Endovascular surgical neuroradiology

Background

According to the Accreditation Council for Graduate Medical Education (ACGME), endovascular surgical neuroradiology (formerly referred to as interventional neuroradiology) is a subspecialty of radiology, neurosurgery, and more recently, neurology. Endovascular surgical neuroradiologists use catheter technology, radiologic imaging, and clinical expertise to diagnose and treat diseases of the central nervous system, head, neck, and spine.

The subspecialty trains physicians in the management of patients with neurological disease, the performance of endovascular surgical neuroradiology procedures, and the integration of endovascular surgical neuroradiology therapy into the clinical management of patients.

A fellowship in endovascular surgical neuroradiology is 12 months in duration. Candidates may enter a subspecialty fellowship after completing training in one of the following specialties: radiology, neurosurgery, or neurology. The ACGME provides fellowship eligibility guidelines for each specialty.

Involved specialties

Radiologists, neuroradiologists, neurosurgeons, neurologists

Positions of specialty boards

AOA

The American Osteopathic Association (AOA) does not publish training or privileging guidelines for endovascular surgical neuroradiology.

ABMS

The American Board of Medical Specialties (ABMS) does not recognize endovascular surgical neuroradiology as a subspecialty and none of its member boards, including the American Board of Radiology, American Board of Neurological Surgery, or the American Board of Psychiatry and Neurology, publish certification, education, or privileging guidelines for endovascular surgical neuroradiology.
Neither the Society of Neurointerventional Surgery (SNIS) or the American Society of Neuroradiology (ASNR) have privileging guidelines for endovascular surgical neuroradiology.

In 2007, the American Society of Neuroimaging (ASNS) and the Society of Vascular and Interventional Neurology (SVIN) published *Qualification Requirements for Performing Neurointerventional Procedures*.

The document summarizes information from regulatory bodies, professional organizations, and clinical trials in regard to indications and qualifications required for performing neurointerventional procedures. It also provides recommendations regarding qualifications required for performing individual neurointerventional procedures.

The document states that fellows entering a training program from a neurology background must have fulfilled the following preparatory requirements:

➤ Completion of an ACGME-accredited residency in neurology.

➤ Completion of an one-year ACGME-accredited vascular neurology program.

➤ Completion of a three-month course in basic radiology skills acceptable to the program director where the neurology training will occur. The physician may acquire the basic radiology skills and neuroradiology training during elective time in the neurology residency.

➤ Completion of three months of clinical experience in an ACGME-accredited neurological surgery program, which the physician may acquire during elective time in neurology and/or vascular neurology training.

➤ Completion of at least 12 months of training, preferably consecutive, in neuroradiology. Candidates who do not come from a radiology training program should have access to a one-year period of training in neuroradiology in the institution sponsoring the endovascular surgical neuroradiology program. The purpose of this preparatory training is to gain experience performing and interpreting diagnostic cerebral angiography.

The document recommends that hospitals move toward “procedure-specific credentialing.” This move is consistent with the recommendations of accrediting organizations and professional associations that support well-defined criteria that
evaluate the experience and competency of applicants rather than evidence of certification, fellowship, or membership in a specific body or society.

**ACGME**

According to the ACGME, endovascular surgical neuroradiology training programs are one year in duration and must include training and experience in the following:

- Signs and symptoms of disorders amenable to diagnosis and treatment by endovascular surgical neuroradiology techniques
- Physical examinations to evaluate patients with neurological disorders
- Pathophysiology and natural history of these disorders
- Indications for and contraindications to endovascular surgical neuroradiology procedures
- Clinical and technical aspects of endovascular surgical neuroradiology procedures
- Medical and surgical alternatives
- Preoperative and postoperative management of endovascular patients
- Neurointensive care management
- Fundamentals of imaging physics and radiation biology
- Interpretation of neuroangiographic studies pertinent to the practice

Programs in endovascular surgical neuroradiology must be jointly administered by ACGME-accredited programs in neurological surgery, diagnostic radiology, neuroradiology, and neurology. Furthermore, the programs must be present within the same institution.

In its 2008 document *ACGME Program Requirements for Graduate Medical Education in Endovascular Surgical Neuroradiology*, the council outlines requirements that candidates from each of the three specialties should possess.

Fellows entering from radiology should demonstrate the following:

- Completion of an ACGME-accredited residency in diagnostic radiology.
- Completion of an ACGME-accredited fellowship (subspecialty residency) in neuroradiology.
- Performance and interpretation of a minimum of 100 diagnostic neuroangiograms under the supervision of a qualified physician.
Complete six months training in neurologic surgery, vascular neurology, and neurointensive care. This requirement may be completed during the radiology residency.

Fellows entering from neurosurgery should demonstrate the following:
- Completion of an ACGME-accredited neurosurgical residency.
- Completion of a preliminary year within neuroradiology during which the program will provide education and clinical experience. This preparatory year may occur during the neurosurgery residency. It should include:
  - A course in basic radiographic skills
  - Performance and interpretation of a minimum of 100 diagnostic neuroangiograms under the supervision of a qualified physician
  - The use of needles, catheters, guide wires, and angiographic devices and materials
  - Recognition and management of complications of angiographic procedures
  - Understanding the fundamentals of non-invasive neurovascular imaging studies pertinent to the practice of endovascular surgical neuroradiology

Fellows entering from neurology should demonstrate the following:
- Completion of an ACGME-accredited residency in neurology
- Completion of an ACGME-accredited one-year fellowship in vascular/stroke neurology that includes at least three months of neurointensive care
- Completion of three months of clinical experience within an ACGME-accredited neurological surgery program
- Completion of a preliminary year within neuroradiology, during which the fellow will receive the following training:
  - A course in basic radiographic skills
  - Performance and interpretation of a minimum of 100 diagnostic neuroangiograms under the supervision of a qualified physician
  - Instruction in the use of needles, catheters, guide wires, and angiographic devices and materials
  - Recognition and management of complications of angiographic procedures
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- Understanding the fundamentals of non-invasive neurovascular imaging studies pertinent to the practice of endovascular surgical neuroradiology

The requirements state that the institution’s patient population must have a diversity of illnesses to provide the candidate with a broad experience. The case materials should encompass a range of diseases, including:

➤ Aneurysms
➤ Arteriovenous malformation
➤ Atherosclerotic disease of the cervical vessels
➤ Occlusive vascular disease and acute infarction
➤ Intracranial neoplasms
➤ Vascular anomalies of the head and neck
➤ Neoplasms of the head and neck
➤ Vascular anomalies of the spine
➤ Neoplasms of the spine
➤ Traumatic vascular lesions of the central nervous system, head, neck, and spine

Fellows must also:
➤ Perform a minimum of 100 therapeutic endovascular procedures
➤ Have adequate training and experience in invasive functional testing
➤ Attend and participate in clinical conferences
➤ Have experience in didactic and clinical experiences that encompass the full clinical spectrum of endovascular surgical neuroradiology therapy
➤ Make daily rounds with the endovascular surgical neuroradiology faculty members

Regarding medical knowledge, fellows undergo clinical training that must consist of a period of 12 continuous months in endovascular surgical neuroradiology during which the fellow has the opportunity to carry out all of the following under close supervision:

➤ Perform clinical pre-procedure evaluations of patients and their preliminary diagnostic studies and consult with clinicians on other services
➤ Perform diagnostic and therapeutic endovascular surgical neuroradiology procedures
➤ Generate procedural reports
➤ Participate in short-term and long-term post-procedure follow-up care
Fellow must also complete the following didactic component areas:

- Arterial and physiologic basic knowledge
- Pharmacology of the central nervous system and vasculature and relevant brain physiology
- Embolic, sclerosing, ablative, and bone stabilization agents
- Technical aspects of endovascular surgical neuroradiology, such as catheter and delivery systems; embolic, sclerosing, and stabilizing agents in cerebral, spinal, and head and neck embolization; stents, balloons, and revascularization devices; flow-controlled navigations and embolization; complications of angiography and embolization; collateral network manipulations and flow diversion; electrophysiology; provocative testing; imaging of the vascular system; direct access/therapeutic injection techniques

Training will provide fellows with the following knowledge base information for the following disease states:

- Arteriovenous malformations and fistulae
- Vascular trauma
- Hemorrhage and epistaxis
- Stroke and cerebral ischemia
- Arteriopathies
- Vertebral fracture and degeneration
- Tumors
- Other vascular malformations and lesions

**Columbia University Medical Center New York, NY**

**Philip M. Meyers, MD,** is an associate professor of clinical radiology, neurological surgery, and neurology at Columbia University Medical Center’s department of radiology. Meyers is also the clinical director of the neuroendovascular service at New York Presbyterian Hospital. He is on the executive committee of the Society of Neurointerventional Surgery.

Meyers, a Harvard University graduate, specializes in interventional neuroradiology. He received postgraduate training in surgery, radiology, and neurosurgery at the University of Cincinnati Medical Center, and interventional neuroradiology/endovascular neurosurgery at the University of California at San Francisco.

According to Meyers, the ACGME requirements for the field define the minimum acceptable criteria that physicians must complete during a fellowship program.

In regard to the number of cases a physician should complete per year to be competent, ACGME sets the minimum for training at
100 therapeutic endovascular procedures, but Meyers thinks this is too few. By contrast, he says he saw 3,000 cases in 2010.

“I personally don’t think you can get really good training if the minimum is 100 per year,” he says. “A really smart person could learn from three cases what someone else might learn from 500. It’s a controversial issue without a great answer.”

He says that the number of cases a fellow completes depends greatly on the fellowship program that he or she has entered and the referral patterns in that institution.

“I’ve been lucky to be in big institutions that have a big case volume and are referral centers,” he says. “When I trained, I got to see a lot of cases. At Columbia, I’m lucky to be at a busy neurovascular center where I treat lots of patients with complex diseases.”

He points out that he has colleagues in the field who do not see as many patients because they do not work in referral centers. “Someone even a few miles away may not see half of the cases that I see—or even less,” he says.

Because of these factors, Meyers says it is difficult to determine whether someone has the education and training necessary to become an endovascular surgical neuroradiologist. “It’s a little bit of the ‘Wild West’ right now,” he says. “There really isn’t a distinction between somebody who’s good and someone who’s not good.”

In regard to references for privilege purposes, he suggests that facilities receive a verbal recommendation from the director of the applicant’s fellowship training program. Meyers says there are currently only five or six ACGME-accredited programs available. The work necessary to become accredited has deterred program directors from doing so. However, if programs do not seek accreditation, Meyers worries that the ACGME may drop the standards in the future due to lack of interest. For the time being, he suggests using the current ACGME standards as the “main hallmark” for minimum quality standards for an endovascular surgical neuroradiologist.

Meyers also believes that monitoring by The Joint Commission is important. “When people know they are being watched, it improves quality.”
In regard to neurologists entering the subspecialty, Meyers states that, historically, neurologists have not been proceduralists. He describes them as “medical specialists in neuroscience.” During the past 20 years, he says procedural specialties have been financially rewarded when compared to cognitive specialties. Thus, neurologists developed a pathway for vascular surgery and started training in neurointervention.

Originally, Meyers says he thought that neurosurgeons would take over this field, because they specialize in neurologic disease and perform surgery; however, neurology has proven to be the field with the most interested physicians. He says neurosurgeons have a pathway to train residents to make them eligible for interventional programs, combining residency with a critical care or stroke medical fellowship, followed by an interventional fellowship.

“They’re increasing in numbers,” he says. “If natural history were to take its course, they will proliferate the field. If you become a medical neurologist, it’s not a very lucrative specialty. But if you can get into procedures, then it’s an opportunity to make a better income.”

In addition, Meyers predicts that soon interventional cardiologists may look to enter the field using the argument that they are “universal vascular specialists.” He says this worries him because he believes in specialty training and cardiologists are trained in internal medicine and heart disease. This is part of an ongoing, controversial debate in the field.

**CMS has no formal position concerning the delineation of privileges for endovascular surgical neuroradiology. However, the CMS *Conditions of Participation (CoP)* define a requirement for a criteria-based privileging process in §482.22(c)(6), stating, “The bylaws must include criteria for determining the privileges to be granted to individual practitioners and a procedure for applying the criteria to individuals requesting privileges.”

§482.12(a)(6) states, “The governing body must ensure that the medical staff bylaws describe the privileging process. The process articulated in the bylaws, rules or regulations must include criteria for determining the privileges that may be granted to individual practitioners and a procedure for applying the criteria to individual practitioners that considers:
Individual character
Individual competence
Individual training
Individual experience
Individual judgment

The governing body must ensure that the hospital’s bylaws governing medical staff membership or the granting of privileges apply equally to all practitioners in each professional category of practitioners.”

Specific privileges must reflect activities that the majority of practitioners in that category can perform competently and that the hospital can support. Privileges are not granted for tasks, procedures, or activities that are not conducted within the hospital, regardless of the practitioner’s ability to perform them.

Each practitioner must be individually evaluated for requested privileges. It cannot be assumed that every practitioner can perform every task, activity, or privilege specific to a specialty, nor can it be assumed that the practitioner should be automatically granted the full range of privileges. The individual practitioner’s ability to perform each task, activity, or privilege must be individually assessed.

CMS also requires that the organization have a process to ensure that practitioners granted privileges are working within the scope of those privileges.

CMS’ CoPs include the need for a periodic appraisal of practitioners appointed to the medical staff/granted medical staff privileges (§482.22[a][1]). In the absence of a state law that establishes a time frame for the periodic appraisal, CMS recommends that an appraisal be conducted at least every 24 months. The purpose of the periodic appraisal is to determine whether clinical privileges or membership should be continued, discontinued, revised, or otherwise changed.

The Joint Commission (formerly JCAHO) has no formal position concerning the delineation of privileges for endovascular surgical neuroradiology. However, in its Comprehensive Accreditation Manual for Hospitals, The Joint Commission states, “The hospital collects information regarding each practitioner’s current license status, training, experience, competence, and ability to perform the requested privilege” (MS.06.01.03).
In the introduction for MS.06.01.03, The Joint Commission states that there must be a reliable and consistent system in place to process applications and verify credentials. The organized medical staff must then review and evaluate the data collected. The resultant privilege recommendations to the governing body are based on the assessment of the data.

The Joint Commission introduces MS.06.01.05 by stating, “The organized medical staff is responsible for planning and implementing a privileging process.” It goes on to state that this process typically includes:

- Developing and approving a procedures list
- Processing the application
- Evaluating applicant-specific information
- Submitting recommendations to the governing body for applicant-specific delineated privileges
- Notifying the applicant, relevant personnel, and as required by law, external entities of the privileging decision
- Monitoring the use of privileges and quality-of-care issues

MS.06.01.05 further states, “The decision to grant or deny a privilege(s) and/or to renew an existing privilege(s) is an objective, evidence-based process.”

The EPs for standard MS.06.01.05 include several requirements as follows:

- The need for all licensed independent practitioners who provide care, treatment, and services to have a current license, certification, or registration, as required by law and regulation
- Established criteria as recommended by the organized medical staff and approved by the governing body with specific evaluation of current licensure and/or certification, specific relevant training, evidence of physical ability, professional practice review data from the applicant’s current organization, peer and/or faculty recommendation, and a review of the practitioner’s performance within the hospital (for renewal of privileges)
- Consistent application of criteria
- A clearly defined (documented) procedure for processing clinical privilege requests that is approved by the organized medical staff
➤ Documentation and confirmation of the applicant’s statement that no health problems exist that would affect his or her ability to perform privileges requested

➤ A query of the NPDB for initial privileges, renewal of privileges, and when a new privilege is requested

➤ Written peer recommendations that address the practitioner’s current medical/clinical knowledge, technical and clinical skills, clinical judgment, interpersonal skills, communication skills, and professionalism

➤ A list of specific challenges or concerns that the organized medical staff must evaluate prior to recommending privileges (MS.06.01.05, EP 9)

➤ A process to determine whether there is sufficient clinical performance information to make a decision related to privileges

➤ A decision (action) on the completed application for privileges occurs within the time period specified in the organization’s medical staff bylaws

➤ Information regarding any changes to practitioners’ clinical privileges are updated as they occur

The Joint Commission further states, “The organized medical staff reviews and analyzes information regarding each requesting practitioner’s current licensure status, training, experience, current competence, and ability to perform the requested privilege” (MS.06.01.07).

In the EPs for standard MS.06.01.07, The Joint Commission states that the information review and analysis process is clearly defined and that the decision process must be timely. The organization, based on recommendations by the organized medical staff and approval by the governing body, develops criteria that will be considered in the decision to grant, limit, or deny a request for privileges. The criteria must be consistently applied and directly relate to the quality of care, treatment, and services. Ultimately, the governing body or delegated governing body has the final authority for granting, renewing, or denying clinical privileges. Privileges may not be granted for a period beyond two years.

Criteria that determine a practitioner’s ability to provide patient care, treatment, and services within the scope of the privilege(s) requested are consistently evaluated.
The Joint Commission further states, “Ongoing professional practice evaluation information is factored into the decision to maintain existing privilege(s), to revise existing privileges, or to revoke an existing privilege prior to or at the time of renewal” (MS.08.01.03).

In the EPs for MS.08.01.03, The Joint Commission says there is a clearly defined process facilitating the evaluation of each practitioner’s professional practice, in which the type of information collected is determined by individual departments and approved by the organized medical staff. Information resulting from the ongoing professional practice evaluation is used to determine whether to continue, limit, or revoke any existing privilege.

**HFAP**

The Healthcare Facilities Accreditation Program (HFAP) has no formal position concerning the delineation of privileges for endovascular surgical neuroradiology. The bylaws must include the criteria for determining the privileges to be granted to the individual practitioners and the procedure for applying the criteria to individuals requesting privileges (03.01.09). Privileges are granted based on the medical staff’s review of an individual practitioner’s qualifications and its recommendation regarding that individual practitioner to the governing body.

It is also required that the organization have a process to ensure that practitioners granted privileges are working within the scope of those privileges.

Privileges must be granted within the capabilities of the facility. For example, if an organization is not capable of performing open-heart surgery, no physician should be granted that privilege.

In the explanation for standard 03.01.13 related to membership selection criteria, HFAP states, “Basic criteria listed in the bylaws, or the credentials manual, include the items listed in this standard. (Emphasis is placed on training and competence in the requested privileges.)”

The bylaws also define the mechanisms by which the clinical departments, if applicable, or the medical staff as a whole establish criteria for specific privilege delineation.

Periodic appraisals of the suitability for membership and clinical privileges is required to determine whether the individual
practitioner’s clinical privileges should be approved, continued, discontinued, revised, or otherwise changed (03.00.04). The appraisals are to be conducted at least every 24 months.

The medical staff is accountable to the governing body for the quality of medical care provided, and quality assessment and performance improvement (03.02.01) information must be used in the process of evaluating and acting on re-privileging and reappointment requests from members and other credentialed staff.

Det Norske Veritas (DNV) has no formal position concerning the delineation of privileges for endovascular surgical neuroradiology. MS.12 Standard Requirement (SR) #1 states, “The medical staff bylaws shall include criteria for determining the privileges to be granted to individual practitioners and a procedure for applying the criteria to those individuals that request privileges.”

The governing body shall ensure that under no circumstances is medical staff membership or professional privileges in the organization dependent solely upon certification, fellowship, or membership in a specialty body or society.

Regarding the Medical Staff Standards related to Clinical Privileges (MS.12), DNV requires specific provisions within the medical staff bylaws for:

- The consideration of automatic suspension of clinical privileges in the following circumstances: revocation/restriction of licensure; revocation, suspension, probation of a DEA license; failure to maintain professional liability insurance as specified; and noncompliance with written medical record delinquency/deficiency requirements
- Immediate and automatic suspension of clinical privileges due to the termination or revocation of the practitioner’s Medicare/Medicaid status
- Fair hearing and appeal

The Interpretive Guidelines also state that core privileges for general surgery and surgical subspecialties are acceptable as long as the core is properly defined.

DNV also requires a mechanism (outlined in the bylaws) to ensure that all individuals provide services only within the scope of privileges granted (MS.12, SR.4).
Clinical privileges (and appointments or reappointments) are for a period as defined by state law or, if permitted by state law, not to exceed three years (MS.12, SR.2).

Individual practitioner performance data must be measured, utilized, and evaluated as a part of the decision-making for appointment and reappointment. Although not specifically stated, this would apply to the individual practitioner’s respective delineation of privilege requests.

**CRC draft criteria**

The following draft criteria are intended to serve solely as a starting point for the development of an institution’s policy regarding endovascular surgical neuroradiology. The core privileges and accompanying procedure list are not meant to be all encompassing. They define the types of activities, procedures, and privileges that the majority of practitioners in this specialty perform. Additionally, it cannot be expected or required that practitioners perform every procedure listed. Instruct practitioners that they may strike through or delete any procedures they do not wish to request.

**Basic education:** MD or DO

**Minimal formal training:** Successful completion of an ACGME-accredited fellowship in endovascular surgical neuroradiology.

**Required current experience:** At least 100 endovascular surgical neuroradiology treatments, reflective of the scope of privileges requested, in the past 12 months or successful completion of an ACGME-accredited clinical fellowship within the past 12 months.

If the applicant is recently trained, a letter of reference should come from the director of the applicant’s training program. Alternatively, a letter of reference may come from the applicable department chair and/or clinical service chief at the facility where the applicant most recently practiced.

Core privileges in endovascular surgical neuroradiology include the ability to admit, evaluate, diagnose, and treat patients of all ages with diseases of the central nervous system by use of catheter technology, radiologic imaging, and clinical expertise. Physicians may provide care to patients in the intensive care setting in conformance with unit policies. They may assess, stabilize, and determine the disposition of patients with emergent
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conditions consistent with medical staff policy regarding emergency and consultative call services.

Core procedures include but are not limited to:
➤ Performance of history and physical exam
➤ Cavernous sinus sampling
➤ Integration of endovascular therapy into the clinical management of patients with neurological diseases (or diseases of the central nervous system) when performing diagnostic and therapeutic procedures
➤ Interpretation of diagnostic studies
➤ Intracranial-/arterial chemotherapy
➤ Venous embolization of fistulas/thrombosis
➤ Participation in short- and long-term post-procedure follow-up care, including neurointensive care
➤ Pre- and postoperative management of endovascular patients
➤ Extracranial and intracranial angioplasty and stenting
➤ Catheter-directed intra-arterial stroke therapy
➤ Cerebral digital subtraction angiography
➤ Intra-arterial thrombolysis and mechanical thrombectomy
➤ Endovascular treatment of intracranial aneurysms
➤ Intracranial stent placement
➤ Embolization of brain arteriovenous malformations
➤ Extracranial endovascular procedures
➤ Angiography and embolization of spinal arteriovenous malformations
➤ Provocative and occlusion tests

Reappointment

Reappointment should be based on unbiased, objective results of care according to a hospital’s quality assurance mechanism. Applicants must demonstrate their competence with evidence that they provided endovascular surgical neuroradiology treatment to at least 200 patients in the past 24 months.

In addition, continuing education related to endovascular surgical neuroradiology should be required.

For more information

Accreditation Council for Graduate Medical Education
515 North State Street, Suite 2000
Chicago, IL 60654
Telephone: 312/755-5000
Website: www.acgme.org
American Society of Neuroradiology
2210 Midwest Road, Suite 207
Oak Brook, IL 60523
Telephone: 630/574-0220
Fax: 630/574-0661
Website: www.asnr.org

The Centers for Medicare & Medicaid Services
7500 Security Boulevard
Baltimore, MD 21244
Telephone: 877/267-2323
Website: www.cms.hhs.gov

DNV Healthcare, Inc.
400 Techne Center Drive, Suite 350
Milford, OH 45150
Website: www.dnvaccreditation.com

Healthcare Facilities Accreditation Program
142 East Ontario Street
Chicago, IL 60611
Telephone: 312/202-8258
Website: www.hfap.org

The Joint Commission
One Renaissance Boulevard
Oakbrook Terrace, IL 60181
Telephone: 630/792-5000
Fax: 630/792-5005
Website: www.jointcommission.org

Joint Section of Cerebrovascular Neurosurgery
5550 Meadowbrook Drive
Rolling Meadows, IL 60008-3852
Telephone: 888/566-2267
Fax: 847/378-0600
Website: www.aans.org

Society of Neurointerventional Surgery
3975 Fair Ridge Drive, Suite 200
North Fairfax, VA 22033
Telephone: 703/691-2272
Fax: 703/537-0650
Website: www.snisonline.org
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