Supplemental Guide: Radiation Oncology

ACGME

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Milestones Supplemental Guide

This document provides additional guidance and examples for the Radiation Oncology Milestones. This is not designed to indicate any specific requirements for each level, but to provide insight into the thinking of the Milestone Work Group.

Included in this document is the intent of each Milestone and examples of what a Clinical Competency Committee (CCC) might expect to be observed/assessed at each level. Also included are suggested assessment models and tools for each subcompetency, references, and other useful information.

Review this guide with the CCC and faculty members. As the program develops a shared mental model of the Milestones, consider creating an individualized guide (Supplemental Guide Template available) with institution/program-specific examples, assessment tools used by the program, and curricular components.

Additional tools and references, including the Milestones Guidebook, Clinical Competency Committee Guidebook, and Milestones Guidebook for Residents and Fellows, are available on the Resources page of the Milestones section of the ACGME website.

Patient Care 1: Consult **Overall Intent:** To develop clinical competence in initial consultation including taking an appropriate history with cultural humility, physical examination, and making a treatment recommendation	
Milestones	**Examples**
Level 1 *Takes basic medical history and performs general physical exam*	● Obtains an accurate general history from the patient and performs a general physical exam
Lists the elements of the informed consent process	● Discusses the need for including risks, benefits, and alternatives within the informed consent
Level 2 *Takes site-focused history and performs basic site-focused physical exam*	● Obtains an accurate site-specific history from a patient with early breast cancer including obstetrics and gynecology history and mammogram history ● Performs a physical exam including a breast and axillary lymph node exam
Lists treatment options	● Lists breast conserving surgery followed by radiotherapy versus mastectomy as treatment options
Answers questions about treatment plan and seeks guidance, when needed	● Explains radiotherapy process to patient including simulation process, prone versus supine positioning, what to expect in treatment vault, etc.; describes acute and late adverse effects of treatment for early breast cancer
Level 3 *Takes comprehensive site-focused history and performs advanced site-focused physical exam*	● Obtains an accurate site-specific history from a patient with locally advanced oropharyngeal cancer including smoking and alcohol history, human papillomavirus (HPV) risk factors ● Performs a physical exam including bimanual oral cavity exam, cervical lymph node exam, and flexible fiberoptic laryngoscopy
Selects treatment(s) for common clinical scenarios and formulates multidisciplinary care plan	● Lists treatment options including chemoradiotherapy versus surgical resection
Identifies risks and benefits of common treatment options and obtains informed consent	● Counsels patient about risks and benefits of surgery followed by adjuvant treatment versus primary chemoradiotherapy; describes acute and late adverse effects of treatment for head and neck cancer
Level 4 *Completes a history/physical for complex clinical scenarios*	● Obtains an accurate site-specific history from a pediatric patient with neuroblastoma and family members ● Performs a physical exam including abdominal exam with palpation of liver

Selects treatment and coordinates the multidisciplinary care plan for complex clinical scenarios *Identifies risks and benefits of complex treatment options and obtains informed consent*	● Lists treatment options for neuroblastoma and collaborates with other care teams to ensure optimal coordination of care with pediatric oncology and pediatric surgery ● Counsels patient and family about risks and benefits of treatment; describes acute and late adverse effects of treatment for head and neck cancer
Level 5 *Leads the multidisciplinary care team*	● Leads multidisciplinary coordination of care for complex cases
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit ● Multisource feedback ● Portfolio ● Simulation (e.g., objective structured clinical exam (OSCE), oral case-based objective skills assessment)
Curriculum Mapping	●
Notes or Resources	● Radiation Oncology Education Collaborative Study Group. Introductory Radiation Oncology Curriculum (IROC). https://roecsg.org/iroc/. Accessed 2021.

Patient Care 2: Simulation **Overall Intent:** To order and supervise simulations, troubleshooting problems that arise	
Milestones	**Examples**
Level 1 *Identifies the members of interprofessional team involved in simulation* *Identifies role of the radiation oncologist in simulation process*	● Understands physicians, radiation therapists, physicists, dosimetrists, nurses, and social workers may be involved with simulation process ● Identifies radiation oncologist as team member that completes simulation order, reviews, and verifies simulation position and scan
Level 2 *Lists simulation parameters* *Supervises simulation to ensure parameters are met*	● Lists different immobilization devices and positions, different breathing techniques for stereotactic lung treatment ● Observes therapists performing computerized tomography (CT) simulation for early lung cancer and reviews simulation scan to ensure tumor is included and scan includes entire length of lungs
Level 3 *Selects simulation parameters for common clinical scenarios to balance tumor exposure and patient comfort* *Recognizes common problems that arise during simulation scans and works with interprofessional team to resolve*	● Instructs therapists to try prone and supine position for a woman with node-negative breast cancer who is uncomfortable in the prone position ● Asks a nurse to access a patient's port for intravenous (IV) contrast rather than start a new IV line
Level 4 *Selects simulation parameters for uncommon clinical scenarios to balance tumor exposure and patient comfort* *Recognizes uncommon problems that arise during simulation scans and works with interprofessional team to resolve*	● Orders simulation to be done feet-first for treatment of squamous cell carcinoma of the toe ● Considers having therapists use a breast board to incline a patient who has head and neck cancer and trouble breathing while undergoing simulation
Level 5 *Develops a new simulation immobilization technique*	● Coordinates with physics and therapists to develop a simulation protocol for an institution that is starting to treat ventricular tachycardia
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit ● Multisource feedback ● Portfolio ● Simulation (e.g., OSCE, oral case-based objective skills assessment)

Curriculum Mapping	●
Notes or Resources	● Radiation Oncology Education Collaborative Study Group. Introductory Radiation Oncology Curriculum (IROC). https://roecsg.org/iroc/. Accessed 2021.

Patient Care 3: Contouring and Target Delineation **Overall Intent:** To accurately contour and delineate targets and organs at risk on treatment planning images with guidance from diagnostic imaging	
Milestones	**Examples**
Level 1 *Identifies relevant organs at risk* *Identifies diagnostic imaging modalities useful for target delineation* *Lists target volume definitions*	● List and define gross tumor target volume (GTV), clinical target volume (CTV), internal target volume (ITV), and planning target volume (PTV) ● Identifies the need for CT, positron emission tomography (PET), and/or magnetic resonance imaging (MRI) to guide target delineation
Level 2 *Contours common organs at risk* *Selects diagnostic images to aid in high-quality target delineation* *Contours simple target volumes*	● In a lung case, contours the spinal canal, lungs, and heart ● Accurately contours simple cases including palliative bone metastases, lung stereotactic body radiation therapy (SBRT) target volume, prostate alone in a breast case, contours the tumor cavity ● Diagnostic imaging: ○ Selects the appropriate imaging sequences (e.g., pre-/post-operative imaging, T1 versus T2 MRI, CT, with or without contrast)
Level 3 *Contours complex organs at risk* *Verifies accuracy of co-registration of the image fusions with the planning scan* *Contours moderately complex target volumes*	● In a glioblastoma case, contours optic chiasm, lacrimal glands, and brain stem ● Accurately contours moderately complex cases including whole pelvis (prostate, endometrium), esophagus, glioblastoma, etc. ● Reviews MRI image registration for glioblastoma case and requests assistance correcting any errors
Level 4 *Identifies errors in organ at risk contours* *Resolves errors in co-registration* *Contours complex target volumes*	● Reviews and corrects organs at risk already contoured by dosimetry/physics staff ● Accurately contours complex cases including definitive or post-operative head and neck, pancreas (intact or post-operative), vulvar, or lymphoma ● In a head and neck case, notices an error in registration of PET scan and adjusts accordingly
Level 5 *Anticipates treatment planning challenges and proactively adjusts target volumes*	● Consistently and proactively adjusts GTV and CTVs to balance coverage with the risk of toxicity to critical structures
Assessment Models or Tools	● Direct observation

	● Multisource feedback ● Volume review
Curriculum Mapping	●
Notes or Resources	● ASTRO. ASTRO Consensus Statement on Standardizing Normal Tissue Contouring for Radiation Therapy Treatment Planning: Executive Summary. https://www.astro.org/Patient-Care-and-Research/Clinical-Practice-Statements/Contouring-Consensus-Guidance-Document. Accessed 2021. ● ASTRO. Radiation Oncology Resources. https://www.astro.org/uploadedFiles/_MAIN_SITE/Affiliate/International/Content_Pieces/IESEducationalresources.pdf. Accessed 2021. ● eContour. https://econtour.org/. Accessed 2021. ● International Journal of Radiation oncology. Contouring Atlases. https://www.redjournal.org/contouring-atlases. Accessed 2021. ● NRG Oncology. Contouring Atlases, Templates & Tools. https://www.nrgoncology.org/ciro-contouring-atlases-templates-and-tools. Accessed 2021.

Patient Care 4: Treatment Planning and Plan Evaluation **Overall Intent:** To systematically review a treatment plan (target coverage and avoidance of organs at risk) and to troubleshoot necessary tradeoffs, reoptimization or changes in treatment planning technique	
Milestones	**Examples**
Level 1 *Identifies the role of the radiation oncologist in treatment planning*	● Identifies that the role of radiation oncologist, after simulation, includes delineation of targets and organs at risk (OAR), coverage and sparing goals, and plan review
Identifies different treatment planning techniques	● Identifies that treatment planning techniques can include three-dimensional conformal radiation therapy (3-D-CRT), intensity-modulated radiation therapy (IMRT), protons, and electrons
Understands that target coverage must be balanced with dose to organs at risk	● Understands that a planning target volume overlapping spine should not exceed spinal cord constraint
Level 2 *Evaluates a simple radiotherapy plan and recognizes when revision is needed*	● Demonstrates a systematic approach to radiation plan review for simple plans, such as Palliative cases, simple breast plans, lung, bone, whole brain, and other simple 3-D plans
Identifies basic treatment planning techniques	● Distinguishes between two-dimensional (2-D), three-dimensional (3-D), IMRT, and brachytherapy plans
Demonstrates general knowledge of organs at risk tolerance (serial and parallel) with conventional fractionation	● Lists common dose constraints such as lung volume receiving greater than 20 Gray (Gy) (V20), spinal cord point maximum doses, and optic nerve maximum dose
Level 3 *Evaluates a moderately complex radiotherapy plan and recognizes when revision is needed*	● Demonstrates a systematic approach to radiation plan review for IMRT and complex 3-D imaging
Suggests plan revisions that incorporate simple planning techniques	● Works with dosimetry to change the energy or add an extra beam in simple 3-D cases and modifies field size
Demonstrates general knowledge organs at risk tolerance for fractionation other than conventional	● Identifies resources for constraints for commonly used hypofractionation schemes
Level 4 *Evaluates a complex radiotherapy plan and recognizes when revision is needed*	● Demonstrates a systematic approach to radiation plan review for central lung SBRT retreat, complex retreatment, challenging pediatrics
Suggests plan revisions that incorporate complex planning techniques	● Suggestion to switch from 3-D-CRT to IMRT for OAR sparing/conformality ● Decision to switch from IMRT to protons

Independently evaluates a reirradiation plan using biologically effective dose or equivalent dose calculations	● Uses and understands biologically effective dose and equivalent dose calculation tool and applies to reirradiation thorax case to minimize dose to spine
Level 5 *Consistently anticipates challenges dosimetrists may incur with plan design and offers prospective advice on how to maximize target coverage and minimize dose to organs at risk*	● Anticipates a potential change in volume and proactively schedules a replan for a patient with cervical cancer and tumor shrinkage and the small bowel drops into the field
Assessment Models or Tools	● Direct observation ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Association of Physicists in medicine (AAPM). Quantitative Analysis of Normal Tissue Effects in the Clinic (QUANTEC). https://www.aapm.org/pubs/quantec.asp. 2021. ● Dean M, Jimenez R, Mellon E, et al. CB-CHOP: A simple acronym for evaluating a radiation treatment plan. *Applied Radiation Oncology*. 2017:28-30. http://cdn.agilitycms.com/applied-radiation-oncology/PDFs/issues/ARO_12-17_Dean.pdf. ● Emami B, Lyman J, Brown A, et al. Tolerance of normal tissue to therapeutic irradiation. *Int J Radiat Oncol Biol Phys*. 1991;21(1):109-122. https://pubmed.ncbi.nlm.nih.gov/2032882/. ● Moore KL, Brame RS, Low DA, Mutic S. Quantitative metrics for assessing plan quality. *Semin Radiat Oncol*. 2012;22(1):62-69. https://pubmed.ncbi.nlm.nih.gov/22177879/. ● RADformation. BED [Biologically Effective Dose] Calculator. https://radformation.com/blog/bed-calculator/. Accessed 2021. ● Wright JL, Yom SS, Awan MJ, et al. Standardizing normal tissue controuring for radiation therapy treatment planning: An ASTRO consensus paper. *Pract Radiat Oncol*. https://pubmed.ncbi.nlm.nih.gov/30576843/.

Patient Care 5: Treatment and Delivery **Overall Intent:** To effectively direct and manage radiation treatments including care coordination, review/evaluation of imaging for treatment set-up, and management of treatment-related toxicities	
Milestones	**Examples**
Level 1 *Describes the purpose of on-treatment visits including eliciting symptoms* *Identifies the importance of online/offline imaging review* *Identifies the importance of continued coordination of care during combined modality treatments*	● Sees patient for on-treatment visit ● Aware that multiple types of images can be obtained to verify patient alignment for treatment ● Aware that some images are reviewed online and some offline ● Knows the members of the multidisciplinary treatment team
Level 2 *Anticipates and elicits common treatment-related acute toxicities* *Assesses online and offline imaging to evaluate for basic set-up* *Identifies issues during treatment that require multidisciplinary discussion*	● Asks appropriate questions during on-treatment visit to elicit acute toxicities ● Reviews and evaluates port films, on-board imaging, and cone beam computed tomography ● Ensures that chemotherapy is scheduled for a patient received concurrent therapy
Level 3 *Manages common treatment-related acute toxicities* *Assesses online and offline imaging to evaluate for complex set-up* *Coordinates the multidisciplinary care of patient receiving combined modality therapy*	● Manages common acute toxicities include dysuria, diarrhea, nausea, dermatitis, esophagitis, headache, mucositis, weight loss ● Recommends changes to treatment imaging depending on clinical situations such as set-up that is not reproducible ● Communicates with medical oncologist when toxicities emerge that might impact course of chemotherapy
Level 4 *Manages complex/high-grade treatment-related acute toxicities* *Independently decides on re-simulations and start adaptive radiotherapy*	● Manages complex toxicities including neutropenic fever, hypomagnesemia, deep vein thrombosis, and/or weight loss requiring a feeding tube ● Recommends re-simulation for a patient with lung cancer who presented with atelectasis and is found on daily imaging to have re-expansion of the lung

Manages multidisciplinary care that requires a deviation from the initial treatment course (such as treatment break)	● Communicates with inpatient medical oncology team about a patient with anal cancer is found to have severe neutropenia and skin toxicities requiring hospital admission and treatment break
Level 5 *Designs novel set-up strategies*	● Works with physics and dosimetry team to develop new immobilization or shielding devices
Assessment Models or Tools	● Direct observation
Curriculum Mapping	●
Notes or Resources	● Radiation Oncology Education Collaborative Study Group. Introductory Radiation Oncology Curriculum (IROC). https://roecsg.org/iroc/. Accessed 2021.

Patient Care 6: Follow-Up **Overall Intent:** To address ongoing cancer management and survivorship care following initial treatment	
Milestones	**Examples**
Level 1 *Participates in post-treatment cancer surveillance* *Describes the purpose of follow-up visits and surveillance including eliciting symptoms related to radiation*	● Performs a general history and physical ● Sees patients as directed in follow-up clinic
Level 2 *Recommends appropriate cancer surveillance in routine situations* *Recognizes and elicits common radiation-induced late toxicities*	● Recommends routine cancer follow-up schedule and required scans/procedures for common cancers such as prostate, breast, lung, and rectal cancers ● Asks questions about urinary and sexual function in prostate cancer follow-up
Level 3 *Recommends appropriate cancer surveillance in complex or rare situations* *Manages common radiation-induced late toxicities*	● Recommends changes to surveillance depending on clinical situations such as recommending more frequent follow-up for a patient with head and neck cancer with severe acute toxicities ● Manages mild urinary habit changes, bowel habit changes, mild lymphedema, and mild sexual dysfunction
Level 4 *Formulates and coordinates a comprehensive cancer survivorship plan* *Manages complex/high-grade radiation-induced late toxicities*	● Formulates and discusses survivorship plans with the patient ● Recommends appropriate screening for secondary malignancies for patients such as recommending early mammogram for patients treated with thoracic radiation as an adolescent/young adult ● Coordinates with multidisciplinary team to manage fistula or stricture formation, non-healing radiation wounds, radiation pneumonitis, or hepatitis
Level 5 *Exemplifies formulation and coordination of a comprehensive cancer survivorship plan*	● Works with multidisciplinary team to revise existing survivorship care plans based on new evidence
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit ● Multisource feedback ● Portfolio ● Simulation (e.g., OSCE, oral case-based objective skills assessment)

Curriculum Mapping	●
Notes or Resources	● American Cancer Society (ACS). American Cancer Society Survivorship Care Guidelines. https://www.cancer.org/health-care-professionals/american-cancer-society-survivorship-guidelines.html. Accessed 2021. ● Children's Oncology Group (COG). Survivorship Guidelines. https://childrensoncologygroup.org/index.php/survivorshipguidelines. Accessed 2021. ● National Comprehensive Cancer Network (NCCN). Survivorship Guidelines. https://www.nccn.org/professionals/physician_gls/pdf/survivorship.pdf. Accessed 2021.

Patient Care 7: Brachytherapy **Overall Intent:** To independently and appropriately engage in the practice of brachytherapy	
Milestones	**Examples**
Level 1 *Identifies brachytherapy applicators*	● Distinguishes applicators: intracavitary (vaginal cylinder, tandem and ovoid/ring) versus interstitial
Identifies targets/organs at risk for brachytherapy	● Identifies urethra, bladder, and rectum as OARs during prostate implants
Participates in brachytherapy treatment plan review	● Reviews prostate high-dose rate brachytherapy plan, including target and OAR doses, with attending
Level 2 *Places simple intracavitary applicators during the implant procedure and participates in peri-operative care*	● Places vaginal cylinder
Delineates common brachytherapy targets/organs at risk	● Contours prostate, urethra, and rectum OARs for prostate brachytherapy implant
Evaluates the plan for common brachytherapy treatment	● Evaluates target and OAR doses for post-operative cervical cancer brachytherapy plan and deems acceptable for delivery
Level 3 *Implants patients for common intracavitary/interstitial procedures and manages peri-operative care including common complications*	● Places tandem and ovoid implants for cervical cancer and interstitial implants for prostate cancer ● Manages perineum hemostasis after removal of interstitial prostate implant
Delineates moderately complex brachytherapy targets/organs at risk	● Delineates pelvic sidewall disease targets for locally advanced or recurrent cervical cancer
Evaluates the plan for moderately complex brachytherapy treatment	● Evaluates a tandem and ovoid implant plan for cervical cancer
Level 4 *Implants patients for complex intracavitary/interstitial procedures and manages peri-operative care including challenging peri-operative complications*	● Appropriately implants and contours target/OARs for patients with head and neck, gastroenterology, sarcoma, or penile implants or interstitial gynecologic implants

Delineates complex brachytherapy targets/organs at risk *Demonstrates consistent ability to evaluate the plan for complex brachytherapy treatment*	● Recognizes when applicators are not appropriately placed and adjusts prior to proceeding with treatment planning, including inadequate vaginal packing and tandem perforation of the uterus ● Evaluates salvage high-dose rate brachytherapy plan for prostate cancer patient who received prior external beam radiation therapy with regard for respect for therapeutic ratio, helping to optimize target coverage and OAR avoidance in a patient and disease specific manner
Level 5 *Exemplifies best practices in brachytherapy*	● Works with physics to customizes a vaginal applicator for a patient with a narrow introitus
Assessment Models or Tools	● Direct observation ● Multisource feedback ● Simulation
Curriculum Mapping	●
Notes or Resources	● American Brachytherapy Society (ABS). Brachytherapy Guidelines and Consensus Statements. https://www.americanbrachytherapy.org/consensus-statements/brachytherapy-guidelines-and-consensus-statements/. Accessed 2021.

Patient Care 8: Procedures **Overall Intent:** To independently and appropriately engage in the practice of stereotactic radiosurgery (SRS)/ stereotactic body radiation therapy (SBRT)	
Milestones	**Examples**
Level 1 *Participates in discussions of SRS/SBRT indications* *Identifies SRS/SBRT targets/OARs* *Recognizes an SRS/SBRT treatment plan*	● Discusses SRS/SBRT with attending physician at time of consult ● Discusses distinct elements of external beam radiation therapy (EBRT) versus SRS/SBRT plan ● In chart rounds, identifies a lung SBRT plan and how it differs from standard fractionation treatment
Level 2 *Demonstrates awareness of indications for SRS/SBRT* *Delineates simple SRS/SBRT targets/OARs* *Evaluates a simple SRS/SBRT plan*	● Recommends SRS as a treatment option for limited brain metastases ● Contours target volumes, including ITV, for Stage 1 non-small cell lung cancer for SBRT ● Appropriately evaluates simple lung SBRT plan
Level 3 *Makes recommendations for simple SRS/SBRT* *Delineates moderately complex SRS/SBRT targets/OARs* *Evaluates a moderately complex SRS/SBRT plan*	● Recommends appropriate treatment for simple SRS/SBRT cases that are lower risk such as peripheral lung, prostate, and/or non-spine bone lesions ● Contours vestibular schwannoma, brainstem, and cochlea for SRS ● Appropriately evaluates a multi-site lung SBRT plan
Level 4 *Makes recommendations for complex SRS/SBRT* *Delineates complex SRS/SBRT targets/OARs* *Evaluates a complex SRS/SBRT plan*	● Recommends appropriate treatment for SRS/SBRT cases that have a higher risk of complications such as central lung, pancreas, liver, or spine ● Contours post-operative pituitary adenoma target for SRS ● Appropriately evaluates a spine re-irradiation case employing SBRT
Level 5 *Exemplifies best practices in SRS/SBRT*	● Develops a process improvement strategy to refine respiratory motion management during lung SBRT
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit

	● Multisource feedback ● Portfolio ● Simulation (e.g., OSCE, oral case-based objective skills assessment)
Curriculum Mapping	●
Notes or Resources	● Benedict SH, Yenice KM, Followill D, et al. Stereotactic body radiation therapy: The report of AAPM Task Group 101. *Med Phys*. 2010;37(8):4078-4101. https://www.aapm.org/pubs/reports/detail.asp?docid=102. ● Grimm J, Marks LB, Jackson A, et al. High dose per fraction, Hypofractionated Treatment Effects in the Clinic (HyTEC): An overview. *Int J radiat Oncol Biol Phys*. 2021;110(1):1-10. https://www.redjournal.org/article/S0360-3016(20)34538-7/fulltext.

Medical Knowledge 1: Applied Sciences (Radiation Physics, Radiation and Cancer Biology, Biostatistics, Trial Design, Oncoanatomy) **Overall Intent:** To incorporate the principles of radiation physics, cancer biology, biostatistics, trial design, and oncoanatomy into daily treatment care decisions	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of basic radiographic anatomy of normal structures*	● Identifies heart, lungs, esophagus, and spinal cord on CT simulation for a patient with non-small cell lung cancer
Recognizes the importance of medical physics in radiation oncology	● In clinic, tells patients that their plans must be checked by a medical physicist prior to starting radiotherapy as a component of quality assurance
Recognizes the importance of radiation/cancer biology in radiation oncology	● Identifies that fractionation is a component of radiation biology which can be altered based on tumor type to maximize therapeutic ratio
Level 2 *Demonstrates knowledge of basic radiographic anatomy of abnormal (oncologic) structures and can apply to relevant staging systems*	● Correlates primary lung tumor and mediastinal lymph nodes in a patient with non-small cell lung cancer with appropriate tumor, lymph nodes, and the presence of metastasis on the American Joint Committee on Cancer (AJCC) staging system
Discusses basic concepts of medical physics	● Describes to a patient the basic components of the linear accelerator and how it is used to deliver focal radiotherapy
Discusses basic concepts of radiation/cancer biology	● Discusses the rationale for standard fractionation with a patient with anal cancer receiving concurrent chemotherapy
Level 3 *Integrates knowledge of pathologic anatomy and targeting guidelines in common clinical situations (e.g., breast/head and neck nodal anatomy)*	● Contours CTVs for post-operative head and neck case using pathologic risk factors to guide volumes
Applies concepts of medical physics to common clinical situations	● Works with dosimetry to determine electron energy and bolus requirement for a skin cancer treatment
Applies concepts of radiation/cancer biology to common clinical situations	● Discusses the pros and cons of hypofractionation with a very young woman with breast cancer
Level 4 *Integrates knowledge of pathologic anatomy and guidelines as needed to complex clinical situations*	● Independently uses pathology and operative reports, imaging, and protocol guidelines to customize target volumes for a patient with sub-total resection of a glioblastoma

Applies medical physics concepts to complex clinical situations *Applies radiation/cancer biology concepts to complex clinical situations*	● Applies medical physics concepts to dosimetry to further optimize an IMRT plan ● Applies radiation biology to determine optimal reirradiation dose ● Understands that systemic medications can alter radiation sensitivity
Level 5 *Demonstrates exemplary knowledge of the application of anatomic and radiographic knowledge* *Demonstrates exemplary knowledge of medical physics concepts in the clinic* *Demonstrates exemplary knowledge of radiation/cancer biology concepts in the clinic*	● Identifies errors in peer-review conference ● Serves as a resource for colleagues with regards to anatomic and radiographic knowledge ● Works with physicists during commissioning and quality assurance ● Designs a clinical trial taking advantage of radiation cancer/biology concepts
Assessment Models or Tools	● Direct observation ● Written exams
Curriculum Mapping	●
Notes or Resources	● AJCC. Cancer Staging Manual. http://cancerstaging.org/references-tools/deskreferences/Documents/AJCC%207th%20Ed%20Cancer%20Staging%20Manual.pdf. Accessed 2021. ● American College of Radiology (ACR). DXIT and TXIT In-Training Exams. https://www.acr.org/Lifelong-Learning-and-CME/Learning-Activities/In-Training-Exams. Accessed 2021. ● Ford E. *Primer on Radiatino Oncology Physics: Video Tutorials with Textbook and Problems*. 1st ed. Boca Raton, FL: CRC Press; 2020. ISBN:978-1138591707. ● Hall EJ, Giaccia AJ. *Radiobiology for the Radiologist.* 8th ed. Philadelphia, PA: Wolters Kluwer; 2019. ISBN:978-1496335418. ● Khan FM, Gibbons JP. *The Physics of Radiation Therapy*. 5th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2014. ISBN:978-1451182453. ● McDermott PN, Orton CG. *The Physics & Technology of Radiation Therapy*. 2nd ed. Madison, WI: Medical Physics Publishing; 2018. ISBN:978-1930524989.

Medical Knowledge 2: Evidence-Based Foundations of Radiation Oncology **Overall Intent:** To develop a foundation of knowledge of the literature in radiation oncology which can be translated into clinical settings	
Milestones	**Examples**
Level 1 *Recognizes the importance of evidence-based medicine in radiation oncology* *Summarizes a published study*	● Identifies that there are major trials that have shaped the treatment paradigm for patients with gastric cancer ● After being provided with the reference, summarizes the results of the intergroup 0116 (INT-0116) trial (i.e., the MacDonald regimen)
Level 2 *Summarizes evidence-based data supporting treatment management of common patient presentations* *Evaluates a basic published study and applies trial data to common clinical situations*	● Summarizes the data for adjuvant radiotherapy for DCIS based on large randomized clinical trials ● In clinic, recommends hypofractionated radiotherapy for a woman with early-staged breast cancer based on Whelan and Standardization of Breast Radiotherapy (START) A/B trials
Level 3 *Summarizes evidence-based data supporting treatment management of uncommon patient presentations* *Evaluates complex published studies and applies trial data to less common clinical situations*	● After seeing a patient on the upcoming clinic schedule, reviews and summarizes the data for adjuvant radiotherapy for breast angiosarcoma ● In clinic, discusses recommendations for reduced dose craniospinal irradiation for medulloblastoma based published studies
Level 4 *Compares/contrasts and critiques evidence-based data supporting treatment management* *Evaluates complex published studies and applies trial data to complex clinical situations*	● Evaluates the literature comprehensively, and compares and contrasts different approaches to nodal dissection in gastric cancer and how it relates to appropriate selection of adjuvant therapy ● Discusses the pros and cons of adjuvant radiotherapy in a patient with resected pancreatic cancer based on conflicting evidence in the literature
Level 5 *Demonstrates exemplary evaluation of published studies*	● Independently provides expert-level commentary on study design, statistical methods, and/or interpretation of results for newly released publications ● Recognizes implicit bias assumptions embedded in published research
Assessment Models or Tools	● Direct observation ● Written exams
Curriculum Mapping	●
Notes or Resources	● Handbook of Evidence-Based Radiation Oncology, Hanson and Roach, 2018 ● Hansen EK, Roach M III. *Handbook of Evidence-Based Radiation Oncology*. 3rd ed. Cham, Switzerland: Springer International Publishing; 2018. ISBN:978-3319626413.

	● International Journal of Radiation Oncology • Biology • Physics. https://www.redjournal.org/. Accessed 2021. ● Practical Radiation Oncology (PRO). https://www.practicalradonc.org/. Accessed 2021. ● Radiation Oncology Education Collaborative Study Group (ROECSG). Biostatistics and Evidence Appraisal for Radiation Oncologists. https://roecsg.org/statistics/. Accessed 2021.

Systems-Based Practice 1: Patient Safety and Quality Improvement (QI) **Overall Intent:** To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals; to conduct a QI project	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of common patient safety events (physical, mental, and financial)*	● Lists patient misidentification prior to treatment as a potential common safety events
Demonstrates knowledge of how to report patient safety events (physical, mental, and financial)	● Describes how to report errors in your environment
Demonstrates knowledge of basic quality improvement methodologies and metrics	● Describes the importance of quality improvement and patient safety
Level 2 *Identifies system factors that lead to patient safety events (physical, mental, and financial)*	● Identifies failure to appropriately label contours may lead to errors during treatment planning
Reports patient safety events through institutional reporting systems (simulated or actual) (physical, mental, and financial)	● Reports lack of hand sanitizer dispenser at each clinical exam room to the medical director
Describes local quality improvement initiatives	● Summarizes processes for ensuring patient has documented consent prior to first treatment
Level 3 *Participates in analysis of patient safety events (simulated or actual)*	● Preparing for morbidity and mortality presentations
Participates in disclosure of patient safety events to patients and families (simulated or actual)	● Through simulation, communicates with patients/families about a radiation misadministration error
Participates in local quality improvement initiatives	● Participates in project identifying root cause of time from CT simulation to treatment inefficiency
Level 4 *Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)*	● Collaborates with a team to conduct the analysis of a radiation misadministration error, treating the wrong vertebral body

Discloses patient safety events to patients and families (simulated or actual) *Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project*	● Effectively communicates with patients/families after an incident with radiation misadministration of the wrong vertebral body ● Participates in the completion of a QI project to improve time between simulation and treatment initiation including assessing the problem, articulating a broad goal, developing an objective plan, and monitoring progress and challenges
Level 5 *Actively engages teams and processes to modify systems to prevent patient safety events* *Role models or mentors others in the disclosure of patient safety events* *Creates, implements, and assesses quality improvement initiatives at the institutional or community level*	● Assumes a leadership role at the departmental or institutional level for patient safety ● Develops a simulation workshop for disclosing patient safety events ● Initiates and completes a QI project to improve county human papillomavirus (HPV) vaccination rates in collaboration with the county health department and shares results with stakeholders
Assessment Models or Tools	● Direct observation ● E-module multiple choice tests ● Medical record (chart) audit ● Multisource feedback ● Portfolio ● Reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● Institute for Healthcare Improvement (IHI). http://www.ihi.org/Pages/default.aspx. Accessed 2021.

Systems-Based Practice 2: System Navigation for Patient-Centered Care **Overall Intent:** To effectively navigate the health care system, including the interdisciplinary team and other care providers, to adapt care to a specific patient population to ensure high-quality patient outcomes	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of care coordination* *Identifies key elements for safe and effective transitions of care and hand-offs* *Demonstrates knowledge of population and community health needs and disparities*	● For a patient with breast cancer identifies the care team including the medical oncologist, surgeon, radiation oncologist, and other health care professionals as members of the team ● Identifies the patient list as an important tool for transitions of care including sign-out and hand-offs ● Identifies that patients in rural areas may have different needs than urban patients
Level 2 *Coordinates care of patients in routine clinical situations effectively using the roles of the interprofessional teams* *Performs safe and effective transitions of care/hand-offs in routine clinical situations* *Identifies specific population and community health needs and inequities for their local population*	● For a patient with breast cancer, coordinates care with surgical oncology to allow adequate post-operative healing time and with medical oncology to ensure hormonal therapy starts after radiotherapy ● Routinely uses a patient list for transitions of care when out of clinic, on vacation, or at change of services ● Identifies that limited transportation options may be a factor for patients getting to multiple radiotherapy appointments
Level 3 *Coordinates care of patients in complex clinical situations effectively using the roles of their interprofessional teams* *Performs safe and effective transitions of care/hand-offs in complex clinical situations* *Uses local resources effectively to meet the needs of a patient population and community*	● For a patient with breast cancer, coordinates chest wall expander deflation with plastic surgery team prior to radiotherapy ● Works with the social worker to coordinate care for a homeless patient to ensure the patient completes their course of radiotherapy ● Routinely communicates clinical details to accepting radiotherapy team after evaluating an on-call patient ● Refers patients to a local pharmacy which provides a sliding fee scale option and prints pharmacy coupons for patients in need
Level 4 *Role models effective coordination of patient-centered care among different disciplines and specialties*	● For a patient with breast cancer, proactively coordinates scheduling of CT simulation after completion of chemotherapy

Role models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems *Participates in changing and adapting practice to provide for the needs of specific populations*	● For a patient with hormone-receptor positive breast cancer, contacts medical oncology team to notify them when radiation treatment is completed so hormonal therapy can be initiated ● Consistently asks patients how far they live from the treating institution to optimize treatment selection and fractionation schema for patients that live far away
Level 5 *Analyzes the process of care coordination and leads in the design and implementation of improvements* *Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes* *Leads innovations and advocates for populations and communities with health care inequities*	● Leads a program to arrange for multidisciplinary survivorship care in conjunction with integrative health ● Develops a protocol to automatically launch referrals to speech therapy and a dietitian for patients starting head and neck radiotherapy ● Leads development of a program to help low-income patients obtain transportation to/from the radiotherapy clinic
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback ● Quality metrics and goals mined from electronic health records (EHRs) ● Review of sign out tools, use and review of checklists
Curriculum Mapping	●
Notes or Resources	● Center for Disease Control and Prevention (CDC). What is Population Health? https://www.cdc.gov/pophealthtraining/whatis.html. Accessed 2021. ● Skochelak SE, Hammoud MM, Lomis KD, et al. *AMA Education Consortium: Health Systems Science*. 2nd ed. Philadelphia, PA: Elsevier; 2020. ISBN:978-0323694629.

Systems-Based Practice 3: Physician Role in Health Care Systems **Overall Intent:** To understand the physician's role in the complex health care system and how to optimize the system to improve patient care and the health system's performance	
Milestones	**Examples**
Level 1 *Identifies key components of the complex health care system (e.g., hospital, skilled nursing facility, finance, personnel, technology)*	● Able to articulate differences in logistics between inpatient and outpatient radiotherapy treatment
Describes basic health payment systems (e.g., government, private, public, uninsured care) and practice models	● Understands the impact of health plan coverage on prescription drugs or radiotherapy options for individual patients
Identifies basic knowledge domains for effective transition to practice (e.g., information technology, legal, billing and coding, financial, personnel)	● Identifies that notes must meet coding requirements
Level 2 *Describes how components of a complex health care system are inter-related, and how this impacts patient care*	● Explains that improving patient satisfaction improves patient adherence to treatment plan and overall outcomes
Delivers care with consideration of each patient's payment constraints (e.g., insurance type)	● Takes into consideration patient's radiotherapy coverage when choosing between 3-D-CRT, IMRT, and/or proton therapy
Describes core administrative knowledge needed for transition to practice (e.g., contract negotiations, malpractice insurance, government regulation, compliance)	● Recognizes that appropriate documentation can influence proper insurance coverage for radiation treatment
Level 3 *Discusses how individual practice affects the broader system (e.g., length of stay, readmission rates, clinical efficiency)*	● Ensures that patients have appropriate follow-up after completion of radiotherapy
Engages with patients in shared decision making, informed by each patient's payment constraints	● Discusses risks and benefits of pursuing advanced imaging in low-risk cancer patients who might have a high deductible

Demonstrates use of information technology required for medical practice (e.g., electronic health record, documentation required for billing and coding)	● Appropriately documents previous radiation treatments in EHR to ensure proper insurance coverage for complex radiation modalities
Level 4 *Manages various components of the complex health care system to provide efficient and effective patient care and transition of care* *Advocates for patient care needs (e.g., community resources, patient assistance resources) with consideration of the limitations of each patient's payment constraints* *Analyzes individual practice patterns and professional requirements in preparation for practice*	● Ensures proper documentation of completion of radiotherapy ● Works collaboratively to improve patient assistance resources for a patient with complicated cancer care and limited resources ● Proactively compiles radiotherapy case log in anticipation of applying for hospital privileges
Level 5 *Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transition of care* *Participates in health policy advocacy activities* *Educates others to prepare them for transition to practice*	● Works with community or professional organizations to advocate for cancer awareness ● Improves informed consent process for non-English-speaking patients requiring interpreter services ● Mentors more junior residents in practice habits
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Patient satisfaction data ● Portfolio
Curriculum Mapping	●
Notes or Resources	● American Board of Internal Medicine. QI/PI activities. Practice Assessment**:** Modules that physicians can use to assess clinical practice. 2019. http://www.abim.org/maintenance-of-certification/earning-points/practice-assessment.aspx. Accessed 2021. ● Agency for Healthcare Research and Quality (AHRQ). Major Physician Measurement Sets. https://www.ahrq.gov/talkingquality/measures/setting/physician/measurement-sets.html. Accessed 2021.

	● AHRQ. Measuring the Quality of Physician Care. https://www.ahrq.gov/talkingquality/measures/setting/physician/index.html. Accessed 2021. ● American Board of Internal Medicine. QI/PI Activities. https://www.abim.org/maintenance-of-certification/earning-points/qi-pi-activities/. Accessed 2021. ● The Commonwealth Fund. Health System Data Center. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1. Accessed 2021. ● Dzau VJ, McClellan MB, McGinnis JM, et al. Vital directions for health and health care: priorities from a National Academy of Medicine initiative. *JAMA*. 2017;317(14):1461-1470. https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/. ● The Kaiser Family Foundation (KFF). www.kff.org. Accessed 2021. ● KFF. Health Reform: https://www.kff.org/topic/health-reform/. Accessed 2021.

Practice-Based Learning and Improvement 1: Evidence-Based and Informed Practice **Overall Intent:** To incorporate evidence and patient values into clinical practice	
Milestones	**Examples**
Level 1 *Demonstrates how to access and use available evidence, and incorporate patient preferences and values to take care of a routine patient*	● Identifies evidence-based treatment guidelines for cervical cancer at National Comprehensive Cancer Network (NCCN) website
Level 2 *Articulates clinical questions and elicits patient preferences and values to guide evidence-based care*	● For a patient with cervical cancer, identifies and discusses potential evidence-based treatment options, and solicits patient perspective
Level 3 *Locates and applies the best available evidence, integrated with patient preference, to the care of complex patients*	● Obtains, discusses, and applies evidence for the treatment of a patient with endometrial cancer and co-existing morbid obesity and cardiac disease ● Understands and appropriately uses clinical practice guidelines in making patient care decisions while eliciting patient preferences
Level 4 *Critically appraises and applies evidence even in the face of uncertainty and conflicting evidence to guide care, tailored to the individual patient*	● Accesses the primary literature to identify alternative treatments to primary surgery for endometrial cancer
Level 5 *Coaches others to critically appraise and apply evidence for complex patients*	● Leads a multidisciplinary journal club at the start of tumor board to review a practice changing study ● Coaches a nurse about evidence-based practice for management of radiation oral mucositis
Assessment Models or Tools	● Direct observation ● Oral or written examinations ● Presentation evaluation ● Research portfolio
Curriculum Mapping	●
Notes or Resources	● National Comprehensive Cancer Network (NCCN). Recently Updated Guidelines. https://www.nccn.org/guidelines/recently-published-guidelines. Accessed 2021. ● U.S. National Library of Medicine (NIH). PubMed Online Training. https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html. Accessed 2021. ● U. S. Preventive Services Task Force. Recommendations. https://www.uspreventiveservicestaskforce.org/uspstf/topic_search_results?topic_status=P. Accessed 2021. ● UpToDate. https://www.uptodate.com/login. Accessed 2021.

Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth **Overall Intent:** To seek clinical performance information with the intent to improve care; reflects on all domains of practice, personal interactions, and behaviors, and their impact on colleagues and patients (reflective mindfulness); develop clear objectives and goals for improvement in some form of a learning plan	
Milestones	**Examples**
Level 1 *Accepts responsibility for personal and professional development by establishing goals* *Identifies the factors which contribute to gap(s) between expectations and actual performance* *Actively seeks opportunities to improve*	● Sets a personal practice goal of reviewing two primary papers per week related to the disease site seen in clinic ● Identifies gaps in knowledge of treatment of common tumor sites ● Asks for feedback from patients, families, and patient care team members
Level 2 *Demonstrates openness to performance data (feedback and other input) to inform goals* *Analyzes and reflects on the factors which contribute to gap(s) between expectations and actual performance* *Designs and implements a learning plan, with prompting*	● Integrates feedback to adjust the discussion of sources and content of papers in clinical documentation ● Assesses time management skills and how it impacts timely completion of clinic notes and contouring of treatment volumes ● When prompted, develops individual education plan to improve their ability to contour head and neck lymph node volumes
Level 3 *Seeks performance data episodically, with adaptability, and humility* *Analyzes, reflects on, and institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance* *Independently creates and implements a learning plan*	● Does a review of cases to determine the percent of patients evaluated with brain MRI prior to chemoradiotherapy for Stage 3 non-small cell lung cancer ● Reviews practice guidelines and updated/newly published clinical trial data prior to patient encounters ● Using web-based resources, creates a personal curriculum to improve understanding of head and neck anatomy and contouring
Level 4 *Intentionally seeks performance data consistently with adaptability, and humility* *Challenges assumptions and considers alternatives in narrowing the gap(s) between expectations and actual performance*	● Completes a quarterly chart audit to ensure documentation of brain MRI prior to chemoradiotherapy for patients with Stage 3 non-small cell lung cancer ● After patient encounter, debriefs with the attending and other patient care team members to optimize future collaboration in the care of the patient and family

Uses performance data to measure the effectiveness of the learning plan and when necessary, improves it	● At the conclusion of the head and neck rotation, reviews the notes from attending feedback on contouring to determine performance, whether the same corrections are being requested, increased corrections are needed, or whether there is improvement. Based on personal review, plans ahead for how to improve on next rotation
Level 5 *Role models consistently seeking performance data with adaptability and humility* *Coaches others on reflective practice* *Facilitates the design and implementation of learning plans for others*	● Models practice improvement and adaptability ● Develops educational module for collaboration with other patient care team members ● Assists first-year residents in developing their individualized learning plans
Assessment Models or Tools	● Direct observation ● Review of learning plan
Curriculum Mapping	●
Notes or Resources	● Burke AE, Benson B, Englander R, Carraccio C, Hicks PJ. Domain of competence: Practice-based learning and improvement. *Acad Pediatr.* 2014;14(2 Suppl):S38-S54. https://www.academicpedsjnl.net/article/S1876-2859(13)00333-1/fulltext. ● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. *Acad Med.* 2009;84(8):1066-1074. https://journals.lww.com/academicmedicine/Fulltext/2009/08000/Measurement_and_Correlates_of_Physicians__Lifelong.21.aspx. ● Lockspeiser TM, Schmitter PA, Lane JL, Hanson JL, Rosenberg AA, Park YS. Assessing residents' written learning goals and goal writing skill: Validity evidence for the learning goal scoring rubric. *Acad Med.* 2013;88(10):1558-1563. https://journals.lww.com/academicmedicine/Fulltext/2013/10000/Assessing_Residents__Written_Learning_Goals_and.39.aspx.

Professionalism 1: Professional Behavior and Ethical Principles **Overall Intent:** To recognize and address lapses in ethical and professional behavior, demonstrates ethical and professional behaviors, and use appropriate resources for managing ethical and professional dilemmas	
Milestones	**Examples**
Level 1 *Identifies and describes potential triggers for professionalism lapses* *Describes when and how to appropriately report professionalism lapses, including strategies for addressing common barriers* *Demonstrates knowledge of the ethical principles underlying informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, stewardship of limited resources, and related topics*	● Understands that being tired can cause a lapse in professionalism ● Understands being late to clinic has adverse effect on patient care and on professional relationships ● Articulates how the principle of "do no harm" applies to a patient who may not need a central line even though the training opportunity exists
Level 2 *Demonstrates professional behavior in routine situations* *Takes responsibility for own professionalism lapses* *Analyzes straightforward situations using ethical principles*	● Respectfully approaches a resident who is late to clinic about the importance of being on time ● Models respect for patients and promotes the same from colleagues when a patient has been waiting an excessively long time to be seen ● Identifies and applies ethical principles involved in informed consent when the resident is unclear of all the risks
Level 3 *Demonstrates professional behavior in complex or stressful situations* *Recognizes need to seek help in managing and resolving complex ethical situations* *Analyzes complex situations using ethical principles*	● Appropriately responds to a distraught family member during a challenging patient conversation about cancer prognosis ● After noticing a colleague's inappropriate social media post, reviews policies related to posting of content and seeks guidance ● Offers treatment options for a terminally ill patient, free of bias, while recognizing own limitations, and consistently honoring the patient's choice
Level 4 *Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in self and others*	● Actively considers the perspectives of others including differences in race, ethnicity, gender, culture, beliefs, as well as different roles in the clinic setting (administrative staff, nursing, dosimetrists, physicists, radiation therapists, referring providers, etc.)

Recognizes and uses appropriate resources for managing and resolving ethical dilemmas as needed. (e.g., ethics consultations, literature review, risk management/legal consultation)	● Recognizes and uses ethics consults, literature, risk-management/legal counsel in order to resolve ethical dilemmas
Level 5 *Coaches others when their behavior fails to meet professional expectations* *Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution through structured quality improvement*	● Coaches others when their behavior fails to meet professional expectations and creates a performance improvement plan to prevent recurrence ● Engages stakeholders to address excessive wait times to decrease patient and provider frustrations that lead to unprofessional behavior
Assessment Models or Tools	● Direct observation ● Global evaluation ● Multisource feedback ● Oral or written self-reflection ● Simulation
Curriculum Mapping	●
Notes or Resources	● ABIM Foundation. American Board of Internal Medicine. Medical professionalism in the new millennium: A physician charter. *Annals of Internal Medicine*. 2002;136(3):243-246. https://annals.org/aim/fullarticle/474090/medical-professionalism-new-millennium-physician-charter. ● American Medical Association. Ethics. https://www.ama-assn.org/delivering-care/ethics. Accessed 2021. ● Bynny RL, Paauw DS, Papadakis MA, Pfeil S. *Medical Professionalism Best Practices: Professionalism in the Modern Era*. Aurora, CO: Alpha Omega Alpha Medical Society; 2017. *Medical Professionalism Best Practices: Professionalism in the Modern Era*. Aurora, CO: Alpha Omega Alpha Medical Society; 2017. http://alphaomegaalpha.org/pdfs/Monograph2018.pdf. ● Domen RE, Johnson K, Conran RM, et al. Professionalism in pathology: A case-based approach as a potential education tool. *Arch Pathol Lab Med.* 2017; 141:215-219. https://pubmed.ncbi.nlm.nih.gov/27763788/. ● Levinson W, Ginsburg S, Hafferty FW, Lucey CR. *Understanding Medical Professionalism*. 1st ed. New York, NY: McGraw-Hill Education; 2014. ISBN:978-0071807432.

Professionalism 2: Accountability/Conscientiousness **Overall Intent:** To take responsibility for one's own actions and the impact on patients and other members of the health care team	
Milestones	**Examples**
Level 1 *Takes responsibility for failure to complete tasks and responsibilities, identifies potential contributing factors, and describes strategies for ensuring timely task completion in the future*	● Responds promptly to reminders from program administrator to complete work hour logs and case logs ● Timely attendance at conferences ● Completes end of rotation evaluations
Level 2 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in routine situations*	● Completes administrative tasks, documents safety modules, procedure review, and licensing requirements by specified due date ● Before going out of town, completes tasks in anticipation of lack of computer access while traveling ● Timely completion of clinic documentation and contours for standard radiation planning
Level 3 *Performs tasks and responsibilities in a timely manner with appropriate attention to detail in complex or stressful situations*	● Notifies attending of multiple competing demands on call, appropriately triages tasks, and asks for assistance from other residents or faculty members as needed ● In preparation for being out of the office, arranges coverage for assigned clinical tasks and ensures appropriate continuity of care ● Timely completion of contours for urgent/emergent radiation planning
Level 4 *Recognizes situations that may impact others' ability to complete tasks and responsibilities in a timely manner*	● Takes responsibility for inadvertently omitting key patient information during consultation, follow-up or treatment planning and professionally discusses with the patient, family and interprofessional team
Level 5 *Takes ownership of system outcomes*	● Sets up a meeting with the nurse manager or radiation therapy manager to streamline patient flow through clinic, simulation and radiation treatment and leads team to find solutions to the problem
Assessment Models or Tools	● Compliance with deadlines and timelines ● Direct observation ● Global evaluations ● Multisource feedback ● Self-evaluations and reflective tools
Curriculum Mapping	●
Notes or Resources	● ASTRO. ASTRO Code of Conduct. https://www.astro.org/About-ASTRO/Board-and-Leadership/ASTRO-Code-of-Conduct#:~:text=The%20ASTRO%20Code%20of%20Conduct,in%20every%20decision%20we%20make. Accessed 2021. ● Code of conduct from fellow/resident institutional manual ● Expectations of residency program regarding accountability and professionalism

Professionalism 3: Self-Awareness and Help-Seeking **Overall Intent:** To identify, use, manage, improve, and seek help for personal and professional well-being for self and others	
Milestones	**Examples**
Level 1 *Identifies elements of wellness and describes risk factors for burnout and signs and symptoms of burnout and depression in self or peers*	● Acknowledges own response to patient's incurable cancer diagnosis
Level 2 *With assistance, recognizes status of well-being and risk factors for maladaptation in self or peers*	● Independently identifies and communicates impact of a personal family tragedy
Level 3 *Independently recognizes status of well-being in self or peers and reports concerns to appropriate personnel*	● With the multidisciplinary team, develops a reflective response to deal with personal impact of difficult patient encounters and disclosures
Level 4 *Develops and implements a plan to improve well-being of self or peers, including utilization of institutional or external resources*	● Independently identifies ways to manage personal stress
Level 5 *Recommends and facilitates system changes to promote wellness in a practice or institution*	● Assists in organizational efforts to address clinician well-being after patient diagnosis/prognosis/death
Assessment Models or Tools	● Direct observation ● Group interview or discussions for team activities ● Individual interview ● Institutional online training modules ● Self-assessment and personal learning plan
Curriculum Mapping	●
Notes or Resources	● This subcompetency is not intended to evaluate a fellow's well-being, but to ensure each fellow has the fundamental knowledge of factors that impact well-being, the mechanisms by which those factors impact well-being, and available resources and tools to improve well-being. ● ACGME. Well-Being Tools and Resources. https://dl.acgme.org/pages/well-being-tools-resources. Accessed 2022. ● Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: Personal and professional development. *Acad Pediatr*. 2014;14(2 Suppl):S80-97. https://www.academicpedsjnl.net/article/S1876-2859(13)00332-X/fulltext.. ● Local resources, including Employee Assistance Programs (EAPs)

Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication **Overall Intent:** To deliberately use language and behaviors to form constructive relationships with patients, to identify communication barriers including self-reflection on personal biases, and minimize them in the doctor-patient relationships; organize and lead communication around shared decision-making	
Milestones	**Examples**
Level 1 *Uses language and nonverbal behavior to demonstrate respect and establish rapport*	● Introduces self and faculty member, identifies patient and others in the room, and engages all parties in health care discussion
Identifies common barriers to effective communication (e.g., language, disability) while accurately communicating own role within the health care system	● Identifies need for a trained interpreter with non-English-speaking patients ● Uses age-appropriate language when discussing treatments with pediatric patients
Identifies the need to adjust communication strategies based on assessment of patient/family expectations and understanding of their health status and treatment options	● Understands the purpose of consent forms
Level 2 *Establishes a therapeutic relationship in straightforward encounters using active listening and clear language*	● Avoids medical jargon and restates patient perspective when discussing dietary and lifestyle changes
Identifies complex barriers to effective communication (e.g. health literacy, cultural)	● Recognizes the need for handouts with diagrams and pictures to communicate information to a patient who is unable to read
Organizes and initiates communication with patient/family by introducing stakeholders, setting the agenda, clarifying expectations, and verifying understanding of the clinical situation	● States purpose of visit, shares details of care, requests feedback from the patient
Level 3 *Establishes a therapeutic relationship in challenging patient encounters*	● Confers with more senior residents or medical staff members on course of action
When prompted, reflects on personal biases while attempting to minimize communication barriers	● Acknowledges patient's concerns and reservations, and can establish rapport and trust
With guidance, sensitively and compassionately delivers medical information, elicits	● In a discussion with the faculty member, acknowledges discomfort in caring for a patient who distrusts oncology treatments or has many missed radiation treatments

patient/family values, goals and preferences, and acknowledges uncertainty and conflict	● Conducts a family meeting to determine a plan for withdrawal of active treatment in a terminally ill patient ● Helps patient or family understand consent forms as questions arise
Level 4 *Easily establishes therapeutic relationships, with attention to patient/family concerns and context, regardless of complexity* *Independently recognizes personal biases while attempting to proactively minimize communication barriers* *Independently, uses shared decision making to align patient/family values, goals, and preferences with treatment options to make a personalized care plan*	● Continues to engage representative family members with disparate goals in the care of a patient with dementia ● Reflects on personal bias related to personal experiences of treatment of family or friends and solicits input from faculty or other residents ● Uses patient and family member input to engage pastoral care and develop a plan for home hospice in the terminally ill patient, aligned with the patient's values ● Translates or explains diagnosis and treatment terminology in common terms, as much as possible, when necessary to facilitate understanding
Level 5 *Mentors others in situational awareness and critical self-reflection to consistently develop positive therapeutic relationships* *Role models self-awareness while identifying a contextual approach to minimize communication barriers* *Role models shared decision making in patient/family communication including those with a high degree of uncertainty/conflict*	● Leads a discussion group on personal experiences of moral, emotional, ethical, or physical distress ● Develops a residency curriculum which addresses unconscious bias ● Serves on a hospital bioethics committee ● Easily discern level of patient's or family's ability to understand medical terminology and intentions and appropriately adjust for maximum understanding without diluting or minimizing message
Assessment Models or Tools	● Direct observation ● Kalamazoo Essential Elements Communication Checklist (Adapted) ● OSCE ● Self-assessment including self-reflection exercises ● Skills needed to Set the state, Elicit information, Give information, Understand the patient, and End the encounter (SEGUE) ● Standardized patients
Curriculum Mapping	●
Notes or Resources	● Laidlaw A, Hart J. Communication skills: An essential component of medical curricula. Part I: Assessment of clinical communication: AMEE Guide No. 51. *Med Teach*.

	2011;33(1):6-8. https://www.tandfonline.com/doi/abs/10.3109/0142159X.2011.531170?journalCode=imte20. ● Makoul G. Essential elements of communication in medical encounters: the Kalamazoo consensus statement. *Acad Med*. 2001;76(4):390-393. https://journals.lww.com/academicmedicine/Fulltext/2001/04000/Essential_Elements_of_Communication_in_Medical.21.aspx. ● Makoul G. The SEGUE Framework for teaching and assessing communication skills. *Patient Educ Couns*. 2001;45(1):23-34. https://www.sciencedirect.com/science/article/abs/pii/S0738399101001367?via%3Dihub. ● Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in residents. *BMC Med Educ*. 2009; 9:1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2631014/.

Interpersonal and Communication Skills 2: Interprofessional and Team Communication **Overall Intent:** To effectively communicate with the health care team, including consultants, in both straightforward and complex situations	
Milestones	**Examples**
Level 1 *Respectfully requests a consultation*	● When asking for a consultation for a patient, respectfully relays the diagnosis and need to discuss areas of concern
Uses language that values all members of the health care team	● Acknowledges the contribution of each member of the consulting team to the patient
Participates in structured feedback	● Asks clarifying questions politely, and expresses gratitude for the consult on all consult requests
Level 2 *Clearly and concisely requests a consultation*	● Communicates diagnostic evaluation recommendations clearly and concisely in an organized and timely manner
Communicates information effectively with all health care team members	● Establishes unified understanding of consult request and responds in a timely manner, respectfully ● Sends a message in EHR to all “need-to-know” team members
Solicits feedback on performance as a member of the health care team	● Regularly asks for feedback ● Independently reviews personal files for feedback ● Asks/knows the timing of recording feedback in their file ● Follows up on feedback/requests clarification on feedback which is contrary to resident’s self-perception
Level 3 *Checks own understanding of consultant recommendations*	● After a consultation has been completed, communicates with the primary care team to verify they have received and understand the recommendations
Uses active listening to adapt communication style to fit team needs	● When receiving treatment recommendations from an attending physician, repeats back the plan to ensure understanding ● At the end of consultation, and prior to signing the consent form, asks the patient to repeat indications and risks of the treatment
Communicates concerns and provides feedback to peers and learners	● Ask clarifying questions ● Clear verification verbally and in documentation in writing when there’s a higher level of risk, e.g., if intentionally exceeding standard dose constraints or in cases of re-treatment

Level 4 *Coordinates recommendations from different members of the health care team to optimize patient care* *Consistently demonstrates effective team communication based upon summative feedback* *Communicates feedback and constructive criticism to superiors*	● Initiates a multidisciplinary meeting to develop coordinated care plan for a patient, e.g., runs a team huddle or coordinates care among nursing, therapists, and social workers ● Asks other members of the health care team to repeat back recommendations to ensure understanding ● Participates in a Program Evaluation Committee meeting and provides feedback to the committee about the program of assessment
Level 5 *Role models flexible communication strategies that value input from all health care team members, resolving conflict when needed* *Develops strategies for and/or leads interdisciplinary team communication training* *Facilitates regular healthcare team-based feedback in complex situations or new technologies*	● Defines rules of engagement such as: no interrupting a speaker, no nonverbal signals of disapproval (e.g., eye rolls), and no abusive language; invites additional comments ● Mediates a conflict resolution between different members of the health care team ● Develops an OSCE for communication training ● Participates on a committee to review a new technology or clinical workflow
Assessment Models or Tools	● Direct observation ● Global assessment ● Medical record (chart) audit ● Multi-source feedback ● Simulation
Curriculum Mapping	●
Notes or Resources	● Braddock CH, Edwards KA, Hasenberg NM, Laidley TL, Levinson W. Informed decision making in outpatient practice: Time to get back to basics. *JAMA*. 1999;282:2313-2320. https://jamanetwork.com/journals/jama/fullarticle/192233. ● Dehon E, Simpson K, Fowler D, Jones A. Development of the faculty 360. *MedEdPORTAL*. 2015;11:10174. https://www.mededportal.org/doi/10.15766/mep_2374-8265.10174. ● Fay D, Mazzone M, Douglas L, Ambuel B. A validated, behavior-based evaluation instrument for family medicine residents. *MedEdPORTAL*. 2007;3:622. https://www.mededportal.org/doi/10.15766/mep_2374-8265.622.

	● François, J. Tool to assess the quality of consultation and referral request letters in family medicine. *Can Fam Physician*. 2011;57(5):574–575. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3093595/. ● Green M, Parrott T, Cook G. Improving your communication skills. *BMJ.* 2012;344:e357 https://www.bmj.com/content/344/bmj.e357. ● Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: A review with suggestions for implementation. *Med Teach*. 2013;35(5):395-403. https://www.tandfonline.com/doi/abs/10.3109/0142159X.2013.769677?journalCode=imte20. ● Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. *Med Teach*. 2018;21:1-4. https://www.tandfonline.com/doi/abs/10.1080/0142159X.2018.1481499?journalCode=imte20.. ● Lane JL, Gottlieb RP. Structured clinical observations: A method to teach clinical skills with limited time and financial resources. *Pediatrics*. 2000;105:973-977. https://pubmed.ncbi.nlm.nih.gov/10742358/.

Interpersonal and Communication Skills 3: Communication within Health Care Systems **Overall Intent:** To effectively communicate using a variety of methods	
Milestones	**Examples**
Level 1 *Accurately records information in the patient record*	● Documentation is accurate but may include extraneous information
Safeguards patient personal health information	● Avoids talking about patients in public arenas ● Protect user credentials and reports abuses of user credentials by any party
Communicates through appropriate channels as required by institutional policy (e.g. patient safety reports, cell phone/pager usage)	● Does not use personal email to communicate patient information ● Identifies institutional and departmental communication hierarchy for concerns and safety issues
Level 2 *Demonstrates organized diagnostic and therapeutic reasoning through notes in the patient record*	● Organized and accurate documentation outlines clinical reasoning that supports the treatment plan
Documents required data in a timely manner, in formats specified by institutional policy	● Develops documentation templates for the service
Respectfully communicates concerns about the system	● Reviews and understand the institutions documentation policy and formats ● Recognizes that a communication breakdown has happened and respectfully brings the breakdown to the attention of the chief resident or faculty member
Level 3 *Concisely reports diagnostic and therapeutic reasoning in the patient record*	● Complex clinical thinking is documented concisely but may not contain anticipatory guidance
Appropriately selects direct (e.g. telephone, in-person) and indirect (e.g. progress notes, text messages) forms of communication based on context	● Calls patient immediately about potentially critical test result speaking only to confirmed authorized patient or patient representative
Uses appropriate channels to offer clear and constructive suggestions to improve the system	● Knows when to direct concerns locally, departmentally, or institutionally, i.e., appropriate escalation
Level 4 *Communicates clearly, concisely, timely, and in an organized written form, including anticipatory guidance*	● Documentation is consistently accurate, organized, and concise, and frequently incorporates anticipatory guidance

Achieves written or verbal communication (e.g., patient notes, email) that serves as an example for others to follow *Initiates difficult conversations with appropriate stakeholders to improve the system data integrity and friendliness*	● Notes are exemplary and used by the chief resident to teach others ● Talks directly to team member or intra-departmental personnel regarding any breakdowns in communication to prevent recurrence
Level 5 *Models feedback to improve others' written communication* *Guides departmental or institutional communication around policies and procedures* *Facilitates dialogue regarding systems issues among larger community stakeholders (institution, health care system, field)*	● Shares written feedback with others' when appropriate ● Shares experiences that either support or argue against established or recommended policies and procedures ● Organize stakeholder conversations with specific and shared agenda items ● Participates in committees that guide improvement in departmental or institutional policies and procedures
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback
Curriculum Mapping	●
Notes or Resources	● Bierman JA, Hufmeyer KK, Liss DT, Weaver AC, Heiman HL. Promoting responsible electronic documentation: Validity evidence for a checklist to assess progress notes in the electronic health record. *Teach Learn Med.* 2017;29(4):420-432. https://www.tandfonline.com/doi/full/10.1080/10401334.2017.1303385. ● Haig KM, Sutton S, Whittington J. SBAR: A shared mental model for improving communication between clinicians. *Jt Comm J Qual Patient Saf*. 2006;32(3):167-175. https://www.jointcommissionjournal.com/article/S1553-7250(06)32022-3/fulltext. ● Starmer AJ, Spector ND, Srivastava R, et al. I-pass, a mnemonic to standardize verbal handoffs. *Pediatrics*. 2012;129.2:201-204. https://pediatrics.aappublications.org/content/129/2/201.long?sso=1&sso_redirect_count=1&nfstatus=401&nftoken=00000000-0000-0000-0000-000000000000&nfstatusdescription=ERROR%3a+No+local+token.

To help programs transition to the new version of the Milestones, the ACGME has mapped the original Milestones 1.0 to the new Milestones 2.0. Indicated below are where the subcompetencies are similar between versions. These are not exact matches, but are areas that include similar elements. Not all subcompetencies map between versions. Inclusion or exclusion of any subcompetency does not change the educational value or impact on curriculum or assessment.

Milestones 1.0	Milestones 2.0
PC1: Lymphoma	
PC2: Head and Neck	
PC3: Genitourinary (GU)	
PC4: Palliation	
PC5: Breast	
PC6: Gastrointestinal (GI)	
PC7: Gynecologic (GYN)	
PC8: Lung	
PC9: Adult Brain Tumor	
PC10: Brachytherapy	PC7: Brachytherapy
PC11: Stereotactic Radiosurgery (SRS)/Stereotactic Body Radiotherapy (SBRT)	PC8: Procedures: Stereotactic Radiosurgery (SRS) and Stereotactic Body Radiation Therapy (SBRT)
	PC1: Consult PC2: Simulation PC3: Contouring and Target Delineation PC4: Treatment Planning and Plan Evaluation PC5: Treatment Delivery PC6: Follow-Up
MK1: Medical Physics	MK1: Applied Sciences
MK2: Radiation/Cancer Biology	MK1: Applied Sciences
	MK2: Evidence-Based Foundations of Radiation Oncology
SBP1: Work and coordinate patient care effectively in various health care delivery settings and systems	SBP2: System Navigation for Patient-Centered Care
SBP2: Incorporate considerations of cost awareness and risk-benefit analysis in patient- and/or population-based care, as appropriate	SBP3: Physician Role in Health Care Systems

SBP3: Work in interprofessional teams to enhance patient safety and improve patient care quality; advocate for quality patient care and optimal patient care systems; participate in identifying system errors and implementing potential system solutions	SBP1: Patient Safety and Quality Improvement
PBLI1: Identify strengths, deficiencies, and limits in one's knowledge and expertise; set learning and improvement goals and identify and perform appropriate learning activities utilizing information technology, evidence from scientific studies, and evaluation feedback; systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement	PBLI2: Reflective Practice and Commitment to Personal Growth
PBLI2: Participate in the education of patients, families, students, residents, and other health professionals	
PROF1: Compassion, integrity, and respect for others, as well as sensitivity and responsiveness to diverse patient populations, including diversity in gender, age, culture, race, religion, disabilities, and sexual orientation; knowledge about, respect for, and adherence to the ethical principles relevant to the practice of medicine, remembering in particular that responsiveness to patients that supersedes self-interest is an essential aspect of medical practice	PROF1: Professional Behavior and Ethical Principles
PROF2: Accountability to patients, society, and the profession; personal responsibility to maintain emotional, physical, and mental health	PROF2: Accountability/Conscientiousness PROF3: Self-Awareness and Help-Seeking
ICS1: Effective communication with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds; effective communication with physicians, other health care professionals, and health-related agencies	ICS1: Patient- and Family-Centered Communication
ICS2: Effective member or leader of a health care team or other professional group; maintenance of comprehensive, timely, and legible medical records	ICS2: Interprofessional and Team Communication
	ICS3: Communication within Health Care Systems

Available Milestones Resources

Milestones 2.0: Assessment, Implementation, and Clinical Competency Committees Supplement, 2021 - *https://meridian.allenpress.com/jgme/issue/13/2s*

Milestones Guidebooks: https://www.acgme.org/milestones/resources/

- *Assessment Guidebook*
- *Clinical Competency Committee Guidebook*
- *Clinical Competency Committee Guidebook Executive Summaries*
- *Implementation Guidebook*
- *Milestones Guidebook*

Milestones Guidebook for Residents and Fellows: https://www.acgme.org/residents-and-fellows/the-acgme-for-residents-and-fellows/

- Milestones Guidebook for Residents and Fellows
- Milestones Guidebook for Residents and Fellows Presentation
- Milestones 2.0 Guide Sheet for Residents and Fellows

Milestones Research and Reports: https://www.acgme.org/milestones/research/

- *Milestones National Report*, updated each fall
- *Milestones Predictive Probability Report,* updated each fall
- *Milestones Bibliography*, updated twice each year

Developing Faculty Competencies in Assessment courses - https://www.acgme.org/meetings-and-educational-activities/courses-and-workshops/developing-faculty-competencies-in-assessment/

Assessment Tool: Direct Observation of Clinical Care (DOCC) - https://dl.acgme.org/pages/assessment

Assessment Tool: Teamwork Effectiveness Assessment Module (TEAM) - https://team.acgme.org/

Improving Assessment Using Direct Observation Toolkit - https://dl.acgme.org/pages/acgme-faculty-development-toolkit-improving-assessment-using-direct-observation

Remediation Toolkit - https://dl.acgme.org/courses/acgme-remediation-toolkit

Learn at ACGME has several courses on Assessment and Milestones - https://dl.acgme.org/