



Practice Analysis Report: Radiation Therapy - Effective January 2022

Introduction

The ARRT establishes the job relatedness of an examination via a practice analysis (also called a job analysis). Practice analyses document the role to be credentialed, the topics to be covered by the examination used in the credentialing decision, as well as the degree of emphasis that each topic receives. The rationale for practice analyses is outlined in *The Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, National Council on Measurement in Education, 2014) and in the National Commission for Certifying Agencies (NCCA) *Standards for the Accreditation of Certification Programs* (NCCA, 2021). Legislation and legal precedent also stress the importance of practice analysis in the development and validation of certification exams. The ARRT conducts a practice analysis for each discipline approximately every five years. Regular updates are important for professions that continually evolve due to advances in technology because they help ensure that the content specifications and other certification requirements reflect current practice.

This report describes the practice analysis for Radiation Therapy conducted from October 2019 to October 2020. The project sought to identify tasks currently required of the typical radiation therapist and to determine what knowledge and cognitive skills are required to effectively perform those tasks.

To accomplish this task, ARRT hosted several meetings with a committee of subject matter experts (SMEs) to develop a survey of job tasks; evaluate survey results; and revise the content specifications, content outline, and clinical competency requirements. ARRT selected six SMEs for this committee from across the United States and from a range of practice settings (e.g., hospitals, clinics, educational programs). These SMEs represented a range of expertise including five certified and registered radiation therapists and one radiation oncologist.

All statistical analyses were performed by trained statisticians employed by ARRT and meetings were primarily conducted by ARRT's Exam Development Coordinators with psychometric support provided by ARRT psychometric staff.

The ARRT Board of Trustees reviewed all changes to exam content and eligibility requirements before giving approval in January 2021. The first exam under the new content and eligibility requirements was administered in January 2022.



Task Inventory

Survey Development

ARRT begins the practice analysis process by revising the task inventory, which is a listing of clinical and supporting procedures related to practice. The committee reviewed the previous task inventory and content outline before creating an updated list of job tasks by adding, deleting, or rewording tasks as necessary to reflect changes in the profession.

The committee used the updated job task list to create a survey for distribution to individuals working in the profession. The first section of this survey consisted of 151 questions asking current radiation therapists how frequently they perform each task utilizing a six-point scale with the following options: *Never Perform*, *Yearly*, *Quarterly*, *Monthly*, *Weekly*, and *Daily*. Based on past research, ARRT uses a frequency scale with absolute anchors because data from scales like importance and criticality, which use subjective anchors, have inferior statistical properties (Babcock, Risk, & Wyse 2020). The data gathered by absolute anchor frequency scales also correspond well to medical imaging practice as defined by external data sources (Babcock & Yoes, 2013) and add value beyond advisory committee members' judgement without data (Wyse & Babcock, 2018).

To reduce the length and burden of the practice analysis survey, the committee identified tasks from the previous task inventory that they believed were so ubiquitous in practice that over 90% of respondents would report that they do perform the task. The following tasks were omitted from the survey and included in the new task inventory without further discussion:

- Wear a radiation monitoring device while on duty
- Practice appropriate measures to minimize unnecessary radiation exposure to the patient
- Practice appropriate precautions to minimize occupational radiation exposure (e.g., ALARA)
- Provide for the patient's safety, comfort, and modesty
- Utilize proper technique during patient transfer
- Recognize and communicate the need for prompt medical attention
- Provide emergency care
- Follow environmental protection standards for handling and disposing of hazardous materials (e.g., disinfectants, chemotherapy IV, radioactive implant)
- Follow environmental protection standards for handling and disposing of bio-hazardous materials (e.g., sharps, blood, body fluids)
- Follow appropriate procedures when caring for patients with communicable diseases.
- Practice standard precautions
- Use sterile or aseptic technique when indicated
- Monitor the patient's auxiliary medical equipment (e.g., IVs, catheters) during treatment or procedures
- Obtain pertinent medical history
- Ensure removal of materials that could interfere with imaging, treatment, or safety of the patient
- Position patient on simulator table using positioning aids and immobilization devices
- Instruct the patient on maintenance of treatment reference marks
- Review patient's treatment record for completeness and accuracy
- Review treatment record and parameters prior to each treatment delivery
- Verify treatment fields by acquiring images



- Label simulation and treatment photos appropriately
- Verify accuracy of custom beam shape prior to treatment
- Communicate relevant information to appropriate stakeholders (e.g., health care providers, ancillary staff)
- Respond as appropriate to treatment or procedure inquiries from the patient, patient's family, or authorized representative (e.g., scheduling changes, procedure duration, other treatment modalities)
- Utilize beam modification devices according to the treatment plan
- Monitor the patient visually and audibly during treatment or procedure

The second section of the survey included 16 questions regarding the respondent's role and workplace such as hours worked, primary job title, and department composition.

Survey Sample

ARRT staff identified an initial population of 11,729 radiation therapists from the ARRT database of certified and registered technologists based on the following conditions:

- All individuals were certified in radiation therapy
- All individuals worked full-time in the USA
- All individuals were not on probation
- All individuals listed radiation therapy as their primary discipline of employment
- All individuals and were working as a therapist (or other similar title)

Staff then excluded any radiation therapist who had been surveyed during either of the two previous practice analyses, bringing the population down to 9,740. Finally, to ensure that the survey responses reflected practice at entry level, staff excluded anyone who had been working in the profession for 6+ years. The final population consisted of 2,968 individuals, and staff randomly selected 1,500 to receive the survey, stratified by years of experience in the profession (less than one year – 17%, 1 to 3 Years – 63%, 4 to 5 – 20%).

ARRT's survey vendor mailed the survey in January 2020. A total of 330 recipients returned their survey by close in February 2020, for an absolute response rate of 22.0%. ARRT staff screened responses to ensure that the surveys were correctly filled out by the intended population, retaining 299 for an effective response rate of 19.9%.



Analysis

ARRT psychometric staff first calculated the percentage of respondents who report performing the task and the percent who report performing the task daily or weekly (Tables 1-3). ARRT allows tasks performed by 40% or more of respondents to be included on the task inventory without further discussion so that committees may focus on discussions most likely to impact task inclusion. However, committees still review all survey results and may choose to include tasks below the threshold or reject tasks above the threshold as they see fit based on their joint expertise.

ARRT psychometric staff next compared the percent of respondents working at small (2 or less therapists) and large (more than two therapists) facilities performing each task to ensure that the tasks included on the inventory are relevant to different facility sizes. Table 2 provides a list of tasks that differed in a potentially meaningful way and staff presented these results to the committee for discussion.

Finally, ARRT staff summarized results for the 16 items that covered the respondent's role and workplace (Tables 3 - 18).



Table 1.
Percent of technologists performing radiation therapy tasks

Item	Task	% Performing	% Daily/Weekly
1	Review personal radiation exposure records.	82.3	10.7
2	Practice appropriate measures to minimize unnecessary radiation exposure to the patient.	100.0	99.0
3	Restrict access to the control area.	100.0	98.0
4	Manage interpersonal interactions in an effective manner.	98.6	98.3
5	Review the treatment or procedure to verify information is accurate, appropriate, and complete (e.g., patient history, clinical diagnosis, physician's orders).	100.0	99.7
6	Enter pertinent patient demographic data into simulation/treatment planning software.	80.5	70.7
7	Ensure that all diagnostic studies and pertinent medical records are available prior to simulation.	74.3	65.9
8	Consult with radiation oncologist before simulation.	90.3	80.3
9	Review patient's record for previous or pending treatments/procedures (e.g., chemotherapy, transfusions, surgery, radiation therapy).	93.3	86.9
10	Provide for the patient's safety, comfort, and modesty.	100.0	100.0
11	Utilize proper technique during patient transfer.	100.0	98.7
12	Use proper body mechanics and/or ergonomic devices to promote personnel safety.	100.0	98.7
13	Obtain vital signs.	37.2	14.4
14	Recognize and communicate the need for prompt medical attention.	100.0	81.6
15	Provide emergency care.	57.0	10.1
16	Follow environmental protection standards for handling and disposing of hazardous materials (e.g., disinfectants, chemotherapy IV, radioactive implant).	82.3	67.9
17	Follow environmental protection standards for handling and disposing of bio-hazardous materials (e.g., sharps, blood, body fluids).	97.3	86.6
18	Monitor the patient's auxiliary medical equipment (e.g., IVs, catheters) during treatment or procedures.	86.9	68.5
19	Maintain oxygen administration as prescribed.	96.0	82.2
20	Obtain pertinent medical history.	69.5	54.7
21	Evaluate the patient's ability to understand and comply with requirements for the requested treatment or procedure.	96.7	92.6
22	Explain treatment or procedure instructions to the patient, patient's family, or authorized representative (e.g., scheduling delays, treatment duration).	100.0	99.7
23	Prior to administration of a contrast agent, determine if the patient is at risk for an adverse event.	58.9	42.1



Item	Task	% Performing	% Daily/Weekly
24	Prior to administration of a contrast agent, review pertinent information to prepare appropriate type and dosage.	54.7	39.2
25	Perform venipuncture.	8.4	4.4
26	Administer contrast agents as required by the procedure.	55.4	35.6
27	Assess the patient after administration of a contrast agent to detect adverse reactions.	57.2	37.7
28	Recognize abnormal or missing lab values relative to the treatment or procedure ordered.	56.9	37.5
29	Utilize knowledge of disease to simulate treatment fields.	82.2	70.4
30	Ensure removal of materials that could interfere with imaging, treatment, or safety of the patient.	99.3	98.7
31	Screen patients for ferrous and radiofrequency sensitive materials (e.g., aneurysm clips, pacemaker) prior to entering MRI magnetic field.	22.7	17.7
32	Use positioning aids, as needed, to reduce patient movement and/or promote patient safety.	99.7	99.3
33	Fabricate individualized immobilization devices.	93.3	83.9
34	Utilize programmable lasers at simulation.	84.9	78.5
35	Explain breathing instructions prior to procedure.	96.3	87.6
36	Select factors to obtain optimal images.	93.2	88.1
37	Acquire an appropriate and complete CT volume for treatment planning according to physician order.	85.5	79.4
38	Acquire an appropriate and complete MRI volume for treatment planning according to physician order.	7.7	6.4
39	Establish reference point(s) within the CT data set (e.g., isocenter, origin).	65.3	58.9
40	Establish reference point(s) within the MRI data set (e.g., isocenter, origin).	4.7	3.7
41	Mark treatment fields and set-up points on patient (e.g., permanent or temporary reference marks, fiducial markers).	96.3	92.6
42	Instruct the patient on maintenance of treatment reference marks.	97.0	92.3
43	Record/verify simulation parameters.	93.6	87.3
44	Document patient positioning instructions in treatment record.	97.7	93.0
45	Review simulation images with radiation oncologist for approval or modification.	89.6	77.4
46	Review the isodose plan, imaging order, and treatment prescription prior to implementation.	92.3	91.3
47	Enter parameters used to calculate monitor units for a prescribed treatment.	31.0	14.5
48	Calculate the number of monitor units for a prescribed treatment.	23.5	6.0
49	Enter parameters used to calculate monitor units for a prescribed treatment in an emergent situation.	37.6	4.4
50	Create and label custom beam shaping devices (e.g., electron blocks, bolus).	86.3	50.8



Item	Task	% Performing	% Daily/Weekly
51	Perform clinical treatment setup (e.g., en face electrons, whole brain).	94.6	56.1
52	Review treatment record and parameters prior to each treatment delivery.	98.7	98.3
53	Verify treatment fields by acquiring images.	99.3	99.0
54	Label simulation and treatment photos appropriately.	96.6	92.9
55	Verify accuracy of custom beam shape prior to treatment.	90.8	85.4
56	Review images for approval or field modification and initiate changes as required.	93.3	89.6
57	Communicate relevant information to appropriate stakeholders (e.g., health care providers, ancillary staff).	90.6	83.6
58	Schedule the patient based on prescribed treatment plan.	97.0	96.3
59	Communicate schedule delays to the patient.	100.0	94.6
60	Respond as appropriate to treatment or procedure inquiries from the patient, patient's family, or authorized representative (e.g., scheduling changes, procedure duration, other treatment modalities).	100.0	99.3
61	Explain and confirm the patient's preparation (e.g., diet restrictions, preparatory medications, bladder filling) prior to treatment or procedure.	98.7	96.0
62	Instruct the patient regarding appropriate nutrition during course of treatment and refer the patient to appropriate personnel as required.	93.0	79.9
63	Instruct the patient concerning proper skin care of treatment area(s).	98.0	93.6
64	Perform and document shifts according to the approved treatment plan.	97.3	96.3
65	Record/verify treatment machine parameters.	99.3	98.7
66	Perform pre-treatment equipment clearance check on applicable treatment plans (e.g., dry run in the treatment room).	96.0	86.6
67	Deliver treatment by setting and activating controls on a linear accelerator console.	97.2	92
68	Notify appropriate personnel of adverse events or incidents (e.g., patient fall, wrong patient treated).	94.4	46.5
69	Verify the documentation of treatment delivery in the patient record.	99.3	98.3
70	Document required information on the patient's medical record (e.g., treatment documentation).	99.0	98.0
71	Participate in quality assurance discussions to review patient issues (e.g., history, diagnostic studies, disease stage, type of treatment).	80.9	61.4
72	Perform daily warm-up procedures (e.g., CT simulator, treatment units) and document results.	98.7	89.6
73	Conduct routine quality assurance checks on imaging and treatment equipment and document results.	91.9	80.4
74	Troubleshoot and correct treatment equipment/software malfunctions, if appropriate.	94.6	76.5
75	Perform CT simulator quality assurance checks.	74.9	64.7



Item	Task	% Performing	% Daily/Weekly
76	Perform MRI simulator quality assurance checks on imaging and treatment equipment and document results.	2.7	1.3
77	Identify abnormal quality assurance results and take appropriate action.	91.9	60.1
78	Complete/verify quality assurance checks on a treatment plan before initial treatment delivery.	85.9	83.2
79	Image registration/image comparison software	92.4	91.7
80	MV imaging	94.9	92.6
81	kV imaging	93.6	91.6
82	Proton therapy	6.7	4.7
83	Respiratory gating protocols	78.1	64.6
84	Enhanced dynamic wedge	91.2	83.1
85	Stereotactic delivery methods (SRS, SBRT)	88.3	72.1
86	Onsite custom electron block fabrication	73.2	49.3
87	Onsite custom bolus fabrication	91.3	57.0
88	3D printed bolus, onsite fabrication	12.5	6.4
89	Diodes/thermoluminescent dosimeters (TLDs)	72.6	35.1
90	Cone beam CT (CBCT)	94.9	93.9
91	Volumetric arc therapy (e.g., VMAT™, Rapid Arc™)	87.9	85.2
92	Non-volumetric arc therapy	56.8	49.3
93	Surface tracking devices (e.g., Vision RT™, OSMS)	46.6	42.6
94	Fiducial tracking devices (e.g., Calypso™)	24.4	14.0
95	Please answer this question 'monthly'.	100.0	0.0
96	Gamma Knife®	6.0	4.0
97	Cyberknife®	5.0	2.7
98	Tomotherapy	15.5	11.1
99	Superficial/Orthovoltage	12.5	8.1
100	MRI guided treatment	3.3	1.7
101	Six degrees of freedom treatment couch (e.g., HexaPOD™, PerfectPitch™)	59.2	55.9
102	CT Simulator	88.6	77.9
103	PET/CT Simulator	19.2	11.4
104	4D CT	66.6	46.2
105	MRI Simulator	4.3	3.3
106	Brachytherapy: HDR	40.8	24.1
107	Brachytherapy: LDR	10.7	5.4



Item	Task	% Performing	% Daily/Weekly
108	Intraoperative Radiation Therapy (IORT)	5.0	1.3
109	Brain: SRS	67.8	34.9
110	Brain: Primary	96.0	70.2
111	Brain: Metastatic (whole brain)	95.6	73.6
112	Brain: Craniospinal	49.8	9.8
113	Head and Neck: Laterals only	71.6	22.0
114	Head and Neck: 3D Conformal	84.2	41.4
115	Head and Neck: IMRT	94.6	89.5
116	Head and Neck: SBRT	39.7	13.1
117	Lung: AP/PA	78.5	29.0
118	Lung: 3D Conformal	92.2	60.0
119	Lung: IMRT	96.0	91.3
120	Lung: SBRT	84.2	60.9
121	Breast: Tangents only	95.0	88.6
122	Breast: Tangents with Supraclavicular	93.3	82.5
123	Breast: Tangents with Supraclavicular and Posterior Axilla	89.9	62.8
124	Breast: Tangents with Supraclavicular and Separate Internal Mammary	70.6	24.7
125	Breast: Partial, 3D Conformal	73.8	39.9
126	Breast: IMRT	76.8	41.4
127	Breast: SBRT	85.9	83.2
128	Breast: Prone	54.8	24.1
129	Abdomen: AP/PA	81.4	28.0
130	Abdomen: 3D Conformal	90.9	49.0
131	Abdomen: Para-Aortic	84.2	30.2
132	Abdomen: IMRT	94.6	75.6
133	Abdomen: SBRT	69.7	24.6
134	Pelvis: AP/PA	86.1	42.9
135	Pelvis: 3D Conformal Supine	94.3	61.4
136	Pelvis: 3D Conformal Prone	75.2	31.5
137	Pelvis: Inguinal Lymph Nodes	92.6	44.8
138	Pelvis: IMRT	95.7	93.0
139	Pelvis: SBRT	58.6	23.1
140	Skeletal: Single Field Spine	50.7	14.4



Item	Task	% Performing	% Daily/Weekly
141	Skeletal: 2D Spine	58.3	22.7
142	Skeletal: 3D Spine	93.6	54.4
143	Skeletal: IMRT Spine	78.7	33.8
144	Skeletal: SBRT Spine	57.2	20.2
145	Skeletal: Extremity	96.6	45.5
146	Electron Fields: Single	94.0	72.2
147	Electron Fields: Abutting Fields	77.1	17.2
148	Heterotopic Treatment	58.6	6.1
149	Total Body Irradiation (TBI)	20.4	7.4
150	Total Skin/Body Electrons (TSE/TBE)	11.7	2.0
151	Total Marrow Irradiation (TMI)	4.4	1.0

Table 2.

Percent performing select tasks for small (2 or less therapists) and large (more than 2 therapists) facilities

Item	Task	Small	Large
8	Consult with radiation oncologist before simulation.	95.1	75.7
29	Utilize knowledge of disease to simulate treatment fields.	89.2	60.8
59	Schedule the patient based on prescribed treatment plan.	99.6	89.2
82	Proton therapy	2.7	18.9
88	3D printed bolus, onside fabrication	8.1	26
96	Gamma Knife®	2.7	16.2
101	Six degrees of freedom treatment couch (e.g., HexaPOD™, PerfectPitch™)	52	81.1
112	Brain: Craniospinal	37.4	87.7
127	Breast: SBRT	6.7	23
149	Total Body Irradiation (TBI)	8	58.1
150	Total Skin/Body Electrons (TSE/TBE)	3.1	37.8
151	Total Marrow Irradiation (TMI)	0.9	15.1



Table 3.

How many hours per week do you work as a radiation therapist?

Response	Count	Percentage
15 or fewer hours	0	0.0
16 to 31 hours	0	0.0
32 hours or more	298	99.7
Blank	1	0.3

Table 4.

How many years have you worked as a radiation therapist?

Response	Count	Percentage
Less than 1 year	12	4.0
1 – 3 Years	163	54.5
4 – 5 Years	97	32.4
6 – 10 Years	26	8.7
More than 10 years	1	0.3

Table 5.

What is your primary job title?

Response	Count	Percentage
Staff Therapist	263	88.0
Simulation Therapist	4	1.3
Senior / Lead Therapist	20	7.0
Department Administrator / Manager	0	0.0
Educator	0	0.0
Dosimetrist	0	0.0
Brachytherapist	1	0.3
Applications Specialist	0	0.0
Other	2	0.7

Table 6.

Which of the following best describes your place of employment?

Response	Count	Percentage
Hospital - Community	111	37.1
Hospital - Academic	53	17.7
Satellite Clinic	59	19.7
Freestanding Clinic (Privately Owned)	66	22.0
Research Facility	2	0.7
Other	5	1.7

Table 7.

How many treatment rooms does your department have?

Response	Count	Percentage
1	92	30.8
2 to 3	133	44.5
4 to 5	40	13.4
6 to 7	17	5.7
More than 7	17	5.7



Table 8.

Do radiation therapists at your facility create custom blocks on site?

Response	Count	Percentage
Yes	115	61.5
No	184	38.5

Table 9.

Do non-therapist staff at your facility create custom blocks on site?

Response	Count	Percentage
Yes	100	33.4
No	198	66.2

Table 10.

Does your facility use custom blocks that are created off site?

Response	Count	Percentage
Yes	64	21.4
No	234	78.3

Table 11.

Have you received training in ergonomics related to the performance of radiation therapy?

Response	Count	Percentage
Yes	191	63.9
No	107	35.8

Table 12.

Does your department have a patient lift system?

Response	Count	Percentage
Yes	179	59.9
No	119	40.0

Table 13.

Have you personally had work loss due to a radiation therapy task-related musculoskeletal injury?

Response	Count	Percentage
Yes	12	4.0
No	284	95.0
Prefer not to answer	2	0.7

Table 14.

To the best of your knowledge, has a radiation therapist in your department had work loss due to a radiation therapy task-related musculoskeletal injury in the last year?

Response	Count	Percentage
Yes	67	22.4
No	192	64.2
Unsure	40	13.4



Table 15.

To the best of your knowledge, has a radiation therapist in your department had work loss due to a radiation therapy task-related musculoskeletal injury in the last three years?

Response	Count	Percentage
Yes	61	20.4
No	165	55.2
Unsure	71	23.7

Table 16.

In the last year, has the number of approved radiation therapist positions changed at your facility?

Response	Count	Percentage
Yes, number increased	126	42.1
Yes, number decreased	32	10.7
No	140	46.8

Table 17.

In the last year, has the number of employed radiation therapists at your facility changed?

Response	Count	Percentage
Yes, number increased	125	41.8
Yes, number decreased	48	16.1
No	126	42.1

Table 28.

Does your facility have plans to offer proton therapy treatment in the next 5 years?

Response	Count	Percentage
Yes, currently treating with proton therapy	24	8.0
Yes, facility plans to install a proton cyclotron	8	2.7
No	267	89.2

Changes to Task Inventory

The practice analysis committee met in March 2020 to review the practice analysis survey data and determine whether any tasks should be dropped from or added to the task inventory. The committee also clarified the wording of several tasks.

The following tasks were added:

- Restrict access to the control area
- Review the treatment or procedure to verify information is accurate, appropriate, and complete (e.g., patient history, clinical diagnosis, physician's orders)
- Use proper body mechanics and/or ergonomic devices to promote personnel safety
- Prior to administration of a contrast agent, review pertinent information to prepare appropriate type and dosage.
- Assess the patient after administration of a contrast agent to detect adverse reactions
- Screen patients for ferrous and radiofrequency sensitive materials (e.g., aneurysm clips, pacemaker) prior to entering MRI magnetic field
- Document patient positioning instructions in treatment record
- Enter parameters used to calculate monitor units for a prescribed treatment in an emergent situation
- Perform clinical treatment setup (e.g., en face electrons, whole brain)



- Schedule the patient based on prescribed treatment plan
- Explain and confirm the patient's preparation (e.g., diet restrictions, preparatory medications, bladder filling) prior to treatment or procedure
- Perform and document shifts according to the approved treatment plan
- Record/verify treatment machine parameters
- Perform pre-treatment equipment clearance check on applicable treatment plans (e.g., dry run in the treatment room)
- Document required information on the patient's medical record (e.g., treatment documentation)
- Perform CT simulator quality assurance checks
- Utilize surface guided radiation therapy (SGRT)
- Breast: Prone
- Breast: Partial, 3D conformal
- Skeletal: 3D Spine
- Skeletal: IMRT Spine
- Skeletal: SBRT Spine

Additional changes include:

- The task "Identify and respond to cultural differences and sensitivities" was replaced with "Manage interpersonal interactions in an effective manner."
- The task "Identify the skin surface contour information for use in treatment planning" was replaced with "Acquire an appropriate and complete CT volume for treatment planning according to physician order."
- The task "Maintain the confidentiality of patient information (i.e., HIPAA)" was replaced with "Demonstrate and promote professional and ethical behavior (e.g., confidentiality, regulation compliance)."
- The task "Identify/verify if patient is at risk for an allergic reaction or has contraindications prior to administration of contrast medium" was replaced with "Prior to administration of a contrast agent, determine if the patient is at risk for an adverse event."
- The tasks "Administer non-IV contrast medium" and "Administer IV contrast medium" were replaced with "Administer contrast agents as required by the procedure."
- The treatment "Set up patient and treatment unit to personally perform the following radiation treatments: Skeletal: Spine" was divided into the following categories:
 - Skeletal: 2D Spine
 - Skeletal: 3D Spine
 - Skeletal: IMRT Spine
 - Skeletal: SBRT Spine
- The task "Complete/verify quality assurance checks on a treatment plan before initial treatment delivery" replaced five separate tasks about quality assurance checks.

The Board of Trustees approved the final task inventory in July 2020. The final task inventory may be found on the ARRT website: <https://www.arrt.org/pages/arrt-reference-documents/by-document-type/task-inventories>



Content Specifications and Clinical Competency Requirements

Changes to Content Specifications

The practice analysis committee updated the content specifications based on changes to the task inventory and the field. The committee considered the knowledge and cognitive skills required to successfully perform the tasks in the final task inventory and verified that those topics were covered in the content specifications, adding additional content as necessary. The committee also removed any topics that could not be linked to the updated task inventory.

The updated content specifications were then made available for public comment in July 2020 and the committee met again in October 2020 to discuss the comments before making any final adjustments.

The most notable changes from the previous version of the content specifications were:

- Patient Care
 - Added pre- and post-treatment instructions
 - Added a pharmacology subsection to include contrast media
- Safety
 - Added content about MRI magnetic field screening
 - Expanded quality control procedures and warm-up/inspection of CT simulators and separated from content on linear accelerators
- Procedures
 - Added motion management
 - Added six degrees of freedom couch

The Board of Trustees approved the final content specifications in January 2021. The final content specifications may be found on the ARRT website: <https://www.arrt.org/pages/arrt-reference-documents/by-document-type/examination-content-specifications>

Content Weighting

The practice analysis committee determined the number of items that should be assigned to each section of the exam through a process known as content weighting. First, the committee performed a bottom-up exercise where members individually estimated the number of unique items that should be included in each section. Second, the committee performed a top-down exercise where members individually estimated the relative proportion of the exam that should be dedicated to each section. Finally, ARRT staff provided the committee with summary values from the two exercises and the committee held a discussion to finalize their recommendation for the number of items assigned to each section (Table 19).



Table 19.
Number of Items per Section

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

Changes to Clinical Competency Requirements

The purpose of the clinical competency requirements is to document that individuals have demonstrated competence performing the clinical activities fundamental to a particular discipline. Competent performance of these fundamental activities, in conjunction with mastery of the cognitive knowledge and skills as documented by the examination requirement, provides the basis for the acquisition of the full range of procedures typically required in a variety of settings. Demonstration of clinical competence means that the candidate has performed the procedure independently, consistently, and effectively during the course of his or her formal education.

The practice analysis committee reviewed and updated the previous clinical competency requirements considering the final task inventory and content specifications. The updated clinical competency requirements were then made available for public comment in July 2020 and the committee met again in October 2020 to discuss the comments before making any final adjustments.

The most notable changes from the previous version of the clinical competency requirements were:

- Added linear accelerator imaging systems and simulator QC water phantom to the quality control procedures
- Removed abdomen from the list of simulation procedures
- Moved custom block (photon or electron) from treatment accessory devices to participatory procedures
- Removed the statement that “abdomen and pelvis does not include treatments for metastatic disease”
- Added SBRT/SRS under participatory procedures
- Moved special treatment simulation procedure (e.g., 4D CT, SBRT, gating, or brachytherapy) from simulation procedures to participatory procedures
- Combined abdomen “multi-field non-IMRT” and “IMRT and/or arc therapy” into one treatment procedure called “multi-field”
- Removed single field spine from skeletal treatment procedures



The Board of Trustees approved the final clinical competency requirements in January 2021. The final clinical competency requirements may be found on the ARRT website: <https://www.rrt.org/pages/rrt-reference-documents/by-document-type/didactic-and-clinical-competency-requirements>



Conclusion

Numerous individuals contributed to this project, as committee members, document reviewers, or as survey respondents. Periodic practice analysis is a necessary step in the life cycle of an exam program to ensure that the content of the exam and the eligibility requirements remain relevant with current practice. This study noted significant changes to the field of radiation therapy, and thanks to the efforts of all involved it assures that the ARRT Radiation Therapy exam program will continue to be an excellent assessment of radiation therapists wishing to demonstrate their qualifications by seeking certification and registration.

