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Defining advanced practice in radiation therapy: A feasibility assessment of a new healthcare provider role in Ontario, Canada

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ABSTRACT

Introduction: This study assesses the feasibility of a new role for radiation therapists in Ontario, Canada, called the Advanced Practice Radiation Therapist (APRT), which would address health service pressures and improve patients' access to care.
Methods: A literature search and expert consensus were used to define advanced practice. A standardized template was used to record each APRTs activities/competencies, along with the requisite knowledge, skills and judgment required to perform these competencies. A thematic analysis of the lists was undertaken to develop a single competency profile. Seven APRTs were deployed at four cancer centres to gather contextual information on the development and integration of the new role.
Results: The definition of AP consists of seven key traits and includes a framework identifying stages of practice from entry-level practitioner through expert to advanced practitioner. The competency profile consists of clinical, technical and professional domains which further define the scope of practice and shepherd the role through stages of implementation. Role testing showed support for the role and demonstrated that APRTs can deliver specialized services, perform delegated tasks and their work can lead to program efficiencies and new services. The new role may also lead to improved radiation therapist recruitment rates and work satisfaction.
Conclusions: This feasibility assessment served as the foundation for the future long-term implementation of the Clinical Specialist Radiation Therapist (CSRT) Project. As of 2018, there were 24 CSRTs in Ontario. The APRT role is a natural progression for a readying profession which can play a transformative role in addressing health human resource shortages.

Introduction

Pressures that exist or surface within a system often motivate healthcare innovation, creating a burning platform that requires action. This action should be approached in a systematic and evidence-based way making it important to characterize the pressures and articulate the type of changes that would best resolve each situation.[1]

In the early 2000s, radiation therapy (RT) programs across Ontario, Canada, were experiencing service pressures, which impacted patients' access to care.[2–4] Treatment delays, service expansion, care gaps, recurring health human resource (HHR) issues, rapid technological innovation and the increasing cancer burden impelled the RT community to examine approaches to managing the stressors while maintaining the quality of care. Strategies to address cyclical fluctuations in supply and demand proved only moderate and temporary. For example, maximizing training program enrolment for relevant professional groups and extended work hours strained departments, leading to increased injury, sick time and burn out. International recruitment drives filled vacant posts, but only temporarily, and when professionals returned to their home countries, vacancies resurfaced. Radiation therapists (RTTs) in Canada, and in other countries, were also increasingly dissatisfied with a limited career path, especially regarding research and extended practice opportunities.[5,6]

RTTs in Ontario began exploring the introduction of advanced practice (AP) roles by creating the Ontario Radiation Therapy Advanced Practice Steering Committee in 2003. The Committee examined AP roles introduced in other jurisdictions, particularly in

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the United Kingdom,[7] surveyed RT department managers about the viability/attractiveness of such roles and conducted a workshop to further explore the concept. The Committee's work and consultations with the profession, employers, and other stakeholders confirmed interest in and perceived value of piloting AP roles in Ontario. The Advanced Practice Radiation Therapist (APRT) Project was launched in August 2004, with full support and funding from Ontario's Ministry of Health and Long-Term Care (MOHLTC) and Cancer Care Ontario (CCO). The goal of the APRT Project was to assess the feasibility of introducing a new kind of RT professional into the existing interprofessional team and facilitating a redistribution of tasks amongst team members so that each could use their relevant scopes of practice more efficiently and effectively.[2] This strategy has become known in the literature as "task shifting" first coined by the World Health Organization (WHO) in 2006.[8] The WHO recommendations for dealing with HHR issues globally identified task shifting as an established and well-documented strategy for alleviating HHR shortages.

This paper describes the feasibility assessment, which served as the foundation for the future long-term Clinical Specialist Radiation Therapist (CSRT) Project series. An overview of Ontario's implementation of the CSRT role is detailed in a companion paper by Harnett et al.,[9] while a second paper describes CSRTs' impact on increasing capacity, improving quality and stimulating research and innovation in the healthcare system.[10]

Methods

The APRT Project was an exploration designed to assess the perceived value and feasibility of AP roles for RTTs in a variety of settings across Ontario, between 2004 and 2007. Such feasibility assessments evaluate the future success and failures of an idea; they provide focus to a project and help determine if it should go ahead.[11] Before a larger scale, evidence-based project could be undertaken, it was critical to understand the issues impacting the development of a new model of care and a new healthcare provider role. To that end, the assessment was divided into three key areas designed to answer the following:

1. Conceptual Role Definition: What is AP?
2. Competence Profile Development: What would APRT practice look like?
3. Role Testing: How could APRTs impact the process and stakeholders?

Role definition methodology

A literature search was undertaken to help answer the first question, and to create a definition and understanding of what AP meant within the project. The MEDLINE (1946–2005) and EMBASE (1980–2005) databases were searched using variations of terms such as advanced practice/role/scope, role advancement/extension and extended scope. Reference lists of included articles were also searched. Articles were included if they offered a clear definition of AP healthcare roles. One reviewer (K.B.) scanned all articles for inclusion and extracted information regarding the definition of AP roles. A summary of the search results was then presented for discussion, feedback and consensus to the APRT Project team.

To answer the second and third questions the APRT Project team set out to field-test and evaluate new APRT positions in Ontario's cancer centres. The first 8 months of the project consisted of a planning phase where oversight, advisory and review committees were established and frameworks, templates and toolkits for the APRTs were developed.[9,10]

Competency profile methodology

To determine what APRT practice would look like, a competency profile was constructed, describing a potential scope of practice for the role. A competency profile is a compilation of all the characteristics of performance or behaviors expected of an individual fulfilling a specific role. To build this profile, each APRT prepared a list, using a standardized template, of the activities/competencies, along with the requisite knowledge, skills and judgment required to perform these competencies.

Using this documentation, the APRT Project team undertook a thematic analysis of the lists of competencies and knowledge components and developed a single, comprehensive competency profile as well as an outline for an aligned curriculum that would lead to the development of these competencies. The APRT Project team subsequently undertook a "member checking" exercise of the draft profile soliciting feedback from the individual investigators regarding the trustworthiness of the results. The results were also shared with post-secondary educational institutions for feedback and consideration in preparatory educational programming for APRT.

Role testing methodology

Once the necessary infrastructure and resources were in place, the Project team selected 7 pilot APRT positions from proposals submitted by Ontario's RT departments to fund for the purposes of the feasibility assessment. Once selected, each position was opened for application and eligible applicants were chosen following a rigorous selection process, which involved specific selection criteria developed in conjunction with external experts in associated fields. It should be noted that the RTTs chosen for each position were not necessarily academically prepared as APs, but were rather chosen for their experience in conducting research and their demonstrated expertise in their field.

Ontario's cancer system demands that individual centres monitor their performance using a variety of key performance indicators (i.e. machine utilization data, documented wait times, incident rates, etc.). These data were reviewed, where available, by APRTs along with any other data available to identify existing gaps/bottlenecks in the local system. APRTs were tasked with finding ways to quantify/characterize these issues, identifying the existence of general support and readiness for the role, as well as characterizing and quantifying (where possible) the impact that APRT could have in their clinical environment. Table 1 offers a summary of the additional methods, including surveys[12] used to gather data, which formed the baseline for future studies on the impact of the new proposed model of care.

Results

1 Role definition: what is advanced practice?

Literature search results

The literature search located 694 articles. Following abstract review, 32 articles were selected for full text review after which 22 were found to be relevant[13–34] and were used to develop the first draft of the AP definition.

APRT definition and levels of practice

Based on the main themes found in the literature and the discussion by the APRT Project team, it was agreed that APRTs should demonstrate seven key traits, which are detailed in Fig. 1.

Table 1
Data gathering techniques used by APRTs.

Type of method	Description
Time Studies	Quantification of time spent in various stages of the care pathway, especially where efficiencies are anticipated with implementation of the APRT role (e.g., how long patients waited to see a doctor, total duration of patient visit, time it took to plan a patient treatment, time from initial consult to first treatment)
Task Studies	Identification of tasks, using ethnographic techniques, undertaken by each member of the interdisciplinary team for specific tasks in the care pathway (e.g. building process maps and workflows for various steps in the process)
Task Congruence Studies	Studies designed to compare the congruence between the "expert" and the APRT in the completion of specific activities (e.g. patient assessment and patient image sets, post simulation changes for palliative patients, clinical mark up of treatment area, etc.).
Stakeholder Feedback	Surveys or interviews to collect views from associated professionals (e.g., radiation oncologists, radiation therapists, medical physicists, nurses/AP nurses, patient flow coordinators).

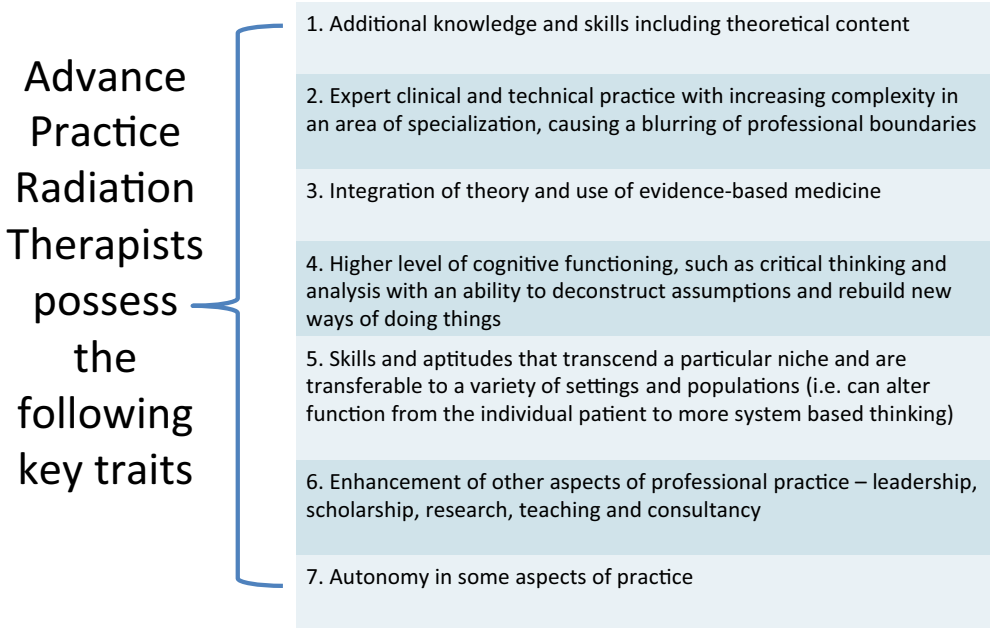

Figure 1. Definition of advanced practice in radiation therapy.

Using this definition of AP, a working framework (Fig. 2), was created to help clarify the four different levels of RT practice and to guide the development and integration of the new role. The framework incorporates a general theoretical model[35] that describes the movement of healthcare practitioners through the various stages of practice from entry-level to advanced practitioner. It also offers practical descriptions of the activities and skills associated with each level of practice.

The entry-level practitioner

RT practice encompasses a continuum of activities and skill levels that allow the RTT to move from an entry-level practitioner to a professional expert. The time required to move from one end of the spectrum to another (from entry-level to expert) is based on a number of factors, including the individual's skills, strengths and motivations. The entry-level practitioner has acquired basic competence required for the practice of the profession. The entry-level practitioner's approach to practice is primarily prescriptive, and practice is guided by the application of rules and scripts. Generally speaking, entry-level practitioners are unable to differentially weigh indicators presented in routine practice: they see all aspects and variables as equal and must consider each one before proceeding or solving the problem at hand in order to satisfy their need to follow a defined procedure.

The expert practitioner

As practitioners move from entry-level to expert, experience allows them to intuitively recognize the full range of factors and variables and distinguish those which are significant. The expert is able to filter out aspects of little or no consequence to a given situation, and focus on those of importance. The expert no longer simply follows 'rules' so practice becomes automated as opposed to 'step-wise'.

The expert practitioner draws on depth of experience to recognize when something is notable or out of the ordinary and to know, within the relevant area of expertise, when action needs to be taken. The expert practitioner has developed the additional attributes of flexibility, discrimination and discretion. In general, the expert practitioner still practices within the existing scope of practice; there is not necessarily a new domain of knowledge or competence employed, just a deep knowledge of a particular specialty. Expert practitioners may be asked to provide consultation on the state of current practice and/or how to improve it. They may not be inclined, however, to deconstruct practice, challenge

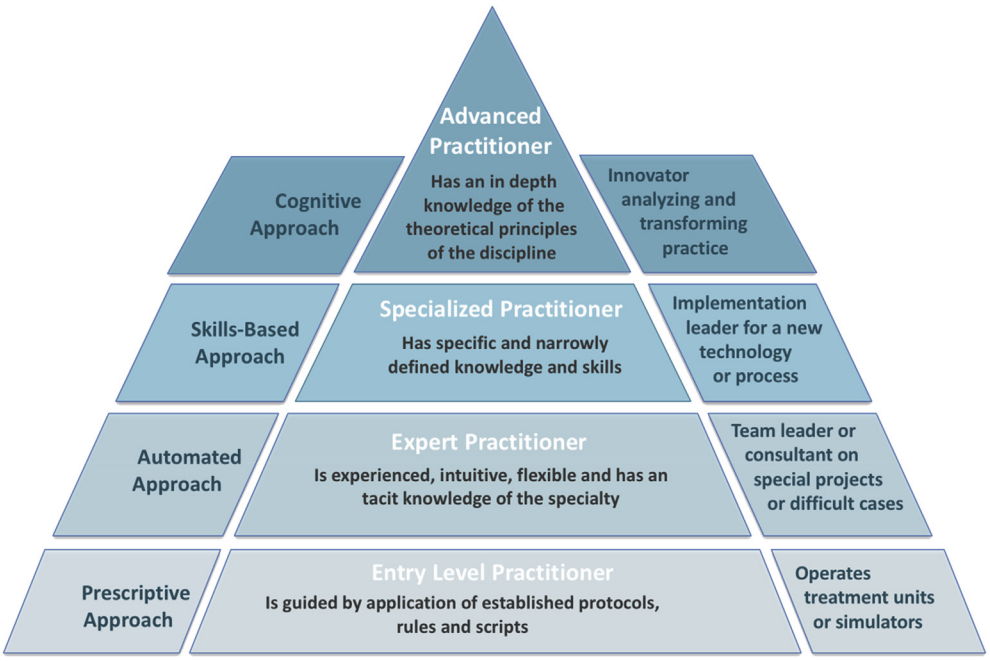

Figure 2. Theoretical framework of the four levels of Radiation Therapy practice.

the basic assumptions upon which practice is based, or rebuild or transform practice.

The specialized practitioner

When describing the specialized practitioner terms such as "expanded", "enhanced" or "extended" roles are often used interchangeably in the discourse. While these terms infer a sense of augmentation of activities of a practitioner, they are not synonymous to or equivalent with AP. Such terms for role extension do not represent a wholesale move to another level of functioning and practice. It frequently occurs in response to local pressures in a particular area. In such cases, an expert practitioner may be asked to move outside of his or her usual scope of practice in a very practical and "skills-based" way. These added responsibilities usually involve the acquisition and application of specific and narrowly defined knowledge and associated skills that eventually become part of the pre-certification education and scope of practice for the entry-level RTT.

The Advanced Practice Radiation Therapist (APRT)

In contrast to the entry-level, expert or specialized practitioner, APRTs are equipped with a constellation of higher order cognitive skills (e.g., critical thinking, problem solving, decision-making skills, etc.), in addition to advanced clinical skills and attributes. These valuable skills are built on an in-depth, advanced knowledge of the theoretical principles of the practitioner's discipline. The abilities and approaches of AP are transferable to a variety of settings in the practitioner's area of specialty.

APRTs also bring to bear a broader understanding of the healthcare discipline and its place in the multidisciplinary healthcare environment. This allows the APRT to consider issues and problems through a larger lens, and to integrate solutions more widely. In addition, APRTs challenge the very basis of practice, deconstructing current models and approaches of care and bringing deep understanding of the profession, creativity and flexibility to true innovation. APRTs are positioned to be transformative leaders and innovators.

2 Role Testing: how could APRTs impact the process and stakeholders?

Participant characteristics

Seven APRT investigators were deployed and field-tested in four cancer centres over a two-year period (2004–2006). The sections below describe the data gathered by APRTs showing opportunity as well as support/readiness for the role. Table 2 provides brief descriptions of their positions.

Opportunity for the role

APRTs can perform delegated tasks. As project investigators studied the steps and transitions along local RT care pathway they began to uncover points in the process – gaps or bottlenecks - that could potentially be addressed by an APRT (Fig. 3). Four researchers collected evidence that showed that APRTs could perform delegated tasks, more recently called 'task-shifting', to acceptable levels when compared with the clinical expert who usually performs the tasks. Data collected by one APRT indicated that 83% (10/12) of the clinical mark-ups completed by the APRT were deemed to be acceptable upon review by the radiation oncologist (RO) (compared to only 67% [4/6] of those completed by the senior resident). A retrospective chart audit of 'therapist only' simulations by a second APRT revealed acceptable field placement in 84% (153/182) of cases seen (across all anatomical sites). Data of contouring congruence collected by a third APRT showed high congruence (the clinical team provided determination of congruence acceptability) when contouring the bladder, rectum and mesorectum (by comparing standard deviations for each individual profession to that for the whole group). Furthermore, data gathered by this APRT showed that 94% (236/250) of the final treatment plans created by the APRT were approved without changes. Finally, the fourth APRT demonstrated that in 90% (18/

Table 2
APRT job descriptions.

AP Role Title/Cancer Centre	Brief Job Descriptions
Palliative Radiation Therapy and Supportive Care APRT/Centre A	- Act as a clinical expert in palliative RT, participates in team consultation, program planning and delivery, patient and supportive care, research, education, efficient resource utilization and effective leadership - Demonstrate a high level of autonomy and expert skill in formulating clinical decisions and appropriate patient management
Planning Image Definition and Contouring APRT/ Centre A	- Autonomously perform/develop precise localization of anatomy using multi-modality imaging for patients with Head and Neck cancer - Responsible for a combination of core clinical duties with consultation, technical development, research, education, policy/process development and efficient resource utilization and effective leadership and patient centered care
APRT in Patient Assessment and Symptom Management for Breast Cancer/Centre A	- Provide comprehensive care to patients during the course of RT by complementing and supplementing supportive care provided - Assess patient and tend to expected RT reactions and refer those who require more in-depth care to other relevant healthcare professionals - Apply leadership, research and educational expertise to enhance the application of evidence-based practice, principles of best practice and quality practices
Palliative Radiation Therapy and Supportive Care APRT/Centre B	- Use advanced skills to formulate/consult on clinical/technical decisions for specific group(s) of patients with metastatic disease - Provides direct patient care, ie., assessments before, during and after RT, ordering tests, prescribing/ administering medication, providing patient education and support, ensuring timely access to services. - Prescribe RT, order simulation and approve RT plans for specific patients - Apply leadership, research and educational expertise to enhance the application of evidence-based practice, principles of best practice and quality practices
AP Skin Cancer Management RT/Centre B	- Function as a key resource for skin cancer patients referred to the centre - Provide comprehensive assessment and referral, treatment planning and delivery services for patients with skin cancer - Apply leadership, research and educational expertise to enhance the application of evidence-based practice, principles of best practice and quality practice
Mycosis Fungoides APRT/Centre C	- Be responsible for ensuring quality patient care with a focus on ensuring continuity of care from referral to follow up - Assess patient, provide education on expected toxicities and provide ongoing management support during and after treatment - Prescribe RT dose and delineate dose supplementation areas - Apply leadership, research and educational expertise to enhance the application of evidence-based practice, principles of best practice and quality practices
Palliative Radiation Therapy and Supportive Care APRT/Centre D	- Streamline referral and triage process to improve access to palliative RT for patients referred to rapid response clinic and from ambulatory clinics - Ensure necessary documentation is present or obtained according to protocols in place, for the planning and prescribing of RT in a defined patient population and assessing the patient before, during and after RT - Apply leadership, research and educational expertise to enhance the application of evidence-based practice, principles of best practice and quality practices

Legend: RT = Radiation Therapy.

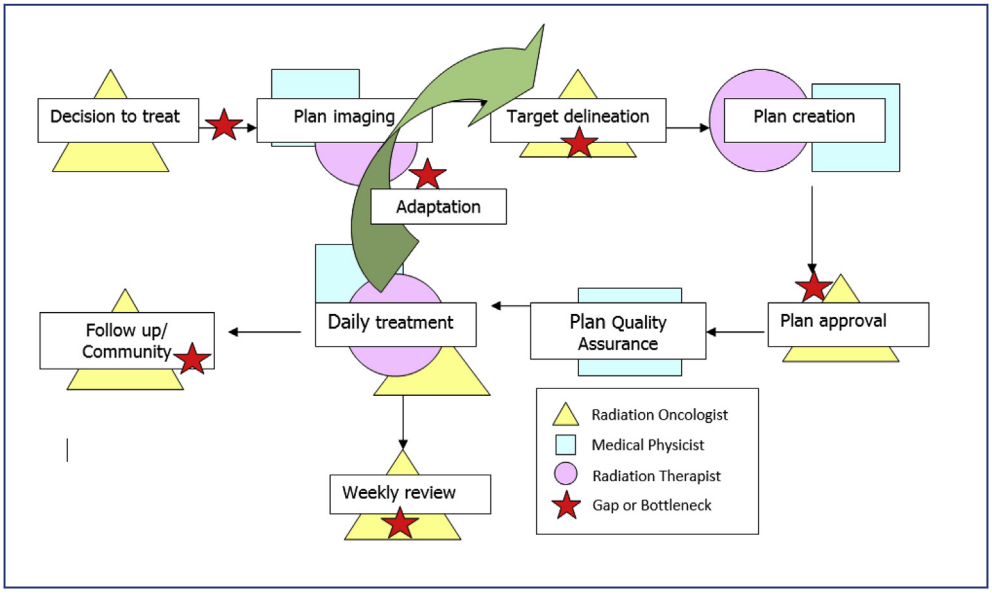

Figure 3. Examples of gaps/bottlenecks commonly found along the radiation therapy pathway.

20) of the cases tested, the APRT could independently determine and record a care plan, based on patient assessment, that was the same as that of the attending physician.

APRTs can add new services. A second finding from the information gathered during the feasibility assessment suggested that APRTs can be used to add new services and enable previously underserved populations access to care. For example, the APRT working with the mycosis fungoides program, which provides a specialized and complex treatment for patients from across Canada, offered telephone mediated care before and after treatment, providing a new and improved option for these patients. Other APRTs extended services in rapid response programs and implemented new services such as community-based follow-up after completion of RT and community outreach to, and consultation with, family physicians.

APRTs can lead to program efficiencies. At all four cancer centres APRTs either undertook or identified activities that resulted/could result in a reduced number of 'hand offs' of the patient case from one professional to another, or reduced the number of 'pages' to find an RO or 'pager nurse' thereby improving continuity of care and reducing the interruptions of team members. The information gathered by the APRTs highlighted opportunities to add APRTs to existing services to improve patient care. Time studies at Centre B, showed that patients spend a significant amount of time at their RO/nurse appointment waiting to see the RO or nurse. Specifically, patients spent 69% of their total appointment time waiting to be seen at the weekly review clinic.

In another example, the APRT was invited to join the multidisciplinary team that conducted the new patient consultation for patients with locally advanced breast cancer. During this appointment, the APRT was able to document the extent of the patient's current disease for incorporation into planning for RT following 6 months of chemotherapy for the patient. This reduced the number of appointments for the patient and improved the information incorporated into the planning process. Table 3 offers additional examples of how each APRT role provided/could provide efficient access to services through the redistribution and/or streamlining of activities.

Stakeholder support and readiness for the role

APRTs have support from the multidisciplinary team. Support for the role and the positive contributions of APRTs were identified across all four centres. In Centre B, an online survey was developed to obtain information from staff regarding current understanding of the pilot APRT role and any opinions formulated to date about the potential impact of the role on existing practice. The survey was distributed to 175 staff with a response rate of 46%. The gathered survey data showed that perceptions of the APRT role were very positive. Responses are listed in Table 4.

APRTs can improve recruitment and work satisfaction for radiation therapists. Across all four cancer centres, survey respondents reported similar key themes regarding the improvement of work satisfaction and job opportunities for RTTs following the implementation of the APRT role. For example, in an online survey conducted at Centre B, 75 respondents commented in an open-ended question about 'possible benefits' of the implementation of APRT positions. The thematic analysis of responses showed the following comments listed most frequently: anticipated service improvements, increased scope and/or opportunities, improved job satisfaction, improved retention and recruitment.

3 What would APRT practice look like?

The numerous discrete activities that were felt to align with advanced RT practice were identified by APRTs in order to create a competency profile. In general, the systemic issues that were raised by the investigators for consideration were related to the high rate of technology changes and the increasing demands put on the RT professions. The profile consists of three main categories of competence: clinical, technical and professional. The clinical domain describes the APRTs' activities as they provide optimal patient care to their defined patient population. The technical domain captures how the APRT will harness advanced oncologic, radiobiological and dosimetric knowledge to optimize the use of available technology for the provision of safe and tailored RT. Finally, the professional domain outlines how the APRT is expected to practice including how he/she uses research and evidence-based practice to serve as a champion, role model and innovator in RT and build the knowledge base of the RT profession. Several competencies fall outside of the current scope of practice of the RTT, requiring the use of medical directives, delegation and/or amendments to legislation. Table 5 presents the a summary of the competencies in each domain.

Discussion

A feasibility study helps determine if an idea or innovation is technically feasible and economically justifiable. It is an important step along the continuum of implementing change. While change can be motivated by a number of factors, in healthcare change and innovation often comes in response to an identified pressure or crisis.

Defining advanced practice

At the start of the project, the Project team believed that they could turn to literature to very quickly understand what advanced practice was, then hit the ground running with the implementation of the newly described healthcare provider role. However, it quickly became clear that the definition of AP varies widely and that extensive work was needed to envision what a new role would look like and many iterations were required to fine tune the definition for the purposes of this project.

Shortly after the completion of this feasibility assessment, UK authors[37,38] undertook conceptual analysis of what constitutes AP in RT and reached similar conclusions. Smith et al.[39] built on this work incorporating characteristics such as communication, collaboration and professionalism arguing that "these are so essential to the higher level role, duties and responsibilities of the advanced practitioner that they cannot be assumed". Interestingly, in their 2015 publication, Smith et al., omitted "research" from its list of mandatory characteristics of AP spurring several letters of response from jurisdictions that feel strongly that best practice can only be maintained through original enquiry and critical analysis of published research.[40,41]

Recent literature[42–44] suggests that there continues to be confusion around the definition of AP in RT. Role clarity is essential not only for the practitioner assuming a new AP position, but also for all others who are involved with, or impacted by it. Therefore, the AP definition, framework and competency profile presented in this paper offer a comprehensive starting point for the development of similar positions. They can be used to bring together characteristics or competencies in an understandable framework to structure or guide performance, education and evaluation. Employers can create APRT job descriptions at their local sites, allowing them to emphasize certain areas of practice in response to

Table 3
Examples of program efficiencies by APRT role.

AP Role Title/Cancer Centre	Examples of program efficiencies
Palliative Radiation Therapy and Supportive Care APRT/Centre A	- Weekly utilization of the conventional simulator ranged from 24 to 58% (median 44%) and CT-Simulator ranged from 22 to 57% (median 36%). These units have the capacity to absorb an increase in throughput by an APRT for both palliative and curative intent cases.
Planning Image Definition and Contouring APRT/ Centre A	- Safely and systematically shortened treatment timelines through evidence-based standardization and triage of patient cohorts with respect to efficacious imaging/contouring - ROs completed contouring activities that ranged from 10 to 240 min. Forty cases were observed requiring the presence of a RO for a total of 42 h. A proportion of this time could be saved by APRTs completing standardized, less complex cases. - A survey of radiation therapy treatment planners regarding plan/chart corrections or changes indicated that 82% attributed such alternations to “inefficiencies” in the planning process, primarily in the area of communication with ROs. A dedicated APRT can provide more timely responses to questions and requests from planners.
APRT in Patient Assessment and Symptom Management for Breast Cancer/Centre A	- 17 000 less complicated, well patients in review clinics were redistributed to the APRT for assessment and monitoring. Resulting in a total of 1700 h of RO time (based on 6 min per review visit) that could be redirected towards more complex reviews or other activities. - Survey results regarding the implementation of the APRT indicated that 30% of radiation therapy patients felt that it was not necessary to see their doctor in each and every review clinic.
Palliative Radiation Therapy and Supportive Care APRT/Centre B	- The APRT developed a multifaceted initiative to reduce inappropriate referrals in order to improve resource utilization reducing inappropriate referrals from 13.7% to 3% - a 10.7% reduction in inappropriate referrals
AP Skin Cancer Management RT/Centre B	- APRTs can be used to combine both patient care and radiation therapy-specific activities into a single patient visit, as opposed to several different appointments.
Mycosis Fungoides APRT/Centre C	- Average time a patient waited from initial consult to start of treatment improved from 51.12 days in 2000 to 25.75 days in 2005. - Time-savings for the nurse were 13.53 min per patient review and 17.38 min per new consultation. Resulting in a time savings, on average, of 3.22 h per patient.
Palliative Radiation Therapy and Supportive Care APRT/Centre D	- A Rapid Response Radiation Program (RRRP) retrospective case review demonstrated that of the 1058 patients seen, only 820 received radiation treatment. This represents 238 RRRP visits and CT simulator appointments that were scheduled inappropriately. More appropriate triaging of patients by a competent APRT could reduce the number of unnecessary bookings and more effective utilization of resources. - The primary reason that patient consolation was requested of the nurses in the Pager Office (a service responsible for *ad hoc patient review*) was for the assessment and management of radiation therapy related side effects (26.3% and 22.3% respectively). The project demonstrated that an APRT can work collaboratively with the nurses to complete these calls and release the nurse for more specific activities.

Table 4
Stakeholder feedback on the value of the APRT role.

Total N - 78	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I believe patient care will improve with the implementation of an APRT	29% (23)	44% (34)	19% (15)	3% (2)	5% (4)
I do NOT see a role for an APRT	1% (1)	3% (2)	16% (13)	45% (35)	35% (27)
I believe the involved clinics will be more efficient with the implementation of an APRT	27% (21)	44% (34)	23% (18)	2% (2)	4% (3)
I believe APRTs will provide NO benefit	1% (1)	1% (1)	13% (10)	50% (39)	35% (27)
I look forward to working with an APRT	22% (17)	44% (34)	29% (23)	1% (1)	3% (2)

Table 5
Competencies.

Clinical competencies	1. Ensure that all relevant patient information is available for clinical decision making 2. Assess the patient's physical condition 3. Assess the patient's cognitive condition and psychosocial status 4. Obtain informed consent for required diagnostic procedures, therapeutic interventions or radiation therapy treatments 5. Formulate and implement an appropriate overall approach for patient management and care 6. Communicate results that will impact patient's course of treatment 7. Prescribe/dispense pharmaceuticals from defined and approved formulary
Technical competencies	1. Provide autonomous technical consultation and advice through integration of relevant clinical, diagnostic and technical information at all phases of the radiation therapy planning and treatment process 2. Implement decisions regarding technical treatment accuracy and precision and dose/fractionation appropriateness by interpreting and integrating available clinical, technical and radiobiological information
Professional competencies	A) Research and evidence-based practice 1. Conduct original research to contribute to the professional knowledge base 2. Lead and participate in quality improvement of program/service/department as a member of the interprofessional healthcare team 3. Lead the ongoing development of best practices using evidence-based approaches B) Leadership 1 Optimize the future of the healthcare team through continual assessment, audit, evaluation and strategic visioning as a key member of the interprofessional healthcare team 2. Create and maintain a team to ensure safe and effective practice 3. Coach and mentor staff, students, other healthcare providers C) Education 1. Develop an education activity to address an identified need/gap

local needs. Having used the profile to develop 24 unique APRT positions province-wide, it is apparent that the profile is adaptable and flexible and can be potentiated as necessary to fulfill the needs of any local practice environment.

APRTs' impact

The data from this feasibility assessment show five distinct areas where APRTs can address care gaps and reduce bottlenecks. One of the main findings from this assessment showed that APRTs can perform certain tasks traditionally completed by other professionals, allowing for more effective use of specialized skill sets in the system resulting in program efficiencies. Less medical, more technical and time-consuming activities could potentially be redistributed to an APRT with enhanced oncologic, radiobiological and physics knowledge and specialized training in a variety of clinical and technical skills (e.g. patient examination, history taking, image fusion, etc.). This "task shifting" strategy has been a common response to healthcare system pressures in the past, and was formally advocated by the WHO.[8]

Furthermore, the effective use of HHR may allow for improved patient flow through the system, better continuity of care and fewer handoffs of patient information reducing the risk of error related to multiple handoffs. AP in RT may also introduce career ladder options *within* the profession to improve job satisfaction for ambitious and accomplished RTTs, and subsequently reduce rates of attrition from the profession.

Competency profile

A competency profile is critical to putting boundaries around a new scope of practice. It has been consistently documented that role clarity is a challenge to developing new healthcare provider roles.[36] Issues related to professional certification, licensure for practice, employer expectations, compensation for the position, all hinge on the definition of the role, and hence the competency profile. In order to shepherd the burgeoning role through the various stages from idea to permanence, expectations of practice must be outlined and communicated.

Over the course of the project, the competency profile continued to be refined as repeated cycles of testing and evaluation were undertaken. It was finalized using a series of validation exercises in 2016, including a national validation study with Canada-wide practitioners. This validated profile is current being used to develop a national certification process for AP for RTTs.

Ongoing and future work

Since the completion of this feasibility study, the APRT role has evolved into the Clinical Specialist Radiation Therapist (CSRT). The CSRT is a registered medical radiation technologist who brings advanced clinical, technical and professional RT competencies to the existing interprofessional healthcare team. As of 2019, there were 24 CSRTs in ten cancer centres in Ontario. Continued efforts focus on the maintenance of standards, consistent approaches to role identification and implementation, and permanent, funded integration of the role. Additionally, there is a national certification process for advanced RT practice, which many of the CSRTs are currently enrolled in or are planning to undertake. Efforts are also underway with several other Canadian provinces to build and/or recognize AP.

Limitations

The nature of a pilot project is to identify variables and information that will lead to valid and generalizable data. Due to the differences between sites and positions, it was not possible to designate consistent metrics. Instead, each position had to identify, examine and test variables, which could be used as baseline data after full APRT role implementation. Over time, however, with experience, a more standardized metrics package was compiled based on this assessment phase and employed in future work.

Conclusion

This feasibility study, emerging in response to the ever-increasing pressures in RT, has led to the development of a new healthcare provider role, which represents an exciting strategy for cancer systems and can play a transformative role in addressing HHR shortages. The results of the study emphasized that RTTs possess a unique constellation of knowledge and skill that makes them ideal candidates to transition from a basic practitioner to a more flexible, diverse practitioner that could render the interdisciplinary team more responsive to varying pressures it experiences over time. It also showed that this AP role appears to be a natural progression for a readying profession that is actively engaged in an intricate model of care that necessitates constant learning, innovation and interactivity.

Conflict of interest

None.

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References

1. Kotter International. *The 8-step process for leading change*. 2014.. In: *http://www.kotterinternational.com/the-8-step-process-for-leading-change/. [Accessed August 2018].*
2. Cancer Care Ontario. New ways of working: A provincial Strategy for Advanced Practice Roles in Canada. https://archive.cancercare.on.ca/common/pages/UserFile.aspx?fileId=13478 [Accessed February, 2019].
3. Randal J. Canada faces shortage of radiation therapists. *J Natl Cancer Inst* 2000;**92**(3):186–8. https://doi.org/10.1093/jnci/92.3.186.
4. D'Souza DP, Martin DK, Purdy L, Bezjak A, Singer PA. Waiting lists for radiation therapy: a case study. *BMC Health Serv Res* 2001;**1**:3. https://doi.org/10.1186/1472-6963-1-3.
5. Bolderston A. Advanced practice perspectives in radiation therapy. *J Radiother Pract* 2005;**4**:57–65.
6. Hercus M. Are we caring for young and ourselves? *Radiographer* 2002;**49**(3):173–8.
7. Department of Health (UK). *Radiography skills mix: a report on the four-tier service delivery model*. 2003. Retrieved from, http://www.dh.gov.uk/assetRoot/04/06/12/60/04061260.pdf. [Accessed July 2017].
8. World Health Organization (WHO). *Treat, train, retain: the AIDS and health workforce plan : report on the Consultation on AIDS and Human Resources for Health*. Geneva: WHO; May, 2006. p. 11–2. http://www.who.int/hiv/pub/meetingreports/TTRmeetingreport2.pdf.
9. Harnett N, Bak K, Zychla L, Lockhart E. A roadmap for change: charting the course of the development of a new advanced role for radiation therapists. *J Allied Health* 2014;**43**:110–6.
10. Harnett N, Bak K, Lockhart E, Ang M, Zychla L, Gutierrez E, et al. The Clinical Specialist Radiation Therapist (CSRT): a case study exploring the effectiveness of a new advanced practice role in Canada. *J Med Radiat Sci* 2018 Jun;**65**(2):86–96.
11. Claase M. Optimizing feasibility studies: Based on a Grounded Theory type comparison of feasibility design research. http://essay.utwente.nl/61979/1/BACHELOR_THESIS_Marcella_Claase.pdf [Last Accessed: February, 2019].
12. Weiss D, Dawis R, England G, Lofquist LH. *Manual for the Minnesota satisfaction questionnaire*. Minneapolis, MN: University of Minnesota; 1977.
13. Stanton MP, Swanson M, Sherrod RA, Packa DR. Case management evolution: from basic to advanced practice role. *Lippincott's Case Manag* 2005;**10**(6):274–84.
14. Canam C. Illuminating the clinical nurse specialist role of advanced practice nursing: a qualitative study. *Nurs Leader Vol* 2005;**18**(4):70–89.

15. Badros KK, Seldomridge LA, Walsh CM. Issues in critical thinking: measurement of advanced practice students. *Nurse Educat* 2005;**30**(4):139–40.
16. Lachance K. Are advanced practice nurses (APNs) here to stay? *CONJ* 2005: 96–101. https://doi.org/10.5737/1181912x15296100.
17. Maloney AM, Volpe J. The Inpatient advanced practice nursing roles in a Canadian pediatric oncology unit. *J Pediatr Oncol Nurs* 2005;**22**(5):254–7.
18. McDuffie AF, Huffman S. A survey of role diversity among advanced practice nurses in pediatric gastroenterology. *Gastroenterol Nurs* 2005;**28**(3). 238-231.
19. Nicolson P, Burr J, Powell J. Becoming an advanced practitioner in neonatal nursing: a psycho-social study of the relationship between educational preparation and role development. *J Clin Nurs* 2005;**14**:727–38.
20. Reasor JE, Farell SP. The effectiveness of advanced practice registered nurses as psychologists. *Arch Psychiatr Nurs* 2005;**19**(2):81–92.
21. Phillips J. Neruoscience Critical Care: the role of the advanced practice nurse in patient safety. *AACN Clin Issues* 2005;**16**(4):581–92.
22. Richmond TS. Creating an advanced practice nurse-friendly culture: a marathon, not a sprint. *AACN Clin Issues* 2005;**16**(1):58–66.
23. Gift AG. The advanced practice nurse as clinical expert. *CNS* 1998;**12**(2):85.
24. Touger-Decker R. Advanced practice doctorate in clinical nutrition: a new graduate degree option for registered dietitians. *Clin Nutr* 2005;**20**(1):48–53.
25. Bucher R. On the natural history of health care occupations. *Work Occup* 1988;**15**:131–47.
26. Sidani S, Irvine D. A conceptual framework for evaluating the nurse practitioner role in acute care settings. *J Adv Nurs* 1999;**11**(2):67–75.
27. Fitch M, Mings D. Cancer nursing in Ontario: defining nursing roles. *Can Oncol Nurs J* 2003;**21**–**35**:31.
28. Lukosius D, DiCenso A. A framework for the introduction and evaluation of advanced practice nursing roles. *J Adv Nurs* 2004;**48**(5):530–40.
29. Nightingale J, Hogg P. Clinical practice at an advanced level: and introduction. *Radiography* 2003;**9**:77–83.
30. Fox VJ, Schira M, Wadlund D. The pioneer spirit in perioperative advanced practice – two practice examples. *AORN J* 2000;**72**(2):241–53.
31. Jamieson L, Mosel Williams L. Confusion prevails in defining 'advanced' nursing practice. *Collegian* 2002;**9**(4):29–33.
32. Pauly B, Schreiber R, MacDonald M, Davidson H, Crickmore J, Moss L, et al. Dancing to our own tune: understandings of advanced nursing practice in British Columbia. *Nurs Leader* 2004;**17**(2):47–59.
33. Alvarado K, Keatings M, Park Dorsay J. Cultivating APNs for the future: a hospital-based advanced practice nursing internship program. *Nurs Leader* 2003;**16**(1):91–8.
34. Fawcett J, Newman DML, McAllister M. Advanced practice nursing and conceptual models of nursing. *Nurs Sci Q* 2004;**17**(2):135–8.
35. Ketefian S, Redman RW, Hanucharurnkul S, Masterson A, Neves EP. The development of advanced practice roles: implications in the international nursing community. *Int Nurs Rev* 2001;**48**:152–63.
36. Dreyfus L, Dreyfus SE. *Mind over Machine: the power of human intuition and expertise in the era of the computer*. Oxford: Basil Blackwell. Public Service Commission of Canada; 1986 (2006). Competencies. Retrieved September 2006 from, http://www.psc-cfp.gc.ca/ppc/hrm_info3_e.htm.
37. Hardy M, Legg J, Smith T, Ween B, Williams I, Motto J. The concept of advanced radiographic practice: an international perspective. *Radiography* 2008;**14**:e15–9.
38. Snaith B, Hardy M. How to achieve advanced practice status: a discussion paper. *Radiography* 2007;**13**:142–6.
39. Smith T, Harris J, Woznitza N, Maresse S, Sale C. Conceptualization of the characteristics of advanced practitioners in the medical radiation professions. *J Med Radiat Sci* 2015;**62**:204–11.
40. Bolderston A, Harnett N, Lewis D, Smoke M. Letter in response to 'The role of research for advanced practitioners'. *J Med Radiat Sci* 2015;**62**(4):292–3.
41. Sim J. Letter in response to 'Omission of search in the conceptual model of advanced practice'. *J Med Radiat Sci* 2015;**62**(3). 234-234.
42. Coleman K, Jasperse M, Herst P, Yielder J. Establishing radiation therapy advanced practice in New Zealand. *JMRS* 2014;**61**:38–44. https://doi.org/10.1002/jmrs.33.
43. Sale C, Halkett G, Cox J. National survey of the practice of radiation therapists in Australia. *JMRS* 2016;**63**:104–13. https://doi.org/10.1002/jmrs.155.
44. Giddings A, Mica L, French J, Davis CA, Smoke M, Bolderston A. Patterns of practice in Canadian radiation treatment centres: results of a national survey. *JMIRS* 2017;**49**(1):23–30.