

All Tasks must be completed **and signed-off** during clinical internship.

Journals submitted without sign-off will be returned to student and will delay graduation. AMA Format is used to cite sources for research. All student work must be approved by CMD or other credentialed practitioner before applying to patient treatment. Any patient care competencies require **Direct Supervision** by qualified practitioner.

Radiation Protection and Radiation Safety

#	Task(s) / Discussion points	Deliverable	Sign-off	Date
R1	Sample analysis by Scintillation Detection (a) Detector response vs. energy (b) Statistical considerations (c) USNRC leak test requirements (d) Sample preparation (e) Data analysis (f) Result interpretation	*Observe wipe sample counting or bioassay, if possible *Discuss in journal		
R2	Personnel Dosimeters: Photon/Electron (a) Detector types and properties (b) Gamma-ray energy response (c) Dose response (d) Stability and reproducibility	*Observe badge exchange, if possible *Discuss in journal		
R3	Personnel Dosimeters: Neutron (a) Detector types and properties (b) Neutron energy response (c) Dose response (d) Dose-equivalent response (e) Stability and reproducibility	*Discuss in journal		
R4	Leakage Radiation from Linacs (a) Anticipated radiation fields (b) Detector types and calibrations (c) AAPM recommendations (d) Measurement and analysis (e) Neutron leakage	*Discuss in journal		
R5	Neutron Survey Instruments (a) Dose equivalent response: Bonner Sphere (b) Energy independent response: Long Counter (c) Calibration: Pu-Be (d) Effective center and neutron response (e) Data analysis and interpretation	*Identify and discuss the use of any neutron survey equipment to which you have access *Discuss in journal		
R6	Tritium Air Concentrations – Biological Burden determination (a) Air dispersion and sample collection (b) Biosample collection (c) Liquid scintillation counting techniques (d) Derived air concentrations (e) Deduced body burdens	*Discuss in journal		

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R7	<p>CT-Diagnostic Suite shielding calculation</p> <p>(a) Special needs and characteristics of sources</p> <p>(b) Use of existing building materials</p> <p>(c) Suite layout and personnel flow</p> <p>(d) Calculation and interpretation</p> <p>(e) Presentation of results</p>	<p>*Determine how your CT suite is shielded (see D10 below)</p> <p>*Discuss in journal</p>		
R8	<p>Particle Transport by Stochastic Sampling</p> <p>(a) Generation of source histories</p> <p>(b) Cross section preparation</p> <p>(c) Geometry preparation</p> <p>(d) Explicit transport of histories</p> <p>(e) Scoring of results</p>	<p>*If relevant research is being done at your site, discuss with researchers</p> <p>*Discuss in journal</p>		
R9	<p>Dose Estimates from Diagnostic Imaging Procedures</p> <p>(a) Fetal dose calculations</p> <p>(b) Pediatric dose issues</p> <p>(c) Risk estimates</p>	<p>*Provide a sample dose estimate for each point</p> <p>*Discuss in journal</p>		
R10	<p>Points of Concern during Therapy</p> <p>(a) Pacemakers and the radiation field</p> <p>(b) Dose estimates near prosthetics</p> <p>(c) Large patients and skin reaction</p> <p>(d) TPS model accuracy issues</p>	<p>*Discuss in journal (one page write up)</p>		

Diagnostic Imaging and Quality Assurance

#	Task(s) / Discussion points	Deliverable	Sign-off	Date
D1	X-Ray production and Machine Output (a) Ionization chamber measurement (b) Effects of kVp, mA, exposure time (c) Effects of filtration (d) Measurement of half-value layer	*Discuss in journal		
D2	Radiographic Film Contrast (a) Densitometry, sensitometry (b) Effects of kV, mA, exposure time (c) H & D curves (d) Processor	*Discuss in journal		
D4	Scatter Reduction (a) Grids (b) Air Gap (c) Collimation	*Discuss in journal		
D5	Radiographic/Fluro Quality Control (a) Focal spot size (b) Radiation/light field (c) Reproducibility, linearity (d) Dose calculation (e) Voltage measurement (f) Tomography, cine, rapid film changers (g) Fluoroscopy (h) Mammography (i) Dental	*Discuss in journal		
D10	Computed Tomography (a) Imaging principles (b) Slice thickness (c) High and low contrast resolution (d) Beam profiles (e) Dose measurements (f) Helical z-axis characterization (g) Positioning light alignment (h) QC and accreditation	*Identify your site's CT equipment and review the site plan *Discuss in journal		
D11	CT daily tests	*Observe *Document and discuss		
D12	CT annual tests (If being performed)	*Observe *Document and discuss		

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D13	CT simulation (a) TG-66 (b) Daily, Monthly, and Annual QA (c) Electron Density Tables	*Observe QA, if possible *Document and discuss		
D14	Review Diagnostic QA reports	*Select a sample of available reports *Discuss your findings in your journal		
D15	MRI daily tests	*Observe, if possible *Document and discuss		
D16	PET daily tests	*Observe, if possible *Document and discuss		
D17	Portal Imaging QA (a) TG-58	*Observe QA, if possible *Document and discuss		

Body-Site-Specific Imaging

#	Site	Deliverable	Sign-off	Date
SI1	CT Sim 1: Prostate	*Observe/Assist *Document/Discuss in Journal		
SI2	CT Sim 2: Lung	*Observe/Assist *Document/Discuss in Journal		
SI3	CT Sim 3: Head/Neck	*Observe/Assist *Document/Discuss in Journal		
SI4	CT Sim 4: Breast	*Observe/Assist *Document/Discuss in Journal		
SI5	CT Sim 5: Brain	*Observe/Assist *Document/Discuss in Journal		
SI6	CT Sim 6: Colon	*Observe/Assist *Document/Discuss in Journal		
SI7	CT Sim 7: Gyn	*Observe/Assist *Document/Discuss in Journal		
SI8	CT Sim 8: Extremity	*Observe/Assist *Document/Discuss in Journal		
SI9	CT Sim 9: Electron field	*Observe/Assist *Document/Discuss in Journal		
SI10	Quality Assurance Process for Simulation (e.g. Review pathology report, patient identification):	*Observe/Assist *Document/Discuss in Journal		
SI11	MRI: any site	*Observe/Assist, or Research *Document/Discuss in Journal		

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SI12	PET: any site	*Observe/Assist, or Research *Document/Discuss in Journal		
SI13	US: Prostate	*Observe/Assist, or Research *Document/Discuss in Journal		
SI14	C-Arm: Surgery	*Observe/Assist, or Research *Document/Discuss in Journal		
SI15	Special Procedure Simulation (e.g Respiratory Gating, SRS, SBRT)	*Observe/Assist, or Research *Document/Discuss in Journal		

Nuclear Medicine Instrumentation and Quality Assurance

#	Task(s) / Discussion points	Deliverable	Sign-off	Date
NM2	Radioisotope Calibrator (a) Quality control: Constancy, linearity, accuracy (b) Wipe testing of radionuclide standards	*Observe dose preparation or calibration QA, if possible *Discuss in journal		
NM6	SPECT (a) Quality control: Center-of-rotation calibration and high-count floods (b) Comparison of planar and tomographic spatial resolution (c) Measurement of field uniformity, RMS noise, accuracy of attenuation correction, and contrast	*Observe QA, if possible *Discuss in journal		
NM7	PET (a) Quality Control (b) Measurement of singles rate, RMS noise, and contrast	*Observe QA, if possible *Discuss in journal (one page write up)		

Radiation Therapy Physics: Instrumentation, QA, and Clinical Studies

#	Task(s) / Discussion points	Deliverable	Sign-off	Date
T1	* Attend multidisciplinary cancer conferences / tumor boards and weekly peer review * Perform one chart check weekly	* Attend * Perform * Provide documentation		
T3	Calibrate a linac photon beam using TG-51 protocol	* Observe or Research * Document and discuss		
T6	Calibrate an electron beam (start with determining energy) using TG-51	* Observe or Research * Document and discuss		
T7	Calibrate and perform two clinical TLD measurements	* Observe TWO (If not available, research topic) * Document and discuss		
T10	Perform Mechanical QA	* Observe * Document and discuss		
T11	Defining GTV, CTV, PTV, and critical structures	* Discuss in your journal		
T13	Calculate MU for five photon non-IMRT clinical cases	* Calculate * Document and discuss		
T16	Hand calcs: * Calculate three cases of irregular photon fields, including one mantle field, by hand, checking with your second-check program * Calculate at least 20 (or as many as possible) other actual patient plans by hand	* Calculate * Document and discuss		
T18	Dose modeling for external photon and electron beams; determine the models used for your TPS	* Discuss your TPS in your journal		
T19	* Observe your site's daily linac tests * Shadow procedure at least three times	* Observe * Document and discuss		
T20	* Observe your site's monthly linac tests * Perform full procedure at least one time if not already covered above	* Observe * Document and discuss		

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T21	<p>Perform a linac annual test (if you are able to do so)</p> <p>If not possible, review your linac last annual test documents</p>	<p>*Observe and document OR</p> <p>*Discuss the procedure and results in journal</p>		
T22	<p>Review your linac acceptance report</p>	<p>*Discuss briefly in journal</p>		
T23	<p>Review your linac commissioning report</p>	<p>*Discuss briefly in journal</p>		
T27	<p>Patient IMRT QA with your physicist</p> <p>*Observe at least two</p> <p>*Perform at least one</p>	<p>*Shadow</p> <p>*Document and discuss</p>		
T29	<p>Review badge reports;</p> <p>Review ALARA notifications, if any;</p> <p>Review provisions for protection of pregnant workers</p>	<p>*Discuss</p>		
T30	<p>Perform routine QA of any device not listed above (e.g. a block cutter)</p>	<p>*Observe</p> <p>*Document and discuss</p>		
T31	<p>Follow one electron case from new start to delivery</p> <p>(a) New Start</p> <p>(b) Weekly chart checks</p> <p>(c) Simulation</p> <p>(d) Block or cutout manufacture</p> <p>(e) Treatment planning</p> <p>(f) Delivery</p> <p>(g) Patient-specific QA</p> <p>(h) Patient follow-up</p>	<p>*Document and discuss</p>		
T32	<p>Calculate a rotational photon beam average TMR manually and check with your second-check program</p>	<p>*Calculate</p> <p>*Document and discuss</p>		

Treatment Planning

If your site performs brachytherapy and external beam for a given body site, plan and review one plan of each. You may use 2D, 3D, IMRT, or VMAT as appropriate. All competencies designated **MANDATORY** must be completed on a patient for successful completion of Clinical Internship. Each **MANDATORY External Beam** competency must be accompanied by a Mandatory Competency Evaluation Form. All student work must be approved by CMD or other credentialed practitioner **before** applying to patient treatment.

#	Site	Deliverable	Sign Off	Date Completed
P1	Prostate 3D or IMRT Prostate- MANDATORY	Plan and Plan Review		
P2	Pelvis (3 or 4 field) with wedges- MANDATORY	Plan and Plan Review		
P3	Pelvis (4 field)- MANDATORY	Plan and Plan Review		
P4	Lung- MANDATORY	Plan and Plan Review		
P5	Head/Neck (Primary)- MANDATORY	Plan and Plan Review		
P6	Breast (tangents)- MANDATORY	Plan and Plan Review		
P7	Brain (Primary)- MANDATORY	Plan and Plan Review		
P8	Gyn- MANDATORY	Plan and Plan Review		
P9	Extremity Limb Melanoma/Sarcoma MANDATORY	Plan and Plan Review		
P10	Abdomen (e.g. Pancreas)- MANDATORY	Plan and Plan Review		
P11	Lymphoma- MANDATORY	Plan and Plan Review		
P12	Any Electron Field- MANDATORY	Plan and Plan Review		
P13	P-aortic or Nodal Irradiation- MANDATORY	Plan and Plan Review		
P14	Fusion Plan- MANDATORY	Plan and Plan Review		
P15	Esophagus- MANDATORY	Plan and Plan Review		

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P16	Craniospinal	Plan and Plan Review or Research Discuss in Journal		
P17	Anus or Vulva	Plan and Plan Review or Research Discuss in Journal		
P18	Palliative- MANDATORY	Plan and Plan Review		
P19	Chest Wall or Intact Breast Tangential w/ Supraclavicular and Axilla Fields- MANDATORY	Plan and Plan Review		
P20	Re-irradiation or Composite Plan- MANDATORY	Plan and Plan Review		
P21	Brain (Whole Brain) or Spine- MANDATORY	Plan and Plan Review		
P22	Simultaneous Integrated Boost (SIB) plan MANDATORY	Plan and Plan Review		

Special Procedures

A minimum of two brachytherapy procedures (one interstitial and one intracavitary) are **MANDATORY**. If not available in your clinic, please review videos provided by the school. **A Mandatory Competency Evaluation Form is not required.**

#	Task(s) / Discussion points	Deliverable	Sign-off	Date
SP1	Brachytherapy: Interstitial-Seed Implant (a) Observe implant or volume study, if possible (b) Review a plan (c) Manually calculate dose	*Observe or Research Topic *Calculate *Document and discuss in journal		
SP2	Brachytherapy: HDR Breast or Prostate (a) Observe implant, if possible (b) Review a plan (c) Manually calculate dose	*Observe or Research Topic *Calculate *Document and discuss in journal		
SP3	Brachytherapy: LDR or HDR Gyn (a) Observe implant, if possible (b) Review a plan (c) Manually calculate dose	*Observe or Research Topic *Calculate *Document and discuss in journal		
SP4	Stereotactic: Brain (a) Observe procedure, if possible (b) Review a plan (c) Check dose to a point by hand or using clinic software	*Observe or Research Topic *Calculate *Document and discuss in journal		
SP5	Stereotactic: Body (a) Observe procedure, if possible (b) Review a plan (c) Check dose to a point by hand or using clinic software	*Observe or Research Topic *Calculate *Document and discuss in journal		
SP6	Intraoperative Irradiation (IORT) (a) Observe procedure, if possible (b) Review a plan	*Observe or Research Topic *Document and discuss in journal		
SP7	Respiratory Gaiting: 4D CT (a) Observe procedure, if possible (b) Review a plan and treatment on the machine	*Observe or Research Topic *Document and discuss in journal		

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SP8	If you are able to perform or observe any other procedures of interest (TBI, arc therapy, proton planning, etc.), list them in the following spaces Other:	*Document and discuss		
SP9	Other:	*Document and discuss		