RADIATION ONCOLOGY RESIDENCY PROGRAM
Competency Evaluation of Resident

Resident's Name:	
Rotation:	Clinical Rotation 1
Inclusive dates of rotation:	
Director or Associate Director:	

Competency Assessment Scheme:

1. Unsatisfactory
    - Performance/Knowledge is below standard
2. Needs Improvement
    - Performance/Knowledge is below standards in certain areas and improvement is needed
3. Meets Expectations
    - Performance/knowledge that consistently meets high standards of competency
4. Above Expectations
    - Performance/Knowledge exceeds expectations
    - Performance/Knowledge is consistently high quality
5. Outstanding
    - Performance/Knowledge is exceptional and consistently superior

Evaluation criteria* (subscript = depth of knowledge, 3=most in-depth)	**Score (1 – 5)**	**Mentor Signature**
Ethics and Professionalism Resident shall provide the certificate of completion for each module below available from: http://www.aapm.org/education/onlinemodules.asp		
a. Attributes of Professions and Professionalism a. Definition of a profession and professionalism b. Ethics of a profession c. Elements of a profession d. Definition of a professional e. Elements of professionalism (altruism, honesty, integrity, excellence, duty, accountability, respect for others) f. How is professionalism judged? g. Do's and don't's of professionalism h. Physician's charter and applicability to physicists		
b. Physician/Patient/Colleague Relationships a. Interactions with colleagues and co-workers b. Interactions with patients and the public c. Confidentiality d. Peer Review		
c. Personal Behavior and Employee Relationships a. Ethics of an individual		
d. Conflicts of Interest		

e. Ethics of Research (fabrication, fraudulence, plagiarism)		
f. Human Subjects Research		
g. Research with Animals		
h. Relationships with Vendors • Conflicts of interest (recognition and management) • Negotiation skills		
i. Publication Ethics		
j. Ethics of Education: Teacher and student		
Leadership		
a. Attended resident session and/or Medical Physics Seminar on Leadership and understands the following concepts: • Leadership • Qualities of leaders • Rules of leadership • Causes of leadership failure		
Patient Safety		
1. General		
a. Understands personnel dosimetry, and the principles behind the development of a general patient and staff safety management program within the hospital		
b. Describes the physicist's role in developing and overseeing an overall quality assurance program for both equipment and procedures, including a discussion of allocation and management of resources necessary to carry out these tasks, incorporation of tools and techniques into these tasks, and inclusion of various groups within the structure of the radiation oncology department		
c. Describes the principles and rationale of TJC Universal Protocol as well as the use of pre-procedure verification and time-outs for the prevention of treatment errors		
d. Describes internal, voluntary, and mandatory incident reporting systems and the role of root cause analysis (RCA) as a tool for continuous quality improvement		
e. Describes the concept of a failure mode and effect analysis (FMEA), design and implementation of an FMEA, and how to use the results of such an analysis to prevent errors and minimize risks to patients and staff		
f. Describes charting systems for the prescription, delivery, and recording of treatment information, standardization of such systems, and the use of such systems within a record and verify electronic medical record system		
g. Describes mechanisms for independent checking of treatment information		
h. Understands radiation safety signs		

i. Knows occupational and public dose limits		
2. Equipment		
a. Describes the implementation of an effective set of equipment operating procedures that would include preventative maintenance and repair, keeping of maintenance and repair records, emergency procedures, and systematic inspection of interlock systems		
b. Describes the development of a program to prevent mechanical injury caused by the machine or accessory equipment, with consideration of the need for visual and audio contact with the patient while the patient is under treatment		
c. Understands potential patient safety hazards related to the use of blocks, block trays, wedges, and other ancillary treatment devices and accessories as well as mechanisms to minimize these risks		
d. Understands potential patient safety hazards posed by patient support and immobilization systems, as well as mechanisms to minimize these risks		
e. Understands potential patient safety hazards of gantry–patient collision as well as mechanisms to minimize this risk		
3. Other patient/staff safety issues		
a. Understands potential electrical hazards affecting patients and staff		
b. Understands the potential hazards to patients and staff posed by strong magnetic fields		
c. Understands the mechanisms of ozone production and related potential hazards to patients and staff		
d. Understands potential hazards to patients and staff arising from the use of cerrobend		
Calibration		
a. Demonstrates an understanding of and an ability to use the instrumentation (e.g., theory of operation, limitations) and protocols that may be employed in calibrating of radiation treatment beams of energy in the megavoltage range		
b. Understands how and why phantoms are used for physical measurements		
c. Understands the correction factors used for photon and electron calibration measurements		
d. Competently calibrates megavoltage external beams of photons and electrons using a recognized national or international protocol (e.g., TG-51)		
Treatment Techniques		
1. Demonstrates IMRT/VMAT understanding of 2D coplanar beam treatment planning		
2. Demonstrates an understanding of the placement of non-coplanar beams (3D) in external beam treatment planning		
3. Demonstrates an understanding of the following image-guided radiation therapy techniques:		
a. Planar MV imaging		

b. Planar kV imaging		
c. Cone beam computed tomography (CBCT)		
d. Ultrasound (US)		
e. Non-radiographic localization, e.g., US, surface camera, radiofrequency (RF) beacon tracking.		
4. Demonstrates an understanding of image registration techniques, e.g., rigid and deformable registration		
5. Demonstrates an understanding of site-specific techniques (photons and electrons) and **performs two to five plans for each of the following sites**:		
a. Performs 3D or IMRT/VMAT treatment planning for breast and chest wall that includes axilla fields and the single isocenter technique		
b. Performs 3D or IMRT treatment planning for the brain, spine, and craniospinal irradiation		
c. Performs 3D or IMRT/VMAT treatment planning for the bladder, prostate, and testis		
d. Performs 3D or IMRT/VMAT treatment planning for gynecological tumors		
e. Performs 3D or IMRT/VMAT treatment planning for gastrointestinal tumors, e.g., colorectal tumors, tumors of the esophagus, stomach, and liver		
f. Performs 3D or IMRT/VMAT treatment planning for head and neck tumors		
g. Performs 3D treatment planning for common lymphomas that includes the mantle field technique;		
h. Performs 3D treatment planning for skin cancers		
i. Demonstrates an understanding of common 3D or IMRT/VMAT treatment planning techniques for pediatric cancers and performs 3D treatment planning for pediatric craniospinal irradiation		
j. Demonstrates an understanding of common 3D or IMRT/VMAT treatment planning techniques for sarcoma of the trunk and extremities		
k. Performs 3D or IMRT/VMAT treatment planning for the lungs, mediastinum, and thoracic region		
Treatment Planning		
1. Beam properties		
a. Demonstrates an understanding of photon and electron percent depth dose in tissue and other media		
b. Demonstrates an understanding of electron ranges (Rp, R80, R90, and dmax) for different energies		
c. Demonstrates an understanding of proton percent depth dose in tissue and other media and proton ranges for different energies, e.g., stopping and scattering power and range		

d. Demonstrates an understanding of the potential uncertainties in dose deposition in proton radiotherapy		
e. Demonstrates an understanding of the flatness and symmetry of photon and electron beams		
f. Demonstrates an understanding of the differences between source-to-axis distance (SAD) and source-to-skin distance (SSD) treatments;		
g. Demonstrates an understanding of the applicability of electron and photon therapy with regard to disease, depth, and critical normal structures		
h. Discusses the impact of dose and fractionation on normal and tumor tissues		
i. Demonstrates an understanding of the impact of beam quality (e.g., linear energy transfer [LET]) on the relative biological effectiveness (RBE) of different forms of ionizing radiation (e.g., electrons, photons, and protons)		
j. Discusses the uncertainties related to electron and photon therapy (e.g., in terms of physics, biology, machine and patient setup accuracy) and how they may be detected and mitigated during the planning and delivery process.		
2. Beam modifiers		
a. Demonstrates an understanding of the effect of beam modifiers (e.g., wedges, compensators) on the dosimetric characteristics of the incident beam		
b. Demonstrates an understanding of wedges (wedge angle, hinge angle) and the different types of wedges used clinically (physical, universal, dynamic)		
c. Demonstrates an understanding of the design of the different commercially available multileaf collimators (MLCs)		
d. Demonstrates an understanding of blocking and shielding for therapy beams		
e. Demonstrates an understanding of the use of custom bolus		
f. Demonstrates an understanding of the design and use of tissue compensators.		
3. Treatment simulation techniques		
a. Demonstrates an understanding of common patient-positioning and immobilization devices		
b. Demonstrates an understanding of when and how to use specific treatment devices for specific treatments		
c. Discusses how to account for beam attenuation from patient-positioning and immobilization devices in treatment planning.		
4. Tumor localization and normal tissue anatomical contouring		
a. Performs structure delineation on CT, MRI, PET, PET/CT, SPECT, or SPECT/ CT data sets		
b. Demonstrates an understanding of target volume determination, including the design of ICRU target structures (involving concepts such as gross tumor volume [GTV], clinical target volume [CTV], internal target volume [ITV], planning target volume [PTV], and planning organ at risk volume [PRV]);		

c. Demonstrates an understanding of how 4D data is used for target definition and relevant radiation treatment prescription parameters such as GTV, PTV, CTV, and ITV		
d. Demonstrates an understanding of the role of maximum intensity projection (MIP) images in the treatment planning process		
e. Demonstrates an understanding of the role of digitally reconstructed radiographs (DRRs) in the treatment planning process		
f. Demonstrates an understanding of and performs image registration and fusion of data sets for modalities such as CT/CT, CT/MRI, and CT/PET; deformable registration; and image/dose registration.		
5. Plan evaluation. Defines and discusses each of the following treating planning evaluation tools, including their limitations:		
a. Dose volume histograms (V(dose), D(volume), mean dose; cumulative and differential)		
b. Conformity index		
c. Homogeneity index		
d. Biological evaluators (e.g., generalized equivalent uniform dose [gEUD], equivalent uniform dose [EUD], normal tissue complication probability [NTCP], and tumor control probability [TCP]).		
e. Discusses dose tolerances for various normal tissue structures along with relevant volume effects.		
Intensity-modulated Radiation Therapy (IMRT/VMAT)		
1. Inverse planning		
a. Demonstrates an understanding of the use of objective functions for IMRT/VMAT optimization		
b. Demonstrates an understanding of the optimization processes involved in inverse planning		
c. Performs inverse planning optimization for a variety of treatment sites in sufficient number to become proficient in the optimization process (see Section 4.5.2.1)		
d. Demonstrates an understanding of commonly used planning procedures and guidelines as well as optimization and dose calculation algorithms.		
2. IMRT/Volumetric modulated arc therapy (VMAT) delivery		
a. Demonstrates an understanding of various IMRT/VMAT delivery techniques (e.g., compensators, static field IMRT, rotational delivery techniques) and their relative advantages and disadvantages		
b. Explains the differences between dynamic multileaf collimator (DMLC) and segmental multileaf collimator (SMLC) leaf sequencing algorithms in terms of delivery parameters and dose distributions		
c. Participates in IMRT/VMAT delivery for patients with a variety of treatment sites and demonstrates an understanding of the techniques and requirements for patient setup, immobilization, and localization.		

Monitor Unit (MU) Calculations		
1. Demonstrates an understanding and performs derivation of the following factors:		
a. Percent depth dose (PDD)		
b. Tissue-air ratio (TAR)		
c. Tissue-maximum ratio (TMR)		
d. Tissue-phantom ratio (TPR)		
e. Scatter factors (i.e., Sc, Sp, Scp)		
f. Off-axis factors		
g. Inverse square factors		
h. Calibration factor (monitor unit [MU] reference conditions)		
i. Standard wedge factors		
j. Virtual and dynamic wedge factors		
k. Compensator factors		
l. Tray and other insert factors		