

2nd Year Epilepsy Fellowship (ACGME Accredited)

The intent of the MGH Epilepsy Fellowship is to provide a strong foundation in clinical epileptology and in the technical, interpretive and clinical aspects of electroencephalography and evoked potentials such that the fellow would be able to direct an Epilepsy Program and an EEG/EP laboratory. Our fellowship program offers training to adult and pediatric neurologists. The Fellowship Program relies on case-based learning to achieve its educational objectives.

The clinical aspects of their education heavily feature in-depth training with the Epilepsy Service at Massachusetts General Hospital. The service includes an inpatient consultation service, an active outpatient epilepsy clinic, an epilepsy monitoring unit, an epilepsy surgery program co-directed by Dr. Emad Eskandar, a Pediatric Epilepsy Program directed by Dr. Thiele, and an active epilepsy research program including both clinical and basic science research approaches to the problem of chronic epilepsy. In addition to offering advice on the medical management of seizure disorders, and evaluation for the surgical management of such problems, the Epilepsy Service also provides the opportunity for patients to enroll in investigational treatment protocols.

Clinical experience is complemented by a series of didactic lectures, an array of clinical and scientific weekly conferences, and a journal club. Fellows also gain teaching experience in their interactions with Neurology residents, medical students, and allied health professionals.

It is expected that the fellow will obtain ABPN Board Certification in Epilepsy within two years of completing the fellowship.

Thus, by the end of the fellowship, the fellow will be:

1. Competent in the diagnostic evaluation, interviewing, and examination of patients with epilepsy and seizures
2. Able to determine the differential diagnoses of patients presenting with epilepsy and seizures, and to determine the appropriate medical and surgical investigations to confirm a diagnosis
3. Competent in the inpatient and outpatient management of patients being treated both medically and surgically
4. Knowledgeable regarding the basic science, genetics, epidemiology, of epilepsy and seizures
5. Experienced in neuroimaging and other diagnostic modalities in epilepsy, including the reviewing and reporting of routine EEGs, Phase 1 scalp monitoring studies, and Phase 2 intracranial monitoring, including subdural grid, depth, and intra-operative electrocorticograph recordings
6. Able to demonstrate their understanding of pharmacologic and non-pharmacologic treatment options, co-morbidities, and prognosis in epilepsy and seizures
7. Competent in their knowledge of neuropsychology

Rotation summaries:

EEG Rotation (3 months, mandatory)

Trainees will be responsible for interpreting EEG studies performed in the clinical neurophysiology laboratory, and entering a preliminary report into the computer-based reporting system. Pediatric cases account for approximately 20% of EEGs conducted at

MGH. During their EEG rotation, fellows will gain the equivalent of two weeks of clinical experience with the care of children with epilepsy and seizure disorders, which will count toward their ACGME-mandated minimum of one month of exposure to pediatric epilepsy. They will review all studies with a faculty member who will ultimately finalize and sign the report. In the case of urgent findings, fellows will communicate directly with the patient care team to advise them of the findings and assist with planning an appropriate response as requested. In some cases, fellows may suggest conversion of the routine EEG into an LTM study to better monitor response. Fellows will also be responsible, in a progressive fashion throughout the year, for triaging EEG requests, troubleshooting technical problems, and addressing clinical issues that might arise in the lab (e.g. the occurrence of a clinical seizure).

Long-term Monitoring Rotation (3 months, mandatory)

Fellows will be responsible for overseeing all longterm bedside monitoring studies conducted in the hospital. Many, but not all of these studies, take place in critical care units. Approximately 30% of LTM studies at MGH are performed on pediatric patients, mainly in the pediatric and neonatal ICU settings. During their LTM rotation, fellows will gain the equivalent of three weeks of clinical experience with the care of children with epilepsy and seizure disorders, which will count toward their ACGME-mandated minimum of one month of exposure to pediatric epilepsy. Fellows will review data several times a day as required, review pertinent findings with a faculty member, and advise the care team about the findings and evolution of the EEG. They may provide management suggestions as required. Fellows will generate preliminary reports of LTM studies, which will be reviewed and finalized by a faculty member. Fellows will assist technologists in solving technical problems, and will oversee triage of monitoring requests.

EMU Rotation (2 months, mandatory)

Fellows will be responsible for overseeing all EMU studies conducted in the hospital. These studies take place on the adult neurology ward and on the pediatric floors in dedicated rooms. The MGH Epilepsy Monitoring Unit is equipped with four pediatric beds and pediatric cases account for approximately 20% of EMU cases seen by fellows. During their EMU rotation, fellows will gain the equivalent of one and a half weeks of clinical experience with the care of children with epilepsy and seizure disorders, which will count toward their ACGME-mandated minimum of one month of exposure to pediatric epilepsy. Fellows will review data several times a day as required, review pertinent findings with a faculty member, and advise the care team about the findings and evolution of the EEG. They may provide management suggestions as required. Fellows will generate preliminary reports of EMU studies, which will be reviewed and finalized by a faculty member. Fellows will assist technologists in solving technical problems. Fellows are responsible for integrating monitoring findings with other clinical data to determine the necessary length of EMU studies, and to adequately interpret them. Fellows will present EMU cases to the MGH Epilepsy Conference, including clinical, imaging, psychological, and EMU data, and will lead the clinical discussion of the findings and their implications for ongoing care. Fellows will communicate those findings and suggestions to patients and to referring physicians.

Outpatient Clinic and Consults Rotation (1 month, mandatory)

The clinic and consults rotation is designed to ensure that our fellows are exposed to full spectrum of epilepsy and seizures across the lifespan. In the outpatient clinic setting, fellows will gain experience with the long term management of patients living with

epilepsy. During this rotation, fellows will be the first point of contact for other services seeking an inpatient epilepsy consult. Fellows will evaluate patients and advise on the appropriate diagnostic studies, interpret imaging and provide recommendations for care.

Sleep Rotation (2 weeks-1 month, elective)

The sleep rotation is designed to expose fellows to polysomnography and sleep medicine in fulfillment of the ACGME-required one month of elective time. Fellows will review sleep studies ½ day each week with a member of the sleep medicine faculty, and assist in generating a report. These individuals will read studies daily, and may attend sleep clinic. Fellows will obtain additional exposure to sleep medicine in the form of didactic lectures offered during our year-long Clinical Neurophysiology Lecture series.

Intraoperative Monitoring Rotation (2 weeks-1 month, elective)

The IOM rotation is designed to expose fellows to IOM in fulfillment of the ACGME-required one month of elective time. Fellows who choose this discipline for their minor will work with members of the IOM faculty ½ day/week to conduct IOM studies, and assist in generating a report. Some fellows may choose to devote a 1 month elective block to obtaining additional focused experience in IOM. These individuals will read studies daily. Fellows will obtain additional exposure to IOM in the form of didactic lectures offered during our year-long Clinical Neurophysiology Lecture series, and in reviewing IOM studies presented at our weekly Clinical Neurophysiology conference.

The Epilepsy Fellowship is intended to be paired with the MGH Clinical Neurophysiology Fellowship to provide a total of two years of training. Fellows will complete the one-year MGH Clinical Neurophysiology Fellowship then continue with the one-year Epilepsy Fellowship. For the majority of cases, these two fellowships will therefore have a combined selection process.

Career preparation:

We expect that nearly 80% of our trainees will go on to become academic clinicians and that approximately 20% will pursue careers in laboratory-based research and basic science. Our fellowship is designed to provide a strong foundation in clinical epileptology and in the technical, interpretive and clinical aspects of electroencephalography and evoked potentials such that at the end of their training, our graduates would have the clinical skills and experience needed to direct an Epilepsy Program and an EEG/EP laboratory. Our fellows will graduate prepared to become leaders in the fields of Epilepsy and Clinical Neurophysiology.

Clinical preparation:

Epilepsy fellows at MGH serve a diverse patient population in both inpatient and outpatient settings and gain exposure to the full spectrum of seizures and epilepsy. Our core rotations provide fellows with experience working in a variety of environments including: an inpatient consultation service, an active outpatient epilepsy clinic, an epilepsy monitoring unit, and an epilepsy surgery program. In addition to offering advice on the medical management of seizure disorders, and evaluation for the surgical management of such problems, the Epilepsy Service also provides the opportunity for patients to enroll in investigational treatment protocols.

Research experience:

Fellows will have the opportunity to participate in the work of our Epilepsy Service's active epilepsy research program including both clinical and basic science research approaches to the problem of chronic epilepsy. There are extensive computer facilities available for EEG/EP work. Current research projects include:

1. Pathophysiology of epileptic phenomena in humans as revealed by MR spectroscopy and fMRI and simultaneous EEG:
2. Studies of the utility of continuous EEG monitoring in various hospital settings:
3. Signal analysis approaches to increasing the sensitivity, specificity and efficiency of continuous EEG data review:
4. Dipole source analysis of benign and abnormal epileptiform transients in normal subjects and patients with epilepsy:
5. EPs in CNS diseases - generator sources as revealed by human clinico-pathologic correlations - pathophysiology of diseases as revealed by EPs - diagnostic and therapeutic implications of EPs
6. Central motor conduction with transcranial magnetic stimulation - studies in normal subjects and patients with neurologic diseases.

Technical skills training:

Under the supervision of an experienced technologist, fellows will receive training in the technical aspects of performing an EEG, from start to finish, and setting up a patient for continuous video EEG monitoring, including placing the electrodes. Similarly, fellows will be trained on the set-up and initiation of a video-EEG study in the Epilepsy Monitoring Unit. By the conclusion of the program, trainees will be expected to demonstrate competence in all technical aspects of these studies.

Rotation descriptions; affiliates:

Sample block diagram:

	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Rotation:	EEG	LTM	EMU	Clin/Con	EEG	LTM	EMU	Vac-Elec	EEG	LTM	Clin/Con	Elec
% Pediatric	25%	40%	25%	--	25%	40%	25%	--	25%	40%	--	--
% Adult	75%	60%	75%	--	75%	60%	75%	--	75%	60%	--	--
% Inpatient	60%	80%	80%	50%	60%	80%	80%	--	60%	80%	50%	--
% Outpatient	40%	20%	20%	50%	40%	20%	20%	--	40%	20%	50%	--

All rotations will take place 100% at MGH. Regardless of rotation, fellows will be expected to spend approximately five hours per week (~10% of time) in didactic conferences and will participate in one half-day of outpatient/ambulatory clinic per week (~10% of time). Per ACGME requirements, fellows will have one month of elective time which can be spent on clinical rotations such as Sleep or Intraoperative Neuromonitoring, or on research.

Required rotations:

- Outpatient Clinic and Consults (Clin/Con), duration: 1 month
- Epilepsy Monitoring Unit (EMU), duration: 2 months
- Long Term Monitoring (LTM), duration: 3 months
- EEG, duration: 3 months

Elective rotations:

- Intraoperative Monitoring (IOM), duration: 2 weeks – 1 month
- Sleep, duration: 2 weeks – 1 month
- Research, duration: 2 weeks – 1 month

Didactics:

Fellow Specific Didactic Activities:

Fellows are provided with a robust didactic curriculum that addresses all aspects of patient care, case management, and quality improvement. Conferences are designed to help fellows improve clinical skills, become familiar with current literature, and learn to analyze patient outcomes from a practice management perspective. During these conferences, fellows and Epilepsy Service faculty present and discuss recent cases, significant literature, current research, and proposed changes in practice. Attendees include Epilepsy and Clinical Neurophysiology fellows, Epilepsy Service faculty, Partners Neurology residents, and EEG technicians.

- 1) MGH EEG and Epilepsy Case Conference
 - a) Time/Location: Weekly – Mondays 1-3pm, Adams ACC 7
 - b) Objectives:
 - i) Analyze scalp (and if applicable) intracranial EEG data
 - ii) Integrate EEG data as well MRI, Pet and any other available data (such as fMRI, MEG, ictal SPECT) to try and determine seizure onset zone
 - iii) Determine when it is appropriate to refer patients for Phase II investigations (invasive EEG monitoring)
 - iv) Review any risk factors present and determine if patient is an appropriate candidate for epilepsy surgery
- 2) Pediatric Epilepsy Surgery Conference
 - a) Time/Location: Weekly – Wednesdays 8:30-9:30am, Blake 12
 - b) Objectives:
 - i) Analyze EEG, MRI, Pet and any other available data for pediatric cases of interest
 - ii) Discuss surgical, pharmacologic, and non-pharmacologic treatment options and their appropriateness for application to children
- 3) Epilepsy Clinic Conference
 - a) Time/Location: Weekly – Fridays 12-1pm, ACC 835
 - b) Objectives:
 - i) Review fellow performance in the outpatient clinic and identify opportunities for improvement
 - ii) Report on difficult cases and review plan of care
 - iii) Review medication changes, referrals, and orders for studies/imaging
- 4) MGH Epilepsy Research Lab Meeting
 - a) Time/Location: Weekly – Tuesdays 10-11am, Adams ACC 7
 - b) Objectives:
 - i) Review current status of epilepsy research studies/projects and preview new and upcoming projects
 - ii) Discuss literature relevant to lab projects and implications of research outcomes for clinical practice
- 5) Clinical Neurophysiology Case Conference
 - a) Time/Location: Weekly – Mondays 12-1pm, EEG Library
 - b) Objectives:
 - i) Review and interpret EEG, MRI, fMRI, MEG and neuropsychological data for cases of interest
 - ii) Discuss available treatment options and patient characteristics that may be significant indicators for a particular approach
- 6) MGH/BWH Clinical Neurophysiology Didactic Conference
 - a) Time/Location: Weekly – Tuesday 11-12pm, Blake 12
 - b) Objectives:

- i) Deepen understanding of key topics in the field of epilepsy treatment and monitoring
 - ii) Review monitoring techniques, updates to technology, approaches to troubleshooting
- 7) Journal Club
- a) Time/Location: Bi-Weekly – Thursdays 1-2pm, EEG Library
 - b) Objectives:
 - i) Review articles of interest with implications for clinical practice and the treatment of patients with epilepsy
 - ii) Discuss new alternatives to current practices, identify opportunities for quality improvement

Other Available Didactic Activities

- 1) Neurology Grand Rounds: Weekly – Thursdays 9-10am, Ether Dome
- 2) Neuromuscular Conference: Weekly – Thursdays 10:30-11:30am, CRP 9

Research:

Fellows are expected to participate in clinical or basic research protocols involving patients on the Epilepsy Service. Fellows are required to complete CITI training within the first month of their program and will receive additional training from faculty and the Epilepsy Service Trial Coordinator on how to communicate with patients regarding enrollment in investigational treatment protocols. Each fellow will be expected to take primary responsibility for one of the division's ongoing trials, under the guidance and mentorship of the Primary Investigator.

Fellows are both welcome and expected to explore basic research activities. Fellows are expected to attend the weekly Epilepsy Research Laboratory lab meeting where they will learn about both the current status of faculty research projects and the basic principles of evidence-based medicine and research. The diversity of our faculty's research interests provides fellows with opportunities to participate in research on a variety of topics. The core curriculum does not provide dedicated research rotations, but fellows have the option of spending up to a month of elective time on research.

Duty hours:

Fellows are expected to arrive at 8am daily (Mon-Fri) to review the previous days monitoring data and be prepared to discuss it with the ward team at or before rounds at 10am. During most rotations, fellows will work Monday through Friday, and can expect to have their shift work completed by around 5pm daily. By 5pm, fellows on inpatient service should touch base with the resident on overnight call for handoff and sign all active patient notes as Preliminary. Fellows in our program do not take overnight call. Weekend coverage is provided by the two fellows on LTM who alternate weekends on service. The weekend fellow will follow an 8am-5pm schedule as on weekdays.

All ACGME duty hour guidelines will be observed by fellows during all rotations.

Patient coverage:

There are no overnight or home call responsibilities for our Epilepsy fellows. Weekend coverage is provided by the two fellows on LTM who alternate weekends on service.

Fellow supervision:

The MGH Epilepsy Training Program is designed to promote the professional growth and development of our fellows. Our goal is to graduate confident, competent clinical neurophysiologists who are capable of independently performing and interpreting high quality neurophysiologic studies, as well as providing high quality care to patients with epilepsy and neuromuscular disorders. This occurs through the performance and interpretation of hundreds of neurophysiologic studies under the supervision of qualified neurophysiology faculty, as well as through the care of numerous individual patients in the epilepsy and neuromuscular clinics, again under the supervision of expert faculty. The supervision of fellows is accomplished through explicit written descriptions of supervisory lines of responsibility for the care of patients. Such guidelines are communicated to all members of the program staff. Fellows are provided with prompt, reliable systems for communication and interaction with supervisory physicians. Fellows are afforded increasing levels of autonomy as their experience accrues and their procedural and clinical skills advance. That level of autonomy varies for each resident and each patient, and is monitored by teaching staff. Faculty are ultimately responsible for patient welfare and safety, and, therefore, supervise all patient care encounters. Faculty are on call and available to fellows 24 hours a day and 7 days a week for supervision and consultation, during every clinical experience and rotation.

1. Direct supervision

- a. Direct care of inpatients, including epilepsy monitoring patients, is provided by the Neurology resident staff under the direct supervision of an assigned neurology attending.
- b. For outpatients, all patients seen by clinical neurophysiology residents are staffed one to one by an attending neurologist in the epilepsy, sleep or neuromuscular groups. Attending physicians are ultimately responsible for clinical care in the outpatient setting.
- c. All clinical neurophysiology tests are supervised and reviewed by an attending neurophysiologist.

2. Indirect supervision

- a. Clinical neurophysiology issues are handled by the clinical neurophysiology residents and staff on a consultative basis, with ultimate responsibility for patient care resting with the attending physician.
- b. Clinical neurophysiology faculty are assigned to Epilepsy, EEG, Sleep and Neuromuscular Services, generally in one month blocks. The assigned faculty members are available 24/7 by telephone or beeper and are always available to assume direct care responsibility in case the resident is overloaded, uncertain, or incapacitated.

3. Oversight

- a. Reports on all clinical neurophysiology tests are ultimately signed by the staff neurophysiologist.

Evaluation and feedback; career counseling and mentoring:

Faculty are expected to provide verbal feedback to fellows throughout each rotation and to summarize areas of strength and opportunities for improvement at the conclusion of each rotation.

For all rotations, faculty are also asked to complete written evaluations via New Innovations for each trainee they worked with or supervised. These evaluations are distributed in two 'waves';

one round is sent out at mid-year and the second round is sent shortly before the end of the year. In addition to faculty evaluations via New Innovations, the Program Director implements a multi-source evaluation system with semi-annual evaluation of the fellows solicited from attending staff, nursing staff, and clerical staff. These evaluations cover the knowledge base, clinical skill, integrity, work habits, interpersonal skills, and individual growth. These evaluations are reviewed by the Program Director and discussed with the fellows twice a year during one-on-one meetings.

The Clinical Competency Committee will be responsible for reviewing all evaluations and preparing Milestones evaluations for each fellow, on a semi-annual basis. The CCC consists of Program Director Andrew Cole and two additional faculty members, currently: Dr. Daniel Hoch and Dr. Brandon Westover. The Program Director will discuss the outcomes of these evaluations with the fellows twice a year, during one-on-one meetings.

The Program Director discusses career goals and clinical/research interests with each fellow at the beginning of the year then provides guidance on the relevant research and elective opportunities available, and helps to put fellows in touch with faculty mentors with shared interests. The Program Director follows up informally throughout the year and formally addresses these issues during the bi-annual meetings.

Evaluation by the fellow/s; program improvement process:

Program faculty including the Program Director, are formally evaluated by their trainees via New Innovations for all rotations. These evaluations are confidential and the feedback provided therein is primarily used by the Program Director to help guide faculty development. Fellows are asked to evaluate the program on an annual basis; fellow feedback is solicited regarding the program's curricular structure, hospital-based resources, didactic activities, etc. All of this information is gathered for annual review by the Program Evaluation Committee (PEC). The PEC is composed of Program Director Andrew Cole, two additional core faculty members (Dr. Daniel Hoch and Dr. Brandon Westover), and one fellow, as the representative for his peers.

The PEC is responsible for considering all aspects of the program, including:

1. Fellow performance – The PEC will track indicators of success for current and former fellows. For current fellows, PEC will look at trends in faculty feedback, frequency of fellows publishing/presenting their research, and any instances of probation or disciplinary action. Among program graduates, the PEC will look at Board passage and job placement rates.
2. Faculty performance – The PEC will review the results of fellow evaluations of faculty and look at recent achievements and scholarly activity by faculty.
3. Curriculum content – The PEC will undertake any revisions of curriculum content/language that they find necessary. They will identify areas of weakness in fellows' training and develop a strategy to address any gaps or areas of non-compliance.
4. Resource availability – The PEC will review feedback from fellows regarding opportunities for the program to better serve its trainees, including suggestions for lecture topics, elective rotations, and professional development.

After reviewing all of these areas, the PEC will evaluate the progress that has been made on the previous year's action plan, and draft an action plan for program improvement in the coming academic year. The new action plan will be distributed to all faculty and fellows at the beginning of each year.