

AMERICAN ACADEMY OF NEUROLOGY NEURO-OPHTHALMOLOGY/NEURO-OTOLOGY FELLOWSHIP CORE CURRICULUM

A CURRICULUM FOR NEURO-OPHTHALMOLOGY

Definition and Scope

Neuro-ophthalmology focuses on brain and systemic abnormalities that cause visual disturbances. A Neuro-ophthalmology fellowship provides the fund of knowledge and detailed clinical skills to diagnose patients with such disturbances.

The practice of neuro-ophthalmology requires an interdisciplinary approach that incorporates knowledge of relevant aspects of basic science, epidemiology, clinical neurology, radiology (focused particularly on CT, MRI, MRA and Contrast Angiography), ophthalmology (including oculo-plastics, pediatric ophthalmology, glaucoma and retina) and ophthalmic diagnostic techniques (such as manual and computer assisted perimetry, color vision testing, contrast sensitivity, prisms, direct and indirect ophthalmoscopy), internal medicine, psychiatry, visual electrophysiology and ultrasound techniques (Doppler ultrasonography, A and B-Scan). The focused discipline of neuro-ophthalmology is complex and quite precise regarding localization and diagnosis of the deficit. It necessitates specific training in medical school and residency that may be supplemented through a focused fellowship.

Appendix

CORE KNOWLEDGE FOR NEURO-OPHTHALMOLOGY FELLOWSHIP

I. NEURO-OPHTHALMOLOGIC MECHANISMS OF DISORDERS

A. Myopathic

B. Myo-neural junction disorders

1. muscle receptors
2. synapse
3. nerve
4. other

C. Peripheral neuropathies

1. demyelinating
2. axonal
3. mixed

D. Brainstem, Chiasm, Brain and Intracranial Abnormalities

1. hereditary
2. toxic
3. infectious and parainfectious

4. demyelination
5. degenerative
6. congenital
7. inflammatory
8. metabolic
9. other

E. Ophthalmologic

1. cornea
2. lens and anterior segment
3. pediatrics
4. oculo-plastics and orbit
5. retina and vitreous
6. other

F. Blood vessel

1. atherosclerosis
2. thrombosis
3. arteritis
4. other

G. Psychiatric

H. Miscellaneous

II. NEURO-OPHTHALMOLOGIC CLINICAL SYNDROMES

A. Afferent System

1. non-arteritic anterior ischemic optic neuropathy
2. arteritic anterior ischemic optic neuropathy
3. optic neuritis
4. optic atrophy
5. papilledema due to intracranial diseases
6. compressive optic neuropathy
7. congenital optic disc anomalies
8. pseudotumor cerebri
9. optic chiasm disorders
10. disorders of visual fields
11. other afferent disorders

B. Efferent System

1. pupil
 - a. parasympathetic lesions
 - b. sympathetic lesions
 - c. physiologic conditions

- d. congenital anomalies
 - e. miscellaneous
2. lid
- a. ptosis and failure to open
 - 1. mechanical
 - 2. muscle
 - 3. myo- neural
 - 4. neuronal
 - 5. miscellaneous
 - b. swelling
 - c. failure to close
 - 1. muscle
 - 2. myo- neural
 - 3. neuronal
 - 4. miscellaneous
 - d. blepharospasm
3. ocular motility
- a. restrictive
 - 1. orbital mass
 - 2. fracture
 - 3. miscellaneous
 - b. muscle
 - 1. thyroid
 - 2. myositis
 - 3. CPEO
 - 4. congenital
 - 5. other
 - c. myo- neural junction
 - 1. myasthenia
 - 2. botulism
 - 3. miscellaneous
 - d. neuronal
 - 1. third nerve palsy
 - 2. fourth nerve palsy
 - 3. sixth nerve palsy
 - 4. combination syndromes
 - e. brainstem disorders
 - f. brain disorders
 - g. cerebellum
 - h. other
4. nystagmus
- a. cerebellar
 - b. brainstem

- c. brain
- d. other
- 5. miscellaneous disorders of ocular motility

C. Systemic Disorders with Neuro-Ophthalmologic Implications

- 1. thyroid and other endocrine disorders
- 2. giant cell arteritis and other rheumatologic disorders
- 3. metastatic and para-neoplastic disorders
- 4. coagulation abnormalities and other hematologic disorders
- 5. other systemic disorders

D. Neurologic Disorders

- 1. general classifications
 - a. hereditary
 - b. inflammatory
 - c. demyelinating
 - d. toxic
 - e. metabolic
 - f. degenerative
 - g. myopathic
- 2. specific neurologic disorders with significant importance in neuro-ophthalmology
 - a. multiple sclerosis
 - b. myasthenia gravis
 - c. cerebrovascular diseases
 - d. headache disorders
 - e. acute inflammatory demyelinating polyneuropathy
 - f. primary brain tumors and masses

III Diagnostic Techniques

A. Examination Skills

- 1. tests of visual function
 - a. confrontation visual fields
 - b. manual perimetry
 - c. computer assisted perimetry
 - d. contrast sensitivity
 - e. color vision testing
- 2. fundoscopy
 - a. direct ophthalmoscopy
 - 1. direct ophthalmoscope
 - 2. Special lens (90 diopter, etc) combined with slit lamp
 - b. indirect ophthalmoscopy
- 3. use of prisms or similar devices for measurement of diplopia.
- 4. pupillary examination techniques

B. Neuro-Imaging.

1. MRI
2. MRA
3. CT Scan
4. Conventional Angiography and Endovascular Techniques

C. Ultrasound Techniques

1. Duplex Doppler Ultrasonography
2. A-Scan
3. B-Scan

D. Electrophysiology

1. Visual Evoked Potentials
2. ERG
3. ocular motility recording techniques

E. Fluorescein Angiography

IV. Patient Management: Knowledge of indications and limitations of therapies that may be recommended for patients with neuro-ophthalmic problems once localization and diagnosis is made.

A. Pharmacologic intervention

1. demyelination
2. headache
3. myasthenia gravis
4. stroke and TIA
5. parainfectious disorders
6. arteritis
7. endocrine disorders
8. inflammatory diseases of brain and orbit
9. other

B. Surgical Therapy

1. orbital mass
2. brain mass
3. trauma
4. oculo-plastic and orbit techniques
5. pediatric-ophthalmology techniques
6. retina techniques

C. Radiologic and Endovascular Techniques

1. aneurysms
2. arterio-venous shunts and malformations
3. biopsy techniques

D. Radiation and chemo-therapy.

V. Epidemiology

- A. Economics and compliance requirements of neuro-ophthalmologic disorders including ICD and CPT codes.
- B. Genetics of specific disorders relevant for neuro-ophthalmology including multiple sclerosis, stroke, migraine and other disorders.
- C. Statistics. Understanding of relative risk, odds ratio, attributable risk, prevalence rate, case control study, cohort study, absolute/relative benefit, risk reduction, number needed to treat, etc.

VI. Clinical research

- A. Clinical Trials
 - 1. Familiarity with the major clinical trials relevant to neuro-ophthalmology.
 - 2. Understanding of concepts such as randomization, masking (blinding), controls, follow up period, adverse events, FDA and IRB regulations, primary outcome events.
- B. Development of skills to present and publish the outcome of retrospective case series, unusual cases or atypical presentations of familiar diseases.

VII. Responsibility as Teacher

- A. This is one of the historic functions and continuing obligations of neuro ophthalmologists.
- B. Creation of a scholarly atmosphere where resources are available to equip fellows with a sense of this responsibility is important.
- C. Opportunity to develop teaching skills is optimal.
- D. Fellows must also develop a sense of the importance of teaching not only medical colleagues but also the general public important aspects of this discipline.

VIII. Ethics

- A. Fellowship preceptors must emphasize the principles of ethical and humane treatment of patients with neuro-ophthalmic diseases.
- B. Preceptors and faculty should communicate these principles to their trainees in both didactic and clinical aspects of fellowship training.
- C. Training programs must meet or exceed RRC requirements for teaching of ethics in residency programs.

A Curriculum for Neuro-Otology

Definition and Scope:

Dizziness and imbalance are one of the most common complaints of patients referred to neurologists and is frequently reported to physicians in general practice. Neuro-otology is a subspecialty that interfaces with otolaryngology, cardiology, ophthalmology, audiology and physical therapy in the diagnosis and treatment of patients with vertigo, nystagmus, and loss of equilibrium.

A Neuro-otology fellowship should provide the clinical and teaching milieu necessary to become well founded in the basic anatomy, physiology and pathology of conditions affecting balance and particularly of conditions affecting the vestibular system. Training should promote academic scholarship, skills in teaching and clinical acumen, particularly in evaluating patients with balance disorders. As part of this, the program should give sufficient experience to allow its graduates to establish and direct Balance Centers and Vestibular Testing Laboratories at other institutions.

The body of evidence that forms the basis of neuro-otology is complex and necessitates specific training in medical school and residency that may be supplemented through a focused fellowship. The candidate Neuro-otology fellowship training program should include collaborative clinical, teaching and research experiences from Neurology and Otolaryngology. Graduate fellows should become competent in clinical evaluations, diagnostic testing techniques, relevant anatomy and neurophysiology, and research techniques under the direct supervision of the program director and faculty.

APPENDIX

CORE KNOWLEDGE FOR NEURO-OTOLOGY FELLOWSHIP

I. CORE TEACHING OBJECTIVES

- A. Accuracy in diagnosis and care of patients with dizziness and imbalance.
- B. Basic science: patho-anatomical, physiological, genetic, neurochemistry, molecular biology, neurophysiology and bioengineering research.
- C. Interdisciplinary knowledge in otolaryngology, ophthalmology, cardiology and geriatrics.
- D. Research in vestibular disorders and gait imbalance.
- E. Competency in the core clinical syndromes (see below).

II. CLINICAL SYNDROME COMPETENCY

- A. Spontaneous, gaze-evoked and positional nystagmus.
- B. Internal and external ophthalmoplegias.

- C. Saccade eye movement abnormalities.
- D. Smooth pursuit and optokinetic eye movement abnormalities.
- E. Conjugate gaze mechanisms
 1. supranuclear
 2. infranuclear causes
 3. ocular motor abnormalities
- F. Central and peripheral positional vertigo.

III. DIAGNOSTIC TECHNIQUES

- A. Electro-oculography, infrared video-oculography, scleral search coil and other eye movement recording techniques.
- B. Caloric and rotational vestibular testing techniques.
- C. Posturography and the principles of surface EMG and the possible utility of these methods in the study of motor control.
- D. Vestibular test interpretation. This should include 100 electro-nystagmograms and 50 rotational studies within the 1st year of fellowship.
- E. Clinical neuro-otology examination of the patient including bedside vestibular testing.
- F. Imaging studies of the brainstem, vestibular system and cerebellum with knowledge of the vascular territories and ability to formulate an appropriate differential diagnosis based on imaging study findings. Neuroradiographic skills should be obtained by direct review of MRI, MRA, angiography and other relevant imaging techniques on patients encountered in the clinical setting.
- G. Interpretation of pure tone audiometry, speech discrimination, electrocochleography and brainstem evoked potentials.
- H. Diagnostic techniques for benign paroxysmal positional vertigo and its variants

IV. TREATMENT AND PATIENT MANAGEMENT

- A. Develop a basic knowledge of the rationale and indications for surgical neuro-otological:
 1. Labyrinthectomy
 2. vestibular neurectomy
 3. perilymph fistula repair
 4. endolymphatic shunt surgery
 5. gentamicin chemodenervation
 6. miscellaneous
- B. Treatment of benign paroxysmal positional vertigo and its variants.

- C. Familiarity with otolaryngological surgery for patients with Meniere's disease.
- D. Treatment of acute vertigo and use of medications for the treatment of dizzy patients.
- E. Treatments for tinnitus.
- F. Balance training physical and occupational therapy exposure should be obtained.

V. METHODS

A. Requirements

1. fellow candidates should be board eligible or board certified in Neurology
2. the training program director must be personally responsible for oversight of the curriculum and clinical program, and insure the quality of the teaching
3. the fellowship training program must receive the support of the chairman of Neurology who must also co-sign the application for certification
4. the institution must be JCAHO accredited with an approved and active Core Neurology Residency Program likewise accredited. Any exceptions must be accompanied by an explanation

B. Training experiences.

1. outpatient neuro-otology clinic experience of at least two half-days per week with a minimum of five new patients per week
2. treatment techniques for benign paroxysmal positional vertigo can be learned in the outpatient clinic with the faculty mentor
3. the faculty designate should closely supervise the outpatient clinic with emphasis on diagnosis and management of patients

C. Recommended conferences and didactic structure.

1. clinical teaching conferences once per week
2. a joint conference with otolaryngology and neuro-ophthalmology participation is desirable
3. readings of electronystagmograms and rotational chair studies should be done on a routine basis with a qualified member of the faculty
4. didactic review of literature for interpretation of ocular motor vestibular testing abnormalities, posturography, auto-rotational tests, brainstem evoked potentials and audiometric techniques
5. presentations to intramural Grand Rounds, resident or medical student teaching rounds and, when possible, national meetings should be strongly encouraged
6. periodic neuroradiology teaching conferences are encouraged
7. monthly journal club literature reviews conferences are encouraged
8. depending on the strengths and weakness of the fellow, reading assignments may be restructured and tailored to best serve the education of the fellow

VI. CLINICAL RESEARCH

- A. A research project should be identified at the outset of the program and direct faculty supervision should be provided as needed.

VII. EVALUATIONS

- A. The program director shall receive feedback from other program faculty and provide quarterly feedback to the fellow on progress and plan of progress toward the remaining goals during the remainder of the fellowship.
- B. Progress in clinical skills will be determined on an ongoing basis in the outpatient clinic.
- C. Presentation and knowledge base skills will be ascertained at weekly conferences in which the fellow will be expected to participate.
- D. Feedback on mastery of topics in neuro-otology may be assessed by direct faculty interaction.
 - 1. assessments may take the form of a weekly one-hour review after reading of pre-determined reading assignment
 - 2. there will also be appropriate faculty-fellow interactions

VIII. DEVELOPMENT OF TEACHING AND RESEARCH SKILLS

- A. Develop competence in teaching the fundamentals of neuro-otology to medical students and residents
- B. Presentation at intramural or extramural conferences is to be encouraged
- C. Develop scholarship and avenues of clinical or basic science research in the field of neuro-otology