledge, disease-site familiarity, confidence in managing toxicities, and

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satisfaction with radiation oncology training (all $p < .05$). **Conclusions:** Findings demonstrate substantial educational benefit and support the APRO curriculum as a scalable, standardized approach to APP onboarding in radiation oncology.

In 2025, the National Cancer Institute projected that there would be approximately two million new cancer cases and more than 600,000 cancer-related deaths for that year (National Cancer Institute, 2025). Beyond current incidence, cancer diagnoses are projected to increase by nearly 30% between 2020 and 2040, substantially outpacing United States population growth, with older adults comprising an increasing proportion of cases (Garner et al., 2023). Concurrent growth in cancer survivorship is expected to further strain the health-care system, with the survivor population projected to rise from 15.5 million to 20.3 million by 2026 (Shulman et al., 2020). Shulman et al. (2020) project that the demand for oncology care will outpace the supply of oncologists by 2035, creating a looming crisis in cancer care delivery.

Radiation therapy is a central component of cancer treatment regimens, with more than half of patients undergoing cancer treatment expected to receive radiation therapy as a primary element of care (American Cancer Society, 2025). Advanced practice providers (APPs), including nurse practitioners and physician associates, play critical roles in specialized fields such as radiation oncology, including patient assessment, patient education, side-effect management, follow-up care, and survivorship care. The uneven distribution of radiation oncologists, particularly in rural areas, combined with an aging workforce nearing retirement, further strains already limited resources, increasing reliance on APPs as essential members of the oncology care team who expand access to care and help address projected workforce shortages (Kenamond et al., 2022; Bourdeanu et al., 2020).

Integrating APPs with standardized training in radiation oncology can reduce errors, improve side-effect management, decrease treatment delays, enhance reimbursement, and lower patient loss to follow-up (Swanson et al., 2023). Despite increased utilization, many APPs report limited access to standardized radiation oncology training, with onboarding often delivered through local apprenticeship-type models (Martin et al., 2020). This inconsistency in training may lead to variable preparedness, unclear role expectations, and reduced job satisfaction (Martin et al., 2020; Hwa et al., 2019; Mackey et al., 2018). Insufficient role definition and lack of specialty-specific education may also contribute to burnout and turnover, negatively affecting continuity of care and increasing organizational costs (Bourdeanu et al., 2020; Hartsell & Noecker, 2020; Arthur et al., 2020).

Prior research shows that standardized online education effectively complements on-the-job training by improving knowledge, clinical confidence, and learner satisfaction, while also increasing access for practitioners with time and travel constraints (Hoffmann et al., 2018; Vallée et al., 2020; He et al., 2021; Konstantinidis et al., 2022). Only 2.5% of oncology APPs report that their graduate education included oncology-specific training, and most feel unprepared to manage clinical challenges and treatment toxicities (Wagner et al., 2026; Mackey et al., 2018). Opportunities for standardized radiation oncology training in cancer care remain limited. Addressing this gap is essential to enable APPs to manage patients with cancer undergoing radiation therapy with greater confidence.

METHODS

To address educational gaps in radiation oncology APP training, a subcommittee of the APSHO Radiation Oncology APP Committee developed the APRO program. A nationally distributed team of radiation oncology APP subject-matter experts designed this 18-module curriculum, covering both foundational principles and disease site–specific content (Appendix A). Each module was delivered in an asynchronous, self-guided video format with embedded knowledge checks and case-based content. Modules were packaged by the APSHO design team and hosted within APSHO's proprietary learning management system, AP Academy, which is accessible upon enrollment (apacademy.apsho.org). Delivered nationally through this platform,

the curriculum engaged a diverse cohort of APPs practicing in academic medical centers, community cancer programs, and hospital-based radiation oncology departments. The program was intentionally designed to standardize foundational training, reduce variability in onboarding, and promote greater consistency in education across diverse oncology practice settings, with an expected average completion time of approximately 5 weeks.

To evaluate learner outcomes, the principal investigator (PI) developed a pre- and post-survey design embedded directly within the AP Academy course to assess changes in radiation oncology knowledge, familiarity with disease site–specific treatment concepts, and confidence in managing radiation-related toxicities. Participation was voluntary, and responses were captured and stored in Qualtrics (Qualtrics LLC, Seattle, WA). Embedding surveys within the learning platform streamlined data collection, minimized participant burden, and supported efficient evaluation across a geographically diverse sample. The PI subsequently extracted and analyzed the data to assess changes in learner knowledge and self-reported competency across the curriculum. The curriculum content, learning objectives, and assessment structure remained stable throughout the data collection period, with no substantive modifications following program launch.

As no validated survey instrument aligned with the specific objectives of this quality improvement project, survey items were developed to reflect APRO course goals and were adapted from comparable online medical education assessments, using the Stoehr et al. (2021) manuscript as a model for question structure and design. This process yielded 16 pre-course and 6 post-course survey items, which subsequently underwent face and content validity review by 10 radiation oncology APP subject-matter experts. Reviewer feedback focused primarily on clarity, readability, and alignment with course objectives, leading to minor revisions to improve wording and comprehension, while most items remained unchanged. Additionally, a unique identifier question, proposed by the study statistician to facilitate pairing of pre- and post-course responses, was included. In practice, participants had difficulty consistently recalling this identifier during the post-course survey, resulting in unpaired samples in the final analysis.

The University of Texas at Tyler Institutional Review Board (IRB) determined that this project met criteria for quality improvement and did not

Table 1. Participant Demographics Pre/Post and APSHO Membership Demographics

	Pre-survey	Post-survey		APSHO	
Variable	***n* (%)**	***n* (%)**	***p* value**	***n* (%)**	***p* value**
Age					
21–30 years old	19 (14)	5 (8)	.3458	N/A	N/A
31–40 years old	65 (46)	30 (45)		N/A	
41–50 years old	36 (26)	16 (24)		N/A	
> 50 years old	20 (14)	15 (23)		N/A	
Gender					
Male	10 (7)	8 (12)	.2585	N/A (6)	.3270
Female	129 (92)	59 (88)		N/A (93)	
Non-binary	1 (1)	0 (0)		N/A	
Professional role					
Nurse practitioner	97 (69)	44 (63)	**.0357**	1,339 (62)	**.0022**
Physician associate	41 (29)	18 (26)		475 (22)	
Other	2 (2)	8 (11)		346 (16)	

Note. APSHO = Advanced Practitioner Society for Hematology and Oncology. *P* values are from chi-squared tests; APSHO demographic data from Kurtin (2023). Non-binary category not included in statistical test due to small cell frequency or data unavailable.

require formal IRB approval. Participation was voluntary and anonymous, and only limited demographic data were collected to preserve participant privacy.

Statistical Analysis

Basic demographic and relevant professional characteristics of the study cohort were measured at baseline using the pre-survey. Data were collected on both the pre- and post-surveys for four areas of interest in order to evaluate improvement after completion of the APRO curriculum: Knowledge of radiation oncology concepts (five questions), familiarity with disease-site treatments (seven sites/questions), confidence in managing radiation-related toxicities (four questions), and overall satisfaction with radiation oncology training (one question). Outcomes were measured using Likert-type scales with knowledge questions measured on a 5-point scale (Strongly disagree/Disagree/Neutral/Agree/Strongly agree), disease site and radiation-related toxicity on a three-point scale (Very familiar/Somewhat familiar/Not familiar) with a 7-point scale for "Ability to prioritize interventions and manage radiation side effects" (1 = Not at all confident to 7 = Very confident). Overall satisfaction was measured on a 7-point scale (1 = Extremely dissatisfied to 7 = Extremely satisfied).

Descriptive statistics for each survey item were calculated as counts with percentages and percent change for all ordinal and nominal variables, and as mean and standard deviation for continuous variables. Likert-type scale variables were converted to numeric equivalents for analysis using the Wilcoxon rank sum test. The Wilcoxon test evaluates differences between two groups for ordinal variables without requiring a normal distribution, making it the best statistical test for the Likert-type scale outcomes used in this project (Rosner, 2015). The rank-sum (two independent groups) approach was used rather than the signed-rank (two dependent groups) approach because the pre- and post-responses were not linked. Differences in age, gender, and professional role were assessed between pre- and post-survey respondents to evaluate the representativeness of the post-cohort after loss to follow-up, and these were also compared with the APSHO membership base to inform the external validity of the results (Table 1). The post hoc comparisons were conducted using chi-square tests (Rosner, 2015) and confirmed that the evaluated sample was representative of

Table 2. Participant Demographics and Professional Characteristics (*N* = 140)

Variable	*N* (%)
Age	
21–30 years old	19 (13.6)
31–40 years old	65 (46.4)
41–50 years old	36 (25.7)
> 50 years old	20 (14.3)
Gender	
Male	10 (7.1)
Female	129 (92.1)
Non-binary	1 (0.7)
Highest degree	
Doctorate	29 (20.7)
Graduate or professional degree	110 (78.6)
Bachelor's degree	1 (0.7)
Professional role	
Nurse practitioner	97 (69.3)
Physician associate	41 (29.3)
Other	2 (1.4)
Specialty	
Radiation oncology	120 (85.7)
Medical oncology	16 (11.4)
Other	4 (2.9)
Practice setting	
Hospital-based radiation facility	94 (67.1)
Community outpatient freestanding radiation facility	37 (26.4)
Other	9 (6.4)
Radiation oncology experience	
0–4 years	93 (66.4)
5–10 years	26 (18.6)
> 10 years	10 (7.1)
N/A (practice not in radiation oncology)	11 (7.9)
Previous radiation oncology training	
On-the-job	121 (87.1)
Nursing education resources	7 (5.0)
Resident/physician resources	2 (1.4)
Other	9 (6.5)

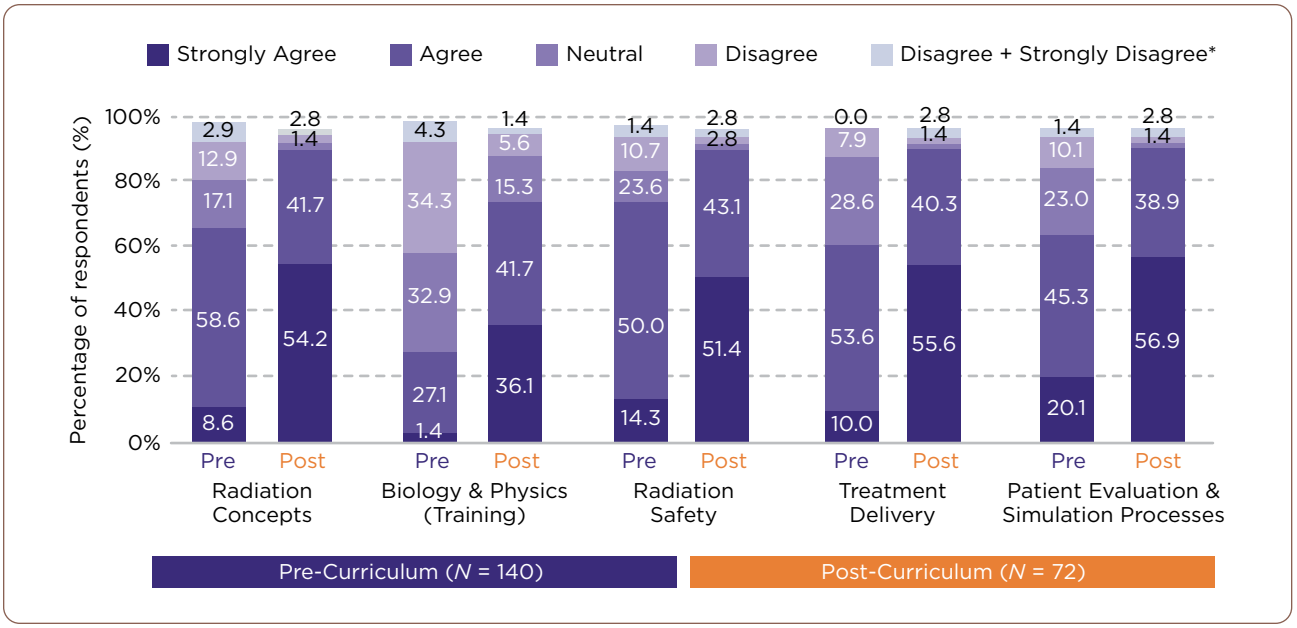


Figure 1. Participant knowledge of oncology concepts before and after curriculum completion.
*Disagree and Strongly Disagree results combined where needed due to graph space constraints.

the overall membership makeup and that the post-survey respondents were representative of the pre-survey group. For all statistical tests, significance was assessed at $p < .05$.

RESULTS

Demographics

The data were collected from April 13, 2025, to February 18, 2026. A total of 140 individuals took the pre-survey, and 72 completed the course and the post-survey (51%). The sample was primarily female (92%) and comprised nurse practitioners (69%), with 74% aged 31 to 50 years (Table 2). 21% of participants held a doctorate, but most reported other graduate or professional degrees as their highest degree earned (79%; Table 2). Most respondents specialized in radiation oncology (86%), with 11% specializing in medical oncology. 66% of course participants had 0 to 4 years of radiation oncology experience. When asked where participants had received radiation oncology training, 86% reported receiving only on-the-job training (n = 121/140). Other training reported came from nursing education resources (5%), radiation oncology resident/physician resources (1%), and radiation therapist resources (1%), with 6% reporting "other" (Table 2).

Knowledge of Radiation Oncology Concepts

Improvement in self-perceived knowledge level of radiation oncology concepts was statistically significant across all assessed areas (in all cases, $p < .0001$; Figure 1, Table 3). Percentage point increases in the number of respondents choosing "Strongly agree" from before to after the course ranged from 34.7 percentage points for "I have sufficient training in biology and physics" to 45.6 percentage points for "I understand radiation oncology concepts" and "I know how radiation treatment is delivered" (Table 3). Additionally, across all questions, the number of Neutral/Disagree/Strongly disagree responses decreased by an average of more than 11% (Figure 1, Table 3). Item nonresponse on the knowledge questions was low, with only one respondent missing one question ("I understand patient evaluation and simulation processes"; Table 3).

Familiarity With Disease-Site Treatments

Familiarity increased significantly across all seven disease sites (all $p \leq .05$; Figure 2, Table 4). Familiarity with gastrointestinal cancers increased substantially, with a 25.0% absolute increase in respondents reporting being "Very familiar" and a 22.9% decrease in those reporting "Not familiar" ($p < .0001$; Figure 2, Table 4). Substantial gains

Table 3. Knowledge of Radiation Oncology Concepts and Results of Wilcoxon Rank Sum Tests

Variable, *N* (%)	Pre (*N* = 140)	Post (*N* = 72)	% point change	*p* value
I understand radiation oncology concepts.				
Strongly agree	12 (8.6)	39 (54.2)	45.6	< .0001
Agree	82 (58.6)	30 (41.7)	-16.9	
Neutral	24 (17.1)	1 (1.4)	-15.8	
Disagree	18 (12.9)	0 (0.0)	-12.9	
Strongly disagree	4 (2.9)	2 (2.8)	-0.1	
I have sufficient training in biology and physics.				
Strongly agree	2 (1.4)	26 (36.1)	34.7	< .0001
Agree	38 (27.1)	30 (41.7)	14.5	
Neutral	46 (32.9)	11 (15.3)	-17.6	
Disagree	48 (34.3)	4 (5.6)	-28.7	
Strongly disagree	6 (4.3)	1 (1.4)	-2.9	
I understand radiation safety.				
Strongly agree	20 (14.3)	37 (51.4)	37.1	< .0001
Agree	70 (50.0)	31 (43.1)	-6.9	
Neutral	33 (23.6)	2 (2.8)	-20.8	
Disagree	15 (10.7)	1 (1.4)	-9.3	
Strongly disagree	2 (1.4)	1 (1.4)	0.0	
I know how radiation treatment is delivered.				
Strongly agree	14 (10.0)	40 (55.6)	45.6	< .0001
Agree	75 (53.6)	29 (40.3)	-13.3	
Neutral	40 (28.6)	1 (1.4)	-27.2	
Disagree	11 (7.9)	1 (1.4)	-6.5	
Strongly disagree	0 (0.0)	1 (1.4)	1.4	
I understand patient evaluation and simulation processes				
Strongly agree	28 (20.1)	41 (56.9)	36.8	< .0001
Agree	63 (45.3)	28 (38.9)	-6.4	
Neutral	32 (23.0)	1 (1.4)	-21.6	
Disagree	14 (10.1)	1 (1.4)	-8.7	
Strongly disagree	2 (1.4)	1 (1.4)	0.0	

were also observed for breast (+24.1 percentage points; p = .0008; Figure 2, Table 4), lung (+22.2 percentage points; p = .0026; Figure 2, Table 4), and genitourinary (+19.9 percentage points; p = .0016; Figure 2, Table 4), with smaller but statistically significant increases for CNS (+17.6 percentage points; p = .0033; Figure 2, Table 4), gynecologic (+11.9 percentage points; p = .0017; Figure 2, Table 4), and head and neck (+9.4 percentage points; p = .0140; Figure 2, Table 4). Consistent with these shifts, "Not familiar" responses declined by > 15% for every site (range, -15.3% [lung] to -25.3% [gynecologic]; Figure 2). Item non-response for familiarity items was minimal (one missing response on two pre-survey and two post-survey items).

Confidence in Managing Radiation-Related Toxicities

Significant pre- to post-course increases in confidence in managing radiation-related toxicities were observed across all domains (all p < .0001; Figure 3, Table 5). The largest gains were seen in pediatric considerations, where "Not familiar"

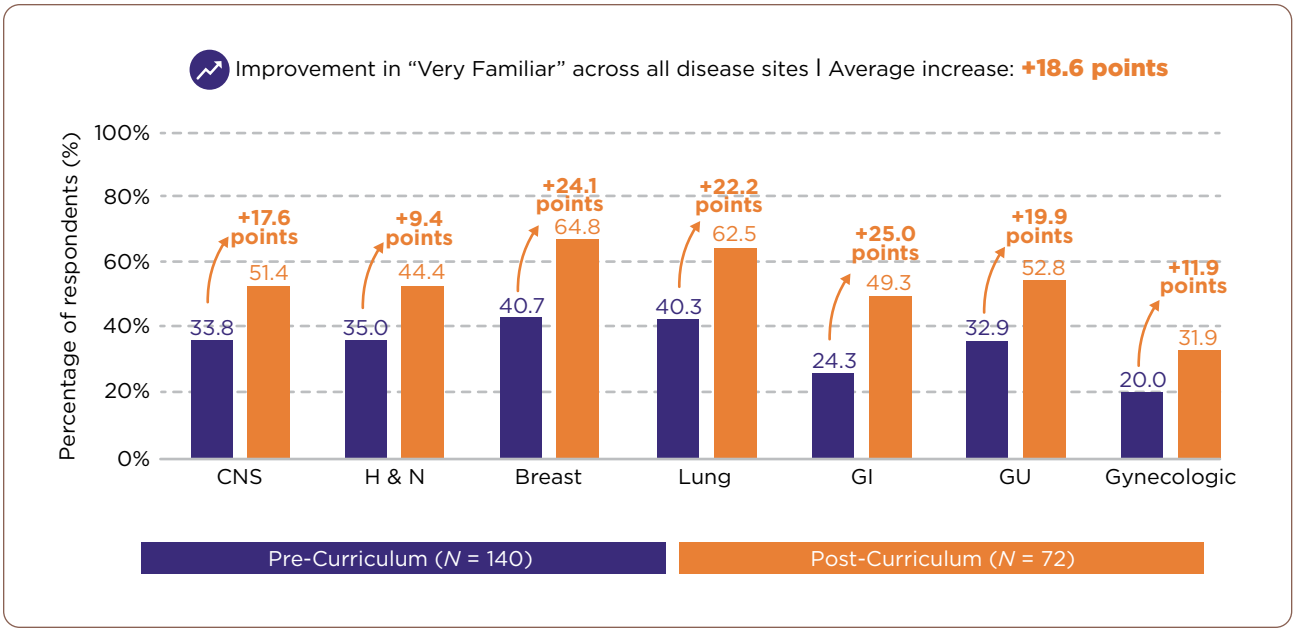


Figure 2. Percentage of participants reporting "very familiar" with disease-site treatments before and after APRO curriculum completion.

responses decreased by 61.9 percentage points (from 81.3% to 19.4%; Figure 3, Table 5), and "Somewhat familiar" and "Very familiar" responses increased substantially (+41.1 percentage points and +20.7 percentage points, respectively; Figure 3, Table 5). Confidence in acute toxicity management also rose, with "Very familiar" responses increasing by 44.5 percentage points and "Not familiar" responses dropping from 12.9% to 0% (Figure 3, Table 5). Similar strong improvements were seen for late and long-term toxicities ("Very familiar" +40.6 percentage points; Figure 3, Table 5) and supportive care/survivorship ("Very familiar" +40.5 percentage points; Figure 3, Table 5). The mean score for "ability to prioritize interventions and manage radiation side effects" increased from 3.01 to 5.28, a 2.27-point gain (75.4% improvement; Table 5). Item nonresponse was minimal, with only one missing response on each of the four pre-survey items and none on the post-survey.

Satisfaction With Training

Overall satisfaction with the "current level of training in radiation oncology" improved substantially from before to after the APRO curriculum ($p < .0001$; Table 6, Figure 4). Prior to the course, 62.2% of participants reported being satisfied with their current level of training, with 18.5% reporting being dissatisfied (19.3% reported feeling neutral; Table 6). After the APRO course, 88.95% of participants reported satisfaction, with only 4.2% remaining dissatisfied ($n = 3$; Table 6). Moreover, there was a strong increase (27.5 percentage points) in the number of participants reporting being extremely satisfied in the post-survey compared with the pre-survey (Figure 4, Table 6). There was no item non-response to the satisfaction question for either survey.

DISCUSSION

This quality improvement project evaluated the APRO curriculum to determine its effectiveness in strengthening foundational and disease-specific radiation oncology education for APPs. The intention of the statistical analysis was to guide program refinement rather than to establish causal efficacy. Despite this non-causal analytic intent, clear and statistically significant improvements were observed across all learning domains, demonstrating the curriculum's educational impact.

Learners reported substantial gains in self-perceived knowledge, familiarity with disease site–specific treatment approaches, and confidence in managing acute, long-term, and complex

Table 4. Familiarity With Disease-Site Treatments and Results of Wilcoxon Rank Sum Tests

Variable, *N* (%)	Pre (*N* = 140)	Post (*N* = 72)	% point change	*p* value
Central nervous system				
Not familiar	36 (25.9)	3 (4.2)	-21.7	.0033
Somewhat familiar	56 (40.3)	32 (44.4)	4.2	
Very familiar	47 (33.8)	37 (51.4)	17.6	
Head and neck				
Not familiar	34 (24.3)	3 (4.2)	-20.1	.0140
Somewhat familiar	57 (40.7)	37 (51.4)	10.7	
Very familiar	49 (35.0)	32 (44.4)	9.4	
Breast				
Not familiar	35 (25.0)	5 (7.0)	-18.0	.0008
Somewhat familiar	48 (34.3)	20 (28.2)	-6.1	
Very familiar	57 (40.7)	46 (64.8)	24.1	
Lung				
Not familiar	27 (19.4)	3 (4.2)	-15.3	.0026
Somewhat familiar	56 (40.3)	24 (33.3)	-7.0	
Very familiar	56 (40.3)	45 (62.5)	22.2	
Gastrointestinal				
Not familiar	38 (27.1)	3 (4.2)	-22.9	< .0001
Somewhat familiar	68 (48.6)	33 (46.5)	-2.1	
Very familiar	34 (24.3)	35 (49.3)	25.0	
Genitourinary				
Not familiar	33 (23.6)	2 (2.8)	-20.8	.0016
Somewhat familiar	61 (43.6)	32 (44.4)	0.9	
Very familiar	46 (32.9)	38 (52.8)	19.9	
Gynecologic				
Not familiar	49 (35.0)	7 (9.7)	-25.3	.0017
Somewhat familiar	63 (45.0)	42 (58.3)	13.3	
Very familiar	28 (20.0)	23 (31.9)	11.9	

toxicities. The consistent improvement across these domains indicates that the APRO curriculum successfully addresses previously identified gaps in radiation oncology onboarding. These advances also support the course's ability to establish a common baseline of preparedness for APPs entering radiation oncology practice.

Clinically, the introduction of a standardized radiation oncology curriculum may help reduce variability in onboarding practices across institutions. Standardized education is likely to improve APP readiness for independent clinical responsibilities, clarify role expectations within interdisciplinary teams, and strengthen confidence in managing radiation-related care. These improvements may also contribute to workforce sustainability by enhancing job satisfaction and reducing early turnover, particularly important in a specialty already experiencing workforce strain.

Strengths and Limitations

A key strength of the APRO curriculum is its national accessibility. As an asynchronous program developed by radiation oncology APP experts for oncology APPs, it meets the unique training needs of clinicians whose prior education often lacks radiation oncology–specific content. The course's national reach enables APPs in varied practice settings to

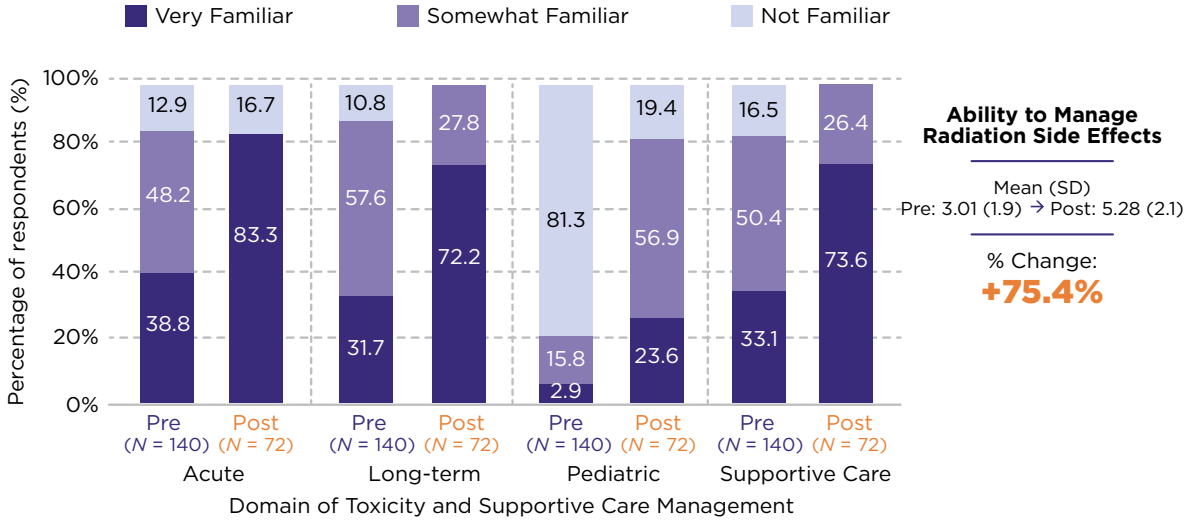


Figure 3. Percentage of participants reporting confidence in managing radiation-related toxicities before and after APRO curriculum completion.

receive consistent, high-quality training regardless of geographic location or institutional resources.

However, this project is not without limitations. Matching pre- and post-survey responses proved difficult due to incomplete or forgotten unique IDs, precluding the use of paired analytic approaches. The average course completion time was approximately 5 weeks, with some learners requiring up to 8 months, further contributing to the unmatched data. Although paired testing can provide increased precision, the consistently statistically significant findings from independent-group analyses indicate that the conclusions regarding educational improvement would not have been altered by matched data. In addition, the sample was limited to APPs who were APSHO members, participants in the Radiation Oncology APP Network listserv, or individuals reached through word of mouth. Broader dissemination may yield different demographic or baseline profiles. Finally, outcomes were based on self-perceived knowledge rather than an objective assessment of mastery.

A notable limitation of this project was participant attrition, with approximately 49% of learners not completing the post-course survey, which is not uncommon in QI initiatives. To address this in future iterations, strategies to improve survey completion will be considered, including incorporating an automated prompt or final checkpoint within the learning platform requiring or reminding participants to complete the post-course survey prior to course completion. Such measures may help reduce attrition and strengthen the completeness and reliability of outcome data.

Applications for Practice and Future Directions

Ongoing refinement will remain essential to maintaining clinical relevance and addressing emerging learner needs. In alignment with the primary aim of this quality improvement project, these findings will directly inform iterative updates to the APRO curriculum. Learner feedback and evolving practice demands highlight several areas for future expansion, including basic imaging interpretation, theranostics, and benign conditions treated with radiation. Future work will also evaluate pre- and post-test performance within individual modules to assess objective knowledge acquisition at the content level, complementing broader measures of learner outcomes. Additional opportunities for more robust evaluation include time-to-competency analyses. Expanding dissemination beyond

Table 5. Confidence in Managing Radiation-Related Toxicities and Wilcoxon Rank Sum Test Results

Variable, *N* (%)	Pre (*N* = 140)	Post (*N* = 72)	% point change	*p* value
Acute radiation toxicity management				
Not familiar	18 (12.9)	0 (0.0)	-12.9	< .0001
Somewhat familiar	67 (48.2)	12 (16.7)	-31.5	
Very familiar	54 (38.8)	60 (83.3)	44.5	
Late and long-term toxicities				
Not familiar	15 (10.8)	0 (0.0)	-10.8	< .0001
Somewhat familiar	80 (57.6)	20 (27.8)	-29.8	
Very familiar	44 (31.7)	52 (72.2)	40.6	
Pediatric considerations in disease management				
Not familiar	113 (81.3)	14 (19.4)	-61.9	< .0001
Somewhat familiar	22 (15.8)	41 (56.9)	41.1	
Very familiar	4 (2.9)	17 (23.6)	20.7	
Supportive care and survivorship				
Not familiar	23 (16.5)	0 (0.0)	-16.5	< .0001
Somewhat familiar	70 (50.4)	19 (26.4)	-24.0	
Very familiar	46 (33.1)	53 (73.6)	40.5	
Ability to prioritize interventions and manage radiation side effects (mean, SD)	3.01 (1.9)	5.28 (2.1)	75.4%	< .0001

APSHO membership will further promote equitable access to standardized training. Collectively, these efforts will ensure that the APRO curriculum remains a dynamic, high-quality national resource capable of supporting the evolving role of APPs in radiation oncology practice.

CONCLUSION

The APRO curriculum demonstrated substantial educational impact and effectively addressed critical gaps in foundational and disease-specific radiation oncology training for APPs in oncology. Statistically significant improvements across all measured domains (knowledge, disease site familiarity, confidence in managing radiation-related toxicities, and satisfaction with radiation oncology training) affirm the curriculum's ability to enhance APP preparedness and support safe, consistent clinical practice. These outcomes align with the primary aim of this quality improvement project: to guide ongoing curriculum refinement and evaluate the program's capacity to strengthen APP competency in radiation oncology. Given the curriculum's accessibility, national reach, and development by radiation oncology APP experts, the APRO curriculum offers an

Table 6. Overall Satisfaction With Current Level of Training in Radiation Oncology

Satisfaction level, *N* (%)	Pre (*N* = 140)	Post (*N* = 72)	% point change	*p* value
Extremely satisfied	12 (8.6)	26 (36.1)	27.5	< .0001
Moderately satisfied	46 (32.9)	28 (38.9)	6.0	
Slightly satisfied	29 (20.7)	10 (13.9)	-6.8	
Neither satisfied nor dissatisfied	27 (19.3)	5 (6.9)	-12.3	
Slightly dissatisfied	15 (10.7)	0 (0)	-10.7	
Moderately dissatisfied	10 (7.1)	2 (2.8)	-4.4	
Extremely dissatisfied	1 (0.7)	1 (1.4)	0.7	

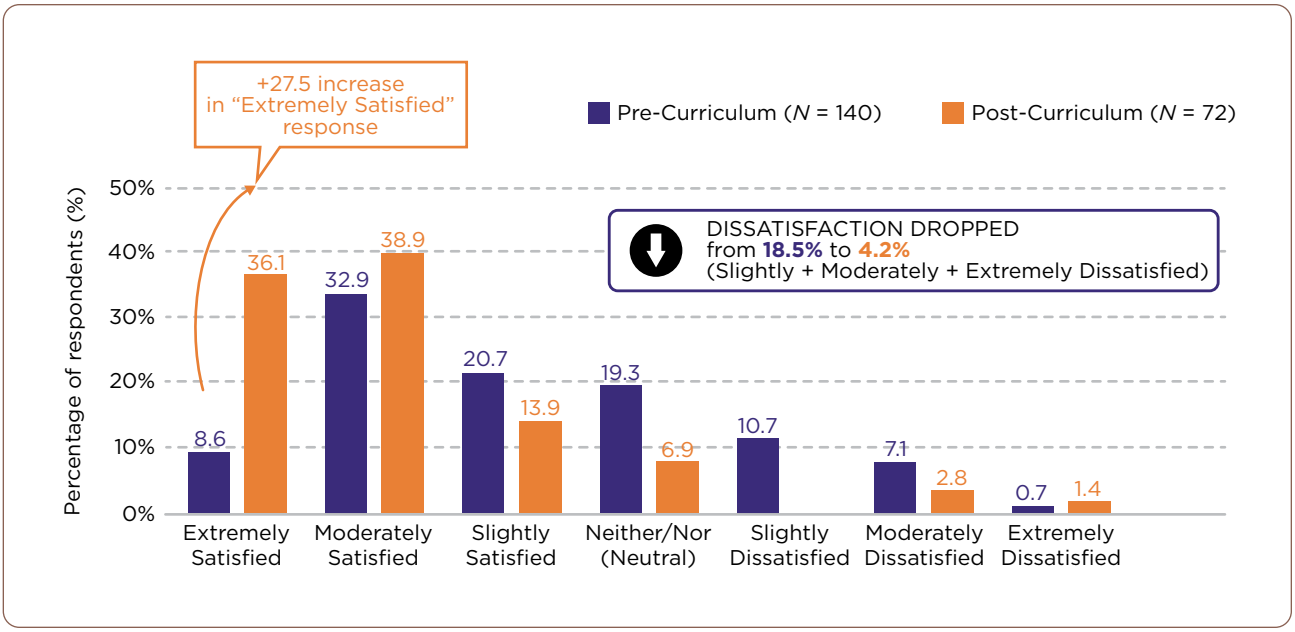


Figure 4. Overall satisfaction with training in radiation oncology. 7-point scale; $p < .0001$, Wilcoxon rank sum test.

evidence-based, scalable solution to the persistent variability in radiation oncology onboarding across practice settings. Incorporating the APRO curriculum into standard onboarding workflows would meaningfully advance training consistency, clinical readiness, and workforce stability in radiation oncology. Together, these findings position the APRO course as a strong and promising candidate for national adoption as a standardized onboarding curriculum for APPs entering radiation oncology practice. While these results highlight its potential, further comparative and outcomes-based research is needed to establish APRO as a national standard.

Disclosure

The author has no conflicts of interest to disclose.

References

American Cancer Society. (2025). *What goes into planning your radiation therapy*. https://www.cancer.org/cancer/treatment-types/radiation/basics.html

Arthur, E., Brom, H., Browning, J., Bell, S., Schueler, A., & Rosselet, R. (2020). Supporting advanced practice providers' professional advancement: The implementation of a professional advancement model at an academic medical center. *The Journal for Nurse Practitioners, 16*(7), 504–508. https://doi.org/10.1016/j.nurpra.2020.04.012

Bourdeanu, L., Zhou, Q. P., DeSamper, M., Pericak, K. A., & Pericak, A. (2020). Burnout, workplace factors, and intent to leave among hematology/oncology nurse practitioners. *Journal of the Advanced Practitioner in Oncology, 11*(2), 141–148. https://doi.org/10.6004/jadpro.2020.11.2.2

Garner, W. B., Smith, B. D., Ludmir, E. B., Wakefield, D. V., Shabason, J., Williams, G. R., Martin, M. Y., Wang, Y., Ballo, M. T., & VanderWalde, N. A. (2023). Predicting future cancer incidence by age, race, ethnicity, and sex. *Journal of Geriatric Oncology, 14*(1), Article 101393. https://doi.org/10.1016/j.jgo.2022.10.008

Hartsell, Z., & Noecker, A. (2020). *Quantifying the cost of advanced practice provider turnover*. SullivanCotter. https://sullivancotter.com/resources/quantifying-the-cost-of-advanced-practice-provider-turnover

He, L., Yang, N., Xu, L., Ping, F., Li, W., Sun, Q., Li, Y., Zhu, H., & Zhang, H. (2021). Synchronous distance education vs traditional education for health science students: A systematic review and meta-analysis. *Medical Education, 55*(3), 293–308. https://doi.org/10.1111/medu.14364

Hoffmann, R. L., Klein, S., Connolly, M., & Rosenzweig, M. Q. (2018). Oncology nurse practitioner web education resource (ONc-PoWER): An evaluation of a web-enhanced education resource for nurse practitioners who are new to cancer care. *Journal of the Advanced Practitioner in Oncology, 9*(1), 27–37. https://doi.org/10.6004/jadpro.2018.9.1.2

Hwa, Y. L., Marshall, A. L., Shelly, J. L., Colborn, L. K., Nowakowski, G. S., & Lacy, M. Q. (2019). Assessment of the need for a hematology-specific fellowship curriculum for advanced practice providers using a needs-based survey. *Journal of Oncology Practice, 15*(7), e593–e599. https://doi.org/10.1200/JOP.18.00697

Kenamond, M. C., Mourad, W. F., Randall, M. E., & Kaushal, A. (2022). No oncology patient left behind: Challenges and solutions in rural radiation oncology. *The Lancet Regional Health – Americas, 13*, Article 100289. https://doi.org/10.1016/j.lana.2022.100289

Konstantinidis, K., Apostolakis, I., & Karaiskos, P. (2022). A narrative review of e-learning in professional education of healthcare professionals in medical imaging and radiation therapy. *Radiography, 28*(2), 565–570. https://doi.org/10.1016/j.radi.2021.12.002

Kurtin, S. (2023). Advanced practitioners in hematology and oncology: A call to action. *Journal of the Advanced Practitioner in Oncology, 14*(Suppl. 3), 5–7. https://doi.org/10.6004/jadpro.2023.14.7.9

Mackey, H., Noonan, K., Kennedy Sheldon, L., Singer, M., & Turner, T. (2018). Oncology nurse practitioner role: Recommendations from the Oncology Nursing Society's Nurse Practitioner Summit. *Clinical Journal of Oncology Nursing, 22*(5), 516–522. https://doi.org/10.1188/18.CJON.516-522

Martin, K. L., Krechmer, B., Boyajian, R. N., Reynolds, M. C., Cagney, D. N., & Martin, N. (2020). Advanced practice providers in radiation oncology. *Practical Radiation Oncology, 10*(4), e192–e198. https://doi.org/10.1016/j.prro.2019.10.001

National Cancer Institute. (2025). *Cancer statistics*. https://www.cancer.gov/about-cancer/understanding/statistics

Rosner, B. (2015). *Fundamentals of biostatistics* (8th ed.). Cengage Learning.

Shulman, L. N., Sheldon, L. K., & Benz, E. J. (2020). The future of cancer care in the United States—Overcoming workforce capacity limitations. *JAMA Oncology, 6*(3), 327–328. https://doi.org/10.1001/jamaoncol.2019.5358

Stoehr, F., Müller, L., Brady, A., Trilla, A., Mähringer-Kunz, A., Hahn, F., Düber, C., Becker, N., Wörns, M. A., Chapiro, J., Hinrichs, J. B., Akata, D., Ellmann, S., Huisman, M., Koff, D., Brinkmann, S., Bamberg, F., Zimmermann, O., Traikova, N. I., . . . Kloeckner, R. (2021). How COVID-19 kick-started online learning in medical education—The DigiMed study. *PLOS One, 16*(9), Article e0257394. https://doi.org/10.1371/journal.pone.0257394

Swanson, S. L., Swanson, J. W., Cavanaugh, S. X., Wright, P. P., & Simpson, R. L. (2023). Radiation oncologist shortage creates opportunity for NPs. *Nursing Administration Quarterly, 47*(4), 306–312. https://doi.org/10.1097/NAQ.0000000000000599

Vallée, A., Blacher, J., Cariou, A., & Sorbets, E. (2020). Blended learning compared to traditional learning in medical education: Systematic review and meta-analysis. *Journal of Medical Internet Research, 22*(8), Article e16504. https://doi.org/10.2196/16504

Wagner, B. S., Martinka, L., Gordon, D., Anderson, S., Bukolt, K., Martin, K., & Golden, D. W. (2026). Characterizing the clinical role of radiation oncology advanced practice providers using entrustable professional activities. *Journal of the Advanced Practitioner in Oncology*. https://doi.org/10.6004/jadpro.2026.17.7.8

Appendix A. Advanced Practitioner in Radiation Oncology (APRO) Curriculum Overview

Introduction to Radiation Oncology	Disease Overview: GU Tumors
Radiation Biology and Physics	Disease Overview: GYN Tumors
Radiation Safety and Compliance	Disease Overview: Systemic, Palliative, Emergent, and Benign Conditions
Radiation Treatment Delivery	Common Toxicities: Acute
Patient Evaluation and Simulation	Common Toxicities: Late/Long Term
Disease Overview: CNS Tumors	Emerging Changes
Disease Overview: Head and Neck Tumors	Pediatric Considerations
Disease Overview: Chest (Breast/Lung) Tumors	Supportive Care, Survivorship and Patient Education
Disease Overview: GI Tumors	AP Practice Fundamentals for Radiation Oncology