



CAST PROGRAM REQUIREMENTS FOR FELLOWSHIP EDUCATION IN NEUROSURGERY OF THE SPINE

INTRODUCTION

Program Eligibility

Fellowship programs which exist within a structure of an ACGME accredited residency in neurological surgery (or the Canadian equivalent) are eligible for accreditation through the Committee on Accreditation of Subspecialty Training (CAST) of The Society of Neurological Surgeons (SNS). Training participants in such fellowship programs will be candidates for accreditation by CAST

Definition and Scope of the Subspecialty

Neurologic surgery of the spine is that subspecialty of neurosurgery that deals with the evaluation and medical and surgical treatment of diseases of the spine, its supporting soft tissue structures, the spinal cord, the nerve roots and its vascular structures. It includes the in-depth study, prevention, diagnosis, and treatment (medical or surgical) of spinal cord and spinal column pathology.

Duration of Training

The length of the fellowship will be of twelve (12) months duration.

Fellow Eligibility

A CAST accredited program may not offer a fellowship position to a potential fellow until they have completed their PGY3 year. All Fellows must have completed a Chief Resident Year in Neurological Surgery or Orthopedic Surgery at an accredited institution.

Broad Description of the Objectives/Goals of Education in the Fellowship

- The fellowship training must provide a broad educational experience in neurologic surgery of the spine, which will complement and enhance the prior residency experience and result in further acquisition of knowledge and skills in the spinal surgery.
- A minimum of six months of fellowship training will be spent in a clinical spinal neurosurgery experience under the direction of specified clinical faculty. This period must provide the trainee with an organized, comprehensive, supervised, full time educational experience in the field of spinal neurosurgery. This should include patient care, utilization and interpretation of appropriate diagnostic modalities, the performance of surgical procedures, and the integration of non-operative and surgical therapies into clinical patient management.
- Each fellowship should provide a broad exposure to clinical evaluation and appropriate patient selection for operative and non-operative management in both the inpatient and outpatient settings.
- Each fellow should actively participate in the operative management of a wide range of spinal disorders including traumatic, degenerative, neoplastic and infectious conditions. Progressive responsibility in patient management should be provided. Exposure to modern spinal instrumentation techniques is considered an integral part of the spinal neurosurgery fellowship experience and training.

- Clinical, anatomic, biomechanical, or neuroscience research constitutes an integral component of the educational experience and provision should be made for the successful completion of research projects.
- Specific competency requirements are provided in Appendix 1. This list of competencies is neither exhaustive nor obligatorily inclusive. However, it is the expectation that most of these competencies will be met.

INSTITUTIONAL ORGANIZATION

The Sponsoring Program and Institution

- The sponsoring neurosurgical residency program and its affiliated institutions must provide sufficient faculty, financial resources, and research support to meet the educational needs of the fellowship trainee and to enable the program to comply with the requirements of accreditation.
- Recognizing the interdisciplinary nature of comprehensive care for patients with complex spinal disease, it is required that within the institution(s) of the fellowship there shall exist clinical facilities and faculty in intensive care, neuroradiology, neurology, orthopedics, and pain management and/or rehabilitation medicine.
- Support for the fellowship program by the sponsoring department/division of neurosurgery must be demonstrated in writing by the program chair and program director at the time of the initial application or renewal of accreditation.

Participating Institutions

- Participating institutions shall be limited to those necessary for a complete fellowship experience, with each participating institution having a clinical caseload in excess of 200 operative spine cases per year, of which at least 100 must involve spinal instrumentation. Each fellow must complete at least 150 cases during the 12-month experience.
- In most instances the spinal neurosurgery fellowship will occur at a single institution. Depending on local circumstances, training may be spent at additional institutions, which may provide special resources for training. Each of these institutions must be located within reasonably close proximity for interactions with the teaching programs of the sponsoring program. The rationale and details of including these institutions must be clearly delineated in the application.
- Additional sites in addition to primary site must be within a 50 mile radius to ensure the fellow is given the best educational experience supported by the Fellowship Program Director and Core Faculty.

Appointment of Fellows

In general, it is anticipated that there will be only one fellowship position per training program. Accreditation of additional positions will be considered by the Committee on Accreditation of Subspecialty Training. In determining the merit of additional fellows, the Committee will consider:

- The presence of a faculty of national stature in spinal neurosurgery.
- The quality of the educational program.
- The quality of clinical care.
- The total number and spectrum of cases.
- The quality of clinical and research programs.
- The quality of fellows trained by the program.
- The impact of fellows on the clinical and educational experience of the neurosurgical residents within the sponsoring program.
- Selection of candidates for the fellowship position must be consonant with the criteria established by the sponsoring program. The fellowship director must adhere to the criteria for fellowship eligibility, which are specified in this document.

- A high rate of fellowship attrition from a program may adversely affect the fellowship accreditation status.

FACULTY QUALIFICATIONS AND RESPONSIBILITIES

Fellowship Director Qualifications

- The fellowship director must be appointed by and be responsible to the chair of the sponsoring neurologic surgery residency program.
- The fellowship director shall be a neurologic surgeon who possesses special expertise in the evaluation and management of spinal disorders and whose practice is concentrated in the area of neurologic spinal surgery.
- The fellowship director should be certified by the American Board of Neurological Surgery or the Royal College of Surgeons (Canada) (RCS)
- The Fellowship Director for new Program applications must have completed a Fellowship in Spinal Surgery.

Responsibilities of the Fellowship Director

- The fellowship director must assume responsibility for the training program and devote sufficient time to the educational program including the following:
- Preparation of a written curriculum outlining the educational goals of the program with respect to knowledge, skills, and other attributes to be attained during the fellowship. This statement must be distributed to the fellow and members of the teaching staff and be available for review.
- Selection of fellows in accordance with institutional and departmental/division policies.
- Selection and supervision of the teaching staff and other program personnel at the institution(s) participating in the program.
- The supervision of the fellow through explicit written directives relative to responsibilities in patient care as well as supervisory lines. These guidelines must be communicated to all members of the program faculty. Fellows must be provided with prompt, reliable systems for communication and interaction with supervisory physicians.
- The fellowship director, with participation of members of the teaching staff, shall perform a regular evaluation of the fellow's knowledge, skills, and overall performance, including the development of professional attitudes, including:
 - Evaluate the knowledge, skills, and professional growth of the fellow using appropriate criteria and procedures.
 - Communicate each evaluation to the fellow in a timely manner.
 - Advance fellows to positions of increasing responsibility based on satisfactory progression in patient management, scholarship and professional growth.
 - Maintain a permanent record of evaluations of each fellow and have it accessible to the fellow and other authorized personnel.
 - Provide a written final evaluation for the fellow on completion of the program. This evaluation must include a review of the fellow's performance during the final period of training and verification of the
 - fellow's demonstrated professional abilities and competence for independent practice. This final evaluation should be part of the fellow's permanent record maintained by the institution.
 - Implement all procedures, as established by the sponsoring institution, regarding academic discipline and complaints or grievances pertinent to the fellowship trainees.
 - Monitor fellow's stress, including mental or emotional conditions affecting performance or learning and drug or alcohol-related dysfunction. Fellowship directors and teaching staff should be sensitive to the need for timely provision of confidential counseling and psychological

support services to the fellow. Training situations that consistently produce undesirable stress on the fellow must be evaluated and modified.

- Prepare accurate statistical and narrative descriptions of the program as required by the CAST.
- Notify CAST regarding major programmatic changes.

Other Teaching Faculty Qualifications and Number

- All clinical faculty members who are neurological surgeons shall be certified by, or be in the certification process of, the American Board of Neurological Surgery, Royal College of Surgeons or possess equivalent qualifications as judged by the SNS.
- In addition to the program director, the teaching staff must include, at a minimum, one other board certified neurological or orthopedic surgeon who has special expertise in the area of spinal neurosurgery and who concentrates his/her practice in spinal neurosurgery as defined above. The primary teaching staff should be based at the sponsoring institution or the participating institutions and maintain a close affiliation with teaching staff within the program.
- All members of the teaching staff must demonstrate a strong interest in the education of fellows, sound clinical and teaching abilities, support of the goals and objectives of the fellowship, a commitment to their own continuing medical education, and participation in scholarly activities.
- If multiple institutions are approved for participation in the fellowship program, a member of the teaching staff at each participating institution must be specifically designated to assume responsibility for the day-to-day activities of the fellowship at that institution with overall coordination by the fellowship director.
- The faculty must have regular documented meetings to review the fellowship training, the financial and administrative support of the fellowship, the volume and variety of patients available for educational purposes, the performance of members of the teaching staff, and the quality of fellowship supervision.

Other Personnel

- Fellowships must be provided with the additional professional, technical, and clerical personnel needed to support the administration and educational goals of the fellowship.

LOGISTICS OF TRAINING

The Educational Program

- All educational components of the fellowship should be related to the specified goals and must not adversely interfere with the training experience of the residents of the sponsoring neurosurgical residency program.

Clinical Components

- A minimum of six months of fellowship training must be spent in clinical activities in spinal neurosurgery.
- The responsibility or independence given to fellows in patient care must be dependent upon the fellow's demonstrated knowledge, manual skill, experience in the complexity of the patient's illness, as well as the perceived risks of the surgical management.
- A portion of the fellowship experience should be allocated to training in an outpatient clinic or office setting which provides preoperative, perioperative and postoperative continuity of patient care in the clinical setting.

OTHER COMPONENTS

- The fellowship program should provide opportunities for the fellow to engage in research relative to the subspecialty. Each fellow should submit a minimum of one manuscript for publication in a peer reviewed journal.
- The fellow should actively participate in scholarly activities and should contribute to the education of neurosurgery residents and medical students.
- The fellowship program should have regular dedicated teaching conferences with participation of the fellow, the associated faculty, and residents of the sponsoring program. Participation of other affiliated disciplines should be encouraged.

FELLOWSHIP POLICIES

Supervision

- All patient care services must be supervised by appropriately qualified faculty in accordance with institutional guidelines.
- The fellow who has completed an accredited neurosurgery residency program may function independently as a junior staff neurosurgeon consistent with institutional and departmental/division policies.
- The fellowship director must always insure and document direct and proper supervision of the fellow by attending physicians with appropriate experience for the severity and complexity of the patient's condition. The fellowship trainee must be provided with rapid, reliable systems for communication with supervisors.

Maintenance of Case Logs

- The fellowship program director must maintain accurate case logs of the spinal neurosurgery case material operated annually within the institution and the subspecialty experience of the graduating chief resident throughout his training as well as that of the fellow.
- The fellow must maintain an accurate prospective case log of his/her operative cases throughout the fellowship, which documents all operative cases and the level of responsibility in the case (assistant versus primary surgeon).

Evaluations

- As specified in IIIB, 5 and 6, there shall be written evaluations and constructive discussions of the fellow by the faculty relative to performance and accomplishments of stated goals. These evaluations must occur at a minimum of two times per year and maintained in a permanent file.
- The fellow shall provide an evaluation of the faculty and fellowship program. This may be submitted either to the fellowship or program director at completion of the fellowship training. This evaluation should be maintained in a permanent file for review by the CAST if requested.

Duty Hours and Conditions of Work

- Duty hours and work conditions for subspecialty fellows must be consistent with ACGME institutional and program requirements for residency training in neurological surgery for those individuals who are in the last year of residency. Those outside of residency are not restricted in terms of work hours other than regulations which may be imposed by the sponsoring institution.

Procedural requirements

Demonstrate competency with all of the procedures listed below having completed at least the minimum number identified below during the fellowship:

CVJ Case / Procedure Type

- Anterior odontoid screw fixation
- Posterior occipital cervical fusion +/- instrumentation
- C12 posterior fusion +/- instrumentation

SUBAXIAL CERVICAL Case / Procedure Type

- ACDF 1 or 2 levels
- ACDF >2 levels
- Corpectomy and fusion +/- instrumentation
- Arthroplasty
- Posterior discectomy or foraminotomy
- Posterior fusion 1 or 2 levels
- Posterior fusion > 2 levels
- Laminoplasty

THORACIC Case / Procedure Type

- Anterior discectomy +/- fusion and instrumentation
- Laminectomy
- Transpedicular decompression +/- fusion and instrumentation
- Costotransversectomy +/- fusion and instrumentation
- Corpectomy and fusion +/- instrumentation

LUMBOSACRAL Case / Procedure Type

- Arthroplasty
- Posterior decompression
- ALIF or OLIF
- PLIF, TLIF or LLIF
- Posterolateral fusion
- SI joint fusion

SPINAL TRAUMA Case / Procedure Type

- Closed reduction of dislocation +/- fusion and instrumentation
- Open reduction of dislocation +/- fusion and instrumentation

DEFORMITY Case / Procedure Type

- Cervical deformity correction
- Thoracolumbar deformity correction (coronal or sagittal)
- High grade spondylolisthesis correction

SPINAL ONCOLOGY Case / Procedure Type

- Corpectomy for tumor +/- fusion and instrumentation
- Resection extradural tumor +/- fusion and instrumentation
- Resection intradural intramedullary tumor
- Resection intradural extramedullary tumor
- Spinal combined extra/intradural lesion any level

Total FELLOW case minimum: 150

MAINTENANCE OF FELLOWSHIP ACCREDITATION

Each year, the program will be required to provide an annual report to CAST. CAST will offer continuous accreditation based upon review of the annual report. Although the fellowship will now have continuous accreditation with an approved annual report, factors that may impact ongoing accreditation include: any adverse actions of the Neurological Surgery Review Committee (RC) relative to the parent residency training

program, changes in fellowship leadership, failure to maintain a satisfactory volume of cases, major changes in the fellowship faculty, and failure to complete required annual reports.

Appendix 1

Competency Requirements of Spine Fellow for CAST accreditation.

I. Clinical Competencies:

General

- Demonstrate advanced knowledge of the anatomy and physiology of the spine and the central nervous system relevant to the management of spine and spinal cord pathologies.
- Demonstrate advanced knowledge of clinical features including signs, symptoms, natural history, and prognosis of spinal traumatic, infectious, metabolic, neoplastic, degenerative, developmental, and congenital spinal disorders.
- Demonstrate the ability to conduct a thorough history and physical examination for various chief complaints that pertain to the spine.
- Demonstrate the ability to provide a thorough differential diagnosis for a variety of spine complaints.
- Demonstrate effective communication with the clinical team, patient and family members regarding various treatment options, including operative versus non-operative options in spine care.
- Demonstrate advanced knowledge of the recognition and treatment of intra-operative, peri-operative and post-operative surgical complications pertaining to spine surgery.
- Understand the principles of electrophysiological techniques used to assess spinal peripheral neural and spinal cord pathology including EMGs, nerve conduction studies, evoked potentials and multimodality intraoperative monitoring.
- Understand the principles of imaging assessments including, plain radiography, myelography, radionuclide scans, CT, PET, SPECT/CT, and MRI.
- Understand the principles of radiation safety in treating spinal disorders.
- Degenerative
- Demonstrate a comprehensive knowledge of the diagnosis and treatment of degenerative spinal disease.
- Demonstrate the ability to use evidence-based medicine decisions when making recommendations regarding operative versus non-operative treatment of the degenerative spine.
- Demonstrate proficiency in the diagnosis and knowledge of medical and surgical management for spondylosis including neurologic effects such as radiculopathy, neurogenic claudication, myelopathy and cauda equina syndrome.
- Demonstrate the ability to compare and contrast the surgical treatment options for cervical spondylotic myelopathy and ossification of the posterior longitudinal ligament, including knowledge of procedures such as multilevel anterior cervical discectomy or corpectomy and fusion, laminectomy, laminectomy and fusion, and laminoplasty.

Trauma

- Recognize the need for urgent immobilization of the spine when instability is suspected.
- Demonstrate the ability to classify injuries according to fracture morphology, instability, and neurological status. Identify syndromes of spinal cord injury, including complete transverse injury, anterior cord injury, Brown-Sequard injury, central cord injury, posterior cord injury, cruciate paralysis, syringomyelia, conus syndrome, and sacral sparing.
- Discuss the indications for acute reduction, decompression, and stabilization as appropriate in the

setting of a polytraumatized patient.

- Discuss non-operative and operative treatment options for fractures and dislocations affecting the spine. Compare and contrast the indications for anterior and posterior spinal fixators in the management of thoracolumbar trauma.

Infectious

- Demonstrate the ability to perform an appropriate history and physical examination in situations where primary, secondary, or post-operative spinal infection is suspected.
- Demonstrate the ability to order and interpret appropriate diagnostic tests to confirm infection and identify the causative organism.
- Demonstrate knowledge on the recommended medical management of infectious lesions of the spine, such as vertebral osteomyelitis, discitis, and epidural abscesses
- Demonstrate knowledge of the indications as well as appropriate surgical procedures required in the management of spinal infections

Oncology & Vascular

- Demonstrate competency in establishing a diagnosis of neoplastic spine disease based on clinical presentation and imaging
- Demonstrate knowledge of the indications for posterior / posterolateral decompression, anterior decompression, or radiotherapy in the setting of primary or metastatic spine tumors
- Demonstrate knowledge on the differences between conventional external beam radiation therapy and newer radiosurgery / stereotactic body radiation therapy (SBRT) options in spine oncology treatment
- Demonstrate an understanding of the principles of tumor surgical resection including knowledge of the indications for en bloc resection of tumor versus intra-lesional debulking
- Demonstrate an understanding of the surgical techniques required for treatment of extradural vs intradural-extramedullary vs. intramedullary spinal tumors.
- Demonstrate the ability to recognize spinal vascular malformations, such as arteriovenous malformations, dural arterio-venous fistula, and hemangiomas, including knowledge of treatment options for spinal vascular conditions

Deformity

- Demonstrate the ability to perform a history and physical examination appropriate for a patient presenting with spinal deformity
- Demonstrate the ability to describe the classification systems for scoliosis, kyphosis, and spondylolisthesis, and craniocervical deformities
- Demonstrate the ability to evaluate spinal balance, flexibility, as well as knowledge of lumbosacral/pelvic radiologic parameters considered important to structural spinal balance

Research & Continued Medical Education

- Demonstrate knowledge of concepts specific to research in the spine, both surgical and non-surgical conditions. These include the development of a research question, hypotheses and specific aims, knowledge of study design, interpretation and critical evaluation of the spine literature
- Develop critical appraisal skills with respect to analyzing literature as is pertinent to a spinal surgery practice

II. Procedural Competencies:

General

Demonstrate Proficiency in:

- Patient positioning, prepping and draping
- Use and application of Gardner-Wells tongs for traction
- Use and application of halo ring for traction
- Use and application of halo and vest
- Closed reduction techniques for spinal disorders
- Bone graft harvesting techniques
- Management of intra-operative and postoperative complications such as dural tears, nerve root injury, hemorrhage, epidural hematoma causing neurologic compression, pedicle screw breeches, persistent CSF leak, and surgical site infection
- Utilization of magnification including a microscope and/or loupe for spinal surgery.
- Maintenance of cervical spine precautions during prone positioning (i.e., Jackson table with Mayfield pins and adaptor)

Cervical Spine

- Demonstrate the ability to carry out both anterior and posterior cervical spine approaches Demonstrate proficiency in the closed and open treatment of cervical spine fractures and dislocations Demonstrate the ability to properly place C1 and C2 sub-laminar cables
- Demonstrate proficiency in multilevel posterior laminectomies with and without foraminotomies
- Demonstrate proficiency in the ability to implant cervical lateral mass screws, including plate/screw and rod/screw instrumented constructs
- Demonstrate the ability to implant cervical trans-laminar screws for cervical stabilization procedures
- Demonstrate the ability to safely implant lower cervical/upper thoracic pedicle screws
- Demonstrate the ability to perform upper cervical instrumented arthrodesis procedures, including the ability to insert C2 pars screws, C1-2 (Magerl) trans-articular C1-2 screws, and the Harms/Goel (i.e., C1 lateral mass and C2 pars/pedicle screw/rod) technique for the management of upper cervical spine disorders
- Demonstrate the ability to perform both single and multilevel anterior cervical discectomies and corpectomies with instrumented fusion
- Demonstrate the ability to perform a multi-level posterior cervical laminoplasty with instrumentation
- Demonstrate proficiency in performing an occipito-cervical instrumented fusion, including the ability to properly place occipital fixation
- Demonstrate proficiency in performing a posterior cervical-thoracic instrumented arthrodesis Demonstrate the ability to perform a cervical odontoid screw fixation
- Demonstrate proficiency in revision decompression with or without revision instrumented fusion of the cervical spine

Thoracic Spine

- Demonstrate proficiency in performing posterior/posterolateral transpedicular, costo-transversectomy and lateral extra-cavitary approaches to the thoracic spine
- Demonstrate the ability to properly place pedicle screws in the thoracic spine
- Demonstrate the ability to properly place laminar, transverse process, and pedicle hooks in the

thoracic spine Demonstrate proficiency in performing a postero-lateral thoracic discectomy

- Demonstrate proficiency in performing anterior thoracic discectomy
- Demonstrate proficiency in performing an anterior thoracic vertebrectomy with reconstruction
- Demonstrate proficiency in performing a posterior multi-level thoracic decompression and fusion

- Demonstrate proficiency in surgically managing thoracic spinal fractures with and without cord compression
- Demonstrate proficiency in revision decompression with or without revision instrumented fusion of the thoracic spine
- Demonstrate proficiency in managing both sagittal and coronal plane deformities of the thoracic spine with instrumentation
- Demonstrate proficiency in spinal osteotomies for the treatment of deformity and tumor

Lumbosacral Spine

- Demonstrate proficiency in performing single and multi-level posterior lumbar discectomies, decompressions and instrumented fusions
- Demonstrate proficiency in performing anterior/anterolateral spine surgery
- Demonstrate proficiency in performing lumbar fusion and/or decompressive surgery for lumbar spinal fractures with and without neurologic injury
- Demonstrate proficiency in the placement of lumbar pedicle screws
- Demonstrate proficiency in performing lumbo-sacro-pelvic instrumented fusions, including the placement of sacral alar and iliac screws
- Demonstrate proficiency in performing interbody fusions from several approaches (including anterior, lateral, and posterior approaches).
- Demonstrate proficiency in revision decompression with or without revision instrumented fusion of the lumbar spine
- Demonstrate proficiency in the use of minimally invasive spine surgery techniques for decompression and instrumented fusion
- Demonstrate the ability to approach the lumbar spine via a minimally invasive lateral transpsoas approach for implant placement, decompression and/or fusion

Other

- Demonstrate proficiency in the use of intra-operative image guided navigation systems (2D, 3D) for spinal disease.
- Demonstrate proficiency in performing vertebral augmentation procedures such as vertebroplasty and balloonkyphoplasty for spinal disease.

