Defining Advanced Practice Radiation Therapy at the University of Texas MD Anderson Cancer Center: A Delphi Study

by

Dr. Shaun T. Caldwell

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Chair of Committee: Dr. Sara McNeil

Committee Member: Dr. Robert Hausmann

Committee Member: Dr. Albert Koong

Committee Member: Dr. Stephanie Eatmon

University of Houston
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Dedication

I am grateful to those people who helped me travel along this path. I was able to complete graduate school and this thesis because of the love and encouragement of my family. My children, Stuart, Brenden, and Carly, have unquestionably and enthusiastically supported any endeavor I took on and were always willing to listen while I shared my progress. My dad, Sharion Caldwell, gave me a sturdy foundation to build upon and has been my greatest supporter. In the hope that this work contributes to a better future, I dedicate it to my grandchildren, Sophia and Austin Arce. To my dear friends, Paul Cuevas and Brad Poff, I am sincerely grateful for your patience and understanding when I couldn't return the level of friendship you showed while I focused on this research.

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I love my students, graduates, colleagues, and profession. I am truly blessed.

Abstract

Background: U.S. research hospitals are using new technologies and techniques to develop treatment procedures that redefine the practice of radiation oncology and require an advanced practice radiation therapist (APRT). For example, at the University of Texas, MD Anderson Cancer Center (MD Anderson), physicians, physicists, and radiation therapists are developing treatment protocols for malignancies using the Elekta Unity, a hybrid magnetic resonance linear accelerator (MRL). MD Anderson initiated a program for radiation therapists to obtain diagnostic magnetic resonance imaging (MRI) credentials upon adopting MRL technology. The further education and clinical training required for MRI credentialing necessitate defining the competencies needed for the APRT. **Purpose:** This research aimed to identify a Comprehensive Competencies Profile (CCP) for advanced practice radiation therapy at MD Anderson. The CCP will be used to determine the role, responsibilities, and educational criteria for creating a master of science degree in advanced practice radiation therapy at MD Anderson. **Methods:** This study measured experts' perceptions regarding the inclusion or exclusion of competencies for a CCP of practice standards for the APRT. Two panels of MD Anderson employees comprised the participants: Panel A had five expert radiation therapists who advised and made decisions regarding survey content; Panel B had 14 expert-level radiation therapists, 10 radiation oncologists, and 10 medical physicists. Competencies listed on the survey originated from the experiences of the Panel A members, the existing competencies for U.S. physician assistants (PAs) and radiologist assistants (RAs), and APRTs practicing in England, Canada, and Australia. Consensus was defined at 75%. **Results:** Panel B assessed a total of 107 competencies in a three-round Delphi consensus

survey. The response rate for each round was 100%, 94.1%, and 91.12%, respectively. The first round produced a consensus for 39 of the 97 competencies. Participants contributed an additional 10 clinical practice competencies for rounds two and three consideration. The second round resulted in a consensus for 22 of the 67 items. The third round resulted in a consensus for four of the 45 competencies. The finding suggests that the APRT CCP should consist of 65 competencies, including three research, 12 leadership and management, and 50 clinical practice. The 65 competencies originated from five sources: 12 (18.5%) from MD Anderson, 22 (33.9%) from U.S PA and RA competencies, 19 (29.2%) APRT competencies in England, eight (12.3%) APRT competencies in Canada, and four (6.2%) APRT competencies in Australia. The level of agreement and comments for the remaining 42 competencies that did not reach consensus were categorized by potential reasons for disagreement. **Conclusion:** The Delphi method effectively determined which competencies should be included in the CCP that defines APRT practice at MD Anderson. This method allowed experts from three diverse disciplines to provide input and comments on which competencies would be the most valuable for APRTs. The CCP is cross-referenced to the radiation therapy practice standards and content specifications and may serve as the structure for a master of science degree in advanced practice radiation therapy.

Keywords: Delphi, advanced practice, radiation therapy, radiation oncology

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Glossary

Advanced Practice Radiation Therapist (APRT): Qualified radiation therapist who has significantly developed their scope of practice and clinical experience as defined in specific areas of practice (Duffton et al., 2019).

American Registry of Radiologic Technologists (ARRT): Certification, registration, and credentialing agency for U.S. radiologic technologists, including radiation therapists.

American Society of Radiologic Technologists (ASRT): Professional association for radiologic technologists, which includes radiation therapists, that publishes practice standards, a curriculum, and professional education in radiation therapy.

Competency: Specific tasks performed by a professional within their profession's scope of practice.

Comprehensive Competency Profile (CCP): Extensive list of competencies performed by a professional within the guidelines of their scope of practice.

Content Specifications: Topics recognized as important to cover within ARRT certification examinations to ensure entry-level medical imaging and radiation therapy professionals have the knowledge and technical skills typically necessary to perform their jobs.

Grounded Theory Methodology (GTM): Philosophical framework for assessing patterns of behaviors that are grounded in the realities of day-to-day practice, therefore informing practice and future research (Glaser & Strauss, 1967).

Image-Guided Radiation Therapy (IGRT): Cancer treatment technique using medical imaging to ensure proper radiation beam tumor alignment before each treatment.

Intensity Modulated Radiation Therapy (IMRT): Cancer treatment that modifies radiation beam intensity within a treatment field.

Linear Accelerator: Treatment machine that produces a variety of energies of radiation and electrons for the treatment of cancer.

Magnetic Resonance Linear Accelerator (MRL): Hybrid device using magnetic resonance imaging and a linear accelerator for cancer treatment; this equipment produces high-quality medical images and real-time dynamic observation of beam placement during radiation beam on time.

Multileaf Collimators (MLC): Specialized device that consists of several sets of metallic leaves that open and close to shape the radiation field produced in a linear accelerator (Khan, 2014).

Practice Standards: Authoritative statements established by the profession for judging the quality of practice, service, and education (ASRT, 2019, June 20).

Radiation Oncologist: Physician specializing in radiation oncology who holds the ultimate responsibility for the outcome of the patient's treatment.

Radiation Therapist (RT): Individual credentialed to plan, monitor, and deliver radiation treatments.

Radiologist Assistant (RA): Certified advanced practice radiologic technologist working under the direct supervision of a radiologist to enhance patient care in the performance of radiologic procedures.

Scope of Practice: The boundaries within which an entry-level radiation therapist can work; more broadly, the services that a qualified health professional is deemed competent to perform and permitted to undertake—in keeping with the terms of their professional license.

Chapter I

Introduction

The entry-level radiation therapist (RT) is a vital member of the radiation oncology team. The RT produces medical images for treatment planning and verifying the accurate delivery of tumoricidal doses for radiation oncology patients. Radiation therapy treatment plans conform radiation doses to individual tumors while sparing healthy tissues. Higher radiation doses to a tumor typically equate to increased tumor cell destruction. The RT administers the treatments as often as five days a week over six weeks. Typically, patients visit their radiation oncologist to discuss treatment adverse reactions and progression once per week. Therefore, the RT must assess the patient's physical and psychological wellbeing during each treatment and determine whether intervention is needed before their next visit with the radiation oncologist.

The development of an advanced practice radiation therapist (APRT) has long been discussed within the United States' health care community without realization. U.S. research cancer hospitals use new technologies and treatment techniques to develop protocols that redefine RT practice. For example, at the University of Texas, MD Anderson Cancer Center (MD Anderson), physicians, physicists, and radiation therapists are developing protocols to treat malignancies using the Elekta Unity, a hybrid magnetic resonance linear accelerator (MRL). With the adoption of MRL technology, management has mandated all RTs employed by MD Anderson obtain additional national credentials in magnetic resonance imaging (MRI). The further education and clinical training required for diagnostic MRI credentialing necessitate defining the APRT and creating a new chapter in cost-effective, patient-centered care.

The integration of image-guided radiation therapy (IGRT), volumetric modulated arc therapy, and proton therapy treatments has changed RT practice standards without addressing the need for additional levels of formal education. Typically, the RT receives limited vendor-developed in-service training for newly adopted technology or treatment techniques. Although practice standards, scopes of practice, content specifications, and curriculum may not address new technologies and treatment techniques until they are adopted nationwide, changes in these documents do not necessarily influence an increase in the required formal education needed for the entry-level RT. The RT must master new skills with only vendor-provided training while maintaining the expectation of error-free patient treatments.

Radiation therapy aims to eradicate or control the patient's disease by administering high doses of radiation to a tumor while sparing normal tissue. Radiation oncologists increasingly rely on the RT to use critical thinking and clinical judgment to identify and assess the adverse reactions of treatment, produce quality medical radiologic images, and ensure accurate patient alignment and treatment to individually defined tumor volumes. For example, the RT produces and assesses medical images to shift treatment fields accurately—often as small as millimeters—for the precise delivery of a prescribed radiation dose to the defined targeted area of the disease. Before adopting IGRT, this practice was reserved solely for the radiation oncologist.

Every four years, the American Registry of Radiologic Technologists (ARRT) conducts a survey that asks RTs working in the United States to rate how often they perform designated tasks. The ARRT Practice Analysis Committee uses the results to determine what should be added to or deleted from the task inventory of certification

examination content. According to the ARRT, “While most of the tasks had high levels of responsibility, tasks dealing with newer or emerging technology, such as proton therapy, or infrequent treatments, such as total marrow irradiation, received low percentages responding as responsible” (ARRT, 2017). As a result, when the ARRT published the *Practice Analysis and Content Specification for Radiation Therapy* in 2017, it excluded specific tasks RTs practice that are associated with emerging techniques or specialized treatment practices, such as complex radiation therapy using MRL. Although the MRL’s hybrid treatment and imaging capability allow for daily tumor localization, daily radiation dose planning, and real-time monitoring of tumor movement during treatment (Lagendijk, 2014), the ARRT does not recognize this skill as within the entry-level RT’s scope of practice.

Another document that affects entry-level practice is *The ASRT Practice Standards for Medical Imaging and Radiation Therapy*, developed by the American Society of Radiologic Technologists. The practice standards identify the RT as possessing the knowledge and skills to assist the radiation oncologist in localizing the tumor, planning treatment, and safely administering prescribed radiation doses (ASRT, 2019, June 20). In 2019, the ASRT Radiation Therapy Curriculum Committee added the safety and operational components of MRI as an optional curricular component of the national curriculum (ASRT, 2019). The content was identified as optional because using MRI in patient simulation and treatment is not yet a nationwide practice. Because MRL and MRI practices are excluded or optional according to the ARRT and ASRT, respectively, emerging technologies and practices such as these must be identified and considered for defining APRT practice standards.

The use of advanced practice health care providers, such as nurse practitioners and physician assistants (PAs), has been established as a cost-effective means of providing quality patient care in the United States (Kleinpell et al., 2019; Morgan et al., 2019; Venning, 2000). The England, New Zealand, and Canada have developed an expanded role for RTs in response to increased technological advancements, demands for services, patient-centered care, efficiency, and the cost-effectiveness of cancer services. To determine whether RTs in Ontario, Canada, performed duties that may be deemed advanced practice, Bolderston (2005) surveyed RTs regarding their definition of advanced practice, the current and future tasks they perceive as advanced practice, and their perceived advantages and disadvantages of current tasks. To date, similar publications cannot be found published in the United States.

Statement of the Problem

Technologic and increasingly complex treatment techniques place the RT practicing at an advanced level not defined within the professional curriculum, practice standards, or the competency and knowledge assessment of the national certification agency.

Purpose of the Study

The purpose of this research is to identify a Comprehensive Competencies Profile (CCP) for an APRT role at the University of Texas, MD Anderson Cancer Center.

Research Questions

Using grounded theory methodology (GTM), a qualitative model for recognizing the practice standards specific to an APRT will serve as the framework to answer the following questions:

1. What are the required competencies for the role of an APRT?

2. What are the practice standards for an APRT?

Context for the Study

This study will occur at a large university-based teaching cancer hospital in the southern United States. The researcher intends to conduct postgraduate studies to validate the research findings for proposing a nationwide adoption of the APRT practice standards.

Significance of the Problem

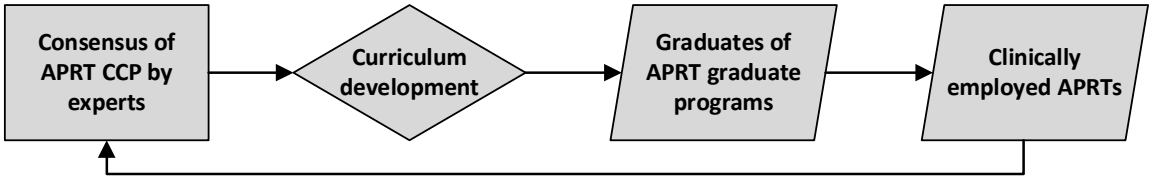
The practice standards, certification requirements, and curriculum for the entry-level RT neglect the role of an APRT.

Educational Value of the Study

This research acknowledges the importance of developing educational programs to meet the academic and clinical student learning outcomes required to produce a quality APRT. Radiation therapy faculty educating the entry-level RT is typically identified as employees of academic divisions or the university/college rather than a practicing clinical RT. Thus, faculty are omitted from participating in vendor-sponsored training programs. Program faculty wait for the emerging technology or technique to be widely adopted and included in the national radiation therapy curriculum or content specifications. They become conceptual experts through self-directed learning. The theoretical framework (see Figure 1) presented in this research defines the practice standards to develop educational content of APRT programs through the consensus of radiation oncology experts and the development of the CCP. The CCP will serve as the foundation for curricular development in the production of qualified APRT graduates. Once in practice, these graduates will aid in the continued quality development of the APRT CCP before the nationwide adoption of new technologies and treatment techniques.

Figure 1

Philosophical Framework



Note. APRT, advanced practice radiation therapy; CCP, Comprehensive Competencies Profile.

Limitations of the Study

This study is limited to one research cancer hospital in the southern part of the United States. Hence, the results are biased because the participants are from one medical facility with a progressive culture and state-of-the-art equipment. Findings in other regions of the U.S. or smaller radiation oncology centers likely would differ from the results of this study.

Summary

Advanced practice health care providers have been established as a cost-effective means of providing quality patient care in the United States. The purpose of this study is to identify the competencies or practice standards of an APRT with a focus on providing efficient, cost-effective, and quality patient care at a large cancer hospital in the southern United States.

The entry-level RTs professional curriculum, practice standards, content specifications, and competency requirements for national certification neglect the function of an APRT. Advancements in technology such as the MRL, radiation therapy simulation using MRI, and IGRT treatment techniques necessitated the development of an APRT at a large cancer hospital in the southern United States. Assessing the current

literature on professional competencies, practice standards, and scopes of practice for APRTs in other countries, radiologist assistants, and PAs, forces one to postulate a grounded theory framework for a qualitative study to identify the CCP for the APRT.

Chapter II

Review of the Literature

Competencies in health care education are the foundation for evidence-based practice (EBP) programs, including nursing, radiologic sciences, and physician assistants (PAs). The World Health Organization (2017) posits that European regions must consider the benefits of EBP, focusing on continuous quality improvement. Competencies as student outcomes are a logical means to measure learning. In a study by Dolezel et al. (2021), the researchers attempted to gain consensus on EBP competencies and associated learning outcomes in European nursing education programs. The identified competencies allow the educator and employer to design specific outcome-based assessments to determine if the graduate demonstrates the appropriate skills and knowledge.

This literature review provides an overview of the grounded theory methodology (GTM), the U.S. entry-level competencies of a radiation therapist (RT), the practice standard model for the entry-level RT and the radiologist assistant (RA), advanced practice radiation therapists (APRTs) in other countries, and competencies defining practice standards for RAs and PAs.

Grounded Theory Methodology

Since the 1960s, GTM has been a research method intended to create qualitative data sets using structured collection and analysis techniques to offer a theoretical explanation of a social phenomenon. It provides a systematic approach to analyzing qualitative data based on the positivism perspective to generate knowledge based upon a single truth. The process demonstrates high levels of validity and reliability. GTM design is a series of simultaneous data collection and analysis. This system allows the participant

to respond to research questions and enables the researcher to view the response correctly, based upon the participants' perspectives. The series of data collection is analyzed for constant comparative and emerging themes substantiated with practical experiences (Kennedy & Lingard, 2006).

Overview of Entry-Level Practice of U.S. Radiation Therapists

Radiation therapy aims to deliver a tumoricidal radiation dose to a tumor while sparing healthy tissues. Radiation therapy dates to a period just after the discovery of x-rays. Patients were treated with external beam irradiation equipment and sealed radioactive sources (IAEA, 2020). Until the 1990s, radiation oncology patients were treated one of two ways: static treatment fields with handmade lead or lead-alloy blocks to define treatment fields and protect healthy tissues, or an external beam source of radiation traveled in an arcing pattern around the patient.

Technologic innovation in medical imaging and radiation therapy is a driving predictor of patient outcomes in radiation treatment. Radiation therapy has embraced conventional radiography, fluoroscopy, computed tomography (CT), positron emission tomography, and magnetic resonance imaging in the localization of tumors and the treatment planning of complex radiation treatments. The information obtained through modern medical imaging assists in planning therapies that conform to tumors in two, three, and four dimensions. Four-dimensional therapies consider the tumor size based on the x, y, and z axes. They include the time and movement (voluntary and involuntary) of the tumor within the treatment field.

Improved imaging allows the radiation oncologist to define the radiation dose and the tumor volume precisely. Physicians then can prescribe higher radiation doses to the

tumors, destroying more tumor cells while also reducing the toxicity to healthy tissues. Additionally, innovations in treatment technology continue to redefine the ever-changing responsibilities and depth of knowledge required of an RT. For example, multileaf collimators (MLCs) have revolutionized radiation therapy treatment techniques. MLCs contain 40 to 120 tungsten leaves arranged in pairs. These computer-controlled leaves can adjust their collective shape to precisely define radiation therapy fields, thus ending the need for custom-made blocks (Khan, 2014). MLCs and CT scans opened the door to radiation therapy treatment techniques that conform to tumor volumes. Intensity-modulated radiation therapy (IMRT) uses the MLC movement during the radiation beam-on time. The treatment planning computer system can control the direction of the MLCs throughout the patient treatment. The treatment plan may include a continual systematic change in leaves throughout an active radiation beam using a step-and-shoot delivery. When the beam terminates, the MLC changes shape, and the beam is again activated. This pattern may continue for several minutes. As the name implies, the energy or intensity modulation of the radiation beam fluctuates throughout the treatment time (Cho, 2018).

Otto (2007) described the technique of volumetric modulated arc therapy as using MLC and intensity modulation in an entire 360° arc around the patient. The treatment plan prescribes a dose of specific radiation energy synchronized with the MLCs for every degree the external beam radiation therapy unit rotates around the patient. According to Otto, “Using the full range gantry will theoretically provide increased flexibility in generating highly conformal treatment plans.”

IMRT techniques have allowed physicians to define tumors with a minimal margin of error. IGRT calls for imaging during a course of highly conformal radiation

therapy. The accuracy of patient setup and verification of proper beam placement requires the RT to assess the accuracy of radiation beam placement compared to the targeted tumor. Medical imaging assures the accurate alignment of the radiation beam to the targeted tumor volume before and during individual radiation treatments. The reduction in treatment setup uncertainties allows for safer treatment with little margin for healthy tissues (Nabavizadeh et al., 2016).

The ASRT Practice Standards for Medical Imaging and Radiation Therapy (2019, June 20) identify radiation therapy professionals' scope of practice and practice standards. The entry-level RT's scope includes radiation safety, evaluating medical images, technical quality, reporting patient condition changes, and performing simulation, localization, and treatment planning (see Appendix A). The practice standards include patient assessment, analysis/determination, education, collaboration, and ethics (see Appendix B). The scope of practice and practice standards are broadly written statements that should be the foundation for the APRT. The content specifications for the national certification examination for the entry-level RT are in Appendix C.

Practice Standards Models

The American Society of Radiologic Technologists (ASRT) is responsible for developing practice standards and the scope of practice for the entry-level RTs and advanced practice RAs. The processes for both professional disciplines are identical. The ASRT Board of Directors appoints individuals to the Practice Standards Council. The Council meets annually to make revisions and recommendations and to develop position statements relevant to the profession. However, because the document provides guidelines for more than a dozen disciplines within the radiologic sciences,

subcommittees review disciplines on a rotating three-year cycle. That is, although the overall document changes every year, the radiation therapy–specific content is reviewed only every third year. The Council provides documentation to support modifications and presents its recommendations for professional and public comment (ASRT, 2019, June 20).

Advanced Practice Radiation Therapy Outside the United States

A common theme in the literature addresses the collaboration of the radiation therapy professional community and governmental agencies to address the issues related to improved staffing, access to quality patient-centered care, and the cost-effectiveness that advanced practitioners provide in cancer care.

A European Society for Radiotherapy and Oncology white paper presented evidence for the development of the APRT due to rapidly advancing technology leading to complex curative treatments, higher patient volumes related to the aging population, and increasing workloads to treat this patient population (Duffton et al., 2019).

In 2017, the professional bodies and the Academy of medical Royal Colleges joined forces to work together and address national health issues in the United Kingdom (National Health Service England, 2017). The outcome was an advanced clinical practice framework and formal definition of advanced practice for all health care professionals. Their goal is to ensure safety, quality, and effectiveness across health care settings. A key driver for the implementation of advanced clinical practice is to enable professionals to practice to their full potential and to optimize their contribution to meet the needs of the population, individuals, families, and caregivers through different models of service delivery and multidisciplinary work.

A competencies framework was created across four pillars: clinical practice, leadership and management, education, and research.

Responding to increasing costs, aging populations, and increasingly complex treatments, Harnet et al. (2014) published findings from an eight-year Canadian Specialist Radiation Therapist (CSRT) study. Their research identified the significant value the CSRT adds to an interprofessional team by delivering high-quality, cost-effective care, demonstrating leadership in the field, and providing flexibility and relief of pressures on the care team. An additional study of the CSRT showed improved coordination and fewer gaps in patient care. (D'Alimonte et al., 2017).

From the patient perspective, the CSRT positions have increased access to care through greater efficiencies of specific tasks and processes along the treatment care pathway. Certain activities previously completed by physicians have been redistributed because CSRTs attained advanced skills and increased responsibilities, decreasing redundancy within patient care processes (D'Alimonte et al., 2017).

Recognizing the international influence of defining advanced practice, Burow et al. (2009) examined the role expansion of RTs performing IGRT in Australia. Their work identified the expansion opportunities of the RT's scope to include extension into other decision-making roles, protocol development, and an IGRT specialist. They concluded that professional advancement could improve job satisfaction, efficiency, and quality of care, and it reduced workload to address the shortage of radiation oncologists.

A national study of New Zealand RTs validated a master's degree–level education to fortify the clinical knowledge within 10 advanced practice areas, including research, brachytherapy, pediatrics, head and neck, prostate, palliative, breast, patient education,

imaging, and contouring. The authors recommended developing one general scope of practice with the specific criteria listed for each profile (Coleman et al., 2014).

Lim et al. (2020) conducted a mixed-methods survey study of randomly chosen radiation oncologists and RTs at a single center in Singapore. The respondents showed strong support for site-specific advanced practice roles of RTs. They believed the position would improve workflow, create a career ladder, promote interprofessional communication and collaboration in clinical care, increase patient-centered care, and benefit treatment delivery.

Canada, New Zealand, and England have established advanced practice roles in radiation therapy. The scopes of practice from each country are summarized in Appendix D. These practices and those of the other advanced practice professions will form the foundation of a Comprehensive Competencies Profile and the development of practice standards and curriculum development for a master of science degree in advanced practice radiation therapy at MD Anderson.

Scopes of Practice for Advanced Practitioners

Much like for the entry-level RT, the ASRT maintains the scope of practice, practice standards, and curriculum for the RA, and the RA's scope of practice and standards follow the same format as the entry-level RT. However, the standards are different. Originating in the early 21st century, the RA is the newest professional modality recognized by the ASRT and the American Registry of Radiologic Technologists. It is the only advanced practice within the profession of radiologic technology. Although the scope of an RA differs from the functions of an RT, some components could benefit the APRT. The RA practice standards are summarized in

Appendix E.

Adopted in 2005, the American Academy of Physician Assistants amended its *Competencies for the Physician Assistant Profession* in 2021. This document charts a course for individuals to function under the PA's scope of practice, whether in primary or specialty care. Competencies include patient safety, cultural competence, quality of health care, and lifelong learning to pursue professional growth (see Appendix F; AAPA, 2021).

Summary

The role of the entry-level RT is well established in the United States. Countries such as Canada, England, Australia, and New Zealand have embraced the development of the APRT; they determined the APRT to be valuable in providing quality, cost-effective, patient-focused care to cancer patients. The ASRT has established mechanisms to adopt practice standards and scopes for advanced practice health care providers. Using GTM, qualitative research of high reliability and validity may be used to determine the practice standards and scope of practice of the APRT at MD Anderson.

Chapter III

Methodology

The Delphi consensus method (Chalmers & Armour, 2019) of research is an established process for determining agreement among health care experts. Recently, Morais et al. (2020) designed a national curriculum for advanced surgical oncology using a three-round study of 15 experts. Adleman et al. (2017) published findings in developing a quality and safety competency curriculum for radiation oncology residents. Roth et al. (2016) surveyed 25 nurses to identify human factors contributing to nursing errors. In 2014, Giuliani et al. published their findings from an international Delphi study determining an imaging literacy curriculum for radiation oncologists. Halkett et al. (2011) conducted an extensive survey of Australian RTs in ranking the essential technology-related research for the radiation therapist (RT).

MD Anderson Cancer Center's Division of Radiation Oncology approached the School of Health Professions Radiation Therapy Program in 2019, requesting programs that produce RTs with magnetic resonance imaging credentials and who can contribute with additional autonomy. This research is the foundation for defining that critical role.

Research Questions

The primary research question is: What competencies are required of an advanced practice radiation therapist (APRT) at MD Anderson? This research aims to develop a Comprehensive Competencies Profile (CCP) for MD Anderson's APRT. A secondary purpose is to identify the role, responsibilities, and educational criteria for creating a master of science degree in advanced practice radiation therapy at MD Anderson.

Research Design

Participants

Panel A consisted of five of 82 eligible expert radiation therapists (RTs) in clinical practice at MD Anderson. Participants were selected based upon their professional title, years of experience, and experiences in unique radiation therapy treatment protocols, such as stereotactic radiotherapy, proton therapy, magnetic resonance linear accelerator (MRL) treatment, and magnetic resonance simulation.

Seven potential participants were identified in consultation with MD Anderson's associate director of radiation therapy services. An invitation was sent to the potential participants explaining that they were chosen to participate and inviting them to a videoconference session (administered via Zoom) to discuss the purpose of the research, methodology, expectations, and time commitment if selected. The potential participants were instructed to email the principal investigator (PI) stating their consent to participate. The first five respondents formed the Panel. The panel member identities remained confidential to ensure their participation had no bearing on their performance evaluations or employment.

Panel B consisted of 10 of 87 qualified radiation oncologists, 10 of 65 qualified medical physicists, and 15 of 82 qualified expert-level RTs recruited from the MD Anderson Division of Radiation Oncology and Houston-area locations. More RTs were chosen for the panel because they represent the specific profession that the CCP will define. Participants were selected based on their expertise in their respective fields. Determining factors for participation included professional title, years of experience, demonstration of leadership characteristics, professional involvement, and professional presentations and publications.

Participants were chosen with the support of the Radiation Oncology Division chair. Participants received an electronic invitation explaining why they were selected to participate, the study's purpose, requirements for participation, and time commitment. Participants were invited to attend a videoconference (Zoom) meeting to discuss the research method and ask questions. The potential participants were asked to notify the PI via email of their willingness to participate. The first 10 RTs, 15 radiation oncologists, and 15 medical physicists who responded were selected as participants. The panel member identities remained confidential to ensure their participation did not affect performance evaluations or employment. Consent to participate was obtained through Research Electronic Data Capture (REDCap) survey software, using the MD Anderson–approved wording. Participation was voluntary, and consent to participate could have been withdrawn at any time.

Data Collection Procedures

Panel A members independently assessed 107 competencies compiled from published documents for U.S. physician assistants (PAs) and radiologist assistants (RAs) and practicing APRTs in England, Canada, and Australia. Panel A met through synchronous videoconferencing to discuss their findings, delete duplicate competencies, remove competencies that did not fit the RT scope of practice, and contribute to the list based on their professional experience. They approved a list of competencies under three categories: Research, Leadership and Management, and Clinical Practice. This approved document formed the survey items presented to Panel B in three rounds.

Panel A reconvened for a second meeting to assess the competencies provided by

Panel B participants' responses in round one of the surveys.

Round One

Immediately following the initial meeting, the Panel B members who consented to participate were given 10 days to complete the survey consisting of 97 competencies approved by Panel A. The participants were asked to indicate, based on their experience, whether each item should be included or excluded from the CCP and to provide additional competencies they thought should be included in the survey.

Upon completing round one, the PI analyzed the data. Competencies that met consensus were defined as those to which 75% or more of the participants selected "definitely include" or "include" on the five-point Likert; these were removed from the survey and added to the CCP. All competencies that did not meet the criteria, as well as the new competencies identified by Panel B and approved by Panel A, formed the items in the second survey.

Round Two

Panel B participants had 10 days to complete the second survey, which included the items not meeting consensus in round one. For these items, the participant received their rating and the distribution of all panel responses to each item. A comment box allowed participants to provide rationale for including or excluding the competency from the CCP or to recommend wording changes that might cause them to support the inclusion of the competency in the CCP.

An analysis of the survey results identified competencies that met the definition of consensus. These competencies were added to the CCP. Items that did not meet consensus and the comments provided formed the content of the third survey.

Round Three

The participants had 10 days to respond to the third survey, which included the noncompliant competencies from the second survey, the comments from the second survey, the participant responses to the competency on the second survey, and the aggregate responses of Panel B on the second survey. Participants were instructed to read the comments, review their rating compared to the distribution of the Panel, and determine whether they were willing to change their response. The competencies meeting the definition of consensus from all three surveys were included in the finalized CCP. The competencies that did not meet consensus were reviewed to identify possible reasons for their non-compliance. A copy of each survey appears in Appendix G.

Data Analysis Procedures

Participants rated each item on a five-point Likert scale (definitely include, include, neither include nor exclude, exclude, definitely exclude). Survey items that received 75% or higher responses “definitely include” and “include” were added to the CCP. The competencies that received less than 75% were assessed to consider reasons for non-compliance.

Study Design/Endpoints

The study employs the Delphi method to survey panels of experts in radiation therapy to achieve a consensus on a comprehensive list of competencies for APRTs at MD Anderson. As described above, two panels (A, B) of experts were formed. Panel A reviewed a master list of competencies gathered from the literature for existing advanced practice professionals, including those in radiation therapy, PAs, and RAs. They refined this list to create the content of the first survey and reviewed the recommendations for

changes and additional competencies documented in the first survey.

Sample Size/Accrual Rate

Panel A consisted of 5 of 82 expert-level RTs. Panel B consisted of 14 of 77 expert-level RTs, 10 of 87 radiation oncologists, and 10 of 65 medical physicists for a total of up to 34 members. There is no typical sample size for a panel of experts participating in a Delphi study, but studies have been performed with panels ranging from three to 171 members (Skulmoski et al., 2007). Homogeneous panels of experts require fewer members than heterogeneous panels to reach a consensus, and a sample size of eight-panel members is seen as an acceptable minimum (Hallowel & Gambetese, 2010).

Analysis

Descriptive statistics (means, standard deviations, medians, ranges, frequency counts, and percentages) were used to summarize the characteristics of the members of Panel A and Panel B, separately. For Panel A, these characteristics included professional title, years of experience, and experiences in unique radiation therapy treatment protocols, such as stereotactic radiotherapy, proton therapy, MRL treatment, and magnetic resonance simulation. For Panel B, these characteristics included professional title, years of experience, demonstration of leadership characteristics, professional involvement, and publications.

Descriptive statistics (percentage of agreement) were used to summarize the Likert scores recorded for each potential competency under review in each of the three rounds of review.

Study Oversight and Data Reporting Requirements

Study data was collected and managed using REDCap electronic data capture

tools hosted at MD Anderson. REDCap (https://www.project-redcap.org) is a secure, web-based application with controlled access designed to support data capture for research studies, providing: (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless downloads to common statistical packages; and (4) procedures for importing data from external sources.

In the case of multi-center studies, REDCap uses data access groups to ensure that personnel at each institution are blinded to the data from other institutions. The MD Anderson Oncology Care & Research Information Systems hosts REDCap (https://redcap.mdanderson.org) on a secure server. Since 2014, the MD Anderson Information Security Office has conducted an annual governance risk and compliance assessment of REDCap and found it to be compliant with HIPAA, Texas Administrative Codes 202-203, University of Texas Policy 165, federal regulations outlined in 21CFR Part 11, and UTMDACC Institutional Policy #ADM0335.

Those with access to the data include the study PI and research collaborators. Users were authenticated against MD Anderson's Active Directory system. External collaborators were given access to the database through their collaborating PI, with their access expiring in six months but renewable in six-month increments at the request of the PI. The application was accessed securely, and data were sent in an encrypted format between the browser and REDCap servers. Research teams determined the roles and the privileges given to team members.

Since study data could be useful for future research studies performed under separate IRB-approved protocols, study data has been archived in REDCap. Because

REDCap is a secure electronic database with controlled access, and because participant identifiers might be needed to link study data to data from other sources under future IRB-approved protocols, participant identifying information will be retained in the archived database.

Summary

A panel (Panel A) of five expert-level RTs reviewed 134 competencies obtained from numerous relevant sources. The Panel assessed the competencies and deleted duplicates, edited for meaning, and contributed additional competencies based on their experience. These competencies formed the first survey items. This Panel reviewed and approved competencies contribution by survey one participants.

A second panel (Panel B) consisted of 14 RTs, 10 radiation oncologists, and 10 medical physicists who were surveyed to determine if the competencies should be included or excluded from the CCP of the APRT at MD Anderson. The three-round Delphi study was administered through REDCap. Participant identities remained confidential. Survey responses were collected using REDCap, and all data stored will be available to the study team members only.

Chapter IV

Results

This study measured experts' perceptions regarding the inclusion or exclusion of competencies for a Comprehensive Competencies Profile (CCP) of practice standards for the advanced practice radiation therapist (APRT). Two panels of MD Anderson employees comprised the participants: Panel A had five expert radiation therapists (RTs) who advised and made decisions regarding survey content; Panel B had 14 expert-level RTs, 10 radiation oncologists, and 10 medical physicists. Competencies listed on the survey originated from the experiences of the Panel A members, the existing competencies for U.S. physician assistants (PAs) and radiologist assistants (RAs), and APRTs practicing in England, Canada, and Australia. Consensus was defined at 75%.

Demographics

The principal investigator (PI) and the associate director of radiation therapy services identified seven expert-level RTs as qualified Panel A participants. An email invitation was sent to the seven potential participants inviting them to attend an informational Zoom session, where the research purpose, methodology, expectations, and time commitments were explained. Potential participants were told to email the PI stating their willingness to participate. The first five to respond were selected to serve on the Panel. Three participants had 10 to 15 years of experience and two had more than 15 years of experience, with an average of 12.6 years.

Panel B members were chosen from 77 expert-level RTs, 20 medical physicists, and 26 radiation oncologists identified by the PI and the Division of Radiation Oncology chair. An email invitation was sent to the 123 potential participants inviting them to attend an

informational Zoom session to explain the purpose of the research, methodology, expectations, and time commitment. The potential participants were instructed to email the PI stating their willingness to participate. The first 15 expert-level RTs, 10 medical physicists, and 10 radiation oncologists to respond were selected to serve on Panel B. However, one expert-level RT did not complete any of the surveys and was excluded from the study.

The demographic data demonstrates that 97% of the respondents had at least five years of experience and 44.1% of respondents had more than 15 years of radiation oncology experience (see Table 1).

Table 1

Panel B Years of Experience

	0-4 years	**5-9 years**	**10-15 years**	**>15 years**	**Total**
Expert-level Radiation Therapist	–	4	4	6	14
Medical Physicist	–	5	2	3	10
Radiation Oncologist	1	1	2	6	10
Total	1	10	8	15	34

Response Rate

The response rates for each study round exceeded 90%. Medical physicists demonstrated the highest overall participation rates with 100% (30/30), with expert-level RTs at 97.6% (41/42) and radiation oncologists at 86.7% (26/30), respectfully (see Table 2).

Table 2

Delphi Response Rate by Round

	Radiation Oncologists (10)	**Medical Physicist (10)**	**Radiation Therapist (14)**	**Response Rate**
Round One	10	10	14	100%
Round Two	8	10	14	94.10%
Round Three	8	10	13	91.12%

Results of Consensus From Panel B

Panel B members participated in the three-round consensus survey consisting of 107 competencies, of which 65 met the definition of consensus for inclusion in the CCP (see Table 3 & Appendix H). The remaining 42 competencies did not reach consensus and were excluded from the CCP.

Table 3

Competencies Reaching Consensus or Non-consensus by Category

	Round 1			Round 2			Round 3		
	Total	**Consensus**	**Non-consensus**	**Total**	**Consensus**	**Non-consensus**	**Total**	**Consensus**	**Non-consensus**
Total Competencies	97	39	58	68	22	46	45	4	41
Research	7	1	6	6	2	4	4	0	4
Leadership and Management	13	10	3	3	1	2	2	1	1
Clinical Practice	77	28	49	59	19	40	39	3	36

Round One Findings

Participants assessed 97 items, including seven Research, 13 Leadership and Management, and 77 Clinical Practice competencies. Consensus was obtained on 39 competencies, including one Research, 10 Leadership and Management, and 28 Clinical Practice competencies. Participants suggested an additional 10 competencies, which were included in the round two survey.

Round Two Findings

Participants assessed 68 competencies from round one and an additional ten competencies provided by Panel B participants in round one, including six Research, three Leadership and Management, and 68 Clinical Practice competencies. Consensus was obtained on 22 competencies, including two Research, one Leadership and Management, and 19 Clinical Practice competencies.

Round Three Findings

Participants assessed 45 competencies, including four Research, two Leadership and Management, and 39 Clinical Practice. This round resulted in a consensus on four competencies: one Leadership and Management and three Clinical Practice. The distribution of results for all three surveys is in Appendix I.

The resulting 65 CCP competencies originated from MD Anderson Panel A and Panel B, U.S. physician assistants (PAs) and RAs, and APRTs practicing in England, Canada, and Australia. The data demonstrates the top three contributors to the CCP are England, the USRA, and MD Anderson (see Table 4). The competency distribution for each originating location is in Appendix K.

Table 4

Consensus Items by Originating Location

Originating Location	Consensus Items	Percentage
MD Anderson	12	18.5%
USPA	6	9.2%
USRA	16	24.6%
Australia	4	6.2%
Canada	8	12.3%
England	19	29.2%
Total	65	100.0%

The CCP competencies were printed onto cards, and two RTs arranged the competencies into six themes or subcategories based on the perceived intent of the competency. Table 5 identifies the six themes with the number of competencies placed in this subcategory. A reporting of each theme with corresponding competencies is documented in Appendix L.

Table 5

Consensus Competencies Subcategorized by Common Themes

Theme	No. of Competencies
Advanced Technology	7
Collaboration/Education	11
Dosimetry	10
Patient Care	18
Process Improvement	10
Safety	9

Competencies Not Receiving Consensus

Consensus was achieved when 75% of participants—who were radiation oncologists, medical physicists, and radiation therapists—agreed the competencies should be included in the CCP of the APRT. Forty-two competencies did not receive consensus, including four Research, one Leadership and Management, and 37 Clinical Practice. A Clinical Practice competency was inadvertently excluded from round three. Although this item received a 74.2% agreement in round two, it was determined not to meet consensus and not included in the CCP. Non-consensus competencies were assessed for common themes and sub-categorized. Table 6 identifies the five themes and the number of competencies in each subcategory.

Table 6

Non-consensus Competencies Subcategorized by Common Themes

Theme	No. of Competencies
Billing	1
Dosimetry	4
Patient Care	32
Research	5
Supervision	1

Summary

Panel B assessed 107 competencies in a three-round Delphi consensus survey. The response rate for each round was 100%, 94.1%, and 91.12%, respectively. The first round produced a consensus for 39 of the 97 competencies. Participants contributed an additional 10 clinical practice competencies for round two. The second round resulted in a consensus for 22 of the 67 items. The third round resulted in an agreement for four of the 45 competencies. The finding suggests that the APRT CCP should consist of three Research, 12 Leadership and Management, and 50 Clinical Practice competencies. The 65 competencies originated from five sources: 12 (18.5%) from MD Anderson, 22 (33.9%) from U.S. physician assistants and radiologist assistants' competencies, 19 (29.2%) APRT competencies in England, 8 (12.3%) APRT competencies in Canada, and 4 (6.2%) APRT competencies in Australia.

Chapter V

Discussion

This study measured the perceptions of 34 experts in radiation oncology in the development of a Comprehensive Competency Profile (CCP) to define the role of an advanced practice radiation therapist (APRT) at The University of Texas, MD Anderson Cancer Center (MD Anderson). The experts completed a three-round Delphi study using 107 competencies from MD Anderson, U.S. physician assistants and radiologist assistants, and APRTs in Canada, England, and Australia. Consensus for inclusion was defined at 75% of participants agreeing on the inclusion of the competency in the CCP. Consensus was obtained for 65 of the 107 competencies.

The competencies reaching consensus were categorized as Research, Leadership and Management, and Clinical Practice and then sorted into six themes: Advanced Technology, Collaboration/Education, Dosimetry, Patient Care, Process Improvement, and Safety. The 42 competencies not included in the CCP were categorized into four potential reasons for not meeting consensus.

Advanced Technology

The data supports magnetic resonance (MR) simulators, MR linear accelerators, Gamma Knife, and Interoperative Radiation Therapy (IORT) as advanced practice skills, which necessitates the development of the APRT. Advancement beyond entry-level to the APRT requires decision-making aspects of adaptive radiotherapy reserved for APRTs with radiation oncologists' approval. Because technology is dynamic, advanced competencies addressing subject-specific knowledge, skills, and behaviors relevant to the role, setting, and scope of the APRT in applying emerging technologies need to be

included in the APRT curriculum. Entry-level radiation therapy curriculum is limited to basic MR safety, such as MR physics, positioning, protocols, advanced safety, and disease identification. Critical thinking in adjusting protocols to accommodate patients and disease will be included in the proposed APRT curriculum. A didactic and clinical component—as exists for national certification in MR—is a desired outcome. Additionally, the APRT must have formal education in discriminating between treatment plans during daily adaptive planning using advanced treatment technology.

Collaboration and Education

The APRT will advance the entry-level RT's role by performing patient, peer, public, and professional education. A formal position in defining organizational culture requires expanded collaboration with radiation oncology and interprofessional health care teams. The APRT curriculum will include concepts of instructional design, organizational psychology, interprofessional education, research techniques, dissemination of research findings, and leadership practices.

Dosimetry

The APRT will demonstrate advanced knowledge in assessing dose-volume histograms (DVHs), dose normalization, and dosimetric criteria for plan optimization when comparing treatment plans. The APRT, in collaboration with the radiation oncologist, will determine the treatment plan that is best suited for a given tumor volume. The APRT will use standard operating procedures to verify adaptive treatment plans for accuracy before delivering radiation treatment. The APRT curriculum will include decision-making skills to assess the effectiveness of complex treatment plans. This will include treatment optimization with a focus on adaptive radiotherapy techniques and the

DVH selection and isodose distribution to the targeted tumor volumes.

Patient Care

The APRT will perform selected advanced procedures during simulation, treatment, and weekly patient visits with the radiation oncologist. The APRT may autonomously deliver patient care in unique categories of radiation oncology treatment of specific diseases. The assessment and performance of image-guided and adaptive therapies will allow the APRT to take a leadership position in image verification and decision-making regarding adaptive treatments and optimizing treatment plans. The role of the APRT necessitates high-level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site from admission to after discharge. The APRT curriculum will contain the education and practical skills in image acquisition and evaluation for making critical judgements in treatment delivery that is supported by the radiation oncologist. Additionally, advanced patient care will be required to ensure the APRT can safely perform invasive procedures and instruct patients for appropriate clinical scenarios as the radiation oncologist directs.

Process Improvement

The APRT will have an expanded role in coordinating resources, developing new protocols and guidelines, and making collaborative links between clinical and research practices through peer- and self-evaluation. The APRT curriculum will include formal education in process improvement in the health care setting (e.g., Models of Change, Six Sigma, and high-reliability organizational structure). The curriculum will include skill development in fiscal responsibility and audit performance of their work and of their peers to make recommendations for revisions, as necessary.

Safety

In collaboration with the radiation oncology team, a leadership role requires the APRT to plan and implement safety initiatives to include new clinical, imaging, and treatment techniques. The APRT will use high-level skills to serve as a physician extender in radiation treatments, leading practice and service design while working across professional boundaries.

The CCP contains two competencies that received 100% agreement from the expert panel. Both items are related to patient safety and minimizing errors. This finding suggests that the APRT should have a significant role in developing and implementing patient safety protocols.

The APRT curriculum will expand beyond entry-level RT knowledge and skills related to radiation safety practices, quality management procedures, and legal and regulatory requirements. For example, the APRT will assume a leadership role in LEAN (Leadership, Eliminate Waste, Act Now), PDCA (Plan, Do, Check, Act), Six Sigma, and root cause analysis as stewards of safety protocols and quality improvement processes. The curriculum will include instruction in strategic planning and effective, efficient methods of implementing new clinical practices.

Alignment to Practice Standards and Content Specifications

The CCP represents an advanced practice in radiation therapy at MD Anderson and provides student learning outcomes or a master of science degree in APRT. The American Society of Radiologic Technologists (ASRT) established 13 practice standards for entry-level RTs (see Appendix B), which, when expanded, provide a foundation for the APRT:

- Standard One: Assessment
- Standard Two: Analysis/Determination
- Standard Three: Education
- Standard Four: Performance
- Standard Ten: Self-Assessment
- Standard Eleven: Collaboration and Collegiality
- Standard Twelve: Ethics
- Standard Thirteen: Research, Innovation, and Professional Advocacy

A practice standard is linked to each competency in the CCP (see Appendix N).

Alignment to Content Specifications

The American Registry of Radiologic Technologists' (ARRT) *Examination Content Specification for Radiation Therapy* for the entry-level RT (see Appendix C) has three content categories: Patient Care, Safety, and Procedures. The data demonstrates the APRT's role as a physician extender having advanced competencies beyond the entry-level RT. The content specifications for APRT certification will define the expanded role and contain the content categories identified in the CCP themes of advanced technology, collaboration/education, dosimetry, safety, patient care, process improvement, and content specifications. A practice analysis and task inventory may benefit the certification examination development once the APRT is well established.

The ARRT content specification "Ethical and Legal Aspects" links to the APRT competency "Understanding of legal and regulatory requirements and the appropriate role of the APRT to Ethics" found in ASRT's Practice Standard Twelve. The ARRT content specification "Quality Control Procedures" is related to the APRT competency "Identify

key failure modes and work collaboratively to design ways to minimize the chance of error" in ASRT's Practice Standard Five. The ARRT content specification "Prescription and Dose Calculation Treatments" is related to the APRT competency "Interpret a treatment plan's isodose lines for optimization" in ASRT's Standard Two. A crosswalk was created to apply the CCP to ARRT content specifications and ASRT practice standards for entry-level and advanced practice certification (see Appendix O).

Competencies Lacking Consensus

The competencies that did not reach consensus included "Supervision of Residents and Fellows in Project Work," which received 24.24% in Round One, 6.25% in Round Two, and 3.45% agreement in Round Three. This suggests the APRT should not supervise residents or fellows in projects. Further, the data indicate the APRT should not write radiation oncology or pharmaceutical prescriptions, order diagnostic tests, assess contours, define treatment volumes, or independently change adaptive radiotherapy. Interestingly, the competency "Assumes a Patient Caseload in Each Clinic" did not meet consensus with the highest agreement 54.55% in Round One, 70.97% in Round Two, and 53.57% in Round Three. However, the competency of "Autonomously Delivering Care to Patients in the Unique Categories of Radiation Oncology Treatment for Specific Diseases, For Example, Palliation, Breast, and Prostate Cancer" met consensus at 69.7% in Round One and 84.38% agreement in Round Two. Because consensus was met in Round Two, data was not collected in Round Three.

The comments related to the 42 non-consensus competencies were evaluated and subcategorized into themes (see Table 7). For example, the competency "Provide health care services and education aimed at disease prevention and health maintenance"

received the comment, “This is the role of an MD, APP (sic), or nurse.” Therefore, this competency was categorized as “Another existing professional role may best perform competency.”

Table 7

Potential Reasons for Non-consensus by Category

	Another existing professional role may best perform competency	**Competency may not improve the efficiency of the treatment team**	**Competency may conflict with current federal or local laws**	**Focus may be better spent on other competencies**
Research	X			X
Leadership and Management	X			
Clinical Practice	X	X	X	X

Study Strengths and Limitations

The Delphi design lends itself to collecting participants’ perceptions while minimizing researcher bias. The expert panel of physicians, physicists, and radiation therapists represent more than 370 years of radiation oncology experience. The diverse professional roles in radiation oncology and a greater than 90% participation rate for each of the three rounds of data collection are strengths of this study.

A significant limitation of this study is that all participants were MD Anderson employees. The data is reflective of a progressive, comprehensive cancer center in a large metropolitan city in the southern United States.

Based on the comments made in the first and second rounds of data collection, the researcher determined it was necessary to remind subjects they were defining a new role of advanced practice and should not be influenced by existing entry-level professional

standards. There is the possibility that this may have injected bias into the study.

Summation and Recommendations

The 65 competencies in the CCP define the APRT at MD Anderson and will serve as the foundation in the development of a master of science degree at MD Anderson's School of Health Professions. Future studies may reveal why non-consensus competencies did not meet consensus and how to revise the competencies. A nationwide study should be conducted to determine if the findings of this study apply to other radiation oncology facilities.

Implications for Education

Didactic courses developed as part of APRT curricula should include magnetic resonance (MR) imaging; critical thinking in adjusting protocols to accommodate patients and disease; instructional design; organizational psychology; interprofessional education; research techniques and dissemination of research; leadership practices; advanced decision-making skills to assess the effectiveness of complex treatment plans; dose-volume histograms and isodose selection to targeted tumor volumes; practical skills in image acquisition and evaluation for making critical judgments in treatment delivery; invasive procedures for appropriate clinical scenarios; process improvement; and advanced skills in creating and administering patient safety protocols. Clinical education should include diagnostic MR and patient care techniques taught in the didactic courses. Preparation for national certification in diagnostic MR should be provided across the curriculum.

Implications for Research

The study should be replicated nationally. A suggestion is to use the parameters of

this study for a national survey of radiation therapists. Because of nationwide differences among radiation oncology facilities, all competencies need to be assessed for consensus. For example, a smaller radiation oncology center may identify competencies to include in the CCP that another research institution might not value.

Implications for Practice

The APRT will increase productivity through skill sharing, cost savings related to efficiencies, and improved outcomes, including increased survival rates and patient satisfaction. The radiation therapist could see increased job satisfaction and employment advancement in their career trajectory.

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Appendix A

Medical Imaging and Radiation Therapy Scope of Practice

The scope of practice of the medical imaging and radiation therapy professional includes:

- Administering medications parenterally through new or existing vascular access, enterally or through other appropriate routes as prescribed by a licensed practitioner.
- Administering medications with an infusion pump or power injector as prescribed by a licensed practitioner.
- Applying principles of ALARA to minimize exposure to patient, self and others.
- Applying principles of patient safety during all aspects of patient care.
- Assisting in maintaining medical records, respecting confidentiality and established policy.
- Corroborating a patient's clinical history with procedure and ensuring information is documented and available for use by a licensed practitioner.
- Educating and monitoring students and other health care providers.
- Evaluating images for proper positioning and determining if additional images will improve the procedure or treatment outcome.
- Evaluating images for technical quality and ensuring proper identification is recorded.
- Identifying and responding to emergency situations.
- Identifying, preparing and/or administering medications as prescribed by a licensed practitioner.
- Performing ongoing quality assurance activities.

- Performing venipuncture as prescribed by a licensed practitioner.
- Postprocessing data.
- Preparing patients for procedures.
- Providing education.
- Providing optimal patient care.
- Receiving, relaying and documenting verbal, written and electronic orders in the patient's medical record.
- Receiving, relaying and documenting verbal, written and electronic orders in the patient's medical record.
- Selecting the appropriate protocol and optimizing technical factors while maximizing patient safety.
- Starting, maintaining and/or removing intravenous access as prescribed by a licensed practitioner.
- Verifying archival storage of data.
- Verifying informed consent for applicable procedures.

Radiation Therapy

- Constructing/preparing immobilization, beam directional and beam-modification devices.
- Delivering radiation therapy treatments as prescribed by a radiation oncologist.
- Detecting and reporting significant changes in patients' conditions and determining when to withhold treatment until the radiation oncologist is consulted.
- Monitoring, under the direction of a radiation oncologist, doses to normal tissues

within the irradiated volume to ensure tolerance levels are not exceeded.

- Participating in brachytherapy procedures.
- Performing simulation, localization, treatment planning procedures and dosimetric calculations as prescribed by a radiation oncologist.
- Using imaging technologies for the explicit purpose of simulation, treatment planning and treatment delivery as prescribed by a radiation oncologist.

Appendix B

Practice Standards of the Radiation Therapist

Standard	General	Specific
Standard One – Assessment The medical imaging and radiation therapy professional collects pertinent data about the patient, procedure, equipment and work environment.	Assesses and maintains the integrity of medical supplies. Assesses factors that may affect the procedure, such as medications, patient history, patient preparation or artifact-producing objects. Assesses patient lab values, medication list and risk for allergic reaction(s) prior to procedure and administration of medication. Confirms that equipment performance, maintenance and operation comply with the manufacturer's specifications. Determines that services are performed in a safe environment, minimizing potential hazards. Maintains restricted access to controlled areas. Obtains and reviews relevant previous procedures and information from all available resources and the release of information as needed. Participates in ALARA, patient and personnel safety, risk management and quality management activities. Recognizes signs and symptoms of an emergency. Verifies patient identification and appropriateness of the procedure requested or prescribed.	Assesses the environment for any potential radiation hazards. Assesses the patient's need for information and reassurance. Identifies and/or removes objects that could interfere with prescribed treatment. Inspects ancillary devices prior to use. Monitors and assesses patients throughout the treatment course and follow-up visits. Monitors doses to normal tissues. Monitors side effects and reactions to treatment. Monitors treatment unit operation during use. Recognizes the patient's need for referral to other care providers, such as a social worker, nurse or dietitian. Reviews treatment protocol criteria and assesses conditions affecting treatment delivery. Reviews treatment record prior to treatment or simulation.

	Verifies that the patient has consented to the procedure. Verifies that protocol and procedure manuals include recommended criteria and are reviewed and revised. Verifies the patient's pregnancy status	
Standard Two – Analysis/Determination The medical imaging and radiation therapy professional analyzes the information obtained during the assessment phase and develops an action plan for completing the procedure.	Consults appropriate medical personnel to determine a modified action plan. Determines that all procedural requirements are in place to achieve a quality diagnostic or therapeutic procedure. Determines the appropriate type and dose of contrast media to be administered based on established protocols. Determines the course of action for an emergent situation. Determines the need for and selects supplies, accessory equipment, shielding, positioning and immobilization devices. Employs professional judgment to adapt imaging or therapeutic procedures to improve diagnostic quality or therapeutic outcomes. Evaluates and monitors services, procedures, equipment and the environment to determine if they meet or exceed established guidelines, and revises the action plan. Selects the most appropriate and efficient action plan after	Determines when to contact the radiation oncologist or licensed practitioner regarding patient side effects or questions. Determines when to withhold treatment until a radiation oncologist is contacted. Ensures the appropriate imaging technique is chosen for image-guided radiation therapy procedures. Participates in decisions about appropriate simulation techniques and treatment positions. Reviews doses daily to ensure that treatment does not exceed prescribed dose, normal tissue tolerance or treatment protocol constraints. Reviews patient treatment plan and prescription prior to initial treatment delivery. Reviews patient treatment records prior to each treatment for prescription or treatment procedure changes. Reviews treatment record, calculations and/or treatment plan for accuracy prior to treatment delivery. Reviews verification images

	reviewing all pertinent data and assessing the patient's abilities and condition.	prior to treatment. Verifies the mathematical accuracy of the prescription and the daily treatment summary. Selects appropriate equipment and scanning techniques to optimize the procedure.
Standard Three – Education The medical imaging and radiation therapy professional provides information about the procedure and related health issues according to protocol; informs the patient, public and other health care providers about procedures, equipment and facilities; and acquires and maintains current knowledge in practice.	Advocates for and participates in continuing education related to area of practice, to maintain and enhance clinical competency. Advocates for and participates in vendor specific applications training to maintain clinical competency. Educates the patient, public and other health care providers about procedures and the associated biological effects. Elicits confidence and cooperation from the patient, the public and other health care providers by providing timely communication and effective instruction. Explains effects and potential side effects of medications. Maintains credentials and certification related to practice. Provides an accurate explanation and instructions at an appropriate time and at a level the patient and their care providers can understand; addresses questions and concerns regarding the procedure. Provides information on	Anticipates a patient's need for information and provides it throughout the treatment course. Instructs other health care providers about radiation protection procedures. Instructs patient in the maintenance of treatment markings. Provides information and instruction on proper skin care, diet and self-care procedures.

	certification or accreditation to the patient, other health care providers and the public. Provides information to patients, health care providers, students and the public concerning the role and responsibilities of individuals in the profession. Provides pre-, peri- and post-procedure education. Refers questions about diagnosis, treatment or prognosis to a licensed practitioner.	
Standard Four – Performance The medical imaging and radiation therapy professional performs the action plan and quality assurance activities.	Adheres to radiation safety rules and standards. Administers first aid or provides life support. Applies principles of aseptic technique. Assesses and monitors the patient's physical, emotional and mental status. Consults with medical physicist or engineer in performing and documenting quality assurance tests. Explains to the patient each step of the action plan as it occurs and elicits the cooperation of the patient. Immobilizes patient for procedure. Implements an action plan. Maintains current information on equipment, materials and processes. Modifies the action plan according to changes in the	Achieves precision patient alignment using imaging and external markings. Assists the radiation oncologist in determining the optimum treatment field to cover the target volume. Calculates monitor units and treatment times. Consults with medical physicist and/or engineer in performing and documenting the quality assurance checks. Creates and manages simulation and verification images. Demonstrates safe handling, storage and disposal of brachytherapy sources. Makes the decision to discontinue patient treatment until equipment is operating properly. Monitors the patient visually and aurally during treatment. Monitors the treatment

	clinical situation. Monitors the patient for reactions to medications. Participates in safety and risk management activities. Performs ongoing quality assurance activities and quality control testing. Performs procedural timeout. Positions patient for anatomic area of interest, respecting patient ability and comfort. Uses accessory equipment. Uses an integrated team approach. When appropriate, wears one or more personal radiation monitoring devices at the location indicated on the personal radiation monitoring device or as indicated by the radiation safety officer or designee.	console during treatment. Obtains radiation oncologist's approval of simulation images prior to initiation of treatment. Performs clinically indicated pretreatment imaging. Performs quality assurance checks on simulator, treatment unit and appropriate equipment. Prepares or assists in preparing brachytherapy sources and equipment. Uses knowledge of biological effects of ionizing radiation on tissue to minimize radiation dose to normal tissues. Verifies that only the patient is in the treatment room prior to initiating treatment or any imaging procedures
Standard Five – Evaluation The medical imaging and radiation therapy professional determines whether the goals of the action plan have been achieved, evaluates quality assurance results and establishes an appropriate action plan.	Communicates the revised action plan to appropriate team members. Completes the evaluation process in a timely, accurate and comprehensive manner. Develops a revised action plan to achieve the intended outcome. Evaluates quality assurance results. Evaluates the patient, equipment and procedure to identify variances that might affect the expected outcome. Identifies exceptions to the expected outcome.	Checks treatment calculations and/or treatment plan. Compares verification images to simulation images using anatomical landmarks or fiducial markers. Evaluates the patient daily for any side effects, reactions and therapeutic responses. Performs treatment chart checks. Reviews treatment discrepancies, determines causes and assists with the action plan. Reviews verification images for quality and accuracy.

	Measures the procedure against established policies, protocols and benchmarks. Validates quality assurance testing conditions and results.	Verifies the accuracy of the patient setup prior to treatment delivery. Verifies treatment console readouts and settings prior to initiating treatment and upon termination of treatment.
Standard Six – Implementation The medical imaging and radiation therapy professional implements the revised action plan based on quality assurance results.	Adjusts imaging parameters, patient procedure or additional factors to improve the outcome. Bases the revised plan on the patient's condition and the most appropriate means of achieving the expected outcome. Implements the revised action plan. Notifies the appropriate health care provider when immediate clinical response is necessary, based on procedural findings and patient condition. Obtains assistance to support the quality assurance action plan. Takes action based on patient and procedural variances.	Collaborates with radiation oncologists, medical physicists and medical dosimetrists to compensate for treatment inaccuracies. Establishes congruence between verification images and simulation images, digitally reconstructed radiographs and/or treatment volumes as defined by the radiation oncologist. Formulates recommendations for process improvements to minimize treatment discrepancies. Implements treatment plan or treatment field changes as directed by the radiation oncologist. Reports deviations from the standard or planned treatment.
Standard Seven – Outcomes Measurement The medical imaging and radiation therapy professional reviews and evaluates the outcome of the procedure according to quality assurance standards.	Assesses the patient's physical, emotional and mental status prior to discharge. Determines that actual outcomes are within established criteria. Evaluates the process and recognizes opportunities for future changes. Measures and evaluates the results of the revised action plan.	Monitors patient status during procedures, throughout the treatment course and for follow-up care.

	Reviews all data for completeness and accuracy. Reviews and evaluates quality assurance processes and tools for effectiveness. Reviews the implementation process for accuracy and validity. Uses evidence-based practice to determine whether the actual outcome is within established criteria.	
Standard Eight – Documentation The medical imaging and radiation therapy professional documents information about patient care, procedures and outcomes.	Archives images or data. Documents diagnostic, treatment and patient data in the medical record in a timely, accurate and comprehensive manner. Documents procedural timeout. Documents unintended outcomes or exceptions from the established criteria. Maintains documentation of quality assurance activities, procedures and results. Provides pertinent information to authorized individual(s) involved in the patient's care. Records information used for billing and coding procedures. Reports any out-of-tolerance deviations to the appropriate personnel. Verifies patient consent is documented.	Documents radiation exposure parameters. Maintains imaging and treatment records according to institutional policy. Reports any treatment discrepancies to appropriate personnel.
Standard Nine – Quality The medical imaging and radiation therapy professional strives to	Adheres to standards, policies and established guidelines. Anticipates, considers and responds to the needs of a	Advocates the need for a minimum of two credentialed radiation therapists to be present for any external beam

provide optimal care.	diverse patient population. Applies professional judgment and discretion while performing the procedure. Collaborates with others to elevate the quality of care. Participates in ongoing quality assurance programs.	patient treatment.
Standard Ten – Self-Assessment The medical imaging and radiation therapy professional evaluates personal performance.	Assesses personal work ethics, behaviors and attitudes. Evaluates performance, applies personal strengths and recognizes opportunities for educational growth and improvement.	
Standard Eleven – Collaboration and Collegiality The medical imaging and radiation therapy professional promotes a positive and collaborative practice atmosphere with other members of the health care team.	Develops and maintains collaborative partnerships to enhance quality and efficiency. Informs and instructs others about radiation safety. Promotes understanding of the profession. Shares knowledge and expertise with others.	
Standard Twelve – Ethics The medical imaging and radiation therapy professional adheres to the profession's accepted ethical standards.	Accepts accountability for decisions made and actions taken. Acts as a patient advocate. Adheres to the established ethical standards of recognized certifying agencies. Adheres to the established practice standards of the profession. Delivers patient care and service free from bias or discrimination. Provides health care services	

	with consideration for a diverse patient population. Respects the patient's right to privacy and confidentiality.	
Standard Thirteen – Research, Innovation and Professional Advocacy The medical imaging and radiation therapy professional participates in the acquisition and dissemination of knowledge and the advancement of the profession.	Adopts new best practices. Investigates innovative methods for application in practice. Monitors changes to federal and state law, regulations and accreditation standards affecting area(s) of practice. Participates in data collection. Participates in professional advocacy efforts. Participates in professional societies and organizations. Pursues lifelong learning. Reads and evaluates research relevant to the profession. Shares information through publication, presentation and collaboration.	

Appendix C

ARRT Content Specifications

EXAMINATION CONTENT SPECIFICATIONS

ARRT BOARD APPROVED: **JANUARY 2021**
IMPLEMENTATION DATE: **JANUARY 1, 2022**

Radiation Therapy

The purpose of the *radiation therapy exam* is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the staff technologist at entry into the profession. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of radiation therapists.[1] An advisory committee then determined the knowledge and cognitive skills needed to perform the tasks on the task inventory and these are organized into the content categories within this document. Every content category can be linked to one or more tasks on the task inventory. The document is used to develop the examination. The *Task Inventory for Radiation Therapy* may be found on the ARRT's website (www.arrt.org).

The ARRT avoids content when there are multiple resources with conflicting perspectives. Educational programs accredited by a mechanism acceptable to ARRT offer education and experience beyond the minimum requirements specified in the content specifications and clinical competency documents.

This document is not intended to serve as a curriculum guide. Although ARRT programs for certification and registration and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address the subject matter that is included in these content specifications, but do not limit themselves to only this content.

The table below presents the major content categories and subcategories covered on the examination. The number of test questions in each category are listed in bold and number of test questions in each subcategory in parentheses. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

Content Category	Number of Scored Questions[2]
Patient Care	**46**
Patient Interactions and Management (29)	
Patient and Medical Record Management (17)	
Safety	**51**
Radiation Physics and Radiobiology (21)	
Radiation Protection[3], Equipment Operation, and Quality Assurance (30)	
Procedures	**103**
Treatment Sites and Tumors (26)	
Treatment Volume Localization (18)	
Prescription and Dose Calculation (24)	
Treatments (35)	
Total	**200**

[1] A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.
[2] The exam includes an additional 30 unscored (pilot) questions.
[3] SI units are the primary (principal) units of radiation measurement used on the radiation therapy examination.

Patient Care

1. Patient Interactions and Management

A. Ethical and Legal Aspects
   1. patients' rights
      a. consent (*e.g., informed, oral, implied)
      b. confidentiality (HIPAA)
      c. American Hospital Association (AHA) Patient Care Partnership (Patients' Bill of Rights)
         1. privacy
         2. extent of care (e.g., DNR)
         3. access to information
         4. living will, health care proxy, advanced directives
         5. research participation
         6. goal of care (e.g., definitive, palliative)
   2. legal issues
      a. verification (e.g., patient identification, treatment site, prescription)
      b. common terminology (e.g., battery, negligence, malpractice, beneficence)
      c. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
      d. restraints versus immobilization (e.g., positioning aids used to prevent motion)
   3. ARRT Standards of Ethics

B. Interpersonal Communication
   1. modes of communication
      a. verbal/written
      b. nonverbal (e.g., eye contact, touching)
   2. challenges in communication
      a. interactions with others
         1. language barriers
         2. cultural and social factors
         3. physical, sensory, or cognitive impairments
         4. age
         5. emotional status, acceptance of condition (e.g., stage of grief)
      b. explanation of medical terms
      c. strategies to improve understanding
   3. patient education
      a. explanation of treatment or procedure (e.g., purpose, length of time, radiation dose)
      b. pre- and post-treatment or procedure instructions (e.g., preparation, diet, and medications)
      c. respond to inquiries about other imaging modalities (e.g., dose differences, types of radiation, patient preparation)
      d. treatment compliance (e.g., positioning, skin marks)
   4. support services
      a. hospice
      b. other professionals (e.g., dietitian, clergy, social services)

C. Ergonomics and Monitoring
   1. body mechanics (e.g., balance, alignment, movement)
      a. patient transfer techniques
      b. ergonomic devices (e.g., transfer board, Hoyer lift, gait belt)
   2. assisting patients with medical equipment
      a. infusion catheters and pumps
      b. oxygen delivery systems
      c. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)
   3. patient monitoring and documentation
      a. vital signs
      b. signs and symptoms (e.g., motor control, cognitive changes)
      c. fall prevention
      d. weight

D. Medical Emergencies
   1. non-contrast allergic reactions (e.g., latex)
   2. cardiac/respiratory arrest (e.g., CPR, AED)
   3. physical injury or trauma
   4. other medical disorders (e.g., seizures, diabetic reactions)

*The abbreviation "e.g.," is used to indicate that examples are listed in parentheses, but that it is not a complete list of all possibilities.

(Patient Care continues on the following page.)

Patient Care (continued)

E. Infection Control
   1. chain of infection (cycle of infection)
      a. pathogen
      b. reservoir
      c. portal of exit
      d. mode of transmission
         1. direct
            a. droplet
            b. direct contact
         2. indirect
            a. airborne
            b. vehicle borne (fomite)
            c. vector borne (mechanical or biological)
      e. portal of entry
      f. susceptible host
   2. asepsis
      a. equipment disinfection
      b. equipment sterilization
      c. medical aseptic technique
      d. sterile technique
   3. CDC Standard Precautions
      a. hand hygiene
      b. use of personal protective equipment (e.g., gloves, gowns, masks)
      c. safe handling of contaminated equipment/surfaces
      d. disposal of contaminated materials
         1. linens
         2. needles
         3. patient supplies
         4. blood and body fluids
      e. safe needle practices
   4. transmission-based precautions
      a. contact
      b. droplet
      c. airborne
   5. additional precautions
      a. neutropenic precautions (reverse isolation)
      b. healthcare-associated (nosocomial) infections

F. Handling and Disposal of Toxic or Hazardous Material
   1. types of materials
      a. chemicals
      b. chemotherapy
      c. metals (e.g., block alloy)
   2. safety data sheet (e.g., material safety data sheet)

G. Pharmacology
   1. contrast media types and properties (e.g., iodinated, water soluble, barium, ionic versus non-ionic)
   2. appropriateness of contrast media to procedure
      a. patient condition
      b. patient age and weight
      c. laboratory values (e.g., BUN, creatinine, eGFR)
   3. complications/reactions
      a. local effects (e.g., extravasation/infiltration, phlebitis)
      b. systemic effects
         1. mild
         2. moderate
         3. severe
      c. emergency medications
      d. radiation therapist's response and documentation

(Patient Care continues on the following page.)

Patient Care (continued)

2. Patient and Medical Record Management

A. Evaluation
   1. epidemiology and etiology
      a. cancer risk factors
      b. prevalence and incidence
   2. cancer screening
   3. signs and symptoms
   4. history and physical examination
   5. imaging studies (e.g., CT, MRI, PET/CT)
   6. other diagnostic studies
      a. lab results
      b. surgical reports
      c. pathology reports

B. Assessment
   1. treatment side effects
      a. signs and symptoms
      b. causes
      c. management
   2. blood studies
      a. types of studies (e.g., CBC, BUN, PSA)
      b. factors affecting blood values
   3. dietary counseling
      a. common problems
      b. causes
      c. dietary management

C. Documentation
   1. information included in treatment record
      a. prescription
      b. monitor units
      c. target dose (daily and accumulated)
      d. energy and type of radiation
      e. date
      f. time of day for b.i.d. treatment
      g. fraction
      h. elapsed days
      i. field number and description
      j. doses to other regions of interest
      k. set-up instructions
      l. imaging orders
   2. elements of record keeping
      a. patient identification
      b. accountability (e.g., signatures)
      c. accuracy and legibility
      d. variance from prescription (errors, prescription changes)
      e. medical events (definition and required documentation)
   3. basic charge capture terminology [1]
      a. professional and technical components
      b. general principles and purpose (e.g., billable services, procedures, and devices)

[1] Specific CPT® codes are not covered.

Safety

1. Radiation Physics and Radiobiology

A. Sources of Radiation
   1. radioactive material
   2. machine-produced radiation
      a. target interactions (i.e., bremsstrahlung, characteristic)
      b. particles (e.g., protons)

B. Principles of Radiation Physics
   1. wave characteristics
   2. attenuation
   3. inverse-square law
   4. x-ray beam quality
   5. interactions with matter
      a. photon interactions (e.g., Compton, photoelectric effect, pair production)
      b. electron interactions
      c. particle interactions (e.g., proton, neutron)
      d. attenuation by various tissues

C. Biological Effects of Radiation
   1. Units of measurement (NCRP #160)
      a. absorbed dose (Gy)
      b. dose equivalent (Sv, rem)
      c. exposure (C/kg)
      d. effective dose (Sv, rem)
      e. air kerma (Gy)
   2. radiosensitivity
      a. dose-response relationships
      b. relative tissue radiosensitivities (e.g., LET, RBE)
      c. oxygen effect
   3. somatic effects
      a. cells
      b. tissue (e.g., hemopoietic, skin, reproductive organs)
      c. embryo and fetus
      d. carcinogenesis
      e. early versus late or acute versus chronic
      f. deterministic versus stochastic
      g. short-term versus long-term exposure
      h. acute radiation syndromes
         1. hemopoietic
         2. gastrointestinal (GI)
         3. central nervous system (CNS)
   4. genetic effects (e.g., genetically significant dose)

D. Radiation Tissue Tolerance
   1. tolerance levels (i.e., whole organ $TD_{5/5}$)
   2. adverse effects
   3. dose to critical structures
   4. radiobiological factors (e.g., dose, fractionation schemes, volume)
   5. biological factors (e.g., age, anatomic variation, medical conditions)
   6. medical factors (e.g., prior surgery, pacemakers)
   7. other factors (e.g., radiosensitizers, radioprotectors)
   8. contribution from other sources
      a. chemotherapy
      b. brachytherapy [2]
      c. other fields (e.g., prior or abutting)
      d. radiation effect modifiers
      e. daily imaging
      f. CT simulation

[2] Only basic concepts related to common uses of brachytherapy are covered, including dose to surrounding tissue and radiation protection issues. Specific procedures and isotope characteristics are not covered.

(Safety continues on the following page.)

Safety (continued)

2. Radiation Protection, Equipment Operation, and Quality Assurance

A. Minimizing Patient Exposure
   1. exposure factors
      a. kVp
      b. mAs
   2. shielding
      a. rationale for use
      b. types
      c. placement
   3. collimation/beam width
   4. patient considerations
      a. positioning
      b. communication
      c. pediatric
      d. morbid obesity

B. Personnel Protection (ALARA)
   1. sources of radiation exposure
   2. basic methods of protection (i.e., time, distance, shielding)
   3. personnel monitoring (NCRP recommendations for personnel monitoring, Report #116)
      a. occupational exposure
      b. public exposure
      c. embryo/fetus exposure
      d. dose equivalent limits
      e. evaluation and maintenance of personnel dosimetry records

C. Facilities and Area Monitoring
   1. NRC regulations (10 CFR, parts 20 and 35)
      a. classification of areas (restricted, controlled, unrestricted)
      b. required postings (signs)
      c. area monitoring devices
   2. barrier requirements
      a. primary
      b. secondary

D. MRI Magnetic Field Screening
   1. biomedical implants
   2. ferrous foreign bodies
   3. medical conditions (e.g., pregnancy)
   4. prior diagnostic or surgical procedures
   5. topical or externally applied items (e.g., tattoos, medication patches, body piercing jewelry, monitoring devices, clothing)
   6. ancillary equipment (e.g., oxygen tank, IV pole)

E. Handling and Disposal of Radioactive Materials

F. Components and Operation
   1. linear accelerator
   2. CT simulator

G. Instrumentation
   1. ionization chamber
   2. Geiger-Müller detector
   3. TLD/OSL (optically stimulated luminescence)
   4. diodes
   5. neutron detectors

(Safety continues on the following page.)

Safety (continued)

H. Quality Control Procedures
   1. warm-up and inspection of linear accelerators
      a. interlock systems
      b. safety lights
      c. emergency switches
      d. laser alignment
      e. critical machine parameters (e.g., pressure, temperature)
      f. electrical and mechanical hazards
      g. imaging systems
      h. audio/visual systems
   2. warm-up and inspection of CT simulators
      a. safety lights
      b. emergency switches
      c. laser alignment
      d. QC water phantom (e.g., CT number, noise)
      e. tube warm-up
   3. radiation output verification
      a. methods
      b. frequency
      c. effect of environment (e.g., humidity) on measurements
   4. light and treatment field checks
      a. light and radiation field agreement
      b. collimator indicator agreement
      c. multileaf collimator performance
      d. sidelight/laser accuracy check (isocenter)
   5. rotation check
      a. safety procedures
      b. operation of gantry/console
   6. evaluation of quality assurance results
      a. interpretation
      b. course of action
      c. documentation

Procedures

1. Treatment Sites and Tumors

A. Anatomy, Pathophysiology, Lymphatic Drainage, and Metastatic Patterns
   1. brain and spinal cord
   2. head and neck (including thyroid and salivary glands)
   3. breast
   4. lung
   5. abdomen, pelvis, GI, and GU
      a. esophagus, stomach, small bowel, large bowel, rectum, and anus
      b. pancreas, adrenals, liver, and gallbladder
      c. ureters, kidneys, bladder, and urethra
   6. reproductive
      a. prostate, testes, penis
      b. endometrium, cervix, ovaries, uterus, vagina, and vulva
   7. skeletal
   8. miscellaneous
      a. lymphoma (Hodgkin and non-Hodgkin)
      b. sarcomas (bone and soft tissue)
      c. multiple myeloma
      d. skin
      e. leukemia
      f. mycosis fungoides
      g. bone marrow transplant
      h. benign (e.g., heterotopic bone, keloid, AVM, meningioma)
      i. oncologic emergencies (e.g., whole brain, SVC, cord compression)

B. Tumor Classification
   1. histopathologic types (e.g., benign, sarcomas, carcinomas)
   2. histopathologic grade
      a. purpose (differentiation and growth rate)
      b. grading system (e.g., GX, G1-G4)
   3. staging (basic concepts; not specific sites)
      a. purpose
      b. systems (e.g., TNM, Ann Arbor)

2. Treatment Volume Localization

A. Treatment Techniques and Anatomic Relationships
   1. radiation therapy techniques
   2. sectional and topographic anatomy
   3. critical organs
   4. patient positioning and immobilization
   5. types and uses of contrast media

B. CT Simulation
   1. CT image acquisition (e.g., mA, slice thickness)
   2. CT image processing and display (e.g., reconstruction, window level, field of view, CT number)
   3. contour volume and isocenter determination
   4. image transmission, storage, and retrieval
   5. programmable lasers

C. Documentation and Verification of Simulation Procedure
   1. implement according to physician order
   2. anatomic position
   3. equipment orientation
   4. accessory equipment
   5. field parameters
   6. set-up instructions
   7. set-up photographs
   8. temporary and/or permanent reference marks

(Procedures continues on the following page.)

Procedures (continued)

3. Prescription and Dose Calculation

A. Treatment Prescription
   1. total target dose
   2. fractionation schedules
   3. beam energy
   4. types of radiation
   5. treatment volume (e.g., GTV, CTV, PTV)
   6. number of fields
   7. fixed/rotational fields
   8. field weighting
   9. field orientation
   10. treatment unit capabilities and limitations
   11. plan modifications
   12. beam modifiers

B. Geometric Parameters and Patient Measurements
   1. field size and shape
   2. target depth
   3. patient thickness
   4. SSD (TSD) and SAD (TAD)
   5. collimator setting
   6. abutting fields (e.g., gap calculations)
   7. fusion with outside diagnostic studies

C. Dose Calculation and Verification
   1. selection of energy
   2. equivalent square (open and blocked field)
   3. scatter factors (e.g., collimator, phantom)
   4. depth of maximum equilibrium (d_{max})
   5. percentage depth dose
   6. TAR, TMR
   7. SSD (TSD), SAD (TAD)
   8. inverse square
   9. extended distance factors
   10. wedges (e.g., wedge angle or factor)
   11. off-axis calculation
   12. isodose curve characteristics (e.g., penumbra, DVH)
   13. factors for beam modifiers (e.g., tray factor, bolus, compensator)
   14. inhomogeneity correction factors
   15. machine output data
   16. verification and documentation

4. Treatments

A. Treatment Options (indications, benefits, risks)
   1. chemotherapy
   2. surgery
   3. radiation therapy
      a. external beam (e.g., photon, electron)
      b. brachytherapy [2]
   4. multimodality treatment

B. Verification and Application of the Treatment Plan
   1. patient position
   2. isocenter location and shifts
   3. treatment parameters (e.g., beam orientation, energy)
   4. prescription
   5. techniques
      a. 2D
      b. 3D
      c. non-volumetric arc therapy
      d. 4D (e.g., respiratory gating)
      e. IMRT
      f. volumetric arc therapy
      g. stereotactic
   6. imaging procedures
      a. kV imaging
      b. cone beam CT (CBCT)
      c. MV imaging

[2] Only basic concepts related to common uses of brachytherapy are covered, including dose to surrounding tissue and radiation protection issues. Specific procedures and isotope characteristics are not covered.

(Procedures continues on the following page.)

Procedures (continued)

C. Treatment Machine Set-Up
   1. auxiliary set-up devices
      a. couch indexing
      b. positioning aids
      c. alignment lasers
      d. motion management
         1. surface guided radiation therapy (SGRT)
         2. gating systems
         3. abdominal compression
   2. machine operations
      a. collimator or cone settings
      b. optical or mechanical distance indicator
      c. gantry angle
      d. collimator angle
      e. field light
      f. treatment couch
      g. six degrees of freedom couch
      h. console controls
      i. pendant controls
   3. parameters
      a. SSD (TSD), SAD (TAD), depth
      b. gantry, collimator, and field size settings
      c. beam energy and type

D. Treatment Accessories
   1. beam modifiers
      a. compensating filters
      b. shielding
      c. blocks (e.g., thickness, half value layer (HVL), half-value thickness (HVT))
      d. multileaf collimation
      e. bolus
      f. wedges (enhanced dynamic wedge, physical wedge)
   2. immobilization devices
      a. custom
      b. standard

E. Treatment Administration
   1. patient monitoring
      a. visual
      b. audio
      c. back-up systems
      d. monitoring regulations
      e. emergency situations
   2. record and verify systems
   3. image acquisition and registration
   4. site verification
   5. dose verification (e.g., diodes)
   6. equipment malfunctions
      a. types (e.g., radiation, electrical, mechanical, software)
      b. troubleshooting and correction
      c. documentation and reporting

Appendix D

APRT Scopes of Practice in Other Countries

Advanced Practice in Medical Radiation Technology

A Canadian Framework

CAMRT ACTRM
SCIENTIA ET MORES
Canadian Association of Medical Radiation Technologists
Association canadienne des technologues en radiation médicale

Recommended citation

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Table of Contents

Introduction

As the healthcare system evolves to meet the changing needs of the Canadian public, significant shifts are taking place in the way patient care is delivered. One of the more notable evolutions is the redistribution of traditional roles amongst healthcare professionals, specifically the rise of advanced practice.

Advanced practice has been tested and embraced in many countries, including Canada. Advanced medical radiation technology (MRT) practice in particular has grown to the point of formal recognition around the world; however, in Canada it is still in its infancy. Although the scope of Canadian medical radiation technology practice has extended over the years, with many instances of individuals performing tasks that extend beyond the principal expectations of practice, what distinguishes Canada from other countries is the lack of a formal definition for advanced MRT practice and, hence, the lack of formal recognition for those practicing in an advanced capacity.

The Canadian Association of Medical Radiation Technologists (CAMRT) firmly believes that there is a place for advanced MRT practice in Canada. The CAMRT has been working towards the development of advanced MRT practice for years. From discussions beginning more than a decade ago, the CAMRT has continued to collaborate with its provincial partner organizations towards this goal, with the support of the Canadian Association of Radiologists (CAR), the Canadian Association of Radiation Oncologists (CARO) and other groups. This Advanced Practice Framework initiative is the culmination of these efforts. It was launched with a broad-based multidisciplinary symposium in November 2010, which established a consensus working definition for advanced MRT practice. Since that time, an Advanced Practice Working Group, made up of a national panel of experts, has been working to hone that definition and elaborate on a vision for advanced MRT practice in Canada.

The goal of this framework is to consolidate support for the forays already underway and establish a common understanding of "advanced practice" as it relates to MRT professions within the Canadian healthcare system. In its exploration of advanced practice experiences in other countries and other healthcare professions, it is hoped that the framework will extend a vision of advanced MRT practice and help Canadian MRTs to begin building the advanced practice roles of the future. The structure it provides should help those interested in advanced MRT practice across the country find a common language and a conceptual frame to advance discussions at the institutional, educational and/or governmental levels.

The document itself is expected to evolve with developments in the field. Beginning as a discussion of high-level concepts (drawing on examples from outside Canada and the MRT profession) it is expected that once advanced MRT practice in Canada becomes widespread, concrete examples will be incorporated and reflected in an evolving definition. In addition, every attempt has been made to maintain a level of discourse that can be applied to every Canadian centre with minimal need for adaptation. As more provinces move to investigate and develop advanced MRT practice, this aspect of the document will need to be updated as well.

Feedback on the framework and its concepts is appreciated and can be directed to **ctopham@camrt.ca**.

Evolution of advanced MRT practice

Although healthcare providers have been practicing at varying levels for centuries, the beginnings of formal advanced practice came about in the 1960s.[1] Physician shortages, together with increased demand for affordable, quality primary healthcare, prompted an examination of new models for the delivery of patient care, and eventually the genesis of the advanced practice nurse in the United States.[2] Not long afterwards, the same changes were occurring in Canada and around the world.[3]

In the 1970s, workforce shortages, growing workloads, and increasing complexity of procedures led radiologists and MRTs (radiographers) in the United Kingdom to find new ways of working together in diagnostic imaging.[4,5] Eventually this led to the Red Dot initiative, a system where MRTs flag abnormal results for the attention of radiologists (using Red Dots) in their image review and reporting. Following extensive experience and study over many years in clinical settings, the Royal College of Radiologists (RCR) and the Society and College of Radiographers (SOR) released a combined statement formally recognizing and supporting the practice of Red Dot.[6]

Legitimacy for this new level of collaboration between the MRT and radiologist professions provided the groundwork for moving forward. Eventually, the system that is present in the UK today emerged—a system that spans four tiers with advanced and consultant practice roles at the top tier where many advanced activities are performed.[7] Today, reports show that more than half of UK hospitals employ radiographers in these advanced tiers to report on radiographic images.[4,8] Furthermore, there is widespread acceptance for their performance of invasive procedures, a variety of diagnostic exams, ultrasound reporting, and reporting on a number of plain film exams of the skeletal system.[4,8]

A similar set of circumstances in the United States also produced an advanced practice stream for medical radiation technology. 2001 saw the creation of the radiologist assistant role through a collaboration of the American College of Radiologists (ACR) and the American Society of Radiologic Technologists (ASRT).[9] Since its inception, this role has evolved, with radiologist assistants now working in many clinical settings. This role has also led to the creation of educational programs.

Other parts of the world are investigating the possibility of advanced MRT practice as well.[10] The Australian Institute of Radiography's (AIR) Advanced Practice Advisory Panel was assembled to implement recent recommendations and move advanced MRT practice forward in Australia.[11] Meanwhile, the Australian government has allocated funds to the Department of Medical Imaging and Radiation Sciences at Monash University for the development of a national

education program for postgraduate radiation therapists to become advanced practitioners as part of a pilot study for the role.[12] Both Australia and New Zealand have also put effort into investigating the merits of advanced practice in radiography, and have put out position statements on their findings.[13,14]

Many in Canada have also participated in the investigation of advanced MRT practices as well. Facility-led efforts have led to roles with extended, expanded and enhanced practices, but for the most part these efforts have been contained to their sites of origin. Provincially-led mandates have also led to establishment of educational programs for the performance of skills and duties beyond traditional scope— these too are generally considered to reflect extensions or enhancements of Canadian MRT practice.

Most recently, there has been notable progress on advanced practice in the province of Ontario, where there is now formal recognition for advanced practice radiation therapists working with Cancer Care Ontario (CCO).[15] A pilot study, which began in 2004 with a feasibility study, has become a success story for advanced practice in Canada. Data collected from the initiative showed that the advanced practice radiation therapist roles enhanced patient care by improving access to radiation therapy treatments, improving patient satisfaction. It also demonstrated wide acceptance of the advanced practice role.[15] Based on this success, the government of Ontario and CCO have committed to expanding the project and allocating financial resources for new positions.

The many lessons from the experiences of these and other examples of advanced practice development and implementation have been studied and used to help shape the CAMRT's position. Examples of advanced roles in the MRT and other professions are used throughout to substantiate the positions taken.

Benefits of advanced practice

The goal of successful and efficient healthcare systems is to deliver safe, effective and efficient care to patients. Challenges and opportunities that arise over time lead healthcare systems to evolve by finding new and innovative ways to deliver the best care. Healthcare decision-makers through the years have been prompted to explore new and non-traditional models of offering care to make the same systems more efficient and ensure patients receive the care they expect and desire.

Advanced practice in the healthcare professions grew out of such an evolution and has taken hold and grown in multiple milieus because of the many direct benefits it has been shown to offer patients and healthcare systems. Realization of these benefits has whet the appetite for innovative care models to improve care and services, and therefore the propagation of advanced practice, across traditional professional boundaries.

The most successful examples of advanced practice are those that emerged from real patient need and are sustained by providing tangible patient benefits. Examples from the literature show how advanced practice can improve patient care in a variety of ways. The primary mechanisms for progress have come through improvements in access to care, and enhancements to the quality of care. These in turn have led to secondary benefits in patient cost containment and system innovation that have cemented the case for advanced practice solutions.

Access to care

Experience with advanced practice shows that one of the foremost ways it can impact patient care is by improving access to care. In many examples of success, advanced practitioners function as a new intermediate tier of professionals, collaborating to alleviate workloads and wait times by focusing on tasks that relieve a backlog for the system.

Access to care has been improved by the introduction of advanced practitioners in different professions.[16-18] Studies of advanced practice from nursing,[16] midwifery,[17] and physiotherapy[18] all show that patient wait times are reduced with the introduction of advanced practice roles. In addition, improved teamwork and team climate have been shown to be associated with better continuity of care, access to care, flow of patients, and patient satisfaction.[19,20]

This is corroborated by research on advanced practice in the MRT professions. Studies of advanced radiographer practice from the UK demonstrated that radiologists could report substantially greater numbers of diagnostic images when other procedures (e.g., barium enemas) were performed by non-radiologist professionals. Ultimately, patient access to radiology services is enhanced with the increase in imaging procedures and reporting.[21] The findings of the initial phase of the Clinical Specialist Radiation Therapist Initiative in Ontario revealed that the advanced practice therapists can improve the efficiency of the system by improving patient wait times across the patient care pathway, increasing patient throughput and facilitating time efficiencies for team members.[22]

Quality of care

Quality of care in healthcare can be measured in many different ways. To date, the majority of studies looking at quality of care in advanced MRT practice settings have focused on the quality provided by advanced practitioners compared to those who have traditionally performed the same tasks. The contention of critics of advanced MRT practice was that despite gains in radiologist time, quality would be lost if MRTs took on radiologist roles like review, reporting and specialized procedures. In fact, studies show that quality is maintained, not compromised.[5,23-26]

Furthermore, broad meta-analyses of the UK Red Dot reporting system show that there is a strong correlation between MRT Red Dot results and radiologist reports. The benefit of the "double read" (when MRT observations are reported and viewed in conjunction with radiologist interpretations), is actually greater continuity of appropriate patient care.[5,23] Studies of double-contrast barium enemas show similar results, demonstrating that MRTs maintained the high accuracy and sensitivity for diagnosis that radiologists provide in the same role.[24-26]

A report from the Canadian Institute of Health Information (CIHI) refers to the emergence of radiologist assistants in the US, which has provided radiologists with more time and opportunity to focus on complex radiological procedures.[21,27]

In addition, the effects of reducing patient wait-times for assessment, improving timeliness of image review, and identifying the need for intervention earlier, all enhance patient management and care.[4,28,29] Studies addressing these and other aspects of quality of care show that areas where advanced practitioners are deployed demonstrate improvements.[4,22,28,29]

Patient satisfaction

Patient satisfaction is linked to quality and to expectation about the care received. In countries like Canada, with publicly-funded universal healthcare, there is an expectation of good quality, accessible care when patients need to call upon the system.[30] As such, improvements to access and quality of care are tied to overall patient satisfaction.[31]

Studies of advanced practice have generally been consistent in showing that the introduction of advanced practice roles into healthcare pathways has led to increased patient satisfaction.[16,17,19,20,32,33] This includes the Clinical Specialist Radiation Therapist (CSRT) initiative, where patients reported high levels of satisfaction with the care received from the advanced practitioners, equal to or in excess of satisfaction reported for other healthcare service providers.[22]

System innovation

Another outcome of advanced practice has been better efficiency for the healthcare system and the ability to deliver the same care at a lower cost. [34,35] Containing cost and maintaining an efficient system in response to evolving demands may not be the direct concern of those wishing to develop advanced practice positions across Canada, but it is a real-world consideration that relates directly to access, quality of care and ultimately patient satisfaction in a public-funded healthcare system.

Many studies have been undertaken to investigate this aspect of advanced practice, but as yet few, if any, offer definitive proof one way or the other. Though it has been difficult to prove through research studies to date, it is still believed advanced practice roles can offer an important option for system innovation overall because of the potential to provide cost savings to the system.[36] As advanced practice is further developed and integrated, it is suggested that more efficient systems will arise, within which cost savings are expected to be achieved over time.[36]

Definition of advanced practice

Advanced practice in Medical Radiation Technology is defined as a higher level of practice wherein clinical responsibilities routinely exceed the current principal expectations of practice. Advanced practice roles require analytical skills to synthesize evidence-based knowledge to autonomously work towards optimal patient outcomes.

The Advanced Practice MRT is able to practice in these roles due to their advanced clinical and theoretical knowledge, skill and judgment acquired through a relevant graduate level education program or equivalent.

Research has shown clarity in terminology and definitions is important in overcoming the confusion and hesitation that emerge when people are faced with decisions about advanced practice. For the purposes of defining the difficult concept of advanced practice, a rigorous approach was taken. The above definition was reached through the participation of a broad panel of MRTs and other professionals from across Canada, and it serves now as a natural starting point for a description of advanced practice for MRTs in Canada. The descriptions that follow in the subsequent sections have been developed to help to put the short definition into the context of MRT practice in Canada.

Principles of advanced practice

To extend the definition and differentiate advanced practice from other forms of practice, we have identified and elaborated on the key principles that define advanced practice roles. These are principles that recur throughout the literature concerning advanced practice,[35-37] representing distinct elements that set advanced practice apart from entry-level, expanded or extended practice.[37-39]

Though the principles are described below as individual and distinct concepts, they are interrelated and complementary. It is the weaving together of all these principles that would elevate a role to the "higher level" we describe, and set advanced practice apart from entry-level, expanded or extended practice.

Improving patient outcomes

The purpose of advanced practice is to improve outcomes for patients, whether through enhanced access, quality of care or satisfaction with the care received. This principle is central to advanced practice and its successful uptake and implementation in any profession. Indeed, the most successful examples of role development, implementation and sustained uptake have come from instances where advanced practice roles enhance the previous multidisciplinary model of care to address patient needs, fill existing gaps, enhance care, or improve outcomes for patients as they navigate the system.

Critical thinking

Critical thinking is a core element of any advanced role. It can be divided into two very important components:[40]

1. A set of information—and belief-generating and processing skills; and
2. The predisposition, based on intellectual commitment, of using those skills to guide behaviour

The first component encompasses elements of critical thinking: interpretation, analysis, synthesis, evaluation, inference and reflection. These cognitive abilities are all important for the advanced practitioner as they allow the practitioner to explore and analyze evidence and

situations in clinical practice to enable a high level of judgment and decision making. The first component of critical thinking is strongly referenced in the definition laid out in this framework—it describes the synthesis of knowledge through skills of analysis and cites advanced clinical and theoretical knowledge, skill and judgment.[41]

The second component is often overlooked, but is essential to our definition of critical thinking in the context of advanced practice. The predisposition that the literature speaks of is the intellectual rigour that guides a professional to put these skills through incorporation of analysis and synthesis of multiple sources of information as well as a deliberate, structured and reflective use of in-depth knowledge, research and expertise in decision making. Whereas all professionals are capable of critical thinking, it is the requirement of rigorous adherence to these practices that makes advanced roles advanced in this regard.

Complex decision making

Complex decision making is characterized by the need to integrate information from a variety of sources and to balance different priorities. It requires healthcare professionals to view problems from different perspectives, considering all possible outcomes and to address incomplete information and ambiguity.

The greater the complexity of the decision, the greater the responsibility bestowed, as the patient entrusts their care and safety to the care provider in the decision-making role. With the ability to tackle increasingly complex clinical decisions, the advanced practice MRT will be able to take responsibility for directions in patient management and enhance the patient-centred experience.[41]

The ability to make decisions about increasingly complex scenarios is both a key enabler and a key requirement for advanced practice. It allows practitioners to truly advance the scope of their responsibilities and function with increased levels of autonomy. Like critical thinking, complex decision making is a principle that is common to most, if not all, examples of advanced practice across the healthcare professions.

Autonomy of role

Advanced practice roles are characterized by an increased level of autonomy, defined by a broader set of responsibilities within the workings of the interdisciplinary team. The increased autonomy of role, with a greater independent contribution to the multidisciplinary care of the patient is a key feature of these roles.

Autonomy is closely tied to education and training, and the critical thinking skills those help develop. With expanded knowledge, skills and judgment a professional is equipped to take on increasingly complex tasks and ready to accept greater accountability for actions together with greater responsibility in patient care. Formal recognition of these new capabilities (in the form of medical directives, new regulation and/or legislation) follows with the creation of roles that allow practitioners the opportunity to work at an advanced level within the care delivery model.

Autonomy is also of critical importance to the acceptance of advanced roles and lays the groundwork for successful implementation of roles that can be sustained. It has been a big factor in the expansion of advanced practice in other professions like nursing, because it has allowed new models of care to develop where activities, once the exclusive domain of physicians, could be shared with a new group to achieve greater efficiency. It is also an enabler for clinical leadership and is identified as one of the core dimensions of job enrichment.[42,43]

Leadership

Leadership is a fundamental principle of advanced practice in nearly all professions in which it has been implemented. Through leadership activities, such as research, mentoring, education and advocacy, the spirit of advancement is extended beyond the clinical realm to the advanced practice MRTs themselves. In this way, the positive changes that result from advanced practices are extended to the broader healthcare team.

Advanced roles in practice

The definition and principles described in the previous sections provide a theoretical foundation for advanced practice roles. In practice, these principles can take on many forms as they are translated into real-world activities and roles. Below, a discussion on the more practical elements of the definition of advanced practice is presented.

Based on MRT practice

With all the focus on what makes a role "advanced", it is important to remember that advanced MRT practice comes from MRT practice. Advanced MRT roles of the future will be clearly identifiable as MRT roles, with evolution from MRT practice of today. Advanced MRTs will still be part of the larger MRT profession, working under the same basic Code of Ethics and professional expectations, and will be governed and regulated by the provincial laws and regulations that govern all MRT practice. The basis in the MRT profession extends to individuals aspiring to these roles—all of whom will be expected to hold certification in one of the four MRT disciplines and experience working as MRTs in the field.

Higher level of practice

In Canada, there have already been numerous forays beyond scope of practice under different headings. Some of these practices have been recognized as being extended or enhanced, whereas others were deemed to form part of the natural evolution of MRT practice. With little agreement on the meaning of these terms, new terminology was chosen to form the basis for common understanding moving forward.

As we state in our definition: Advanced Practice in Medical Radiation Technology is defined as a "higher level of practice". These words "level of practice" were carefully chosen to set a new vision for advanced MRT roles in the future.

To elevate advanced roles to the higher level envisioned will require careful planning. These higher-level roles will need to be built around activities that not only exceed the principle expectations of MRT practice in Canada, but also incorporate the principles of advanced practice, such as critical thinking and complex decision making, in a fundamental way.

Although there is no prescription as to how many advanced activities would elevate a role to this higher level, experience with other advanced roles in healthcare has shown that advanced capacity in several key areas is common to roles that thrive. In addition, it is critical that the activities that make up the core of a new advanced role are incorporated into a practitioner's primary day-to-day work.

Examples of implementation of these types of advanced roles in practice vary across the jurisdictions in which they are found. On examination, it is evident that common core principles are shared, yet the way these principles and competencies are manifested within specific positions and situations is highly variable and dependent on local scopes and standards. In the UK, advanced MRT roles have emerged largely with a focus on advancement in specialist clinical areas, whereas advanced practice in the US, for example, is applied much more generally across tasks.

Furthermore, advanced practice must be built with consideration for a continually evolving practice throughout the MRT professions. Over time, technological advances and shifts in priorities lead to evolution within the profession—pushing the boundaries of the profession to new limits. The challenge in developing an advanced role is to ensure roles are not exclusively tied to activities that will be absorbed into standard practice.

The decision was made in drafting this framework to stay away from identifying specific activities that would be considered advanced in the Canadian context. The continual evolution of MRT practice and differences in practice across Canadian provincial jurisdictions make it difficult to find examples that can be applied nationally and fixed in time. Table 1 provides an example of advanced activities in practice that is considered reflective of this framework's definition of advanced practice. It has been included to help illustrate how the principles laid out might apply to a clinical setting.

Autonomy and collaboration

Despite the considerable focus on increasing autonomy of an advanced practice role, it must also be emphasized that any advanced role would continue to function within a larger interprofessional model of care, where numerous practitioners with varying degrees of decision-making autonomy continually collaborate to deliver the best outcomes for patients. In fact, in keeping with the principles of *Optimal patient outcomes* and *Leadership*, it would be expected that advanced practice MRTs strive to broaden and deepen collaboration by sharing their knowledge and expertise within the multidisciplinary healthcare team.

Current examples of advanced MRT practice demonstrate how professionals can collaborate at an advanced level with adaptations to the traditional models of care. It is expected that advanced practice MRTs in Canadian roles would mirror this collaborative approach by continuing to work with radiologists, oncologists, physicists and other MRTs and healthcare professionals to improve services and care.

Active leadership

In addition to finding ways to advance clinical practice, advanced practitioners are expected to use their advanced knowledge and understanding to act as transformational leaders in their facilities. Active leadership in the workplace, in research and in education, is central to this component of advanced practice.

In the history of advanced practice, research has typically formed an important component of new roles in development. Even if the conduct of formal research does not form a core element of every future advanced MRT role in Canada, it is believed that reflective practice based on an understanding of the principles and basis of good research and aimed at optimizing clinical services, should be considered a core and fundamental element of any advanced practice role. With a basis in evidence-based practice, advanced practitioners continually evaluate and reflect on the care being delivered and stay attuned with innovations in the field. These practices allow advanced practitioners to continually develop the frontiers of their own roles and the profession as a whole.

The Canadian healthcare landscape

The realities of the Canadian healthcare landscape are sure to present challenges along the way for those who wish to pursue this national vision. Much of the power to enact decisions at the level required to create new tiers of practice (such as advanced MRT practice) rest at the provincial level. It is the provincial, and not the federal, government that bears responsibility for administration, planning and funding for healthcare facilities and professionals. Changes as fundamental to the MRT profession as establishing a new advanced tier would be reliant on provincial support, which could vary from province to province.

MRT scopes of practice across Canada can vary substantially at the provincial level. Though all MRTs are certified at a national level, differences emerge through variations in provincial law and provincial regulation (if present). This presents a challenge for those seeking to pursue a national

standard for advanced practice, because many of the activities that are being considered in these discussions are subject to different interpretations across provincial lines.

Currently, there is also a wide variation in what is considered to be extended, enhanced or expanded from one provincial jurisdiction to the next. In some provinces this kind of activity outside the traditional scope of practice is commonplace and even formalized, whereas a framework for such activities in other provinces does not exist under the legislation in effect.

It is with consideration for all these elements of the Canadian landscape that the CAMRT considers an agreement on principles and ideas about advanced practice at this highest level to be so important moving forward.

Table 1. Example of AP principles in practice[44]

Consultant Breast Radiographer (UK)

The four-tier service delivery model for radiography has seen the addition of two tiers of practice over and above the traditional role of radiographer in the UK National Health Service (NHS). The position of consultant radiographer is the highest clinical grade a radiographer can attain within the service model, offering professionals the possibility of great autonomy and freedom of practice within the bounds of the profession (e.g., within professional scope of practice and local protocols). It provides an example of the principles we have identified in the real world.

Critical thinking and complex decision making

The consultant breast radiographer can manage an entire 'episode of imaging care' at a patient attendance without the radiologist—taking steps to ensure the optimal clinical outcome for the patient. This entails ensuring all appropriate imaging and interventional tests are performed, making decisions based on the results and producing a comprehensive radiological report received by the requesting clinician.

Consultant breast radiographers are also key members of breast multidisciplinary team meetings where many complex cases are discussed, and they make significant contributions to the decision-making process.

Autonomy of role

The consultant breast radiographer enjoys an unprecedented level of autonomy in radiographic professional practice. Each consultant radiographer manages their own case loads and is responsible for the delivery of a full range of breast imaging studies and associated procedures, including mammography, ultrasound, biopsy and tumour marking, cyst/seroma/abscess aspirations, fine needle aspiration for cytology, and image-guided localization procedures for impalpable lesions. Consultants make adjustments based on the results they get back and report on diagnostic images.

Leadership

Consultant breast radiographers are clinical and professional leaders in their field. They drive research into practice developments and take a lead on active dissemination of findings and integration (where appropriate) of change in local practice. In addition, they make significant contributions to the profession through extra-clinical duties, such as teaching assignments, contributing to scientific journals and taking prominent roles on relevant professional bodies.

For a more comprehensive description of the activities performed by the Consultant Breast Radiographer, as well as a description of advanced clinical, technical and professional practices in established roles found in the UK, US and Canada please refer to the **Appendix**.

Educational preparation for advanced practice roles

The CAMRT definition of advanced practice envisions roles in which there are increased demands on critical thinking and complex decision making with a greater degree of autonomy. In order to successfully practice at this advanced level, a thorough education with a focus on advanced clinical and theoretical knowledge, skill, judgment, and the other principles of advanced practice is essential. To lay such a foundation, MRTs would need to obtain training and education beyond their entry-level qualification, including the knowledge, skills and judgment acquired in their experiential learning. In order to meet this need and the requirements of the advanced practice MRTs of the future it is believed that such an educational preparation should be thorough, accessible and standardized.

Thorough

It is believed that preparation for advanced practice roles must be thorough and comprehensive. In practical terms this means that candidates for advanced practice will be prepared with advanced clinical and technical knowledge to operate in their new roles and will receive education that helps them develop critical thinking and complex decision-making abilities.

The specific elements of such education will eventually be determined by the specific demands that individual advanced practice roles present. Specific roles can be characterized by specific competency profiles, which can in turn be matched to requirements for advanced education.

Accessible

It is important that education for advanced MRT roles is accessible to Canadian MRTs. The MRT profession as it currently exists in Canada is a complex mix of professionals with diverse educational backgrounds. It is believed that requirements for entry into courses/programs and/or standards for certification should take this strongly into consideration. An advanced practice candidate who is able to demonstrate the acquisition of knowledge, skills and judgment should be afforded the opportunity to pursue this path. Of course, the entry criteria for any programs developed would be determined by individual educational institutions and the onus for proving equivalency would always rest with the candidate.

Standardized

The value of standardization of education is a corresponding standard in expectation and recognition across centres and jurisdictions. Because the reliability of one individual training

regime is hard to judge against the next, formal education is strongly encouraged. This will benefit the profession as a whole, as it strives to create a credible and trustworthy foray into new areas.

Level of education

It is not for the CAMRT to dictate the level of education that is provided, nor the regulatory/legal standards that would permit licensure to such advanced roles. Such decisions are made at the provincial level in Canada, and educational standards for advanced MRT practice would be set by provincial regulators/legislators.

It is, however, the role of the CAMRT to present recommendations it believes are consistent with the best practice experiences of others and the best evidence available. In the case of advanced practice, experience of other advanced healthcare providers in Canada and abroad provide important lessons for decision makers today.

For example, the Canadian Nursing Association recently elevated their recommendation for entry into advanced practice roles to a graduate education. They cite that the decision was based on the expertise such an education provides in research, knowledge synthesis and transfer skills. Based on their own experiences working in the Ontario healthcare system, and considering the entry-level norms for education in radiation therapy in the province, the leaders of the Clinical Specialist Radiation Therapist (CSRT) initiative also recently recommended a graduate level education for entry into CSRT roles in the future.[22] Reasons cited include the need to broaden knowledge in the realms of leadership, professional communication and healthcare policy; to deepen understanding of foundational radiation medicine concepts (essential for the clinical decision making the roles demand); and to develop skills required in the chosen specialized domain of radiation therapy practice.[22]

These recommendations are echoed across the advanced practice literature.

Considering this, and the advanced knowledge and attributes recommended for advanced MRT roles, the CAMRT suggests that the thorough education required for these future roles would most commonly be achieved through educational preparation at the graduate level. The combination of advanced studies and independent research typically pursued in graduate education provides both the structure and latitude for an individual to develop an understanding and comfort with the complex subject matter central to advanced practice. Additional advantages of a graduate education include the track record in delivering this kind of education in a variety of fields.

Looking to the future

As stated, it is the CAMRT's firm belief that advanced MRT practice has a place in shaping the Canadian healthcare landscape of the future. As healthcare requirements in Canada evolve, it is expected that the dynamics of the system designed to fulfil those requirements will evolve as well. Advanced practice is an innovation that has proven worth for healthcare providers that seek to adapt and create new efficiencies.

Role of the CAMRT

With the publication of this framework, the CAMRT envisions taking on a role for advanced practice that mirrors its role in all levels of MRT practice. To serve the interest of its MRT members, the CAMRT will work as an advocate and in other capacities where appropriate to support the cause of advanced practice for the profession in Canada.

Advocacy

This framework forms the basis for the CAMRT's advocacy. As a position statement, it communicates the view of the professional association on the nature of advanced practice for the MRT profession in Canada. The CAMRT considers the communication of a clear and consistent national vision for advanced practice as core to its responsibilities to members, and will work to maintain and adapt this framework into the future to ensure this goal is met.

The role of advocate will also entail the engagement of other professional bodies or healthcare decision makers from across the provinces in the important discussions that need to take place to move advanced practice in the MRT professions closer to reality.

Facilitation

The CAMRT expects to act as a facilitator for development of roles at the local level by providing its members with access to tools and preparing the ground through advocacy. In its role as national body, the CAMRT will help all members across the country find opportunity to collaborate and share. This is especially vital in new areas like advanced practice where development and research is likely to take place in pockets across the country. The association is already fulfilling this role in relation to the work with advanced practice in radiation therapy in Ontario. Several working groups and meetings have been organized by the CAMRT, and it continues to facilitate the interactions suggested by its national stakeholders on these important issues.

As the national body, the CAMRT will also be uniquely placed to advance the cause and discourse about developments in advanced practice in the MRT professions with other stakeholders around the globe. Not only will the CAMRT promote the progress made by Canadians abroad, but it will also seek to connect key Canadian MRT decision makers to expertise, learning and CAMRT contacts from countries with experience in advanced practice.

Certification

The CAMRT's interest in and commitment to certification is to ensure a standard set in one jurisdiction in Canada can be applied across the country, just as it is with the four entry-to-practice standards now. The vision of national certification is proposed to benefit CAMRT members by providing standards for each role, leading to credibility and recognition across centres, provinces and healthcare professions. Furthermore, a certification process provides the opportunity to assess and validate candidates from diverse experiences and educational backgrounds and award a credential certifying those who obtain the standard for advanced practice as set out by the CAMRT.

The CAMRT is currently involved in the investigation of a certification process for the advanced practice radiation therapists already working throughout Ontario. This process would potentially form the structure on which certification across all MRT disciplines could be based. The recommendations from this investigation will be incorporated into an update of this report when they become available.

Future of advanced MRT roles in Canada

Despite the unique challenges presented by the structure and diversity of the Canadian healthcare landscape, it is believed that advanced practice is attainable across jurisdictions.

The CSRT initiative in Ontario has recently been expanded and represents a model on which to innovate advanced practice in radiation therapy across all provinces. In addition, innovative ventures already underway suggest there is potential for advanced MRT roles that mirror and extend beyond what has been developed internationally, within all the disciplines. It is not for the CAMRT to speculate on ways these roles might specifically evolve in the future, but rather to support members in the ways described above in preparation for innovations as they arrive.

For the immediate future, it is important to acknowledge that with the reality of implementation at the provincial level, advanced MRT practice built on the same principles may vary in implementation from one provincial jurisdiction to another.

This framework represents an important first step in the advanced practice discussion for both MRTs and the CAMRT. We hope that the publication of this document will stimulate interest around advanced practice in the MRT community and provide the common language and starting point regarding advanced MRT practice and its place in the evolving Canadian healthcare model.

Glossary

Advanced activities

Activities that not only exceed the principle expectations of MRT practice in Canada, but that incorporate the principles of advanced practice, such as critical thinking and complex decision making, in a fundamental way.

Advanced roles

Roles that incorporate advanced activities into a practitioner's primary day-to-day work and that reflect all the principles of advanced practice. A role reflects a full job description, as opposed to the description of a single activity.

Analytical skills

A cluster of common skills that are used to analyze and develop solutions to problems.

Autonomy

Full autonomy means that a professional is independent and reasonably self-governing in making decisions in practice. In our discussion, we adopt the concept that autonomy can be expressed in degrees or on a spectrum where full autonomy lies at one end and full dependence at the other end. The advanced practice MRT would not be fully autonomous in the healthcare system, but would make a greater number of autonomous decisions relative to other MRTs and be said to possess a greater degree of overall autonomy as a result.[45]

Enhanced practice / Expanded practice / Extended practice

Extended practice refers to practices or roles that extend beyond the principal expectations of practice. Individual provinces have developed formal definitions for these roles, but because principal expectations of practice may differ across the country, so too does the use of this terminology.

As they relate to advanced practice, it is possible that some of these practices would form one element of advanced practice. The relationship of enhanced/expanded/extended practice to advanced practice is discussed in the *Advanced roles in practice* chapter.

Equivalency

A level of achievement that is considered to be on the same level as finishing a course of study.

Expert practice

MRT practice can be characterized along a continuum from novice to expert, progressive with time and experience. Unlike advanced practice, there is no formal requirement for expert practice. In fact, the same construct would exist in an advanced tier of practice where professionals would enter as novice advanced practice MRTs and progress over time to expert advanced practice MRTs.[46]

Framework

A document used to create common understanding of the basic elements of a position, and which provides a frame for future endeavours in this topic area.

Graduate level education

Graduate level education refers to post-university degree programs for students. This includes the Master's and Doctorate level degrees, together with the possibility of a variety of post-graduate certificates.

Medical radiation technologist / technology (MRT)

The terminology used in Canada to discuss the professions of radiologic technology/radiography, nuclear medicine, magnetic resonance imaging and radiation therapy.

Patient outcomes

General terminology for the results of healthcare interventions or processes.

Principal expectations of practice (PEOP)

PEOP is defined as "principal expectations of practice" and refers to those services and procedures that fall within the scope of practice for MRTs. It includes those taught in medical radiation technology entry-level programs, plus any additional clinical experience or training that one must undertake in order to maintain competency to provide standard practice.

Principle

A fundamental component of our advanced practice definition.

Radiographer

Radiographer is used in this framework to explain examples in the context of the UK healthcare system, where the term radiographer refers to the same professionals as those encompassed by the term MRT in Canada.

Red Dot initiative

A system introduced in the UK, whereby radiographers (MRTs) used "red dots" to signal potential abnormalities on plain radiographs prior to the by radiologists' review and reporting.

Routinely

In our definition of advanced practice, the word routinely is used to suggest practices/activities that a professional would undertake on a daily basis in their role. The concept is reflected in the discussion of the *Advanced roles in practice*.

Abbreviations

ACR: American College of Radiology

AIR: Australian Institute of Radiography

AP4RT: Advanced Practice for Radiation Therapy
(Former name for Ontario advanced practice initiative in advanced practice radiation therapy)

APN: Advanced practice nurse/nursing

APRT: Advanced Practice Radiation Therapist

ASRT: American Society of Radiologic Technologists

CAMRT: Canadian Association of Medical Radiation Technologists

CAR: Canadian Association of Radiologists

CARO: Canadian Association of Radiation Oncology

CCO: Cancer Care Ontario

CIHI: Canadian Institute for Health Information

CNA: Canadian Nurses Association

CSRT: Clinical Specialist Radiation Therapist
(Current name for advanced practice radiation therapist in Ontario)

GI: Gastrointestinal

MRT: Medical radiation technologist/technology

NHS: National Health Service (UK)

PDSA: Plan, Do, Study, Act (Planning tool)

PEPPA: Participatory, Evidence-informed, Patient-centred Process for Advanced-practice nurse role development, implementation and evaluation (Planning framework and tool)

RA: Radiologist assistant (Advanced practice position in the US)

RCR: Royal College of Radiologists (UK)

SOR: Society of Radiographers (also known as the Society and College of Radiographers) (UK)

Appendix. Examples of Advanced MRT Roles

Gastrointestinal Consultant Radiographer (UK)[47]	
Description	The GI Consultant radiographer practices autonomously to deliver a full range of radiographic services to patients. Advanced practice is focused in the specialist area of GI imaging
Advanced elements	• Audit own practice to ensure their continuing competence • Greater autonomy and responsibility for patient care: ○ Independently carrying out many GI diagnostic tests ○ Contributing to the reporting process ○ Managing case loads ○ Little reference to radiologists • Likely to be seen as the lead for the GI services across the hospitals • Work across disciplines (e.g., with endoscopy)
Examples of advanced clinical activities	• Pre-interventional counselling and follow-up • Independent delivery of a wide range of GI studies: ○ Double contrast barium enema (DCBE) and variants (e.g., contrast enemas, etc.) ○ Barium swallow ○ Videofluoroscopic swallowing study (VFSS) (often with speech therapy) ○ CT colonography ○ Proctography ○ Non-GI fluoroscopic studies (e.g., hysterosalpingography; cystography) ○ Small bowel studies ○ Interventional work ○ Sigmoidoscopy • Increased contribution to the reporting process • Offering a formal report as part of a double reporting system • Issuing the definitive report for most examinations • Management of fluoroscopy suite
Examples of evidence-based activities	• Involvement in multi-disciplinary research and audit, resulting in peer-reviewed publications and presentations • Auditing of the GI imaging service against the evidence base and reconfiguring to improve the patient (and referrer) experience • Participation in research
Examples of leadership	• Clinical leadership • Collaboration with multiple professionals • Extra-clinical activities: ○ Regular attendance at relevant clinico-radiological meetings ○ Teaching and providing mentorship to different professional groups in the clinical environment and local universities ○ Involvement in national associations and scientific journals ○ Membership on relevant professional bodies and committees
Resultant improvements to service	• Reduced waiting lists • New services introduced for patients as a result of staffing efficiencies (videofluoroscopy for speech and language therapy, 'same day' endoscopy, radiology clinics) • Dedicated lists for particular examinations • Flexible appointments for patients (e.g., longer exam times for patients who require it, evening appointments, etc.)

Consultant Breast Imaging Radiographer (UK)[44]	
Description	The Breast Imaging Consultant radiographer practices autonomously to deliver a full range of radiographic services to patients. Advanced practice is focused in the specialist area of breast imaging
Advanced elements	• Audit own practice to ensure their continuing competence • Greater autonomy and responsibility for patient care: ○ Taking responsibility for completion of breast imaging diagnostic tests and procedures ○ Reporting on diagnostic images ○ Managing case loads
Examples of advanced clinical activities	• Manages the diagnostic decision-making pathway for breast imaging studies: ○ Review of patient history ○ Informed decisions regarding which diagnostic tools are appropriate • Independent delivery of a wide range of breast imaging studies and procedures: ○ Ultrasound-guided biopsy ○ Cyst/seroma/abscess aspirations ○ Fine needle aspiration for cytology ○ Vacuum-assisted biopsies ○ Biopsy or tumour marking ○ Image-guided localization procedures for impalpable lesions • Image interpretation and communication of the result: ○ Immediate reports on the mammograms and ultrasound scans to referring physicians from 'fast track diagnostic clinics' for symptomatic patients ○ Communication of results to patients ○ Reports for routine post surgical follow-up and family history surveillance mammograms ○ Indicates a description of the imaging appearances; the exact location and size of any significant abnormalities; a differential diagnosis, where possible; further imaging/biopsy in the management of a particular breast abnormality, if appropriate and possible • Breast clinical examination
Examples of evidence-based activities	• Participation in a regular educational self-assessment scheme (PERFORMS—PERsonal perFORmance in Mammographic Screening)[48] • Self-audit of interventional work • Participation in research
Examples of leadership	• Clinical leadership • Collaboration with multiple professionals • Introduction of new innovations into practice (e.g., new vacuum biopsy approach) • Dissemination of breast imaging knowledge • Extra-clinical roles: ○ Teaching and providing mentorship to different professional groups in the clinical environment and local universities ○ Supervision of undergraduate student radiographer dissertations ○ Publication and presentation of work at conferences ○ Speaking to the general public and breast cancer support groups regarding the role of breast imaging in diagnosing breast disease ○ Involvement in national associations and scientific journals ○ Membership on relevant professional bodies and committees
Resultant improvements to service	• Reduced waiting lists

Clinical Specialist Radiation Therapist (Ontario)—Palliative Radiation Therapy[49]	
Description	Clinical Specialist Radiation Therapists in Ontario practice autonomously to deliver a full range of services to patients in a variety of specialist areas. In this example, advanced practice is focused in the specialist area of palliative patients
Advanced elements	• Primary responsibility for patient triage, review and interpretation of results and establishing care plans • Assumes a patient case load in each clinic • Coordination of resources • On-treatment and end of treatment patient review
Examples of advanced clinical activities	• Leadership in palliative patient assessment: o Conduct patient interviews o Comprehensive physical examinations. o Document patient history and physical assessment data • Formulate care plans for palliative patients • Provide technical and dosimetric consultation: o Interpretation of diagnostic information and patient condition to establish a plan for radiation therapy o Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines o Liaison and consultation with other healthcare facilities, services and team members o Assignment of patient priority for therapy o Assignment of dose/fractionation according to disease site, target volume and dose limiting structures o Determination of gross, clinical and planning target volumes o Prescription of treatment regimen o Obtain informed consent o Reviews patient set up on the first day of treatment • Respond to a variety of unusual clinical situations, adverse or unusual reactions • Review of referrals for appropriateness • First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged • Patient education • Pain management • Provision of patient support (psycho-social) in palliative radiation therapy
Examples of evidence-based activities	• Active involvement in research projects: o Clinically relevant research work o Work on patient- and treatment-related outcomes o Patient recruitment o Involvement in practice guidelines, treatment protocol development o Supervise/mentor health-related professionals in research/ clinical activities
Examples of leadership	• Patient, professional and community education • Strategic planning in workplace • Supervision of residents and fellows in project work
Resultant improvements to service	• Decreased patient wait times • Increased patient throughput • Improved efficiency of cancer care in Ontario

Radiologist Assistant (USA)[50-52]	
Description	The radiologist assistant works under the supervision of a radiologist to enhance patient care by assisting in the diagnostic imaging environment. In practice, the clinical roles and responsibilities of each RA are tailored to the needs of the patient population, practice setting, state licensure laws and regulations, institutional credentialing requirements and federal reimbursement policies. As a result, RA practice varies from facility to facility
Advanced elements	• Lead role in patient management and assessment • Performance of selected radiology examinations and procedures under the supervision of a radiologist – the level of radiologist supervision varies, depending on the type of examination • Initial image observations (not diagnosis) to be forwarded to the supervising radiologist
Restrictions on practice	• The RA cannot: ○ Substitute for the radiologist ○ Act independently ○ Prescribe medications, treatments or therapies ○ Provide an official interpretation of the imaging findings ○ Prepare a final written report ○ Independently bill for services
Examples of advanced clinical activities	• Patient assessment: ○ Patient interview to verify and update medical history ○ Radiology-focused physical examination ○ Patient anxiety and pain levels ○ Analysis of data (e.g., signs and symptoms, laboratory values, vital signs, and significant abnormalities) ○ Report of findings to the delegating radiologist • Assistance with invasive or complex radiology procedures • Performance of selected procedures under the supervision of the radiologist: ○ Fluoroscopy ○ Non-invasive procedures ○ Feeding tube placements ○ Venous diagnostic exams • Moderate sedation procedures ○ Administration of moderate sedation ○ Observation and assessment of moderately sedated patients • Obtaining and documentation of patient consent: ○ Explanation of procedure to the patient or significant others, including a description of risks, benefits, alternatives and follow-up ○ Referral of questions about diagnosis, treatment or prognosis to the delegating radiologist • Communicates initial observations: ○ Evaluates images for image and diagnostic quality ○ Reviews the images for initial observations ○ Report of initial observations to delegating radiologist • Communication of delegating radiologist's report to the appropriate healthcare provider • Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiologist: ○ Post-care instructions to patient as ordered by the delegating radiologist

Radiologist Assistant (USA)[50-52]	
Examples of evidence-based activities	• Collection of data for clinical research
Examples of leadership	• Involvement in evaluation and maintenance of patient safety programs and initiatives • Education of other healthcare providers regarding area of expertise
Resultant improvements to service	• Continuity of care for the patient (i.e., one person remains with the patient throughout the entire radiologic procedure) • Improved departmental efficiency: ○ Radiologists free to perform more complex procedures and for interpretation

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Advanced Practice Framework Committee

Committee Chair:
Louis Gordon, BSW, MSW
Dean, Red River College

Karen Davis, CMD, BSc(T), RTT
Chief Medical Dosimetrist, Saskatchewan Cancer Centre
Representative to CAMRT Board of Directors

Bill Dow, MA, RTNM
Dean, British Columbia Institute of Technology (BCIT)

Louise Kallhood, ACR, Med, MRT(R)
Program Chair, Department of Allied Health and Technologies, MRT Program, Camosun College

Brian Martell, BHSC, DHSA, RTR
Diagnostic Imaging Manager, Capital Health, Halifax, NS

Robert Miller, MD, FRCPC
Liaison to Canadian Association of Radiologists

Marcia Smoke, ACT, MSc, MRT(T), RTT
Head of Radiation Therapy, Juravinski Cancer Centre, Hamilton, ON
Chair, Ontario Radiation Therapy Advanced Practice (ORTAP) Group

Greg Toffner, BSc, MRT(R), RTR
President and CEO, Ontario Association of Medical Radiation Sciences (OAMRS)

Elizabeth Whitmell, BAppSc, RTNM, RTMR
Program Manager, Physician Assistant, Professional Degree Program, University of Toronto

Advisors to the Advanced Practice Framework Committee

Alain Cromp, MIT(E), BEd, DAS, MPA, CAdm
Chief Executive Officer, Ordre des technologies en imagerie médicale en radio-oncologie et en électrophysiologie médicale du Québec (OTIMRO-EPMQ)

Linda Gough, MPA, BSc, MRT(R)
Registrar, College of Medical Radiation Technologists of Ontario (CMRTO)

Advanced Practice Framework Committee Staff Support

Elaine Dever, ACR, BHS, RTR
Director of Education, CAMRT

Mark Given, RTR, RTMR
Director of Professional Practice, CAMRT

Christopher Topham, BSc, MSc
Project Consultant, CAMRT

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Australian Institute of Radiography

EXECUTIVE SUMMARY

Discussion Paper: A Model of Advanced Practice in Diagnostic Imaging and Radiation Therapy in Australia

Report of the Advanced Practice Working Group (APWG) to the Board of Directors of the Australian Institute of Radiography (AIR)

May 2009

Introduction

Demographic pressures and the global shortage of Radiologists and Oncologists are generally perceived as the dominant drivers of the development of advanced practice roles for Diagnostic Radiographers and Radiation Therapists. Comparatively little attention has been given to the improvements in patient care and service quality & safety that may flow from developing the occupational roles of the non-medical members of the medical imaging and radiation therapy teams. There is an opportunity to establish new models of clinical care in medical imaging and radiation oncology, ensuring that quality of service and patient safety are prioritised above all else. Formal mechanisms for negotiation of practice boundaries must be put in place to ensure that advanced radiographic and radiation therapy practice are performed within an appropriate legal, ethical, moral, social and economic framework to ensure the best possible outcomes for patients and for the health care system. This can only be achieved by interprofessional consultation, negotiation and teamwork.

Background

A decision was taken in August 2007 by the Board of Directors of the AIR to establish the Advanced Practice Working Group (APWG) to follow-up on the work done by the Future Directions Working Party (FDWP, 2004) and the Professional Advancement Working Party (PAWP, 2006). The terms of reference were to define an 'Advanced Practitioner model' and how practitioners in diagnostic imaging and radiation therapy could achieve 'advanced' status.

There is strong evidence that there will be a significantly smaller proportion of the population participating in the workforce in the future than has been so in the past. However, providing Radiographers and Radiation Therapists with professional development opportunities, such as extended clinical roles, will increase the likelihood of them staying in the medical radiation workforce for longer periods of their working life. It will also provide the opportunity for Radiologists and Oncologists to focus their extensive knowledge, skills and ability on complex cases. The National Health and Hospital Reform Commission (NHHRC) recognised the need to change the skill mix of multidisciplinary teams, deemphasising the influence of traditional professional boundaries that 'restrict the ability to use fully the skills of the health workforce'. The NHHRC suggests that the provision of a 'competency-based framework' is of particular importance to enhance 'the effective use of all professional groups and individuals in ways that maximise the use of skills without compromising patient safety and quality of services'.

Other countries have already implemented advanced practice models in their medical radiation workforce. In the United Kingdom (UK) the Radiographers' roles have been evolving in diagnostic imaging and radiation therapy for many years, both in response to service demand and in accordance with government policy aimed at modernising the health care system. In 2000 a decision was taken to pilot a 'four-tier' career progression framework within the UK radiography workforce, with the initial focus of the breast screening programme. The four-tiers comprise, Assistant

Practitioner, Registered Practitioner, Advanced Practitioner and Consultant Practitioner. Early success resulted in the four-tier pilot model being extended to radiotherapy in 2001 and diagnostic imaging in 2002. It has now been implemented widely across the UK, in a variety of contexts.

In 2008, the New Zealand Institute of Medical Radiation Technology (NZIMRT) released a report on role development and career progression. The report concluded with a recommendation that the medical radiation technology profession in New Zealand should introduce a three-tier career framework, including Assistant Practitioner, Practitioner and Advanced Practitioner roles. This conclusion was predicated on the findings of a series of pilot projects.

Meanwhile, in the United States, the American Society of Radiologic Technologists (ASRT) initiated discussions with the American College of Radiology (ACR) as early as 1989-90 with the aim of developing an advanced practice, Radiologist Assistant (RA) role for Radiographers. In March 2002 agreement was reached on an Advanced Practitioner model designed to '… improve productivity, increase patient access to radiologic services, and enhance the overall quality of patient care'. In 2007 there were 10 education providers in the US offering RA programmes. The scope of practice of the RA is defined according to a list clinical activities that may be performed, each of which requires either 'general', 'direct' or 'personal' supervision by a Radiologist, who must also verify the candidate's competency.

Key Concepts

The APWG implemented a consultation framework, targeted at AIR Members. The aim was to explore their knowledge and experience, opinions and values, and attitudes and feelings in relation to advanced practice. Information gathered from a variety of sources was analysed using qualitative research techniques, leading to the emergence of seven key concepts, as listed below.

Concept 1: Practice Standards and Guidelines

There is a need to define the term 'advanced practice' and to delineate the scope of advanced practice. The accreditation framework should be structured enough to provide credibility and rigour but flexible enough to accommodate local needs, in terms of filling service gaps. Leadership, responsibility and accountability should be assumed as part of advanced clinical roles and this should be reflected in the accreditation requirements.

Concept 2: Service Quality and Access

Advanced practice roles should primarily focus on the needs of patients. Service quality could be improved and waiting times reduced with less dependence on Radiologists and Oncologists for routine procedures. Overall efficiency and the rate of transit of patients through the system could be improved. There may also be a reduction in the cost of service delivery through the delegation of clinical roles.

Concept 3: Education and Training

Education must underpin advance practice. Courses and programmes must meet the same national standard, at Masters level. Programmes and courses should be flexible, widely accessible and mutually accredited across universities. Advanced practice programmes must have a substantial clinical component. Universities and employers must work together to develop programmes.

Concept 4: Workforce and Employment

There is a lack of clarity about how advanced practice roles will integrate with current roles and employment conditions. Advanced practice accreditation should align with position descriptions and job selection criteria. Business cases, justifying the 'need for change', should be put forward to establish advanced practice positions. Advanced Practitioners would ease the workload of Radiologists and Oncologists, freeing them for other duties, while staff retention would improve by giving early career practitioners something to aspire to.

Concept 5: Collaboration and Consultation

Development of the advanced practice model will require extensive consultation, particularly with the Royal Australian and New Zealand College of Radiologists (RANZCR). Universities and employers must also work closely together. Support should be given to such collaborations in the development of advanced practice roles and models. Further consultation and collaboration is necessary, with a focus on teamwork and quality of care.

Concept 6: Research and Evidence

Advanced practice must be supported by evidence of appropriateness and effectiveness of the change. It should address 'service gaps' and 'patient need'. Outcomes must be measured. Advanced practitioners will contribute to the development of evidence-based clinical protocols and guidelines. They will use current best practice in their field and be subject to regular 'clinical audits'.

Concept 7: Blockers and Limitations

A wide range of potential blockers and limitations were identified, including the following: the lack of definition of 'advanced practice'; the risk of litigation; current Medicare legislation; industrial issues; medical dominance and challenges from other health professions; small numbers of potential course candidates; and, chronic underfunding in the tertiary education sector, resulting in limitation of the capacity of universities to respond the professions needs and expectations.

The Proposed Model

The APWG interpreted the term 'advanced practice' to mean circumstances in which a Diagnostic Radiographer or Radiation Therapist performs a clinical practice, duty or task on a regular basis that is beyond the established core practice boundaries of their profession. In doing so the Advanced Practitioner demonstrates clinical

leadership and a high level of knowledge, skills, ability and personal attributes, as well as professional autonomy and responsibility. These are applied to a specific, delegated clinical role in order to provide optimum service quality and patient care.

The APWG proposes that Advanced Practitioners in the medical radiation professions occupy the positions titled 'Clinical Specialist', each of which is listed below, with a list of tasks that could potentially fall under each role.

Medical Imaging Clinical Specialists

Clinical Specialist in Accident and Emergency Imaging

- Triage medical imaging pathway for Emergency Department (ED) patients.
- Close consultation with Emergency Physicians and Clinical Nurse Specialists.
- Perform general radiography and computed tomography.
- Discharge patients who have no radiological abnormality from the ED.
- Frontline reporting of appendicular and axial skeletal plain radiography images.

Clinical Specialist in Fluoroscopic and Interventional Imaging

- Performing gastro-intestinal fluoroscopic procedures.
- Overseeing the delivery of services in an angiographic suite.
- IV cannulation and insertion of PICC lines and other tubes and catheters.
- Performing image guided injections into joints for diagnosis or pain management.
- Preliminary reporting to a Radiologist on examinations.

Clinical Specialist in Ultrasound Imaging

- Formalised reporting role on a limited range of examination types.
- Performing percutaneous biopsies, fine needle aspirations and drainage.
- Leading services attached to Emergency Departments and GP Clinics.
- Providing specialist sonography services.

Clinical Specialist in Breast Imaging

- First reporting of double-reported screening mammograms.
- Performing core biopsy, fine needle aspiration and tumour localisation.
- Performing both mammography and breast ultrasound.
- Trained in counseling of breast cancer patients.

Clinical Specialist in Computed Tomography (CT)

- Triage patients and determine examination requirements.
- Design and modify examination protocols and techniques in complex cases.
- Intravenous cannulation and in the administration of contrast media.
- Provide a Radiographer's opinion to the Radiologist.
- Performing biopsies and facet joint injections under CT guidance.

Clinical Specialist in Magnetic Resonance Imaging (MRI)

- As for the Clinical Specialist in CT, with the exception of the last dot-point.
- Assess patients with suspected eye or other foreign bodies and surgical implants.

Radiation Therapy Clinical Specialists

Clinical Specialist in Image Guide and Adaptive Radiotherapy

- Lead role in all on-line imaging verification and decision making.
- May specialise in particular regions or in multiple treatment types.
- Monitor and analyse 2D and 3D image data.
- Developing new protocols and guidelines in consultation with the Oncologists.
- Superior knowledge of CT cross-sectional anatomy.
- Responsible for internal stabilisation of anatomical structures.
- Responsive to technological advances and new applications in their field.

Clinical Specialist in Breast Radiotherapy

- High level skills and knowledge about all aspects of breast cancer treatment.
- Manage the breast cancer patient's radiotherapy pre-treatment pathway.
- Tasks range from patient counseling to target volume delineation.
- Communication conduit between Oncologist's, Radiation Therapists and patients.

Clinical Specialist in Paediatric Radiotherapy

- Lead role in the management of paediatric cases (a familiar face).
- High level skills and knowledge relating to the paediatric cancer.
- Knowledge of treatment options, particularly chemo-radiation regimes.
- Provide family support and advice to the family and carers as needed.
- General oversight of the patient's treatment pathway.

Clinical Specialist in Palliative Radiotherapy

- Lead role of the delivery of radiotherapy to palliative care patients.
- Consultation with other members of the multidisciplinary team.
- Monitoring the patient's general health status while undergoing treatment.
- High level skills and knowledge of disease pathways and treatment options.

Clinical Specialist in Radiotherapy Treatment Review

- Clinical assessment of patients undergoing radiation therapy.
- Reviewing patient records and recording matters of concern.
- Developing and establishing protocols and guidelines.
- Communication with other members of the multidisciplinary treatment team.
- May prescribe some medications to manage treatment side-effects.

Clinical Specialist in Integrated Cancer Care

- Help ensure a seamless cancer treatment journey for the patient.
- Provide support and advice to patients undergoing radiotherapy.
- Coordinating treatment of patients suffering from common cancers.
- Possess a sound knowledge of all stages in the treatment pathway.
- Monitoring of chemo-radiation regimes and side-effects.
- Key member of the multidisciplinary treatment team.

Recommendations

Number 1: Accreditation and Registration

That professional accreditation of individual Advanced Practitioners should be vested in the AIR and registration of Advanced Practitioners should be through the National Registration and Accreditation Board, as a category of Radiographer and Radiation Therapist registration. The primary requirement for national registration at Advanced Practitioner level should be eligibility for AIR Advanced Practitioner professional accreditation. The accreditation of postgraduate advanced practice education programmes should be performed by the AIR, reporting to the registration board.

Number 2: The Interprofessional Practice Advisory Team (IPAT)

That the Board of Directors of the AIR engages other key professional organisations in discussions about advanced practice without delay. These discussions should initially centre on establishing the Interprofessional Practice Advisory Team (IPAT) with representation from across the medical radiation professions. IPAT would subsequently:

- Identify opportunities to apply new models of advanced practice;
- Strategise around the concept of advanced clinical practice;
- Create a framework for advanced practice standards and guidelines;
- Consider professional indemnity issues related to advanced practice; and
- Consult with Australian universities about advanced practice education.

Number 3: Advanced Practitioner Advisory Panel (APAP)

That, the Advanced Practitioner Advisory Panel (APAP) is established immediately and on an ongoing basis within the AIR organisational structure to:

- Advise the Board on a programme of seeding grants over the next 5 years;
- Establish a research agenda in advanced practice within the profession;
- Oversee the allocation of advanced practice scholarships for Members;
- Oversee the accreditation of Advanced Practitioner Members; and
- Advise on the allocation of Advanced Practitioner CPD points.

Number 4: Meetings with Government

That the AIR establishes a dialogue with the Department of Health and Aging, including with the Minister and senior bureaucrats and policy advisors in the Medical Benefits and the Mental Health and Workforce Divisions of the Department.

Number 5: Leadership Training

That the AIR invests in the development of a programme of leadership training and supports locally-based leadership training opportunities for its Members.

Number 6: Future Consultations

That all stakeholder organisations (as listed in the report) are included on the dissemination list for this report and that they are invited to comment.

NHS

Multi-professional framework for advanced clinical practice in England

"New solutions are required to deliver healthcare to meet the changing needs of the population. This will need new ways of working, new roles and new behaviours."

The combined Professional Bodies and Royal Colleges representing the Health workforce published in October 2017 a Joint Professions statement - this stated their shared commitment to work together in the interests of the health of the nation to build effective multi-professional teams, building summative value by playing to the strengths of the professions within teams.**http://www.aomrc.org.uk/wp-content/uploads/2017/01/2017-01-26_NCM_Academy_Joint_Statement_Action_Plan.pdf**

"Multi-professional work requires flexibility in attitude and behaviours and for professionals to value and respect the distinct contribution each professional makes."

"New ways of working and delivering healthcare requires employers to ensure that clinicians have the professional development they need to adapt to changing circumstances. Clinicians need to see there are appropriate career pathways open to them to enable them to expand their contribution to healthcare and their personal job satisfaction."

"Evidence consistently shows that multi-professional team working delivers better outcomes for patients and more effective and satisfying work for clinicians."

Contents

Foreword

The National Health Service was conceived and designed to deliver universal healthcare to communities across England and continues to provide unrivalled access and outcomes of any health system internationally. At the heart of this model is the outstanding commitment, compassion and expertise of the staff that work within it.

This multi-professional Advanced Clinical Practice (ACP) framework set out a new and bold vision in developing this critical workforce role in a consistent way to ensure safety, quality, and effectiveness. It has been developed for use across all settings including primary care, community care, acute, mental health and learning disabilities. This framework recognises that the health and care system rapidly evolves to deliver innovative models of care, health and care professionals have adapted, to meet the increasing demands of individuals, families and communities.

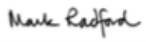
In their report, *Reshaping the Workforce*[i], the Nuffield Trust identified the many benefits advanced clinical practice brings to patients, practitioners and employers but recognised the lack of clarity around the advanced practitioner role. This framework provides the clarity required for good governance, enabling employers to develop, enhance and deploy advanced clinical practice within their organisations.

For the first time in England this framework sets out an agreed definition for advanced clinical practice for all health and care professionals and articulates what it means for individual practitioners to practise at a higher level from that achieved on initial registration. The framework sets out the capabilities expected of practitioners working at advanced level across four pillars; and it describes the educational and support requirements. Finally; it provides employers with advice on planning and implementing advanced clinical practice, ensuring appropriate clinical and organisational governance arrangements are in place.

National adoption of the framework will ensure a common understanding of advanced clinical practice and will support individuals, employers, commissioners, planners and educators in the transformation of services to improve patient experience and outcomes.

The organisations that have contributed to this framework have given a clear commitment to advance this agenda and support the expansion of advanced clinical practice for the future of the NHS. Alongside this a great deal of individual hard work and commitment has been demonstrated by all those who have contributed to the development of this Framework. Their expertise, insight, judgement and tenacity has been invaluable in building and developing the consensus required in order to publish this framework.

John Clark
Director and Dean of Education and Quality
Regional Chief Nurse
Health Education England - South



Mark Radford
Director of Nursing – Improvement
NHS Improvement
Co-Chair of Advanced Clinical Practice Steering Group

Suzanne Rastrick
Chief Allied Health Professions Officer
NHS England

'It has been a pleasure to have been invited by the Chief AHP Officer to co-chair the ACP steering group on behalf of the Allied Health Professions. I have been grateful for the support from Dr Sally Gosling, who has provided significant contributions to this work, in her capacity as Chair of the Health and Care Professions Education Leads group. The framework offers a positive opportunity to harmonise advanced clinical practice across the diversity of roles, settings and sectors in which Allied Health Professionals practise. It should enable and strengthen support for advanced clinical practice development across the non-medical workforce, thereby enhancing experience and outcomes for patients and progressing new models of care'.

Charlotte Beardmore
Co-Chair of Advanced Clinical Practice Steering Group
Health & Care Professions' Education Leads Group (HCPEL)

'As the knowledge, skills and competencies of our workforce develop to meet the needs of patients and their families, it is right that we recognise this higher level practice. The Advanced Clinical Practice Framework provides this recognition for all healthcare practitioners to deliver outstanding care in any setting. The creation of this framework has been one of co-production with partners from practice, patients, higher education, professional bodies and the Arms Length Bodies. It has been a great privilege to share in this journey and ensure this framework is published.'

John Clark
Director and Dean of Education and Quality
Regional Chief Nurse
Health Education England – South

'As a former nurse consultant, I directly saw the patient and organisational benefits of advanced clinical practice delivered care. This new framework develops a common understanding across professions with agreed education and competency arrangements and it is the ideal platform to increase the use of this innovative NHS Workforce solution. It has been a great privilege to work with key stakeholders across professions to develop this ACP framework for the NHS'.

Mark Radford
Director of Nursing – Improvement
NHS Improvement
Co-Chair of Advanced Clinical Practice Steering Group

'The Advanced Clinical Practice Framework recognises the potential of health care professionals to enhance capacity, be innovative and deliver improved outcomes for patients.'

Suzanne Rastrick
Chief Allied Health Professions Officer
NHS England

Purpose

This framework builds upon the definition of advanced clinical practice in England. This was developed and agreed by all stakeholders. It is designed to enable a consistent understanding of advanced clinical practice, building on work carried out previously across England, Scotland, Wales and Northern Ireland.

The core capabilities for health and care professionals at the level of advanced clinical practice are articulated in this framework and these will apply across all advanced clinical practice roles, regardless of the health and care professional's setting, subject area and job role. Use of the word capabilities is intended to convey the extent to which health and care professionals working at the level of advanced clinical practice can adapt to change, generate new knowledge and apply it in different ways to formulate and problem solve within a context of complexity and uncertainty[ii].

This framework requires that health and care professionals working at the level of advanced clinical practice should have developed and can evidence the underpinning competencies applicable to the specialty or subject area, i.e. the knowledge, skills and behaviours relevant to the health and care professional's setting and job role.

The core capabilities across the four pillars - clinical practice, leadership and management, education and research[ii] are then applied to these specialist competencies. These may be manifested/demonstrated in different ways depending on the profession, role, population group, setting and sector in which an individual is practising.

For the purposes of this document hereafter core capabilities and specialist competencies will be referred to as 'the capabilities', as health and care professionals at the level of advanced clinical practice need to demonstrate both capability across the four pillars and competence.

This framework sets the standard for the system with regards to the safe and effective requirements for advanced clinical practice, but allows for local context in regards to the implementation and application of principles.

The framework has been written with the NHS in mind, however the fundamental principles and opportunity for workforce transformation are relevant across all sectors. Health Education England, NHS Improvement and NHS England intend the framework to be used as a standard for healthcare providers, service providers, employers, service leads[1], education providers and health and care professionals practising at, or aspiring to practise at, the level of advanced clinical practice. Transformation of the workforce will support the delivery of excellent care and health improvement to individuals and the public by optimising the way new and existing roles are developed.

The key elements of the framework and a toolkit, which looks at the practical implementation of this approach, are available to individuals and the public on the Health Education England website **(https://hee.nhs.uk/our-work/developing-our-workforce/advanced-clinical-practice)**.

 [1]From herein this framework will refer to healthcare providers, service providers, employers and service leads as 'employers'.

Context

The NHS England Five Year Forward View (2014)[v] and the NHS England Next Steps on the Five Year Forward View (2017) set out the current challenges experienced by the NHS, its possible future and choices to be made. It is recognised in England that the increase in demand for services is intensifying the pressure on the workforce. It is also acknowledged that there are several issues throughout England and at a regional and/or local level, which have resulted in some significant gaps in the workforce, as well as low retention and recruitment rates.

The ability of the NHS to respond to these challenges has been affected by tighter financial constraints, growing workforce capacity issues and changes to working patterns. In addition, there have been significant concerns about the quality, safety and delivery of care in some settings (e.g. the issues raised in the Francis Report, 2013[vi]). Service providers have developed advanced clinical practice roles in response to some of these workforce and patient safety issues.

The growth in advanced clinical practice roles has been accompanied by debate over how the level of advanced clinical practice should be defined and what core skills and capabilities are required, resulting in frameworks being developed locally and regionally over the past decade. These have offered similar, but varying, definitions of advanced clinical practice, rather than an agreed common definition which can be used across professional boundaries and in a range of contexts. Therefore, this framework provides the agreed definition of the level of advanced clinical practice to be applied to registered health and care professions in England. Key principles guide the planning and development of the workforce and its governance.

The Five Year Forward View signals how the health service needs to change, arguing for a more engaged relationship with citizens and communities to promote well-being and prevent ill-health. This requires workforce transformation and a consistent approach to the development of new roles and new ways of working including advanced clinical practice as one of the many solutions[i]. A recent joint professions statement by the royal colleges and professional bodies representing the health workforce coordinated by the Academy of Medical Royal Colleges[vii] has supported and recognised this need and the professions have committed to work together to help create the environment to support effective team working and new ways of working and workforce development that impact on the quality of life of individuals, families and carers. This paves the way for different ways of working, using new models of care to achieve workforce transformation.

A key driver for the implementation of advanced clinical practice is to enable practitioners to practise to their full potential and to optimise their contribution to meeting population and individuals', families' and carers' needs through different models of service delivery and multi-disciplinary working.

This document has been developed as a result of wide engagement and collaboration, with contributions from health and care professionals, employers, universities, professional bodies and patient and service user representatives. It draws on and consolidates existing frameworks relating to advanced clinical practice from across the UK and provides guidance and principles for current and future professionals working at the level of advanced clinical practice.

Section 1: The capabilities for advanced clinical practice in England

1.1 Definition

The definition of advanced clinical practice was developed and agreed by all stakeholders is outlined below and some of the terminology has been updated to reflect more current language:

Advanced clinical practice is delivered by experienced, registered health and care practitioners. It is a level of practice characterised by a high degree of autonomy and complex decision making. This is underpinned by a master's level award or equivalent that encompasses the four pillars of clinical practice, leadership and management, education and research, with demonstration of core capabilities and area specific clinical competence.

Advanced clinical practice embodies the ability to manage clinical care in partnership with individuals, families and carers. It includes the analysis and synthesis of complex problems across a range of settings, enabling innovative solutions to enhance people's experience and improve outcomes.

This definition therefore requires that health and care professionals working at the level of advanced clinical practice will exercise autonomy and decision making in a context of complexity, uncertainty and varying levels of risk, holding accountability for decisions made.

1.2 Capabilities for advanced clinical practice in England

All health and care professionals working at the level of advanced clinical practice should have developed their skills and knowledge to the standard outlined in this framework; the capabilities are common across this level of practice enabling standardisation.

The four pillars[ii] that underpin this practice are:

1. Clinical Practice

2. Leadership and Management

3. Education

4. Research

The language used to describe the capabilities is deliberately mapped to level 7 taxonomy to support and make clear the expectation that people working at this level are required to operate at master's level i.e. to have the ability to make sound judgements in the absence of full information and to manage varying levels of risk when there is complex, competing or ambiguous information or uncertainty.

This framework acknowledges that the developmental pathway towards delivering advanced clinical practice may be different for individual practitioners. Health and care practitioners will demonstrate the capabilities in different ways, depending upon the nature of their scope and context of their practice, role and profession. It recognises there are many ways to gain and develop advanced practice capabilities, for further details please see the 'Education and development' section.

Listed below are the capabilities for health and care professionals working at the level of advanced clinical practice. The capabilities apply to all models of advanced clinical practice across sectors, specialties and professions and can be applied in either uni-professional or multi-professional models of care provision.

1. Clinical Practice

Health and care professionals working at the level of advanced clinical practice should be able to:

1.1 Practise in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.

1.2 Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice, including when working with complexity, risk, uncertainty and incomplete information.

1.3 Act on professional judgement about when to seek help, demonstrating critical reflection on own practice, self-awareness, emotional intelligence, and openness to change.

1.4 Work in partnership with individuals, families and carers, using a range of assessment methods as appropriate (e.g. of history-taking; holistic assessment; identifying risk factors; mental health

[ii]The capabilities have been mapped to the Framework for Higher Education Qualifications FHEQ (2008) Qualifications Assurance Agency for Higher Education (QAA) level 7 descriptors relevant for master's level education (see http://www.qaa.ac.uk/en/Publications/Documents/qualifications-frameworks.pdf).

assessments; requesting, undertaking and/or interpreting diagnostic tests; and conducting health needs assessments).

1.5 Demonstrate effective communication skills, supporting people in making decisions, planning care or seeking to make positive changes, using Health Education England's framework to promote person-centred approaches in health and care[viii].

1.6 Use expertise and decision-making skills to inform clinical reasoning approaches when dealing with differentiated and undifferentiated individual presentations and complex situations, synthesising information from multiple sources to make appropriate, evidence-based judgements and/or diagnoses.

1.7 Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, life style advice and care.

1.8 Exercise professional judgement to manage risk appropriately, especially where there may be complex and unpredictable events and supporting teams to do likewise to ensure safety of individuals, families and carers.

1.9 Work collaboratively with an appropriate range of multi-agency and inter-professional resources, developing, maintaining and evaluating links to manage risk and issues across organisations and settings.

1.10 Act as a clinical role model/advocate for developing and delivering care that is responsive to changing requirements, informed by an understanding of local population health needs, agencies and networks.

1.11 Evidence the underpinning subject-specific competencies i.e. knowledge, skills and behaviours relevant to the role setting and scope, and demonstrate application of the capabilities to these, in an approach that is appropriate to the individual role, setting and scope.

2. Leadership and Management

Health and care professionals working at the level of advanced clinical practice should be able to:

2.1 Pro-actively initiate and develop effective relationships, fostering clarity of roles within teams, to encourage productive working.

2.2 Role model the values of their organisation/place of work, demonstrating a person-centred approach to service delivery and development.

2.3 Evaluate own practice, and participate in multi-disciplinary service and team evaluation, demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e. outcomes of care, experience and safety).

2.4 Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements.

2.5 Lead new practice and service redesign solutions in response to feedback, evaluation and need, working across boundaries and broadening sphere of influence.

2.6 Actively seek feedback and involvement from individuals, families, carers, communities and colleagues in the co-production of service improvements.

2.7 Critically apply advanced clinical expertise in appropriate facilitatory ways to provide consultancy across professional and service boundaries, influencing clinical practice to enhance quality, reduce unwarranted variation and promote the sharing and adoption of best practice.

2.8 Demonstrate team leadership, resilience and determination, managing situations that are unfamiliar, complex or unpredictable and seeking to build confidence in others.

2.9 Continually develop practice in response to changing population health need, engaging in horizon scanning for future developments (e.g. impacts of genomics, new treatments and changing social challenges).

2.10 Demonstrate receptiveness to challenge and preparedness to constructively challenge others, escalating concerns that affect individuals', families', carers', communities' and colleagues' safety and well-being when necessary.

2.11 Negotiate an individual scope of practice within legal, ethical, professional and organisational policies, governance and procedures, with a focus on managing risk and upholding safety.

3. Education

Health and care professionals working at the level of advanced clinical practice should be able to:

3.1 Critically assess and address own learning needs, negotiating a personal development plan that reflects the breadth of ongoing professional development across the four pillars of advanced clinical practice.

3.2 Engage in self-directed learning, critically reflecting to maximise clinical skills and knowledge, as well as own potential to lead and develop both care and services.

3.3 Engage with, appraise and respond to individuals' motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximise their health and well-being.

3.4 Advocate for and contribute to a culture of organisational learning to inspire future and existing staff.

3.5 Facilitate collaboration of the wider team and support peer review processes to identify individual and team learning.

3.6 Identify further developmental needs for the individual and the wider team and supporting them to address these.

3.7 Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of learning to practice

3.8 Act as a role model, educator, supervisor, coach and mentor, seeking to instill and develop the confidence of others.

4. Research

Health and care professionals working at the level of advanced clinical practice should be able to:

4.1 Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety, productivity and value for money.

4.2 Evaluate and audit own and others' clinical practice, selecting and applying valid, reliable methods, then acting on the findings.

4.3 Critically appraise and synthesise the outcome of relevant research, evaluation and audit, using the results to underpin own practice and to inform that of others.

4.4 Take a critical approach to identify gaps in the evidence base and its application to practice, alerting appropriate individuals and organisations to these and how they might be addressed in a safe and pragmatic way.

4.5 Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activity[xi] and/or seeking out and applying for research funding.

4.6 Develop and implement robust governance systems and systematic documentation processes, keeping the need for modifications under critical review.

4.7 Disseminate best practice research findings and quality improvement projects through appropriate media and fora (e.g. presentations and peer review research publications).

4.8 Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers

Section 2: Key principles for the implementation of advanced clinical practice

2.1 Planning the workforce and governance

'How to ensure the right people, with the right skills, are in the right place at the right time' is a key priority to enable delivery of sustainable health and care services. This framework is relevant for any service looking to transform its workforce to meet the needs of the population through the employment of advanced clinical practice roles. How these are integrated into service delivery and team structures for a sustainable, consistent approach to the advanced clinical practice workforce development are presented as broad principles. This is so as to embrace the multiple settings and roles at this level and local context. In this section, both planning and governance of this workforce are addressed.

The governance of advanced clinical practice roles is vital to their success. Good governance involves inclusive, participative decision making with clear lines of accountability and responsibility. Policies and processes need to be in place and must include the evaluation of effectiveness, impact, ongoing sustainability and responsiveness. Organisations must ensure that robust governance arrangements surrounding all types and levels of practice, are in place prior to the establishment of new roles, and these must be enhanced and strengthened for existing ones.

As stated in the definition at the beginning of this framework, advanced clinical practice refers to a level of practice. Currently many titles are used for health and care professionals who work as this level such as 'Advanced Clinical Practitioner', 'Advanced Nurse Practitioner' and 'Advanced Practice Therapeutic Radiographer'. It is important to note that some professionals have been given the term 'advanced' in their role descriptor, but may not working at this level for various reasons. This may mean that employers need to review their workforce in order to make sure that there is no misunderstanding by the public and the multi-disciplinary team. Where needed, such professionals should be supported, developed and facilitated to work across all four pillars. Governance arrangements must be in place to consider these cases. Please see case examples - **https://www.hee.nhs.uk/our-work/developing-our-workforce/advanced-clinical-practice/case-studies**.

In order to embed advanced clinical practice and ensure its sustainability, it is necessary that the organisational governance and infrastructure arrangements include consideration of the following aspects of service transition:

- Practice governance and service user safety requirements
- Adherence to legal and regulatory frameworks
- Support systems and infrastructure for delegated roles (e.g. requesting diagnostic tests, administering medicines)
- Professional and managerial pathways of accountability
- Continued assessment against, and progression through, the capabilities identified within this framework
- Location of advanced clinical practice within a career framework that supports recruitment and retention, and succession planning to support workforce development
- Regular constructive clinical supervision that enables reflective practice together with robust annual appraisal.

The process of planning and thinking through these elements for advanced clinical practice roles in the workforce should result in the development of a business case that includes the above information and the resources required. The financial aspects should not be considered in isolation. Consideration must also be given to the ongoing support and structures that may be required to facilitate education, ongoing development, assessment and supervision (see the Education and development section).

A risk analysis and options appraisal, as well as an evaluation of the impact and effectiveness of existing and new roles should be included (see the toolkit **https://hee.nhs.uk/our-work/developing-our-workforce/advanced-clinical-practice** for further tools and examples).

Key principles for planning the workforce and governance:

In identifying the need for such roles and their potential impact, employers need to:

1. **Consider where advanced clinical practice roles can best be placed within health and care pathways to maximise their impact**

Historically there have been many drivers for the introduction of the level of advanced clinical practice: clinical, operational, financial and professional. However, primary consideration must be given to where this level of practice would be best placed for greatest impact in health and care pathways.

This may mean that those working in advanced clinical practice might operate outside traditional service delivery boundaries and potentially, traditional professional boundaries. The intention should be to move towards developing and planning the workforce to meet local population needs. Therefore, at the local area level, organisations should be working to generate a sustainable supply of health and care workforces who are able to work more flexibly across these boundaries.

2 **Define a clear purpose and objectives for advanced clinical practice roles.**

The level of advanced clinical practice typically exists across professional boundaries within multi-professional teams. Planning must not be done in isolation, local consideration must be given to workforce supply, existing roles and support for development. In addition, attention must be paid to the starting points for different professions relative to their core training, as well as to their duties and responsibilities. The capabilities which reflect the area of work or specialty will be required to be clearly defined.

Clinicians and service managers should be involved in planning the workforce together. Such planning should focus on the wider team, thinking about the value of the role and its purpose and objectives. Practitioners must be working to national standards, where these exist.

3. **Consider and evaluate the impact of advanced clinical practice roles on service user experience and outcomes and on service delivery and improvement objectives.**

Patient/service user and public involvement in understanding these roles, their functions and boundaries as part of the wider health and care teams, is essential and must be built into this process.

The importance of ensuring continuous improvement in the quality of care to individuals is widely recognised. It is therefore necessary to measure the impact of the activities of all staff, with a particular focus on new roles added to the workforce. The development and utilisation of robust evaluation methods is essential. In addition, evidence demonstrating value for money and good quality of care may be required to influence senior management teams to support the introduction of new roles. This will include how the organisation or employer should quality assure itself to ensure the safety and effectiveness of the advanced clinical practice roles. For example, by using methods for monitoring and evaluating both effectiveness and impact such as, the monitoring of complaints, incidents and patient/service user outcomes and feedback. This is an essential part of governance, i.e. the observation and evaluation of intended and unintended consequences.

There are specific questions employers need to address in considering advanced clinical practice roles and to ensure good governance of those roles

- What objective outcomes are expected from the advanced clinical practice role?
- When will these outcomes be achieved and how will these be measured pre and post implementation?
- What risks and unintended consequences might there be to the introduction of this role and how may they be mitigated against?
- What resources and support are required for role development and succession planning?
- Is workforce optimised to ensure clinical and financial benefits are maximised?
- How will on-going competence and capability be reviewed and enabled?

- What reporting and line management structure will be in place?
- What processes will identify gaps in performance and/ or shortfalls in implementation and how will these be addressed?
- Has a quality assurance model been considered to measure this e.g. CQC 5 key lines of enquiry which will support inspection.

Thinking through these questions and finding answers will then guide governance structures and policy development but also evaluation against expected and unexpected outcomes.

4. Ensure clarity about the service area the individuals will work within

Understanding the level of advanced clinical practice relative to the wider team, requires the roles of all team members, i.e. those above, below and surrounding this level, to be understood. Multi-professional engagement in this work is essential to build trust, understanding, supervision and support (see the 'Education and development section' for more information on supervision). Those working in an advanced clinical practice role will need to negotiate their individual scope of practice with service managers and the rest of the team. The wider team needs to understand the level of accountability of those in this role. To achieve these objectives there needs to be clarity and understanding as well as a proactive culture of working in partnership.

By advancing the level of practice of some staff, the people in the grades below may need some development to increase their skills and knowledge as the expectation of their roles develops too. Staff in the grades above may need some support to potentially change some aspects of their role and potentially start doing some work differently. This must be understood, supported and widely communicated.

Employers also need to consider impact planning and the evaluation of the team into which the new role is introduced, and those it may impact on outside this team, reflecting on the implications for the skills mix and any changes that might be needed.

This process may then enable career and succession planning opportunities.

5. Ensure clear and unambiguous support for the role from the organisation/ employer at all levels

The employer must recognise the responsibilities and capabilities of someone working in these roles. This must be reflected and supported at a local and organisational level. The support must be wider than educational, the voice of the those working in an advanced clinical practice role must be heard via existing or new governance and reporting structures. The board level directors, the clinical leads for the profession and managers must be aware of, understand and recognise the value of, advanced clinical practice roles. This must be cited in the governance arrangements, so that there are clear lines of professional and managerial accountability up to board level.

In addition, the employer must be aware that certain skills, e.g. prescribing, are only legally allowed for certain professions, and that this does not preclude all professions from working in an advanced clinical practice role.

6. Develop a succession plan for future workforce.

This should be actively supported for service sustainability, succession planning and staff retention. Clarity in the above principles will enable a clear pipeline to be developed and will support retention.

2.2 Accountability

Health and care professionals working in advanced clinical practice roles are encouraged to work to their full potential to optimise the benefits that can be gained from new models of care. Therefore, individual and organisational governance need to be robust and within legal, regulatory and professional frameworks, as there is a possibility that professionals taking on new roles and responsibilities could put people at risk. This could be caused by lack of competence to carry out duties safely or effectively, or where adequate safeguards are not in place, if these roles are not properly supported. This section examines these elements of governance which must be in place for the advanced clinical practice role.

For the purpose of this document and the point in time at which it has been formulated, this framework applies to those who have statutory registration. In order to offer

clarity to the system, this work has been formulated with the regulated workforce in in mind. It is understood that there are some professions that are being considered for statutory regulation and therefore are not registered at this time. Not being registered does not preclude these professional groups from working at this level but employers and employees must understand the implications and have an appropriate approach to this through safe and effective governance.

The development of advanced clinical practice roles requires that:

1. **Individual practitioners, as registered professionals, continue to hold professional responsibility and accountability for their practice.**

Work by the Commission for Healthcare Regulatory Excellence (2009)[xi], now the Professional Standards Authority, emphasised that the activities undertaken by professionals at a level of advanced clinical practice do not lie beyond the scope of existing regulation, unless the nature of their practice changes to such a significant extent that their sphere of practice is fundamentally different from that at initial registration.

Practitioners working in advanced clinical practice roles must be aware of their own limitations and through this, recognise the parameters of their scope of practice.

It is proposed that advanced clinical practice roles should reflect a set of responsibilities and capabilities which act as an indicator of a specific stage on the career development ladder. In addition, such practitioners will always be accountable to their original regulatory body, whatever the level or context of their practice. This has been reflected in the capabilities.

2. **Employers recognise and accept potential new responsibilities and greater accountability in relation to governance and support for these roles and associated level of practice.**

Governance has been mentioned in the key principles for planning the workforce and governance. It is also cited in the capabilities. It applies to all registrants and is articulated within respective professional codes of practice. Employers carry responsibility and vicarious liability for practitioners, and must be responsible for ensuring that all advanced clinical practice roles, both those that are existing or those of the future, do not compromise safety. Policies and processes may need to be modified to reflect this. Without this, there is a risk of "unconscious incompetence[xii]", which may compromise safe person-centred care, as well as the reputation of advanced clinical practice.

3. **Professional support arrangements, which recognise the nature of the role and the responsibilities involved must be explicit and developed.**

Good governance regarding new role development and implementation must be based on consistent expectations and understanding of the level of practice required to deliver the service and assure safe quality standards of practice for service users. This is best achieved through the benchmarking of such posts against: agreed standards in England, best practice and the capabilities under the four pillars. Strategies such as supervision, mentorship, good record-keeping, ongoing self-assessment and development are an essential element of demonstrating accountability within practice. Existing professional support mechanisms may not be sufficient and may need to be reviewed.

These processes and strategies should be complemented by clear lines of professional responsibility and line-management and regular independent clinical reviews. Management lines of accountability may need strengthening as often staff will have a line manager separate to their team and may perhaps work across a number of teams which may add complexity and competing pressures. This must be understood and managed.

Appraisal processes may need strengthening. These processes will need to be completed in collaboration with the line manager and an appropriately qualified clinical lead. Appraisal may use evidence or feedback; clinical audit data; outcomes and issues review: productivity measures; 360 degree feedback and service user feedback.

This approach provides the most effective means of controlling risks to a patient/service user's safety from an individual professional's practice and provides a proportionate response.

4. Employers must ensure regular review and supervision is carried out by those who are appropriately qualified to do so.

Governance arrangements must also ensure that those who support and review practice are also developed, facilitated and supported to carry out this role.

2.3 Education and development

This section outlines the principles to support the development of the workforce to work at the level of advanced clinical practice. The document recognises and respects that there are many ways to gain and develop these capabilities. It aims to ensure that there are robust and clear routes to evidencing achievement of the capabilities.

Educators and employers are therefore challenged to enable capability and competence, offering an environment and a process that allows practitioners to develop abilities that are sustainable for changability, improvability and responsiveness.[ii]

Principles for education and development

At an advanced clinical practice level the attainment of both competence and capability are important:

- It is essential that practitioners are developed to be clinically competent within their specialty, sector and setting.
- Capability development is also essential: this requires practitioners to be able to recognise what level of competence is required within any given situation and apply this successfully, recognising the limits of their competence. Capability also requires the practitioner to have the ability to extend these limits when required and flexibly adapt to unfamiliar professional environments.

Local adaptation of this guidance is important to ensure workforce development is matched to local population needs, however the capabilities are deliberately stated in order to support a common understanding and expectation of this level of practice, in order to facilitate the development and mobility of this workforce at scale.

In order to meet the diverse and ever-changing workforce needs, it is essential that an outcome driven approach to developing the workforce is utilised, using the capabilities to ensure underpinning consistency and rigor. Therefore, the focus must be on the outcome, i.e. of the capabilities being met at the required level, as opposed to the developmental input or the educational process undertaken.

Education progression routes need to enable practitioners to develop and demonstrate the capabilities, recognising that this can be achieved in multiple ways, dependent upon sector, profession, setting, role and service need.

The flow chart in the 'Development routes' diagram (page 16-17) shows the educational routes possible to develop both clinical competence and capability.

The development of health and care professionals to enable them to operate at the level of advanced clinical practice, requires three elements within the workplace:

- **development** of competence and capability
- **supervision** and support in the work place
- **assessment** of competence and capability

Development of competence and capability

Practitioners and employers will need to work collaboratively to identify individual learning needs and determine the most effective route to meet these. It is essential to recognise that each profession will begin from a different starting point in their development of advanced level skills. Employers are encouraged to support practitioners to identify personal learning plans, help and meet their learning needs by supporting the:

- clear articulation of the role and scope to be undertaken
- understanding of the availability of existing speciality specific national clinical competencies or support to develop these with the clinical team
- mapping of previous education or experience against the four pillars to decide whether a practitioner's existing qualifications cover the relevant capabilities required for the level of advanced clinical practice in the health and care professional's setting, subject area and job role. This may enable the individual to evidence some of the required capabilities through a portfolio route or as APL/APEL.

- appraisal of existing educational programmes content, approach and structure to determine match to individual requirements
- agreement of an appropriate educational approach e.g. programme of assessed work based learning and/or an academic programme
- understanding of funding routes e.g. apprenticeship, local funding arrangement etc.
- agreement of the required work based assessments to evidence sustained attainment of the agreed capabilities in practice
- support of a named, trained educational supervisor, who is a specialist within the clinical area, to support the work based learning and assessment and sign off for the capabilities/portfolio.

The accreditation or recognition of relevant prior learning or prior experiential learning (APL/APEL) process is integral to ensure health and care professionals' existing qualifications and experiential learning are recognised as appropriate. New models of evidencing RPL and equivalence are being explored.

Individuals and healthcare providers may utilise a combination of approaches e.g. work based learning, simulation or e-learning to ensure that professionals developing a portfolio to evidence advanced clinical practice get full exposure to the appropriate levels of learning. All routes are important as some health and care professionals aspiring to work in an advanced clinical practice role may have completed alternative qualifications at master's level, particularly in health and care professions that require a master's level award for registration.

Clinical training must acknowledge the importance of time and experience to build confidence in decision making and the management of risk.

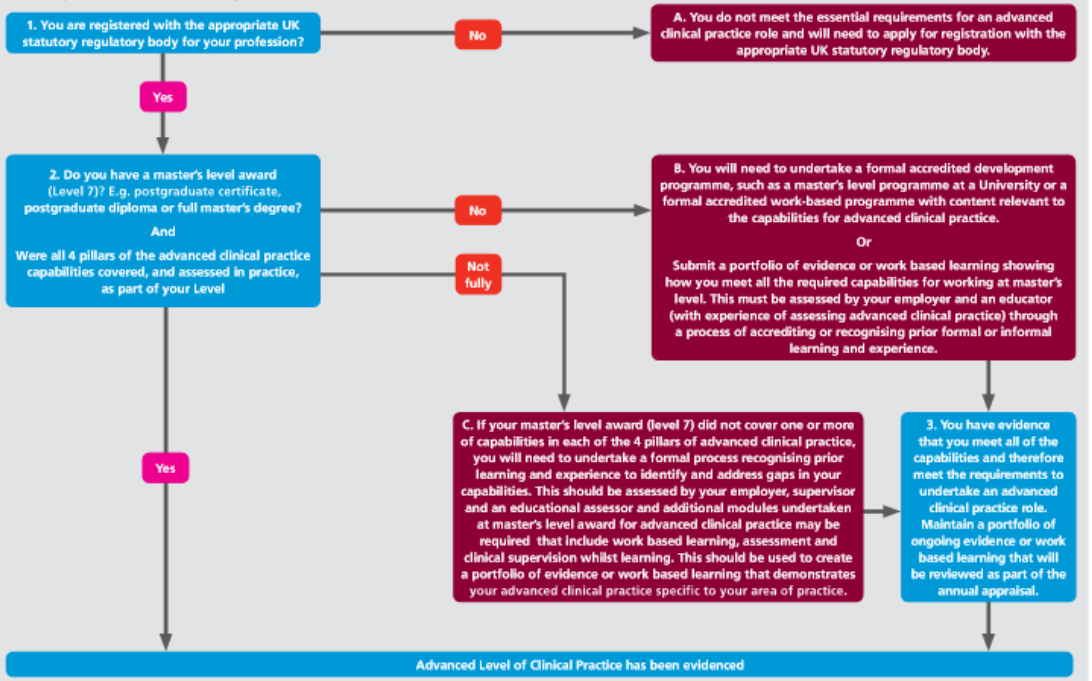
It is important to note that having a master's degree does not grant the practitioner advanced clinical practitioner status. Evidenced achievement of the capabilities, employer support and a clear funded role to move into are all essential components.

Multi-professional framework for
advanced clinical practice in England

Development routes

The following flow chart provides guidance on the possible ways of evidencing the capabilities within the four pillars of advanced clinical practice

Pathway to Evidence level of Advanced Clinical Practice



Supervision and support in the workplace

Individuals will need to commit to the achievement of the assessment requirements for the level of advanced clinical practice, however, they will also be reliant on the support of others.

During their development individuals will require the support of an identified educational supervisor in the work place, for example a colleague working at consultant level or another appropriately qualified senior practitioner. The supervisor will provide continuity of support and an overview of the development of the individual practitioner as a whole.

Other staff may undertake supervision for shorter, focused periods of training. The supervisor and members of the wider education teams will need to be clear about the roles and responsibilities each has for day-to-day support in developing individuals, as well as being aware of their importance in nurturing and supporting the personal development of individuals.

Access to supported peer review, in addition to a supportive environment is essential and may happen within or across organisations. The use of action learning sets or learning groups offers a broader level of support.

Professionals working at a level of advanced clinical practice have a responsibility for their on-going continuing professional development. Employers will need to ensure there are opportunities for continuing professional development to ensure patient safety, the appropriate ongoing development and maintenance of capability.

Assessment of competence and capability

Work Based Assessment

A key element of the preparation for individuals to practice at the level of advanced clinical practice will be a formal assessment of achievement of the capabilities, specific to the context of their practice. It is critical to the implementation, acceptance and sustainability of advanced clinical practice that health and care professionals working at this level are widely recognised as having a consistent level of competence. They must also be equally capable of fulfilling the specialist requirements of functioning at this level.

Assessment outside of formal programmes of study will need to be valid and reliable and may include: case based presentation, theoretical and/or practical tests of knowledge skills and behaviours critical reflections, portfolio of evidence etc.

To ensure assessment in the workplace is valid and reliable:

- assessors must be occupationally competent, recognised as such by employers and education providers, and be familiar with the chosen assessment tool
- a range of assessors, trained in the relevant assessments, should be used, including educators with appropriate academic and clinical experience and competent health and care professionals at the required level
- healthcare providers must invest in and support staff to undertake assessment(s) in practice.

Work based assessment must happen within the work setting undertaken by experienced clinicians aware of the benchmark level of capability required for this level of practice, especially where a variety of professions are undertaking advanced practice skills.

There will be a strong need for collaboration and working across professional and organisational boundaries to ensure that learning and assessment in practice delivers practitioners who consistently meet the required outcomes in all settings.

Assessment of a portfolio of evidence

This requires experts trained in the standardised assessment of The Framework for Higher Education Qualification - QAA level 7 work based learning to review the collected portfolio of evidence submitted against the capabilities listed. This should be undertaken by a balanced group of two or more experienced assessors and an agreement reached if the panel agree that the portfolio of evidence reflects the registrants' assertion that they have met the standards.

Local arrangements are recommended and should be resourced locally, enabling local partnerships with experienced and trained clinicians, postgraduate medical educators, Higher Education Institute (HEI) staff or as part of a Royal College/Professional Body accreditation programme.

Additional considerations

In order to optimise cost effective training, collaboration across an area or place may be required to enable master's level programmes offering sufficient flexibility to develop the workforce to have the required speciality specific competency and broad capability across the four pillars.

The specialist modules may need to be delivered across England, regionally or locally due to numbers of learners required for course viability. Thus, APEL/APL and flexible work based learning are vital to enable this to be accommodated within local programmes of study. The development of bespoke local support with practice educators/educational supervisors, Higher Education Institutes and/or Postgraduate Medical Education will offer useful local momentum to support this work, for example:

- a collaborative programme to appraise portfolios utilising existing clinical experts and educators within service
- work based units to ensure meaningful clinical exposure and assessment
- specialist training modules
- adoption of national specialist clinical standards into programmes, where they exist
- delivery of inter-professional learning and support where feasible, to support workforce transformation, by building relationships, trust and respect
- workplace assessment

The potential offered by the apprenticeship route at level 7 will need to be understood and explored, as one of a number of potential vehicles to support the delivery of this agenda. This work has been developed alongside the apprenticeship standards and both documents support the development of the workforce to the same level and capabilities, although the language used has needed to be different. It has been necessary to set the Apprenticeship level as full master's award due to the nature of the process, this document offers further flexibility to service to support a variety of outcome focussed developmental routes to build workforce capability.

Conclusion

This framework defines and sets the standard for the level of advanced clinical practice. It establishes the capabilities for this level. It also sets out a clear standard of education.

Guidance is given to employers on decision making processes that must be introduced so that they understand when and how this level of practice should be implemented. Primary consideration is given to where this level of practice would be best placed in individuals', families' and carers' journeys for greatest impact upon the planning of the workforce. Employers responsibilities regarding processes and governance are set out.

The level of advanced clinical practice needs to be widely explained and understood, both by the rest of the workforce and by the public. Those practising at the level of advanced clinical practice, and those aspiring to this role, need to be supported by their employers and everyone working around them. This will encourage innovative ways of working in modern teams.

This is an area of much current development and new opportunities this framework will be reviewed after one year to update the content to reflect changes to education, national specialty specific developments, the potential regulation of new professions and the fast paced developments in service.

The expected timeline for this framework to be implemented is 2020, it is understood that new and existing workforce will need different and yet complimentary support to evidence their attainment of the level of practice. This corresponds with the timescale for change set by the NHS England Five Year Forward View (2014). This ensures the quality of care that is being delivered, will be responsive to changing requirements and informed by an understanding of local population health needs.

Glossary

ACP	Advanced Clinical Practice
AHP	Allied Health Professional
APL/APEL	Accreditation of Prior Learning
Capabilities	Extent to which individuals can adapt to change, generate new knowledge and continue to improve their performanceii
Competencies	What individuals know or are able to do in terms of knowledge, skills and behaviourii
Education Provider	A provider of higher educational services
HCPEL Group	Health & Care Professions' Education Leads Group
HEE	Health Education England
HEI	Higher Education Institute
Master's level award	This is an award that uses the relevant descriptors set at level 7 by the Framework for Higher Education Qualifications (FHEQ). This is explained here: **https://www.gov.uk/what-different-qualification-levels-mean/list-of-qualification-levels**
NHSI	NHS Improvement
NHSE	NHS England
Practitioner	A non-medical clinical member of the workforce who may come from any professional background
PSA	Professional Standards Authority
QAA level 7	The Framework for Higher Education Qualifications FHEQ (2008) Qualifications Assurance Agency for Higher Education (QAA) level 7 descriptors relevant for master's level education

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Advanced Clinical Practice Steering Group representation included:

Jennifer Aston
Royal College of General Practitioners

Charlotte Beardmore
Health & Care Professions' Education Leads Group (HCPEL Group)

Iain Beith
Council of Deans of Health

Trevor Beswick
Pharmacy, HEE

Rebecca Burgess-Dawson
Mental Health Programme, HEE

John Clark
Director and Dean of Education and Quality, HEE

Gill Coverdale
Royal College of Nursing

Natalie Cullen
Department of Health

Liz Fenton
Shape of Caring programme, HEE

Helen Finch
HEE Local Offices Advanced Clinical Practice Working Group

Maxine Foster
Genomics, HEE

Sam Foster
Advanced Clinical Practitioner Apprenticeship Programme

Appendix 1: List of Contributors

Sadie Gay
National School of Healthcare Science

Lynne Hall
Mental Health and Learning Disability, HEE

Beverley Harden
Multi-professional Workforce, HEE & New Care Models, NHSE

Peter Harris
Patient/Public Representative

Sharon Harrison
National ACP Programmes, HEE

Carol Jollie
National Commissioners Network, HEE

Sukvinder Kaur
National ACP Programmes, HEE

Donna Poole
HEE Local Offices Advanced Clinical Practice Working Group

Kevin Moore
Workforce Transformation, HEE

Shelagh Morris
AHP, NHS England

Ruth Pearce
Association of Advanced Practice Educators

Mark Radford
Director of Nursing, NHS Improvement

Patricia Saunders
Policy, HEE

Clare Sutherland
ACP, Derby Hospitals NHS Foundation Trust

Robyn Swain
NHS Employers

David Wilkinson
Postgraduate Deans, HEE

Barbara Wood
Patient/Public Representative

Gillian Arblaster
Lisa Atkins
Charlotte Beardmore
Clare Bentall
Michelle Bishop
Rebecca Burgess-Dawson
Nigel Charlesworth
John Clark
Robert Crouch
Anne-Marie Culpan
Saima Ehsan
Liz Fenton
Maxine Foster
Danielle Fullwood
Sandie Gay
Phil Goode
Adrian Jones
Beverley Harden
Peter Harris
Jenny Hiley
Kathryn Jones
Angela Keen
Katrina Maclaine
Pauline Milne
Shelagh Morris
Hanna Murphy
Ruth Pearce
Wendy Preston
Patricia Saunders
Andy Sharman
Jill Smit
Clare Sutherland
Juliette Swift
Juliet Thorogood
Anne Welling
Stephen-Andrew Whyte
Barbara Wood

Jennifer Aston
Harminder Bains
Iain Beith
Trevor Beswick
Jackie Brocklehurst
Jane Butler
Clare Chivers
Gill Coverdale
Natalie Cullen
Sarah Davies
Theresa Fail
Helen Finch
Sam Foster
Rhonda Fusco
Judy Gillow
Sally Gosling
Lynne Hall
Deborah Harding
Sharon Harrison
Carol Jollie
Sukvinder Kaur
Fleur Kitsell
Ruth Pearce
Kevin Moore
Louise Morton
Catherine O'Keeffe
Donna Poole
Mark Radford
Dawn Scott
Catherine Sills
Lisa Stone
Robyn Swain
Christine Sykes
Jo Watson
Ros Wells
David Wilkinson

Appendix 2 – Resources (websites and documents

Academy of Medical Royal Colleges & New Care Models Programme Workforce Joint statement **http://www.aomrc.org.uk/wp-content/uploads/2017/01/2017-01-26_NCM_Academy_Joint_Statement_Action_Plan.pdf**

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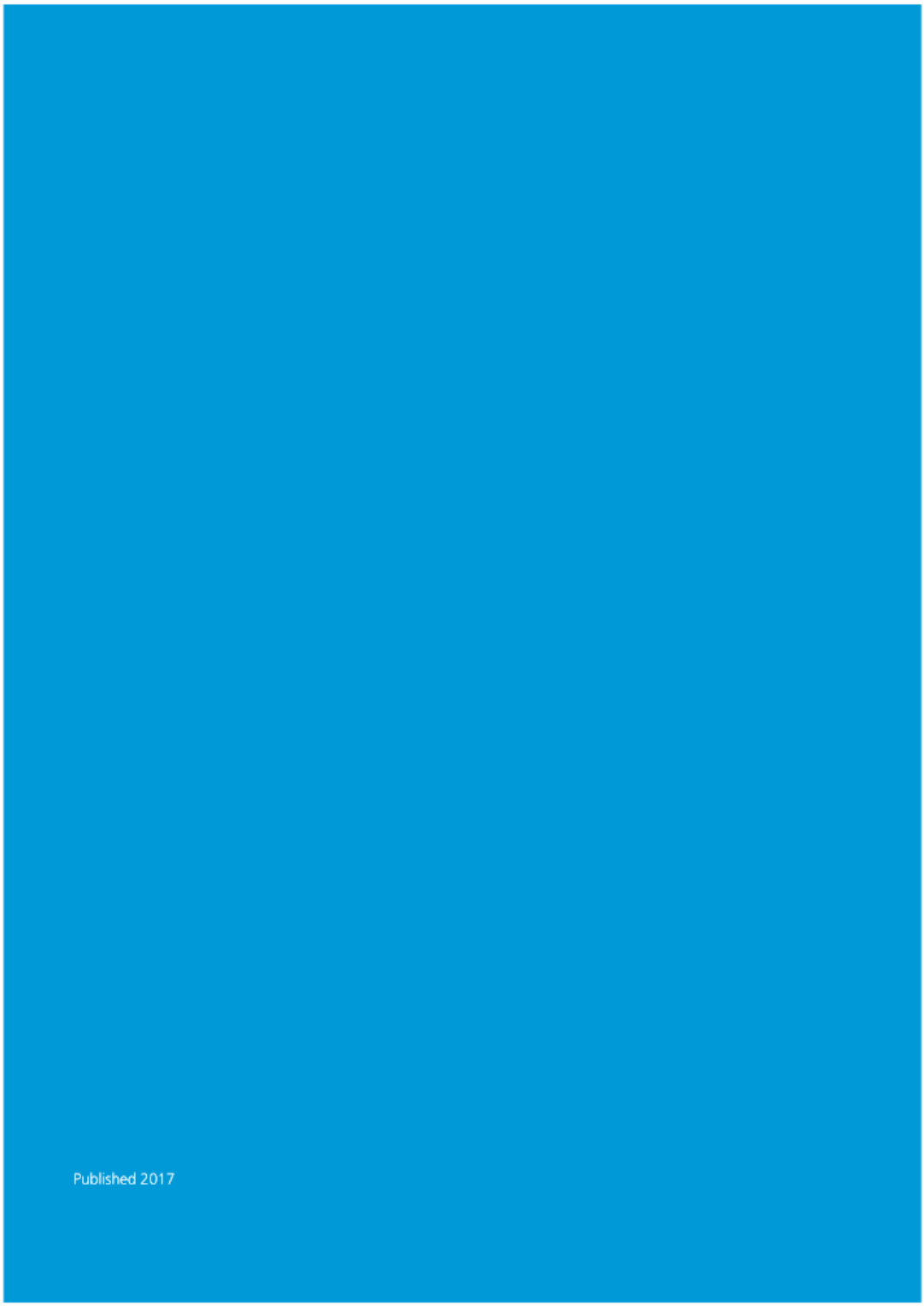
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Appendix E

Practice Standards of the Radiologist Assistant (USA)

Description	The radiologist assistant works under the supervision of a radiologist to enhance patient care by assisting in the diagnostic imaging environment. In practice, the clinical roles and responsibilities of each R.A. are tailored to the needs of the patient population, practice setting, state licensure laws and regulations, institutional credentialing requirements and federal reimbursement policies. As a result, R.A. practice varies from facility to facility
Advanced elements	• Lead role in patient management and assessment • Performance of selected radiology examinations and procedures under the supervision of a radiologist – the level of radiologist supervision varies, depending on the type of examination • Initial image observations (not diagnosis) to be forwarded to the supervising radiologist
Restrictions on practice	The R.A. cannot: • Substitute for the radiologist • Act independently • Prescribe medications, treatments or therapies • Provide an official interpretation of the imaging findings • Prepare a final written report • Independently bill for services
Examples of advanced clinical activities	Patient assessment: • Patient interview to verify and update medical history • Radiology-focused physical examination • Patient anxiety and pain levels • Analysis of data (e.g., signs and symptoms, laboratory values, vital signs, and significant abnormalities) • Report of findings to the delegating radiologist • Assistance with invasive or complex radiology procedures Performance of selected procedures under the supervision of the radiologist: • Fluoroscopy

	• Non-invasive procedures • Feeding tube placements • Venous diagnostic exams • Moderate sedation procedures • Administration of moderate sedation • Observation and assessment of moderately sedated patients Obtaining and documentation of patient consent: • Explanation of procedure to the patient or significant others, including a description of risks, benefits, alternatives and follow-up • Referral of questions about diagnosis, treatment or prognosis to the delegating radiologist Communicates initial observations: • Evaluates images for image and diagnostic quality • Reviews the images for initial observations • Report of initial observations to delegating radiologist • Communication of delegating radiologist's report to the appropriate healthcare provider Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiologist: • Post-care instructions to patient as ordered by the delegating radiologist
Examples of evidence-based activities	• Collection of data for clinical research
Examples of leadership	• Involvement in evaluation and maintenance of patient safety programs and initiatives • Education of other healthcare providers regarding area of expertise
Resultant improvements to service	• Continuity of care for the patient (i.e., one person remains with the patient throughout the entire radiologic procedure) Improved departmental efficiency: • Radiologists free to perform more complex procedures and for interpretation

Appendix F

Physician Assistant Competencies

Competencies for the PA Profession
(Adopted 2005, reaffirmed 2010, 2018, amended 2013, 2021)

Introduction

This document defines the specific knowledge, skills, and attitudes that physician assistants (PAs) in all clinical specialties and settings in the United States should be able to demonstrate throughout their careers. This set of competencies is designed to serve as a roadmap for the individual PA, for teams of clinicians, for healthcare systems, and other organizations committed to promoting the development and maintenance of professional competencies among PAs. While some competenciesare acquired during the PA education program, others are developed and mastered as PAs progress through their careers.

The PA professional competencies include seven competency domains that capture the breadth and complexity of modern PA practice. These are: (1) knowledge for practice, (2) interpersonal and communication skills, (3) person-centered care, (4) interprofessional collaboration, (5) professionalism and ethics, (6) practice-based learning and quality improvement,and (7) society and population health. The PA competencies reflect the well-documented need for medical practice to focus on surveillance, patient education, prevention, and population health. These revised competencies reflect the growing autonomy of PA decision-making within a team-based framework and the need for the additional skills in leadership and advocacy.

As PAs develop greater competency throughout their careers, they determine their level of understanding and confidence in addressing patients' health needs, identify knowledge and skills that they need to develop, and then work to acquire further knowledge and skills in these areas.

This is a lifelong process that requires discipline, self-evaluation, and commitment to learningthroughout a PA's professional career.

Background

The PA competencies were originally developed in response to the growing demand for accountability and assessment in clinical practice and reflected similar efforts conducted by other healthcare professions. In 2005, a collaborative effort among four national PA organizations produced the first Competencies for the Physician Assistant Profession. These organizations are theNational Commission on Certification of Physician Assistants, the Accreditation Review Commissionon Education for the Physician Assistant, the American Academy of PAs, and the Physician Assistant Education Association (PAEA, formerly the Association of Physician Assistant Programs). The same four organizations updated and approved this document in 2012.

Methods

This version of the *Competencies for the Physician Assistant Profession* was developed by the Cross-Org Competencies Review Task Force, which included two representatives from each of the four national PA organizations. The task force was charged with reviewing the professional competencies as part of a periodic five-year review process, as well as to "ensure alignment with the *Core Competencies for New PA Graduates*," which were developed by the Physician Assistant Education Association in 2018 to provide a framework for accredited PA programs to standardize practice readiness for new graduates.

The Cross-Org Competencies Review Task Force began by developing the following set of guiding principles that underpinned this work:

1. PAs should pursue self- and professional development throughout their careers.
2. The competencies must be relevant to all PAs, regardless of specialty or patient care setting.
3. Professional competencies are ultimately about patient care.
4. The body of knowledge produced in the past should be respected, while recognizing the changing healthcare environment.
5. The good of the profession must always take precedence over self-interest.

The task force reviewed competency frameworks from several other health professions. The resultis a single document that builds on the *Core Competencies for New PA Graduates* and extends through the lifespan of a PA's career.

The competencies were drawn from three sources: the previous Competencies for the Physician Assistant Profession, PAEA's Core Competencies for New PA Graduates, and the Englander et al article Toward a Common Taxonomy of Competency Domains for the Health Professions and Competencies for Physicians which drew from the competencies of several healthprofessions.[1] The task force elected not to reference the source of each competency since most of these competencies were foundational to the work of multiple health professions and are in the public domain. The task force acknowledges the work of the many groups that have gone before them in seeking to capture the essential competencies of health professions.

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Competencies

1. Knowledge for Practice

Demonstrate knowledge about established and evolving biomedical and clinical sciences and the application of this knowledge to patient care. PAs should be able to:

1.1 Demonstrate investigative and critical thinking in clinical situations.

1.2 Access and interpret current and credible sources of medical information.

1.3 Apply principles of epidemiology to identify health problems, risk factors, treatment strategies, resources, and disease prevention/health promotion efforts for individuals and populations.

1.4 Discern among acute, chronic, and emergent disease states.

1.5 Apply principles of clinical sciences to diagnose disease and utilize therapeutic decision-making, clinical problem-solving, and other evidence-based practice skills.

1.6 Adhere to standards of care, and to relevant laws, policies, and regulations that govern thedelivery of care in the United States.

1.7 Consider cost-effectiveness when allocating resources for individual patient or population-based care.

1.8 Work effectively and efficiently in various healthcare delivery settings and systemsrelevant to the PA's clinical specialty.

1.9 Identify and address social determinants that affect access to care and deliver high qualitycare in a value-based system.

1.10 Participate in surveillance of community resources to determine if they are adequate tosustain and improve health.

1.11 Utilize technological advancements that decrease costs, improve quality, and increaseaccess to healthcare.

2. Interpersonal and Communication Skills

Demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals. PAs should beable to:

2.1 Establish meaningful therapeutic relationships with patients and families to

ensure that patients' values and preferences are addressed and that needs and goals are met to deliverperson-centered care.

2.2 Provide effective, equitable, understandable, respectful, quality, and culturally competent care that is responsive to diverse cultural health beliefs and practices, preferred languages,health literacy, and other communication needs.

2.3 Communicate effectively to elicit and provide information.

2.4 Accurately and adequately document medical information for clinical, legal, quality, andfinancial purposes.

2.5 Demonstrate sensitivity, honesty, and compassion in all conversations, including challenging discussions about death, end of life, adverse events, bad news, disclosure oferrors, and other sensitive topics.

2.6 Demonstrate emotional resilience, stability, adaptability, flexibility, and tolerance ofambiguity.

2.7 Understand emotions, behaviors, and responses of others, which allows for effectiveinterpersonal interactions.

2.8 Recognize communication barriers and provide solutions.

3. Person-centered Care

Provide person-centered care that includes patient- and setting-specific assessment, evaluation,and management and healthcare that is evidence-based, supports patient safety, and advances health equity. PAs should be able to:

3.1 Gather accurate and essential information about patients through history-taking, physicalexamination, and diagnostic testing.

3.2 Elicit and acknowledge the story of the individual and apply the context of the individual'slife to their care, such as environmental and cultural influences.

3.3 Interpret data based on patient information and preferences, current scientific evidence,and clinical judgment to make informed decisions about diagnostic and therapeutic interventions.

3.4 Develop, implement, and monitor effectiveness of patient management plans.

3.5 Maintain proficiency to perform safely all medical, diagnostic, and surgical proceduresconsidered essential for the practice specialty.

3.6 Counsel, educate, and empower patients and their families to participate in their care and enable shared decision-making.

3.7 Refer patients appropriately, ensure continuity of care throughout transitions betweenproviders or settings, and follow up on patient progress and outcomes.

3.8 Provide healthcare services to patients, families, and communities to prevent healthproblems and to maintain health.

4. Interprofessional Collaboration

Demonstrate the ability to engage with a variety of other healthcare professionals in a manner that optimizes safe, effective, patient- and population-centered care. PAs should be able to:

4.1 Work effectively with other health professionals to provide collaborative, patient-centeredcare while maintaining a climate of mutual respect, dignity, diversity, ethical integrity, andtrust.

4.2 Communicate effectively with colleagues and other professionals to establish and enhanceinterprofessional teams.

4.3 Engage the abilities of available health professionals and associated resources to complement the PA's professional expertise and develop optimal strategies to enhancepatient care.

4.4 Collaborate with other professionals to integrate clinical care and public healthinterventions.

4.5 Recognize when to refer patients to other disciplines to ensure that patients receive optimalcare at the right time and appropriate level.

5. Professionalism and Ethics

Demonstrate a commitment to practicing medicine in ethically and legally appropriate ways and emphasizing professional maturity and accountability for delivering safe and quality care to patients and populations. PAs should be able to:

5.1 Adhere to standards of care in the role of the PA in the healthcare team.

5.2 Demonstrate compassion, integrity, and respect for others.

5.3 Demonstrate responsiveness to patient needs that supersedes self-interest.

5.4 Show accountability to patients, society, and the PA profession.

5.5 Demonstrate cultural humility and responsiveness to a diverse patient populations, including diversity in sex, gender identity, sexual orientation, age, culture, race,

ethnicity, socioeconomic status, religion, and abilities.

5.6 Show commitment to ethical principles pertaining to provision or withholding of care, confidentiality, patient autonomy, informed consent, business practices, and compliancewith relevant laws, policies, and regulations.

5.7 Demonstrate commitment to lifelong learning and education of students and other healthcare professionals.

5.8 Demonstrate commitment to personal wellness and self-care that supports the provision ofquality patient care.

5.9 Exercise good judgment and fiscal responsibility when utilizing resources.

5.10 Demonstrate flexibility and professional civility when adapting to change.

5.11 Implement leadership practices and principles.

5.12 Demonstrate effective advocacy for the PA profession in the workplace and in policymaking processes.

6. Practice-based Learning and Quality Improvement

Demonstrate the ability to learn and implement quality improvement practices by engaging in critical analysis of one's own practice experience, the medical literature, and other information resources for the purposes of self-evaluation, lifelong learning, and practice improvement. PAs should be able to:

6.1 Exhibit self-awareness to identify strengths, address deficiencies, and recognize limits inknowledge and expertise.

6.2 Identify, analyze, and adopt new knowledge, guidelines, standards, technologies, products,or services that have been demonstrated to improve outcomes.

6.3 Identify improvement goals and perform learning activities that address gaps in knowledge,skills, and attitudes.

6.4 Use practice performance data and metrics to identify areas for improvement.

6.5 Develop a professional and organizational capacity for ongoing quality improvement.

6.6 Analyze the use and allocation of resources to ensure the practice of cost-effective healthcare while maintaining quality of care.

6.7 Understand of how practice decisions impact the finances of their organizations, whilekeeping the patient's needs foremost.

6.8 Advocate for administrative systems that capture the productivity and value of PA

practice.

7. Society and Population Health

Recognize and understand the influences of the ecosystem of person, family, population, environment, and policy on the health of patients and integrate knowledge of these determinants ofhealth into patient care decisions. PAs should be able to:

7.1 Apply principles of social-behavioral sciences by assessing the impact of psychosocial andcultural influences on health, disease, care seeking, and compliance.

7.2 Recognize the influence of genetic, socioeconomic, environmental, and other determinantson the health of the individual and community.

7.3 Improve the health of patient populations

7.4 Demonstrate accountability, responsibility, and leadership for removing barriers to health.

Appendix G

Capabilities for Advanced Clinical Practice in England

Defining Advanced Practice Radiation Therapy Delphi Round 1

Please assess each of the competencies listed with the understanding the Advanced Practice Radiation Therapist who is properly educated and trained may perform the task.

Please complete the survey below.

Thank you!

Experience

How many years of experience do you have in Radiation Oncology?

- ◯ 0 to 4 years
- ◯ 5 to 9 years
- ◯ 10 to 15 years
- ◯ >15 years

Research

	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude
1. Active involvement in all aspects of independent evidence-based research.	◯	◯	◯	◯	◯
2. Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety productivity and value for money.	◯	◯	◯	◯	◯
3. Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.	◯	◯	◯	◯	◯
4. Critically appraise and synthesize the outcome of relevant research, evaluation and audit, using results to underpin own practice and to inform that of others.	◯	◯	◯	◯	◯

5. Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations to the these and how they might be addressed in a safe pragmatic way.	○	○	○	○	○
6. Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activities and/or seeking out and applying for research funding.	○	○	○	○	○
7. Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.	○	○	○	○	○

Leadership & Management					
	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude
1. Supervise/mentor health-related professionals in research/ clinical activities.	○	○	○	○	○
2. Patient, professional and community education.	○	○	○	○	○
3. Strategic planning in workplace.	○	○	○	○	○
4. Supervision of residents and fellows in project work.	○	○	○	○	○
5. Involvement in evaluation and maintenance of patient safety programs and initiatives.	○	○	○	○	○
6. Education of other healthcare providers regarding area of expertise.	○	○	○	○	○

7. Advocate for and contribute to a culture of organizational learning to inspire future and existing staff.	○	○	○	○	○
8. Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning.	○	○	○	○	○
9. Identify further developmental needs for the individual and the wider team and supporting them to address these.	○	○	○	○	○
10. Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of learning to practice.	○	○	○	○	○
11. Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.	○	○	○	○	○
12. Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.	○	○	○	○	○
13. Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques)	○	○	○	○	○

Clinical Practice					
	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude

1. Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.	○	○	○	○	○
2. Conduct patient triage, review and interpret results and establish care plans.	○	○	○	○	○
3. Assumes a patient case load in each clinic.	○	○	○	○	○
4. Coordination of resources	○	○	○	○	○
6. Conduct patient patient interviews.	○	○	○	○	○
7. Documents patient history and physical assessment data.	○	○	○	○	○
8. Formulate care plans for palliative patients.	○	○	○	○	○
9. Provide technical and dosimetric consultation	○	○	○	○	○
11. Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines.	○	○	○	○	○
12. Liaison and consultation with other healthcare facilities, services and team members	○	○	○	○	○
13. Assignment of patient priority for therapy	○	○	○	○	○
14. Assignment of dose/fractionation according to disease site, target volume and dose limiting structures	○	○	○	○	○
15. Determination of gross, clinical and planning target volumes	○	○	○	○	○
16. Write Prescription of treatment regimen for physician signature	○	○	○	○	○
18. Review of referrals for appropriateness	○	○	○	○	○

19. First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged	○	○	○	○	○
20. Patient education	○	○	○	○	○
21. Pain management	○	○	○	○	○
22. Provision of patient support (psycho-social) in palliative radiation therapy	○	○	○	○	○
23. Patient interview to verify and update medical history	○	○	○	○	○
25. Report of findings to the delegating radiation oncologist	○	○	○	○	○
26. Assist with invasive or complex radiation oncology procedures	○	○	○	○	○
27. Performance of selected procedures under the supervision of the radiation oncologist during simulation	○	○	○	○	○
28. Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation	○	○	○	○	○
29. Performance of selected procedures under the supervision of the radiation oncologist IGRT treatment/approval	○	○	○	○	○
30. Performance of selected procedures under the supervision of the radiation oncologist MRI simulation	○	○	○	○	○
31. Performance of selected procedures under the supervision of the radiation oncologist MRL treatment	○	○	○	○	○
32. Administration of oral sedatives	○	○	○	○	○
33. Observation and assessment of moderately sedated patients	○	○	○	○	○

34. Referral of questions about diagnosis, treatment or prognosis to the delegating radiation oncologist	○	○	○	○	○
35. Evaluates images for image and diagnostic quality	○	○	○	○	○
36. Reviews the images for initial observations	○	○	○	○	○
37. Report of image observations to delegating radiation oncologist	○	○	○	○	○
38. Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist	○	○	○	○	○
39. Post-care instructions to patient as ordered by the delegating radiation oncologist	○	○	○	○	○
40. Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment)	○	○	○	○	○
41. Understand, evaluate, and apply evidence-based medicine clinical scenarios	○	○	○	○	○
42. Understand, evaluate, and apply scientific principles related to patient care clinical scenarios	○	○	○	○	○
43. Understand, evaluate, and apply etiologies, risk factors, underlying pathologic process, and epidemiology for medical conditions related to clinical scenarios	○	○	○	○	○
44. Understand, evaluate, and apply signs and symptoms of medical and surgical conditions related to clinical scenarios	○	○	○	○	○
45. Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios	○	○	○	○	○

46. Understand, evaluate, and apply management of general medical and surgical conditions to include pharmacologic and other treatment modalities to clinical scenarios	○	○	○	○	○
47. Understand, evaluate, and apply interventions for prevention of disease and health promotion/maintenance related to clinical scenarios	○	○	○	○	○
48. Understand, evaluate, and apply screening methods to detect conditions in an asymptomatic individual related to clinical scenarios	○	○	○	○	○
49. Understand, evaluate, and apply history and physical findings and diagnostic studies to formulate differential diagnoses related to clinical scenarios	○	○	○	○	○
50. Make decisions about diagnostic and therapeutic interventions based on patient information and preferences, current scientific evidence, and informed clinical judgment	○	○	○	○	○
51. Develop and implement patient management plans	○	○	○	○	○
52. Counsel and educate patients and their families	○	○	○	○	○
53. Perform medical and surgical procedures essential to their area of practice	○	○	○	○	○
54. Provide health care services and education aimed at disease prevention and health maintenance	○	○	○	○	○
55. Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT	○	○	○	○	○

56. Locate, appraise, and integrate evidence from scientific studies related to their patients' health	○	○	○	○	○
57. Apply knowledge of study designs and statistical methods to the appraisal of clinical literature and other information on diagnostic and therapeutic effectiveness	○	○	○	○	○
58. Understand the funding sources and payment systems that provide coverage for patient care and use the systems effectively	○	○	○	○	○
59. Practice cost-effective health care and resource allocation that does not compromise quality of care	○	○	○	○	○
60. Recognize and appropriately address system biases that contribute to health care disparities	○	○	○	○	○
61. Apply the concepts of population health to patient care	○	○	○	○	○
62. Practice in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.	○	○	○	○	○
63. Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.	○	○	○	○	○

64. Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, lifestyle advice and care.	○	○	○	○	○
65. Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.	○	○	○	○	○
66. Evaluate own practice, and participate in multi-disciplinary service and team evaluation demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e. outcomes of care, experience and safety)	○	○	○	○	○
67. Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements.	○	○	○	○	○
68. Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence.	○	○	○	○	○
69. Actively seek feedback and involvement from individuals, families, caregivers, communities and colleagues in the co-production of service improvements.	○	○	○	○	○

70. Critically apply advanced clinical expertise in appropriate faciliatory ways to provide consultancy across professional and service boundaries, influencing clinical practice to enhance quality, reduce unwarranted variation and promote the sharing and adoption of best practice.	○	○	○	○	○
71. Negotiate an individual scope of practice within legal, ethical, professional and organizational policies, governance and procedures, with a focus on managing risk and upholding safety.	○	○	○	○	○
72. Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.	○	○	○	○	○
73. Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.	○	○	○	○	○
74. Specialize in regions or in multiple treatment types of image guided and adaptive radiotherapy	○	○	○	○	○
75. Develop new protocols and guidelines in consultation with the Oncologist.	○	○	○	○	○
76. Superior knowledge of cross-sectional anatomy.	○	○	○	○	○
77. High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site	○	○	○	○	○

78. Provide technical and dosimetric evaluation of adaptive therapy	○	○	○	○	○
79. Normalize volumes/dosimetric criteria for optimal adaptive therapy	○	○	○	○	○
80. Evaluate treatment volume contours and deform for optimal adaptive therapy added	○	○	○	○	○
81. Manipulate margins while escalating dose and reducing fractionation accordingly	○	○	○	○	○

Are there other competencies you believe should be included in this study?

Defining Advanced Practice Radiation Therapy Delphi Round 3

These directions have been updated based on the comments from the Round 2 Survey. Please read them carefully.

Thank you for your participation in this third and final survey. This survey contains the items that did not reach consensus in round two. Each item will contain the answer you provided in round two along with the aggregate responses and comments of all participants.

Please determine if the aggregate results and comments may influence your assessment of the competencies listed with the understanding that the new role of an Advanced Practice Radiation Therapist who is properly educated and trained may perform the task.

This survey will close at 11:59 PM on Moday, January 31, 2022.

INFORMED CONSENT/AUTHORIZATION FOR PARTICIPATION IN RESEARCH
Defining Advanced Practice Radiation Therapy at the University of Texas MD Anderson Cancer center: A Delphi Study Study
Chair: Shaun T. Caldwell
The goal of this research is to develop a comprehensive list of Advanced Practice Radiation Therapy competencies at the University of Texas MD Anderson Cancer Center. If you agree to participate in this study, click on the link in this email to start the survey. Participation in this study will take several hours of your time. There will be no cost to you for completing the questionnaire. Your identify is confidential. Your participation will not be published or shared with your supervisor or the Department of Radiation Oncology Chair or others.

Consent Statement You have read the study description and have decided to participate in the research project described here. You understand that you may refuse to answer any (or all) of the questions at this or any other time. You understand that you are free to refuse any further participation if you wish. You may withdraw your authorization at any time. You can learn more about how to withdraw your authorization by calling 713-792-6477 or by contacting the study chair at 713-563-3485.

Please complete the survey below.

Thank you!

Research

Please determine if the aggregate results and comments may influence your assessment of the competencies listed with the understanding that the new role of an Advanced Practice Radiation Therapist who is properly educated and trained may perform the task.

Your answer on Round 2 [mda6_2b]
Overall Results [bar-chart:mda6_2b:bar-vertical,bar-stacked]
Round 2 Comments:

Active involvement" in "all aspects" takes time away from patient care and it may be difficult to juggle the demands of full clinic and research loads."
Change all" to "some" and I would agree."
I am keeping with my same answer on this one. Knowing our PA's do not do research, I do not think any Advanced Practice Radiation Therapist should be responsible for independent research projects.
I don't know that they need to be able to perform research independently but certainly they should assist with research efforts.
I was not influenced by the aggregate results.
Participating in evidence based research could be an aspect of the role for advance RTTs but this would not be the primary focus of their job. They would not be expected to independently design studies or analyze the data from them.
To ensure the role is primarily a clinician role vs research role.

1) Active involvement in all aspects of independent evidence-based research.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ukr1_2b]
Overall Results [bar-chart:ukr1_2b:bar-vertical,bar-stacked]
Round 2 Comments
Engagement is critical to facilitate the implementation of these strategies in clinical application.
I am keeping with my original answers; I do not feel like our Advanced Practice Radiation Therapists should be responsible for research activities. PA's in other practices do not do research.
I was not influenced by the aggregate results.
Participating in evidence based research could be an aspect of the role for advance RTTs but this would not be the primary focus of their job.

2) Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety productivity and value for money.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ukr3_2b]
Overall Results [bar-chart:ukr3_2b:bar-vertical,bar-stacked]
Round 2 Comments
I have switched my answer to exclude. Since I do not feel that research should be included in the role of the Advanced Practice Radiation Therapist.
I was not influenced by the aggregate results.
They should be able the use the results and inform others but it is not clear they need to be able to critically appraise and audit the research

3) Critically appraise and synthesize the outcome of relevant research, evaluation and audit, using results to underpin own practice and to inform that of others.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ukr5_2b]
Overall Results [bar-chart:ukr5_2b:bar-vertical,bar-stacked]
Round 2 Comments
I am keeping my answer the same. I do believe some of this question is the role of the Advanced Practice Radiation Therapist. Acting as an educator and leader is key for this position. Innovation is also needed for difficult set ups or new immobilization devices. But, the contributor to research activities and seeking out research funding should not be included in this new role.
I was not influenced by the aggregate results.

4) Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activities and/or seeking out and applying for research funding.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Leadership and Management

Your answer on Round 2 [ccrt33_2b]
Overall Results [bar-chart:ccrt33_2b:bar-vertical,bar-stacked]
Round 2 Comments
I must have misread the first time. Supervision of residents and fellows should be done by the physicians who are assigned to train them.
The confusion here is because we have residents that will be around but therapist don't need to be in charge of the residents.
We should not be responsible for supervising the residents and fellows projects

5) Supervision of residents and fellows in project work.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ukr8_2b]
Overall Results [bar-chart:ukr8_2b:bar-vertical,bar-stacked]
Round 2 Comments

I was not influenced by the aggregate results.

6) Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Clinical Practice

Your answer on Round 2 [ccsrt2_2b]
Overall Results [bar-chart:ccsrt2_2b:bar-vertical,bar-stacked]
Round 2 Comments
Again, I find it surprising that I selected include" to this the first time. Isn't it the physicians job to establish a care plan?"
I don't think that therapists would be establishing care plans.
I was not influenced by the aggregate results.
RTTs are not nurses, MDs, or APPs and are not trained to understand medications and interactions those may cause- I think this would be a very dangerous practice.
This is a unique role reserved for the radiation oncologist.

7) Conduct patient triage, review and interpret results and establish care plans.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt3_2b]
Overall Results [bar-chart:ccsrt3_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
More clarification is needed on what this means.
Not clear what patient case load" means but again they are not MD

8) Assumes a patient case load in each clinic.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt6_2b]
Overall Results [bar-chart:ccsrt6_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
Not clear what patient interviews means- if it is in regards to asking them questions about how they are feeling and having the patient participate in the time out then include, but if the point of the interview" is for the RTT to manage the questions and provide clinical expertise then exclude"

9) Conduct patient patient interviews.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt8_2b]
Overall Results [bar-chart:ccsrt8_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
RTTs do not have training of a nurse, APP, MD to document this.

10) Documents patient history and physical assessment data.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt9_2b]
Overall Results [bar-chart:ccsrt9_2b:bar-vertical,bar-stacked]
Round 2 Comments
How is this different than Conduct patient triage
Plans should be left up to the physicians. Perhaps presence in planning clinic would help this for patients.
This is a unique role reserved for the radiation oncologist.
This is the job of the MD - they have the clinical training to assess interactions from other medications etc that RTTs do not.

11) Formulate care plans for palliative patients.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt12_2b]
Overall Results [bar-chart:ccsrt12_2b:bar-vertical,bar-stacked]
Round 2 Comments
Advanced RTTs are trained in radiation delivery not in what should be ordered for a patient based on their medical history. Understanding the complexities of a patients medical history is the role of the nurse, APP, and MD
I was not influenced by the aggregate results.
If ordering strictly based on guidelines, then can be computer-automated. If ordering diagnostic tests based on medical judgment, this is outside the scope of therapists who did not go to medical school. May open up to liability issues. Generally, if a task can be perhaps best done by physician assistants or radiation oncology residents, then there is little need to train therapists to be able to do it as well.

12) Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt14_2b]
Overall Results [bar-chart:ccsrt14_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
Requires substantial medical judgment, as therapy need and priority depends on the patient's comorbidities, other procedures, chemotherapy, etc. Also will need to discuss assignment decision with physicians from other departments and this communication may be difficult for therapists to follow since therapists did not go to medical school, internship, or residency, to fully understand the medical jargons and hospital-based care considerations.
They have to be involved.

13) Assignment of patient priority for therapy

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt15_2b]
Overall Results [bar-chart:ccsrt15_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD not any other person in the clinic - if an advanced RTT can do this then what is the point of having an MD?

14) Assignment of dose/fractionation according to disease site, target volume and dose limiting structures

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt16_2b]
Overall Results [bar-chart:ccsrt16_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD not any other person in the clinic - if an advanced RTT can do this then what is the point of having an MD?

15) Determination of gross, clinical and planning target volumes

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt20_2b]
Overall Results [bar-chart:ccsrt20_2b:bar-vertical,bar-stacked]
Round 2 Comments
Determining the dose and fractionation is the job of the Radiation Oncologist preparing predefined scripts under the radiation oncologists supervision could be within the scope of the advanced RTT.
I was not influenced by the aggregate results.
MDs should write their prescription to ensure it is what is desired

16) Write Prescription of treatment regimen for physician signature

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt21_2b]
Overall Results [bar-chart:ccsrt21_2b:bar-vertical,bar-stacked]
Round 2 Comments
Advanced RTTs do not have the clinical training to know if a referral to RadOnc is appropriate
I was not influenced by the aggregate results.
This is a role reserved for the Radiation Oncologist.

17) Review of referrals for appropriateness

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt22_2b]
Overall Results [bar-chart:ccsrt22_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
It is unclear what would be the extent of this role.
The first point of contact should be someone that can place referrals, order medication and tests - this is not the training of an advanced RTT

18) First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt24_2b]
Overall Results [bar-chart:ccsrt24_2b:bar-vertical,bar-stacked]
Round 2 Comments
I believe I read the question wrong on the first survey.
I was not influenced by the aggregate results.
Most physicians do not even prescribe medications for pain management. This needs to be left to the attending or the pain management department.
Therapist are often great at physically positioning patients to reduce pain. Docs and nurses must be in charge of medicines used for pain management.

19) Pain management

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ccsrt25_2b]
Overall Results [bar-chart:ccsrt25_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
Is is not clear what would be involved, referral for additional service could be in this role but would not replace the role of other team members who would hare this responsibility
Not clear what this means but RTTs should always be supportive and provide patients with support to other hopsital programs such as patient advocacy when needed

20) Provision of patient support (psycho-social) in palliative radiation therapy

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [usra4_2b]
Overall Results [bar-chart:usra4_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.

21) Patient interview to verify and update medical history

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [usra12_2b]
Overall Results [bar-chart:usra12_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.

22) Administration of oral sedatives

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [usra13_2b]
Overall Results [bar-chart:usra13_2b:bar-vertical,bar-stacked]
Round 2 Comments
all of this depends on what the training is. would need very specific training for this role.
I was not influenced by the aggregate results.
If the patient is under treatment therapist should participate but not make decision.
Isn't this the role of a nurse? Observation and assessments require clinical knowledge base of medication being delivered

23) Observation and assessment of moderately sedated patients

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [usra21_2b]
Overall Results [bar-chart:usra21_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
Standard instructions could be delivered based on the treatment and staging for selected patients.

24) Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [usra25_2b]
Overall Results [bar-chart:usra25_2b:bar-vertical,bar-stacked]
Round 2 Comments
I don't see how that could work for therapists.
I was not influenced by the aggregate results.
Include as long as treatment here is in reference to radiation treatment only and not other treatments such as chemo/surgery etc

25) Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment)

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1b_2b]
Overall Results [bar-chart:uspa1b_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.

26) Understand, evaluate, and apply scientific principles related to patient care clinical scenarios

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1c_2b]
Overall Results [bar-chart:uspa1c_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is not the training of an advanced RTT - this involves medical training that is received in nursing APP, or MD school

27) Understand, evaluate, and apply etiologies, risk factors, underlying pathologic process, and epidemiology for medical conditions related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1d_2b]
Overall Results [bar-chart:uspa1d_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
It is not clear what this question means,
This is not the training of an advanced RTT - this involves medical training that is received in nursing APP, or MD school

28) Understand, evaluate, and apply signs and symptoms of medical and surgical conditions related to clinical scenarios

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1e_2b]
Overall Results [bar-chart:uspa1e_2b:bar-vertical,bar-stacked]
Round 2 Comments
Advanced RTTs should be able to read a radiology report and review DI images to understand where disease is, but ordering" is not in their scope"
I was not influenced by the aggregate results.

29) Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1f_2b]
Overall Results [bar-chart:uspa1f_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
if full APP training, then yes.

30) Understand, evaluate, and apply management of general medical and surgical conditions to include pharmacologic and other treatment modalities to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1g_2b]
Overall Results [bar-chart:uspa1g_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.

31) Understand, evaluate, and apply interventions for prevention of disease and health promotion/maintenance related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1h_2b]
Overall Results [bar-chart:uspa1h_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD

32) Understand, evaluate, and apply screening methods to detect conditions in an asymptomatic individual related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa1i_2b]
Overall Results [bar-chart:uspa1i_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD

33) Understand, evaluate, and apply history and physical findings and diagnostic studies to formulate differential diagnoses related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa11_2b]
Overall Results [bar-chart:uspa11_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD

34) Make decisions about diagnostic and therapeutic interventions based on patient information and preferences, current scientific evidence, and informed clinical judgment.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa12_2b]
Overall Results [bar-chart:uspa12_2b:bar-vertical,bar-stacked]
Round 2 Comments
I guess this is not clear. I believe we have different definitions for management plans.
I was not influenced by the aggregate results.
This is a role reserved for the radiation oncologist
This is the role of an MD

35) Develop and implement patient management plans.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa14_2b]
Overall Results [bar-chart:uspa14_2b:bar-vertical,bar-stacked]
Round 2 Comments
Here also I think the medical and surgical procedures" are not clear."
I was not influenced by the aggregate results.
It is not clear what this question means
This is the role of an MD

36) Perform medical and surgical procedures essential to their area of practice.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa15_2b]
Overall Results [bar-chart:uspa15_2b:bar-vertical,bar-stacked]
Round 2 Comments
I think they have to participate.
I was not influenced by the aggregate results.
This is the role of an MD, APP, or nurse

37) Provide health care services and education aimed at disease prevention and health maintenance,

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa24_2b]
Overall Results [bar-chart:uspa24_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD

38) Locate, appraise, and integrate evidence from scientific studies related to their patients' health.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 1 [uspa25_2b]
Overall Results [bar-chart:uspa25_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of an MD

39) Apply knowledge of study designs and statistical methods to the appraisal of clinical literature and other information on diagnostic and therapeutic effectiveness.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa29_2b]
Overall Results [bar-chart:uspa29_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
This is the role of the billing team

40) Understand the funding sources and payment systems that provide coverage for patient care and use the systems effectively.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [uspa35_2b]
Overall Results [bar-chart:uspa35_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.

41) Apply the concepts of population health to patient care.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ukcp7_2b]
Overall Results [bar-chart:ukcp7_2b:bar-vertical,bar-stacked]
Round 2 Comments
I don't think therapist should be doing this.
I was not influenced by the aggregate results.
This is the role of an MD

42) Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, lifestyle advice and care.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [ukcp11_2b]
Overall Results [bar-chart:ukcp11_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.

43) Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [mda4_2b]
Overall Results [bar-chart:mda4_2b:bar-vertical,bar-stacked]
Round 2 Comments
I was not influenced by the aggregate results.
MDs are responsible for treatment volumes and ensuring they have been adapted correctly

44) Evaluate treatment volume contours and deform for optimal adaptive therapy added.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [mda5_2b]
Overall Results [bar-chart:mda5_2b:bar-vertical,bar-stacked]
Round 2 Comments
Dose and fractionation is the role of the radiation oncologist
I was not influenced by the aggregate results.
This is the role of the MD

45) Manipulate margins while escalating dose and reducing fractionation accordingly.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Additional Competencies for Consideration

Your answer on Round 2 [r1_1_v2b]
Overall Results [bar-chart:r1_1_v2b:bar-vertical,bar-stacked]

46) Extensive knowledge of pathology

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Your answer on Round 2 [r1_2_v2b]
Overall Results [bar-chart:r1_2_v2b:bar-vertical,bar-stacked]
Round 2 Comments
Should know what to prescribe for ailments

47) Extensive knowledge of pharmacology

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

48) Identify key failure modes and work collaboratively to design ways to minimize chance of error.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

Round 2 Comments for:
Identify key failure modes and work collaboratively to design ways to minimize chance of error.
Definitely Include
Definitely Include
definitely include
Definitely include.
Definitely include
Include
Include
There is no choice for this item.

Defining Advanced Practice Radiation Therapy Delphi Round 2

Thank you for your participation in this study. This survey contains the items that did not reach consensus in round one. Each item will contain the answer you provided in round one along with the aggregate responses.

Please determine if the aggregate results may influence your assessment of the competencies listed with the understanding the Advanced Practice Radiation therapist who is properly educated and trained may perform the task.

This survey will close at 11:59 PM on Monday, January 10, 2022. INFORMED CONSENT/AUTHORIZATION FOR PARTICIPATION IN RESEARCH Defining Advanced Practice Radiation Therapy at the University of Texas MD Anderson Cancer center: A Delphi Study Study Chair: Shaun T. Caldwell The goal of this research is to develop a comprehensive list of Advanced Practice Radiation Therapy competencies at the University of Texas MD Anderson Cancer Center. If you agree to participate in this study, click on the link in this email to start the survey. Participation in this study will take several hours of your time. There will be no cost to you for completing the questionnaire. Your identify is confidential. Your participation will not be published or shared with your supervisor or the Department of Radiation Oncology Chair or others.

Consent Statement You have read the study description and have decided to participate in the research project described here. You understand that you may refuse to answer any (or all) of the questions at this or any other time. You understand that you are free to refuse any further participation if you wish. You may withdraw your authorization at any time. You can learn more about how to withdraw your authorization by calling 713-792-6477 or by contacting the study chair at 713-563-3485.

Please complete the survey below.

Thank you!

Research

Please determine if the aggregate results and comments may influence your assessment of the competencies listed with the understanding the Advanced Practice Radiation Therapist who is properly educated and trained may perform the task.

Your answer on Round 1 [mda6]
Overall Results [bar-chart:mda6:bar-vertical,bar-stacked]

1) Active involvement in all aspects of independent evidence-based research.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

2) Comments

Your answer on Round 1 [ukr1]
Overall Results [bar-chart:ukr1:bar-vertical,bar-stacked]

3) Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety productivity and value for money.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

4) Comments

Your answer on Round 1 [ukr2]
Overall Results [bar-chart:ukr2:bar-vertical,bar-stacked]

5) Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

6) Comments

Your answer on Round 1 [ukr3]
Overall Results [bar-chart:ukr3:bar-vertical,bar-stacked]

7) Critically appraise and synthesize the outcome of relevant research, evaluation and audit, using results to underpin own practice and to inform that of others.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

8) Comments

Your answer on Round 1 [ukr4]
Overall Results [bar-chart:ukr4:bar-vertical,bar-stacked]

9) Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations to the these and how they might be addressed in a safe pragmatic way.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

10) Comments

Your answer on Round 1 [ukr5]
Overall Results [bar-chart:ukr5:bar-vertical,bar-stacked]

11) Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activities and/or seeking out and applying for research funding.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

12) Comments

Your answer on Round 1 [ukr7]
Overall Results [bar-chart:ukr7:bar-vertical,bar-stacked]

13) Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

14) Comments

Leadership and Management

Your answer on Round 1 [ccsrt33]
Overall Results [bar-chart:ccsrt33:bar-vertical,bar-stacked]

15) Supervision of residents and fellows in project work.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

16) Comments

Your answer on Round 1 [ukr6]
Overall Results [bar-chart:ukr6:bar-vertical,bar-stacked]

17) Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

18) Comments

Your answer on Round 1 [ukr8]
Overall Results [bar-chart:ukr8:bar-vertical,bar-stacked]

19) Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

20) Comments

Your answer on Round 1 [mda7]
Overall Results [bar-chart:mda7:bar-vertical,bar-stacked]

21) Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques)

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

22) Comments

Clinical Practice

Your answer on Round 1 [ccsrt1]
Overall Results [bar-chart:ccsrt1:bar-vertical,bar-stacked]

23) Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

24) Comments

Your answer on Round 1 [ccsrt2]
Overall Results [bar-chart:ccsrt2:bar-vertical,bar-stacked]

25) Conduct patient triage, review and interpret results and establish care plans.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

26) Comments

Your answer on Round 1 [ccsrt3]
Overall Results [bar-chart:ccsrt3:bar-vertical,bar-stacked]

27) Assumes a patient case load in each clinic.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

28) Comments

Your answer on Round 1 [ccsrt6]
Overall Results [bar-chart:ccsrt6:bar-vertical,bar-stacked]

29) Conduct patient patient interviews.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

30) Comments

Your answer on Round 1 [ccsrt8]
Overall Results [bar-chart:ccsrt8:bar-vertical,bar-stacked]

31) Documents patient history and physical assessment data.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

32) Comments

Your answer on Round 1 [ccsrt9]
Overall Results [bar-chart:ccsrt9:bar-vertical,bar-stacked]

33) Formulate care plans for palliative patients.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

34) Comments

Your answer on Round 1 [ccsrt10]
Overall Results [bar-chart:ccsrt10:bar-vertical,bar-stacked]

35) Provide technical and dosimetric consultation

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

36) Comments

Your answer on Round 1 [ccsrt12]
Overall Results [bar-chart:ccsrt12:bar-vertical,bar-stacked]

37) Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

38) Comments

Your answer on Round 1 [ccsrt14]
Overall Results [bar-chart:ccsrt14:bar-vertical,bar-stacked]

39) Assignment of patient priority for therapy

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

40) Comments

Your answer on Round 1 [ccsrt15]
Overall Results [bar-chart:ccsrt15:bar-vertical,bar-stacked]

41) Assignment of dose/fractionation according to disease site, target volume and dose limiting structures

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

42) Comments

Your answer on Round 1 [ccsrt16]
Overall Results [bar-chart:ccsrt16:bar-vertical,bar-stacked]

43) Determination of gross, clinical and planning target volumes

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

44) Comments

Your answer on Round 1 [ccsrt20]
Overall Results [bar-chart:ccsrt20:bar-vertical,bar-stacked]

45) Write Prescription of treatment regimen for physician signature

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

46) Comments

Your answer on Round 1 [ccsrt21]
Overall Results [bar-chart:ccsrt21:bar-vertical,bar-stacked]

47) Review of referrals for appropriateness

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

48) Comments

Your answer on Round 1 [ccsrt22]
Overall Results [bar-chart:ccsrt22:bar-vertical,bar-stacked]

49) First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

50) Comments

Your answer on Round 1 [ccsrt24]
Overall Results [bar-chart:ccsrt24:bar-vertical,bar-stacked]

51) Pain management

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

52) Comments

Your answer on Round 1 [ccsrt25]
Overall Results [bar-chart:ccsrt25:bar-vertical,bar-stacked]

53) Provision of patient support (psycho-social) in palliative radiation therapy

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

54) Comments

Your answer on Round 1 [usra4]
Overall Results [bar-chart:usra4:bar-vertical,bar-stacked]

55) Patient interview to verify and update medical history

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

56) Comments

Your answer on Round 1 [usra8]
Overall Results [bar-chart:usra8:bar-vertical,bar-stacked]

57) Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

58) Comments

Your answer on Round 1 [usra12]
Overall Results [bar-chart:usra12:bar-vertical,bar-stacked]

59) Administration of oral sedatives

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

60) Comments

Your answer on Round 1 [usra13]
Overall Results [bar-chart:usra13:bar-vertical,bar-stacked]

61) Observation and assessment of moderately sedated patients

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

62) Comments

Your answer on Round 1 [usra21]
Overall Results [bar-chart:usra21:bar-vertical,bar-stacked]

63) Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

64) Comments

Your answer on Round 1 [usra22]
Overall Results [bar-chart:usra22:bar-vertical,bar-stacked]

65) Post-care instructions to patient as ordered by the delegating radiation oncologist

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

66) Comments

Your answer on Round 1 [usra25]
Overall Results [bar-chart:usra25:bar-vertical,bar-stacked]

67) Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment)

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

68) Comments

Your answer on Round 1 [uspa1a]
Overall Results [bar-chart:uspa1a:bar-vertical,bar-stacked]

69) Understand, evaluate, and apply evidence-based medicine clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

70) Comments

Your answer on Round 1 [uspa1b]
Overall Results [bar-chart:uspa1b:bar-vertical,bar-stacked]

71) Understand, evaluate, and apply scientific principles related to patient care clinical scenarios

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

72) Comments

Your answer on Round 1 [uspa1c]
Overall Results [bar-chart:uspa1c:bar-vertical,bar-stacked]

73) Understand, evaluate, and apply etiologies, risk factors, underlying pathologic process, and epidemiology for medical conditions related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

74) Comments

Your answer on Round 1 [uspa1d]
Overall Results [bar-chart:uspa1d:bar-vertical,bar-stacked]

75) Understand, evaluate, and apply signs and symptoms of medical and surgical conditions related to clinical scenarios

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

76) Comments

Your answer on Round 1 [uspa1e]
Overall Results [bar-chart:uspa1e:bar-vertical,bar-stacked]

77) Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

78) Comments

Your answer on Round 1 [uspa1f]
Overall Results [bar-chart:uspa1f:bar-vertical,bar-stacked]

79) Understand, evaluate, and apply management of general medical and surgical conditions to include pharmacologic and other treatment modalities to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

80) Comments

Your answer on Round 1 [uspa1g]
Overall Results [bar-chart:uspa1g:bar-vertical,bar-stacked]

81) Understand, evaluate, and apply interventions for prevention of disease and health promotion/maintenance related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

82) Comments

Your answer on Round 1 [uspa1h]
Overall Results [bar-chart:uspa1h:bar-vertical,bar-stacked]

83) Understand, evaluate, and apply screening methods to detect conditions in an asymptomatic individual related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

84) Comments

Your answer on Round 1 [uspa1i]
Overall Results [bar-chart:uspa1i:bar-vertical,bar-stacked]

85) Understand, evaluate, and apply history and physical findings and diagnostic studies to formulate differential diagnoses related to clinical scenarios.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

86) Comments

Your answer on Round 1 [uspa11]
Overall Results [bar-chart:uspa11:bar-vertical,bar-stacked]

87) Make decisions about diagnostic and therapeutic interventions based on patient information and preferences, current scientific evidence, and informed clinical judgment.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

88) Comments

Your answer on Round 1 [uspa12]
Overall Results [bar-chart:uspa12:bar-vertical,bar-stacked]

89) Develop and implement patient management plans.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

90) Comments

Your answer on Round 1 [uspa14]
Overall Results [bar-chart:uspa14:bar-vertical,bar-stacked]

91) Perform medical and surgical procedures essential to their area of practice.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

92) Comments

Your answer on Round 1 [uspa15]
Overall Results [bar-chart:uspa15:bar-vertical,bar-stacked]

93) Provide health care services and education aimed at disease prevention and health maintenance,

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

94) Comments

Your answer on Round 1 [uspa24]
Overall Results [bar-chart:uspa24:bar-vertical,bar-stacked]

95) Locate, appraise, and integrate evidence from scientific studies related to their patients' health.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

96) Comments

Your answer on Round 1 [uspa25]
Overall Results [bar-chart:uspa25:bar-vertical,bar-stacked]

97) Apply knowledge of study designs and statistical methods to the appraisal of clinical literature and other information on diagnostic and therapeutic effectiveness.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

98) Comments

Your answer on Round 1 [uspa29]
Overall Results [bar-chart:uspa29:bar-vertical,bar-stacked]

99) Understand the funding sources and payment systems that provide coverage for patient care and use the systems effectively.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

100) Comments

Your answer on Round 1 [uspa30]
Overall Results [bar-chart:uspa30:bar-vertical,bar-stacked]

101) Practice cost-effective health care and resource allocation that does not compromise quality of care.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

102) Comments

Your answer on Round 1 [uspa34]
Overall Results [bar-chart:uspa34:bar-vertical,bar-stacked]

103) Recognize and appropriately address system biases that contribute to health care disparities.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

104) Comments

Your answer on Round 1 [uspa35]
Overall Results [bar-chart:uspa35:bar-vertical,bar-stacked]

105) Apply the concepts of population health to patient care.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

106) Comments

Your answer on Round 1 [ukcp7]
Overall Results [bar-chart:ukcp7:bar-vertical,bar-stacked]

107) Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, lifestyle advice and care.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

108) Comments

Your answer on Round 1 [ukcp11]
Overall Results [bar-chart:ukcp11:bar-vertical,bar-stacked]

109) Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

110) Comments

Your answer on Round 1 [auig1]
Overall Results [bar-chart:auig1:bar-vertical,bar-stacked]

111) Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

112) Comments

Your answer on Round 1 [mda1]
Overall Results [bar-chart:mda1:bar-vertical,bar-stacked]

113) High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

114) Comments

Your answer on Round 1 [mda3]
Overall Results [bar-chart:mda3:bar-vertical,bar-stacked]

115) Normalize volumes/dosimetric criteria for optimal adaptive therapy.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

116) Comments

Your answer on Round 1 [mda4]
Overall Results [bar-chart:mda4:bar-vertical,bar-stacked]

117) Evaluate treatment volume contours and deform for optimal adaptive therapy added.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

118) Comments

Your answer on Round 1 [mda5]
Overall Results [bar-chart:mda5:bar-vertical,bar-stacked]

119) Manipulate margins while escalating dose and reducing fractionation accordingly.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

120) Comments

Additional Competencies for Consideration

121) Extensive knowledge of pathology

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

122) Comments

123) Extensive knowledge of pharmacology

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

124) Comments

125) Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

126) Comments

127) Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

128) Comments

129) Technology specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

130) Comments

131) Understand dosimetric criteria notations for plan optimization.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

132) Comments

133) Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

134) Comments

135) Interpret a treatment plan's isodose lines for plan optimization.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

136) Comments

137) Perform formal therapy check of the plan for accuracy.

◯ Definitely Include ◯ Include ◯ Neither include nor exclude ◯ Exclude ◯ Definitely exclude

138) Comments

139) Identify key failure modes and work collaboratively to design ways to minimize chance of error.

140) Comments

Appendix H

Competency Profile for Advance Practice Radiation Therapists

Research
Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.
Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations and how they might be addressed in a safe pragmatic way.
Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.
Leadership and Management
Involvement in evaluation and maintenance of patient safety programs and initiatives.
Patient, professional and community education.
Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning.
Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of learning to practice.
Education of other healthcare providers regarding area of expertise.
Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.
Advocate for and contribute to a culture of organizational learning to inspire future and existing staff.
Identify further developmental needs for the individual and the wider team and supporting them to address these.
Strategic planning in workplace.
Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.
Supervise/mentor health-related professionals in research/clinical activities.
Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques).
Clinical Practice
Identify key failure modes and work collaboratively to design ways to minimize chance of error.
Practice in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.
Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications
Technology specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc.
Performance of selected procedures under the supervision of the radiation oncologist MRI simulation.

Performance of selected procedures under the supervision of the radiation oncologist MRL treatment.
Evaluates images for image and diagnostic quality.
Report of image observations to delegating radiation oncologist.
Evaluate own practice and participate in multi-disciplinary service and team evaluation demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e., outcomes of care, experience and safety).
Perform formal therapy check of the plan for accuracy.
Post-care instructions to patient as ordered by the delegating radiation oncologist.
Patient education.
Performance of selected procedures under the supervision of the radiation oncologist during simulation.
Performance of selected procedures under the supervision of the radiation oncologist IGRT treatment/approval.
Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.
Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements.
Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence.
Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.
Specialize in regions or in multiple treatment types of image guided and adaptive radiotherapy.
Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications.
Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan.
Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation.
Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment).
Practice cost-effective health care and resource allocation that does not compromise quality of care.
Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT.
Actively seek feedback and involvement from individuals, families, caregivers, communities and colleagues in the co-production of service improvements.
Superior knowledge of cross-sectional anatomy.
Interpret a treatment plan's isodose lines for plan optimization.
Recognize and appropriately address system biases that contribute to health care disparities.
Assist with invasive or complex radiation oncology procedures.

Referral of questions about diagnosis, treatment or prognosis to the delegating radiation oncologist.
Reviews the images for initial observations.
Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.
Understand dosimetric criteria notations for plan optimization.
Coordination of resources.
Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.
Develop new protocols and guidelines in consultation with the Oncologist.
Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.
Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist.
Understand, evaluate, and apply scientific principles related to patient care clinical scenarios.
Liaison and consultation with other healthcare facilities, services and team members.
Report of findings to the delegating radiation oncologist.
Counsel and educate patients and their families.
High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site.
Negotiate an individual scope of practice within legal, ethical, professional and organizational policies, governance and procedures, with a focus on managing risk and upholding safety.
Provide technical and dosimetric evaluation of adaptive therapy.
Provide technical and dosimetric consultation.
Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.
Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.
Normalize volumes/dosimetric criteria for optimal adaptive therapy.
Critically apply advanced clinical expertise in appropriate faciliatory ways to provide consultancy across professional and service boundaries, influencing clinical practice to enhance quality, reduce unwarranted variation and promote the sharing and adoption of best practice.

Appendix I

Results of Each Competency in Rounds One, Two, and Three

(Research) Active involvement in all aspects of independent evidence-based research.

Round #	1			Overall Rate:	45.45%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	12	10	7	1	1	34
Expert Level Radiation Therapist	1	4	4	4	1		14
Medical Physicist	1	5	4				10
Radiation Oncologist	1	3	2	3		1	10

Round #	2			Overall Rate:	45.16%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	13	8	7	2	3	34
Expert Level Radiation Therapist		4	5	3	2		14
Medical Physicist	1	4	3	2			10
Radiation Oncologist		5		2		3	10

Round #	3			Overall Rate:	33.33%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		10	6	12	2	4	34
Expert Level Radiation Therapist		4	1	5	2	2	14
Medical Physicist		5	1	4			10
Radiation Oncologist		1	4	3		2	10

(Research) Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety productivity and value for money.

Round #	1			Overall Rate:	51.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	11	9	6	1	1	34
Expert Level Radiation Therapist	2	2	5	4	1		14
Medical Physicist	3	4	3				10
Radiation Oncologist	1	5	1	2		1	10

Round #	2			Overall Rate:	48.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	11	9	5	2	3	34
Expert Level Radiation Therapist	1	4	4	3	2		14
Medical Physicist	3	4	3				10
Radiation Oncologist		3	2	2		3	10

Round #	3			Overall Rate:	50.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		15	6	7	2	4	34
Expert Level Radiation Therapist		4	2	4	2	2	14
Medical Physicist		7	1	2			10
Radiation Oncologist		4	3	1		2	10

(Research) Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.

Round #	1			Overall Rate:	75.76%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	14	3	4	1	1	34
Expert Level Radiation Therapist	5	5	1	2	1		14
Medical Physicist	3	6	1				10
Radiation Oncologist	3	3	1	2		1	10

Round #	2			Overall Rate:	84.38%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	16	3	1	1	2	34
Expert Level Radiation Therapist	2	8	3		1		14
Medical Physicist	6	3		1			10
Radiation Oncologist	3	5				2	10

(Research) Critically appraise and synthesize the outcome of relevant research, evaluation and audit, using results to underpin own practice and to inform that of others.

Round #	1			Overall Rate:	63.64%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	13	7	4	1	1	34
Expert Level Radiation Therapist	4	4	3	2	1		14
Medical Physicist	2	5	3				10
Radiation Oncologist	2	4	1	2		1	10

Round #	2			Overall Rate:	65.63%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	20	7	3	1	2	34
Expert Level Radiation Therapist		7	4	2	1		14
Medical Physicist	1	6	2	1			10
Radiation Oncologist		7	1			2	10

Round #	3			Overall Rate:	68.97%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		20	2	5	2	5	34
Expert Level Radiation Therapist		7		3	2	2	14
Medical Physicist		6	2	2			10
Radiation Oncologist		7				3	10

(Research) Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations to the these and how they might be addressed in a safe pragmatic way.

Round #	1			Overall Rate:	60.61%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	10	6	6	1	1	34
Expert Level Radiation Therapist	4	3	2	4	1		14
Medical Physicist	4	3	3				10
Radiation Oncologist	2	4	1	2		1	10

Round #	2			Overall Rate:	77.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	13	6	1		3	34
Expert Level Radiation Therapist	6	4	3	1			14
Medical Physicist	3	4	3				10
Radiation Oncologist	2	5				3	10

(Research) Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activities and/or seeking out and applying for research funding.

Round #	1			Overall Rate:	57.58%		
Role	**Definitely Include**	**Include**	**Neither include nor exclude**	**Exclude**	**Definitely exclude**	**Blank**	**Grand Total**
Grand Total	6	13	7	6	1	1	34
Expert Level Radiation Therapist	4	3	3	3	1		14
Medical Physicist	1	5	3	1			10
Radiation Oncologist	1	5	1	2		1	10

Round #	2			Overall Rate:	58.06%		
Role	**Definitely Include**	**Include**	**Neither include nor exclude**	**Exclude**	**Definitely exclude**	**Blank**	**Grand Total**
Grand Total	1	17	6	5	2	3	34
Expert Level Radiation Therapist	1	6	4	2	1		14
Medical Physicist		5	2	2	1		10
Radiation Oncologist		6		1		3	10

Round #	3			Overall Rate:	60.00%		
Role	**Definitely Include**	**Include**	**Neither include nor exclude**	**Exclude**	**Definitely exclude**	**Blank**	**Grand Total**
Grand Total	1	17	5	4	3	4	34
Expert Level Radiation Therapist	1	6	3	1	1	2	14
Medical Physicist		6		2	2		10
Radiation Oncologist		5	2	1		2	10

(Research) Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.

Round #	1			Overall Rate:	63.64%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	11	5	6	1	1	34
Expert Level Radiation Therapist	3	4	3	3	1		14
Medical Physicist	5	3	1	1			10
Radiation Oncologist	2	4	1	2		1	10

Round #	2			Overall Rate:	78.13%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	20	3	3	1	2	34
Expert Level Radiation Therapist	2	7	2	2	1		14
Medical Physicist	2	7		1			10
Radiation Oncologist	1	6	1			2	10

(Leadership and Management) Supervise/mentor health-related professionals in research/ clinical activities.

Round #	1			Overall Rate:	75.76%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	11	6	1	1	1	34
Expert Level Radiation Therapist	5	5	3	1			14
Medical Physicist	4	5	1				10
Radiation Oncologist	5	1	2		1	1	10

(Leadership and Management) Patient, professional and community education.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	19	11	3			1	34
Expert Level Radiation Therapist	9	5					14
Medical Physicist	6	2	2				10
Radiation Oncologist	4	4	1			1	10

(Leadership and Management) Strategic planning in workplace.

Round #	1			Overall Rate:	81.82%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	13	14	6			1	34
Expert Level Radiation Therapist	6	6	2				14
Medical Physicist	3	4	3				10
Radiation Oncologist	4	4	1			1	10

(Leadership and Management) Supervision of residents and fellows in project work.

Round #	1			Overall Rate:	24.24%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	4	11	12	2	1	34
Expert Level Radiation Therapist	1	2	3	7	1		14
Medical Physicist	2		4	4			10
Radiation Oncologist	1	2	4	1	1	1	10

Round #	2			Overall Rate:	6.25%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	1	1	29		2	34
Expert Level Radiation Therapist		1	1	12			14
Medical Physicist	1			9			10
Radiation Oncologist				8		2	10

Round #	3			Overall Rate:	3.45%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1		2	25	1	5	34
Expert Level Radiation Therapist			2	9	1	2	14
Medical Physicist	1			9			10
Radiation Oncologist				7		3	10

(Leadership and Management) Involvement in evaluation and maintenance of patient safety programs and initiatives.

Round #	1		Overall Rate:	100.00%			
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	24	9				1	34
Expert Level Radiation Therapist	9	5					14
Medical Physicist	9	1					10
Radiation Oncologist	6	3				1	10

(Leadership and Management) Education of other healthcare providers regarding area of expertise.

Round #	1			Overall Rate:	87.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	19	10	3	1		1	34
Expert Level Radiation Therapist	7	5	1	1			14
Medical Physicist	7	1	2				10
Radiation Oncologist	5	4				1	10

(Leadership and Management) Advocate for and contribute to a culture of organizational learning to inspire future and existing staff.

Round #	1			Overall Rate:	84.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	19	9	4	1		1	34
Expert Level Radiation Therapist	7	5	1	1			14
Medical Physicist	7	1	2				10
Radiation Oncologist	5	3	1			1	10

(Leadership and Management) Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	15	15	1	2		1	34
Expert Level Radiation Therapist	5	7		2			14
Medical Physicist	5	5					10
Radiation Oncologist	5	3	1			1	10

(Leadership and Management) Identify further developmental needs for the individual and the wider team and supporting them to address these.

Round #	1			Overall Rate:	84.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	15	13	4	1		1	34
Expert Level Radiation Therapist	5	7	1	1			14
Medical Physicist	5	4	1				10
Radiation Oncologist	5	2	2			1	10

(Leadership and Management) Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of learning to practice.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	16	2	1		1	34
Expert Level Radiation Therapist	5	7	1	1			14
Medical Physicist	5	5					10
Radiation Oncologist	4	4	1			1	10

(Leadership and Management) Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.

Round #	1			Overall Rate:	69.70%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	15	6	2	2	1	34
Expert Level Radiation Therapist	3	3	5	2	1		14
Medical Physicist	4	5	1				10
Radiation Oncologist	1	7			1	1	10

Round #	2			Overall Rate:	87.10%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	23	3		1	3	34
Expert Level Radiation Therapist	2	9	2		1		14
Medical Physicist	2	7	1				10
Radiation Oncologist		7				3	10

(Leadership and Management) Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.

Round #	1			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	14	8	2	1	1	34
Expert Level Radiation Therapist	4	3	4	2	1		14
Medical Physicist	3	7					10
Radiation Oncologist	1	4	4			1	10

Round #	2			Overall Rate:	74.19%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	20	6	1	1	3	34
Expert Level Radiation Therapist	2	6	4	1	1		14
Medical Physicist	1	9					10
Radiation Oncologist		5	2			3	10

Round #	3			Overall Rate:	79.31%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	20	4		2	5	34
Expert Level Radiation Therapist	2	5	3		2	2	14
Medical Physicist	1	9					10
Radiation Oncologist		6	1			3	10

(Leadership and Management) Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques)

Round #	1			Overall Rate:	75.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	9	15	1	5	2	2	34
Expert Level Radiation Therapist	6	7		1			14
Medical Physicist	2	3	1	4			10
Radiation Oncologist	1	5			2	2	10

Round #	2			Overall Rate:	77.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	19		7		3	34
Expert Level Radiation Therapist	4	9		1			14
Medical Physicist	1	3		6			10
Radiation Oncologist		7				3	10

(Clinical Practice) Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.

Round #	1			Overall Rate:	69.70%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	11	5	2	3	1	34
Expert Level Radiation Therapist	8	5	1				14
Medical Physicist	4	3	2		1		10
Radiation Oncologist		3	2	2	2	1	10

Round #	2			Overall Rate:	84.38%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	11	2	2	1	2	34
Expert Level Radiation Therapist	11	3					14
Medical Physicist	4	4	1	1			10
Radiation Oncologist	1	4	1	1	1	2	10

(Clinical Practice) Conduct patient triage, review and interpret results and establish care plans.

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	6	6	8	3	1	34
Expert Level Radiation Therapist	7	3	3	1			14
Medical Physicist		1	2	4	3		10
Radiation Oncologist	3	2	1	3		1	10

Round #	2			Overall Rate:	45.16%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	3	4	10	3	3	34
Expert Level Radiation Therapist	8	2	3	1			14
Medical Physicist				7	3		10
Radiation Oncologist	3	1	1	2		3	10

Round #	3			Overall Rate:	19.23%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	3	2	15	4	8	34
Expert Level Radiation Therapist	2	2	2	5		3	14
Medical Physicist				5	3	2	10
Radiation Oncologist		1		5	1	3	10

(Clinical Practice) Assumes a patient case load in each clinic.

Round #	1			Overall Rate:	54.55%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	12	7	4	4	1	34
Expert Level Radiation Therapist	5	7	2				14
Medical Physicist	1	2	3	2	2		10
Radiation Oncologist		3	2	2	2	1	10

Round #	2			Overall Rate:	70.97%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	18	4	2	3	3	34
Expert Level Radiation Therapist	3	10	1				14
Medical Physicist	1	4	2	1	2		10
Radiation Oncologist		4	1	1	1	3	10

Round #	3			Overall Rate:	53.57%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	12	7	4	2	6	34
Expert Level Radiation Therapist	3	7	2			2	14
Medical Physicist		2	3	3	1	1	10
Radiation Oncologist		3	2	1	1	3	10

(Clinical Practice) Coordination of resources

Round #	1			Overall Rate:	81.82%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	17	5	1		1	34
Expert Level Radiation Therapist	3	8	3				14
Medical Physicist	3	6		1			10
Radiation Oncologist	4	3	2			1	10

(Clinical Practice) Conduct patient patient interviews.

Round #	1			Overall Rate:	54.55%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	9	9	8	6	1	1	34
Expert Level Radiation Therapist	4	5	3	2			14
Medical Physicist	2	3	2	3			10
Radiation Oncologist	3	1	3	1	1	1	10

Round #	2			Overall Rate:	64.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	12	6	5		3	34
Expert Level Radiation Therapist	5	6	2	1			14
Medical Physicist	1	4	3	2			10
Radiation Oncologist	2	2	1	2		3	10

Round #	3			Overall Rate:	71.43%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	16	4	4		6	34
Expert Level Radiation Therapist	4	6	1	1		2	14
Medical Physicist		5	3	1		1	10
Radiation Oncologist		5		2		3	10

(Clinical Practice) Documents patient history and physical assessment data.

Round #	1			Overall Rate:	51.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	7	7	7	2	1	34
Expert Level Radiation Therapist	6	4	3	1			14
Medical Physicist	1	2	3	3	1		10
Radiation Oncologist	3	1	1	3	1	1	10

Round #	2			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	10	3	6	1	4	34
Expert Level Radiation Therapist	6	5	1	1		1	14
Medical Physicist	1	4	1	3	1		10
Radiation Oncologist	3	1	1	2		3	10

Round #	3			Overall Rate:	51.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	8	3	10		7	34
Expert Level Radiation Therapist	5	4	1	2		2	14
Medical Physicist	1	1	1	5		2	10
Radiation Oncologist		3	1	3		3	10

(Clinical Practice) Formulate care plans for palliative patients.

Round #	1			Overall Rate:	36.36%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	4	8	7	6	1	34
Expert Level Radiation Therapist	6	3	3	2			14
Medical Physicist			2	4	4		10
Radiation Oncologist	2	1	3	1	2	1	10

Round #	2			Overall Rate:	40.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	5	6	8	4	4	34
Expert Level Radiation Therapist	7	3	1	2		1	14
Medical Physicist			2	5	3		10
Radiation Oncologist		2	3	1	1	3	10

Round #	3			Overall Rate:	28.57%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	6	3	12	5	6	34
Expert Level Radiation Therapist	2	6		4		2	14
Medical Physicist				5	4	1	10
Radiation Oncologist			3	3	1	3	10

(Clinical Practice) Provide technical and dosimetric consultation

Round #	1			Overall Rate:	60.61%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	14	7	4	2	1	34
Expert Level Radiation Therapist	3	5	5	1			14
Medical Physicist	2	3		3	2		10
Radiation Oncologist	1	6	2			1	10

Round #	2			Overall Rate:	75.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	17	5	1	2	2	34
Expert Level Radiation Therapist	4	7	3				14
Medical Physicist	3	3	1	1	2		10
Radiation Oncologist		7	1			2	10

(Clinical Practice) Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines.

Round #	1			Overall Rate:	45.45%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	7	4	7	7	1	34
Expert Level Radiation Therapist	6	5		3			14
Medical Physicist			3	3	4		10
Radiation Oncologist	2	2	1	1	3	1	10

Round #	2			Overall Rate:	50.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	8	2	5	8	4	34
Expert Level Radiation Therapist	6	6		1		1	14
Medical Physicist			1	2	7		10
Radiation Oncologist	1	2	1	2	1	3	10

Round #	3			Overall Rate:	32.14%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	5		7	12	6	34
Expert Level Radiation Therapist	4	3		3	2	2	14
Medical Physicist				1	8	1	10
Radiation Oncologist		2		3	2	3	10

(Clinical Practice) Liaison and consultation with other healthcare facilities, services and team members

Round #	1			Overall Rate:	78.79%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	13	13	5	1	1	1	34
Expert Level Radiation Therapist	7	5	2				14
Medical Physicist	2	5	1	1	1		10
Radiation Oncologist	4	3	2			1	10

(Clinical Practice) Assignment of patient priority for therapy

Round #	1			Overall Rate:	51.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	7	4	7	5	1	34
Expert Level Radiation Therapist	7	4	1	2			14
Medical Physicist		1	1	5	3		10
Radiation Oncologist	3	2	2		2	1	10

Round #	2			Overall Rate:	54.84%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	7	3	8	3	3	34
Expert Level Radiation Therapist	8	4	2				14
Medical Physicist		1		6	3		10
Radiation Oncologist	2	2	1	2		3	10

Round #	3			Overall Rate:	35.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	5	1	12	5	6	34
Expert Level Radiation Therapist	3	4	1	4		2	14
Medical Physicist	1			5	3	1	10
Radiation Oncologist	1	1		3	2	3	10

(Clinical Practice) Assignment of dose/fractionation according to disease site, target volume and dose limiting structures

Round #	1			Overall Rate:	39.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	8	1	8	11	1	34
Expert Level Radiation Therapist	4	6		4			14
Medical Physicist				1	9		10
Radiation Oncologist	1	2	1	3	2	1	10

Round #	2			Overall Rate:	22.58%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	5		11	13	3	34
Expert Level Radiation Therapist	2	5		5	2		14
Medical Physicist				1	9		10
Radiation Oncologist				5	2	3	10

Round #	3			Overall Rate:	17.86%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		5		6	17	6	34
Expert Level Radiation Therapist		5		3	4	2	14
Medical Physicist					9	1	10
Radiation Oncologist				3	4	3	10

(Clinical Practice) Determination of gross, clinical and planning target volumes

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	11	1	7	9	1	34
Expert Level Radiation Therapist	4	6		4			14
Medical Physicist		1		2	7		10
Radiation Oncologist	1	4	1	1	2	1	10

Round #	2			Overall Rate:	38.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	11		10	9	3	34
Expert Level Radiation Therapist	1	8		5			14
Medical Physicist		1		2	7		10
Radiation Oncologist		2		3	2	3	10

Round #	3			Overall Rate:	25.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	5		11	10	6	34
Expert Level Radiation Therapist	2	4		6		2	14
Medical Physicist		1			8	1	10
Radiation Oncologist				5	2	3	10

(Clinical Practice) Write Prescription of treatment regimen for physician signature

Round #	1			Overall Rate:	51.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	11	2	7	7	1	34
Expert Level Radiation Therapist	5	7		2			14
Medical Physicist				4	6		10
Radiation Oncologist	1	4	2	1	1	1	10

Round #	2			Overall Rate:	48.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	11	3	9	4	3	34
Expert Level Radiation Therapist	4	8	1	1			14
Medical Physicist			1	5	4		10
Radiation Oncologist		3	1	3		3	10

Round #	3			Overall Rate:	39.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	10	2	11	4	6	34
Expert Level Radiation Therapist	1	8		3		2	14
Medical Physicist			1	5	3	1	10
Radiation Oncologist		2	1	3	1	3	10

(Clinical Practice) Review of referrals for appropriateness

Round #	1			Overall Rate:	39.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	9	5	11	4	1	34
Expert Level Radiation Therapist	2	7	1	4			14
Medical Physicist			1	6	3		10
Radiation Oncologist	2	2	3	1	1	1	10

Round #	2			Overall Rate:	33.33%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	9	4	12	4	4	34
Expert Level Radiation Therapist	1	6	2	5			14
Medical Physicist			2	5	3		10
Radiation Oncologist		3		2	1	4	10

Round #	3			Overall Rate:	25.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	5	2	16	3	6	34
Expert Level Radiation Therapist	2	4	1	5		2	14
Medical Physicist				6	3	1	10
Radiation Oncologist		1	1	5		3	10

(Clinical Practice) First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged

Round #	1			Overall Rate:	42.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	9	6	7	6	1	34
Expert Level Radiation Therapist	4	6	2	2			14
Medical Physicist			2	4	4		10
Radiation Oncologist	1	3	2	1	2	1	10

Round #	2			Overall Rate:	51.61%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	12	6	5	4	3	34
Expert Level Radiation Therapist	3	9	2				14
Medical Physicist		1	2	4	3		10
Radiation Oncologist	1	2	2	1	1	3	10

Round #	3			Overall Rate:	39.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	10	4	8	5	6	34
Expert Level Radiation Therapist	1	7	2	2		2	14
Medical Physicist			2	3	4	1	10
Radiation Oncologist		3		3	1	3	10

(Clinical Practice) Patient education

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	13	17	2	1		1	34
Expert Level Radiation Therapist	7	7					14
Medical Physicist	2	6	2				10
Radiation Oncologist	4	4		1		1	10

(Clinical Practice) Pain management

Round #	1			Overall Rate:	27.27%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	6	6	12	6	1	34
Expert Level Radiation Therapist	2	5	2	5			14
Medical Physicist			4	2	4		10
Radiation Oncologist	1	1		5	2	1	10

Round #	2			Overall Rate:	25.81%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	6	1	17	5	3	34
Expert Level Radiation Therapist	2	5		7			14
Medical Physicist			1	5	4		10
Radiation Oncologist		1		5	1	3	10

Round #	3			Overall Rate:	18.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		5	2	17	3	7	34
Expert Level Radiation Therapist		4	1	7		2	14
Medical Physicist			1	4	3	2	10
Radiation Oncologist		1		6		3	10

(Clinical Practice) Provision of patient support (psycho-social) in palliative radiation therapy

Round #	1			Overall Rate:	57.58%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	11	4	6	4	1	34
Expert Level Radiation Therapist	5	6		3			14
Medical Physicist	1	1	4	2	2		10
Radiation Oncologist	2	4		1	2	1	10

Round #	2			Overall Rate:	67.74%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	16	5	3	2	3	34
Expert Level Radiation Therapist	4	8	1		1		14
Medical Physicist	1	3	3	2	1		10
Radiation Oncologist		5	1	1		3	10

Round #	3			Overall Rate:	64.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		18	5	3	2	6	34
Expert Level Radiation Therapist		10	1		1	2	14
Medical Physicist		3	3	2	1	1	10
Radiation Oncologist		5	1	1		3	10

(Clinical Practice) Patient interview to verify and update medical history

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	8	9	6	2	1	34
Expert Level Radiation Therapist	5	4	4	1			14
Medical Physicist	1	2	2	3	2		10
Radiation Oncologist	2	2	3	2		1	10

Round #	2			Overall Rate:	61.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	14	6	4	2	3	34
Expert Level Radiation Therapist	4	7	2		1		14
Medical Physicist	1	3	3	2	1		10
Radiation Oncologist		4	1	2		3	10

Round #	3			Overall Rate:	62.96%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	15	3	4	3	7	34
Expert Level Radiation Therapist	2	8	1		1	2	14
Medical Physicist		4	1	2	1	2	10
Radiation Oncologist		3	1	2	1	3	10

(Clinical Practice) Report of findings to the delegating radiation oncologist

Round #	1			Overall Rate:	78.79%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	13	13	5	1	1	1	34
Expert Level Radiation Therapist	6	5	3				14
Medical Physicist	2	5	1	1	1		10
Radiation Oncologist	5	3	1			1	10

(Clinical Practice) Assist with invasive or complex radiation oncology procedures

Round #	1			Overall Rate:	84.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	15	13	2	2	1	1	34
Expert Level Radiation Therapist	7	6		1			14
Medical Physicist	3	4	2		1		10
Radiation Oncologist	5	3		1		1	10

(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist during simulation

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	18	12	1	2		1	34
Expert Level Radiation Therapist	7	6		1			14
Medical Physicist	6	3	1				10
Radiation Oncologist	5	3		1		1	10

(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation

Round #	1			Overall Rate:	69.70%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	12	6	2	2	1	34
Expert Level Radiation Therapist	7	7					14
Medical Physicist	4	2	2	1	1		10
Radiation Oncologist		3	4	1	1	1	10

Round #	2			Overall Rate:	90.32%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	17		3		3	34
Expert Level Radiation Therapist	8	6					14
Medical Physicist	3	5		2			10
Radiation Oncologist		6		1		3	10

(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist IGRT treatment/approval

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	14	2		1	1	34
Expert Level Radiation Therapist	7	6			1		14
Medical Physicist	5	4	1				10
Radiation Oncologist	4	4	1			1	10

(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist MRI simulation

Round #	1			Overall Rate:	93.94%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	15	1		1	1	34
Expert Level Radiation Therapist	7	6			1		14
Medical Physicist	4	5	1				10
Radiation Oncologist	5	4				1	10

(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist MRL treatment

Round #	1			Overall Rate:	93.94%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	15	1		1	1	34
Expert Level Radiation Therapist	7	6			1		14
Medical Physicist	4	5	1				10
Radiation Oncologist	5	4				1	10

(Clinical Practice) Administration of oral sedatives

Round #	1			Overall Rate:	42.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	9	6	9	4	1	34
Expert Level Radiation Therapist	3	6	2	2	1		14
Medical Physicist	1	2	3	2	2		10
Radiation Oncologist	1	1	1	5	1	1	10

Round #	2			Overall Rate:	29.03%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	5	5	14	3	3	34
Expert Level Radiation Therapist	3	3	4	4			14
Medical Physicist	1	2	1	5	1		10
Radiation Oncologist				5	2	3	10

Round #	3			Overall Rate:	17.86%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	2	5	16	2	6	34
Expert Level Radiation Therapist	2	2	3	5		2	14
Medical Physicist	1		1	5	2	1	10
Radiation Oncologist			1	6		3	10

(Clinical Practice) Observation and assessment of moderately sedated patients

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	8	9	6	2	1	34
Expert Level Radiation Therapist	4	3	6	1			14
Medical Physicist	2	4	2	1	1		10
Radiation Oncologist	2	1	1	4	1	1	10

Round #	2			Overall Rate:	45.16%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	9	10	6	1	3	34
Expert Level Radiation Therapist	4	3	7				14
Medical Physicist	1	6	1	2			10
Radiation Oncologist			2	4	1	3	10

Round #	3			Overall Rate:	32.14%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	6	11	8		6	34
Expert Level Radiation Therapist	2	2	5	3		2	14
Medical Physicist	1	3	3	2		1	10
Radiation Oncologist		1	3	3		3	10

(Clinical Practice) Referral of questions about diagnosis, treatment or prognosis to the delegating radiation oncologist

Round #	1			Overall Rate:	84.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	16	4		1	1	34
Expert Level Radiation Therapist	5	8	1				14
Medical Physicist	3	5	2				10
Radiation Oncologist	4	3	1		1	1	10

(Clinical Practice) Evaluates images for image and diagnostic quality

Round #	1			Overall Rate:	93.94%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	15	16		2		1	34
Expert Level Radiation Therapist	7	6		1			14
Medical Physicist	2	7		1			10
Radiation Oncologist	6	3				1	10

(Clinical Practice) Reviews the images for initial observations

Round #	1			Overall Rate:	84.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	17	3	1	1	1	34
Expert Level Radiation Therapist	7	7					14
Medical Physicist	1	6	2		1		10
Radiation Oncologist	3	4	1	1		1	10

(Clinical Practice) Report of image observations to delegating radiation oncologist

Round #	1			Overall Rate:	93.94%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	19		2		1	34
Expert Level Radiation Therapist	7	7					14
Medical Physicist	1	8		1			10
Radiation Oncologist	4	4		1		1	10

(Clinical Practice) Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist

Round #	1			Overall Rate:	60.61%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	9	5	4	4	1	34
Expert Level Radiation Therapist	6	4	2	2			14
Medical Physicist	2	3	2	1	2		10
Radiation Oncologist	3	2	1	1	2	1	10

Round #	2			Overall Rate:	80.65%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	14	4	2		3	34
Expert Level Radiation Therapist	7	4	2	1			14
Medical Physicist	2	6	1	1			10
Radiation Oncologist	2	4	1			3	10

Round #	3			Overall Rate:	89.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	5	20	2	1		6	34
Expert Level Radiation Therapist	4	7	1			2	14
Medical Physicist	1	6	1	1		1	10
Radiation Oncologist		7				3	10

(Clinical Practice) Post-care instructions to patient as ordered by the delegating radiation oncologist

Round #	1			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	11	5	3	3	1	34
Expert Level Radiation Therapist	6	5	2	1			14
Medical Physicist	2	4	2	1	1		10
Radiation Oncologist	3	2	1	1	2	1	10

Round #	2			Overall Rate:	93.55%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	19		2		3	34
Expert Level Radiation Therapist	6	8					14
Medical Physicist	2	7		1			10
Radiation Oncologist	2	4		1		3	10

(Clinical Practice) Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment)

Round #	1			Overall Rate:	72.73%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	12	6	1	2	1	34
Expert Level Radiation Therapist	8	5	1				14
Medical Physicist	1	3	3	1	2		10
Radiation Oncologist	3	4	2			1	10

Round #	2			Overall Rate:	90.32%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	17	3			3	34
Expert Level Radiation Therapist	7	6	1				14
Medical Physicist	1	7	2				10
Radiation Oncologist	3	4				3	10

Round #	3			Overall Rate:	92.86%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	22	2			6	34
Expert Level Radiation Therapist	4	7	1			2	14
Medical Physicist		8	1			1	10
Radiation Oncologist		7				3	10

(Clinical Practice) Understand, evaluate, and apply evidence-based medicine clinical scenarios

Round #	1			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	15	7	1	3	1	34
Expert Level Radiation Therapist	3	7	3		1		14
Medical Physicist		5	3	1	1		10
Radiation Oncologist	4	3	1		1	1	10

Round #	2			Overall Rate:	74.19%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		23	6	2		3	34
Expert Level Radiation Therapist		9	4	1			14
Medical Physicist		8	1	1			10
Radiation Oncologist		6	1			3	10

(Clinical Practice) Understand, evaluate, and apply scientific principles related to patient care clinical scenarios

Round #	1			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	15	5	3	3	1	34
Expert Level Radiation Therapist	3	7	2	1	1		14
Medical Physicist	1	5	1	2	1		10
Radiation Oncologist	3	3	2		1	1	10

Round #	2			Overall Rate:	80.65%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	23	3	2	1	3	34
Expert Level Radiation Therapist	2	9	2		1		14
Medical Physicist		7	1	2			10
Radiation Oncologist		7				3	10

Round #	3			Overall Rate:	89.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	23	3			6	34
Expert Level Radiation Therapist	2	9	1			2	14
Medical Physicist		9				1	10
Radiation Oncologist		5	2			3	10

(Clinical Practice) Understand, evaluate, and apply etiologies, risk factors, underlying pathologic process, and epidemiology for medical conditions related to clinical scenarios

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	10	8	6	3	1	34
Expert Level Radiation Therapist	4	3	4	2	1		14
Medical Physicist		4	2	3	1		10
Radiation Oncologist	2	3	2	1	1	1	10

Round #	2			Overall Rate:	58.06%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	17	9	2	2	3	34
Expert Level Radiation Therapist	1	9	3		1		14
Medical Physicist		3	4	2	1		10
Radiation Oncologist		5	2			3	10

Round #	3			Overall Rate:	51.85%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		14	10	2	1	7	34
Expert Level Radiation Therapist		9	3			2	14
Medical Physicist			5	2	1	2	10
Radiation Oncologist		5	2			3	10

(Clinical Practice) Understand, evaluate, and apply signs and symptoms of medical and surgical conditions related to clinical scenarios

Round #	1			Overall Rate:	51.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	11	8	6	2	1	34
Expert Level Radiation Therapist	3	6	2	3			14
Medical Physicist	1	3	3	2	1		10
Radiation Oncologist	2	2	3	1	1	1	10

Round #	2			Overall Rate:	74.19%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		23	4	3	1	3	34
Expert Level Radiation Therapist		13	1				14
Medical Physicist		5	2	2	1		10
Radiation Oncologist		5	1	1		3	10

Round #	3			Overall Rate:	67.86%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	18	7	2		6	34
Expert Level Radiation Therapist	1	9	2			2	14
Medical Physicist		4	3	2		1	10
Radiation Oncologist		5	2			3	10

(Clinical Practice) Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios

Round #	1			Overall Rate:	51.52%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	10	7	6	3	1	34
Expert Level Radiation Therapist	5	3	2	3	1		14
Medical Physicist	1	2	4	2	1		10
Radiation Oncologist	1	5	1	1	1	1	10

Round #	2			Overall Rate:	67.74%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	18	4	5	1	3	34
Expert Level Radiation Therapist	3	8	2		1		14
Medical Physicist		4	2	4			10
Radiation Oncologist		6		1		3	10

Round #	3			Overall Rate:	75.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	20	3	4		6	34
Expert Level Radiation Therapist	1	11				2	14
Medical Physicist		5	2	2		1	10
Radiation Oncologist		4	1	2		3	10

(Clinical Practice) Understand, evaluate, and apply management of general medical and surgical conditions to Include pharmacologic and other treatment modalities to clinical scenarios

Round #	1			Overall Rate:	36.36%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	8	4	14	3	1	34
Expert Level Radiation Therapist	3	4	1	5	1		14
Medical Physicist		2	2	5	1		10
Radiation Oncologist	1	2	1	4	1	1	10

Round #	2			Overall Rate:	18.75%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	5	3	20	3	2	34
Expert Level Radiation Therapist	1	4	2	6	1		14
Medical Physicist			1	8	1		10
Radiation Oncologist		1		6	1	2	10

Round #	3			Overall Rate:	10.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	2	1	23	1	6	34
Expert Level Radiation Therapist	1	2	1	8		2	14
Medical Physicist				8	1	1	10
Radiation Oncologist				7		3	10

(Clinical Practice) Understand, evaluate, and apply interventions for prevention of disease and health promotion/maintenance related to clinical scenarios

Round #	1			Overall Rate:	39.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	7	6	10	4	1	34
Expert Level Radiation Therapist	4	4	2	3	1		14
Medical Physicist		2	2	4	2		10
Radiation Oncologist	2	1	2	3	1	1	10

Round #	2			Overall Rate:	18.75%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	5	5	17	4	2	34
Expert Level Radiation Therapist	1	5	2	5	1		14
Medical Physicist			2	6	2		10
Radiation Oncologist			1	6	1	2	10

Round #	3			Overall Rate:	14.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	2		23	1	6	34
Expert Level Radiation Therapist	2	2		8		2	14
Medical Physicist				8	1	1	10
Radiation Oncologist				7		3	10

(Clinical Practice) Understand, evaluate, and apply screening methods to detect conditions in an asymptomatic individual related to clinical scenarios

Round #	1			Overall Rate:	36.36%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	6	7	10	4	1	34
Expert Level Radiation Therapist	4	3	2	4	1		14
Medical Physicist		2	3	3	2		10
Radiation Oncologist	2	1	2	3	1	1	10

Round #	2			Overall Rate:	15.63%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	3	5	19	3	2	34
Expert Level Radiation Therapist	2	3	3	5	1		14
Medical Physicist			1	7	2		10
Radiation Oncologist			1	7		2	10

Round #	3			Overall Rate:	10.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		3		24	1	6	34
Expert Level Radiation Therapist		3		9		2	14
Medical Physicist				8	1	1	10
Radiation Oncologist				7		3	10

(Clinical Practice) Understand, evaluate, and apply history and physical findings and diagnostic studies to formulate differential diagnoses related to clinical scenarios

Round #	1			Overall Rate:	36.36%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	8	4	11	6	1	34
Expert Level Radiation Therapist	3	5	1	4	1		14
Medical Physicist		1	2	3	4		10
Radiation Oncologist	1	2	1	4	1	1	10

Round #	2			Overall Rate:	28.13%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		9	1	18	4	2	34
Expert Level Radiation Therapist		8	1	4	1		14
Medical Physicist				7	3		10
Radiation Oncologist		1		7		2	10

Round #	3			Overall Rate:	10.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		3	1	21	3	6	34
Expert Level Radiation Therapist		3	1	8		2	14
Medical Physicist				6	3	1	10
Radiation Oncologist				7		3	10

(Clinical Practice) Make decisions about diagnostic and therapeutic interventions based on patient information and preferences, current scientific evidence, and informed clinical judgment

Round #	1			Overall Rate:	36.36%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	6	5	10	6	1	34
Expert Level Radiation Therapist	5	4	1	4			14
Medical Physicist			2	4	4		10
Radiation Oncologist	1	2	2	2	2	1	10

Round #	2			Overall Rate:	31.25%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	9	2	15	5	2	34
Expert Level Radiation Therapist	1	8	1	4			14
Medical Physicist				5	5		10
Radiation Oncologist		1	1	6		2	10

Round #	3			Overall Rate:	21.43%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		6	1	16	5	6	34
Expert Level Radiation Therapist		5	1	6		2	14
Medical Physicist				4	5	1	10
Radiation Oncologist		1		6		3	10

(Clinical Practice) Develop and implement patient management plans

Round #	1			Overall Rate:	39.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	10	8	7	5	1	34
Expert Level Radiation Therapist	3	8	2	1			14
Medical Physicist			2	5	3		10
Radiation Oncologist		2	4	1	2	1	10

Round #	2			Overall Rate:	48.39%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	14	6	7	3	3	34
Expert Level Radiation Therapist	1	11	1	1			14
Medical Physicist			3	4	3		10
Radiation Oncologist		3	2	2		3	10

Round #	3			Overall Rate:	25.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	6	4	13	4	6	34
Expert Level Radiation Therapist	1	5	1	5		2	14
Medical Physicist			1	5	3	1	10
Radiation Oncologist		1	2	3	1	3	10

(Clinical Practice) Counsel and educate patients and their families

Round #	1			Overall Rate:	78.79%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	16	3	2	2	1	34
Expert Level Radiation Therapist	7	7					14
Medical Physicist	1	5	2	1	1		10
Radiation Oncologist	2	4	1	1	1	1	10

(Clinical Practice) Perform medical and surgical procedures essential to their area of practice

Round #	1			Overall Rate:	36.36%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	9	4	8	9	1	34
Expert Level Radiation Therapist	2	4	1	5	2		14
Medical Physicist		1	3	1	5		10
Radiation Oncologist	1	4		2	2	1	10

Round #	2			Overall Rate:	32.26%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	9	2	11	8	3	34
Expert Level Radiation Therapist	1	5	1	5	2		14
Medical Physicist		2	1	4	3		10
Radiation Oncologist		2		2	3	3	10

Round #	3			Overall Rate:	32.14%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	8	2	10	7	6	34
Expert Level Radiation Therapist	1	4	2	4	1	2	14
Medical Physicist		2		3	4	1	10
Radiation Oncologist		2		3	2	3	10

(Clinical Practice) Provide health care services and education aimed at disease prevention and health maintenance

Round #	1			Overall Rate:	45.45%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	9	5	8	5	1	34
Expert Level Radiation Therapist	4	6	3	1			14
Medical Physicist	1	1	1	4	3		10
Radiation Oncologist	1	2	1	3	2	1	10

Round #	2			Overall Rate:	61.29%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	16	1	10	1	3	34
Expert Level Radiation Therapist	3	11					14
Medical Physicist		4	1	4	1		10
Radiation Oncologist		1		6		3	10

Round #	3			Overall Rate:	60.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	14	1	8	2	6	34
Expert Level Radiation Therapist	2	9	1			2	14
Medical Physicist		3		4	2	1	10
Radiation Oncologist	1	2		4		3	10

(Clinical Practice) Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT

Round #	1			Overall Rate:	87.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	13	2	1	1	1	34
Expert Level Radiation Therapist	4	7	1	1	1		14
Medical Physicist	4	5	1				10
Radiation Oncologist	8	1				1	10

(Clinical Practice) Locate, appraise, and integrate evidence from scientific studies related to their patients' health

Round #	1			Overall Rate:	54.55%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	12	5	9	1	1	34
Expert Level Radiation Therapist	3	5	3	3			14
Medical Physicist	1	3	2	3	1		10
Radiation Oncologist	2	4		3		1	10

Round #	2			Overall Rate:	54.84%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	15	6	7	1	3	34
Expert Level Radiation Therapist	2	7	3	2			14
Medical Physicist		3	3	3	1		10
Radiation Oncologist		5		2		3	10

Round #	3			Overall Rate:	50.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	13	6	7	1	6	34
Expert Level Radiation Therapist	1	8	1	2		2	14
Medical Physicist		2	2	4	1	1	10
Radiation Oncologist		3	3	1		3	10

(Clinical Practice) Apply knowledge of study designs and statistical methods to the appraisal of clinical literature and other information on diagnostic and therapeutic effectiveness

Round #	1			Overall Rate:	42.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	10	7	10	2	1	34
Expert Level Radiation Therapist	2	3	2	6	1		14
Medical Physicist		4	3	2	1		10
Radiation Oncologist	2	3	2	2		1	10

Round #	2			Overall Rate:	32.26%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		10	9	11	1	3	34
Expert Level Radiation Therapist		4	2	6	1	1	14
Medical Physicist		2	5	3			10
Radiation Oncologist		4	2	2		2	10

Round #	3			Overall Rate:	32.14%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		9	6	12	1	6	34
Expert Level Radiation Therapist		4	1	7		2	14
Medical Physicist		2	3	3	1	1	10
Radiation Oncologist		3	2	2		3	10

(Clinical Practice) Understand the funding sources and payment systems that provide coverage for patient care and use the systems effectively

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	9	6	8	3	1	34
Expert Level Radiation Therapist		5	3	5	1		14
Medical Physicist	5	1	2	1	1		10
Radiation Oncologist	2	3	1	2	1	1	10

Round #	2			Overall Rate:	56.25%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	15	4	9	1	2	34
Expert Level Radiation Therapist		7	1	5	1		14
Medical Physicist	3	4		3			10
Radiation Oncologist		4	3	1		2	10

Round #	3			Overall Rate:	59.26%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total		16		11		7	34
Expert Level Radiation Therapist		6		6		2	14
Medical Physicist		4		5		1	10
Radiation Oncologist		6				4	10

(Clinical Practice) Practice cost-effective health care and resource allocation that does not compromise quality of care

Round #	1			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	9	13	5	4	2	1	34
Expert Level Radiation Therapist	2	5	3	3	1		14
Medical Physicist	3	5		1	1		10
Radiation Oncologist	4	3	2			1	10

Round #	2			Overall Rate:	90.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	21	1	1	1	4	34
Expert Level Radiation Therapist	3	9	1		1		14
Medical Physicist	2	6		1		1	10
Radiation Oncologist	1	6				3	10

(Clinical Practice) Recognize and appropriately address system biases that contribute to health care disparities

Round #	1			Overall Rate:	69.70%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	11	12	3	4	3	1	34
Expert Level Radiation Therapist	4	4	1	2	3		14
Medical Physicist	3	4	2	1			10
Radiation Oncologist	4	4		1		1	10

Round #	2			Overall Rate:	86.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	22	2		2	4	34
Expert Level Radiation Therapist	1	10			2	1	14
Medical Physicist	2	7	1				10
Radiation Oncologist	1	5	1			3	10

(Clinical Practice) Apply the concepts of population health to patient care

Round #	1			Overall Rate:	42.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	8	8	6	5	1	34
Expert Level Radiation Therapist	4	2	3	3	2		14
Medical Physicist	1	3	3		3		10
Radiation Oncologist	1	3	2	3		1	10

Round #	2			Overall Rate:	58.06%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	16	6	4	3	3	34
Expert Level Radiation Therapist	1	7	3	1	1	1	14
Medical Physicist	1	4	1	2	2		10
Radiation Oncologist		5	2	1		2	10

Round #	3			Overall Rate:	67.86%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	18	3	4	2	6	34
Expert Level Radiation Therapist		9	2		1	2	14
Medical Physicist	1	4		3	1	1	10
Radiation Oncologist		5	1	1		3	10

(Clinical Practice) Practice in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.

Round #	1			Overall Rate:	96.97%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	25	7	1			1	34
Expert Level Radiation Therapist	9	4	1				14
Medical Physicist	8	2					10
Radiation Oncologist	8	1				1	10

(Clinical Practice) Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	24	6	1	2		1	34
Expert Level Radiation Therapist	8	4	1	1			14
Medical Physicist	8	1		1			10
Radiation Oncologist	8	1				1	10

(Clinical Practice) Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, lifestyle advice and care.

Round #	1			Overall Rate:	48.48%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	9	3	8	6	1	34
Expert Level Radiation Therapist	5	6	2	1			14
Medical Physicist		1	1	5	3		10
Radiation Oncologist	2	2		2	3	1	10

Round #	2			Overall Rate:	51.61%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	12		11	4	3	34
Expert Level Radiation Therapist	4	9		1			14
Medical Physicist		1		6	3		10
Radiation Oncologist		2		4	1	3	10

Round #	3			Overall Rate:	35.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	8	2	11	5	6	34
Expert Level Radiation Therapist	2	5	1	3	1	2	14
Medical Physicist		1		4	4	1	10
Radiation Oncologist		2	1	4		3	10

(Clinical Practice) Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.

Round #	1			Overall Rate:	66.67%		
Role	**Definitely Include**	**Include**	**Neither include nor exclude**	**Exclude**	**Definitely exclude**	**Blank**	**Grand Total**
Grand Total	13	9	8	3		1	34
Expert Level Radiation Therapist	5	4	4	1			14
Medical Physicist	3	3	3	1			10
Radiation Oncologist	5	2	1	1		1	10

Round #	2			Overall Rate:	67.74%		
Role	**Definitely Include**	**Include**	**Neither include nor exclude**	**Exclude**	**Definitely exclude**	**Blank**	**Grand Total**
Grand Total	8	13	9	1		3	34
Expert Level Radiation Therapist	3	6	4	1			14
Medical Physicist	2	4	4				10
Radiation Oncologist	3	3	1			3	10

Round #	3			Overall Rate:	75.00%		
Role	**Definitely Include**	**Include**	**Neither include nor exclude**	**Exclude**	**Definitely exclude**	**Blank**	**Grand Total**
Grand Total	2	19	6	1		6	34
Expert Level Radiation Therapist	2	8	1	1		2	14
Medical Physicist		5	4			1	10
Radiation Oncologist		6	1			3	10

(Clinical Practice) Evaluate own practice, and participate in multi-disciplinary service and team evaluation demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e. outcomes of care, experience and safety)

Round #	1			Overall Rate:	93.94%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	17	1	1		1	34
Expert Level Radiation Therapist	5	8		1			14
Medical Physicist	4	5	1				10
Radiation Oncologist	5	4				1	10

(Clinical Practice) Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	14	1	2		1	34
Expert Level Radiation Therapist	6	6		2			14
Medical Physicist	5	5					10
Radiation Oncologist	5	3	1			1	10

(Clinical Practice) Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	15	15	1	2		1	34
Expert Level Radiation Therapist	6	5	1	2			14
Medical Physicist	4	6					10
Radiation Oncologist	5	4				1	10

(Clinical Practice) Actively seek feedback and involvement from individuals, families, caregivers, communities and colleagues in the co-production of service improvements.

Round #	1			Overall Rate:	87.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	15	14	3	1		1	34
Expert Level Radiation Therapist	5	6	2	1			14
Medical Physicist	4	5	1				10
Radiation Oncologist	6	3				1	10

(Clinical Practice) Critically apply advanced clinical expertise in appropriate facilitatory ways to provide consultancy across professional and service boundaries, influencing clinical practice to enhance quality, reduce unwarranted variation and promote the sharing and adoption of best practice.

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	16	1	1	1	1	34
Expert Level Radiation Therapist	5	8			1		14
Medical Physicist	5	3	1	1			10
Radiation Oncologist	4	5				1	10

(Clinical Practice) Negotiate an individual scope of practice within legal, ethical, professional and organizational policies, governance and procedures, with a focus on managing risk and upholding safety.

Round #	1			Overall Rate:	75.76%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	13	12	4	2	2	1	34
Expert Level Radiation Therapist	5	5	1	1	2		14
Medical Physicist	5	2	2	1			10
Radiation Oncologist	3	5	1			1	10

(Clinical Practice) Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.

Round #	1			Overall Rate:	81.82%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	19	4	2		1	34
Expert Level Radiation Therapist	3	9	1	1			14
Medical Physicist	3	5	1	1			10
Radiation Oncologist	2	5	2			1	10

(Clinical Practice) Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.

Round #	1			Overall Rate:	69.70%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	9	5	5		1	34
Expert Level Radiation Therapist	4	7	2	1			14
Medical Physicist	6		3	1			10
Radiation Oncologist	4	2		3		1	10

Round #	2			Overall Rate:	81.25%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	17	9	4	2		2	34
Expert Level Radiation Therapist	6	6	1	1			14
Medical Physicist	5	2	2	1			10
Radiation Oncologist	6	1	1			2	10

(Clinical Practice) Specialize in regions or in multiple treatment types of image guided and adaptive radiotherapy

Round #	1			Overall Rate:	90.91%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	14	3			1	34
Expert Level Radiation Therapist	6	6	2				14
Medical Physicist	5	4	1				10
Radiation Oncologist	5	4				1	10

(Clinical Practice) Develop new protocols and guidelines in consultation with the Oncologist.

Round #	1			Overall Rate:	81.82%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	9	18	2	4		1	34
Expert Level Radiation Therapist	3	8		3			14
Medical Physicist	1	6	2	1			10
Radiation Oncologist	5	4				1	10

(Clinical Practice) Superior knowledge of cross-sectional anatomy.

Round #	1			Overall Rate:	87.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	16	13	4			1	34
Expert Level Radiation Therapist	4	8	2				14
Medical Physicist	6	3	1				10
Radiation Oncologist	6	2	1			1	10

(Clinical Practice) High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site

Round #	1			Overall Rate:	72.73%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	9	15	6	3		1	34
Expert Level Radiation Therapist	5	8	1				14
Medical Physicist	1	3	5	1			10
Radiation Oncologist	3	4		2		1	10

Round #	2			Overall Rate:	77.42%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	17	6	1		3	34
Expert Level Radiation Therapist	5	8	1				14
Medical Physicist	1	5	3	1			10
Radiation Oncologist	1	4	2			3	10

(Clinical Practice) Provide technical and dosimetric evaluation of adaptive therapy

Round #	1			Overall Rate:	75.76%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	15	2	4	2	1	34
Expert Level Radiation Therapist	2	8	2	1	1		14
Medical Physicist	3	5		1	1		10
Radiation Oncologist	5	2		2		1	10

(Clinical Practice) Normalize volumes/dosimetric criteria for optimal adaptive therapy

Round #	1			Overall Rate:	63.64%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	7	14	5	4	3	1	34
Expert Level Radiation Therapist	2	7	3	1	1		14
Medical Physicist	3	2	2	1	2		10
Radiation Oncologist	2	5		2		1	10

Round #	2			Overall Rate:	75.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	20	3	3	2	2	34
Expert Level Radiation Therapist	2	9	1	1	1		14
Medical Physicist	1	6	1	1	1		10
Radiation Oncologist	1	5	1	1		2	10

(Clinical Practice) Evaluate treatment volume contours and deform for optimal adaptive therapy added

Round #	1			Overall Rate:	66.67%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	9	13	5	3	3	1	34
Expert Level Radiation Therapist	2	8	2	1	1		14
Medical Physicist	3	2	3		2		10
Radiation Oncologist	4	3		2		1	10

Round #	2			Overall Rate:	71.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	8	15	4	3	2	2	34
Expert Level Radiation Therapist	3	8	1	1	1		14
Medical Physicist	2	4	2	1	1		10
Radiation Oncologist	3	3	1	1		2	10

Round #	3			Overall Rate:	70.37%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	3	16	2	6		7	34
Expert Level Radiation Therapist	2	7	1	1		3	14
Medical Physicist	1	4	1	3		1	10
Radiation Oncologist		5		2		3	10

(Clinical Practice) Manipulate margins while escalating dose and reducing fractionation accordingly

Round #	1			Overall Rate:	45.45%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	11	5	4	9	1	34
Expert Level Radiation Therapist	2	7	3	1	1		14
Medical Physicist		2		2	6		10
Radiation Oncologist	2	2	2	1	2	1	10

Round #	2			Overall Rate:	38.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	8	2	9	8	3	34
Expert Level Radiation Therapist	3	6	1	3	1		14
Medical Physicist				5	5		10
Radiation Oncologist	1	2	1	1	2	3	10

Round #	3			Overall Rate:	25.00%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	5	1	10	10	6	34
Expert Level Radiation Therapist	2	3	1	4	2	2	14
Medical Physicist				4	5	1	10
Radiation Oncologist		2		2	3	3	10

(Clinical Practice) Extensive knowledge of pathology

Round #	2			Overall Rate:	46.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	6	9	2	12	3	2	34
Expert Level Radiation Therapist	5	7		1	1		14
Medical Physicist			2	6	2		10
Radiation Oncologist	1	2		5		2	10

Round #	3			Overall Rate:	35.71%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	4	6	1	13	4	6	34
Expert Level Radiation Therapist	4	4		3	1	2	14
Medical Physicist			1	5	3	1	10
Radiation Oncologist		2		5		3	10

(Clinical Practice) Extensive knowledge of pharmacology

Round #	2			Overall Rate:	34.38%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	2	9	7	12	2	2	34
Expert Level Radiation Therapist	2	8	2	2			14
Medical Physicist			3	5	2		10
Radiation Oncologist		1	2	5		2	10

Round #	3			Overall Rate:	17.86%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	1	4	4	16	3	6	34
Expert Level Radiation Therapist	1	4	2	4	1	2	14
Medical Physicist			1	6	2	1	10
Radiation Oncologist			1	6		3	10

(Clinical Practice) Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications

Round #	2			Overall Rate:	96.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	19	1			2	34
Expert Level Radiation Therapist	5	8	1				14
Medical Physicist	3	7					10
Radiation Oncologist	4	4				2	10

(Clinical Practice) Technology specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc.

Round #	2			Overall Rate:	96.88%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	17	1			2	34
Expert Level Radiation Therapist	5	9					14
Medical Physicist	4	5	1				10
Radiation Oncologist	5	3				2	10

(Clinical Practice) Perform formal therapy check of the plan for accuracy

Round #	2			Overall Rate:	93.75%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	18	2			2	34
Expert Level Radiation Therapist	4	8	2				14
Medical Physicist	4	6					10
Radiation Oncologist	4	4				2	10

(Clinical Practice) Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications

Round #	2			Overall Rate:	90.63%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	17	2	1		2	34
Expert Level Radiation Therapist	4	8	1	1			14
Medical Physicist	4	5	1				10
Radiation Oncologist	4	4				2	10

(Clinical Practice) Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan

Round #	2			Overall Rate:	90.63%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	10	19	3			2	34
Expert Level Radiation Therapist	3	8	3				14
Medical Physicist	4	6					10
Radiation Oncologist	3	5				2	10

(Clinical Practice) Interpret a treatment plan's isodose lines for plan optimization

Round #	2			Overall Rate:	87.50%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	16	4			2	34
Expert Level Radiation Therapist	5	6	3				14
Medical Physicist	4	6					10
Radiation Oncologist	3	4	1			2	10

(Clinical Practice) Understand dosimetric criteria notations for plan optimization

Round #	2			Overall Rate:	84.38%		
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	12	15	4	1		2	34
Expert Level Radiation Therapist	3	8	3				14
Medical Physicist	5	4		1			10
Radiation Oncologist	4	3	1			2	10

(Clinical Practice) Identify key failure modes and work collaboratively to design ways to minimize chance of error

Round #	3		Overall Rate:	100.00%			
Role	Definitely Include	Include	Neither include nor exclude	Exclude	Definitely exclude	Blank	Grand Total
Grand Total	14	13				7	34
Expert Level Radiation Therapist	6	6				2	14
Medical Physicist	5	3				2	10
Radiation Oncologist	3	4				3	10

Appendix J

Comments for Competencies

Competency	Comments
	Research
Active involvement in all aspects of independent evidence-based research.	I was not influenced by the aggregate results.
	I am keeping with my same answer on this one. Knowing our PA's do not do research, I do not think any Advanced Practice Radiation Therapist should be responsible for independent research projects.
	To ensure the role is primarily a clinician role vs research role.
	I don't know that they need to be able to perform research independently but certainly they should assist with research efforts.
	Participating in evidence based research could be an aspect of the role for advance RTTs but this would not be the primary focus of their job. They would not be expected to independently design studies or analyze the data from them.
	"Active involvement" in "all aspects" takes time away from patient care and it may be difficult to juggle the demands of full clinic and research loads.
	Change "all" to "some" and I would agree.
Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety productivity and value for money.	I was not influenced by the aggregate results.
	I am keeping with my original answers; I do not feel like our Advanced Practice Radiation Therapists should be responsible for research activities. PA's in other practices do not do research.
	Engagement is critical to facilitate the implementation of these strategies in clinical application.
	Participating in evidence based research could be an aspect of the role for advance RTTs but this would not be the primary focus of their job.
Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.	I was not influenced by the aggregate results.
	It is important to evaluate your own practice. It is also important to see what can be done better by evaluating other departments and PA's.
Critically appraise and synthesize the outcome of relevant research, evaluation and audit, using results to underpin own practice and to inform that of others.	I was not influenced by the aggregate results.
	I have switched my answer to exclude. Since I do not feel that research should be included in the role of the Advanced Practice Radiation Therapist.
	They should be able the use the results and inform others but it is not clear they need to be able to critically appraise and audit the research
Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and	I was not influenced by the aggregate results.

organizations and how they might be addressed in a safe pragmatic way.	I have switched my answer because someone should be looking at this but, I am not sure it should be the role of the Advanced Practice Radiation Therapist. Participating in evidence based research could be an aspect of the role for advance RTTs but this would not be the primary focus of their job. They would not be expected to independently design studies or analyze the data from them.
Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activities and/or seeking out and applying for research funding.	I was not influenced by the aggregate results.
Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.	I was not influenced by the aggregate results. Quality improvement projects are necessary for this new role and also presenting the findings to management and staff members via townhall or special session meetings. But, researching in general and research publications should not be included.
	Leadership and Management
Supervision of residents and fellows in project work.	I must have misread the first time. Supervision of residents and fellows should be done by the physicians who are assigned to train them. We should not be responsible for supervising the residents and fellows projects The confusion here is because we have residents that will be around but therapist don't need to be in charge of the residents.
Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.	I was not influenced by the aggregate results. the governance systems would mist likely be established by other members of the research team, the advanced RTT would be responsible for the documentation.
Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.	I was not influenced by the aggregate results.
Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques)	I was not influenced by the aggregate results. If I understand correctly this is regarding the therapists. I don't think they can be the sole decision maker. They can definitely be involved, though. Leader is fine but decision maker is too strong. The physicians and, sometimes, the physicists are the decision makers.

Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.	I was not influenced by the aggregate results.
	would recommend not autonomous
	Radiation Oncologists require 5 years of training after medical school to make decisions on radiation oncology treatment for patients. Be careful what you allow someone without that training to do.
	I originally interpreted this question as the advanced RTT deciding on dose and fractionation as well as doing the medical evaluation. If instead this is delivering the care including evaluating all the imaging with a hand off back to a MD in case of unexpected changes I would agree with including.
	I find it surprising that I selected "include" to this the first time. I suppose I don't really know what this question means. Maybe an example would help.
Conduct patient triage, review and interpret results and establish care plans.	I was not influenced by the aggregate results.
	RTTs are not nurses, MDs, or APPs and are not trained to understand medications and interactions those may cause- I think this would be a very dangerous practice.
	I don't think that therapists would be establishing care plans.
	Again, I find it surprising that I selected "include" to this the first time. Isn't it the physicians job to establish a care plan?
Assumes a patient case load in each clinic.	I was not influenced by the aggregate results. Not clear what "patient case load" means but again they are not MD, nurse, or APP. Their training and expertise is in the safe delivery of radiation, but they do not manage the patients entire care- that is the role of the MD.
Conduct patient interviews.	I was not influenced by the aggregate results.
	Not clear what patient interviews means- if it is in regards to asking them questions about how they are feeling and having the patient participate in the time out then include, but if the point of the "interview" is for the RTT to manage the questions and provide clinical expertise then exclude
	Clinical Practice
Documents patient history and physical assessment data.	I was not influenced by the aggregate results.
	RTTs do not have training of a nurse, APP, MD to document this.
Formulate care plans for palliative patients.	Plans should be left up to the physicians. Perhaps presence in planning clinic would help this for patients.
	This is the job of the MD - they have the clinical training to assess interactions from other medications etc that RTTs do not.
	This is a unique role reserved for the radiation oncologist.
	How is this different than "Conduct patient triage, review and interpret results and establish care plans."

Provide technical and dosimetric consultation	I was not influenced by the aggregate results.
	The advanced RTT should be able to consult with physics and dosimetry on what is technically feasible for the patient but they do not have training as a dosimetrist or physicist so I wouldn't expect them to consult on the dosimetry of a plan.
	This is a great area for therapists to expand their scope as it is still within radiation therapy and does not require a full medical school education. See Atwood et al. (JACR 2021) about this type of technical consultation (they proposed it for physicists) to offload some of the technical discussion during physician consults to another personnel.
	Hmm. I hope this is not a actually a psychology experiment. I find it hard to believe I selected "exclude" first time.
Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines.	I was not influenced by the aggregate results.
	Advanced RTTs are trained in radiation delivery not in what should be ordered for a patient based on their medical history. Understanding the complexities of a patients medical history is the role of the nurse, APP, and MD
	If ordering strictly based on guidelines, then can be computer-automated. If ordering diagnostic tests based on medical judgment, this is outside the scope of therapists who did not go to medical school. May open up to liability issues. Generally, if a task can be perhaps best done by physician assistants or radiation oncology residents, then there is little need to train therapists to be able to do it as well.
Assignment of patient priority for therapy	I was not influenced by the aggregate results.
	Determining the clinical urgency of treatment is an MD decision.
	They have to be involved.
	Requires substantial medical judgment, as therapy need and priority depends on the patient's comorbidities, other procedures, chemotherapy, etc. Also will need to discuss assignment decision with physicians from other departments and this communication may be difficult for therapists to follow since therapists did not go to medical school, internship, or residency, to fully understand the medical jargons and hospital-based care considerations.
Assignment of dose/fractionation according to disease site, target volume and dose limiting structures	I was not influenced by the aggregate results.
	This is the role of an MD not any other person in the clinic - if an advanced RTT can do this then what is the point of having an MD?
Determination of gross, clinical and planning target volumes	I was not influenced by the aggregate results.
	This is the role of an MD not any other person in the clinic - if an advanced RTT can do this then what is the point of having an MD?
Write Prescription of treatment regimen for physician signature	I was not influenced by the aggregate results.
	MDs should write their prescription to ensure it is what is desired

	Determining the dose and fractionation is the job of the Radiation Oncologist preparing predefined scripts under the radiation oncologists supervision could be within the scope of the advanced RTT.
Review of referrals for appropriateness	I was not influenced by the aggregate results.
	Advanced RTTs do not have the clinical training to know if a referral to RadOnc is appropriate
	This is a role reserved for the Radiation Oncologist.
First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged.	I was not influenced by the aggregate results.
	The first point of contact should be someone that can place referrals, order medication and tests - this is not the training of an advanced RTT
Pain management	I was not influenced by the aggregate results.
	Most physicians do not even prescribe medications for pain management. This needs to be left to the attending or the pain management department.
	I believe I read the question wrong on the first survey.
	Therapist are often great at physically positioning patients to reduce pain. Docs and nurses must be in charge of medicines used for pain management.
Provision of patient support (psycho-social) in palliative radiation therapy	I was not influenced by the aggregate results.
	Not clear what this means but RTTs should always be supportive and provide patients with support to other hospital programs such as patient advocacy when needed
	It is not clear what would be involved, referral for additional service could be in this role but would not replace the role of other team members who would have this responsibility
Patient interview to verify and update medical history	I was not influenced by the aggregate results.
Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation.	I was not influenced by the aggregate results.
	No sure what selected procedures entails - if these are radiation producing procedures such as a verification sim, CBCT, treatment then include but if this like take vitals, scope the patient, etc then exclude
Administration of oral sedatives	I was not influenced by the aggregate results.
Observation and assessment of moderately sedated patients	I was not influenced by the aggregate results.
	all of this depends on what the training is. would need very specific training for this role.
	Isn't this the role of a nurse? Observation and assessments require clinical knowledge base of medication being delivered
	If the patient is under treatment therapist should participate but not make decision.

Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist	I was not influenced by the aggregate results. Standard instructions could be delivered based on the treatment and staging for selected patients.
Post-care instructions to patient as ordered by the delegating radiation oncologist	I was not influenced by the aggregate results.
Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment)	I was not influenced by the aggregate results. Include as long as treatment here is in reference to radiation treatment only and not other treatments such as chemo/surgery etc
Understand, evaluate, and apply evidence-based medicine clinical scenarios.	I was not influenced by the aggregate results. Include as long as this relates to radiation clinical scenarios
Understand, evaluate, and apply scientific principles related to patient care clinical scenarios	I was not influenced by the aggregate results.
Understand, evaluate, and apply etiologies, risk factors, underlying pathologic process, and epidemiology for medical conditions related to clinical scenarios.	I was not influenced by the aggregate results. This is not the training of an advanced RTT - this involves medical training that is received in nursing APP, or MD school
Understand, evaluate, and apply signs and symptoms of medical and surgical conditions related to clinical scenarios	I was not influenced by the aggregate results. This is not the training of an advanced RTT - this involves medical training that is received in nursing APP, or MD school It is not clear what this question means,
Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.	I was not influenced by the aggregate results. Advanced RTTs should be able to read a radiology report and review DI images to understand where disease is, but "ordering" is not in their scope
Understand, evaluate, and apply management of general medical and surgical conditions to include pharmacologic and other treatment modalities to clinical scenarios.	I was not influenced by the aggregate results. if full APP training, then yes.
Understand, evaluate, and apply interventions for prevention of disease and health promotion/maintenance related to clinical scenarios.	I was not influenced by the aggregate results.
Understand, evaluate, and apply screening methods to detect conditions in an asymptomatic	I was not influenced by the aggregate results. This is the role of an MD

individual related to clinical scenarios.	
Understand, evaluate, and apply history and physical findings and diagnostic studies to formulate differential diagnoses related to clinical scenarios.	I was not influenced by the aggregate results. This is the role of an MD
Make decisions about diagnostic and therapeutic interventions based on patient information and preferences, current scientific evidence, and informed clinical judgment.	I was not influenced by the aggregate results. This is the role of an MD
Develop and implement patient management plans.	I was not influenced by the aggregate results. This is the role of an MD This is a role reserved for the radiation oncologist I guess this is not clear. I believe we have different definitions for management plans.
Perform medical and surgical procedures essential to their area of practice.	I was not influenced by the aggregate results. This is the role of an MD It is not clear what this question means Here also I think the "medical and surgical procedures" are not clear.
Provide health care services and education aimed at disease prevention and health maintenance,	I was not influenced by the aggregate results. This is the role of an MD, APP, or nurse I think they have to participate.
Locate, appraise, and integrate evidence from scientific studies related to their patients' health.	I was not influenced by the aggregate results. This is the role of an MD
Apply knowledge of study designs and statistical methods to the appraisal of clinical literature and other information on diagnostic and therapeutic effectiveness.	I was not influenced by the aggregate results. This is the role of an MD
Understand the funding sources and payment systems that provide coverage for patient care and use the systems effectively.	I was not influenced by the aggregate results. This is the role of the billing team
Practice cost-effective health care and resource allocation that does not compromise quality of care.	I was not influenced by the aggregate results.

Recognize and appropriately address system biases that contribute to health care disparities.	I was not influenced by the aggregate results.
Apply the concepts of population health to patient care.	I was not influenced by the aggregate results.
Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, lifestyle advice and care.	I was not influenced by the aggregate results. This is the role of an MD I don't think therapist should be doing this.
Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.	I was not influenced by the aggregate results.
Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.	I was not influenced by the aggregate results. really depends on what "lead role" means
High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site.	I was not influenced by the aggregate results.
Normalize volumes/dosimetric criteria for optimal adaptive therapy.	I was not influenced by the aggregate results. This is the role of an MD to determine dose and dose limits acceptable for a patient
Evaluate treatment volume contours and deform for optimal adaptive therapy added.	I was not influenced by the aggregate results. MDs are responsible for treatment volumes and ensuring they have been adapted correctly
Manipulate margins while escalating dose and reducing fractionation accordingly.	I was not influenced by the aggregate results. This is the role of the MD Dose and fractionation is the role of the radiation oncologist
Extensive knowledge of pathology	Should know what to prescribe for ailments
Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications.	Generalize to image guided adaptive radiation therapy not just MRL guided
Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications.	No comments

Technology specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc.	No comments
Understand dosimetric criteria notations for plan optimization.	They should understand notations but they should not be responsible for optimization
Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan.	No comments
Interpret a treatment plan's isodose lines for plan optimization.	No comments
Perform formal therapy check of the plan for accuracy.	No comments
Identify key failure modes and work collaboratively to design ways to minimize chance of error.	Include For 139: Definitely include definitely include to q139. There is no choice for this item. Include Definitely include. Definitely Include

Appendix K

Results by Origin

	Total	Consensus	Non-consensus
Research	**7**	**3**	**4**
MD Anderson	1		1
England	6	3	3
Leadership and Management	**13**	**12**	**1**
MD Anderson	1	1	
USRA	2	2	
Canada	4	3	1
England	6	6	
Clinical Practice	**87**	**50**	**37**
MD Anderson	15	11	4
USPA	21	6	15
USRA	17	14	3
Australia	4	4	
Canada	19	5	14
England	11	10	1
Grand Total	**107**	**65**	**42**

Note. USPA, United States physician assistant; USRA, United States radiologist assistant.

Appendix L

Competencies Subcategorized by Theme

Consensus Competencies Subcategorized by Theme

Advanced Technology

Technology specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc.

Performance of selected procedures under the supervision of the radiation oncologist MRI simulation.

Performance of selected procedures under the supervision of the radiation oncologist MRL treatment.

Performance of selected procedures under the supervision of the radiation oncologist IGRT treatment/approval.

Specialize in regions or in multiple treatment types of image guided and adaptive radiotherapy.

Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications.

Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope.

Collaboration/Education

Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.

Patient, professional and community education.

Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of learning to practice.

Education of other healthcare providers regarding area of expertise.

Advocate for and contribute to a culture of organizational learning to inspire future and existing staff.

Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.

Supervise/mentor health-related professionals in research/ clinical activities.

Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.

Actively seek feedback and involvement from individuals, families, caregivers, communities and colleagues in the co-production of service improvements.

Liaison and consultation with other healthcare facilities, services and team members.

Counsel and educate patients and their families.

Dosimetry

Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications
Evaluates images for image and diagnostic quality.
Perform formal therapy check of the plan for accuracy.
Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan.
Superior knowledge of cross-sectional anatomy.
Interpret a treatment plan's isodose lines for plan optimization.
Understand dosimetric criteria notations for plan optimization.
Provide technical and dosimetric evaluation of adaptive therapy.
Provide technical and dosimetric consultation.
Normalize volumes/dosimetric criteria for optimal adaptive therapy.

Patient Care

Report of image observations to delegating radiation oncologist.
Post-care instructions to patient as ordered by the delegating radiation oncologist.
Patient education.
Performance of selected procedures under the supervision of the radiation oncologist during simulation.
Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation.
Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment).
Recognize and appropriately address system biases that contribute to health care disparities.
Assist with invasive or complex radiation oncology procedures.
Referral of questions about diagnosis, treatment or prognosis to the delegating radiation oncologist.
Reviews the images for initial observations.
Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.
Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.
Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.
Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist.
Understand, evaluate, and apply scientific principles related to patient care clinical scenarios.
Report of findings to the delegating radiation oncologist.
High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site.

Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.

Process Improvement

Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.

Identify further developmental needs for the individual and the wider team and supporting them to address these.

Strategic planning in workplace.

Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques).

Evaluate own practice and participate in multi-disciplinary service and team evaluation demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e. outcomes of care, experience and safety).

Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements.

Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence.

Practice cost-effective health care and resource allocation that does not compromise quality of care.

Coordination of resources.

Develop new protocols and guidelines in consultation with the Oncologist.

Safety

Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations and how they might be addressed in a safe pragmatic way.

Involvement in evaluation and maintenance of patient safety programs and initiatives.

Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning.

Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.

Identify key failure modes and work collaboratively to design ways to minimize chance of error.

Practice in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.

Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.

Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT.

Negotiate an individual scope of practice within legal, ethical, professional and organizational policies, governance and procedures, with a focus on managing risk and upholding safety.

Non-consensus Competencies Subcategorized by Theme

Billing

Understand the funding sources and payment systems that provide coverage for patient care and use the systems effectively

Dosimetry

Assignment of dose/fractionation according to disease site, target volume and dose limiting structures

Determination of gross, clinical and planning target volumes

Evaluate treatment volume contours and deform for optimal adaptive therapy added

Manipulate margins while escalating dose and reducing fractionation accordingly

Research

Active involvement in all aspects of independent evidence-based research.

Critically engage in research activity, adhering to good research practice guidance, so that evidence-based strategies are developed and applied to enhance quality, safety productivity and value for money.

Critically appraise and synthesize the outcome of relevant research, evaluation and audit, using results to underpin own practice and to inform that of others.

Actively identify potential need for further research to strengthen evidence for best practice. This may involve acting as an educator, leader, innovator and contributor to research activities and/or seeking out and applying for research funding.

Apply knowledge of study designs and statistical methods to the appraisal of clinical literature and other information on diagnostic and therapeutic effectiveness

Supervision

Supervision of residents and fellows in project work.

Patient Care

Conduct patient triage, review and interpret results and establish care plans.

Conduct patient triage, review and interpret results and establish care plans.

Assumes a patient case load in each clinic.

Conduct patient interviews.

Documents patient history and physical assessment data.

Formulate care plans for palliative patients.

Identification and order of required diagnostic tests (CT, MRI, X-rays) and procedures, within scope of practice and medical directives/protocols and practice guidelines.

Assignment of patient priority for therapy

Write Prescription of treatment regimen for physician signature

Review of referrals for appropriateness

First point of contact for patients receiving palliative radiotherapy, and for those who have completed treatment and been discharged

Pain management

Provision of patient support (psycho-social) in palliative radiation therapy

Patient interview to verify and update medical history

Administration of oral sedatives

Observation and assessment of moderately sedated patients

Understand, evaluate, and apply evidence-based medicine clinical scenarios

Understand, evaluate, and apply etiologies, risk factors, underlying pathologic process, and epidemiology for medical conditions related to clinical scenarios

Understand, evaluate, and apply signs and symptoms of medical and surgical conditions related to clinical scenarios

Understand, evaluate, and apply management of general medical and surgical conditions to Include pharmacologic and other treatment modalities to clinical scenarios

Understand, evaluate, and apply interventions for prevention of disease and health promotion/maintenance related to clinical scenarios

Understand, evaluate, and apply screening methods to detect conditions in an asymptomatic individual related to clinical scenarios

Understand, evaluate, and apply history and physical findings and diagnostic studies to formulate differential diagnoses related to clinical scenarios

Make decisions about diagnostic and therapeutic interventions based on patient information and preferences, current scientific evidence, and informed clinical judgment

Develop and implement patient management plans

Perform medical and surgical procedures essential to their area of practice

Provide health care services and education aimed at disease prevention and health maintenance

Locate, appraise, and integrate evidence from scientific studies related to their patients' health

Apply the concepts of population health to patient care

Initiate, evaluate and modify a range of interventions which may include prescribing medicines, therapies, lifestyle advice and care.

Extensive knowledge of pathology

Extensive knowledge of pharmacology

Appendix M

Rating of Competencies Reaching Consensus

Competencies	Overall Rating
(Leadership and Management) Involvement in evaluation and maintenance of patient safety programs and initiatives.	100.00%
(Clinical Practice) Identify key failure modes and work collaboratively to design ways to minimize chance of error.	100.00%
(Clinical Practice) Practice in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.	96.97%
(Clinical Practice) Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications	96.88%
(Clinical Practice) Technology specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc.	96.88%
(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist MRI simulation.	93.94%
(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist MRL treatment.	93.94%
(Clinical Practice) Evaluates images for image and diagnostic quality.	93.94%
(Clinical Practice) Report of image observations to delegating radiation oncologist.	93.94%
(Clinical Practice) Evaluate own practice and participate in multi-disciplinary service and team evaluation demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e. outcomes of care, experience and safety).	93.94%
(Clinical Practice) Perform formal therapy check of the plan for accuracy.	93.75%
(Clinical Practice) Post-care instructions to patient as ordered by the delegating radiation oncologist.	93.55%
(Leadership and Management) Patient, professional and community education.	90.91%
(Leadership and Management) Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning.	90.91%
(Leadership and Management) Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of learning to practice.	90.91%
(Clinical Practice) Patient education.	90.91%
(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist during simulation.	90.91%

(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist IGRT treatment/approval.	90.91%
(Clinical Practice) Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.	90.91%
(Clinical Practice) Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements.	90.91%
(Clinical Practice) Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence.	90.91%
(Clinical Practice) Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-being.	90.91%
(Clinical Practice) Specialize in regions or in multiple treatment types of image guided and adaptive radiotherapy.	90.91%
(Clinical Practice) Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications.	90.62%
(Clinical Practice) Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan.	90.62%
(Clinical Practice) Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation.	90.32%
(Clinical Practice) Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment).	90.32%
(Clinical Practice) Practice cost-effective health care and resource allocation that does not compromise quality of care.	90.00%
(Leadership and Management) Education of other healthcare providers regarding area of expertise.	87.88%
(Clinical Practice) Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT.	87.88%
(Clinical Practice) Actively seek feedback and involvement from individuals, families, caregivers, communities and colleagues in the co-production of service improvements.	87.88%
(Clinical Practice) Superior knowledge of cross-sectional anatomy.	87.88%
(Clinical Practice) Interpret a treatment plan's isodose lines for plan optimization.	87.50%
(Leadership and Management) Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.	87.10%
(Clinical Practice) Recognize and appropriately address system biases that contribute to health care disparities.	86.67%

(Leadership and Management) Advocate for and contribute to a culture of organizational learning to inspire future and existing staff.	84.85%
(Leadership and Management) Identify further developmental needs for the individual and the wider team and supporting them to address these.	84.85%
(Clinical Practice) Assist with invasive or complex radiation oncology procedures.	84.85%
(Clinical Practice) Referral of questions about diagnosis, treatment or prognosis to the delegating radiation oncologist.	84.85%
(Clinical Practice) Reviews the images for initial observations.	84.85%
(Clinical Practice) Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer.	84.38%
(Clinical Practice) Understand dosimetric criteria notations for plan optimization.	84.38%
(Leadership and Management) Strategic planning in workplace.	81.82%
(Clinical Practice) Coordination of resources.	81.82%
(Clinical Practice) Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower individuals to participate in decisions about their care and to maximize their health and well-	81.82%
(Clinical Practice) Develop new protocols and guidelines in consultation with the Oncologist.	81.82%
(Clinical Practice) Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy.	81.25%
(Clinical Practice) Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist.	80.65%
(Clinical Practice) Understand, evaluate, and apply scientific principles related to patient care clinical scenarios.	80.65%
(Leadership and Management) Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.	79.31%
(Clinical Practice) Liaison and consultation with other healthcare facilities, services and team members.	78.79%
(Clinical Practice) Report of findings to the delegating radiation oncologist.	78.79%
(Clinical Practice) Counsel and educate patients and their families.	78.79%
(Research) Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications.	78.12%
(Research) Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations and how they might be addressed in a safe pragmatic way.	77.42%

(Clinical Practice) High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site.	77.42%
(Research) Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings.	75.76%
(Leadership and Management) Supervise/mentor health-related professionals in research/ clinical activities.	75.76%
(Clinical Practice) Negotiate an individual scope of practice within legal, ethical, professional and organizational policies, governance and procedures, with a focus on managing risk and upholding safety.	75.76%
(Clinical Practice) Provide technical and dosimetric evaluation of adaptive therapy.	75.76%
(Leadership and Management) Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques).	75.00%
(Clinical Practice) Provide technical and dosimetric consultation.	75.00%
(Clinical Practice) Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.	75.00%
(Clinical Practice) Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role,	75.00%
(Clinical Practice) Normalize volumes/dosimetric criteria for optimal adaptive therapy.	75.00%

Appendix N

ASRT Practice Standards Applied to the APRT Role

Competency	ASRT Practice Standard
Evaluate and audit own and others' clinical practice, selection and applying valid, reliable methods, then acting on the findings	Standard Thirteen: Research, Innovation and Professional Advocacy
Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations and how they might be addressed in a safe pragmatic way	Standard Thirteen: Research, Innovation and Professional Advocacy
Disseminate best practice research findings and quality improvement projects through appropriate media and for presentations and peer review research publications	Standard Eleven: Collaboration and Collegiality Standard Thirteen: Research, Innovation and Professional Advocacy
Supervise/mentor health-related professionals in research/ clinical activities	Standard Eleven: Collaboration and Collegiality Standard Thirteen: Research, Innovation and Professional Advocacy
Patient, professional and community education	Standard Three: Education
Strategic planning in workplace	Standard Two: Analysis/Determination
Involvement in evaluation and maintenance of patient safety programs and initiatives	Standard One: Assessment Standard Two: Analysis/Determination
Education of other healthcare providers regarding area of expertise	Standard Three: Education
Advocate for and contribute to a culture of organizational learning to inspire future and existing staff	Standard Eleven: Collaboration and Collegiality Standard Thirteen: Research, Innovation and Professional Advocacy
Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning	Standard Eleven: Collaboration and Collegiality
Identify further developmental needs for the individual and the wider team and supporting them to address these	Standard Eleven: Collaboration and Collegiality
Supporting the wider team to build capacity and capability through work-based and inter-professional learning, and the application of leaning to practice	Standard Eleven: Collaboration and Collegiality
Serves as a leader and decision maker for the planning and implementation of new	Standard Eleven: Collaboration and Collegiality

clinical practices (technologies/treatment techniques)	
Develop and implement robust governance systems and systematic documentation processes, keeping the need for modification under critical review.	Standard One: Assessment Standard Two: Analysis/Determination
Facilitate collaborative links between clinical practice and research through proactive engagement, networking with academic, clinical and other active researchers.	Standard Eleven: Collaboration and Collegiality
Coordination of resources	Standard One: Assessment Standard Two: Analysis/Determination
Liaison and consultation with other healthcare facilities, services and team members	Standard Eleven: Collaboration and Collegiality
Patient education	Standard Three: Education
Report of findings to the delegating radiation oncologist	Standard Eleven: Collaboration and Collegiality
Assist with invasive or complex radiation oncology procedures	Standard Four: Performance
Performance of selected procedures under the supervision of the radiation oncologist during simulation	Standard Four: Performance
Performance of selected procedures under the supervision of the radiation oncologist IGRT treatment/approval	Standard Four: Performance
Performance of selected procedures under the supervision of the radiation oncologist MRI simulation	Standard Four: Performance
Performance of selected procedures under the supervision of the radiation oncologist MRL treatment	Standard Four: Performance
Referral of questions about diagnosis, treatment or prognosis to the delegating radiation oncologist	Standard Eleven: Collaboration and Collegiality
Evaluates images for image and diagnostic quality	Standard One: Assessment Standard Two: Analysis/Determination
Reviews the images for initial observations	Standard Five: Evaluation
Report of image observations to delegating radiation oncologist	
Counsel and educate patients and their families	Standard Three: Education
Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT	Standard Twelve: Ethics

Practice in compliance with their respective code of professional conduct and within their scope of practice, being responsible and accountable for their decisions, actions and omissions at this level of practice.	Standard Twelve: Ethics
Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.	Standard Ten: Self-Assessment Standard Twelve: Ethics
Evaluate own practice, and participate in multi-disciplinary service and team evaluation demonstrating the impact of advanced clinical practice on service function and effectiveness, and quality (i.e., outcomes of care, experience and safety	Standard Ten: Self-Assessment
Actively engage in peer review to inform own and other's practice, formulating and implementing strategies to act on learning and make improvements	Standard Eleven: Collaboration and Collegiality
Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence	Standard One: Assessment Standard Eleven: Collaboration and Collegiality
Actively seek feedback and involvement from individuals, families, caregivers, communities and colleagues in the co-production of service improvements	Standard Eleven: Collaboration and Collegiality
Critically apply advanced clinical expertise in appropriate faciliatory ways to provide consultancy across professional and service boundaries, influencing clinical practice to enhance quality, reduce unwarranted variation and promote the sharing and adoption of best practice	Standard Four: Performance
Negotiate an individual scope of practice within legal, ethical, professional and organizational policies, governance and procedures, with a focus on managing risk and upholding safety	Standard Ten: Self-Assessment Standard Twelve: Ethics Standard Thirteen: Research, Innovation and Professional Advocacy
Engage with appraise and respond to individual's motivation, development stage and capacity, working collaboratively to support health literacy and empower	Standard Four: Performance Standard Eleven: Collaboration and Collegiality

individuals to participate in decisions about their care and to maximize their health and well-being.	
Specialize regions or in multiple treatment types of image guided and adaptive radiotherapy	Standard Four: Performance
Develop new protocols and guidelines in consultation with the Oncologist	Standard Four: Performance Standard Thirteen: Research, Innovation and Professional Advocacy
Superior knowledge of cross-sectional anatomy	Standard Four: Performance
Provide technical and dosimetric evaluation of adaptive therapy added	Standard Four: Performance
Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer	Standard Four: Performance
Provide technical and dosimetric consultation	Standard Four: Performance
Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation	Standard Four: Performance
Provision of patient discharge, procedure and post-care instructions summary for review and co-signature by the delegating radiation oncologist	Standard Four: Performance
Post-care instructions to patient as ordered by the delegating radiation oncologist	Standard Four: Performance
Continuity of care for the patient (i.e., one person remains with the patient throughout the entire treatment)	Standard Four: Performance
Understand, evaluate, and apply scientific principles related to patient care clinical scenarios	Standard One: Assessment Standard Two: Analysis/Determination Standard Four: Performance
Practice cost-effective health care and resource allocation that does not compromise quality of care	Standard Four: Performance Standard Twelve: Ethics
Recognize and appropriately address system biases that contribute to health care disparities	Standard Thirteen: Research, Innovation and Professional Advocacy
Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy	Standard One: Assessment Standard Two: Analysis/Determination Standard Four: Performance

High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site	Standard Four: Performance Standard Eleven: Collaboration and Collegiality
Normalize volumes/dosimetric criteria for optimal adaptive therapy added	Standard Four: Performance
Understand, evaluate, and apply evidence-based medicine clinical scenarios	Standard One: Assessment Standard Two: Analysis/Determination
Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios	Standard One: Assessment Standard Two: Analysis/Determination
Evidence the underpinning of subject-specific competencies i.e. knowledge, skills and behaviors relevant to the role setting and scope and demonstrate application of the capabilities to these in an approach that is appropriate to the individual role, setting and scope	Standard Ten: Self-Assessment Standard Twelve: Ethics
Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications	Standard Four: Performance
Efficacy and practical knowledge of image acquisition and optimization for CT on-line and offline applications	Standard Four: Performance
Technology specific expertise. For example, linear accelerators, CT Simulators, MR Simulators, IORT, MRL, gamma knife, etc.	Standard Four: Performance
Understand dosimetric criteria notations for plan optimization.	Standard Four: Performance
Interpret DVHs to be able to determine whether the daily adaptive plan is better than the reference plan	Standard Four: Performance
Interpret a treatment plan's isodose lines for plan optimization.	Standard Two: Analysis/Determination Standard Four: Performance
Perform formal therapy check of the plan for accuracy.	Standard Four: Performance

Appendix O

Crosswalk of Entry-Level versus Advanced Practice Radiation Therapists

Essential Functions Organized by ARRT Content Specifications and ASRT Practice Standards		
ARRT Content Specification for Entry Level Radiation Therapist	ASRT Practice Standard*	Advanced Practice Radiation Therapist
Patient Care		
Patient Interactions and Management Ethical and Legal Aspects	Standard Twelve	Understanding of legal and regulatory requirements, as well as the appropriate role of the APRT.
Interpersonal Communication		
Patient Education Explain procedure Pre and post-treatment instructions Respond to inquiries about other imaging modalities Support Services	Standard Three	Pre and post-treatment patient education Health Care Community Education Public Education
Medical Emergencies CPR/AED, injury, other medical disorders (Basic life support) Contrast reactions	Standard One Standard Two	Advanced Cardiac Life Support Understand, evaluate, and apply appropriate diagnostic studies related to clinical scenarios.
Infection control		
Handling and Disposal of Toxic or Hazardous Materials		
Patient and medical Records Management Evaluation Epidemiology, etiology, risk, prevention Screening, history, physical diagnostic lab, and imaging studies	Standard 4 Standard 13	Performance of selected procedures under the supervision of the radiation oncologist weekly treatment evaluation. Recognize and appropriately address system biases that contribute to health care disparities.

Assessment Treatment of side effects Blood studies Dietary counseling Documentation Treatment record Record keeping Basic billing procedures		Assist with invasive or complex radiation oncology procedures. Autonomously deliver care to patients in the unique categories of radiation oncology treatment for specific diseases for example palliation, breast, and prostate cancer. High level skills and knowledge for specializations as a physician extender in all aspects of radiation treatment of a specific disease site.
Safety		
Radiation Physics and Radiobiology Sources of Radiation Principles of radiation physics Biological effects of radiation Radiation tissue tolerance	Standard Four	MR Physics Efficacy and practical knowledge of image acquisition and optimization for MRI/MRL on-line and offline applications.
Radiation Protection, Equipment, Operation, and Quality Assurance Minimize patient exposure Personnel protection Facilities and area monitoring MRI field screening Handling and disposal of radioactive materials Components of operation Linear accelerator CT simulator Instrumentation (radiation measurement devices)	Standard Four Standard Five	Level II MRI Safety Lead role in all on-line imaging verification and decision making for image guided and adaptive radiotherapy. Reviews the images for initial observations. Report of findings to the delegating radiation oncologist.
Quality Control Procedures Warm-up and inspection of CT	Standard Four	Perform formal therapy check of the plan for accuracy.

simulators and linear accelerators Verification of radiation output, light, treatment field, and rotation Evaluate QA results		Identify key failure modes and work collaboratively to design ways to minimize chance of error. Take a critical approach to identify gaps in the evidence base and its application to practice, altering appropriate individuals and organizations and how they might be addressed in a safe pragmatic way. Facilitate collaboration of the wide team and support peer review processes to identify individual and team learning. Demonstrate a critical understanding of their broadened level of responsibility and autonomy and the limits of own competence and professional scope of practice including working with complexity, risk, uncertainty and incomplete information.
Procedures		
Treatment Sites and Tumors Treatment Volume Localization Prescription and Dose Calculation Treatments	Standard Two Standard Four	Technology-specific expertise. For example, Linear accelerators, CT simulators, MR Simulators, IORT, MRL, gamma knife, etc. Specialize in regions or in multiple treatment types of image guided and adaptive radiotherapy. Interpreted DVHs to be able to determine whether the daily adaptive plan is better than the reference plan. Interpret a treatment plan's isodose lines for plan

		optimization. Understand dosimetric criteria notations for plan optimization. Normalize volumes/dosimetric criteria for optimal adaptive therapy. Develop new protocols and guidelines in consultation with the Oncologist. Serves as a leader and decision maker for the planning and implementation of new clinical practices (technologies/treatment techniques). Lead new practice and service redesign solutions in response to feedback, evaluations and need, working across boundaries and broadening sphere of influence.

Appendix P

ARRT Permission to Reproduce Copyright Material

THE AMERICAN REGISTRY OF RADIOLOGIC TECHNOLOGISTS®

August 16, 2021

Shaun Caldwell, MS, R.T.(R)(T)(ARRT)
MD Anderson Cancer Center
scaldwell@mdanderson.edu

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If the foregoing meets with your approval, please sign and date this letter and return it via email to bonnie.sorenson@arrt.org.

Sincerely,

Jerry B. Reid, Ph.D.
CEO

Appendix Q

University of Texas MD Anderson Cancer Center IRB Documents

THE UNIVERSITY OF TEXAS
MD Anderson Cancer Center
Making Cancer History®

Office of Human Subject Protection
7007 Bertner Avenue - Unit 1637
Houston, Texas 77030
Mainline: 713-792-6477 (2-6477)

APPROVAL

October 29, 2021

Albert Koong
Radiation Oncology - Clinical

On 9/30/2021, the IRB reviewed and approved the following protocol:

IRB ID	2021-0744
Type of Review:	Initial Study
Level of Review:	Expedited
Review Category:	(7)(a) Behavioral research
Home IRB:	
Title:	Defining Advanced Practice Radiation Therapy at the University of Texas MD Anderson Cancer Center: A Delphi Study A Thesis Proposal for the Degree Executive Doctor of Education Leadership in Health Sciences
Funding:	None
Grant Title:	
Grant ID:	None
IND, IDE or HDE:	None
Documents Reviewed:	• Consent, Category: Consent Form; • Caldwell , Category: IRB Protocol; • Memo of Support Biostatsitcs, Category: Other; • SHP Priority List, Category: Departmental Prioritization List;

The IRB approved the protocol from 9/30/2021 to 9/29/2022 inclusive. Investigators are required to submit a Continuing Review between 90 and 60 days prior to expiration or within 30 days of study close, whichever is earlier.

If continuing review approval is not granted before the expiration date of 9/29/2022 approval of this protocol expires on that date.

Please Note: This study is NOT YET ACTIVATED. No research related activities can begin on this protocol until it has been officially activated by OPRR. You will receive a separate activation memo once all of the requirements have been met.

You will conduct this Human Research in accordance with requirements in the Human Research Protection Program manual.

Sincerely,

Qianna Royston
FWA #: 00000363
OHRP IRB Registration Number: IRB 4 IRB00005015