

AMERICAN ACADEMY OF NEUROLOGY SPINE FELLOWSHIP CORE CURRICULUM

Introduction

Spine conditions affect virtually everyone at some time during their life. Surveys indicate a yearly prevalence of spine-related symptoms in fully 50% of working-age adults. Spine pain and other spine problems rank high among reasons for health care visits. Spine pain and spine-related conditions are very costly to society. In the United States, direct and indirect expenditures total at least \$50 billion per year. The costs include medical and surgical treatment, lost productivity, and loss of the ability to perform and enjoy normal activities. Lower back problems are the most common cause of disability for patients under the age of 45.

Neurologists are in an excellent position to provide care for patients with spine pain and other spine disorders. Neurologists know the symptoms and signs that indicate worrisome spine problems. Neurologists are familiar with the tests that can rule in and rule out serious spine disorders. Neurologists are aware of the indications for surgery on the spine and have no incentive to recommend unnecessary surgery. Because treatment algorithms and outcomes studies for patients with spine conditions are based on neurologic signs and symptoms, neurologists are very capable of evaluating and managing patients with spine problems. Because of our expertise, neurologists can effectively evaluate new and old therapies, both established and controversial. Thus, neurologists can provide outstanding care for patients with spine problems and do so cost-effectively. For many neurologists, conditions of the spine already constitute a significant portion of their practice. Seeing patients with disorders of the spine can help to ensure the financial viability of a neurologist's practice.

Scope of Expertise

Currently, there are almost no neurology training program-administered medical spine fellowships. The following core curriculum is recommended for all neurology trainees to be learned during their residency. The same core curriculum elements presented in a more limited fashion would be appropriate for medical students, and the same elements presented in greater depth would be appropriate for an individual taking a post-residency fellowship in medical diagnosis and treatment of spine disorders. The curriculum is not sufficient for individuals who wish to acquire the skills needed to operate on the spine. Neurology residents should be able to interpret imaging studies of the spine. Neurology residents should have knowledge of non-invasive, minimally invasive, and invasive therapies of spine-related conditions. Depending on the residents' preferences and exposure, they may or may not be able to perform injection therapy at the conclusion of their training. In summary, the accompanying core curriculum should enable the graduate of a neurology residency program to evaluate and treat medically all types of diseases affecting the spine. Neurologists should know which diagnostic tests to obtain and when to obtain them. They should know when and to whom to refer patients for treatment that is beyond their knowledge and experience. They should know the indications for surgical

intervention, the procedures which are performed on the spine, and when and when not to refer patients for surgical consultation.

Goals, Objectives, and Definitions

The goals of the curriculum recommended for “Conditions of the Spine” are to enable practitioners to confidently, competently, and cost-effectively evaluate and treat adolescents and adults with conditions of the spine. Examples of these conditions include developmental disorders such as scoliosis, spondylosis, disk protrusions and extrusions, myofascial pain, spondylolisthesis, synovial cysts, arachnoid cysts, intra-axial and extra-axial tumors, syringomyelia, arteriovenous malformations, infections, demyelinating disease, and the effects of trauma. With the knowledge provided by this curriculum, the practitioner should be able to diagnose a wide range of disorders, know when to order which diagnostic studies and how to interpret the results, know when to seek surgical consultation, and know which pharmacologic and non-pharmacologic therapies are appropriate for the patient’s medical spine condition.

Content

The core curriculum content is described in the accompanying appendix.

Prerequisites for the Trainee

Since this core curriculum is intended for neurology residents, the prerequisites are the same as they are for an individual entering a neurology residency training program.

Personnel Needed for the Training and their Qualifications

The trainers will need to have experience and expertise in the content areas described in the core curriculum. In many instances, these individuals will be fully trained and board certified neurologists. Training programs should also have access to experienced specialists in physical medicine and rehabilitation, neurologic surgeons or orthopedic surgeons (and preferably both specialties), and anesthesiologists or other pain management specialists who provide blocks and other invasive therapies. The training program should have access to specialists in imaging of the spine including neuroradiologists. All of these other specialists should also be board certified.

Facilities Needed for the Training

The facilities will be the same as required for neurology training programs. In general, this would include both an outpatient care facility and a hospital setting where patients with spine conditions are treated medically and surgically. Physical therapy and electrophysiologic testing should also be available.

Set-up for the Training and Methods of Training

The “set-up and methods” of training will be similar to those employed for other aspects of the neurology resident’s training. During the course of the residency, they need to see patients with spine disorders. This should include some patients whom they evaluate and manage directly and some who are seen in consultation. Some trainees might choose to spend time working under the supervision of a physiatrist, a spine surgeon, or a pain management specialist. More frequently the neurology trainee will interact consultatively with these other specialists who care for patients with diseases of the spine. Neurology trainees should have access to neuroradiologists and nuclear medicine specialists and the opportunity to review teaching files of films and/or spend time with the radiologist reviewing spine imaging studies. Ideally, neurology trainees should follow patients with spine conditions in order to develop competence in the evaluation and management of their conditions. Trainees will learn how to evaluate patients with spine and limb pain electrophysiologically as part of their electrophysiology training.

Timetable for Training

Neurology residents will typically learn how to evaluate and treat patients with conditions of the spine over the entire course of their training. Alternatively, some neurology trainees may elect to take a rotation on a service that specializes in the care of patients with back problems (a spine center, a rehabilitation facility, a physical medicine service, or a neurosurgical or orthopedic service), or a pain management center.

Methods of Evaluation of the Trainee and Training Process

The methods of evaluating the trainee and the training process will be the same as those used by the training program for other specialty areas. Ideally, the training program should monitor the number and type of patients with spine problems seen by each trainee. The training program should assess its trainees and its training using internal evaluation methods (case reviews, oral and written examinations) and external reviews (residency examination, specialty board examination).

Mechanisms for Feedback and Methods of Constantly Upgrading Knowledge

The mechanisms for feedback and methods of “constantly upgrading knowledge” will be the same as those employed by the residency training program for other subspecialty areas.

Continuing Medical Education

At this time, there are no specific recommendations for dedicated spine disorder-related continuing medical education. Maintenance of expertise in the evaluation and treatment of patients with spine conditions depends on seeing patients with these disorders on a regular basis. It is expected that individuals who see patients with conditions of the spine will remain current through review of literature and attending spine disorder-related courses and meetings where they will obtain continuing medical education credit.

Appendix
Core Curriculum Content for Spinal Disorders

- I. General Issues of Spinal Disorders
 - A. History of spinal disorders
 - B. Epidemiology of spinal disorders
 - 1. Prevalence of spine and limb pain
 - a. Occupational risk factors
 - b. Individual risk factors
 - c. Prevalence of disk degeneration and facet joint osteoarthritis
 - 2. Prevalence of other specific spine conditions
 - C. Economics of spinal disorders
 - 1. Direct costs – medical
 - 2. Direct costs – non-medical
 - 3. Indirect costs
 - D. Insurance systems and evaluation of disability and impairment
 - 1. Workers compensation and other disability insurance systems
 - 2. Relationship between pain, disability, and physical impairment
 - 3. Impairment rating
 - E. Prevention and treatment of spine disorders
 - 1. Primary and secondary prevention
 - 2. Functional capacity evaluation, functional restoration, and work hardening
 - 3. Pain clinics and pain rehabilitation centers
 - 4. Pharmacologic management of acute and chronic back pain
 - a. Nonsteroidal anti-inflammatory drugs and acetaminophen
 - b. Tricyclic antidepressants
 - c. Opioids
 - d. Muscle relaxants
 - e. Intrathecal treatments
 - f. Other medications
 - 5. Non-pharmacologic treatments
 - a. Minimally invasive surgery

- b. IDET
 - c. Others

- F. Sensitivity, specificity, and value of
 - 1. Medical history
 - 2. Physical examination
 - 3. Imaging studies
 - 4. Neurophysiologic studies

- G. Specific clinical tools in the evaluation of patients with suspected spine problems
 - 1. Range of motion of various levels of the spine and joints
 - 2. Neurologic evaluation and signs
 - 3. Non-organic physical signs

- H. Pain and pain pathways
 - 1. Anatomy
 - 2. Physiology
 - 3. Psychology

- I. The role of orthoses for spine conditions
 - 1. Cervical
 - 2. Thoracic
 - 3. Lumbosacral

- J. Diagnostic studies used in the evaluation of spinal disorders
 - 1. Imaging of spinal disorders
 - a. Plane and dynamic x-rays (motion)
 - b. Magnetic resonance imaging of the spine
 - c. Computed tomography of the spine
 - d. Myelography with computed tomography
 - e. Angiography of the spine
 - f. Nuclear medicine scans for tumor, fracture, and infection
 - g. Discography
 - 2. Electromyography and nerve conduction velocity testing for nerve root and anterior horn cell involvement
 - 3. Somatosensory evoked potentials
 - 4. Blood tests
 - 5. Diagnostic injections

K. Evidence-based assessment of old, new, and controversial therapies

II. Specific Conditions Affecting the Spine

A. Degenerative disk and joint disease of the spine

1. Disk anatomy and physiology
2. Facet joints, muscles, ligaments, and bones
3. Medical management of spinal spondylosis
 - a. Non-steroidal anti-inflammatory drugs
 - b. Other analgesics
 - c. Tricyclic agents
 - d. Anticonvulsants
 - e. Muscle relaxants
 - f. Other medications
4. Indications for surgery

B. Metabolic bone disease

1. Osteoporosis
2. Osteomalacia
3. Paget's disease

C. Rheumatic disorders

1. Rheumatoid arthritis
 - a. Upper cervical subluxations
2. Ankylosing spondylitis
 - a. Fracture dislocation
 - b. Upper cervical subluxations
 - c. Cauda equina syndrome as a late, non-compressive complication
3. Psoriatic arthropathy
4. Enteropathic arthropathy
 - a. Crohn's disease
 - b. Ulcerative colitis
5. Reactive arthritis
 - a. Reiter's syndrome

6. Other conditions
- D. Infectious diseases of the spine
1. Pyogenic infections
 - a. Disk space, epidural, osteomyelitis
 2. Granulomatous infections
 - a. Tuberculosis of the spine (Pott's disease)
 - b. Coccidioidomycosis
 - c. Blastomycosis
 - d. Cryptococcosis
 - e. Aspergillosis
 3. Parasitic infections
- E. Infectious diseases of the spinal cord and nerve roots
1. Myelitis due to viruses
 - a. Poliomyelitis
 - b. Herpes zoster
 - c. Rabies
 - d. HTLV I
 - e. HIV
 2. Myeloradiculitis secondary to bacteria
 - a. Syphilis
 - b. Lyme disease
 - c. Meningomyelitis
 - d. Abscess of spinal cord
 3. Tuberculosis affecting spinal cord
 4. Parasitic and fungal infections affecting spinal cord
- F. Non-infectious myelitis
1. Multiple sclerosis
 2. Post-infectious, parainfectious, and post-vaccinal myelitis
 3. Associated with vasculitis
 4. Subacute necrotizing myelitis
 5. As a remote effect of malignant neoplasm
 6. Radiation-induced

- G. Spinal injury
 - 1. Penetrating
 - 2. Non-penetrating
 - 3. Fractures
 - 4. Delayed effects
- H. “Whiplash”
- I. Tumors of the spine
 - 1. Primary and secondary tumors of the spinal canal
 - a. Meningioma
 - b. Neurofibroma
 - c. Glioma
 - d. Ependymoma
 - e. Lipoma
 - f. Epidermoid, dermoid, teratomas
 - g. Hemangioblastomas
 - h. Metastatic tumor
 - 2. Primary and secondary tumors of the spine
 - a. Osteochondroma
 - b. Osteblastoma
 - c. Osteoid osteoma
 - d. Aneurysmal bone cyst
 - e. Hemangioma
 - f. Giant cell tumor
 - g. Eosinophilic granuloma
 - h. Plasmacytoma
 - i. Multiple myeloma
 - j. Osteosarcoma
 - k. Ewing’s sarcoma
 - l. Chordoma
 - m. Chondrosarcoma
 - n. Lymphoma
 - o. Metastatic tumor
- J. Syringomyelia
 - 1. Associated with Arnold-Chiari malformation
 - 2. Associated with neoplasms
 - 3. Associated with previous spinal cord injury
 - 4. Idiopathic

- K. Vascular diseases of the spinal cord
 - 1. Spinal vascular anomalies
 - a. Dural arteriovenous fistula
 - b. Intradural arteriovenous malformations
 - 2. Spinal cord infarction
 - 3. Hematomyelia unassociated with vascular malformation

- L. Miscellaneous spinal cord diseases
 - 1. Subacute combined degeneration
 - 2. Spinal arachnoiditis (chronic adhesive spinal arachnoiditis)
 - 3. Caisson disease (decompression sickness)

III. Cervical Spine-Specific Considerations

- A. Anatomy, pathology, and biomechanics of the cervical spine
- B. Cervical radiculopathy syndromes
 - 1. Clinical, imaging, and electrophysiologic findings
 - 2. Non-operative approaches (physical therapy and other modalities, cervical traction, orthoses, and injections)
 - 3. Indications for surgery
 - a. Anterior versus posterior approach
- C. Cervical myelopathy
 - 1. Clinical, imaging, and electrophysiologic findings
 - 2. Non-operative therapy
 - 3. Decompression
 - a. Anterior versus posterior approach
 - b. To fuse or not to fuse
- D. Congenital anomalies of the cervical spine
 - 1. Basilar impression
 - 2. Atlantoaxial instability
 - 3. Fusion

 - 4. Klippel-Feil syndrome
 - 5. Cervical ribs

- E. Postoperative cervical spine pain with or without instability
- F. Miscellaneous – achondroplasia

IV. Thoracic Spine

- A. Anatomy, pathology, and biomechanics of the thoracic spine
- B. Thoracic disk herniation

- 1. Non-operative approaches
- 2. Indications for surgery

- C. Thoracic myelopathy
- D. Congenital anomalies of the thoracic spine
- E. Postoperative thoracic spine pain with or without instability
- F. Kyphosis

- 1. Causes
- 2. Non-operative care
- 3. Indications for surgery
 - a. Pain
 - b. Progressing deformity
 - c. Neurologic deficit
 - d. Cosmesis

- 4. Surgical approaches

G. Scoliosis

- 1. Causes
- 2. Non-operative care
- 3. Indications for surgery
 - a. Pain
 - b. Progressing deformity
 - c. Neurologic deficit
 - d. Cosmesis

- 4. Surgical approaches

H. Miscellaneous – achondroplasia

V. Lumbosacral Spine

- A. Anatomy, pathology, and biomechanics of the lumbosacral spine
- B. Availability of evidence-based clinical practice guidelines

1. AHRQ and others
- C. Acute and chronic lumbar disk herniation
1. Clinical, imaging, and electrophysiologic findings
 2. Non-operative approaches (physical therapy and other modalities, spinal manipulation, orthoses, and injections)
 3. Indications for surgery
 - a. Surgical approaches
- D. Lumbar spinal stenosis
1. Clinical, imaging, and electrophysiologic findings
 2. Non-operative approaches (weight loss, orthoses, use of a short cane)
 3. Indications for surgery
 - a. Decompression with or without fusion
- E. Congenital anomalies of the lumbosacral spine
- F. Spondylolisthesis
1. Classification
 2. Non-operative treatment
 3. Indications for surgery
 - a. Surgical approaches
- G. Postoperative lumbosacral pain with or without instability
- H. Cauda equina syndrome
- I. Compression fractures-conservative, invasive, and injection therapy (vertebroplasty)