



ACGME International

**Advanced Specialty Program Requirements for Graduate
Medical Education in
Radiology**

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Radiology**

I. Introduction

I.A. Definition and Scope of the Specialty

Radiology encompasses image-based diagnosis and image-guided therapeutic techniques, and includes: computed tomography (CT); interventional procedures; magnetic resonance imaging (MRI); medical physics; nuclear radiology and molecular imaging; radiography/fluoroscopy; ultrasonography; and radiology quality and safety.

Radiology educational content includes diagnostic imaging and related image-guided interventions in the content areas of breast, cardiac, gastrointestinal, musculoskeletal, neurologic, pediatric, reproductive and endocrine, thoracic, urinary, and vascular.

I.B. Duration of Education

I.B.1. The education in radiology must be 48 or 60 months in length.

I.B.1.a) If the program includes an integrated broad-based clinical year, 12 additional months must be added to the program's length.

II. Institutions

II.A. Sponsoring Institution

See International Foundational Requirement, Section I.A.

II.B. Participating Sites

II.B.1. Radiology education should occur in environments with other residents and/or fellows from other specialties at the Sponsoring Institution and/or participating sites to facilitate the interchange of knowledge and experience among the residents.

II.B.2. Programs using multiple participating sites must ensure the provision of a cohesive educational experience.

II.B.3. Each participating site must offer meaningful educational opportunities that enrich the overall program.

III. Program Personnel and Resources

III.A. Program Director

III.A.1. In addition to program administration, the program director should maintain an active practice in radiology.

- III.A.2. The program director must:
- III.A.2.a) review resident procedural experiences at least annually to ensure complete and accurate tracking in the ACGME-I Case Log System throughout the entire educational program; and,
 - III.A.2.b) participate in faculty development activities facilitated by graduate medical education organizations and/or meetings.

III.B. Faculty

- III.B.1. There must be at least one core physician faculty member in each of the following practice domains:
- III.B.1.a) abdominal (gastrointestinal and genitourinary) radiology,
 - III.B.1.b) breast radiology,
 - III.B.1.c) cardiothoracic (thoracic and cardiac) radiology,
 - III.B.1.d) interventional radiology,
 - III.B.1.e) musculoskeletal radiology,
 - III.B.1.f) neuroradiology,
 - III.B.1.g) nuclear radiology and molecular imaging, and
 - III.B.1.h) pediatric radiology.
- III.B.2. One core faculty member must be responsible for the educational content of his or her respective practice domain, and must organize conferences that cover topics in that domain.
- III.B.2.a) Core faculty members must devote 50 percent of their time in the practice domain, and must demonstrate a commitment to the domain. Such commitment should be demonstrated by any two of the following:
 - III.B.2.a).(1) specialty/subspecialty certification, successful completion of a fellowship, or three years of practice in the domain;
 - III.B.2.a).(2) active participation in clinical or academic societies associated with the practice domain;
 - III.B.2.a).(3) publications and presentations in the practice domain; or,
 - III.B.2.a).(4) annual continuing medical education credits in the practice domain.

III.B.3. There must be one physician faculty member who ensures that subject matter experts develop and conduct didactic sessions in each of the following:

III.B.3.a) CT;

III.B.3.b) MRI;

III.B.3.c) radiography/fluoroscopy;

III.B.3.d) reproductive/endocrine imaging;

III.B.3.e) ultrasonography; and,

III.B.3.f) vascular imaging.

III.B.4. There should be physician faculty, non-physician faculty, or other staff members available to the program, within the institution, with expertise in quality, safety, and informatics.

III.B.4.a) These faculty or staff members should develop didactic content related to their area of expertise.

III.B.5. No faculty member should have primary responsibility for the educational content of more than one practice domain, although faculty members may have clinical responsibilities and/or teaching responsibilities in several practice domains.

III.C. Other Program Personnel

III.C.1. There must be a dedicated program coordinator who has sufficient time to fulfill the responsibilities essential in meeting the educational goals and administrative requirements of the program.

III.D. Resources

III.D.1. The program must provide adequate space, necessary equipment, and modern facilities to ensure an effective educational experience for residents in all of the required rotations, including interventional radiology.

III.D.2. The program must ensure sufficient volume and variety of pediatric and adult patients for residents to gain experience in the full spectrum of radiological examinations, procedures, and interpretations.

III.D.2.a) The program must have a volume of no fewer than 7,000 radiologic examinations per year per resident.

IV. Resident Appointment

IV.A. Eligibility Criteria

- IV.A.1. Residents must have successfully completed 12 months of a broad-based clinical program (PGY-1) that is:
- IV.A.1.a) accredited by ACGME-I, the Accreditation Council for Graduate Medical Education (ACGME), or the Royal College of Physicians and Surgeons of Canada (RCPSC) in preliminary general surgery, preliminary internal medicine, or the transitional year; or,
 - IV.A.1.b) at the discretion of the Review Committee-International, a program where a governmental or regulatory body is responsible for the maintenance of a curriculum providing clinical and didactic experiences to develop competence in the fundamental clinical skills of medicine; or,
 - IV.A.1.b).(1) A residency that accepts candidates from these programs must complete an evaluation of each resident's fundamental clinical skills within six weeks of matriculation, and must provide remediation to residents as needed.
 - IV.A.1.c) integrated into the residency where the program director must oversee and ensure the quality of didactic and clinical education.
- IV.A.2. The PGY-1 must be completed in a structured program in which residents are educated in high-quality medical care based on scientific knowledge, evidence-based medicine, and sound teaching by qualified educators.
- IV.A.3. With appropriate supervision, residents must have first-contact responsibility for evaluation and management for all types and acuity levels of patients.
- IV.A.4. Residents must have responsibility for decision-making and direct patient care in all settings, to include the writing of orders, progress notes, and relevant records.
- IV.A.5. Residents must develop competence in the following fundamental clinical skills during the PGY-1:
- IV.A.5.a) obtaining a comprehensive medical history;
 - IV.A.5.b) performing a comprehensive physical examination;
 - IV.A.5.c) assessing a patient's medical condition;
 - IV.A.5.d) making appropriate use of diagnostic studies and tests;
 - IV.A.5.e) integrating information to develop a differential diagnosis; and,
 - IV.A.5.f) developing, implementing, and evaluating a treatment plan.

IV.B. Number of Residents

IV.B.1. There must be a minimum number of two residents per year of the educational program.

V. Specialty-Specific Educational Program

V.A. Regularly Scheduled Didactic Sessions

V.A.1. If it includes an integrated PGY-1, the educational program must contain regularly scheduled didactic sessions that enhance and correspond to the residents' fundamental clinical skills education.

V.A.2. The curriculum must include at least five hours per week of didactic (classroom and laboratory training) education.

V.A.3. There must be interactive conferences and interdepartmental conferences in which both residents and faculty members participate.

V.A.4. Residents must be provided with protected time to attend lectures and conferences scheduled by the program.

V.A.4.a) The program must provide mechanisms for residents to participate in all scheduled didactic sessions either in-person or by electronic means.

V.A.5. The didactic curriculum must include:

V.A.5.a) anatomy, disease processes, imaging and physiology;

V.A.5.b) specialty/subspecialty clinical and general content;

V.A.5.c) topics related to professionalism, physician well-being, diversity, and ethics;

V.A.5.d) training in the clinical application of medical physics, distributed throughout the educational program;

V.A.5.d).(1) A medical physicist must oversee the development of the physics curriculum.

V.A.5.e) content integral to the practice of nuclear radiology, including,

V.A.5.e).(1) radiation physics, instrumentation, and radiation biology;

V.A.5.e).(2) radiation protection;

V.A.5.e).(3) mathematics pertaining to use and measurement of radioactivity;

V.A.5.e).(4) the chemistry of byproduct material for medical use; and,

V.A.5.e).(5) classroom and laboratory training in basic radionuclide handling techniques.

V.B. Clinical Experiences

V.B.1. If the program includes an integrated PGY-1, this experience must include a minimum of 11 months of direct patient care.

V.B.1.a) During the integrated PGY-1, each resident's experiences must include responsibility for patient care commensurate with his or her ability.

V.B.1.a).(1) Residents must have responsibility for decision-making and direct patient care in all settings, subject to review and approval by senior-level residents and/or attending physicians, to include the planning of care and the writing of orders, progress notes, and relevant records.

V.B.1.b) At a minimum, 28 weeks must be in rotations provided by a discipline or disciplines that offer fundamental clinical skills in the primary specialties, such as emergency medicine, family medicine, general surgery, internal medicine, obstetrics and gynecology, or pediatrics.

V.B.1.b).(1) Subspecialty experiences, with the exception of critical care unit experiences, must not be used to meet fundamental clinical skills curriculum requirements.

V.B.1.b).(2) Each experience must occur through, at minimum, a four-week continuous block.

V.B.1.c) At a minimum, residents must have 140 hours of experience in ambulatory care provided in family medicine or primary care internal medicine, general surgery, obstetrics and gynecology, or pediatrics.

V.B.1.d) Residents must have a maximum of 20 weeks of elective experiences.

V.B.1.d).(1) Elective rotations should be determined by the educational needs of the individual resident.

V.B.2. Resident participation in patient care and radiology-related activities must occur throughout the entire educational program in radiology.

V.B.3. Resident participation in on-call activities, including being on-duty after-hours and on weekends or holidays, should begin in the second year of the program and occur throughout the remainder of the program.

- V.B.3.a) Resident on-call experiences must include interpretation, reporting, and management of active cases, and must not include administrative roles or duties consisting primarily of re-review of previously reported cases.
- V.B.4. Programs must include clinical experiences in nuclear radiology (including PET and nuclear cardiology), ultrasonography (including obstetrical and vascular ultrasound), and the 10 content areas of breast, cardiac, gastrointestinal, musculoskeletal, neurologic, pediatric, reproductive and endocrine, thoracic, urinary, and vascular radiology.
- V.B.4.a) For programs with 48 months of education in radiology, the maximum period of education in any one of these areas must be 16 months.
- V.B.4.b) For programs with 60 months of education in radiology, the maximum period of education in any one of these areas must be 20 months.
- V.B.5. Residents must have education and experience in clinical nuclear radiology.
- V.B.5.a) Residents must have education and work experience under supervision of a faculty member with expertise in basic radionuclide handling techniques and radiation safety applicable to the medical use of unsealed byproduct material for imaging and localization studies and oral administration of sodium iodide I-131.
- V.B.5.b) Supervised work experience, at a minimum, must involve all operational and quality control procedures integral to the practice of nuclear radiology, including:
- V.B.5.b).(1) receiving packages;
 - V.B.5.b).(2) using generator systems;
 - V.B.5.b).(3) calibrating and administering unsealed radioactive materials for diagnostic and therapeutic use;
 - V.B.5.b).(4) completing written directives;
 - V.B.5.b).(5) adhering to the ALARA (as low as reasonable achievable) principle;
 - V.B.5.b).(6) ensuring radiation protection in practice, to include dosimeters, exposure limits, and signage;
 - V.B.5.b).(7) using radiation-measuring instruments;
 - V.B.5.b).(8) conducting area surveys;
 - V.B.5.b).(9) managing radioactive waste;

- V.B.5.b).(10) preventing medical events; and,
- V.B.5.b).(11) responding to radiation spills and accidents.
- V.B.5.c) Under supervision, residents must participate in cases involving the oral administration of sodium iodide I-131.
- V.B.6. Residents must have clinical rotations in breast imaging.
- V.B.6.a) Residents should document the interpretation/multi-reading of mammograms in the ACGME-I Case Log System, and must meet the procedural minimums as defined by the Review Committee.
- V.B.7. Residents must have documented supervised experience in interventional procedures, including image-guided biopsies, drainage procedures, angioplasty, embolization and infusion procedures, and other percutaneous interventional procedures, to include the performance, interpretation, and complications of vascular, interventional, and invasive procedures.
- V.B.8. Residents must maintain current certification in advanced cardiac life-support.
- V.B.9. Residents should have experience in sedation analgesia.

V.C. Residents' Scholarly Activities

- V.C.1. Residents must have education and training in critical thinking skills and research design.
- V.C.2. All residents must engage in a scholarly project under faculty member supervision.
- V.C.3. The results of such projects must be published or presented at institutional, local, regional, or national meetings.
- V.C.4. The program should specify how each project will be evaluated.

V.D. Duty Hour and Work Limitations

- V.D.1. Supervision of Residents
 - V.D.1.a) Faculty supervision must be available at all participating sites.
 - V.D.1.b) The program must systematically review the radiologic images evaluated only by residents to ensure accuracy by having all resident reports signed and reviewed by faculty members within 24 hours.
 - V.D.1.c) Residents must interpret examinations with direct supervision until they have completed at least 12 months of radiology training.

V.D.1.d) Faculty members must always be available when residents are on call after hours, on weekends, or on holidays.

VI. ACGME-I Competencies

VI.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.

VI.A.1. Residents must demonstrate proficiency in:

VI.A.1.a) using safe, efficient, appropriate, and quality-controlled diagnostic radiology techniques;

VI.A.1.b) interpreting CT, MRI, radiography, and radionuclide imaging of the cardiovascular system (heart and great vessels);

VI.A.1.c) interpreting images obtained during the performance of interventional procedures, and integration of the imaging findings into the procedure;

VI.A.1.d) generating ultrasound images using the transducer and imaging system, and interpretation of ultrasonographic examinations of various types;

VI.A.1.e) applying low-dose radiation to adults and children;

VI.A.1.f) using needles, catheters, guide wires, balloons, stents, stent-grafts, vascular filters, embolic agents, biopsy devices, ablative technologies, and other interventional devices;

VI.A.1.g) managing contrast reactions;

VI.A.1.h) communicating effectively and in a timely manner the results of procedures, studies, and examinations to the referring physician and/or other appropriate individuals;

VI.A.1.i) accessing, interpreting, and applying best scientific evidence to the care of patients (evidence-based medicine);

VI.A.1.j) exhibiting ongoing awareness of radiation exposure, protection, and safety, as well as the application of these principles in imaging; and,

VI.A.1.k) administering pharmacologic agents, including sedatives, analgesics, antibiotics, and other drugs commonly employed in conjunction with endovascular, invasive, and non-vascular procedures.

VI.A.2. Residents must be able to:

- VI.A.2.a) perform basic image-guided procedures;
- VI.A.2.b) perform invasive diagnostic venous and arterial imaging; and,
- VI.A.2.c) demonstrate clinical judgement and technical ability to perform vascular and non-vascular image-guided interventions on a sufficient variety of patients and pathological conditions to allow for competent post-graduate practice.

VI.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 must demonstrate proficiency in their knowledge of:

- VI.B.1. the principles of medical imaging physics, including CT, dual-energy X-ray absorptiometry, fluoroscopy, gamma camera and hybrid imaging technologies, MRI, radiography, and ultrasonography;
- VI.B.2. health care economics;
- VI.B.3. appropriate and patient-centered imaging utilization;
- VI.B.4. quality improvement techniques;
- VI.B.5. physiology, utilization, and safety of contrast agents and pharmaceuticals; and,
- VI.B.6. radiologic/pathologic correlation.

VI.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:

- VI.C.1. identify strengths, deficiencies, and limits in one's knowledge and expertise;
- VI.C.2. set learning and improvement goals;
- VI.C.3. identify and perform appropriate learning activities;
- VI.C.4. systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement;
- VI.C.5. incorporate formative evaluation feedback into daily practice;

- VI.C.6. locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;
- VI.C.7. use information technology to optimize learning; and,
- VI.C.8. participate in the education of patients, families, students, residents, and other health professionals.

VI.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 must:

- VI.D.1. communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds;
- VI.D.2. communicate effectively with physicians, other health professionals, and health-related agencies;
- VI.D.3. work effectively as a member or leader of a health care team or other professional group;
- VI.D.4. act in a consultative role to other physicians and health professionals; and,
- VI.D.5. maintain comprehensive, timely, and legible medical records, if applicable; and,
- VI.D.6. demonstrate competence in obtaining informed consent and effectively describing imaging appropriateness, safety issues, and the results of diagnostic imaging and procedures to patients;
- VI.D.7. supervise, provide consultation, and teach medical students and/or residents; and,
- VI.D.8. function as a consultant for other health care professionals, and acting as a resource for information regarding the most appropriate use of imaging resources.

VI.E. Professionalism

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

- VI.E.1. compassion, integrity, and respect for others;
- VI.E.2. responsiveness to patient needs that supersedes self-interest;
- VI.E.3. respect for patient privacy and autonomy;

- VI.E.4. accountability to patients, society and the profession;
- VI.E.5. sensitivity and responsiveness to a diverse patient population, including to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation; and,
- VI.E.6. ethical and medical jurisprudence.

VI.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 must:

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