

Special Article

Advanced Practice Providers in Radiation Oncology



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Received 11 June 2019; revised 1 October 2019; accepted 1 October 2019

Abstract

Purpose: The report highlights utilization of advanced practice providers (APPs) in an academic radiation oncology center and how their role benefits patient care and departmental workflow.

Methods and Materials: A self-reported workflow analysis of department APPs was conducted across 5 disease sites. A review of electronic medical records was performed to determine the percent of APP follow-ups completed independently versus in a shared capacity with the radiation oncologist. A review of the APP's didactic and clinical training program was performed.

Results: Across all disease sites, approximately 40% of the APP's time was spent on direct patient care, predominantly composed of independent follow-up visits (9%-35%) and telehealth (2%-30%). The breast malignancies group was an outlier with a higher focus on consults or shared visits (25%). Indirect patient care accounts for 30% to 50% of workflow with the focus on visit preparation or care coordination (13%-35%) and dictation (8%-13%). Administrative responsibilities including process improvement, research, education, and leadership account for the remainder (5%-26%) and are varied across disease sites. The central nervous system malignancies group and genitourinary malignancies group reported a greater percentage of their time (23%-26%) on administration compared with other groups (5%-9%). On average APPs see most of their visits independently from the physicians (86.41%) with 13.59% of visits being seen in a shared capacity.

Conclusions: APPs can positively affect the field of radiation oncology by augmenting clinical capacity, optimizing workflow and increasing department efficiency via both direct and indirect patient care and through involvement in administrative and leadership duties. By implementing an independent-to practice model, simultaneous APP and physician clinics run parallel to each other, limiting shared visits for complex cases. This promotes APP job satisfaction and provides greater access to patient care without compromising quality. This article highlights a model for the utilization of APPs, which can be implemented by other radiation oncology departments or practices.

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Introduction

An estimated 1.76 million new cancer diagnoses occurred in 2019 in the United States.¹ This, in parallel, with reduced cancer mortality since the 1990s¹ highlights the increased workload for radiation oncologists (ROs) across America.² Bluethmann et al projected that 26.1

Sources of support: none.

Disclosures: none.

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<https://doi.org/10.1016/j.prro.2019.10.001>

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million Americans will have a cancer history by 2040.³ As clinical capacity increases, new care models are needed.

According to the National Commission on Certification of Physician Assistants 2017 statistical report on certified physician assistants (PAs), the profession has grown by approximately 54% in the past 7 years.⁴ Many medical fields have seen an influx in providers, including surgical subspecialties, emergency medicine, and hospital medicine.⁴ One area of medicine that has been slower to adopt PAs is radiation oncology with only 0.2% of current PAs reporting working in the field,⁴ which is unchanged since 2013,⁵ despite the growing need for providers. Overall, there is no centralized database to track how many advanced practice providers (APPs), nurse practitioners (NPs), and PAs work within the field of radiation oncology. Bruinooge et al speculate there are approximately 5000 to 7000 APPs working in oncology, most working in hematology and oncology.⁶ A survey of 540 oncology APPs showed an average of 6.5% of respondents who indicated their specialty as radiation oncology with a breakdown of 7.1% of respondents being NPs and 5.1% being PAs.⁶ This suggests there are more NPs than PAs practicing in radiation oncology. ROs comprise approximately 0.5% of active medical doctors (MDs) in the United States in 2017,⁷ which is also stagnant since 2013 according to the AAMC physician specialty data book.⁸

APPs can augment clinical capacity for radiation oncologists by optimizing workflow and increasing department efficiency. Integrating APPs efficiently into clinical care paradigms allows ROs to focus on new patient consultations and more complex patient management issues. This allows for increased productivity for the RO,⁹ in addition to patient access to care, without compromising quality¹⁰ as seen by patient and provider surveys from the American Society of Clinical Oncology (ASCO) study of collaborative practice arrangements.¹¹ Of APPs working in oncology, it was shown that approximately 80% of their time is spent in patient care, both direct and indirect, providing patient counseling, diagnosing or treating, prescribing, and completing follow-up visits.⁶ This article shares our practice model using APPs in a large academic radiation oncology department.

Methods

The population of interest for this article included all NPs and PAs practicing within an academic radiation oncology department during the year 2017 to 2018. This included 2 PAs and 3 NPs. There was one APP working within each disease site: central nervous system (CNS), gynecologic malignancies (GYN), head and neck malignancies (H&N), breast malignancies, and genitourinary malignancies (GU). The APPs worked with multiple ROs within their respective disease sites. Any APPs who did not work the full 2017 to 2018 year were excluded from

this analysis including APPs within the thoracic, spine, gastrointestinal, pediatric, and palliative radiation groups. Institutional review board exemption was granted as this article was deemed a clinical process improvement project by this hospital system's human research committee.

The APPs in this radiation oncology department self-reported the percent time per week they spent on direct patient care, indirect patient care, and administrative duties. Subgroups within the direct, indirect, and administrative groups were devised through direct observation of duties and based on similar work flow analyses and surveys of APP responsibilities from prior studies.^{6,12,13} The self-reported workflow instrument was reviewed by the participating APPs and 2 radiation oncologists and revisions were made based on feedback. The 5 participating APPs completed the workflow analysis table as seen in [Table 1](#) based on their review of their duties.

A review of the electronic medical records for the 5 participating APPs from the 2017 to 2018 year was completed to determine, as a collective group, the total number of follow-up visits, number of independent follow-up visits, and number of shared follow-up visits as shown in [Table 2](#). This was collected via an electronic report from the electronic medical records, which was generated with all notes created, edited, or addended by the 5 participating APPs in the 2017 to 2018 year. Manual review of each follow-up note was done to determine whether the patient was seen in a shared visit (cosignatures by APP and RO or attestation from RO on the documentation) or independently (APP signature only). Documentation outside of the follow-up visits or on-treatment visits (OTVs) visits were excluded for the purposes of this article.

Data analysis via descriptive statistics was used. Frequencies and percentages were calculated. Data from electronic medical record review not specific to follow-up visits was excluded.

Results

General model for APP program

This radiation oncology department initially implemented APPs into clinical practice using a 1:1 shared visit model in which APPs supported all visit types alongside the RO. This approach was felt to limit APP independence based on accounts from former APPs. This resulted in poor job satisfaction with former APPs citing an inability to practice at the top of their license, lack of independence, and poor understanding of the roles of an APP. This is consistent with published findings in Towle et al in the ASCO Study of Collaborative Practice Arrangements.¹¹ Ultimately within this radiation oncology department, the lack of job satisfaction led to poor departmental retention of APPs. Considering this, a new

Table 1 Advanced practice provider workflow across teams as documented in percent time spent per week

	CNS	H&N	Breast	GYN	GU
Direct patient care	40%	40%	40%	44%	40%
Telephone/patient portal/telehealth	3%	19%	2%	3%	30%
Independent follow-up visits	30%	18%	10%	35%	9%
Acute symptom management visits	2%	1%	3%	1%	1%
Consult visits/shared visits (inpatient or outpatient)	5%	2%	25%	5%	0%
Indirect patient care	34%	51%	51%	51%	37%
Visit prep/care coordination (image/laboratory review, OSH review, note preparation, placing orders)	15%	13%	30%	35%	16%
Dictation/note completion	10%	13%	9%	8%	13%
Team/intradisciplinary communications	5%	14%	8%	5%	5%
Triaging new patient consults	1%	0%	2%	1%	1%
Tumor board	1%	0%	1%	1%	0%
Chart rounds	1%	0%	0%	1%	1%
Prior authorizations	1%	11%	1%	0%	1%
Administrative/other	26%	9%	9%	5%	23%
Process improvement projects/clinical operations	10%	2%	2%	3%	14%
Research and innovation	5%	1%	1%	1%	8%
Intradepartmental education (participating, lecturing)	3%	5%	1%	1%	1%
Leadership and professional development	8%	1%	5%	0%	0%
Total	100%	100%	100%	100%	100%

Abbreviations: CNS = central nervous system; H&N = head and neck malignancies; GU = genitourinary malignancies GYN = gynecologic malignancies; OSH = outside hospital.

approach was implemented: hiring APPs to practice in the independent-to practice model (ITPM). This practice model has allowed for the department's APPs to function independent of the physician within APP run follow-up clinics, with physician support as needed. This model is discussed in more detail below. Table 1 shows the clinical and nonclinical roles APPs currently contribute to within the radiation oncology team, as well as the variability of the APP role across different disease sites. We believe our model is effective in using APPs in radiation oncology. This can be used as a guide to model future APP follow-up clinics.

Independent follow-ups

APPs were delegated follow-up and survivorship clinics, allowing for increased clinical capacity, patient access to providers, and continued high-quality care. As described by ASCO, an ITPM is used.¹¹ In this model, the APP sees patients in an independent clinic but discusses cases with the physician when treatment planning or complex care decisions are required. This differs from independent practice where the APP sees patients completely independently of the physician.^{9,11} The ITPM results in fewer shared visits than a 1:1 model. However, shared visits are necessary when a patient is found to have disease progression or further treatment management decisions are required. This is seen in Table 2, which through chart review of the 2017 to 2018 fiscal year,

quantifies the number of independent versus shared visits seen by the APPs.

The ITPM allows simultaneous clinics to run parallel to each other allowing for additional support and dialogue between the APP and physician. As reported in the 2018 ASCO report on the role of APPs in oncology, the APP or physician collaborative practice arrangement ultimately results in high levels of physician, APP, and patient satisfaction.¹¹ Bruinooge et al showed APP satisfaction is highest when providers can practice in an ITPM, limiting shared visits for complex cases.⁶ Within the scope of this paper we were unable to quantify RO and APP satisfaction in this radiation oncology department since the transition from 1:1 to ITPM. It is our intention to further investigate this in a dedicated article as more disease sites move toward an ITPM and as the APP program within this department grows. Table 2 shows that most follow-up visits (86.41%) seen by APPs are completed independently. Shared OTVs accounted for a small percentage of shared visits (5.58%) and is a practice being phased out of our department as we move toward the ITPM. In contrast, the previous 1:1 model had APPs completing shared visits for nearly 100% of follow-ups or OTVs. OTVs are now seen by the resident physician or RO team rather than the APP and RO. This practice allows the resident physicians to follow the patients from the consultation or planning stages to managing acute symptoms while patients are on treatment, which is a critical component of their clinical education.

Table 2 Total number of independent and shared follow-up visits in the 2017 to 2018 fiscal year

	Independent follow-up visits	Shared follow-up visits	Shared on treatment visits	Total APP visits
	1704	158	110	1972
Percentage of total visits	86.41%	8.01%	5.58%	100%

Abbreviation: APP = advanced practice providers.

Example from the CNS malignancies group

Patients are initially seen and treated by the CNS radiation oncologist. At the time of initial consultation, the radiation oncologist will discuss the role of the APP in patient care to ensure smooth transition to the APP lead follow-up clinic. This discussion ensures that the patient is aware of the APP's role in their follow-up care, which creates a trusting patient and provider relationship and allows for more effective patient care. The workflow for the central nervous system team alternates 2 follow-up visits with the APP and every third visit being seen by the RO and resident team.

The APP sees the patient for their first posttreatment visit, which is billed as a global visit. The APP will review the previsit MRI and discuss the results with the patient. They will discuss any treatment or disease related symptoms and perform a focused physical examination. The APP will then formulate and discuss a follow-up and treatment plan to address the patients concerns. They will then review the follow-up schedule with the patient, again reiterating that the patient can expect to see the RO and resident every third visit unless otherwise indicated. This is determined by the provider (RO or APP) effectively triaging each patient during their visit to determine whether the patient's next follow-up should be scheduled in the APP follow-up clinic or if it is likely the patient will need further treatment or will need complex medical management, in which case the patient is scheduled in the RO and resident clinic. Triaging the patients in advance reduces the number of shared visits and opens time slots for other patients to be seen by either the RO or APP. Depending on the disease type and the patient's individual disease course, some patients are eventually transitioned to the APP run survivorship clinic. This process ensures that the bulk of the follow-up visits are held by the APP and opens the radiation oncologists schedule for more new patient consults and complicated cases which benefits patients as they have greater access to care.

In the event of a complicated follow-up (eg, disease progression, symptomatic radiation necrosis, complicated symptom management), the APP will discuss the case with the RO and will collaborate to determine next steps

in management. If the patient requires further radiation therapy, the APP will discuss treatment options and consent the patient as well as manage the care coordination with the administrative, nursing, and medical oncology teams. The RO will see the patient to complete the shared visit.

As described in [Table 1](#), most of the APP's time is devoted to indirect and direct patient care ranging from 73% to 95%. Specifically looking at independent follow-ups, the CNS and GYN teams report 30% and 35%, respectively. This is in line with previous reports, which have shown similar work load evaluations.¹³ In addition, the GU team reports primarily using independent telecommunication visits as their follow-up model (30%) with only 9% being performed in clinic. H&N is split between clinic follow-up visits and telephone communications (combined total of 38%). Finally, the breast service is currently transitioning from the previously described 1:1 shared model to the ITPM that is being used elsewhere in the department. This is reflected by the lower percentage of independent follow-up visits (10%) and higher percentage of shared visits (25%). We expect these numbers to follow the trends of the other services as the workflow continues to shift toward an independent follow-up model.

The APPs within the radiation oncology department at this large academic institution have been instrumental in defining the follow-up clinic workflow for their specific disease sites. In discussions with the RO, RN, and administrative teams, and in coordination with National Comprehensive Cancer Network guidelines, the APPs have led the effort in standardizing the workflow for the APP driven follow-up clinic. Once defined and agreed upon by the service, the workflow is then implemented by the administrative team when scheduling patients for follow-up. An example of this process is shown in [Fig 1](#).

Financial benefit

In the 2017 to 2018 fiscal year, CNS and GYN introduced APPs to their services in this radiation oncology department. After the introduction of those APPs, new patient starts increased by 50 visits with approximately 1.2 million dollars in new patient service revenue (NPSR) from these 2 services alone. NPSR was calculated by determining the professional and hospital or technical revenue per new start and multiplying it by the number of new starts per year. The return on investment (ROI) as calculated by the gain from investment (or the NPSR in this case) minus the cost of investment (the APP salary and benefits) divided by the cost of investment. Salary was obtained using the national 50th percentile for PA salary in radiation oncology in 2018 as outlined in the 2019 American Academy of Physician Assistant's salary report.¹⁴ Salary makes up 68.6% of employee compensation and benefits make up 31.4% of salary according to

Workflow for Brain Metastases Follow Up

- Initial post-treatment 6 week follow up with APP
- APP to see patient for 2 follow up visits to every 1 MD follow up visit unless concern for disease progression (i.e. likely to require simulation at next visit)/complicated cases
- Continue shared visits for any patient on APP schedule requiring simulation/treatment
 - Notes to be written by APP, MD to complete attestation and billing

For standard, non-trial stereotactic radiosurgery (SRS) patients:

- Initial follow up 6 weeks post completion of radiation therapy
- Every 2-3 months following for first year, then every 3-4 months for year 2, then every 4-6 months at years 3 and beyond
- Restart at beginning for each new treatment cycle
- Exceptions include:
 - Dexamethasone trial for radiation necrosis (3 week steroid taper followed by 6 week MRI brain) – OK to follow up with APP
 - 2 month short interval follow up for high risk of disease progression/systemic regimen trials

For standard, non-trial WBRT patients

- Initial follow up 8 weeks post completion of radiation therapy
- Every 2-3 months follow up for first year, then every 3-4 months for year 2, then every 4-6 months at years 3 and beyond
- Exceptions
 - As in SRS model

Figure 1 Workflow for brain metastases follow-up. *Abbreviations:* APP = advanced practice provider; MD = medical doctor; SRS = stereotactic radiosurgery; MRI Brain = magnetic resonance imaging of the brain; WBRT = whole brain radiation therapy.

the 2019 US Department of Labor Bureau of Labor Statistics.¹⁵ Thus, an APP making the medium national salary for radiation oncology of \$108,000 will make \$49,434 in benefits for a total employee compensation of \$157,434. Using this compensation for 2 APPs discussed earlier, ROI can be calculated as $(1,200,000 - [157,434 \times 2]) / [157,434 \times 2] = 281\%$. Established patient follow-ups for the GYN and CNS services are projected to increase by 47% at the end of the 2018 to 2019 fiscal year owing to increased capacity offered by ITPM APPs. Completion of a 3-month training period and development of a patient panel during the first year of APP practice likely accounts for the projected increase in the APP follow-up visits in the following fiscal year. In that setting, we would anticipate and increased ROI as well.

Care coordination

The APP plays a primary role in care coordination within the radiation oncology department. When not working clinically, part of the APP role includes coordinating with internal and external medical oncologists, external radiation oncologists, PCPs, and specialists to ensure successful treatment. Care coordination is essential, as it is known that oncology patients often have fragmented care as outlined by the Institute of Medicine.¹⁶ Previous studies in the breast and colon cancer populations have shown that care coordination helps to eliminate barriers to treatment, reduces costly redundant

testing, improves reported patient satisfaction, and leads to timelier treatment.¹⁷⁻¹⁹

The APP works with the administrative team, nursing team, and physicians (both internal and external) to ensure that planned treatments can occur without complication and that duplicative care does not occur across the multiple providers. The administrative team will ensure all laboratory and imaging orders as well as any previous treatment information is obtained in advance of treatment for the APP to review. The APP will ensure that the patient's laboratory and imaging are stable for treatment and will coordinate with the medical oncology team if transfusions, hydration, and device checks (eg, pacemakers) are required before therapy.

If there are any barriers to treatment, the APP will discuss these with the patient and review the plan of care that is required to receive radiation. The APP will communicate these barriers with the multidisciplinary team to confirm that the patient will proceed to treatment as planned or will be delayed until intervention for the barrier occurs. The degree of care coordination varies by service. Table 1 highlights the APPs within the breast and GYN services as providing more care coordination than other services; 30% to 35% in breast and GYN, respectively, compared with 13% to 16% across CNS, H&N, and GU services. This is likely a result of coordination with medical and surgical oncology teams before radiation and ensuring patient's outside hospital preprocedure workup is complete before brachytherapy. During the care

coordination period, the APP often is the point of contact and contributes to patient safety and quality of care.

Acute symptom management

Given their broad education in medicine or advanced practice nursing, APPs are well equipped to triage and manage acute symptoms. APPs in radiation oncology are also trained in recognizing acute and late effects of radiation. In the event a patient is reporting new or worsening symptoms during their treatment or during a follow-up visit, the APP will evaluate and develop a treatment plan. This can range from providing reassurance and education to directing the patient to the emergency dept for further workup or admission. Typical symptom management includes but is not limited to seizure, altered mental status, acute or worsening headache, nausea or vomiting, mucositis, shortness of breath or hypoxia, skin irritation, dysphagia, and pain management.

If the interaction is considered routine, such as medication refills or reassuring a patient that reported side effects are normal, and require minimal to no intervention, the APP will alert the patient's medical team to the outcome of the interaction. Urgent interactions occur when the patient reports poor symptom control on their current regimen, new side effects which affect their day-to-day life, or when there are new study results that indicate a change in treatment plan is indicated. The APP will evaluate the patient and determine a plan to address the patient's concerns. If the interaction is emergent, such as acute change in patients' condition that necessitate an emergency department (ED) visit, the APP will direct the patient to the ED (either direct from clinic or via 911 call) and will place an ED expect note. The APP will discuss emergent cases immediately with the other providers on the patient's medical team, including the radiation oncologist and medical oncologists.

Using the principles of team-based health care (shared goals, clear roles, mutual trust, effective communication, and feedback on outcomes),²⁰ the APP is empowered to address acute symptom management within the radiation oncology department. Ultimately, this is a small component of the workload seen by the APPs at this institution, as seen by the 1% to 3% indicated in [Table 1](#). This is likely owing to acute symptoms being managed during on treatment visits with the RO or resident and during APP follow-up visits.

Radiation oncology APP training

Across the United States in 2017 there were approximately 123,000 licensed APPs of which only 0.2% report working in the radiation field.⁴ Bruinooge et al estimate less than 10% of NPs working in oncology work within the radiation oncology field.⁶ Given radiation oncology's

subspecialization within the oncology community, few APPs received any formal training before beginning their career, with most clinical rotations being completed within the hematology oncology sphere, where most oncology APPs practice.⁶ Owing to this lack of formal education, a thorough training program is needed to ensure a successful APP Program.

All newly hired APPs in this radiation oncology department are provided with a didactic training curriculum, which includes lectures on general oncology, oncology emergencies, radiation oncology, general radiology, palliative care, and disease program-specific symptom management. The didactic material was created using a variety of established sources including the MD Anderson Introduction to Clinical Oncology lecture series,²¹ National Comprehensive Cancer Network clinical practice guidelines,²² and institutional training materials. In addition to the general didactic material, each APP receives additional disease site specific literature to review during their 90-day training period. The APPs spend time with the radiation therapists, dosimetrists, and radiologists to deepen their understanding of the radiation oncology field. APPs are encouraged to attend daily resident conference as well as the various educational lectures that are held each week in the department.

Finally, clear expectations are laid out for days 30, 60, and 90 for both the training APP and radiation oncologist regarding progressing from shadowing the RO on day one to running an independent clinic by the completion of their training period. Frequent check-ins with the APP, RO, and medical director occur throughout the 90 days to determine whether more time is needed at the end of the training period. It is our hope that by creating a detailed didactic and clinical training program the APPs will feel comfortable in both their clinical knowledge as well as their collaborative relationship with their physician team. A well thought out educational model nurtures APP development and as a result improves APP job satisfaction and ultimately, retention.²³

Conclusions

APPs are not widely used in the field of radiation oncology, but with a thoughtful training program, they could greatly benefit the field of radiation oncology by working collaboratively with the radiation oncologist to diagnose, treat, and manage oncology patients. Their broad medical education, in addition to their radiation training, allows them to manage both acute and chronic symptoms that can occur throughout a patient's treatment course. These skills allow for increased access to high quality patient care, increased physician capacity to see new or complex patients, and continuity of care coordination.

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