



Proton Beam Radiation Therapy

Alternative Forms of Recognition

The purpose of ARRT's alternative forms of recognition (AFR) programs is to provide a mechanism for individuals to document completion of activities that are prerequisite to the professional performance of a role in areas for which ARRT does not currently offer certification and registration, but which are within ARRT's scope of interest as described by its mission. The proton beam radiation therapy (PBRT) recognition program is the first AFR offered by ARRT.

Related Documents

The practice analysis process and resulting task inventory that serve as the foundation for the recognition program are described in the *Proton Beam Radiation Therapy Task Inventory* document. The *Proton Beam Radiation Therapy Clinical Standard and Requirements* are described in a separate document by that name.

Body of Knowledge Standard

The purpose of the Body of Knowledge Standard is to identify a comprehensive listing of the knowledge supporting the professional performance of the role of a radiation therapist in proton beam radiation therapy. The task inventory developed from the practice analysis lists the job responsibilities typically required of a radiation therapist working in proton beam radiation therapy. An advisory committee composed of subject matter experts working under the guidance of ARRT identified the body of knowledge necessary to perform the responsibilities included on the task inventory. The committee organized the knowledge areas into a content outline. Every content category in the outline can be linked to one or more job responsibilities on the task inventory.

Eligibility Requirements

The following requirements are necessary for candidates applying for the PBRT AFR:

- Current certification and registration in radiation therapy
- Experience working in PBRT as a radiation therapist either previously or currently
- Submission of the application for recognition along with the appropriate fee
- Submission of documentation from employer(s) verifying the number of years the candidate has been employed full-time performing proton beam radiation therapy
- Renewal of PBRT AFR every seven years as new technologies in PBRT emerge

Pathways to Achieve AFR

Candidates pursuing recognition in PBRT have varying backgrounds in the field of proton beam radiation therapy. For this reason, there are two pathways available for individuals to earn the PBRT AFR. The first pathway is for those currently performing PBRT full-time for 24 months or less at the time of submitting their application. The second pathway is for those currently working full-time in the field of PBRT for more than 24 months at the time of submitting their application. This pathway is also for those who had worked full-time in PBRT but are no longer working in PBRT within the past 24 months from the time of submitting their application. The individuals who qualify for pathway two have the choice of utilizing either pathway.



PBRT Content Category

Patient Care

Patient Interactions and Medical Record Management

Safety

Radiation Physics, Equipment, and Quality Assurance

Radiation Protection

Procedures

Treatment Sites

Simulation

Prescription, Geometric Parameters, and Dose Calculation

Treatments

DRAFT



Patient Care

1. Patient Interactions and Medical Record Management

- A. Patient Education
 - 1. simulation and treatment preparation (*e.g., bowel, bladder, NPO)
 - 2. timeframe to begin treatment
 - a. typical timeframe
 - b. scheduling considerations
 - 3. variances in daily treatment delivery times
 - 4. explanation of quality assurance imaging (e.g., evaluation scanning, adaptive scanning)
 - 5. explanation of treatment procedure
 - a. imaging requirements
 - b. removal of materials in the beam's path
 - 6. explanation of beam delivery system downtime

- B. Assessment
 - 1. patient's ability to maintain treatment position (e.g., anesthesia, respiratory motion)
 - 2. dietary counseling (e.g., reduction of air in bowels and stomach)
 - 3. routine monitoring
 - a. weight
 - b. skin
- C. Documentation of Procedures (e.g., detailed set-up instructions)

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

Safety

1. Radiation Physics, Equipment, and Quality Assurance

- A. Basic Characteristics of Particles
 - 1. Bragg peak
 - 2. entrance dose (e.g., no skin sparing)
- B. Components and Operation
 - 1. cyclotron/synchrotron
 - 2. beam transport system
 - 3. treatment room design
 - a. gantry
 - b. fixed beam room (FBR) or stationary beam room (SBR)
 - 4. robotic patient positioning system (PPS)
 - 5. imaging equipment
 - 6. treatment software
 - 7. nozzle/treatment snout
- C. Method of Beam Delivery
 - 1. passive scatter (e.g., single scatter, double scatter)
 - a. aperture
 - b. compensator
 - c. spread out bragg peak (SOBP)
 - d. range modulator wheel
 - 2. pencil beam (e.g., IMPT, spot scanning)
 - a. scanning magnets
 - b. bending magnets
 - c. energy layers

- d. range shifter
- e. range uncertainty
- f. relative biological effectiveness (RBE)
- g. water equivalent thickness (WET)
- h. motion

- D. Quality Control Procedures
 - 1. evaluation of quality assurance results
 - 2. sign off from appropriate personnel when measures are outside tolerance
 - 3. verify treatment plan quality assurance has been performed

2. Radiation Protection

- A. Radiation Tissue Tolerance
 - 1. dose to critical structures (no exit dose)
 - 2. adverse effects (e.g., consequences of misalignment)
- B. Occupational Radiation Exposure
 - 1. neutron area monitoring (e.g., fixed monitors, portable neutron survey meters)
 - 2. neutron dosimeters
 - 3. search button
 - 4. handling of radioactive material
 - a. activation of equipment
 - b. activation of beam modifiers



Procedures

1. Treatment Sites

- A. CNS
 - 1. primary brain
 - 2. craniospinal
- B. Head and neck
- C. Thorax
 - 1. lung
 - 2. mediastinum
 - 3. thymus
- D. Breast
- E. Abdomen, pelvis, GI, and GU
 - 1. esophagus, stomach, small bowel, large bowel, rectum, and anus
 - 2. pancreas, adrenals, liver, and gallbladder
 - 3. ureters, kidneys, bladder, and urethra
- F. Reproductive
 - 1. prostate, testicles
 - 2. endometrium, cervix, ovaries, uterus, vagina, and vulva
- G. Skeletal
 - 1. spine
 - 2. extremity
- H. Miscellaneous
 - 1. lymphoma (Hodgkin and non-Hodgkin)
 - 2. sarcoma (bone and soft tissue)
 - 3. ocular
 - 4. pediatric
 - 5. metastases

2. Simulation

- A. Patient positioning and immobilization
 - 1. review of patient records (e.g., previous radiation)
 - 2. collaboration with anesthesia care team
 - 3. fabrication of non-beam attenuating immobilization devices
 - 4. minimize material in the path of the beam
- B. Image acquisition (e.g., include skin contour and immobilization device in treatment area)
- C. Scan with contrast
- D. 4D gating scan for tumor motion evaluation for treatment eligibility
- E. Voluntary breath hold device
- F. Evaluation and adaptive scanning
- G. Collaboration with other team members (e.g., physician, physicist, dosimetrist)
- H. Modalities

- 1. CT
- 2. PET/CT
- 3. MRI
- 4. PET/MRI

3. Prescription, Geometric Parameters, and Dose Calculation

- A. Treatment Prescription
 - 1. total target dose
 - 2. treatment volume (e.g., robust optimization, range uncertainty)
 - 3. number of fields
 - a. single field optimization (SFO)
 - b. multiple field optimization (MFO)
 - 4. field orientation
 - 5. beam modifiers
 - 6. contribution from other sources (e.g., previous photon treatment)
- B. Geometric Parameters
 - 1. field size and shape
 - 2. target depth (e.g., tumor versus D_{max})
- C. Dose Calculation
 - 1. isodose curve characteristics (e.g., lateral penumbra)
 - 2. inhomogeneity correction factors
 - 3. beam energy (e.g., variable MeV)
 - 4. air gap
 - 5. medical factors (e.g., artificial implants)

4. Treatments

- A. Verification and Application of the Treatment Plan
 - 1. accessory equipment (e.g., aperture, compensator)
 - 2. image guided radiation therapy (IGRT)
 - 3. treatment unit capabilities and limitations
 - a. 360-degree treatment delivery system
 - b. robotic PPS (e.g., pitch, roll, rotation)
- B. Treatment Administration
 - 1. position within beam queue (e.g., beam priority)
 - 2. equipment malfunctions
 - a. collaboration with main control room
 - b. communication with patient and staff
 - c. downtime



Body of Knowledge Requirements

The purpose of the Body of Knowledge Requirements is to document that candidates have completed educational activities covering a significant portion of the Proton Beam Radiation Therapy Body of Knowledge as listed in the Standard. Whereas the Body of Knowledge Standard represents a comprehensive listing of the knowledge supporting the professional performance of the role of a radiation therapist in proton beam radiation therapy, the Body of Knowledge Requirements represent evidence that the individual has had the opportunity to learn that body of knowledge. The Body of Knowledge Requirements identify the activities that must be documented. This will demonstrate that candidates have had the opportunity to develop fundamental knowledge, integrate theory into practice, and hone affective and critical thinking skills required for professional practice in proton beam radiation therapy.

Pathway One

This pathway is for radiation therapists currently performing PBRT full-time for two years or less at the time of submitting their application. In addition to completing clinical procedures as outlined in the *Proton Beam Radiation Therapy Clinical Standard and Requirements*, candidates are required to meet the Body of Knowledge Requirements by providing evidence of performing one or more of the following activities which solely or in aggregate covers the entirety of the content outline found within the *Proton Beam Radiation Therapy Body of Knowledge Standard and Requirements*. Candidates must complete 16 hours of structured education through one or more of the following activities.

- Attend or participate in proton beam radiation therapy RCEEM-approved continuing education (CE) activities:
 - Candidate must submit a certificate of completion.
 - All submissions will be audited.
- Teach or create a proton beam radiation therapy RCEEM-approved course:
 - Candidate must submit the course syllabus.
- Receive academic credit from an educational program that is accredited by a mechanism approved by the ARRT:
 - Credit may be received from courses strictly pertaining to proton beam radiation therapy or from courses that include proton beam radiation therapy as a portion of the course.
 - Candidate must submit his/her transcript from the educational institution from which the course was taken.
 - Candidate must receive a C or better in the course or Pass if Pass/Fail.
- Participate in RCEEM-approved proton beam radiation therapy vendor training for newly installed machines and/or for version upgrades:
 - Candidate must submit RCEEM-approved documentation showing completion of vendor training.
 - Training must be received by the vendor directly.



- Complete a proton beam radiation therapy educational mentorship and provide a written report containing:
 - A list of the educational goals and objectives
 - A description of the mentoring activities
 - A list of the measures used to assess a successful outcome
 - Attestations by mentor and mentee that each participated in the educational mentorship
 - Mentors can be an individual or a group of individuals who have mastered the knowledge in the *Proton Beam Radiation Therapy Body of Knowledge Standard and Requirements*.
 - Mentors may be a department supervisor, lead radiation therapist, dosimetrist, physicist, or radiation oncologist.
 - One structured education hour will be given for each 50 minutes spent in mentoring activities.

Pathway Two

This pathway is for radiation therapists currently working full-time in the field of PBRT for more than two years at the time of submitting their application. This pathway is also for radiation therapists who had worked full-time in PBRT for at least 24 months, but are no longer working in PBRT within the past 24 months from the time of submitting their application. Candidates who fall into this category may opt to utilize pathway one detailed above or Pathway Two..

If the evidence of educational activities outlined in Pathway One cannot be retrieved, a candidate using this pathway will still have to provide evidence of having knowledge covering the content outline as listed in the Body of Knowledge Standard, but the Body of Knowledge Requirements will differ. Instead of the candidate needing to document specific evidence of knowledge, the individual will need to be able to provide attestation from each of the following members working at the facility with the candidate: a radiation oncologist, medical physicist, supervisor, and a peer radiation therapist. The attestation will be included in a modified version of the Body of Knowledge Standard and Requirements. Each section of the content outline in this version will contain a statement that the person attesting has had an opportunity to review the section noted and is attesting that the candidate has displayed an understanding of the content during performance of PBRT or demonstrated knowledge when questioned about the content.

If evidence of the clinical requirements outlined in the *Proton Beam Radiation Therapy Clinical Standard and Requirements* cannot be retrieved, a candidate using this pathway will still have to provide evidence of performing a subset of the proton beam radiation therapy clinical procedures as listed in the Clinical Standard, but the Clinical Requirements will differ. Instead of the candidate needing to document specific evidence of procedures performed, the individual will need to be able to provide attestation from each of the following members working at the facility with the candidate: a radiation oncologist, medical physicist, supervisor, and a peer radiation therapist. The attestation will be included in a modified version of the Clinical Standard and Requirements. The procedures section in this version will contain a statement that the candidate has performed many of the procedures or demonstrated knowledge when questioned about performing the procedures.



The attestations will provide an opportunity for the person attesting to speak directly to what the person has witnessed from the candidate or has received appropriate responses from the candidate when asking PBRT content and procedure related questions.

This pathway will be open to eligible radiation therapists until December 31, 2020. After that date, all candidates seeking the PBRT AFR will have to satisfy all requirements as noted in pathway one detailed above.

Grid summarizing the PBRT Body of Knowledge Standard and Requirements and Clinical Standard and Requirements

PBRT Body of Knowledge Standard and Requirements: All applicants must meet the Body of Knowledge Standard and Requirements. See chart below for details on the evidence accepted to satisfy this requirement.

PBRT Clinical Standard and Requirements: All applicants must meet the Clinical Standard and Requirements. See chart below for details on the evidence accepted to satisfy this requirement.

	Time in PBRT	Evidence Accepted		Time Frame
Eligibility Pathway One	Those with 24 months of full-time experience or less in PBRT must satisfy the Body of Knowledge Standard and Requirements and Clinical Standard and Requirements.	Body of Knowledge Standard and Requirements Completion of 16 hours of structured education through one or more of the activities listed on pages 5-6 of this document.	Clinical Standard and Requirements Completion of a minimum of 18 different treatment procedures out of the 35 procedures listed on page 5 of the Clinical Standard and Requirements.	The Body of Knowledge Standard and Requirements and Clinical Standard and Requirements must be completed within the 24 months immediately preceding the submission of the application.
Eligibility Pathway Two	*Those with more than 24 months of full-time experience in PBRT have two options to satisfy the the Body of Knowledge Standard and Requirements and the Clinical Standard and Requirements.	Completion of 16 hours of structured education through one or more of the activities listed on pages 5-6 of this document.	Completion of two types of immobilization devices and minimum of 18 different treatment procedures out of the 35 procedures listed on page 5 of the Clinical Standard and Requirements.	The Body of Knowledge Standard and Requirements and Clinical Standard and Requirements must be completed within the 24 months immediately preceding the submission of the application.
	or	Provide attestations for each section of the Body of Knowledge Standard and Requirements (i.e., Patient Care) from a radiation oncologist, physicist, supervisor and radiation therapist that work in PBRT.	Provide attestations for each section of the Clinical Standard and Requirements (i.e., Specific Procedural Requirements) from a radiation oncologist, physicist, supervisor, and radiation therapist that work in PBRT.	

*Candidates with more than 24 months of experience may submit either type of evidence for the *PBRT Body of Knowledge Standard and Requirements*, and they may submit either type of evidence for the *PBRT Clinical Standard and Requirements*. **Pathway Two will be in effect until Dec. 31, 2020. After that, all applicants will have to satisfy requirements through Pathway One.**