Supplemental Guide:
Nuclear Medicine
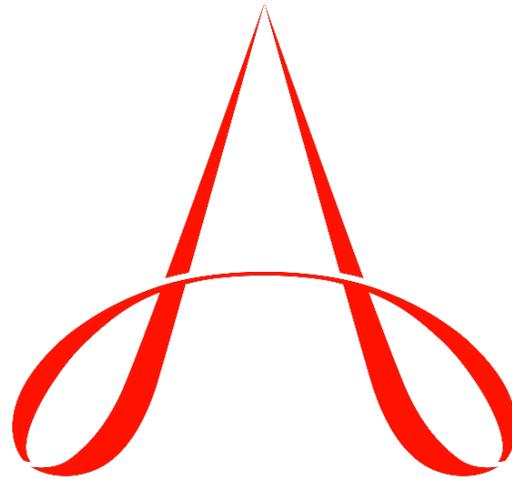
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Milestones Supplemental Guide

This document provides additional guidance and examples for the Nuclear Medicine 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: Diagnostic Planar, Single Photon-Emission Computed Tomography (SPECT), and Positron Emission Tomography (PET) Imaging: Patient Evaluation, Procedure Selection, Monitoring, and Interpretation **Overall Intent:** To gain expertise in protocoling and interpreting diagnostic studies and adjust protocols as needed	
Milestones	**Examples**
Level 1 *Performs patient-focused assessment and discusses routine nuclear medicine procedures, common indications, and contraindications* *Recognizes normal physiologic distribution of FDA-approved radiopharmaceuticals*	● Obtains focused history to determine appropriate patient preparation prior to PET scanning (e.g., nil per os (NPO) status, glucose levels, insulin administration, diet restrictions, etc.) ● Recognizes normal physiologic and variant distribution of fluorodeoxyglucose (FDG)
Level 2 *Proposes procedure and patient preparation based on exam request and patient information* *Identifies abnormalities in the physiologic distribution and forms a preliminary impression in the context of a patient's history*	● For myocardial sarcoid study, prescribes high fat/low carbohydrate diet preparation ● Recognizes abnormal muscle activity in patients receiving FDG under the influence of insulin stimulation or exercise
Level 3 *Selects procedures for routine cases and modifies protocols, as needed* *Assesses completion of and accurately interprets procedures done for uncomplicated cases*	● Assures appropriate scan coverage when imaging patients with head and neck cancers ● Assures appropriate scan coverage for extremity tumors
Level 4 *Selects procedures for complex cases and modifies protocols, as needed* *Assesses completion of and accurately interprets procedures done for complex or less common cases*	● For cardiac viability FDG study, applies appropriate glucose loading and insulin procedures ● Requests repeat scan due to motion artifact or attenuation correction errors
Level 5 *Develops or revises protocol(s) for nuclear medicine procedures* *Manages the nuclear medicine clinic and acts as a consultant in an interdisciplinary conference*	● Assists in annual protocol review to assess adherence to practice guidelines ● Manages daily oversight and interpretation of nuclear medicine procedures
Assessment Models or Tools	● Direct observation ● Medical record (chart) review

Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., Society of Nuclear Medicine and Molecular Imaging (SNMMI))

Patient Care 2: Cardiovascular Nuclear Medicine-Stress Testing: Patient Evaluation and Procedure Monitoring
Overall Intent: To protocol, monitor, perform, and interpret appropriate nuclear cardiology study

Milestones	Examples
Level 1 *Performs targeted patient evaluation for a range of cardiac stress protocols*	● Obtains focused patient history to determine stress versus adenosine (or analog) versus dobutamine protocol selection
Level 2 *Interprets electrocardiogram and monitors stress procedure, and applies criteria for procedure completion or termination*	● Applies appropriate exercise termination criteria (e.g., maximal stress testing versus attainment of 85 percent maximal predicted heart rate) ● Interprets resting electrocardiogram (EKG) prior to beginning stress procedure
Level 3 *Recognizes and manages common procedure complications and contraindications*	● Recognizes left bundle branch block and the implications for exercise stress testing ● Recognizes ST depression or elevation ● Evaluates wheezing prior to adenosine or regadenoson administration
Level 4 *Recognizes and manages complex or less common procedure complications*	● Recognizes and manages heart blocks resulting from adenosine administration ● Recognizes danger of R-on-T phenomenon ● Appropriately uses aminophylline to reverse pharmacologic stress side effects
Level 5 *Manages the nuclear cardiology clinic and acts as a consultant in an interdisciplinary conference*	● Presents nuclear cardiology results at cardiac catheterization conference
Assessment Models or Tools	● Direct observation ● Medical record (chart) review
Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., SNMMI)

Patient Care 3: Theranostics: Radioiodine for Benign Thyroid Disease- Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up Overall Intent: To consult with patient, examine the neck, and order appropriate tests and therapies for benign thyroid disease	
Milestones	**Examples**
Level 1 *Performs initial patient evaluation and discusses patient preparation, indications, contraindications, guidelines, and radiation safety precautions*	● Performs a pre-therapy consultation ● Discusses pregnancy and breastfeeding radiation precautions with young female patients
Level 2 *Analyzes relevant patient information and confirms patient preparation, pertinent imaging, and therapeutic procedure set-up and technique*	● Reviews patients imaging to include size of gland, symmetry, and uptake values ● Obtains patient medications for any potential contraindications
Level 3 *Formulates the therapeutic plan, performs the procedure, and recommends follow-up strategies for routine clinical situations*	● Provides appropriate release criteria after radioiodine therapy ● Calculates dose of radioiodine appropriate for thyroid disease condition
Level 4 *Formulates the therapeutic plan, performs the procedure, and recommends follow-up strategies for complicated or less common situations*	● Intervenes with appropriate plan in a patient with exophthalmos ● Educates the parent of a child regarding post-radiotherapy instructions
Level 5 *Acts as an expert consultant for radioiodine theranostics for benign thyroid disease*	● Works with radiation safety officer and endocrinologist to formulate a plan for a patient on dialysis
Assessment Models or Tools	● Direct observation ● Medical record (chart) review
Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., SNMMI)

Patient Care 4: Theranostics: Radioiodine for Thyroid Malignancy – Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up	
Overall Intent: To consult with patient, review imaging and labs, and perform appropriate radioactive iodine ablations	

Milestones	Examples
Level 1 *Performs initial patient evaluation and discusses patient preparation, indications, contraindications, and radiation safety precautions*	● For a woman of childbearing age with thyroid cancer, discusses pregnancy precautions and home setup, and appropriateness from pathology/labs
Level 2 *Analyzes relevant patient information and confirms patient preparation, pertinent imaging, and therapeutic procedure set-up and technique*	● Counsels appropriate precaution for child and family for a patient with a small child at home ● Ensures low-iodine diet and/or thyroid-stimulating hormone medication has been taken prior to treatment
Level 3 *Formulates the therapeutic plan, performs the procedure, and recommends follow-up strategies for routine clinical situations*	● Determines dose from pathology ● Coordinates with endocrinologist and patient for follow-up
Level 4 *Formulates the therapeutic plan, performs the procedure, and recommends follow-up strategies for complicated or less common situations*	● Formulates dose with regards to toxicity and efficacy for patients with lung metastasis
Level 5 *Acts as an expert consultant for radioiodine theranostics for thyroid malignancies and acts as a consultant for multidisciplinary conferences*	● Attends thyroid cancer tumor board and formulate plan within the context of overall patient cancer management with oncologists/endocrinologists
Assessment Models or Tools	● Direct observation ● Medical record (chart) review
Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., SNMMI)

Patient Care 5: Theranostics: Parenteral – Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up Overall Intent: To consult with patient, review labs and images, order, and deliver appropriate therapy and follow-up	
Milestones	**Examples**
Level 1 *Performs initial patient evaluation and discusses patient preparation, indications, contraindications, and radiation safety precautions*	● Ensures laboratory values are correct to continue with treatment and ensures patient understands preparations, indications, and safety precautions
Level 2 *Analyzes relevant patient information and confirms patient preparation, pertinent imaging, therapeutic procedure set-up and technique, and regulatory compliance*	● Confirms patient has DOTATATE-avid lesions if considering Lutathera® ● Communicates the different components of the infusion process to the patient, including timing for the infusion with amino acids and radiopharmaceutical
Level 3 *Formulates the therapeutic plan, performs the procedure, and recommends follow-up strategies for uncomplicated clinical situations*	● Ensures long-acting octreotide is given immediately after Lutathera® ● Orders follow-up renal, hematologic, and hepatic labs for radiation toxicity during Lutathera® treatment
Level 4 *Formulates the therapeutic plan, performs the procedure, and recommends follow-up strategies for complicated or less common clinical situations*	● Counsels patient and referring physician for procedures such as paracentesis/biopsy during Lutathera® treatment
Level 5 *Acts as an expert consultant for parenteral theranostics and acts as a consultant for multidisciplinary conferences*	● Attends neuroendocrine tumor tumor board and coordinate care within the overall cancer patient context
Assessment Models or Tools	● Direct observation ● Medical record (chart) review
Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., SNMMI)

Medical Knowledge 1: Physiology and Pathophysiology
Overall Intent: To understand physiology and pathologic findings of nuclear medicine procedures and preparations

Milestones	Examples
Level 1 *Describes basic physiology and pathophysiology of common diseases*	● Describes mechanisms of uptake for common radiotracers ● Describes the physiologic flow of hepatobiliary agent through the gastrointestinal system ● Describes physiologic basis of ventilation/perfusion imaging
Level 2 *Identifies physiologic basis for patient preparation and adjunct pharmacologic interventions*	● Knows the importance of NPO status prior to hepatobiliary imaging ● Selects the appropriate pharmacologic intervention for hepatobiliary scintigraphy, e.g., cholecystokinin versus morphine
Level 3 *Explains imaging findings of common diseases based on knowledge of physiology and pathophysiology*	● Explains tracer uptake pattern in bone scanning for metastasis, trauma, or degenerative changes
Level 4 *Explains imaging findings of complex and less common diseases based on knowledge of physiology and pathophysiology*	● Explains differences in physiologic findings in scanning thyroid conditions
Level 5 *Applies knowledge of physiology and pathophysiology to perform meaningful nuclear medicine research, assess and revise (as needed) department protocols for imaging or therapy, or critically assess research in the medical literature*	● For novel radiotracers differentiates tracer localization in normal and abnormal states
Assessment Models or Tools	● Assess reports generated ● Direct observation ● In-service training exam
Curriculum Mapping	●
Notes or Resources	● American Board of Nuclear Medicine (ABNM). https://www.abnm.org/. 2021. ● Relevant professional procedure guidelines (e.g., SNMMI) ● United States Nuclear Regulatory Commission (U.S.NRC). https://www.nrc.gov/. 2021.

Medical Knowledge 2: Anatomic Imaging	
Overall Intent: To correlate image findings with appropriate anatomic structures and variants	

Milestones	Examples
Level 1 *Demonstrates knowledge of basic normal anatomy for imaging*	● Identifies patterns of normal uptake in structures on a bone scan
Demonstrates knowledge of anatomy depicted on commonly obtained imaging views	● Identifies normal distribution of pertechnetate
Level 2 *Demonstrates knowledge of normal cross-sectional anatomy, common anatomic variants, and commonly encountered abnormalities*	● Identifies heart, lungs, and thymus on PET computed tomography (CT) scan ● Identifies vicarious excretion of the FDG in the gallbladder ● Understands lymph node stations and liver segmentation
Obtains common imaging views to depict desired anatomy	● Requests pinhole imaging for hip dysplasia: target organ damage view for full bladder
Level 3 *Applies knowledge of anatomy to correlative, functional, and hybrid imaging*	● Ask technologist to obtain obliques and lateral views to delineate gallbladder on hepatobiliary iminodiacetic acid (HIDA) scans
Directs technical staff members to obtain common imaging views to depict desired anatomy	● Requests SPECT/CT on parathyroid and appropriate bone scans
Level 4 *Demonstrates knowledge of less common anatomic variants, less common abnormalities, and critical findings*	● Recognizes need for additional zoom views for work-up of bone abnormalities or SPECT
Directs technical staff members to acquire images to depict less common anatomical views	● Requests caudal or "tail on detector" view to evaluate pelvic rim on a bone scan
Level 5 *Teaches anatomic imaging to junior residents, medical students, and technologists*	● Teaches a cross-sectional anatomy course at a medical school or to visiting medical students
Modifies protocols as needed to depict desired anatomy and function	● Leads discussion on protocol review for a procedure that may not have been reviewed recently ● Helps develop new protocols
Assessment Models or Tools	● Direct observation ● E-anatomy ● In-training exam

Curriculum Mapping	●
Notes or Resources	● Eanatomy. http://eanatomy.com/. 2021. ● Netter FH. *Atlas of Human Anatomy*. 7th ed. Philadelphia, PA: Elsevier; 2018. ISBN:978-0323393225.

Medical Knowledge 3: Instrumentation	
Overall Intent: To understand and identify errors in collection of images and processing and how to fix them	

Milestones	Examples
Level 1 *Describes basic image acquisition and image processing*	● Understands image acquisition for a bone scan and common studies such as collimators, energy window ● Understands utility of dynamic versus static acquisition
Level 2 *Recognizes common imaging artifacts and technical problems*	● Recognizes photopenic artifacts from metals and star artifact in radioiodine imaging; recognizes lateralization ● Recognizes static versus dynamic images
Level 3 *Demonstrates knowledge of instrument quality control and recognizes unusual and rare artifacts and technique problems*	● Identifies non-uniformity, pacemaker-mediated tachycardia, wrong collimator, and camera windowing off-peak artifacts
Level 4 *Works with technologist to optimize image acquisition and processing*	● Selects optimal region of interest and acquisition parameters used for common nuclear medicine studies
Level 5 *Modifies institutional protocols, including instrumentation and image acquisition*	● Creates/modifies acquisition protocols for imaging of suspected osteomyelitis—three-phase bone scan, tagged white blood cell study, sulfur colloid marrow imaging
Assessment Models or Tools	● Direct observation ● In training exam
Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., SNMMI)

Medical Knowledge 4: Radiopharmaceuticals and Molecular Agents	
Overall Intent: To understand normal distribution patterns and deviant patterns and which is optimal in clinical setting	

Milestones	Examples
Level 1 *Demonstrates knowledge of common radiopharmaceutical properties*	● Demonstrates knowledge of 18F-FDG half life
Demonstrates knowledge of appropriate use and normal distribution of common radiopharmaceuticals	● Recognizes the physiological distribution of 18F-FDG in the brain
Level 2 *Demonstrates knowledge of common radiopharmacy operations and routine quality control*	● Recognizes free pertechnetate uptake in the thyroid on a gastrointestinal bleeding scan
Demonstrates knowledge of pathology for common imaging procedures	● Recognizes non-visualization of gall bladder on a HIDA scan is a pathology
Level 3 *Demonstrates knowledge of less common radiopharmaceutical properties*	● Understand the distribution of Gallium-67
Demonstrates knowledge of appropriate use, abnormal distribution, and pathology of less common radiopharmaceuticals	● Understands abnormal uptake in the spine for osteomyelitis and malignant otitis media
Level 4 *Demonstrates knowledge of recently approved radiopharmaceuticals and other molecular agents*	● Understand the distribution of Gallium 68 DOTATATE
Demonstrates knowledge of appropriate use, abnormal distribution, and pathology for recently approved imaging procedures	● Recognizes extradural uptake in the brain is a possible meningioma
Level 5 *Demonstrates knowledge of emerging radiopharmaceuticals that are near Food and Drug Administration (FDA) approval*	● Demonstrates knowledge of newly emerging prostate-specific membrane antigen agents for theragnostic
Conducts research on emerging radiopharmaceuticals	● Participates in clinical trials using novel tracers
Assessment Models or Tools	● Direct observation ● In training exam

Curriculum Mapping	●
Notes or Resources	● American College of Nuclear Medicine (ACNM). ACNM/SNMMI Joint CME/SAM Webinars. https://acnmonline.org/ACNM/ACNM-Webinars/Webinars.aspx?WebsiteKey=081028ac-fc63-4231-8064-b5a2243e2a1e&ACNM%2fSNMMI+Joint+Webinars=2&ACNM/SNMMI%20Joint%20Webinars=1#ACNM/SNMMI%20Joint%20Webinars. 2021. ● American College of Radiology (ACR). ACR Appropriateness Criteria. https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria. 2021. ● ABNM. https://www.abnm.org/. 2021. ● The Journal of Nuclear Medicine (JNM). https://jnm.snmjournals.org/. 2021. ● SNMMI. SNMMIT Outreach Educational Tools. http://www.snmmi.org/AboutSNMMI/Outreach.aspx?ItemNumber=21456. 2021.

Medical Knowledge 5: Medical Physics, Mathematics, and Radiation Biology	
Overall Intent: To understand biological effects of normal background, diagnostic and therapeutic radiation, and mechanism of effect	

Milestones	Examples
Level 1 *Understands the concepts underlying medical physics pertinent to nuclear medicine*	● Knows half-life of F18 and other common radionuclides and appropriate camera window settings
Recognizes the importance of radiation/cancer biology in nuclear medicine	● Understands principles of as low as reasonably achievable (ALARA)
Level 2 *Applies basic medical physics and mathematical principles in clinical nuclear medicine practice*	● Uses concepts of time, distance, and shielding to achieve ALARA
Discusses the basic concepts of radiation biology as pertains to nuclear medicine	● Understands biologic effect of gamma, beta, and alpha radiation
Level 3 *Applies advanced medical physics and mathematical principles in clinical nuclear medicine practice*	● Demonstrates ability to decay correct a radiopharmaceutical dose
Applies advanced concepts in radiation biology to clinical nuclear medicine practice	● Understands the concepts and use of dosimetry in radiopharmaceutical therapy
Level 4 *Functions and converses with the department's medical physicist staff at an advanced level*	● Collaborates with medical physicist to calculate dosimetry for radiopharmaceutical therapies
Serves as an expert consultant with both patients and other medical staff members on matters of radiation treatment	● Prescribes appropriate preparations and interventions for radiopharmaceutical therapies
Level 5 *Serves as an expert on the radiation safety committee*	● Attends radiation safety committee meetings and is a regular contributor
Assessment Models or Tools	● In-training exam ● Direct observation
Curriculum Mapping	●
Notes or Resources	● Relevant professional procedure guidelines (e.g., SNMMI)

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* *Demonstrates knowledge of how to report patient radiation safety events* *Demonstrates knowledge of basic quality improvement methodologies and metrics*	● Lists patient misidentification or medication contraindications as common patient safety events ● Recognizes that radiopharmaceutical misadministrations and medical events are safety events and knows where and how to report such errors ● Describes how to report dose errors in their environment
Level 2 *Identifies system factors that lead to patient safety events* *Reports patient safety events through institutional reporting systems (simulated or actual)* *Describes local quality improvement initiatives*	● Confirms patient identification and dose documentation prior to administration ● Reports dose errors to the appropriate authority (e.g., radiopharmacy, radiation safety officer) ● Summarizes protocols for eliminating inappropriate dose administration
Level 3 *Participates in analysis of patient safety events (simulated or actual)* *Participates in disclosure of patient radiation safety events to patients and their families (simulated or actual)* *Participates in local quality improvement initiatives*	● Participates in preparing a report to U.S.NRC or agreement state after a medical event (inappropriate dose administration) simulated or actual ● Through simulation, communicates with patients/families about inappropriate dose administration ● Participates in project identifying root cause of inappropriate dose administration
Level 4 *Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)* *Discloses patient radiation safety events to patients and their families (simulated or actual)*	● Collaborates with a team to conduct the analysis of an inappropriate dose administration and reports error to patient ● Participates in the completion of a QI project to reduce inappropriate dose administrations within the practice, including assessing the problem, articulating a broad goal, developing

Demonstrates the skills required to identify, develop, implement, and analyze a quality improvement project	a SMART (Specific, Measurable, Attainable, Relevant, Time-bound) objective plan, and monitoring progress and challenges
Level 5 *Actively engages teams and processes to modify systems to prevent patient safety events*	● Assumes a leadership role at the departmental or institutional level for patient safety
Role models or mentors others in the disclosure of patient radiation safety events	● Conducts a simulation for disclosing patient safety events
Creates, implements, and assesses quality improvement initiatives at the institutional or community level	● Initiates and completes a QI project to reduce inappropriate dose administration in collaboration with the safety committee
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 of Healthcare Improvement. http://www.ihi.org/Pages/default.aspx. 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 in nuclear medicine imaging and therapies*	● For a patient with multiple myeloma identifies the hematologist-oncologist, home health nurse, and social workers as members of the team
Identifies key elements for safe and effective transitions of care and hand-offs	● Lists radiation safety precautions for nursing staff following ^{131}I treatment
Demonstrates knowledge of population and community health needs and disparities	● Identifies that patients in rural areas may have different needs than urban patients
Level 2 *Coordinates care of patients in routine nuclear medicine imaging and therapies, effectively utilizing the roles of the interprofessional team members*	● Coordinates care with dialysis team following radioiodine treatment
Performs safe and effective transitions of care/hand-offs in routine clinical situations	● Prescribes radiation safety precautions for nursing staff following ^{131}I treatment
Identifies specific population and community health needs and inequities for the local population	● Identifies that limited transportation options may be a factor in rural patients getting to multiple chemotherapy appointments
Level 3 *Coordinates care of patients in complex nuclear medicine imaging and therapies, effectively utilizing the roles of the interprofessional team members*	● Communicates with patient, family members, or other caregivers to coordinate care following radioiodine therapy for incontinent patients
Performs safe and effective transitions of care/hand-offs in complex clinical situations	● Reviews radiation safety precautions with nursing staff following ^{131}I treatment
Uses local resources effectively to meet the needs of a patient population and community	● Refers patients to a local pharmacy that 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*	● During inpatient rotations, leads team members in approaching consultants to review cases/recommendations and arranges radiology rounds for the team

Role models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems, including outpatient settings	● Participates in training for nursing and auxiliary staff (e.g., housekeeping, dietary) on radiation safety precautions following inpatient radioiodine therapy
Participates in changing and adapting practice to provide for the needs of specific populations	● Considers strontium for a patient who is unable to afford radium
Level 5 *Analyzes the process of care coordination and leads in the design and implementation of improvements*	● Analyzes the current process for ordering appropriate pre-treatment laboratory examinations for ^{131}I treatments
Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes	● Develops a protocol to improve transitions to discharge and home care
Leads innovations and advocates for populations and communities with health care inequities	● Leads development of telehealth diagnostic services for underserved areas regarding radiopharmaceutical therapy
Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Multisource feedback ● Objective Structured Clinical Exam (OSCE) ● Quality metrics and goals mined from electronic health records (EHR) ● Review of sign-out tools, use and review of checklists
Curriculum Mapping	●
Notes or Resources	● Centers for Disease Control and Prevention. Population Health Training. https://www.cdc.gov/pophealthtraining/whatis.html. 2021. ● Kaplan KJ. In Pursuit of Patient-Centered Care. Tissue Pathology; 2016. http://tissuepathology.com/2016/03/29/in-pursuit-of-patient-centered-care/#axzz5e7nSsAns. 2021. ● Skochelak SE, Hammoud MM, Lomis KD, et al. *AMA Education Consortium: Health Systems Science*. 2nd ed. Elsevier; 2021. ISBN:9780323694629.

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, finance, personnel, technology)* *Describes basic health payment systems (e.g., government, private, public, uninsured care) and practice models*	● Recognizes that multiple components exist in a health care system, including various practice settings, reimbursement models, and types of insurance ● Understands the differences between inpatient, hospital outpatient, and private practice payment systems.
Level 2 *Describes how components of a complex health care system are interrelated and impact patient care* *Delivers care with consideration of each patient's payment model (e.g., insurance type)*	● Understands that pre-authorization may impact patient care and remuneration to the health system ● Takes into consideration patient's insurance situation when recommending a PET scan
Level 3 *Discusses how individual practice affects the broader system (e.g., length of stay, readmission rates, clinical efficiency)* *Engages with patients in shared decision making, informed by each patient's payment model*	● Understands that turnaround times and dictation errors may affect patient care, e.g., length of stay, which impacts the broader system ● Discusses risks and benefits of pursuing radiopharmaceutical therapy in the setting of metastatic bone disease (e.g., radium versus strontium) based on the patient's insurance payor
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 model*	● Works collaboratively with pertinent stakeholders to improve procedural workflow ● Works collaboratively to improve informed consent for patients requiring interpreter services ● Works with payers to obtain approval for newer radiopharmaceuticals for diagnosis and treatment (e.g., DOTATATE)
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*	● Publishes original research on high-value patient care in peer-reviewed journal ● Advocates and educates for better and safer methods (e.g., Technegas)

Assessment Models or Tools	● Direct observation ● Medical record (chart) audit ● Patient satisfaction data ● Portfolio
Curriculum Mapping	●
Notes or Resources	● Agency for Healthcare Research and Quality (AHRQ). Major Physician Measurement Sets. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/measurementsets.html. 2021. ● AHRQ. Measuring the Quality of Physician Care. https://www.ahrq.gov/professionals/quality-patient-safety/talkingquality/create/physician/challenges.html. 2021. ● American Board of Internal Medicine (ABIM). QI/PI Activities. https://www.abim.org/maintenance-of-certification/earning-points/qi-pi-activities/. 2021. ● Center for Medicare and Medicaid Services (CMS). MACRA https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-MIPS-and-APMs.html. 2021. ● The Commonwealth Fund. Health System Data Center. http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1. 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/. 2021. ● The Kaiser Family Foundation. www.kff.org. 2021. ● The Kaiser Family Foundation: Topic: Health Reform. https://www.kff.org/topic/health-reform/. 2021.

Systems-Based Practice 4: Radiation Protection, Patient Safety, and Procedural Safety	
Overall Intent: To understand the concepts needed to deliver safe and competent patient care through knowledge of radiation protection and patient and procedural safety concepts	
Milestones	**Examples**
Level 1 *Demonstrates knowledge of basic radiation protection concepts and basic procedural safety in nuclear medicine* *Demonstrates knowledge of universal precautions, including hand washing and sterile injection technique*	● Practices time, distance, and shielding during radioiodine treatments ● Washes hands before and after palpating a thyroid gland to correlate with image findings
Level 2 *Demonstrates knowledge of radiation protection concepts in nuclear medicine and correlative imaging* *Demonstrates knowledge of appropriate use of "time-out" procedure, and how to ensure the right patient has the right study or therapy at the right time in the right setting*	● Uses appropriate radiation protection measures based on emitter used (e.g., radium versus radioiodine) ● Assures correct patient, correct dose, correct route of administration of radioiodine therapy following checklist
Level 3 *Consistently practices ALARA (as low as reasonably achievable) principle for patients, patients' families, staff members, and the public* *Demonstrates knowledge of more complex concepts of procedural safety and contraindications*	● Uses low-dose CT when only attenuation correction is needed ● Demonstrates appropriate techniques involving radioactive spheres
Level 4 *Models excellent understanding of radiation protection and/or procedural safety* *Demonstrates knowledge of prevention and management of procedural complications for nuclear medicine and correlative imaging studies*	● Prepares appropriate written directive for authorized user signature ● Correctly responds to simulated radioactive materials spill
Level 5 *Participates in Radiation Safety Committee meetings and/or independently manages radiation safety events*	● Conducts root cause analysis of radiation safety event

Implements new safety procedures and quality control measures impacting patient care	● Participation of creation procedures for new radiopharmaceutical treatments (e.g., implementing Lutathera® treatment)
Assessment Models or Tools	● Direct observation ● Exams ● Medical record (chart) audit ● Portfolio
Curriculum Mapping	●
Notes or Resources	● CRICO. Strategies for Patient Safety (SPS) Library. https://www.rmf.harvard.edu/Clinician-Resources/Newsletter-and-Publication/2011/CRICO-SPS-Past-Issues. 2021. ● The Joint Commission. Patient Safety. https://www.jointcommission.org/resources/patient-safety-topics/patient-safety/. 2021. ● U.S.NRC. Radiation Protection. https://www.nrc.gov/about-nrc/radiation.html. 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 *With assistance, accesses available evidence and practice guidelines for patient care*	● Identifies appropriateness criteria on ACR and SNMMI websites
Level 2 *Independently identifies available evidence and practice guidelines for patient care*	● In a patient with prostate cancer, identifies and discusses potential evidence-based imaging options and solicits patient perspective
Level 3 *Critically appraises evidence and applies to patient care*	● Obtains, discusses, and applies evidence for the imaging management of a patient with prostate cancer and co-existing renal disease ● Understands and appropriately uses clinical practice guidelines in making patient care decisions while eliciting patient preferences
Level 4 *Applies best available evidence, even in the face of insufficient and/or conflicting information*	● Accesses the primary literature to identify new and alternative imaging approaches for prostate cancer
Level 5 *Coaches others and serves as a role model to apply evidence to patient care and/or participates in the development of guidelines*	● Leads clinical teaching on application of best practices in critical appraisal of prostate cancer imaging
Assessment Models or Tools	● Direct observation ● Oral or written examinations ● Presentation evaluation ● Research portfolio
Curriculum Mapping	●
Notes or Resources	● National Institutes of Health (NIH). Write Your Application. https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm. 2021. ● US National Library of Medicine. PubMed Online Training. https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html. 2021. ● Institutional Review Board (IRB) guidelines ● Various journal submission guidelines

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 *Identifies gaps in knowledge and performance* *Actively seeks opportunities to improve*	● Sets a personal practice goal of documenting use of the Deauville score when evaluating lymphoma ● Seeks feedback on completeness of reports from attendings
Level 2 *Reflects on the factors that contribute to gaps between expectations and actual performance* *Designs and implements a learning plan, with assistance*	● Assesses time management skills and how it impacts timely completion of clinic notes and literature reviews ● Integrates feedback to adjust the documentation of reports ● When prompted, develops individual education plan to improve one's evaluation for Deauville score
Level 3 *Institutes changes to narrow the gaps between expectations and actual performance* *Independently creates and implements a learning plan*	● Systematically reviews attendings edits of reports ● Using web-based resources, creates a personal curriculum to improve one's evaluation of lymphoma quantitative evaluation
Level 4 *Intentionally seeks performance data to narrow the gaps between expectations and actual performance* *Measures the effectiveness of the learning plan and makes appropriate changes*	● Completes a quarterly audit to ensure documentation of the Deauville criteria ● Debriefs with the attending and other patient care team members to optimize future collaboration in the care of the patient and family
Level 5 *Role models reflective practice* *Facilitates the design and implementation of learning plans for others*	● Shares personal experience of a missed fining and what was learned ● 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. 2021.

	● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. *Acad Med.* 2009;84(8):1066-74. https://insights.ovid.com/crossref?an=00001888-200908000-00021. 2021. ● 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://insights.ovid.com/article/00001888-201310000-00039. 2021.

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 *Demonstrates knowledge of common ethical principles and potential triggers for professionalism lapses* *Describes when and how to appropriately report professionalism lapses*	● Understands that lack of sleep can cause a lapse in professionalism ● Understands delay in dictating reports has adverse effect on patient care and on professional relationships
Level 2 *Analyzes straightforward situations using ethical principles* *Recognizes and takes responsibility for one's own professionalism lapses*	● Respects patient's wishes to decline further imaging ● Identifies when they have had a lapse in professionalism and without prompting, apologizes to the impacted party
Level 3 *Manages and resolves complex ethical situations, including personal lapses, with assistance*	● Appropriately responds to a distraught patient, following a misadministration ● Discusses with clinical team about the appropriate use of brain death scan
Level 4 *Intervenes and uses appropriate resources to prevent and manage professionalism lapses and dilemmas in oneself and others*	● Attends risk management courses ● Uses strategies learned in implicit bias and/or microaggression course
Level 5 *Coaches others when their behavior fails to meet professional expectations*	● Coaches another resident who was rude when debating scan appropriateness with the referring physician ● Engages stakeholders to employ strategies to decrease 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. 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. 2021. ● AMA. Ethics. https://www.ama-assn.org/delivering-care/ethics. 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. 2021.
- 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://meridian.allenpress.com/aplm/article/141/2/215/132523/Professionalism-in-Pathology-A-Case-Based-Approach. 2021.
- 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*	● Responds promptly to reminders from program administrator to complete work hour logs ● Timely attendance at conferences ● Completes end of rotation evaluations
Level 2 *Performs tasks in a timely manner or provides notification when unable to complete tasks*	● 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
Level 3 *Performs tasks 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 on radionuclide therapy patients and ensures appropriate continuity of care
Level 4 *Takes responsibility in situations that impact the ability of team members to complete tasks and responsibilities in a timely manner*	● Takes responsibility for inadvertently omitting key patient information during transitions of care and professionally discusses with the patient, family and interprofessional team
Level 5 *Coaches others in taking responsibility for administrative and clinical care duties*	● Sets up a meeting with the chief nuclear technologist to streamline patient scanning 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 ● Simulation
Curriculum Mapping	●
Notes or Resources	● Code of conduct from fellow/resident institutional manual ● Expectations of residency program regarding accountability and professionalism

Professionalism 3: Well-Being 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 *Recognizes status of personal and professional well-being, as well as the limits of such knowledge, with assistance*	● Receives feedback on missed emotional cues after a family meeting ● With prompting, recognizes feeling burnout after a challenging call shift
Level 2 *Independently recognizes status of personal and professional well-being, as well as the limits of such knowledge*	● Independently identifies and communicates impact of a personal family tragedy
Level 3 *With assistance, proposes a plan to optimize personal and professional well-being*	● Attends wellness curriculum and applies strategies to own wellness plan ● With supervision, develops a personal learning or action plan to address stress and/or burnout for self or team and gaps in personal clinical knowledge
Level 4 *Independently develops a plan to optimize personal and professional well-being*	● Independently identifies ways to manage personal stress ● Goes for a walk after work to relax ● Independently develops a personal learning or action plan to address stress and/or burnout for self or team and gaps in personal clinical knowledge
Level 5 *Coaches others and role models the continual ability to monitor and address personal and professional well-being*	● Assists in organizational efforts to address clinician well-being after patient diagnosis/prognosis/death ● Mentors colleagues in self-awareness ● Establishes health management plans to limit stress and burnout
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 resident's well-being. Rather, the intent is to ensure that each resident has the fundamental knowledge of factors that impact well-being, the mechanism by which those factors impact well-being, and available resources and tools to improve well-being. ● Local resources, including an employee assistance program (EAP) ● ACGME. Tools and Resources. https://www.acgme.org/What-We-Do/Initiatives/Physician-Well-Being/Resources. 2021. ● Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: personal and professional development. *Acad Pediatr*. 2014 Mar-Apr;14(2 Suppl):S80-97. https://www.academicpedsjnl.net/article/S1876-2859(13)00332-X/fulltext. 2021.

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 *Identifies common barriers to effective communication*	● Identifies need for trained interpreter with non-English-speaking patients
Recognizes the need to adjust communication strategies based on context	● Uses appropriate language based on cultural literacy when discussing radiation dose/exposure with patients
Learns to obtain informed consent	● Understands ethical considerations for informed consent for therapy
Level 2 *Identifies complex barriers to effective communication*	● Recognizes the need for handouts with diagrams and pictures to communicate information to a patient who is unable to read
Verifies patient's/patient's family's understanding of the clinical situation to optimize effective communication	● Has patient/family repeat actional items and instruction to confirm understanding
Obtains informed consent for routine procedures	● Demonstrates ability to obtain an informed consent
Level 3 *Reflects on personal biases while attempting to minimize communication barriers*	● Acknowledges bias against patients with high BMI when making a decision for stress test procedure
With guidance, uses shared decision making to align the patient's/patient's family's values, goals, and preferences with treatment options to make a personalized care plan	● Participates in family discussion with patients and patient's family for not inserting a urinary catheter according patient's preferences
Obtains informed consent for complex procedures	● Obtains an informed consent for Luthera® therapy
Level 4 *Proactively improves communication by addressing barriers, including patient and personal bias*	● Reflects on personal bias related to preference of pharmacologic stress instead of treadmill stress testing for patients with high BMIs and seeks faculty input on resolution
Independently uses shared decision making to make a personalized care plan	● Conducts a family meeting for diagnosis of brain death

Teaches junior residents how to obtain informed consent in common clinical and research situations	● Teaches more junior residents how to obtain informed consent and written directives for therapy
Level 5 *Role models communication that addresses barriers* *Role models shared decision making in patient/patient's family communication, including in situations with a high degree of uncertainty/conflict* *Addresses informed consent in complex clinical and research situations*	● Develops education that differentiates the reasons for a maximum treadmill exercise versus pharmacologic regardless of patients BMI ● Serves on a hospital bioethics committee ● Obtains complex informed consent for nuclear medicine research
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. 2021. ● 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. 2021. ● 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. 2021. ● 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/. 2021.

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 *Uses respectful communication (verbal and non-verbal) with all members of the health care team*	● Respectfully asks technologist for additional views or different images
Demonstrates openness to feedback	● Asks technologist for feedback on whether patient can tolerate the treatment
Level 2 *Communicates effectively with all health care team members*	● Communicates the reasoning for additional views
Is responsive to feedback	● Willing to change protocols based on technologist feedback
Level 3 *Adapts communication style within and across heath care teams to ensure mutual understanding*	● Works collaboratively with the technologists to obtain the best views for the diagnosis
Seeks and provides performance feedback	● Comments on adequacy of images obtained by the technologist
Level 4 *Coordinates recommendations from different members of the health care team to optimize patient care*	● Coordinates multidisciplinary input for protocol review for diagnostic nuclear medicine procedures
Uses feedback to improve one's own performance and provides actionable feedback to team members	● Seeks feedback from attending physician to maximize study quality
Level 5 *Role models flexible communication strategies that value input from all health care team members, resolving conflict when needed*	● Integrates role of nuclear medicine physician within the multidisciplinary team
Role models giving and receiving of feedback	● Teaches more junior residents how to optimize feedback with technologists
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. 2021. - 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. 2021. - 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. 2021. - 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/. 2021. - Green M, Parrott T, Cook G. Improving your communication skills. *BMJ.* 2012;344:e357 https://www.bmj.com/content/344/bmj.e357. 2021. - 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. 2021. - 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/. 2021. - 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. 2021.

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*	● Creates accurate documentation but it may be incomplete
Safeguards patients' personal health information in communications	● Avoids talking about patients in the elevator
Level 2 *Demonstrates organized diagnostic and therapeutic reasoning through notes in the patient record*	● Creates organized and accurate documentation outlining clinical reasoning that supports the treatment plan
Appropriately selects forms of communication based on context	● Develops documentation templates for reporting ● 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*	● Documents complex clinical thinking concisely but it may not contain anticipatory guidance
Includes key stakeholders in all communications	● Calls patient or referring physician immediately about potentially critical test result ● 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*	● Creates consistently accurate, organized, and concise documentation, and frequently incorporates anticipatory guidance
Produces written or verbal communication that serves as an example for others to follow	● Takes exemplary notes that are used by the chief resident to teach others ● Talks directly referring physicians about critical results and documents in a report
Level 5 *Role models optimal documentation*	● Participates in a task force established by the hospital QI committee to develop a plan to make reports more meaningful to referring physicians
Guides departmental or institutional communication around policies and procedures	● Meaningfully participates in a committee to examine response to radiation safety emergencies.
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. 2021. - 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. 2021. - 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. 2021.

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: Diagnostic: General Nuclear Medicine, Cardiovascular, and Molecular Imaging	PC1: Diagnostic Planar, SPECT, and PET Imaging: Patient Evaluation, Procedure Selection, Monitoring, and Interpretation
PC2: Cardiovascular Nuclear Medicine-Stress Testing: Patient Evaluation and Procedure Monitoring	PC2: Cardiovascular Nuclear Medicine-Stress Testing: Patient Evaluation and Procedure Monitoring
PC3: Therapy: Radioiodine for Benign Thyroid Disease-Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up	PC3: Theranostics: Radioiodine for Benign Thyroid Disease-Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up
PC4: Therapy: Radioiodine for Thyroid Malignancy – Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up	PC4: Theranostics: Radioiodine for Thyroid Malignancy – Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-Up
PC5: Therapy: Parenteral – Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-up	PC5: Theranostics: Parenteral – Patient Evaluation, Procedure Selection, Procedure Performance, and Follow-up
MK1: Physiology and Pathophysiology	MK1: Physiology and Pathophysiology
MK2: Anatomic Imaging	MK2: Anatomic Imaging
MK3: Instrumentation	MK3: Instrumentation
MK4: Radiopharmaceuticals and molecular agents	MK4: Radiopharmaceuticals and molecular agents
MK5: Medical physics, mathematics, and radiation biology	MK5: Medical physics, mathematics, and radiation biology
MK6: Regulatory Requirements	No match
MK7: Radiation Protection, Patient Safety, and Procedural Safety	SBP1: Patient Safety and Quality Improvement SBP4: Radiation Protection, Patient Safety, and Procedural Safety
SBP1: Computer Systems	ICS3: Communication within Healthcare Systems
SBP2: Economics	SBP3: Physician Role in Health Care Systems
PBLI: Self-Directed Learning and Understanding Scientific Studies	PBLI1: Evidence-Based and Informed Practice PBLI2: Reflective Practice and Commitment to Personal Growth
PBLI2: Implements Quality Improvement Project	SBP1: Patient Safety and Quality Improvement
PROF: Professional Ethics and Accountability	PROF1: Professional Behavior and Ethical Principles PROF2: Accountability/Conscientiousness

No match	PROF3: Knowledge of Systemic and Individual Factors of Well-Being
ICS1: Patient Communications	ICS1: Patient- and Family-Centered Communication
ICS2: Health Care Team	SBP2: System Navigation for Patient-Centered Care ICS2: Interprofessional and Team Communication

Available Milestones Resources

Clinical Competency Committee Guidebook, 2020 - https://www.acgme.org/Portals/0/ACGMEClinicalCompetencyCommitteeGuidebook.pdf?ver=2020-04-16-121941-380

Clinical Competency Committee Guidebook Executive Summaries, 2020 - https://www.acgme.org/What-We-Do/Accreditation/Milestones/Resources - Guidebooks - Clinical Competency Committee Guidebook Executive Summaries

Milestones Guidebook, 2020 - https://www.acgme.org/Portals/0/MilestonesGuidebook.pdf?ver=2020-06-11-100958-330

Milestones Guidebook for Residents and Fellows, 2020 - https://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesGuidebookforResidentsFellows.pdf?ver=2020-05-08-150234-750

Milestones for Residents and Fellows PowerPoint, 2020 -https://www.acgme.org/Residents-and-Fellows/The-ACGME-for-Residents-and-Fellows

Milestones for Residents and Fellows Flyer, 2020 https://www.acgme.org/Portals/0/PDFs/Milestones/ResidentFlyer.pdf

Implementation Guidebook, 2020 - https://www.acgme.org/Portals/0/Milestones%20Implementation%202020.pdf?ver=2020-05-20-152402-013

Assessment Guidebook, 2020 - https://www.acgme.org/Portals/0/PDFs/Milestones/Guidebooks/AssessmentGuidebook.pdf?ver=2020-11-18-155141-527

Milestones National Report, updated each Fall - https://www.acgme.org/Portals/0/PDFs/Milestones/2019MilestonesNationalReportFinal.pdf?ver=2019-09-30-110837-587 (2019)

Milestones Bibliography, updated twice each year - https://www.acgme.org/Portals/0/PDFs/Milestones/MilestonesBibliography.pdf?ver=2020-08-19-153536-447

Developing Faculty Competencies in Assessment courses - https://www.acgme.org/Meetings-and-Educational-Activities/Other-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://dl.acgme.org/pages/assessment

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

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