

NEUROLOGY RESIDENCY CURRICULUM

INTRODUCTION

Neurology is a medical specialty concerned with the diagnosis and treatment of all categories of diseases involving the central, peripheral and autonomic nervous systems. Neurological problems can be encountered in a variety of settings such as ambulatory care, hospital, long term care and home care. For these diseases, the neurologist is often the principal care physician and may render all levels of care commensurate with his/her training. The goal of this curriculum is to ensure that the neurology resident understands the anatomic and physiologic basis of clinical neurology, learns the art of localizing neurologic lesions, becomes familiar with the presenting features, diagnosis and treatment of common neurologic disorders. The neurology resident should be able to recognize and manage neurologic emergencies, understand principles of ordering and interpreting neurologic tests, and become familiar with common procedures such as lumbar puncture. These objectives will be achieved through the following:

1. Formal didactic lectures.
2. Localization rounds.
3. Subspecialty conferences.
4. Grand Rounds.
5. Morning report and hospital rounds.
6. Teaching in the outpatient clinic.
7. Neuroscience Course.
8. Journal Club.
9. Self-study.

I. NEUROANATOMY AND NEUROPHYSIOLOGY

Neurology residents will first understand the basic neuroanatomy and neurophysiology and its relevance to clinical neurology before learning more intricate details. In the central nervous system, examples would include anatomy and functions of the various lobes of the brain, anatomy and physiological functions of the basal ganglia, anatomy, organization and physiology of the cerebellum, and the structure and functions of the spinal cord. In the peripheral nervous system, topics would include structure and organization of nerve plexuses, detailed anatomy of individual peripheral nerves in the limbs, anatomy of the neuromuscular junction, and muscle structure and physiology. Also included would be structure, function and neurotransmission in the autonomic nervous system.

II. NEUROLOGICAL HISTORY AND EXAMINATION

There is no more important diagnostic intervention than the neurologic history and the examination. The neurology resident should be able to take a detailed neurological history and should have a very good understanding of the various components of the neurology examination and will also learn the correct techniques in eliciting the various neurological signs. The components of the neurological examination are that will be taught are:

1. Examination of higher mental functions.
2. Examination of speech.
3. Cranial nerve examination.
4. Examination of the motor system.
5. Examination of the sensory system.
6. Examination of reflexes.
7. Examination of coordination.
8. Examination of gait, spine, and Romberg sign.
9. Miscellaneous tests such as signs of meningeal irritation.

III. NEUROLOGIC LOCALIZATION

The neurology resident should become well versed in the art of neurologic localization. In confronting neurological problems, the neurologist must learn to answer three questions: A) is there a disease involving the nervous system? B) if so, where is the disease located, and C) what kind of disease is it? (that is, what is the pathological nature of the disease)? In this regard, the residents will learn to recognize whether a lesion responsible for neurological disease is focal or diffuse and whether it is located at the supratentorial level, posterior fossa level, the spinal level, the peripheral level, or at more than one level. The neurologist should also be able to recognize whether the lesion is most likely vascular, degenerative, inflammatory/immunologic, neoplastic, toxic metabolic, traumatic, or congenital developmental.

IV. MANAGEMENT AND TREATMENT OF INDIVIDUAL NEUROLOGICAL DISORDERS

In addition to learning the anatomical and physiological basis of clinical neurology and learning the neurology examination as well as the art of neurologic localization, the trainees will be instructed in the clinical features and care of individual neurologic disease disorders. **The list below names the major categories of neurologic diseases and highlights an important aspect of each category.**

DISORDERS OF MOTILITY

Trainees will learn to differentiate between lower motor neuron and upper motor neuron paralysis, recognize various types of movement disorders due to dysfunction of the extrapyramidal system, such as Parkinson's disease, choreoathetosis, etc. They will become familiar with the signs and symptoms of cerebellar disease, and various disorders of stance and gait.

HEADACHE, BACK PAIN, OTHER DISORDERS OF SOMATIC SENSATION

Residents will understand the anatomy of headache and become familiar with the clinical features, investigation and treatment of various kinds of headaches such as migraine, cluster headaches, tension headaches, etc. They will also learn about other important pain syndromes such as low back pain, reflex sympathetic dystrophy etc.

DISORDERS OF THE SPECIAL SENSES

The neurology resident will learn about the visual pathway and common causes of visual disturbances such as diseases of the optic nerves or the visual cortex. They will also learn about innervation of the pupil, ocular motility and supranuclear control of eye movement, and its disorders. They will become familiar with the concept of central and peripheral vertigo and management of each.

EPILEPSY AND DISORDERS OF CONSCIOUSNESS

The neurology trainee will become familiar with the different kinds of epilepsy, their recognition, as well as the medical and surgical treatment of epilepsy. They will come to understand the role of video EEG monitoring in the management of epilepsy. Trainees will have a working knowledge of physiology of normal sleep as well as its various disorders. They will understand the physiological basis of coma, and the clinical and investigational approach to such a patient.

DERANGEMENTS OF INTELLECT, BEHAVIOR, AND LANGUAGE DUE TO DIFFUSE AND FOCAL CEREBRAL DISEASE

The trainees will become familiar with the various types of dysarthrias and dysphasias. They will learn to differentiate between delirium and dementia and will become familiar with the diagnosis and treatment of common causes of dementia such as Alzheimer's disease and will learn to evaluate patients for treatable causes of dementia such as endocrine dysfunction, nutritional deficiency, and infections. The neurology residents will learn about various disturbances of memory, with special emphasis on the characteristic memory disturbance seen in alcohol related Wernicke-Korsakoff syndrome.

CEREBROVASCULAR DISEASE

The neurology residents will learn to differentiate different kinds of cerebrovascular disease such as ischemic strokes, intracerebral hemorrhages, and subarachnoid hemorrhages. They will learn to recognize risk factors associated with stroke, and be able to initiate primary and secondary prevention. They will become familiar with the indications and contraindications for thrombolytic therapy in acute stroke. They will understand the use of carotid ultrasound and carotid endarterectomy in the diagnosis and treatment of carotid artery stenosis. They should understand the need for rapid evaluation of patients with hemorrhagic stroke and the role of Neurosurgery in such patients.

CNS INFECTIONS

The neurology resident should recognize the different clinical syndromes that occur with bacterial, viral, fungal, and parasitic infections of the CNS. They should be able to interpret the results of lumbar puncture and select the correct antibiotics based on the likely pathogens. The trainee should have an understanding of the challenge presented by diagnosis and treatment of CNS infections in patients with HIV or other causes of immunosuppression.

CNS NEOPLASMS

Trainees must recognize the signs and symptoms of CNS neoplasms including signs and symptoms related to raised intracranial pressure and signs and symptoms related to the specific location of the neoplasm. They should become familiar in the role of medicines, surgery, and radiation in the management of such diseases.

MULTIPLE SCLEROSIS AND THE ALLIED DEMYELINATING DISEASES

Neurology trainees will learn about the epidemiology, clinical presentation, investigation, and management of patients with multiple sclerosis. They will become familiar with the use of steroids and disease-modifying agents in the treatment of this disease. They will also learn about other demyelinating diseases such as acute disseminated encephalomyelitis (AEDM, etc.)

EFFECT OF DRUGS AND TOXINS ON THE NERVOUS SYSTEM

Trainees will become well versed with the injurious effects of alcohol on the central nervous system, their clinical presentation and management. Effects of various recreational drugs on the brain will also be taught.

DEGENERATIVE DISEASES OF THE NERVOUS SYSTEM

The neurology residents will learn about the common degenerative neurological diseases of the central nervous system. These include diseases characterized by abnormal movements such as Parkinson's disease, Huntington's disease, as well as diseases presenting with in coordination such as cerebellar ataxia, or with cognitive impairment such as Alzheimer's disease. The residents will learn about new diagnostic tests and treatments that are now available for many of these degenerative diseases such as Alzheimer's disease.

NEUROMUSCULAR DISORDERS

The residents will become trained to recognize diseases of the peripheral nervous system, including diseases of peripheral nerves, muscles, and neuromuscular junction. They will learn to recognize common and treatable acute neuropathies such as Guillain-Barre syndrome and the role of intravenous immunoglobulin and plasmapheresis in the treatment of such patients. They will learn to recognize and treat common chronic neuropathies such as diabetic neuropathy. They will become familiar with the clinical features of neuromuscular junction diseases such as myasthenia gravis and the Eaton-Lambert syndrome as well as with their diagnosis and management. They should learn the symptoms and signs of primary muscle disease as well as treatment of muscle diseases such as polymyositis. Residents must recognize when to use EMG and nerve conduction studies and nerve biopsies and must become familiar with ways of treating neuropathic pain.

SPINAL CORD DISEASES

Residents will become familiar with the concept of compressive and non-compressive myelopathies, Disease categories that will be studied include spinal trauma, compression, infections and inflammation of the spine and its coverings.

PEDIATRIC NEUROLOGY

The neurology residents will have a three month rotation in pediatric neurology, in which they will learn about normal mental and physical development, how to clinically differentiate static and progressive neurologic disease, and become familiar with inherited metabolic diseases of the nervous system as well as with other diseases peculiar to the pediatric population such as muscular dystrophies, epilepsy syndromes etc.

ALLIED SPECIALTIES

During their rotations in psychiatry, Neurosurgery and physical medicine and rehabilitation the residents will be taught aspects of these specialties that are relevant to the practice of clinical neurology.

V. MANAGEMENT OF NEUROLOGIC EMERGENCIES

In addition to detailed knowledge of the various neurological disorders, special emphasis will be placed on recognition and management of neurological emergencies such as:

1. Status epilepticus.
2. Acute raised intracranial pressure.
3. Neuromuscular disease with respiratory involvement.
4. Coma.
5. CNS infection.
6. Acute cord compression.

VI. ORDERING AND UNDERSTANDING NEUROLOGIC TESTS

Residents will become familiar with indications, interpretation, sensitivities, and specificity for the following neurologic tests:

1. CT/MRI of the CNS.
2. Carotid ultrasound.
3. Cerebral angiography.
4. EEG and evoked potentials.
5. EMG and nerve conduction studies.
6. Muscle biopsy.
7. Lumbar puncture.
8. Sleep studies.
9. Anticonvulsant drug levels.

VII. PROCEDURAL SKILLS

Residents will learn to perform common neurologic procedures such as lumbar puncture. They will also learn the basic nerve conduction studies and EMG. They will become familiar with placement of EEG electrodes and operation of the EEG machine. They will also learn how to perform other diagnostic tests such as the Tensilon test.

Department of Neurology
RESIDENTS' READING LIST

General Texts

Adams and Victor. *Principles of Neurology*. McGraw Hill
Asbury, McKhann, McDonald (eds). *Diseases of the Nervous System, Vol I and II*.
Saunders
Baker and Baker. *Clinical Neurology*. Harper and Row
Bradley, Daroff, et al. *Neurology in Clinical Practice*. Butterworth Heinemann
Rowland. *Merritt's Textbook of Neurology*. Lea and Febiger

Major Subspecialty Texts and Monographs

Adams and Lyon. *Neurology of Hereditary Metabolic Diseases of Children*. McGraw Hill
Adams and Duchen. *Greenfield's Neuropathology*. Oxford Press
Aminoff. *Neurology and General Medicine*. Churchill Livingstone
Barnett, Mohr, Stein, and Yatsu (eds). *Stroke: Pathophysiology, Diagnosis, and Management, Volumes I and II*. Churchill Livingstone
Benson. *Aphasia, Alexia, and Agraphia*. Saunders
Brooke. *A Clinician's View of Neuromuscular Diseases*. F.A.Davis
Caplan. *Stroke: A Clinical Approach*. Butterworths
Davis and Robertson. *Textbook of Neuropathology*. Williams and Wilkins
Dyck, Thomas, Lambert, and Bunge. *Peripheral Neuropathy*. Saunders
Engel. *Seizures and Epilepsy*. F.A.Davis
Engel and Banker. *Myology*. McGraw Hill
Escourolle and Poirier. *NeuroPathology*.
Fenichel. *Cerebrospinal Fluid in Diseases of the Nervous System*. Saunders
Gilman, Bloedel, and Lechtenberg. *Disorders of the Cerebellum*. F.A.Davis
Glaser. *Neuro-ophthalmology*. Lippincott
Johnson. *Viral Infections of the Nervous System*. Raven
Kryger, Roth & Dement. *Principles and Practice of Sleep Medicine*. Saunders
Layzer. *Neuromuscular Manifestations of Systemic Disease*. F.A.Davis
Leigh and Zee. *The Neurology of Eye Movements*. Contemporary Neurology Series,
F.A.Davis
Levy, Dreifuss et al. *Antiepileptic Drugs*. Raven
Low. *Clinical Autonomic Disorders*. Little, Brown
Menkes. *Textbook of Child Neurology*. Lea and Febiger

Mesulam. *Principles of Behavioral Neurology*. F.A. Davis
Miller. *Walsh and Hoyt's Clinical Neuro-Ophthalmology, Volumes I-V*. Williams and Wilkins
Parkes. *Sleep and Its Disorders*. Saunders
Plum and Posner. *The Diagnosis of Stupor and Coma*. F.A.Davis
Raskin. *Headache*. Churchill Livingstone
Ropper and Kennedy. *Neurological and Neurosurgical Intensive Care*. Aspen
Schaumburg, Berger and Thomas. *Disorders of Peripheral Nerves*. F.A.Davis
Stewart. *Focal Peripheral Neuropathies*. Elsevier
Strub and Black. *The Mental Status Examination in Neurology*. F.A.Davis
Wilkins. *Neurosurgery, Volumes I-III*. McGraw-Hill
Wyllie. *The Treatment of Epilepsy*. Lea & Febiger

Electrodiagnosis

Daly and Pedley. *Current Clinical Practice of EEG*. Raven
Kimura. *Electrodiagnosis in Disease of Nerve and Muscle*. F.A.Davis
Spehlmann. *EEG Primer*. Elsevier
Misulis. *Spehlmann's Evoked Potential Primer*. Butterworth Heinemann

Neuroimaging

Lee et al. *Cranial MRI and CT*. McGraw Hill
Mazziotta and Gilman. *Clinical Brain Imaging: Principles and Applications*. Contemporary Neurology Series, F.A.Davis
Okazaki. *Fundamentals of Cerebral Angiography*. Harper and Row
Phelps, Mazziotta, and Schelbert. *Positron Emission Tomography and Autoradiography*.
Weisberg, Nice, and Katz. *Cerebral Computed Tomography*. Saunders
Osborn. *Diagnostic Neuroradiology*.

Scientific

Brodal. *Neurological Anatomy*. Oxford
Carpenter and Sutin. *Human Neuroanatomy*. Williams and Wilkins
Cooper, Bloom, and Roth. *The Biochemical Basis of NeuroPharmacology*. Oxford University Press
Kandel and Schwartz. *Principles of Neural Science*. Elsevier

Kuffler and Nicholls. *From Neuron to Brain*. Sinauer
Rosenberg et al. *The Molecular and Genetic Basis of Neurological Disease*.
Butterworth
Shepherd. *The Synaptic Organization of the Brain*. Oxford
Siegel, Albers, Agranoff, and Katzman. *Basic Neurochemistry*. Raven Press

Localization and Diagnosis

Brazis, Masdeu and Biller. *Localization in Clinical Neurology*. Little, Brown and Co
DeJong. *The Neurological Examination*. Harper and Row
Gilman and Newman. *Manter and Gatz's Essentials of Clinical Neuroanatomy and
Neurophysiology*. F.A.Davis
Mumenthaler. *Neurologic Differential Diagnosis*. Thieme-Stratton, Inc
Patten. *Neurological Differential Diagnosis*. Springer-Verlag