



ACGME International

**Advanced Specialty Program Requirements for
Graduate Medical Education in
Neurological Surgery**

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I Introduction

I.A. Definition and Scope of Specialty

Neurological surgery is the surgical specialty that provides: operative and non-operative management (i.e., prevention, diagnosis, evaluation, interpretation of imaging, treatment, critical care, and rehabilitation) of disorders of the central, peripheral, and autonomic nervous systems, including their supporting structures and vascular supply; the evaluation and treatment of pathological processes that modify the function or activity of the nervous system, including the hypophysis; and the operative and non-operative management of pain.

I.B. Duration of Education

I.B.1. The education in neurological surgery must be 84 or 96 months in length.

II Institutions

II.A. Sponsoring Institution

II.A.1. The Sponsoring Institution should also sponsor ACGME International (ACGME-I)-accredited programs in anesthesiology, diagnostic radiology, general surgery, internal medicine, neurology, and pediatrics.

II.A.2. There should be clinical resources in anesthesiology, critical care, emergency medicine, endocrinology, ophthalmology, otolaryngology, pathology, and psychiatry for the education of residents.

II.B. Participating Sites

II.B.1. All participating sites in the program should have at least 100 major neurological surgery procedures per year distributed among the spectrum of cases (see III.D.2.).

II.B.1.a) Exceptions to the required number of major neurological surgery procedures would necessitate the offering of special clinical resources (e.g., stereotaxy, trauma, or pediatric neurological surgery) that significantly augment the availability of index cases for residents.

II.B.2. Participating sites should not be so geographically remote from one another as to provide an undue travel burden to residents.

III Program Personnel and Resources

III.A. Program Director

See International Foundational Requirements, Section II.A.

III.B. Faculty

- III.B.1. There must be a minimum of three faculty neurological surgeons at the primary clinical teaching site.
- III.B.2. Site directors at each participating sites must:
 - III.B.2.a) be qualified neurological surgeons appointed by and accountable to the program director for the educational activities at their respective sites;
 - III.B.2.b) be responsible for the education and evaluation of the residents at their respective sites;
 - III.B.2.c) supervise the teaching activities and monitor the professional standing of other faculty neurological surgeons at their respective sites; and,
 - III.B.2.d) have major clinical responsibilities at their respective sites.
- III.B.3. Physician faculty members must:
 - III.B.3.a) have an established, in-depth understanding of pathophysiology and clinical neurosurgical practice;
 - III.B.3.b) demonstrate elements of evidence-based practice; and,
 - III.B.3.c) document ongoing participation in activities that expose them to new developments in the field.

III.C. Other Program Personnel

See International Foundational Requirements, Section II.C.

III.D. Resources

- III.D.1. Patient Population
 - III.D.1.a) There must be a sufficient number and variety of patients admitted each year across all clinical facilities available to the program to ensure that residents participate in the care of patients suffering from the full spectrum of neurosurgical diseases.
 - III.D.1.b) Within the total clinical facilities available to the program, there should be a minimum of 500 major neurological surgery procedures per year per graduating resident.

- III.D.1.b).(1) Residents' surgical cases should represent a well-balanced spectrum of neurological surgery cases in both adults and children.
- III.D.1.b).(2) This spectrum of surgical cases should include:
 - III.D.1.b).(2).(a) cerebrospinal fluid diversion procedures, including endoscopy, endovascular neurosurgery, and functional/epilepsy surgery;
 - III.D.1.b).(2).(b) craniotomies for trauma, neoplasms, aneurysms, and vascular malformations;
 - III.D.1.b).(2).(c) extracranial carotid artery surgery;
 - III.D.1.b).(2).(d) transsphenoidal and stereotaxic surgery, including radiosurgery;
 - III.D.1.b).(2).(e) pain management; and,
 - III.D.1.b).(2).(f) spinal procedures, of a sufficient number and variety, using modern techniques.

III.D.2. Inpatient Facilities

- III.D.2.a) Inpatient facilities should have an adequate number of beds, support personnel, and proper equipment to ensure quality education, support for peri-operative care of index case patient volume thresholds, and excellence in overall patient care.
- III.D.2.b) Neurological surgery beds should be on a unit designated for the care of neurological surgery patients.

III.D.3. Research Facilities

- III.D.3.a) There should be space and support personnel for research identified in the neurological surgery division or department, with active research and publication efforts.
- III.D.3.b) Clinical and/or basic research opportunities should be available to residents, with faculty member supervision.

IV Resident Appointments

IV.A. Eligibility Criteria

See International Foundational Requirements, Section III.A.

IV.B. Number of Residents

IV.B.1. There should be at least one resident in each year of the program.

V Specialty-Specific Educational Program

V.A. Regularly Scheduled Didactic Sessions

V.A.1. Conferences must be coordinated among participating sites to allow attendance by a majority of faculty members and residents.

V.A.2. A conference attendance record for both residents and faculty members should be maintained.

V.A.3. Residents should be protected from clinical responsibilities during didactics.

V.A.4. Didactic sessions must include:

V.A.4.a) basic sciences, neuropathology, radiation oncology, and basic physics as they relate to tumors of the central nervous system and the late effects of radiation on the central nervous system, as well as topics related to all required patient care and medical knowledge outcomes;

V.A.4.b) the surgical, endovascular, radiation therapy, and conservative management of adult and pediatric patients with disorders of the nervous system;

V.A.4.c) disorders of the brain, meninges, skull (including skull base), and their blood supply, including the surgical and endovascular treatment of disorders of the intracranial and extracranial vasculature supplying the brain and spinal cord;

V.A.4.d) disorders of the pituitary gland;

V.A.4.e) disorders of the spinal cord, meninges, and vertebral column, including those that may require treatment by fusion, instrumentation, or endovascular techniques;

V.A.4.f) disorders of the cranial, peripheral, and spinal nerves throughout their distribution; and,

V.A.4.g) neuroradiology, including endovascular surgical neuroradiology, and neuropathology designed specifically for neurological surgery residents.

V.A.4.g).(1) These didactic sessions should be taught by qualified neuroradiologists and preferably endovascular neurological surgeons, and neuropathologists.

V.B. Clinical Experiences

V.B.1. The first year of education must be organized so that residents participate in clinical and didactic activities to:

V.B.1.a) develop the knowledge, attitudes, and skills needed to formulate principles and assess, plan, and initiate treatment of patients with surgical and medical problems;

V.B.1.b) be involved in the care of patients with surgical and medical emergencies, multiple organ system trauma, and nervous system injuries and diseases;

V.B.1.c) gain experience in the care of critically-ill surgical and medical patients;

V.B.1.d) participate in the pre-, intra-, and post-operative care of surgical patients; and,

V.B.1.e) develop basic surgical skills and an understanding of surgical anesthesia, including anesthetic risks and the management of intra-operative anesthetic complications.

V.B.2. The program must provide at least 54 months of clinical neurological surgery education at the primary clinical site or at an approved participating site.

V.B.2.a) At least 21 months of neurological surgery education must occur at the primary clinical site.

V.B.2.b) There must be a minimum of six months of structured education in general patient care and at least 42 months of operative neurological surgery.

V.B.2.c) During the first 18 months of education, residents must have at least three months of basic clinical neuroscience education and at least three months of critical care education applicable to the neurosurgical patient.

V.B.2.c).(1) Critical care education must include experience in the following procedures:

V.B.2.c).(1).(a) intracranial pressure (ICP) monitor placement;

V.B.2.c).(1).(b) external ventricular drain;

V.B.2.c).(1).(c) ventriculoperitoneal (VP) shunt tap/programming;

V.B.2.c).(1).(d) cervical spine traction (tongs/halo);

- V.B.2.c).(1).(e) stereotactic frame placement;
- V.B.2.c).(1).(f) central venous pressure (CVP) line placement;
- V.B.2.c).(1).(g) airway management (intubation/tracheostomy);
- V.B.2.c).(1).(h) arterial line placement; and,
- V.B.2.c).(1).(i) arteriography.
- V.B.3. Resident experiences must include:
 - V.B.3.a) participating in the management, including critical care and surgical care, of adult and pediatric patients, which should include the full spectrum of neurosurgical disorders;
 - V.B.3.b) making pre-operative decisions and participating in procedures, including surgical, endovascular, interventional, and radiological procedures; and,
 - V.B.3.c) active involvement in post-operative care and follow-up evaluation of their patients, to develop skills in assessing post-operative recovery, recognizing and treating complications, communicating with referring physicians, and developing the physician-patient relationship.
 - V.B.3.c).(1) Resident participation in and responsibility for operative procedures embracing the entire neurosurgical spectrum should increase progressively throughout the educational program.
- V.B.4. Residents must have opportunities to evaluate patients referred for elective surgery in an outpatient environment.
 - V.B.4.a) Under appropriate supervision, this experience should include obtaining a complete history, conducting an examination, ordering and interpreting diagnostic studies, including imaging as needed, and arriving independently at a diagnosis and plan of management.
 - V.B.4.b) Consonant with their skills and level of experience, residents should be actively involved in pre-operative decision making and subsequent operative procedures under the supervision of an attending physician.
- V.B.5. Residents must spend a 12-month period as chief resident on the neurological surgery clinical service in the Sponsoring Institution or at approved participating sites.
 - V.B.5.a) The chief resident must have major or primary responsibility for patient management with faculty member supervision.

V.B.5.b) The specific portion of the clinical education that constitutes the 12 months of chief residency must be specifically designated as the chief residency experience and must be identified as such at the time of program review.

V.B.5.c) The chief resident should have administrative responsibility designated by the program director.

V.C. Residents' Scholarly Activities

V.C.1. Residents must participate in the development of new knowledge, learn to evaluate research findings, and develop habits of inquiry as a continuing professional responsibility.

V.D. Duty Hour and Work Limitations

See International Subspecialty Foundational Requirements, Section VI

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. Residents must demonstrate proficiency in:

VI.A.1. gathering essential patient information in a timely manner;

VI.A.2. synthesizing and properly utilizing acquired patient data;

VI.A.3. generating a differential diagnosis and properly sequencing critical actions for patient care, including managing complications and morbidity and mortality;

VI.A.4. generating and implementing an effective plan of management;

VI.A.5. prioritizing and stabilizing multiple patients simultaneously;

VI.A.6. performing neurosurgical operative procedures, including;

VI.A.6.a) adult cranial procedures, to include:

VI.A.6.a).(1) craniotomy for brain tumors;

VI.A.6.a).(2) craniotomy for intracranial vascular lesions;

VI.A.6.a).(3) craniotomy for pain;

VI.A.6.a).(4) craniotomy for trauma;

VI.A.6.a).(5) endovascular/interventional procedures for intracranial cerebrovascular and neuro-oncologic conditions;

- VI.A.6.a).(6) extracranial vascular procedures (open surgery and endovascular);
- VI.A.6.a).(7) functional procedures;
- VI.A.6.a).(8) radiosurgery; and,
- VI.A.6.a).(9) VP shunt.
- VI.A.6.b) adult spinal procedures, to include:
 - VI.A.6.b).(1) anterior cervical approaches for decompression/stabilization;
 - VI.A.6.b).(2) posterior cervical approaches for decompression/stabilization;
 - VI.A.6.b).(3) interventional procedures for spinal conditions;
 - VI.A.6.b).(4) lumbar discectomy;
 - VI.A.6.b).(5) peripheral nerve procedures; and,
 - VI.A.6.b).(6) thoracic/lumbar instrumentation fusion.
- VI.A.6.c) pediatric procedures, to include:
 - VI.A.6.c).(1) craniotomy for brain tumor;
 - VI.A.6.c).(2) spinal procedures, including Chiari decompressions, laminectomy for dysraphism, laminectomy for spinal tumors, laminectomy for syringomyelia, and correction of spinal deformity;
 - VI.A.6.c).(3) craniotomy for trauma; and,
 - VI.A.6.c).(4) VP shunt.
- VI.A.6.d) craniotomy for epilepsy for adult and pediatric patients.
- VI.A.7. assessing post-operative recovery, recognizing and treating complications, communicating with referring physicians, and developing the physician-patient relationship;
- VI.A.8. analyzing patient outcomes; and,
- VI.A.9. providing health care services aimed at preventing health problems and maintaining health.

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 knowledge of:

- VI.B.1. neurosurgical emergencies;
- VI.B.2. treating neurosurgical conditions, including:
 - VI.B.3.a) cerebrovascular disorders;
 - VI.B.3.b) functional neurosurgery;
 - VI.B.3.c) neurocritical care;
 - VI.B.3.d) neuro-oncology;
 - VI.B.3.e) pain;
 - VI.B.3.f) pediatric neurological surgery;
 - VI.B.3.g) peripheral nerve disorders;
 - VI.B.3.h) spinal disorders; and,
 - VI.B.3.i) trauma.
- VI.B.3. different medical practice models and delivery systems and how to best utilize them to care for an individual patient; and,
- VI.B.4. study design and statistical methods.

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;
- VI.C.8. participate in the education of patients, families, students, residents and other health professionals; and,
- VI.C.9. incorporate evidence-based principles in their clinical practice.

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;
- VI.D.5. maintain comprehensive, timely, and legible medical records, if applicable;
- VI.D.6. demonstrate effective written communication skills;
- VI.D.7. demonstrate effective listening and non-verbal communication skills;
- VI.D.8. demonstrate an effective therapeutic relationship with patients and their families, with respect for diversity and cultural, ethnic, spiritual, emotional, and age-specific differences; and,
- VI.D.9. involve patients and their families in medical decisions, including decisions related to palliative care, end-of-life care, and withdrawal of care.

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;
- VI.E.6. sensitivity to patient's pain, emotional state, and gender/ethnicity issues; and,
- VI.E.7. the ability to discuss death honestly, sensitively, patiently, and compassionately.

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 interprofessional teams to enhance patient safety and improve patient care quality;
- VI.F.6. participate in identifying system errors and implementing potential systems solutions; and,
- VI.F.7. access, appropriately utilize, and evaluate the effectiveness of the resources, providers, and systems necessary to provide optimal neurosurgical care.