

**AMERICAN ACADEMY OF NEUROLOGY  
MOVEMENT DISORDERS  
FELLOWSHIP CORE CURRICULUM**

**FINAL VERSION INCORPORATING RECOMMENDATIONS OF SECTION  
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**CORE CURRICULUM FOR MOVEMENT DISORDERS FELLOWSHIP TRAINING**

**Introduction**

Specialists in Movement disorders possess specialized knowledge in the science, clinical evaluation and management of conditions that affect the control of movement , the basal ganglia , the cerebellum and their direct or indirect connections to the cortex, subcortex, brainstem and spinal cord. This field encompasses knowledge of the pathophysiology, pathology, diagnosis, and treatment of these disorders at a level that is significantly beyond the training and knowledge of a general neurologist.

**I. Definition of Movement Disorders**

The specialty of Movement Disorder neurology focuses on a large number of neurological disorders that share the common clinical feature of involuntary movements of either hypo- or hyperkinetic character. Movement disorders are classified first phenomenologically and then etiologically. The involuntary movements generally occur in the absence of weakness, and therefore these disorders were originally termed "extrapyramidal", although this term has been largely dropped from current nosography. In terms of phenomenology, hypokinetic movement disorders include Parkinson's disease, several other conditions with Parkinsonian features, and rare disorders like stiff-person syndrome. The large number of hyperkinetic movement disorders are divided in several categories including tremors, chorea, dystonia, tics, stereotypies and myoclonus. The ataxias and movement abnormalities associated with cerebellar system disorders and the large category of gait disorders also fall within this specialty. Finally, dyspraxias that affect the successful execution of movements involved in complex tasks or movement patterns are aspects of movement disorders.

Movement disorders are also classified by their causative process, and include neurodegenerative, genetic, infectious, metabolic, nutritional, toxicological, and vascular etiologies. As such, movement disorders may be considered primary when they occur as an isolated neurological syndrome or secondary when they occur as part of a larger process of known cause. Importantly, because many movement disorders are drug-induced and iatrogenic in etiology, experts must be particularly aware of the agents that are associated with their induction.

Movement disorder neurology encompasses several aspects of basic science, including neuroepidemiology, molecular biology, neurochemistry and neuropharmacology as well as neurophysiology. In addition, because most movement disorders are chronic conditions, treatment

expertise also incorporates elements of neurorehabilitation. With the increasing emphasis on neurosurgical interventions for the treatment of Parkinson's disease, dystonia and various forms of tremor, movement disorder specialists must be skilled in identifying candidates for surgery and regularly participate in pre- and post-operative neurological management. Because some movement disorders have typical magnetic resonance imaging patterns, especially various secondary movement disorders, neuroimaging expertise also closely integrates in the daily practice of movement disorders as a neurological speciality.

## **II. Core Content of Movement Disorder Fellowships**

### **a. Goals and Objectives**

The major goals of a Movement Disorder curriculum are to develop a specialized teaching program in the areas of patient care, clinical and/or basic science research, teaching, and education. The field of Movement Disorders, with its numerous disorders, lends itself to further subspecialization by phenomenological entities or etiological factors. Given the broad nature of Movement Disorders, however, this document primarily addresses a general curriculum for training in Movement Disorders, considered as a single speciality, and leaves open the possibility of expansion of the curriculum by programs or individuals with more selective and in-depth interests. The curriculum is oriented at the level of post-residency fellows, but can be adapted for other types of training.

The major objectives of a Movement Disorder curriculum are to delineate training that will develop expertise in the recognition, diagnosis, treatment, management, and rehabilitation of inpatients and outpatients with Movement Disorders. Exposure to the following areas of neurology, neurobiology and allied disciplines are recommended as they apply specifically to Movement Disorders:

- # Clinical neurology: adult and pediatric
- # Emergency medicine for management of acute development and decompensation of Movement Disorders
- # Psychiatry for interface of movement disorders in primary psychiatric conditions, drug-induced movement disorders, and psychogenic movement disorders
- # Neurorehabilitation for acute and chronic reeducation techniques
- # Neuroimaging: MR, CT, PET patterns in Movement Disorders
- # Neuroepidemiology: populational patterns and epidemiological issues relative to Movement Disorders
- # Molecular biology, neuropharmacology, neurochemistry, and neurophysiology:
- # Neurosurgery in the context of interventions for Movement Disorders
- # Cellular biology as it relates to primary neurodegeneration, apoptosis, and trophic influences on cell function
- # Neurological Education: teaching experience for physicians, health professionals, patients and the public in Movement Disorders

### **b. Prerequisites for Training**

Fellowships in Movement Disorders are post-residency positions that are reserved for licensed physicians who have successfully completed neurology residency. Foreign medical graduates may receive a waiver of this prerequisite based on approval by the fellowship Program Director. Other specialists, such as pediatricians, psychologists and rehabilitation specialists may qualify on an individual basis.

### **c. Duration of Training**

The minimal period of training will be one year. Depending on the specific goals of individual programs, training periods may be longer.

### **d. Training Program**

#### 1. Institutional Requirement

The Movement Disorder fellowship must be conducted under the auspices of an approved neurology residency training program within an accredited medical school, a hospital affiliated with a medical school, or a non-medical school environment that meets all other requirements. The fellowship must have the support of the Chairperson of the respective Department of Neurology (or equivalent) and appropriate key personnel of the institution. The training institution must have inpatient services, outpatient services, a critical care unit, neuroimaging facilities, neurorehabilitation unit, and clinical or basic research laboratories applicable to Movement Disorders. To qualify as a site for Movement Disorder fellowship training, active patient care, research and educational activities must all be present. Institutional clinical faculty will include neurologists, neurosurgeons, neurorehabilitation specialists, and psychiatrists. Laboratory scientists will vary in their expertise and composition, but sufficient exposure must be available for interaction with the fellow. In the event that the core faculty or institutional components are partly missing from the sponsoring institution itself, the fellowship director may arrange for critical training to occur at another institution with official arrangements documented.

#### 2. Training Program Faculty

- # Program Director (PD). The PD must be a board certified neurologist and possess sufficient clinical, research, educational and administrative ability to direct the fellowship program. Ideally, the PD himself/herself is a recognized leader in the field of Movement Disorder neurology. The PD must be a full-time faculty member in the sponsoring institution and be available on a regular basis to interact directly with and supervise the fellow's progress.
- # Primary Faculty. Primary training program faculty will be neurologists who are board certified or board eligible and spend the majority of their neurological commitment in the study and treatment of Movement Disorders and related issues. They must have sufficient protected time, administrative support and commitment to mentor fellows. They must have access to sufficient patients and the ability to teach fellows. At each fellowship program there should be at least one, and preferably more, primary clinical faculty members who, along with the PD, will provide a diverse and in-depth fellowship experience.
- # Support Faculty. Other institutional faculty may include but not be limited to clinical specialists in neurosurgery, neuroimaging, neurorehabilitation, neurobehavior and neuropsychology,

neuroepidemiology, critical care medicine, and psychiatry. Each clinical faculty member training a Movement Disorder fellow must be board certified in the respective field of expertise. Basic science and research faculty may relate to the above fields and also include specialists in molecular biology, neurotoxicology, neuropharmacology, neurochemistry, neurophysiology and related areas. Such support faculty may or may not be members of the core institution faculty, but must have a commitment to training fellows to the extent required by the PD. At least one, and preferably more, basic science support faculty must be identified as directly involved in the Movement Disorder fellowship mentorship.

### 3. Method of Teaching

Fellows will be trained clinically through direct patient contact in both inpatient and outpatient Movement Disorder clinics. They will be supervised by trained faculty. The Movement Disorder clinic will provide opportunities to evaluate all types of disorders including Parkinson's disease, dystonia, Gilles de la Tourette's syndrome, myoclonus, and tremors.

They will also be involved in teaching conferences, symposia, seminars, and lectures that focus on Movement Disorders. They will learn through reading assignments. The focal point of the general Movement Disorder training will be clinical experiences of one-on-one mentorship by the PD and primary faculty. Special areas of subspecialty training will be arranged by work with the support faculty.

#### **e. Timetable for training**

Movement Disorder fellowships will last a minimum of one year and will be longer for individual programs. In the one-year fellowship, at least nine months must be involved with full-time direct patient care (including inpatient and outpatient).

#### **f. Methods of Evaluation of the Trainee**

The PD or designated primary faculty member will be responsible for meeting with the fellow at least every three months to provide regular feedback on performance and to advise the fellow about strengths and weaknesses. The information on performance will be obtained by contact with the faculty and staff involved with the fellow over that past months since the prior evaluation. A final written evaluation will be provided by the PD at the end of the fellowship. This evaluation will verify that the fellow has demonstrated sufficient professional ability to practice competently and independently in the area of Movement Disorder neurology. This final document will be part of the fellow's permanent record retained by the institution.

#### **g. Methods of Evaluating the Fellowship Training Process**

In the absence of a formal Movement Disorder board certification mechanism or oversight group whose purpose is to monitor and evaluate Movement Disorder fellowship programs, a self-evaluation program must be instituted within each program. This process may take several forms:

- # Yearly retreat for faculty to critique the perceived strengths and weaknesses of training and to solicit suggestions for upgrading or improving the program
- # Annual feedback from fellows who are in the program as well as those who have completed the program and are now in their careers. This process can be open-ended with a letter from each fellow, or be documented in a standard form.
- # Outside reviewers may be invited to visit the program and critique it with a written list of suggestions for improvements
- # Other quality assurance methods, including number of fellows who pass their Neurology boards, academic or practice positions secured by graduates of the fellowship program, number of publications, research grants obtained, or practice success in the first years after fellowship training.
- # Continuing education is essential throughout the fellowship (see below) and the fellow is responsible for documenting the educational activity and delivering those documents to the PD. Documents on this evaluation process should be kept as part of the institutional file on the Movement Disorder fellowship.

#### **h. Mechanisms for feedback**

Fellows will complete evaluations of the faculty and curriculum at least every three months during the fellowship. In addition, the PD or designated primary faculty member will be available in between these meetings on a weekly basis to discuss any concerns by the fellow or other staff members regarding the fellowship.

#### **i. Methods for upgrading knowledge**

The faculty and fellows within the program will participate in continuing education in order to expand their knowledge base and remain up-to-date in their expertise of Movement Disorders. Activities to accomplish this goal may include:

- # Active participation in clinical discussion, rounds and conferences that stimulate discussion and scholarship
- # Participation in journal clubs and research conferences
- # Active participation in professional and scientific societies at the local, regional, national or international level particularly in the form of attendance to meetings and publication of materials in their respective journals.
- # Participation in clinical or basic science research programs in Movement Disorders or its related neurobiology.
- # Participation in continuing medical education (see below)

#### **j. Continuing Medical Education needed**

At least 20 hours of Category 1 of continuing education in Movement Disorders must be completed annually by the Movement Disorder fellow. The appropriate documents verifying these credits should

be given to the PD.

**k. Curriculum necessities**

I. Anatomy, neurochemistry and neurophysiology of the basal ganglia

- # Basal gangliar connections
- # Intrastriatal structures
- # Additional brain stem-cortical loops
- # Basal gangliar interactions with the cerebellum
- # Neurotransmitter chemistry and pharmacology: Dopamine, Acetylcholine, Gamma-amino butyric acid (GABA), Glutamate, Norepinephrine, Serotonin
- # Neurophysiological patterns of basal ganglia function
- # Anatomical, neurochemical and physiological hypotheses related to hypokinesia and hyperkinesia

II. Clinical Evaluation of Movement Disorders

- # Skills to recognize and document patterns of clinical findings in movement disorders when the patient is at rest
- # Skills to perform a complete general neurological examination
- # Skills to perform a focused examination for movement disorders including turning, rest, assuming a posture, doing a task
- # Skills to recognize and document patterns of clinical findings in movement disorders when the patient maintains a posture
- # Skills to recognize and document patterns of clinical findings in movement disorders when the patient executes a task
- # Skills to evaluate tone
- # Skills to evaluate walking
- # Familiarity and ability to apply standardized rating scales for movement disorders
- # Skills to recognize and document non-neurological findings typical of movement disorders
- # Expertise in the definition and recognition of the following neurological phenomena
  - Hypokinesia (akinesia and bradykinesia)
  - Hyperkinesia
  - Tremor
  - Chorea
  - Choreoathetosis
  - Ballism
  - Tics
  - Stereotypies
  - Akathisia
  - Myoclonus
  - Hemifacial Spasm
  - Dystonia
  - Parkinsonism

III. Diagnosis, treatment, and scientific understanding of neurological disorders that are considered within the speciality of Movement Disorder neurology. For each of the entities listed below, the

following areas of training must be covered:

Pathogenesis and Pathophysiology: including molecular biology and genetic issues

Epidemiology and risk factors

Clinical features

Diagnostic evaluation: neuroimaging, laboratory studies

Differential diagnosis

Treatment: pharmacological, surgical, rehabilitative. Treatment involves special emphasis on :

Acute vs. chronic interventions

Differential treatment of patient subgroups:

- early vs. middle vs. late disease

- old vs young patients

- complexities of polypharmacies

- treatment associated adverse events

- primary vs. secondary movement disorders

Competency in special treatments including use of botulinum toxin

Prognosis and natural history

Current areas of research

# Hypokinetic Movement Disorders

Parkinson's Disease

Parkinsonism-plus syndromes

Multiple system atrophy, Progressive supranuclear palsy, Cortico-basal degeneration, Lewy body dementia

Stiff-person syndrome

# Hyperkinetic Movement Disorders

Huntington's disease

Other forms of chorea

Sydenham's chorea, Chorea gravidarum, Lupus chorea, Tardive dyskinesia

Primary dystonia

Secondary forms of dystonia

Hallervorden-Spatz disease

Gilles de la Tourette syndrome

Other primary tic disorders

Secondary tic disorders

Stereotypies seen in primary psychiatric illnesses

Stereotypies seen in neurological conditions

Painful legs/moving toes

Action and non-rest tremors

Essential or familial tremor

Physiological tremor

Drug-induced tremors, and tremors of metabolic and medical illnesses

Rubral tremor

Tremors seen in cerebellar disorders

- Wilson's disease
- Hemifacial spasm
- Essential Myoclonus
- Secondary myoclonus
- Startle syndromes
- Gait disorders
- Spinal cerebellar ataxias and other forms of ataxias
- Paroxysmal dyskinesias
- Restless leg syndrome
- Akathisia
- Drug-induced movement disorders

IV. Special Procedures

- Techniques of chemical denervation such as botulinum toxin and other agents.

## **APPENDIX I: SUGGESTED CORE READING AS PART OF CURRICULUM**

**THE SECTION WILL UPDATE THIS REGULARLY TO ASSIST FELLOWSHIP PROGRAMS WITH A GENERAL READING LIST THAT COVERS THE MAJOR AREAS OF MOVEMENT DISORDER FELLOWSHIP TRAINING.**

**DRAFT:**

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