

ACGME Program Requirements for Graduate Medical Education in Nuclear Medicine

Common Program Requirements are in BOLD

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Introduction

Int.A. Residency is an essential dimension of the transformation of the medical student to the independent practitioner along the continuum of medical education. It is physically, emotionally, and intellectually demanding, and requires longitudinally-concentrated effort on the part of the resident.

The specialty education of physicians to practice independently is experiential, and necessarily occurs within the context of the health care delivery system. Developing the skills, knowledge, and attitudes leading to proficiency in all the domains of clinical competency requires the resident physician to assume personal responsibility for the care of individual patients. For the resident, the essential learning activity is interaction with patients under the guidance and supervision of faculty members who give value, context, and meaning to those interactions. As residents gain experience and demonstrate growth in their ability to care for patients, they assume roles that permit them to exercise those skills with greater independence. This concept—graded and progressive responsibility—is one of the core tenets of American graduate medical education. Supervision in the setting of graduate medical education has the goals of assuring the provision of safe and effective care to the individual patient; assuring each resident’s development of the skills, knowledge, and attitudes required to enter the unsupervised practice of medicine; and establishing a foundation for continued professional growth.

Int.B. Definition

Nuclear medicine is the medical specialty that uses the tracer principle, most often with radiopharmaceuticals, to evaluate molecular, metabolic, physiologic and pathologic conditions of the body for the purposes of diagnosis, therapy and research.

Int.C. Duration of Education

The educational program in nuclear medicine must be 36 months in length.

I. Institutions

I.A. Sponsoring Institution

One sponsoring institution must assume ultimate responsibility for the program, as described in the Institutional Requirements, and this responsibility extends to resident assignments at all participating sites.

The sponsoring institution and the program must ensure that the program director has sufficient protected time and financial support for his or her educational and administrative responsibilities to the program.

I.A.1. The program director must be provided with no less than the equivalent of one half day per week of protected time in order to fulfill the responsibilities inherent to carrying out the administrative activities and meeting the educational goals of the program.

I.B. Participating Sites

I.B.1. There must be a program letter of agreement (PLA) between the program and each participating site providing a required assignment. The PLA must be renewed at least every five years.

The PLA should:

I.B.1.a) identify the faculty who will assume both educational and supervisory responsibilities for residents;

I.B.1.b) specify their responsibilities for teaching, supervision, and formal evaluation of residents, as specified later in this document;

I.B.1.c) specify the duration and content of the educational experience; and,

I.B.1.d) state the policies and procedures that will govern resident education during the assignment.

I.B.2. The program director must submit any additions or deletions of participating sites routinely providing an educational experience, required for all residents, of one month full time equivalent (FTE) or more through the Accreditation Council for Graduate Medical Education (ACGME) Accreditation Data System (ADS).

I.B.3. The program should be based at the primary clinical site. A program using multiple sites must ensure a unified educational experience for the residents. Each participating site must offer significant educational opportunities to the overall program.

I.B.4. Programs should avoid affiliations with sites at such distances from the primary clinical site as to make resident attendance at rounds and conferences impractical, unless there is a comparable educational experience at the site.

II. Program Personnel and Resources

II.A. Program Director

II.A.1. There must be a single program director with authority and

accountability for the operation of the program. The sponsoring institution's GMEC must approve a change in program director. After approval, the program director must submit this change to the ACGME via the ADS.

- II.A.2. The program director should continue in his or her position for a length of time adequate to maintain continuity of leadership and program stability.**
- II.A.3. Qualifications of the program director must include:**
 - II.A.3.a) requisite specialty expertise and documented educational and administrative experience acceptable to the Review Committee;**
 - II.A.3.b) current certification in the specialty by the American Board of Nuclear Medicine, or specialty qualifications that are acceptable to the Review Committee; and,**
 - II.A.3.c) current medical licensure and appropriate medical staff appointment.**
 - II.A.3.d) broad knowledge of, experience with, and commitment to general nuclear medicine and must have served as a nuclear medicine faculty member for at least one year preceding appointment as the program's director.**
- II.A.4. The program director must administer and maintain an educational environment conducive to educating the residents in each of the ACGME competency areas. The program director must:**
 - II.A.4.a) oversee and ensure the quality of didactic and clinical education in all sites that participate in the program;**
 - II.A.4.b) approve a local director at each participating site who is accountable for resident education;**
 - II.A.4.c) approve the selection of program faculty as appropriate;**
 - II.A.4.d) evaluate program faculty and approve the continued participation of program faculty based on evaluation;**
 - II.A.4.e) monitor resident supervision at all participating sites;**
 - II.A.4.f) prepare and submit all information required and requested by the ACGME, including but not limited to the program information forms and annual program resident updates to the ADS, and ensure that the information submitted is accurate and complete;**
 - II.A.4.g) provide each resident with documented semiannual**

- evaluation of performance with feedback;
- II.A.4.h)** ensure compliance with grievance and due process procedures as set forth in the Institutional Requirements and implemented by the sponsoring institution;
- II.A.4.i)** provide verification of residency education for all residents, including those who leave the program prior to completion;
- II.A.4.j)** implement policies and procedures consistent with the institutional and program requirements for resident duty hours and the working environment, including moonlighting, and, to that end, must:
- II.A.4.j).(1)** distribute these policies and procedures to the residents and faculty;
- II.A.4.j).(2)** monitor resident duty hours, according to sponsoring institutional policies, with a frequency sufficient to ensure compliance with ACGME requirements;
- II.A.4.j).(3)** adjust schedules as necessary to mitigate excessive service demands and/or fatigue; and,
- II.A.4.j).(4)** if applicable, monitor the demands of at-home call and adjust schedules as necessary to mitigate excessive service demands and/or fatigue.
- II.A.4.k)** monitor the need for and ensure the provision of back up support systems when patient care responsibilities are unusually difficult or prolonged;
- II.A.4.l)** comply with the sponsoring institution's written policies and procedures, including those specified in the Institutional Requirements, for selection, evaluation and promotion of residents, disciplinary action, and supervision of residents;
- II.A.4.m)** be familiar with and comply with ACGME and Review Committee policies and procedures as outlined in the ACGME Manual of Policies and Procedures;
- II.A.4.n)** obtain review and approval of the sponsoring institution's GMEC/DIO before submitting to the ACGME information or requests for the following:
- II.A.4.n).(1)** all applications for ACGME accreditation of new programs;
- II.A.4.n).(2)** changes in resident complement;
- II.A.4.n).(3)** major changes in program structure or length of

- training;
- II.A.4.n).(4) progress reports requested by the Review Committee;
- II.A.4.n).(5) responses to all proposed adverse actions;
- II.A.4.n).(6) requests for increases or any change to resident duty hours;
- II.A.4.n).(7) voluntary withdrawals of ACGME-accredited programs;
- II.A.4.n).(8) requests for appeal of an adverse action;
- II.A.4.n).(9) appeal presentations to a Board of Appeal or the ACGME; and,
- II.A.4.n).(10) proposals to ACGME for approval of innovative educational approaches.
- II.A.4.o) obtain DIO review and co-signature on all program information forms, as well as any correspondence or document submitted to the ACGME that addresses:
 - II.A.4.o).(1) program citations, and/or
 - II.A.4.o).(2) request for changes in the program that would have significant impact, including financial, on the program or institution.
- II.A.4.p) ensure that residents entering at the NM2 level achieve the required NM1 and NM2 competency outcomes by the completion of the NM2 year; and,
- II.A.4.q) ensure that residents entering at the NM3 level achieve the required NM1, NM2 and NM3 competency outcomes by the completion of the NM3 year.

II.B. Faculty

II.B.1. At each participating site, there must be a sufficient number of faculty with documented qualifications to instruct and supervise all residents at that location.

The faculty must:

II.B.1.a) devote sufficient time to the educational program to fulfill their supervisory and teaching responsibilities; and to demonstrate a strong interest in the education of residents, and

- II.B.1.b) administer and maintain an educational environment conducive to educating residents in each of the ACGME competency areas.**
- II.B.2. The physician faculty must have current certification in the specialty by the American Board of Nuclear Medicine, or possess qualifications acceptable to the Review Committee.**
- II.B.3. The physician faculty must possess current medical licensure and appropriate medical staff appointment.**
- II.B.3.a) In programs affiliated with a medical school, all physician faculty must have an academic appointment.
- II.B.3.b) In programs not affiliated with a medical school, all physician faculty must be members of the medical staff of at least one of the participating sites.
- II.B.4. The nonphysician faculty must have appropriate qualifications in their field and hold appropriate institutional appointments.**
- II.B.5. The faculty must establish and maintain an environment of inquiry and scholarship with an active research component.**
- II.B.5.a) The faculty must regularly participate in organized clinical discussions, rounds, journal clubs, and conferences.**
- II.B.5.b) Some members of the faculty should also demonstrate scholarship by one or more of the following:**
- II.B.5.b).(1) **peer-reviewed funding;**
- II.B.5.b).(2) **publication of original research or review articles in peer-reviewed journals, or chapters in textbooks;**
- II.B.5.b).(3) **publication or presentation of case reports or clinical series at local, regional, or national professional and scientific society meetings; or,**
- II.B.5.b).(4) **participation in national committees or educational organizations.**
- II.B.5.c) Faculty should encourage and support residents in scholarly activities.**
- II.B.5.d) The faculty as a whole must have demonstrated ongoing participation in scholarly activities during the past five years.
- II.B.6. There must be at least one FTE physician faculty member in addition to the program director.**

II.B.6.a) Programs must maintain a ratio of at least one FTE physician faculty member per two residents.

II.C. Other Program Personnel

The institution and the program must jointly ensure the availability of all necessary professional, technical, and clerical personnel for the effective administration of the program.

II.C.1. There must be a dedicated program coordinator to assist the program director in effectively fulfilling the administrative requirements of the program.

II.D. Resources

The institution and the program must jointly ensure the availability of adequate resources for resident education, as defined in the specialty program requirements.

II.D.1. There must be at least one computer with Internet access dedicated for resident educational use.

II.E. Medical Information Access

Residents must have ready access to specialty-specific and other appropriate reference material in print or electronic format. Electronic medical literature databases with search capabilities should be available.

III. Resident Appointments

III.A. Eligibility Criteria

The program director must comply with the criteria for resident eligibility as specified in the Institutional Requirements.

III.A.1. To be eligible for appointment to the program at the NM1 level, residents must have satisfactorily completed:

III.A.1.a) one year of graduate medical education in a program accredited by the ACGME, the Royal College of Physicians and Surgeons of Canada (RCPSC), or the American Osteopathic Association (AOA). This year must include a minimum of nine months of direct patient care; or alternatively,

III.A.1.b) two or more years of graduate medical education and a passing score on the United States Medical Licensing Exam (USMLE) Step 3.

III.A.2. To be eligible for appointment to the program at the NM2 level, residents must have completed a program accredited by the ACGME, the RCPSC, or the AOA.

III.A.2.a) The educational program for these residents should be 24 months in length.

III.A.3. To be eligible for appointment to the program at the NM3 level, residents must have completed a program in diagnostic radiology accredited by the ACGME, the RCPSC, or the AOA.

III.A.3.a) The educational program for these residents should be 12 months in length.

III.B. Number of Residents

The program director may not appoint more residents than approved by the Review Committee, unless otherwise stated in the specialty-specific requirements. The program's educational resources must be adequate to support the number of residents appointed to the program.

III.C. Resident Transfers

III.C.1. **Before accepting a resident who is transferring from another program, the program director must obtain written or electronic verification of previous educational experiences and a summative competency-based performance evaluation of the transferring resident.**

III.C.2. **A program director must provide timely verification of residency education and summative performance evaluations for residents who leave the program prior to completion.**

III.D. Appointment of Fellows and Other Learners

The presence of other learners (including, but not limited to, residents from other specialties, subspecialty fellows, PhD students, and nurse practitioners) in the program must not interfere with the appointed residents' education. The program director must report the presence of other learners to the DIO and GMEC in accordance with sponsoring institution guidelines.

IV. Educational Program

IV.A. **The curriculum must contain the following educational components:**

IV.A.1. **Overall educational goals for the program, which the program must distribute to residents and faculty annually;**

IV.A.2. **Competency-based goals and objectives for each assignment at each educational level, which the program must distribute to residents and faculty annually, in either written or electronic form. These should be reviewed by the resident at the start of each rotation;**

IV.A.3.

Regularly scheduled didactic sessions;

- IV.A.3.a) There must be a dedicated formal didactic lecture schedule that indicates the specific date and time of each lecture, the topic of the lecture, the individual presenting the lecture, and the duration of the lecture.
- IV.A.3.a).(1) Residents must attend the regularly scheduled didactic lectures.
- IV.A.3.a).(2) The topics must include:
- IV.A.3.a).(2).(a) diagnostic use of radiopharmaceuticals: clinical indications, technical performance, and interpretation of *in-vivo* imaging of the body organs and systems, using external detectors and scintillation cameras, including single photon emission computed tomography (SPECT), single photon emission computed tomography – computed tomography (SPECT/CT), positron emission tomography (PET), and positron emission tomography – computed tomography (PET/CT) and correlation of nuclear medicine procedures with other pertinent imaging modalities;
- IV.A.3.a).(2).(b) exercise and pharmacologic stress testing: the pharmacology of cardioactive drugs and physiologic gating techniques;
- IV.A.3.a).(2).(c) non-imaging studies: training and experience in non-imaging procedures, such as radiolabeled antibody preparation, uptake measurements, and *in-vitro* studies;
- IV.A.3.a).(2).(d) therapeutic uses of unsealed radiopharmaceuticals in the treatment of benign and malignant disorders: patient selection and management, including dosimetry, dose administration, toxicity, and radiation protection considerations; and,
- IV.A.3.a).(2).(e) fundamentals of imaging molecular targets, processes and events and existing and emerging molecular imaging techniques, particularly as they relate to current clinical practice.
- IV.A.3.b) Basic Science Educational Program
- Residents must complete classroom and laboratory experience in basic radionuclide handling techniques applicable to the medical

use of unsealed byproduct material and radionuclides requiring a written directive. This must include the following areas:

- IV.A.3.b).(1) radiation physics and instrumentation, including:
 - IV.A.3.b).(1).(a) radiation physics: structure of matter, modes of radioactive decay, particle and photon emissions, and interactions of radiation with matter; and,
 - IV.A.3.b).(1).(b) instrumentation: principles of instrumentation used in detection, measurement, and imaging of radioactivity with special emphasis on gamma cameras, including SPECT, SPECT/CT, PET and PET/CT systems, and associated electronic instrumentation and computers employed in image production and display. Instruction must be provided in the instrumentation principles of magnetic resonance imaging and multi-slice computed tomography.
- IV.A.3.b).(2) radiation protection and regulations, including:
 - IV.A.3.b).(2).(a) means of reducing radiation exposure, radiation dose limits, evaluation of radiation overexposure, medical management of persons overexposed to ionizing radiation, management and disposal of radioactive substances, and establishment of radiation safety programs in accordance with federal and state regulations.
- IV.A.3.b).(3) mathematics pertaining to the use and measurement of radioactivity, including statistics and medical decision making;
- IV.A.3.b).(4) chemistry of radioactive material for medical use, including reactor, cyclotron, and generator production of radionuclides; radiochemistry; and formulation of radiopharmaceuticals; and,
- IV.A.3.b).(5) radiation biology: biological effects of ionizing radiation and calculation of radiation dose.
- IV.A.3.c) All residents and faculty members must participate in regularly scheduled clinical nuclear medicine seminars, journal clubs and interdisciplinary conferences. Participation should be documented with attendance logs.
- IV.A.4. Delineation of resident responsibilities for patient care, progressive responsibility for patient management, and supervision of residents over the continuum of the program; and,**

IV.A.5. ACGME Competencies

The program must integrate the following ACGME competencies into the curriculum:

IV.A.5.a) Patient Care

Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Residents:

IV.A.5.a).(1) completing the NM1 year must demonstrate competency in:

IV.A.5.a).(1).(a) initial patient evaluation to include pertinent patient information relevant to the requested procedure using patient interview, chart and computer data base review, the performance of a focused physical examination as indicated, and communication with the referring physician;

IV.A.5.a).(1).(b) selection of appropriate nuclear medicine procedures in bone, thyroid, hepatobiliary, and cardiac imaging;

IV.A.5.a).(1).(c) supervision of the performance of nuclear medicine procedures in bone, thyroid, hepatobiliary, and cardiac imaging as well as the preliminary review and interpretation of the resulting images; and,

IV.A.5.a).(1).(d) therapeutic administration of radioiodine for benign thyroid disease, including: patient selection, evaluating risks and benefits, determining the administered dose, patient identity verification, obtaining informed consent, documenting pregnancy status, using administrative controls to prevent a medical event, complying with federal and state regulations regarding medical use of radiopharmaceuticals, counseling patients and their families about radiation safety issues, and scheduling and performing post-therapy follow-up.

IV.A.5.a).(2) completing the NM2 year must demonstrate competency in:

IV.A.5.a).(2).(a) selection of appropriate procedures(s) based on the referring physician's request and the patient's history;

IV.A.5.a).(2).(b) selection of the appropriate radiopharmaceutical, dose, imaging technique, data analysis, basic

- supervisory skills, image presentation, and preliminary interpretation in the performance of parathyroid, gastrointestinal, infection, pulmonary, urinary tract procedures, and PET studies;
- IV.A.5.a).(2).(c) interpretation of PET studies performed for oncologic indications;
- IV.A.5.a).(2).(d) preparation of radiopharmaceuticals, including preparing patient doses and performing quality control measures; and,
- IV.A.5.a).(2).(e) therapeutic administration of radioiodine for thyroid malignancy, including patient selection, evaluating risks and benefits, determining the administered dose, patient identity verification, obtaining informed consent, documenting pregnancy status, using administrative controls to prevent a medical event, complying with federal and state regulations regarding the medical use of radiopharmaceuticals, counseling patients and their families about radiation safety issues, and scheduling and performing post-therapy follow-up.
- IV.A.5.a).(3) completing the NM3 year must demonstrate competency in:
- IV.A.5.a).(3).(a) recommending, planning, conducting, supervising, interpreting, and reporting diagnostic and therapeutic nuclear medicine procedures appropriate for the clinical problem or condition;
- IV.A.5.a).(3).(b) correlating the nuclear medicine procedure with clinical information, laboratory, and other procedural or imaging studies;
- IV.A.5.a).(3).(c) interpreting PET studies performed for non-oncologic indications;
- IV.A.5.a).(3).(d) therapeutic administration of radiopharmaceuticals, including patient selection, evaluating risks and benefits, determining the administered dose, patient identity verification, obtaining informed consent, documenting pregnancy status, using administrative controls to prevent a medical event, complying with federal and state regulations regarding the medical use of radiopharmaceuticals, counseling patients and their families about radiation safety issues, and scheduling and performing post-therapy follow-up; and,

IV.A.5.a).(3).(e)	interpreting the following:
IV.A.5.a).(3).(e).(i)	musculoskeletal studies for benign and malignant disease;
IV.A.5.a).(3).(e).(ii)	myocardial perfusion imaging with treadmill and pharmacologic stress, including patient monitoring, with special emphasis on electrocardiographic interpretation;
IV.A.5.a).(3).(e).(iii)	ECG-gated ventriculography for evaluation of ventricular performance;
IV.A.5.a).(3).(e).(iv)	endocrinologic studies, including thyroid and parathyroid;
IV.A.5.a).(3).(e).(iv).(a)	Thyroid studies must include measurement of iodine uptake and dosimetry calculations for radio-iodine therapy.
IV.A.5.a).(3).(e).(v)	gastrointestinal studies, including transit studies, liver and hepatobiliary, bleeding, and Meckel's diverticulum;
IV.A.5.a).(3).(e).(vi)	infection studies, including gallium, labeled leukocytes, and bone marrow imaging;
IV.A.5.a).(3).(e).(vii)	oncology studies, including sentinel node localization, fluorodeoxyglucose (FDG), adrenal, somatostatin-receptor imaging and other agents as they become available;
IV.A.5.a).(3).(e).(viii)	neurologic studies, including cerebral perfusion, cerebral metabolism and cerebrospinal fluid. This should include studies of dementia, epilepsy, and brain death;
IV.A.5.a).(3).(e).(ix)	pulmonary studies, including perfusion and ventilation for pulmonary embolus, right-to-left shunts, and quantitative assessment of perfusion and ventilation;
IV.A.5.a).(3).(e).(x)	urinary tract studies, including renal perfusion, function and cortical imaging, renal scintigraphy with pharmacologic interventions, and renal transplant evaluation; and,
IV.A.5.a).(3).(e).(xi)	cross-sectional imaging of the brain, head

and neck, thorax, abdomen, and pelvis with CT in the context of SPECT/CT and PET/CT.

IV.A.5.a).(4) at all levels must:

IV.A.5.a).(4).(a) demonstrate compliance with radiation safety rules and regulations, including Nuclear Regulatory Commission (NRC) or agreement state rules, local regulations, and the ALARA (as low as reasonably achievable) principle for radiation protection; and,

IV.A.5.a).(4).(b) have certification in both basic and advanced cardiac life support.

IV.A.5.b) Medical Knowledge

Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care. Residents:

IV.A.5.b).(1) completing the NM1 year should demonstrate basic knowledge of radiation safety; nuclear medicine instrumentation, including quality control; nuclear medicine procedures, including bone scans, thyroid uptake and scans; radioiodine therapy for hyperthyroidism; hepatobiliary scans; myocardial perfusion; and gated ventriculography;

IV.A.5.b).(2) completing the NM2 year should demonstrate basic knowledge in radiopharmacy; nuclear medicine procedures, including parathyroid, gastrointestinal, infection, pulmonary and urinary tract; radioiodine therapy for thyroid malignancy; positron emission tomography for oncologic indications; and cross-sectional imaging of the thorax, abdomen, and pelvis with CT in the context of SPECT/CT and PET/CT; and,

IV.A.5.b).(3) completing the NM3 year should demonstrate competence in their knowledge of all topics included in the didactic curriculum.

IV.A.5.c) Practice-based Learning and Improvement

Residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning. Residents are expected to develop skills and habits to be able to meet the following goals:

- IV.A.5.c).(1) **identify strengths, deficiencies, and limits in one's knowledge and expertise;**
- IV.A.5.c).(2) **set learning and improvement goals;**
- IV.A.5.c).(3) **identify and perform appropriate learning activities;**
- IV.A.5.c).(4) **systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement;**
- IV.A.5.c).(5) **incorporate formative evaluation feedback into daily practice;**
- IV.A.5.c).(6) **locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;**
- IV.A.5.c).(7) **use information technology to optimize learning; and,**
- IV.A.5.c).(8) **participate in the education of patients, families, students, residents and other health professionals.**
- IV.A.5.c).(9) regularly obtain follow-up information, and correlate the clinical findings with their study interpretation; and,
- IV.A.5.c).(10) evaluate their personal practice utilizing scientific evidence, best practices, and/or self-assessment programs or modules for practice improvement. This reflective process must be demonstrated as part of an individual learning plan in the Resident Learning Portfolio (as described in IV.A.6.a).(4)).

IV.A.5.d) Interpersonal and Communication Skills

Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals. Residents are expected to:

- IV.A.5.d).(1) **communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds;**
- IV.A.5.d).(2) **communicate effectively with physicians, other health professionals, and health related agencies;**
- IV.A.5.d).(3) **work effectively as a member or leader of a health care team or other professional group;**

- IV.A.5.d).(4) **act in a consultative role to other physicians and health professionals; and,**
- IV.A.5.d).(5) **maintain comprehensive, timely, and legible medical records, if applicable.**
- IV.A.5.d).(6) demonstrate competence by the completion of the NM1 year in:
 - IV.A.5.d).(6).(a) preparing a preliminary basic nuclear medicine procedure report; and
 - IV.A.5.d).(6).(b) communicating the final procedure results promptly and clearly to the referring physician.
- IV.A.5.d).(7) demonstrate competence by the completion of the NM2 year in:
 - IV.A.5.d).(7).(a) preparing a complete and concise nuclear medicine procedure interpretation report;
 - IV.A.5.d).(7).(b) providing effective contributions to the interdisciplinary and clinical didactic conferences; and
 - IV.A.5.d).(7).(c) educating patients and their families in diagnostic and therapeutic nuclear medicine procedures.
- IV.A.5.d).(8) demonstrate competence by the completion of the NM3 year in:
 - IV.A.5.d).(8).(a) communicating the final procedure interpretation, an appropriate differential diagnosis, and any clinical, diagnostic or therapeutic recommendations; and
 - IV.A.5.d).(8).(b) supervising and teaching junior residents, residents from other services, and students on rotations in nuclear medicine.

IV.A.5.e) Professionalism

Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Residents are expected to demonstrate:

- IV.A.5.e).(1) **compassion, integrity, and respect for others;**
- IV.A.5.e).(2) **responsiveness to patient needs that supersedes self-interest;**

- IV.A.5.e).(3) **respect for patient privacy and autonomy;**
- IV.A.5.e).(4) **accountability to patients, society and the profession; and,**
- IV.A.5.e).(5) **sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation.**

IV.A.5.f) Systems-based Practice

Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to:

- IV.A.5.f).(1) **work effectively in various health care delivery settings and systems relevant to their clinical specialty;**
- IV.A.5.f).(2) **coordinate patient care within the health care system relevant to their clinical specialty;**
- IV.A.5.f).(3) **incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate;**
- IV.A.5.f).(4) **advocate for quality patient care and optimal patient care systems;**
- IV.A.5.f).(5) **work in interprofessional teams to enhance patient safety and improve patient care quality; and,**
- IV.A.5.f).(6) **participate in identifying system errors and implementing potential systems solutions.**

IV.A.6. Curriculum Organization and Resident Experiences

IV.A.6.a) Residents entering the program at any level must:

- IV.A.6.a).(1) **participate in a radiopharmacy rotation. This experience must include:**
 - IV.A.6.a).(1).(a) **ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;**
 - IV.A.6.a).(1).(b) **performing quality control procedures on instruments used to determine the activity of**

- dosages, and performing checks for proper operation of survey meters;
- IV.A.6.a).(1).(c) calculating, measuring, and safely preparing patient or human research subject dosages;
- IV.A.6.a).(1).(d) using administrative controls to prevent a medical event involving the use of unsealed byproduct material;
- IV.A.6.a).(1).(e) using procedures to safely contain spilled radioactive material and using proper decontamination procedures; and,
- IV.A.6.a).(1).(f) administering dosages of radioactive drugs to patients or human research subjects.
- IV.A.6.a).(2) participate with appropriate supervision in the performance of nuclear medicine imaging and non-imaging procedures to include instrumentation quality control;
- IV.A.6.a).(3) participate in basic radiation safety and survey procedures;
- IV.A.6.a).(4) maintain a Resident Learning Portfolio. This portfolio must be maintained by each resident, must be reviewed with the program director as part of the semiannual evaluation, and must include the following:
- IV.A.6.a).(4).(a) Patient Care
- IV.A.6.a).(4).(a).(i) documentation of participation in the following required nuclear medicine procedures:
- IV.A.6.a).(4).(a).(i).(a) 10 cases of oral administration of less than or equal to 1.22 gigabecquerels (33 millicuries) of sodium iodide I-131, for which a written directive is required;
- IV.A.6.a).(4).(a).(i).(b) five cases of oral administration greater than 1.22 gigabecquerels (33 millicuries) of sodium iodide I-131, for which a written directive is required;
- IV.A.6.a).(4).(a).(i).(c) three cases of parenteral administration of any beta emitter, or a photon-emitting radionuclide with a photon energy less than 150 keV, for which a written directive is required

	and/or parenteral administration of any other radionuclide, for which a written directive is required; and,
IV.A.6.a).(4).(a).(i).(d)	50 cardiovascular pharmacologic and/or exercise stress studies.
IV.A.6.a).(4).(a).(ii)	documentation of participation in therapeutic procedures, including date, diagnosis, and dose of each therapy;
IV.A.6.a).(4).(a).(iii)	documentation of participation in stress myocardial studies including date, radiopharmaceutical, and type of stress (exercise or pharmacologic); and,
IV.A.6.a).(4).(a).(iii).(a)	It is suggested that residents document the completion of a minimum of 25 pediatric nuclear medicine procedures per year.
IV.A.6.a).(4).(a).(iv)	documentation of basic cardiac life support (BCLS) and advanced cardiac life support (ACLS) certification.
IV.A.6.a).(4).(b)	Medical Knowledge
IV.A.6.a).(4).(b).(i)	documentation of conference presentations, external courses and meetings attended, and self-assessment modules completed;
IV.A.6.a).(4).(b).(ii)	documentation of compliance with regulatory-based training requirements; and
IV.A.6.a).(4).(b).(iii)	documentation of performance on the annual in-training examination.
IV.A.6.a).(4).(c)	Practice-based Learning and Improvement
IV.A.6.a).(4).(c).(i)	annual resident self-assessment and learning plan.
IV.A.6.a).(4).(d)	Interpersonal and Communication Skills
IV.A.6.a).(4).(d).(i)	formal faculty evaluation of report quality.
IV.A.6.a).(4).(e)	Professionalism
IV.A.6.a).(4).(e).(i)	documentation of compliance with institutional and departmental policies; and,

- IV.A.6.a).(4).(e).(ii) status of medical license.
- IV.A.6.a).(4).(f) Systems-based Practice
- IV.A.6.a).(4).(f).(i) documentation of participation in identifying and implementing potential systems solutions.
- IV.A.6.a).(4).(g) Scholarly Activities
- IV.A.6.a).(4).(g).(i) documentation of scholarly activity, such as publications, announcement of presentations;
- IV.A.6.a).(4).(g).(ii) any additional materials requested by the program director; and,
- IV.A.6.a).(4).(g).(iii) submission of a scholarly activity to the program director for evaluation by the completion of the NM3 year.
- IV.A.6.b) Residents entering the program at the NM1 level must:
- IV.A.6.b).(1) participate in the stress component of myocardial perfusion exams;
- IV.A.6.b).(2) participate in radioiodine therapy for benign thyroid disease;
- IV.A.6.b).(3) participate with appropriate supervision in the performance of nuclear medicine procedures including bone scans, thyroid uptake and scans, hepatobiliary scans, and myocardial perfusion procedures;
- IV.A.6.b).(4) formulate a scholarly activity or research project and identify a faculty mentor for this activity during the NM1 year; and
- IV.A.6.b).(5) have no more than three months of elective rotations during the program; and,
- IV.A.6.b).(6) not exceed a total of three months of dedicated research time during the program.
- IV.A.6.c) Residents promoted to or entering the program at the NM2 level must:
- IV.A.6.c).(1) participate in a minimum of six months of CT experience;
- IV.A.6.c).(1).(a) A minimum of four months must be obtained on a

diagnostic radiology CT service.

- IV.A.6.c).(1).(b) The remaining two months may be continued on the diagnostic CT service and/or may be combined with a rotation that includes PET/CT or SPECT/CT.
- IV.A.6.c).(1).(c) This experience must be supervised by qualified faculty.
- IV.A.6.c).(1).(d) Residents who have satisfactorily completed an ACGME-, RCPSC-, or AOA-accredited diagnostic radiology program are exempt from the requirement.
- IV.A.6.c).(2) have no more than two months of elective rotations during the program. This does not apply to residents entering at the NM1 or NM3 level; and,
- IV.A.6.c).(3) not exceed a total of two months of dedicated research time during the program.
- IV.A.6.d) Residents entering the program at the NM3 level must:
 - IV.A.6.d).(1) have no more than one month of elective rotations; and,
 - IV.A.6.d).(2) not exceed a total of one month of dedicated research time during the program.

IV.B. Residents' Scholarly Activities

IV.B.1. The curriculum must advance residents' knowledge of the basic principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care.

IV.B.2. Residents should participate in scholarly activity.

- IV.B.2.a) All residents must participate in a scholarly project under faculty supervision.
 - IV.B.2.a).(1) The scholarly project should take the form of laboratory research, clinical research, or the analysis of disease processes, imaging techniques, or practice management issues.
 - IV.B.2.a).(2) The results of such projects must be published or presented at institutional, local, regional, or national meetings, and included in the Resident Learning Portfolio.
 - IV.B.2.a).(3) The program must specify how each project will be evaluated.

IV.B.3. The sponsoring institution and program should allocate adequate educational resources to facilitate resident involvement in scholarly activities.

V. Evaluation

V.A. Resident Evaluation

V.A.1. Formative Evaluation

V.A.1.a) The faculty must evaluate resident performance in a timely manner during each rotation or similar educational assignment, and document this evaluation at completion of the assignment.

V.A.1.b) The program must:

V.A.1.b).(1) provide objective assessments of competence in patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice;

V.A.1.b).(2) use multiple evaluators (e.g., faculty, peers, patients, self, and other professional staff);

V.A.1.b).(3) document progressive resident performance improvement appropriate to educational level; and,

V.A.1.b).(4) provide each resident with documented semiannual evaluation of performance with feedback.

V.A.1.c) The evaluations of resident performance must be accessible for review by the resident, in accordance with institutional policy.

V.A.1.d) Residents must participate in the annual in-training examination. The results of this examination must be used only to identify deficiencies in knowledge and to assist in developing a remediation plan.

V.A.2. Summative Evaluation

The program director must provide a summative evaluation for each resident upon completion of the program. This evaluation must become part of the resident's permanent record maintained by the institution, and must be accessible for review by the resident in accordance with institutional policy. This evaluation must:

V.A.2.a) document the resident's performance during the final period of education, and

V.A.2.b) verify that the resident has demonstrated sufficient competence to enter practice without direct supervision.

V.B. Faculty Evaluation

V.B.1. At least annually, the program must evaluate faculty performance as it relates to the educational program.

V.B.2. These evaluations should include a review of the faculty's clinical teaching abilities, commitment to the educational program, clinical knowledge, professionalism, and scholarly activities.

V.B.3. This evaluation must include at least annual written confidential evaluations by the residents.

V.B.3.a) Faculty must receive annual feedback from these resident evaluations.

V.C. Program Evaluation and Improvement

V.C.1. The program must document formal, systematic evaluation of the curriculum at least annually. The program must monitor and track each of the following areas:

V.C.1.a) resident performance;

V.C.1.b) faculty development;

V.C.1.c) graduate performance, including performance of program graduates on the certification examination; and,

V.C.1.d) program quality. Specifically:

V.C.1.d).(1) Residents and faculty must have the opportunity to evaluate the program confidentially and in writing at least annually, and

V.C.1.d).(2) The program must use the results of residents' assessments of the program together with other program evaluation results to improve the program.

V.C.2. If deficiencies are found, the program should prepare a written plan of action to document initiatives to improve performance in the areas listed in section V.C.1. The action plan should be reviewed and approved by the teaching faculty and documented in meeting minutes.

V.C.3. At least 50% of a program's graduates from the preceding five years taking the American Board of Nuclear Medicine certifying examination for the first time should pass.

VI. Resident Duty Hours in the Learning and Working Environment

VI.A. Professionalism, Personal Responsibility, and Patient Safety

- VI.A.1. Programs and sponsoring institutions must educate residents and faculty members concerning the professional responsibilities of physicians to appear for duty appropriately rested and fit to provide the services required by their patients.**
- VI.A.2. The program must be committed to and responsible for promoting patient safety and resident well-being in a supportive educational environment.**
- VI.A.3. The program director must ensure that residents are integrated and actively participate in interdisciplinary clinical quality improvement and patient safety programs.**
- VI.A.4. The learning objectives of the program must:**
- VI.A.4.a) be accomplished through an appropriate blend of supervised patient care responsibilities, clinical teaching, and didactic educational events; and,**
 - VI.A.4.b) not be compromised by excessive reliance on residents to fulfill non-physician service obligations.**
- VI.A.5. The program director and institution must ensure a culture of professionalism that supports patient safety and personal responsibility. Residents and faculty members must demonstrate an understanding and acceptance of their personal role in the following:**
- VI.A.5.a) assurance of the safety and welfare of patients entrusted to their care;**
 - VI.A.5.b) provision of patient- and family-centered care;**
 - VI.A.5.c) assurance of their fitness for duty;**
 - VI.A.5.d) management of their time before, during, and after clinical assignments;**
 - VI.A.5.e) recognition of impairment, including illness and fatigue, in themselves and in their peers;**
 - VI.A.5.f) attention to lifelong learning;**
 - VI.A.5.g) the monitoring of their patient care performance improvement indicators; and,**

- VI.A.5.h) honest and accurate reporting of duty hours, patient outcomes, and clinical experience data.**
- VI.A.6. All residents and faculty members must demonstrate responsiveness to patient needs that supersedes self-interest. Physicians must recognize that under certain circumstances, the best interests of the patient may be served by transitioning that patient's care to another qualified and rested provider.**
- VI.B. Transitions of Care**
- VI.B.1. Programs must design clinical assignments to minimize the number of transitions in patient care.**
- VI.B.2. Sponsoring institutions and programs must ensure and monitor effective, structured hand-over processes to facilitate both continuity of care and patient safety.**
- VI.B.3. Programs must ensure that residents are competent in communicating with team members in the hand-over process.**
- VI.B.4. The sponsoring institution must ensure the availability of schedules that inform all members of the health care team of attending physicians and residents currently responsible for each patient's care.**
- VI.C. Alertness Management/Fatigue Mitigation**
- VI.C.1. The program must:**
- VI.C.1.a) educate all faculty members and residents to recognize the signs of fatigue and sleep deprivation;**
- VI.C.1.b) educate all faculty members and residents in alertness management and fatigue mitigation processes; and,**
- VI.C.1.c) adopt fatigue mitigation processes to manage the potential negative effects of fatigue on patient care and learning, such as naps or back-up call schedules.**
- VI.C.2. Each program must have a process to ensure continuity of patient care in the event that a resident may be unable to perform his/her patient care duties.**
- VI.C.3. The sponsoring institution must provide adequate sleep facilities and/or safe transportation options for residents who may be too fatigued to safely return home.**
- VI.D. Supervision of Residents**
- VI.D.1. In the clinical learning environment, each patient must have an**

identifiable, appropriately-credentialed and privileged attending physician (or licensed independent practitioner as approved by each Review Committee) who is ultimately responsible for that patient's care.

VI.D.1.a) This information should be available to residents, faculty members, and patients.

VI.D.1.b) Residents and faculty members should inform patients of their respective roles in each patient's care.

VI.D.2. The program must demonstrate that the appropriate level of supervision is in place for all residents who care for patients.

Supervision may be exercised through a variety of methods. Some activities require the physical presence of the supervising faculty member. For many aspects of patient care, the supervising physician may be a more advanced resident or fellow. Other portions of care provided by the resident can be adequately supervised by the immediate availability of the supervising faculty member or resident physician, either in the institution, or by means of telephonic and/or electronic modalities. In some circumstances, supervision may include post-hoc review of resident-delivered care with feedback as to the appropriateness of that care.

VI.D.3. Levels of Supervision

To ensure oversight of resident supervision and graded authority and responsibility, the program must use the following classification of supervision:

VI.D.3.a) Direct Supervision – the supervising physician is physically present with the resident and patient.

VI.D.3.b) Indirect Supervision:

VI.D.3.b).(1) with direct supervision immediately available – the supervising physician is physically within the hospital or other site of patient care, and is immediately available to provide Direct Supervision.

VI.D.3.b).(2) with direct supervision available – the supervising physician is not physically present within the hospital or other site of patient care, but is immediately available by means of telephonic and/or electronic modalities, and is available to provide Direct Supervision.

VI.D.3.c) Oversight – the supervising physician is available to provide review of procedures/encounters with feedback provided after care is delivered.

VI.D.4. The privilege of progressive authority and responsibility, conditional independence, and a supervisory role in patient care delegated to each resident must be assigned by the program director and faculty members.

VI.D.4.a) The program director must evaluate each resident's abilities based on specific criteria. When available, evaluation should be guided by specific national standards-based criteria.

VI.D.4.b) Faculty members functioning as supervising physicians should delegate portions of care to residents, based on the needs of the patient and the skills of the residents.

VI.D.4.c) Senior residents or fellows should serve in a supervisory role of junior residents in recognition of their progress toward independence, based on the needs of each patient and the skills of the individual resident or fellow.

VI.D.5. Programs must set guidelines for circumstances and events in which residents must communicate with appropriate supervising faculty members, such as the transfer of a patient to an intensive care unit, or end-of-life decisions.

VI.D.5.a) Each resident must know the limits of his/her scope of authority, and the circumstances under which he/she is permitted to act with conditional independence.

VI.D.5.a).(1) In particular, PGY-1 residents should be supervised either directly or indirectly with direct supervision immediately available. [

VI.D.6. Faculty supervision assignments should be of sufficient duration to assess the knowledge and skills of each resident and delegate to him/her the appropriate level of patient care authority and responsibility.

VI.E. Clinical Responsibilities

The clinical responsibilities for each resident must be based on PGY-level, patient safety, resident education, severity and complexity of patient illness/condition and available support services.

VI.F. Teamwork

Residents must care for patients in an environment that maximizes effective communication. This must include the opportunity to work as a member of effective interprofessional teams that are appropriate to the delivery of care in the specialty.

VI.G. Resident Duty Hours

VI.G.1. Maximum Hours of Work per Week

Duty hours must be limited to 80 hours per week, averaged over a four-week period, inclusive of all in-house call activities and all moonlighting.

VI.G.1.a) Duty Hour Exceptions

A Review Committee may grant exceptions for up to 10% or a maximum of 88 hours to individual programs based on a sound educational rationale.

The Review Committee for Nuclear Medicine will not consider requests for exceptions to the 80-hour limit to the residents' work week.

VI.G.1.a).(1) In preparing a request for an exception the program director must follow the duty hour exception policy from the ACGME Manual on Policies and Procedures.

VI.G.1.a).(2) Prior to submitting the request to the Review Committee, the program director must obtain approval of the institution's GMEC and DIO.

VI.G.2. Moonlighting

VI.G.2.a) Moonlighting must not interfere with the ability of the resident to achieve the goals and objectives of the educational program.

VI.G.2.b) Time spent by residents in Internal and External Moonlighting (as defined in the ACGME Glossary of Terms) must be counted towards the 80-hour Maximum Weekly Hour Limit.

VI.G.2.c) PGY-1 residents are not permitted to moonlight.

VI.G.3. Mandatory Time Free of Duty

Residents must be scheduled for a minimum of one day free of duty every week (when averaged over four weeks). At-home call cannot be assigned on these free days.

VI.G.4. Maximum Duty Period Length

VI.G.4.a) Duty periods of PGY-1 residents must not exceed 16 hours in duration.

VI.G.4.b) Duty periods of PGY-2 residents and above may be scheduled to a maximum of 24 hours of continuous duty in the hospital. Programs must encourage residents to use

alertness management strategies in the context of patient care responsibilities. Strategic napping, especially after 16 hours of continuous duty and between the hours of 10:00 p.m. and 8:00 a.m., is strongly suggested.

VI.G.4.b).(1) It is essential for patient safety and resident education that effective transitions in care occur. Residents may be allowed to remain on-site in order to accomplish these tasks; however, this period of time must be no longer than an additional four hours.

VI.G.4.b).(2) Residents must not be assigned additional clinical responsibilities after 24 hours of continuous in-house duty.

VI.G.4.b).(3) In unusual circumstances, residents, on their own initiative, may remain beyond their scheduled period of duty to continue to provide care to a single patient. Justifications for such extensions of duty are limited to reasons of required continuity for a severely ill or unstable patient, academic importance of the events transpiring, or humanistic attention to the needs of a patient or family.

VI.G.4.b).(3).(a) Under those circumstances, the resident must:

VI.G.4.b).(3).(a).(i) appropriately hand over the care of all other patients to the team responsible for their continuing care; and,

VI.G.4.b).(3).(a).(ii) document the reasons for remaining to care for the patient in question and submit that documentation in every circumstance to the program director.

VI.G.4.b).(3).(b) The program director must review each submission of additional service, and track both individual resident and program-wide episodes of additional duty.

VI.G.5. Minimum Time Off between Scheduled Duty Periods

VI.G.5.a) PGY-1 residents should have 10 hours, and must have eight hours, free of duty between scheduled duty periods.

VI.G.5.b) Intermediate-level residents should have 10 hours free of duty, and must have eight hours between scheduled duty periods. They must have at least 14 hours free of duty after 24 hours of in-house duty.

NM-1 and NM-2 residents are considered to be at the intermediate

level.

VI.G.5.c) Residents in the final years of education must be prepared to enter the unsupervised practice of medicine and care for patients over irregular or extended periods.

NM-3 level residents are considered to be in the final years of education.

VI.G.5.c).(1) This preparation must occur within the context of the 80-hour, maximum duty period length, and one-day-off-in-seven standards. While it is desirable that residents in their final years of education have eight hours free of duty between scheduled duty periods, there may be circumstances when these residents must stay on duty to care for their patients or return to the hospital with fewer than eight hours free of duty.

VI.G.5.c).(1).(a) Circumstances of return-to-hospital activities with fewer than eight hours away from the hospital by residents in their final years of education must be monitored by the program director.

VI.G.5.c).(1).(b) The Review Committee defines such circumstances as: required continuity of care for a severely ill or unstable patient, or a complex patient with whom the resident has been involved; events of exceptional educational value; or, humanistic attention to the needs of a patient or family.

VI.G.6. Maximum Frequency of In-House Night Float

Residents must not be scheduled for more than six consecutive nights of night float.

VI.G.7. Maximum In-House On-Call Frequency

PGY-2 residents and above must be scheduled for in-house call no more frequently than every-third-night (when averaged over a four-week period).

VI.G.8. At-Home Call

VI.G.8.a) Time spent in the hospital by residents on at-home call must count towards the 80-hour maximum weekly hour limit. The frequency of at-home call is not subject to the every-third-night limitation, but must satisfy the requirement for one-day-in-seven free of duty, when averaged over four weeks.

VI.G.8.a).(1) At-home call must not be so frequent or taxing as to

preclude rest or reasonable personal time for each resident.

VI.G.8.b) Residents are permitted to return to the hospital while on at-home call to care for new or established patients. Each episode of this type of care, while it must be included in the 80-hour weekly maximum, will not initiate a new “off-duty period”.

VII. Innovative Projects

Requests for innovative projects that may deviate from the institutional, common and/or specialty specific program requirements must be approved in advance by the Review Committee. In preparing requests, the program director must follow Procedures for Approving Proposals for Innovative Projects located in the ACGME Manual on Policies and Procedures. Once a Review Committee approves a project, the sponsoring institution and program are jointly responsible for the quality of education offered to residents for the duration of such a project.

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