Clinical Neurophysiology

University of Pittsburgh School of Medicine
Department of Neurology

Fellows/Residents Manual
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EEG/Epilepsy Faculty and Staff

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### PROGRAM OVERVIEW

The Clinical Neurophysiology Fellowship Program at the University of Pittsburgh Medical Center is accredited by the ACGME and allows fellows to become certified by the American Board of Psychiatry & Neurology for Added Qualifications in Clinical Neurophysiology. Depending on the individualized training of fellows, they may also become eligible for subspecialty certification in other clinical neurophysiology subspecialties. The training period is one year, and two funded positions are available to residents who are Board-eligible or certified in Neurology. The program is accredited for a third position that may be filled if alternative funding is available; e.g., via Childrens Hospital.

This one-year training program concentrates upon EMG and EEG but offers a broad exposure to clinical neurophysiology. The program builds upon basic skills learned during neurology residency and provides the fellow with the opportunity to obtain greater knowledge and skills in clinical neurophysiology. More subspecialized training is introduced and clinical correlation is stressed with the addition of clinical experiences and didactic sessions. Fellows must spend time in both specialties, but the percentage of time in either can vary. Many fellows elect to apply their time equally. Specific EMG training includes nerve conduction studies/EMG, pediatric EMG, autonomic nervous system testing, and EMG-guided botulinum toxin therapy administration for movement disorders. A minimum of one-half day per week involves outpatient evaluations of patients with neuromuscular diseases, especially myasthenia gravis, peripheral neuropathy, amyotrophic lateral sclerosis, and myopathies, including dystrophies. Fellows also learn to perform needle muscle biopsies and interpret muscle and nerve histopathology. The EEG training includes interpretation of EEGs, long-term EEG monitoring in the epilepsy monitoring unit and via ambulatory EEG, video EEG, and evoked potentials. Ambulatory EEGs are also performed. Training in Evoked Potentials, including auditory, visual, and somatosensory, is also provided. Outpatient epilepsy evaluation and pre- and post-surgical epilepsy evaluation are also performed. Electives in polysomnography and intraoperative monitoring are available.

Fellows are encouraged to participate in academic activities, including clinical research.
Examples of fellows' schedules are shown:

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Schedules are typically arranged in three-month blocks. One block can include up to 60% elective time with 20% EMG and 20% EEG.

ORIENTATION

Fellows will undergo a general orientation for new residents and fellows at the University of Pittsburgh Medical Center in July. The program director will meet with fellows and Dr. Zivkovic will meet with residents at the beginning of their rotations to review goals and responsibilities. The residents and fellows should meet with the EMG lead technician to receive educational materials and with Dr. Ghearing to get EEG reading materials.

In addition, the program director will meet every two months with the Neurophysiology fellows to discuss their experiences in the fellowship, to structure their programs individually, and to obtain feedback. He will also discuss their career plans, financial considerations, and billing and compliance issues.

CONFERENCES

The mandatory conferences are as follows:

- Wednesday, 1:00-2:00, in Stroke conference room: EEG Conference
- Tuesday, 3:30-4:30 PM, in A509-PUH: Muscle/Nerve Conference
- Thursday, 4-5PM, Fellows’ Office, G812, PUH: EMG Case Conference
- Wednesday, 4-5 PM, 11 Scaife Hall: Neurology Grand Rounds

Optional conferences:
- Thursday, 8-9 AM, in 4C Neurosurgery Conf. Rm., PUH: Epilepsy Surgery Conference
- Tuesday, 12-1 PM, Stroke conference room (teleconference): Child Neurology Conferences

Fellows may also attend weekly Sleep Grand Rounds.

Conference Descriptions (See Schedules on pages 34-39)

EMG/Neuromuscular Conferences:

- **Muscle/Nerve**: The fellows will be required to present at the nerve muscle conferences throughout the course of the year. The presentations should include the clinical, electrodiagnostic, and pathologic aspects of the disorder. Peripheral nerve as well as muscle diseases will be presented. Any changes in the schedule should be made at the fellow level. High-quality PowerPoint presentations are required. If the fellow requires pathologic specimens, they must be requested at least two weeks in advance from the program director. Conferences are held in the Neuropathology sign-out room, A509, PUH. See attached schedule.

**EMG Didactic Conferences**: Each week, a fellow or resident will be assigned an AAEM minimonograph or similar publication to discuss at the didactic conference. Under the supervision of an attending
physician, the fellow or resident will then review the topic. Journal clubs are also held in this venue. See attached schedule.

**Annual EMG Conference:** A two-day EMG Conference is held annually in March at UPMC Presbyterian. **Attendance is mandatory for all fellows.**

**EEG/Epilepsy Conferences:**

**EEG Conference:** Each week Dr. Richard Brenner and the epilepsy faculty will review EEGs showing a variety of normals, normal variants, artifacts, seizures, and other important data of which all residents and fellows in neurology should be aware. The conference is held at UPMC Presbyterian and teleconferenced to Children’s Hospital. Relevant clinical scenarios and cases will be discussed in conjunction with these EEGs. Fellows and residents are expected to attend and will be asked at random to interpret and discuss various EEG findings. Fellows are also expected to give PowerPoint™ presentations on pertinent topics assigned to the by Dr. Brenner. Throughout the year, various faculty members will give didactic lectures on the following topics:

- Epilepsy Surgery Conference is weekly, Monday from 4:00 to 5:00 held jointly via teleconference at Children’s Hospital and UPMC Presbyterian.

This conference is a multi-disciplinary conference in which the fellows, epilepsy and neurosurgical faculty participate. It concentrates on patients being evaluated for epilepsy surgery and patients undergoing video EEG and other forms of long term monitoring. The conference also addresses the results of imaging, lesions and language localization, and surgical planning.

**Epilepsy Surgery Conference:**

Once each week, the Epilepsy Surgery Conference is held Children’s Hospital and teleconferenced to UPMC Presbyterian. Interesting cases are presented in a forum for relevant discussion. Attendees will include not only the fellows, but also various adult and pediatric epilepsy physicians and staff, as well as epilepsy neurosurgery physicians and staff. Fellows are expected to present cases throughout the course of the year.

**COMPETENCY-BASED GOALS AND OBJECTIVES FOR FELLOWS**

**EMG/Neuromuscular Clinic Rotation Goals and Objectives** (Autonomic testing is also part of this rotation)

**Patient Care**

**Goal:** Provide competent, appropriate, and effective neurophysiologic testing and care of neuromuscular patients

**Competency:** Perform, review, and analyze EMG and autonomic studies competently

**Objective:** Competently evaluate and treat patients with neuromuscular disorders

**Objective:** Preview records on patients and obtain and perform a basic history and examination on EMG patients. Perform comprehensive histories and examinations on clinic patients. Formulate differential diagnoses. By the end of fellowship, little input from faculty should be necessary.

**Objective:** Accurately perform and interpret clinical neurophysiology studies, and provide written or dictated EMG or clinic reports to faculty. Minimal changes should be required by the end of fellowship.

**Medical Knowledge**

**Goal and Competencies:** Demonstrate broad knowledge of neuromuscular disorders, EMG, autonomic testing, and neuromuscular clinical neurophysiology and apply it to patient care (emphasis on EMG). Specific areas of emphasis include peripheral system anatomy, basics of nerve conduction and neuromuscular physiology, NCS/EMG findings in disease states, EMG-pathologic correlation, EMG finding in movement disorders, and findings in autonomic disorders.
Objective: Gain understanding of normal clinical neurophysiology and alterations in pathologic states through clinical study, didactic sessions, conferences, case conferences, assigned reading, and self-study

Objective: Demonstrate understanding of limitation(s) in testing and in diagnosis.

Practice-based Learning and Improvement
Goal: Demonstrate the ability to investigate the nature of findings of neurophysiologic studies as they relate to neuromuscular disorders.
Competency: Appraise and assimilate scientific evidence in order to improve patient care.
Objective: Demonstrate understanding of how scientific discovery enhances patient care in journal club presentations.
Competency: Incorporate feedback from faculty into daily practice in order to improve reporting and patient care.
Competency: Become familiar with electrodiagnostic and neuromuscular educational resources and be able to apply this information to clinical practice in common and unusual cases.
Objective: Demonstrate the use of such researches in case presentations at conferences.
Competency: Search the literature for information pertaining to patients and electrophysiology and apply this information to clinical practice and the conference setting. Demonstrate the use of this information in didactic presentations.

Interpersonal and Communication Skills
Goal: Demonstrate interpersonal and communication skills that allow for effective exchange of information regarding clinical neurophysiology testing and care of neuromuscular patients to patients, families, and professional associates.
Competency: Communicate diagnoses effectively to patients.
Competency: Communicate diagnoses effectively to referring MDs verbally and in writing.
Competency: Produce timely and comprehensive reports.
Competency: Interact well with technicians and ancillary support staff.
Competency: Present at conferences with clarity.
Objective: Attain satisfactory or higher scores in conference evaluations.
Competency: As skills advance, become able to educate the technicians.
Objective: Attain satisfactory or higher scores in 360 evaluations from lead EMG technician.

Professionalism
Goal: Develop professional communications style/affect that exhibits compassion, integrity and respect by:
Demonstrating professional communications style with referring MDs.
Demonstrating professional communications style with colleagues and staff.
Demonstrating professional communications style with students.
Demonstrating professional communications style with patients.
Competency: Demonstrate respect for patient’s privacy.
Competency: Be compassionate and empathetic during EMG testing.
Competency: Be reliable, punctual and dress appropriately.
Competency: Exhibit ethical behavior during testing and patient care.
Competency: Be HIPAA compliant.
Competency: Serve as a role model for junior trainees.
Objective: By the end of training, perform and act like a junior attending, maintain a professional CV, conduct a successful job search, and pass the Clinical Neurophysiology board examination.

Systems-based Practice
Goal: Develop an approach to electrodiagnostic testing based on the disease category, cost awareness, and risk-benefit analysis to provide optimal care.
Competency: Develop an approach to improve patient and staff safety in the following areas:
Electrical safety
Needle safety
Hand hygiene
Competency: Demonstrate knowledge and utilization of basic and advanced aspects of health system resources; e.g., electronic medical record

Competency: Demonstrate knowledge of outside regulatory agencies and professional organizations

Competency: Demonstrate knowledge of the administrative and technical aspects of running an EMG lab.

Objective: By the end of training, demonstrate the ability to form or assimilate a clinical neurophysiology practice within a health system.

Goals and Objectives for EEG/Evoked Potentials Rotation and Epilepsy Clinical Experiences

Patient Care

Goal: Provide competent, appropriate, and effective neurophysiologic testing and care of epilepsy patients

Competency: Perform, review, and analyze competently the following:
EEG
Evoked potentials

Objective: Competently evaluate and treat patients with Epilepsy

Objective: Perform comprehensive histories and examinations on clinic patients. Formulate differential diagnoses. By the end of fellowship, little input from faculty should be necessary.

Objective: Accurately perform and interpret EEG and evoked potential studies, and provide written or dictated EEG or clinic reports to faculty. Minimal changes should be required by the end of fellowship.

Medical Knowledge

Goal and Competencies: Demonstrate broad knowledge of seizure disorders and clinical neurophysiology (EEG and evoked potentials) and apply it to patient care. Particular area of emphasis include the basis of EEG activity, Artifacts and EEG variants, EEG findings in normal and disease states, ambulatory, video and intraoperative monitoring, EEG of sleep, origin of evoked potentials waveforms, and the use of visual, brainstem, and somatosensory evoked potentials in disease localization.

Objective: Gain understanding of normal EEG and evoked potentials clinical neurophysiology and alterations in pathologic states through clinical study, didactic sessions, conferences, case conferences, assigned reading, and self-study

Objective: Demonstrate understanding of limitation(s) in testing and in diagnosis.

Practice-based Learning and Improvement

Goal: Demonstrate the ability to investigate the nature of findings of neurophysiologic studies as they relate to neurologic disorders.

Competency: Appraise and assimilate scientific evidence in order to improve patient care. Objective: Demonstrate understanding of how scientific discovery enhances patient care in journal club presentations.

Competency: Incorporate feedback from faculty into daily practice in order to improve reporting and patient care.

Competency: Become familiar with electrodiagnostic and epilepsy educational resources and be able to apply this information to daily practice in common and unusual cases. Objective: Demonstrate the use of such researches in case presentations at conferences.

Competency: Search the literature for information pertaining to patients and electrophysiology and apply this information to clinical practice and the conference setting. Demonstrate the use of this information in didactic presentations.

Interpersonal and Communication Skills

Goal: Demonstrate interpersonal and communication skills that allow for effective exchange of information regarding EEG and evoked potential testing and care of epilepsy and neuromuscular patients to patients, families, and professional associates.

Competency: Communicate diagnoses effectively to patients.

Competency: Communicate diagnoses effectively to referring MDs verbally and in writing.

Competency: Produce timely and comprehensive reports.

Competency: Interact well with technicians and ancillary support staff.
**Competency:** Present at conferences with clarity. **Objective:** Attain satisfactory or higher scores in conference evaluations.

**Competency:** As skills advance, become able to educate the technicians. **Objective:** Attain satisfactory or higher scores in 360 evaluations from the lead EEG technician.

**Professionalism**

**Goal:** Develop professional communications style/affect that exhibits compassion, integrity and respect by:
- Demonstrating professional communications style with referring MDs
- Demonstrating professional communications style with colleagues and staff
- Demonstrating professional communications style with students
- Demonstrating professional communications style with patients

**Competency:** Demonstrate respect for patient’s privacy

**Competency:** Be compassionate and empathetic during EEG testing

**Competency:** Be reliable, punctual and dress appropriately.

**Competency:** Exhibit ethical behavior during testing and patient care.

**Competency:** Be HIPAA compliant

**Competency:** Serve as a role model for junior trainees.

**Objective:** By the end of training, perform and act like a junior attending, maintain a professional CV, conduct a successful job search, and pass the Clinical Neurophysiology board examination.

**Systems-based Practice**

**Goal:** Develop an approach to electrodiagnostic testing based on the disease category, cost awareness, and risk-benefit analysis to provide optimal care.

**Competency:** Develop an approach to improve patient and staff safety in the following areas:
- Electrical safety
- Hand hygiene

**Competency:** Demonstrate knowledge and utilization of basic and advanced aspects of health system resources; e.g., electronic medical record.

**Competency:** Demonstrate knowledge of outside regulatory agencies and professional organizations.

**Competency:** Demonstrate knowledge of the administrative and technical aspects of running an EEG lab.

**Objective:** By the end of training, demonstrate the ability to form or assimilate a clinical neurophysiology practice within a health system.

**Sleep Disorders Goals and Objectives (Elective Rotation)**

**Patient Care**

**Goal:** Provide competent, appropriate, and effective sleep disorders testing and care of patients with sleep disorders.

**Competency:** Perform, review, and analyze Polysomnograms competently.

**Objective:** Competently evaluate and treat patients with Sleep Disorders.

**Objective (elective):** Perform comprehensive histories and examinations on clinic patients. Formulate differential diagnoses. By the end of fellowship, little input from faculty should be necessary.

**Objective:** Accurately perform and interpret Polysomnograms and provide written or dictated EEG or clinic reports to faculty. Minimal changes should be required by the end of fellowship.

**Medical Knowledge**

**Goal and Competencies:** Demonstrate broad knowledge of clinical neurophysiology as it applies to normal sleep, aging, and the common sleep disorders, and apply it to patient care.

**Objective:** Gain understanding of normal clinical neurophysiology of sleep and alterations in pathologic states through clinical study, didactic sessions, conferences, case conferences, assigned reading, and self-study.

**Objective:** Demonstrate understanding of limitation(s) in testing and in diagnosis.

**Practice-based Learning and Improvement**

**Goal:** Demonstrate the ability to investigate the nature of findings of neurophysiologic studies as they relate to sleep disorders.
Competency: Appraise and assimilate scientific evidence in order to improve patient care.
Objective: Demonstrate understanding of how scientific discovery enhances patient care in journal club presentations.
Competency: Incorporate feedback from faculty into daily practice in order to improve reporting and patient care.
Competency: Become familiar with sleep disorders educational resources and be able to apply this information to daily practice in common and unusual cases.
Objective: Demonstrate the use of such researches in case presentations at conferences.
Competency: Search the literature for information pertaining to patients and electrophysiology and apply this information to clinical practice and the conference setting. Demonstrate the use of this information in didactic presentations.

Interpersonal and Communication Skills
Goal: Demonstrate interpersonal and communication skills that allow for effective exchange of information regarding sleep disorders testing and care of sleep disorder patients to patients, families, and professional associates.
Competency: Communicate diagnoses effectively to patients.
Competency: Communicate diagnoses effectively to referring MDs verbally and in writing.
Competency: Produce timely and comprehensive reports.
Competency: Interact well with technicians and ancillary support staff.
Competency: Present at conferences with clarity.
Objective: Attain satisfactory or higher scores in conference evaluations.

Professionalism
Goal: Develop professional communications style/affect that exhibits compassion, integrity and respect by:
- Demonstrating professional communications style with referring MDs.
- Demonstrating professional communications style with colleagues and staff.
- Demonstrating professional communications style with students.
- Demonstrating professional communications style with patients.
Competency: Demonstrate respect for patient’s privacy.
Competency: Be reliable, punctual and dress appropriately.
Competency: Exhibit ethical behavior during testing and patient care.
Competency: Be HIPAA compliant.

Systems-based Practice
Goal: Develop an approach to sleep disorders testing based on the disease category, cost awareness, and risk-benefit analysis to provide optimal care.
Competency: Develop an approach to improve patient and staff safety.
Electrical safety.
Competency: Know and utilize basic and advanced aspects of health system resources; e.g., electronic medical record.
Competency: Learn about outside regulatory agencies and professional organizations.

Intraoperative Monitoring Rotation Goals and Objectives
Patient Care
Goal: Provide competent, appropriate, and effective intraoperative monitoring in patients undergoing surgery.
Competency: Perform, review, and analyze competently somatosensory and evoked potentials performed in the operating room.

Medical Knowledge
Goal and Competencies: Demonstrate broad knowledge of clinical neurophysiology as it applies to intraoperative monitoring using brainstem and somatosensory evoked potentials.
Objective: Gain understanding of normal clinical neurophysiology (evoked potentials) during anesthesia and in pathologic states through clinical study, didactic sessions, conferences, case conferences, assigned reading, and self-study.

Objective: Demonstrate understanding of limitation(s) in testing and in diagnosis.

Practice-based Learning and Improvement
Goal: Demonstrate the ability to investigate the nature of findings of neurophysiologic studies as they relate to OR monitoring.
Competency: Appraise and assimilate scientific evidence in order to improve patient care.
Objective: Demonstrate understanding of how scientific discovery enhances patient care in journal club presentations.
Competency: Incorporate feedback from faculty into daily practice in order to improve reporting and patient care.

Interpersonal and Communication Skills
Goal: Demonstrate interpersonal and communication skills that allow for effective exchange of information regarding OR monitoring and care of patients in the OR undergoing monitoring.
Competency: Communicate diagnoses effectively to referring MDs verbally and in writing.
Competency: Interact well with technicians and ancillary support staff.

Professionalism
Goal: Develop professional communications style/affect that exhibits compassion, integrity and respect by:
Competency: Demonstrate professional communications style with referring MDs.
Competency: Demonstrate professional communications style with colleagues and staff.
Competency: Demonstrate respect for patient’s privacy.
Competency: Be reliable, punctual and dress appropriately.
Competency: Exhibit ethical behavior during testing and patient care.
Competency: Be HIPAA compliant.

Systems-based Practice
Goal: Develop an approach to OR monitoring based on the disease category, surgical procedure, and risk-benefit analysis to provide optimal care.
Competency: Develop an approach to improve patient and staff safety in the following area:
Electrical safety

GOALS FOR CLINICAL NEUROPHYSIOLOGY FELLOWS

I. Neuromuscular/EMG Training
   a. Learn to perform and interpret nerve conduction studies and electromyography.
   b. Learn to identify electrodiagnostic features of normals, normal variants, and nerve and muscle disorders.
   c. Learn to evaluate and treat patients with neuromuscular diseases.
   d. Learn the basic aspects of autonomic testing and single fiber EMG.
   e. Learn the basics of nerve and muscle histopathology and the EMG and clinical correlations.
   f. Attain superior knowledge of peripheral nervous system anatomy.
   g. Understand the basics of neurophysiology that are pertinent to the interpretation of NCS/EMG.

   For a-h, the fellow will obtain the skills through supervised hands-on training and participation in EMG and neuromuscular pathology conferences and in reading of the pertinent literature. The assessment will also include attending physician's observation of the fellow’s presentations at didactic conferences. These clinical skills will be assessed by the EMG and Neuromuscular attending physician’s reviews of electrodiagnostic
testing and patient evaluations, and by monitoring the fellow during electrodiagnostic testing. The attending physician will review the pertinent reports that have been generated. The evaluation will also be performed with the appropriate technicians and nurses. The portfolio of the fellow will be reviewed by the program director.

h. Understand the limitations of electrodiagnostic testing.
i. Learn to generate a thorough, organized report for the referring physician.
   Assessment will include the attending physician’s review of the report with the appropriate feedback being rendered. Feedback from referring clinicians will also be solicited when appropriate.
j. Understand the clinical implications of research findings in neuromuscular diseases.
   The assessment will also include attending physician’s observation of the fellow’s presentations at didactic conferences.

**Autonomic Nervous System Testing:**

During their neuromuscular rotation, clinical neurophysiology trainees will be exposed to various procedures for evaluating the autonomic nervous system. Trainees will observe and perform specific tests that evaluate the integrity of the autonomic nervous system, and assist in developing appropriate strategies tailored to a patient’s individual problem. Examples of autonomic testing that trainees acquire knowledge of are sudomotor function testing, cardiovagal testing, and tilt-table evaluation.

Direct patient experience is supplemented by didactic lectures, review of selected journal articles, and the option of participating in clinical research projects.

**II. EEG/Epilepsy Training**

Learn to perform and interpret electroencephalograms. Such expertise will include, but not be limited to, knowledge of the following:

a. Instrumentation and technique.
b. Minimum and preferred technical standards for performing EEGs.
c. Understand the basics of neurophysiology that are pertinent to the interpretation of EEG.
d. Normal EEG patterns and their variants.
e. Developmental aspects of EEG.
f. Changes in EEG activity with aging.
g. Abnormal EEG patterns and their functional correlates.
h. The role of EEG in diagnosing and treating specific neurological disorders.
i. The relation of EEG findings to results of other neurodiagnostic tests.
j. Learn to identify and treat seizures.
k. Learn to differentiate artifact and normal variants from pathologic changes.
l. Learn to identify EEG features of encephalopathic disorders, structural brain processes, and seizure disorders.
m. Learn to evaluate and treat patients with epilepsy, including pre-surgical evaluations.
n. Learn to identify seizure patterns and to understand the clinical correlations.
o. Learn to identify and treat non-convulsive, convulsive, and other seizure types.
p. Understand the basics of neurophysiology that are pertinent to the interpretation of EEGs.

These clinical skills will be assessed by the EEG and Epilepsy attending physician’s reviews of electroencephalography testing and patient evaluations, and by monitoring the fellow during electroencephalography testing. The attending physician will review the pertinent reports that have been generated. The evaluation will also be performed with the appropriate technicians and nurses. The portfolio of the fellow will be reviewed by the program director.

q. Learn to utilize appropriate triage and management skills when asked to assist in treatment of seizure disorders by the Neurology Consult Service or other requesting inpatient services.
r. Understand the clinical implications of research findings in epilepsy.
The fellow will obtain the skills through participation in EEG conferences and in reading of the pertinent literature. The assessment will include attending physician’s observation of the fellow’s presentations at didactic conferences.

- Learn to generate a thorough, organized report for the referring physician.
  - Assessment will include the attending physician’s review of the report with appropriate feedback being rendered. Feedback from referring clinicians will also be solicited when appropriate.

III. General

- Develop appropriate communication skills.
  - These skills will include teaching residents and informing external and internal referring clinicians with regard to results of electrodiagnostic tests. It will also include communication with technical personnel. Assessment will include personal observation by attending physicians as well as feedback from staff and timeliness of testing.
- Professionalism.
  - Act in a professional manner with the allied professionals, ancillary staff and attending physicians. The assessment will consist of attending physician observation on a daily basis, along with feedback from ancillary staff.
- Practice evidence-based medicine utilizing attending physician instruction, guidelines provided by the American Association of Electrodiagnostic Medicine, and the pertinent medical literature.
  - These skills will be assessed at didactic EMG/EEG conferences, as well as during observation of technical procedures.
- For systems-based practice, the fellow will interact with other hospital-based services in a timely and effective manner, especially with inpatients and with patients who are seeing multiple physicians on the same day.
  - Assessment will consist of observation of the turn-around time and “360° Evaluations”

FELLOW RESPONSIBILITIES

I. EMG/Neuromuscular Rotation:

- The fellow is responsible for obtaining the pertinent neurologic history and performing the pertinent neurologic examination on all patients before presenting the patient to the attending physician.
- In conjunction with the technician, the fellow should be able to determine which nerves should be examined on nerve conduction studies.
- The fellow should perform the nerve conduction studies or at least review the nerve conduction studies with the technician before presenting the case to the attending physician. (The fellow is expected to perform five nerve conduction studies on normals before starting patient examinations.)
- The fellow performs the needle examination under the supervision of the attending physician. Fellows should not expect to perform only needle examinations and omit nerve conduction studies.
- Generate the report and review changes made by the attending physician.
- The fellow is also responsible for supervising and teaching rotating residents in the EMG Laboratory.
- The fellow is to attend and present at required conferences and to assign topics to the rotating residents.
- The fellow will learn to perform needle muscle biopsies.
- The fellow is to maintain a logbook of all procedures.
- The fellow must evaluate the attending physicians twice a year and turn in the evaluations to the Education Coordinator.
- The fellow will meet with the program director every two months.
I. The fellow will engage in scholarly activities.

**Outpatient:**

a. The fellow is responsible for attending outpatient neuromuscular clinics as assigned and to arrive on time. Fellows are expected to dress and act in a professional manner (no scrubs, jeans, or sneakers).

b. The fellow is expected to evaluate and examine patients in a thorough but timely manner, present the case to the attending physician, localize the process, and generate a differential diagnosis, determine the necessary diagnostic tests, and formulate a treatment plan. The fellow is required to document the findings in the outpatient record. This is also an excellent opportunity to hone skills for the Neurology Boards and clinical practice.

c. Request for vacations must be presented four weeks prior to the date to the program director.

d. The fellow has primary responsibility for coverage during the absence of the attending physician for vacation and conferences. A staff person will serve as the back up.

e. The fellow may be required to supervise and teach residents and teach medical students who are rotating through the outpatient neuromuscular service.

II. EEG/Epilepsy Rotation

a. The fellow is responsible for obtaining the pertinent neurologic history and for reviewing the EEG before presenting the findings to the attending physician. The fellow should be involved in performance of the EEG if clinically indicated. Furthermore, the fellow should perform a neurologic examination and supervise administration of anti-convulsant medications when clinically indicated for emergent EEGs.

b. In conjunction with the EEG technician, the fellow should be able to determine which, if any, additional montages, electrodes, or activating procedures should be performed during an EEG.

c. Generate the report and review any changes made by the attending physician.

d. The fellow is also responsible for supervising and educating rotating residents in the EEG Laboratory.

e. The fellow is to attend and present at required conferences.

f. Maintain a logbook of all procedures.

g. The fellow must evaluate the attending physicians twice a year and submit the evaluations to the education coordinator.

h. The fellow will meet with the program director monthly.

**Outpatient and Epilepsy Monitoring Unit:**

a. The fellow is responsible for reviewing epilepsy monitoring unit data from the previous day and for reporting the pertinent findings to the attending physician.

b. The fellow is expected to examine inpatients in the epilepsy monitoring unit, document all findings, and coordinate the care with the attending physician and other house staff.

c. The fellow is expected to evaluate and examine patients in the Epilepsy Clinic in a timely but thorough manner, to formulate a differential diagnosis, to determine the necessary diagnostic testing, and to formulate a treatment plan under the supervision of an attending physician.

d. The fellow will be required to provide every-other weekend call coverage for emergency or urgent EEGs. (Weekend call to be divided equally between both fellows.)

**Video-EEG Long-Term Monitoring:**

Trainees acquire knowledge of the use of video-EEG in the context of a comprehensive evaluation of patients with paroxysmal phenomena, including epilepsy. Trainees will have extensive knowledge of the following:
• Basic electronics, computer skills, and data reduction techniques necessary for effective and efficient long-germ monitoring.
• Digital EEG and polygraphic methods.
• The clinical and electrographic correlated of various paroxysmal behavior, and especially the features that allow distinguishing between epileptic and nonepileptic phenomena.
• Electroclinical correlates of different seizure types and the various epilepsy syndromes.
• The relation of scalp to intracranial potentials.
• Integrating results of video-EEG recording with other neurodiagnostic data including MRI, PET and neuropsychological testing.
• Use of video-EEG recording to formulate specific treatment strategies.

Goals and Responsibilities in Evoked Potentials

During their rotation in and exposure to evoked potentials, trainees will acquire the necessary background to interpret and direct the recording of standard visual brainstem auditory and short-latency somatosensory evoked potentials. Training objectives will include, but not be limited to, a comprehensive knowledge of the following:

1. Instrumentation, including principles of signal averaging.
2. Basic visual, somatosensory and auditory physiology, anatomy, and related neuroscience.
3. Technical and end-organ factors that influence evoked potentials.
4. Normal patterns of evoked potentials, their variations in normal control populations, and the effect of peripheral and central nervous system immaturity and of aging.
5. Definitions of abnormal, interpretation of abnormal patterns, and relevant clinical correlations.
6. Use of evoked potentials in specific neurological diseases, especially demyelinating and degenerative disorders.

Sleep Disorders: Goals and Responsibilities

Goals: to acquire an overview of:
1. Normal human chronobiology.
2. Clinical evaluation of sleep disorders.
3. The neurophysiological tests available to assess suspected sleep disorders appropriately.

Objectives:
1. To review polysomnograms and understand the normal stages of sleep.
2. To attend sleep clinic and sleep conferences in order to evaluate and understand sleep disorders.
3. To review polysomnograms from patients with sleep disorders and to understand the findings.

Intraoperative Electrophysiological Monitoring: Goals and Responsibilities

The major goal of this rotation is to provide clinical neurophysiology trainees with the necessary background and skills to direct and interpret electrocorticography, and the use of evoked potentials. In particular, the resident should be able to:

Goal: to obtain basic knowledge of intra-operative monitoring of cerebral, brainstem, and cranial nerve, spinal cord, and peripheral nervous system functions.

Objectives:
1. To review intra-operative EEGs, evoked potential, and nerve root monitoring and understand the associated basic technical factors.
2. To observe and understand the patterns of EEG related to anesthesia.
3. To observe EEG or evoked potential changes during brain and carotid surgery and to understand the importance of focal changes.
4. To observe and understand the usefulness, limitations, and electrical patterns of somatosensory evoked potentials and nerve root monitoring during spinal cord surgery.
Equipment and Facilities
EMG/Neuromuscular Disease

There are four patient rooms for EMG/nerve conduction testing within UPMC Presbyterian Hospital. Both inpatient and outpatient testing is conducted in this area. They are at least 10x12 feet each and each contain Nicolet Viking Select® EMG machines. Single fiber and quantitative EMG software packages are available. The Autonomics Laboratory is equipped with QSWEAT® for quantitative sudomotor axon reflex testing and a tilt table with Colin Pilot® heart rate and blood pressure monitoring and Atlas® software.

The EMG lab at the UPMC Presbyterian campus also has a 10X16 feet technician and staff room with a Neuromuscular and “electrodiagnostics” book and video library, and the Health Sciences library is adjacent to UPMC Presbyterian. Pubmed and other on-line sources, including electronic journals and books, are readily available. PCs are available at workstations in the EMG Laboratory and fellows’ office. Nicvue® software is used for report generation. Access to electronic health records is available at these workstations.

Outpatients with neuromuscular diseases are seen in the Kaufmann Medical Bldg. The 8th floor outpatient clinic is comprised of 18 examination/consultation rooms, 2 procedure rooms, a spacious waiting area for patients and a large reception area for staff and office records. The clinical neurophysiology fellow uses a separate room where he/she sees the patient alone before presenting the patient to the faculty teaching attending. Movement disorders patients receive botulinum toxin injections in the clinic using EMG guidance.

Inpatients are evaluated either in the EMG lab or at the bedside. Approximately 96 inpatient EMGs are performed yearly.

EEG/Evoked Potentials:

Three XLTEK® and two Bio-logic CEEGraph® portable EEG machines are used in the UPMC Presbyterian Hospital EEG Laboratory. In addition, two XLTEK® and two Bio-logic CEEGraph® portable EEG machines are used in the EEG Laboratory at UPMC Montefiore Hospital (Montefiore Hospital is considered part of UPMC Presbyterian/Shadyside) (one of each machine at each location).

The EEG reading room is approximately 12x10 feet and contains three Microsoft Windows®-based personal computers utilizing digital EEG-reading software by XLTEK® and Bio-logic® to interpret EEGs. There is an additional computer in the adjacent fellows' office that may serve as another reading station.

Inpatients are evaluated either in the EEG lab or at the bedside; 4731 inpatient EEGs were performed in 2009. Many of the inpatient EEGs are performed on critically ill patients.

Persyst Insight II® software is utilized when reviewing and interpreting prolonged EEG recordings in both portable or resting EEGs and EMU monitoring. Persyst MagicMarker® software is utilized to view and interpret after-hours, emergent EEGs from home via internet through a secure website over a local area network connection. Both fellows and supervising faculty use this system.

There is one 7x10 foot room used for evoked potentials testing, which is performed utilizing one Nihon-Kohden® evoked potential measuring system. Printouts of visual, brainstem auditory, and somatosensory evoked potentials are generated for interpretation.

Outpatients with epilepsy/seizure disorders are seen in the Kaufmann Medical Bldg. The 8th floor outpatient clinic is comprised of 18 examination/consultation rooms, 2 procedure rooms, a spacious waiting area for patients and a large reception area for staff and office records. The clinical
neurophysiology fellow uses a separate room where he/she sees the patient alone before presenting the patient to the faculty teaching attending.

**Epilepsy Monitoring Unit:**
The Epilepsy Monitoring Unit is a state-of-the-art monitoring unit that is capable of monitoring four patients simultaneously for extended periods. Each of the 4 patient rooms is approximately 18x20 feet and is hard-wired for complete video and audio capabilities. In addition, one room is equipped with a 128-channel capability for pre-surgical patients who have undergone subdural grid electrode placement or depth-electrode placement. The room that houses all of the recording and monitoring equipment is approximately 18x20 feet and is equipped with state-of-the-art epilepsy monitoring software by Biologic® and Persyst®. Twenty-four hour ambulatory EEGs are performed utilizing two Oxford® 16-channel ambulatory EEG devices. Persyst Insight II® software is used to review and interpret this data.

Personal computers are available at the reading station in the EEG Laboratory, fellow's office, and physician workstations on the inpatient floors. All hospital computers have access to the Health Sciences Library website which provides access to a variety of online journals, electronic books, Pub-Med, Ovid, and other online services.

**Elekta Neuromag® MEG System for magnetoencephalography (MEG) at UPMC Presbyterian/Shadyside:**
Elekta Neuromag® MEG System is a completely non-invasive bioelectromagnetic measurement system for functional brain studies. The sensor system includes 306 MEG-channels and up to 128 EEG-channels, all registering the electromagnetic signatures of the intracranial ionic currents associated with brain function. The MEG-sensor unit in its floor-mounted gantry, the movable subject chair and bed, together with the patient audio-visual monitoring and stimulus delivery systems are contained in a MSR. The integrated EEG-system consists of 124 single-ended channels and four differential channels, enabling recordings of EEG, EOG, EMG and ECG signals. The maximal acquisition sampling rate is 5 kHz.

A full set of stimulus delivery and subject/patient response equipment is integrated in the system using 16 trigger lines to allow flexible combinations of somatosensory, visual and auditory stimuli. Somatosensory stimuli are delivered using two DS7A electrical stimulators located in a stimulus cabinet in the front of the MSR. Audiovisual stimuli are delivered using a dedicated PC with the E-prime presentation program. Panasonic PT-D7700 premium projector is used for visual presentations.

**Sleep Laboratory:**
The accredited sleep laboratory is at the UPMC Presbyterian campus and consists of six beds. Sensormedics® polysomnographs are used. There is 2,000 square feet of space. This sleep program is accredited by the American Academy of Sleep Medicine.

**Children’s Hospital of Pittsburgh of UPMC (CHP)**
Outpatient and video EEG and Epilepsy monitoring are also performed at CHP. The CHP Epilepsy Center is an independent inpatient hospital unit and is capable of monitoring four patients at a time. The equipment includes state-of-the-art digital EEG/video technology and is open 24 hours a day, seven days a week. The neurology outpatient clinic is located in a dedicated suite of rooms adjacent to the neurology office suite. The outpatient clinical area contains six patient exam rooms, a teaching and consultation room, a nurses’ station and a patient waiting area. Outpatients are seen in the outpatient clinic five days a week, Monday through Friday.

The EEG facilities at CHP utilize XLTEX/Natus® digital EEG equipment. The routine lab has five acquisition stations, all of which may be used for portable recordings and one of which has portable video capability. This lab has three reading stations and one CD burner for purposes of record storage. The only term monitoring lab has four acquisition stations for video EEG, two reading stations and one CD burner.

One Viking Quest® EMG machine is used at CHP in a 10 X 14 foot examination room.
Fellow’s Office:

Located at G812, PUH, the Fellows’ Office is in the vicinity of the EMU and EMG Laboratory, and two personal computers are available. The fellow at Children’s Hospital also has office space adjacent to the EEG Lab.

Additional Electrodiagnostic Training:

The fellows may spend additional time in botulinum toxin clinic (for movement disorders and spasticity) and learn to interpret autonomic studies and quantitative sensory testing.

Professional Development:

A clinical research project is highly recommended. Fellows are expected to present at a national meeting.

Fellows should maintain a “portfolio” which includes a logbook of all electrodiagnostic studies, electroencephalography studies, needle muscle biopsies, conferences attended, conferences given, teaching sets, evaluations, and other pertinent information as deemed appropriate.

Evaluation:

Fellows will be given a written EMG test at the beginning and end of the fellowship. In addition, evaluations will be performed every three months by the attending neurologists, based on the fellow’s observed performance in the EMG Laboratory and outpatient clinic. The program director will solicit input from the lead technician and nurse for a 360° evaluation. Moreover, EEG/Epilepsy attending physicians will also evaluate the fellows every three months based on their observed performances in the EEG Laboratory and outpatient clinic. The program co-director will solicit input from various ancillary staff, including EEG/EMU technicians and the epilepsy clinic nurse practitioner. Fellows will also keep a portfolio (available at Clinical Neurophysiology website) documenting their achievements. Presentations made by fellows at didactic conferences will also be formally critiqued. Fellows are also expected to evaluate the attending physicians at least every six months, and these evaluations should be submitted to the education coordinator.
### GME evaluation system

#### Creating a new evaluation

**Name:** David Lencioni  
**Department:** Neurology  
**Position:** Faculty  
**Evaluating:** Senior Housestaff

<table>
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<tr>
<th>Days spent:</th>
<th>Rotation:</th>
<th>Period:</th>
<th>Evaluated:</th>
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#### Evaluating

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<tr>
<th>5 - 7</th>
<th>Unsatisfactory</th>
<th>4 - 6</th>
<th>Satisfactory</th>
<th>7 - 9</th>
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#### 1. Patient Care

**Clinical Skills**
- Incomplete, inaccurate medical interviews
- Incomplete, inaccurate neurological examinations
- Poor procedural skills (LP, EMG, EEG)
- Incomplete review and summary of other data sources (internal and outside records)

**Patient Management Skills**
- Poor synthesis of clinical data
- Poor clinical judgment
- Ignores valid evidence
- Ignores patient preferences

**Specific comments recognizing excellent performance or areas for improvement**

**Comments:**

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#### 2. Medical Knowledge

**Unsatisfactory**
- Limited basic science/clinical fund of knowledge
- Inattention to learning
- Cannot explain mechanisms of disease

**Superior**
- Exceptional basic science/clinical fund of knowledge
- Exceptional interest in learning
- Consistently able to explain mechanisms of disease

**Specific comments recognizing excellent performance or areas for improvement**

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3. Practice-Based Learning

Unsatisfactory
- Falls to perform self-evaluation
- Lacks insight
- Lacks initiative
- Falls in use of information in care
- Poor understanding and application of principles of evidence-based medicine

Superior
- Constantly monitors own performance
- Excellent insight
- Excellent initiative
- Efficient use of information in care
- Excellent understanding and based application of principles of evidence-based medicine

Specific comments recognizing excellent performance or areas for improvement

4. Communication and Interpersonal Skills

Unsatisfactory
- Does not use listening skills that facilitate the collection of accurate information
- Poor written documentation of patient care
- Poor teamwork with outpatient nurses and other members of outpatient team
- Poor communication of results to patients
- Distorted notes and/or hospital summaries lacking in detail, organization or content

Superior
- Consistently uses excellent listening skills to facilitate the collection of accurate information
- Written documentation of patient encounters is consistently well-organized and accurate
- Excellent organizational and verbal presentation
- Excellent teamwork with outpatient nurses and other members of outpatient team
- Excellent communication of results to patients
- Distorted notes and/or hospital summaries with excellent detail, organization and content

Specific comments recognizing excellent performance or areas for improvement

5. Professionalism

Unsatisfactory
- Does not demonstrate empathy and compassion
- There are concerns about honesty and integrity
- Fails to accept responsibility appropriate for level of ability
- Poor motivation for self-improvement
- Poor teamwork with teammates, including nursing and other health staff
- Does not consistently attend to duties in a timely and/or efficient fashion
- Does not answer pages promptly
- Fails to lend help to teammates when situation warrants
- Frequently appears disinterested, unkempt or not in a manner consistent with a medical professional
- Frequently negative or disrespectful to patients, teammates and staff

Superior
- Consistently demonstrates empathy and compassion
- Always honest, always behaves with integrity
- Always accepts responsibility appropriate for level of ability
- Highly motivated for self-improvement
- Consistently supports teammates, including nursing and allied health staff
- Consistently attends to duties in a timely and/or efficient fashion
- Consistently answers pages promptly
- Consistently lends help to teammates when situation warrants
- Always well-groomed with an consistent with a medical professional
- Never negative or disrespectful to patients, teammates and staff

Specific comments recognizing excellent performance or areas for improvement

6. System-based Practice

Unsatisfactory
- Does not use information resources (electronic resources, practice guidelines) independently
- Needs efforts to improve systems of care
- Does not understand interrelationships between health care professionals and their roles in providing optimal patient care
- Does not attempt to practice cost-effective healthcare by facilitating timely patient admissions, discharges and transfers to enhance overall system efficiency

Superior
- Consistently uses information resources (electronic resources, practice guidelines) independently
- High level of interest to improve systems of care
- Excellent understanding of interrelationships between health care professionals and their roles in providing optimal patient care
- Consistently attempts to provide cost-effective healthcare by facilitating timely patient admissions, discharges and transfers to enhance overall system efficiency

Specific comments recognizing excellent performance or areas for improvement
NURSING AND ALLIED HEALTH EVALUATION
CLINICAL NEUROPHYSIOLOGY FELLOW
INTERPERSONAL SKILLS AND PROFESSIONALISM SKILLS

Resident: ___________________________ Date: ___________________________
Outpatient Location: ___________________________ Nursing Station: ________________
Evaluator: ____________________________________________________________________

The Neurology Department at the University Health Center of Pittsburgh expects its residents to demonstrate the communication, interpersonal, and professionalism skills that promote care delivered in the best interest of the patient. Please complete this evaluation based on your interactions with the above-named resident. Check “needs improvement” or “satisfactory” in the space provided after each statement. If you cannot comment on an item, please leave it blank. All “needs improvement” responses require explanation in the space provided below. We ask that you or your immediate supervisor discuss any significant concerns with the resident privately before submitting this form.

<table>
<thead>
<tr>
<th>COMMUNICATION/INTERPERSONAL SKILLS</th>
<th>Needs Improvement</th>
<th>Satisfactory</th>
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<tbody>
<tr>
<td>Consistently demonstrates willingness to listen to patients.</td>
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<tr>
<td>Consistently demonstrates willingness to listen to nursing and allied staff.</td>
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<td>Consistently explains information to patients and families using clear, understandable terms.</td>
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<td>Consistently participates cooperatively in multidisciplinary rounds.</td>
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<th>PROFESSIONALISM</th>
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<tr>
<td><strong>Altruism/Empathy</strong></td>
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<tr>
<td>Consistently attentive to details of patient comfort and delivery of care (performance of procedures).</td>
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<tr>
<td>Accepts inconvenience when necessary to meet the needs of the patient.</td>
</tr>
<tr>
<td><strong>Respect</strong></td>
</tr>
<tr>
<td>Consistently respects patient privacy when conducting examinations.</td>
</tr>
<tr>
<td>Consistently courteous and receptive to nursing and allied health staff.</td>
</tr>
<tr>
<td><strong>Responsibility</strong></td>
</tr>
<tr>
<td>Consistently responds in a timely manner when paged or called.</td>
</tr>
<tr>
<td>Consistently follows through on patient care issues.</td>
</tr>
<tr>
<td><strong>Integrity</strong></td>
</tr>
<tr>
<td>Maintains composure during stressful/crisis situations.</td>
</tr>
</tbody>
</table>

Please provide specific comments to substantiate any “needs improvement” response.

__________________________________________________________________________

Do you have any additional concerns regarding this resident’s communication, interpersonal, or professionalism skills?

__________________________________________________________________________

__________________________________________________________________________

Please provide information if this resident has consistently performed in an outstanding manner.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
University of Pittsburgh School of Medicine  
Division of Neuromuscular Diseases  
Clinical Neurophysiology  
Fellow/Resident Evaluation

(Neuromuscular Service)

Resident’s/Fellow’s Name: ___________________ Rotation Dates: ___________

Evaluator’s Name: Steve Boksenbaum, Lead EMG Tech  Evaluation Date: _______

Scoring:  
Excellent = 1  
Very Good = 2  
Average = 3  
Fair = 4  
Poor = 5  
N/A = not applicable

1. Nerve Conduction Study skills _______

2. Interpretation of NCS _______

3. Interaction with techs _______

4. Interaction with patients _______

5. Teaching Skills _______

6. Overall function _______

Comment:
(Epilepsy Service)

Fellow’s Name: ___________________________ Rotation Dates: ________________

Evaluator’s Name: ______________________ Evaluation Date: ____________

Scoring:  
- Excellent = 1  
- Very Good = 2  
- Average = 3  
- Fair = 4  
- Poor = 5  
- N/A = not applicable

1. Clinical skills

2. Patient Care/Caring

3. Interaction with nurse

4. Interaction with patients

5. Professionalism

6. Overall function

Comment:
University of Pittsburgh School of Medicine  
Clinical Neurophysiology  
Fellow/Resident Evaluation  

(Epilepsy Service)

Resident’s/Fellow’s Name: ____________________________ Rotation Dates: __________

Evaluator’s Name: Cheryl Plummer, REEGT, Lead EMU Tech  Evaluation Date: __________

Scoring:  
Excellent  = 1  
Very Good  = 2  
Average  = 3  
Fair  = 4  
Poor  = 5  
N/A  = not applicable

1. Interpretation of Video EEG  ______

2. Interaction with techs  ______

3. Interaction with patients  ______

4. Teaching Skills  ______

5. Overall function  ______

Comment:
(Epilepsy Service)

Resident's/Fellow's Name: ___________________________ Rotation Dates: __________

Evaluator's Name: Susan Burkett, REEGT, Lead EEG Tech Evaluation Date: __________

Scoring:

<table>
<thead>
<tr>
<th>Score</th>
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<tbody>
<tr>
<td>Excellent</td>
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<tr>
<td>Very Good</td>
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<td>Average</td>
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<td>Fair</td>
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<tr>
<td>Poor</td>
<td>5</td>
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<tr>
<td>N/A</td>
<td>not applicable</td>
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</table>

1. Interpretation of EEG

2. Interaction with techs

3. Interaction with patients

4. Teaching Skills

5. Overall function

Comment:
# CLINICAL NEUROPHYSIOLOGY MINI-CLINICAL EVALUATION EXERCISE (CEX)

## Evaluator: ___________________________ Date: ___________________________

Resident: ___________________________ N1 N2 N3

**Patient Problem/Dx:**

**Settings:**
- [ ] Ambulatory
- [ ] In-Patient
- [ ] EMU
- [ ] EMG Laboratory

**Patient:** Age: _______ Gender: _______ New Follow-up

**Complexity:**
- [ ] Low
- [ ] Moderate
- [ ] High

**Focus:**
- [ ] Data Gathering
- [ ] Diagnosis
- [ ] Therapy
- [ ] Counseling

### 1. Medical Interviewing Skills (Not observed)

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### 2. Neurological Examination Skills (Not observed)

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### 3. Technical Skills (Not observed)

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### 4. Synthesis and Localization (Not observed)

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### 5. Humanistic Qualities/Professionalism (Not observed)

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### 6. Clinical Judgment (Not observed)

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### 7. Counseling Skills (Not observed)

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### 8. Organization/Efficiency (Not observed)

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### 9. Overall Competence (Not observed)

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### Mini-CEX Time:


Critique: ____________________________________________

_____________________________________________________

Resident Signature Evaluator Signature
GUIDELINES FOR IMPLEMENTING THE MINI-CEX

The clinical neurophysiology mini-clinical evaluation exercise (CEX) focuses on the core skills that residents demonstrate in patient encounters. It can be easily implemented by attending physicians as a routine, seamless evaluation of residents in any setting. The mini-CEX is an observation or “snapshot” of a resident/patient interaction. Based on multiple encounters over time, this method provides a valid, reliable measure of a resident’s performance. **Attending physicians are encouraged to perform one mini-CEX per resident during the rotation.**

Settings to Conduct Mini-CEX: Mini-CEX Evaluators

| In-patient services (EMU) | Attending Physicians |
| Ambulatory (Neuromuscular or Epilepsy Clinics) | Supervising Physicians |
| EMG Laboratory |

**Rating Scale:** A nine point rating scale is used; a **rating of 4 is defined as “marginal”** and conveys the expectation that with remediation, the resident will meet the standards for Board Certification.

DESCRIPTORS OF COMPETENCIES DEMONSTRATED DURING THE MINI-CEX

**Medical Interviewing Skills:** Facilitates patient’s telling of story; effectively uses questions/directions to obtain accurate, adequate information needed; responds appropriately to affect, non-verbal cues.

**Physical Examination Skills:** Follows efficient, logical sequence; balances screening/diagnostic steps for problem; informs patient; sensitive to patient’s comfort, modesty.

**Technical Skills:** Demonstrates skillful use of nerve conductions, EMG, or EEG in evaluating patients, based on their symptoms and neurologic examination findings.

**Synthesis and Localization:** Appropriately uses information obtained from history and physical examination to localize the disease process in the nervous system and create an accurate differential diagnosis.

**Humanistic Qualities/Professionalism:** Shows respect, compassion, empathy, establishes trust; attends to patient’s needs of comfort, modesty, confidentiality; and information.

**Clinical Judgment:** Selectively orders/perform appropriate diagnostic studies and therapeutic measures; considers risks and benefits.

**Counseling Skills:** Explains rationale for test/treatment; obtains patient’s consent, and educates/counsels regarding management.

**Organization/Efficiency:** Prioritizes; is timely and succinct.

**Overall Clinical Competence:** Demonstrates judgment, synthesis, caring, effectiveness, and efficiency.
**Vacation:**
Fellows are allotted four weeks of vacation in addition to UPMC-observed holidays. Job interviews must be taken from vacation time. The last week of December could be split between the fellows. In addition, fellows may have one week for conferences.

Vacation requests must be made in writing to the program director four weeks prior to the dates requested.

**On-Call Responsibilities:**
There is no evening or weekend call for EMG/Neuromuscular. There is weekend on-call from home for urgent EEG and for rounding on patients on the epilepsy monitoring unit. Call starts at 5 PM on Friday and ends at 8 AM on Monday. Fellows are on call every other weekend. There is no weeknight call for EEG. Fellows are responsible for the schedule; the program director will resolve conflicts.

**Fellow Stress**
Fellows receive a lecture on stress and the availability of the Fellows and Residents Assistance Program (RFAP) organized by the GME Office during orientation. They may receive confidential counseling through this program upon request. The program director works with the fellows at least four days per week and meets with them formally every two months and monitors their behavior. They are told to report any stress or problems to the program director or residency coordinator or to contact the RFAP, and counseling will be advised if deemed indicated. Faculty is also educated to identify signs of stress through the GMEC policy on Fatigue which is posted on the institutional GME Intranet website (GME Knows) for their review.

**Recent Trainees**

<table>
<thead>
<tr>
<th>Name</th>
<th>Fellowship Year</th>
<th>Current Location</th>
<th>Board – Certified in Clinical Neurophysiology</th>
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<tbody>
<tr>
<td>Palangio, Kimberly</td>
<td>2010-2011</td>
<td>Carroll County Hospital, Maryland</td>
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<tr>
<td>Patterson, Christina</td>
<td>2010-2011</td>
<td>Tyler, TX, hospital faculty</td>
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<td>Taavoni, Arash</td>
<td>2010-2011</td>
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<tr>
<td>Jessica Kraker</td>
<td>2009-2010</td>
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<tr>
<td>Allison Hennigan</td>
<td>2009-2010</td>
<td>Tyler, TX, hospital faculty</td>
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<tr>
<td>Ai-Lahham, Tawfiq</td>
<td>2008-2009</td>
<td>Univ Arkansas, hospital faculty</td>
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<td>Khavandgar, Simin</td>
<td>2008-2009</td>
<td>Pittsburgh, PA, hospital faculty</td>
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<td>Sitwat, Bilal</td>
<td>2008-2009</td>
<td>Pittsburgh PA, hospital faculty</td>
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<td>Liang, Ye (Vivian)</td>
<td>2007-2008</td>
<td>Pittsburgh, PA, hospital faculty</td>
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<td>Lu, Angela</td>
<td>2007-2008</td>
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<td>Bekele-Acuri, Zewditu</td>
<td>2006-2007</td>
<td>Middletown, NY, private practice</td>
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<td>Stevens, Michelle</td>
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<td>Erie, PA, private practice</td>
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<td>Thirumala, Parthasarathy</td>
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<td>Abdel-Hamid, Hoda</td>
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<td>Qazizadeh, Salim</td>
<td>2005-2006</td>
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<td>Sioufi, Firas</td>
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<td>Eshragi, Shervin</td>
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<td>Mendez, Oscar</td>
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<td>Crossville, TN, private practice</td>
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<td>Jung, Ki</td>
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<td>Gastonia, NC, private practice</td>
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<td>Mushtaq, Romila</td>
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<td>Milwaukee, WI, hospital faculty</td>
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<td>Barsouk, Tatyana</td>
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<td>Washington, PA, private practice</td>
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<td>Pulipaka, Uma</td>
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<td>Longview, TX, private practice</td>
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<td>Qi, Yan</td>
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<td>Creel, G B</td>
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Petrella, J T  1997-1998
Rana, SS  1997-1998  Pittsburgh, PA, hospital faculty
Blatt, I  1996-1997
Campellone, Joseph  1996-1997  Camden, NJ, hospital faculty
Aggarwal, Avinash  1995-1996  Tarentum, PA, private practice
Gonzalez, J  1995-1996

Publications by Fellows

REFEREED ARTICLES:


INVITED REVIEWS, BOOK CHAPTERS AND EDITORIALS:


MEETINGS AND ABSTRACTS:


**OTHER PUBLICATIONS:**


---

**Goals for Rotating Residents in Neuromuscular Diseases**

1. Review/learn peripheral nervous system neuroanatomy in detail, including the brachial plexus and major muscle groups.
2. Learn the indications for and limitations of electrodiagnostic testing.
3. Learn to perform and interpret nerve conduction studies.
4. Learn to perform or understand and interpret needle electromyography.
5. Learn to evaluate and treat patients with neuromuscular diseases.
6. Learn the basics of nerve and muscle histopathology.
7. Understand the clinical implications of research findings in neuromuscular diseases.

**Responsibilities for Rotating Residents in Neuromuscular Disease**

1. Be present in the EMG laboratory during routine working hours.
2. Residents are required to learn to perform nerve conduction studies (at least on five normal upper and five normal lower extremities).
3. Take a pre-and post-test during the rotation and be able to draw the brachial plexus.
4. Perform nerve conduction studies and EMG on patients as assigned. In general, needle exams will not be performed during the first four weeks.
5. Attend mandatory conferences and present at conferences when assigned.
6. Present cases to the attending physician in conjunction with the fellow.
7. Evaluate the attending physicians at the end of the rotation and return the form to the education coordinator.

Generating EMG Reports

If the study is normal, it is mandatory that a brief history be dictated for each patient. If the EMG study is abnormal, a brief history is optional. The typed or dictated summary should emphasize the abnormalities. “Special” tests, including F-waves and H-reflexes, must be mentioned. Present tense is preferred for the nerve conductions; the past tense can be used for the needle examination. The reports should be as succinct as possible. An example of a normal upper extremity nerve conduction study is as follows:

The right median, ulnar, and radial sensory responses are normal. The right median, ulnar, and radial motor responses are normal including conduction velocities and F-waves.

It is acceptable to merely mention the abnormalities and state that the other nerves that were examined (see list) were normal, but the special tests need to be stated for coding.

In dictating the needle examination findings, slang terms such as “thin units” or “unit” are to be avoided. The proper terms would include “short duration” “motor unit potentials.” The needle examination findings should also be succinct. It is inappropriate to list individual muscles. A pattern should be identified when present. For example, one could state, “long duration, polyphasic motor unit potentials were present in right L-5 innervated muscles.” Another example is “short duration, low amplitude polyphasic motor unit potentials were present in proximal more than distal arm and leg muscles.”

The impression is the most important component of the report. Diagnosis should be listed individually and numbered in a new paragraph. Since EMG is considered an extension of the clinical examination, it is useful to use the term “electrodiagnostic evidence of” prior to each diagnosis.

Clinical diagnoses and clinical recommendations are not part of the electrodiagnostic impression. They should be mentioned in a separate paragraph, e.g., “clinical correlation.”

Goals for Rotating Residents in EEG/EMU

1. Review and learn various seizure disorders, including their presentations, diagnosis, and treatment.
2. Learn the indications for and limitations of electroencephalography, including indications for emergent EEG testing.
3. Learn the basics of EEG equipment, setup, and operation.
4. Learn to read and interpret routine and prolonged EEGs.
5. Learn to evaluate and treat patients with seizure disorders.
6. Understand the indications for epilepsy surgery, pre-surgical workup, and post-surgical follow-up.
7. Understand the clinical implications of research findings in seizure disorders.

Responsibilities for Rotating Residents in EEG/EMU

1. Review and learn various seizure disorders, including their presentations, diagnosis, and treatment.
2. Learn the indications for and limitations of electroencephalography, including indications for emergent EEG testing.
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5. Learn to evaluate and treat patients with seizure disorders.
6. Understand the indications for epilepsy surgery, pre-surgical workup, and post-surgical follow-up.
7. Understand the clinical implications of research findings in seizure disorders.

Generating EEG Reports

The format for generating an EEG report must include the patient’s identifying information (name, medical record number, and EEG number), brief history, EEG diagnosis/findings, EEG description, and interpretation/conclusions. An example of a normal EEG study is as follows:

Patient Name: John Doe
Medical Record Number: 000-00-0000
EEG Number: 00000X or 00000C (“X” denotes XLTEK record; “C” denotes CEEGraph record)

History:
An EEG is requested in this 33 year-old man with a history of HTN and DM, who now has syncopal episodes.

EEG Diagnosis: Normal

EEG Description: A resting 22-channel, digital EEG was performed with a total recording time of 25 minutes. A dominant posterior rhythm of 10 Hz was present following eye closure. There were no epileptiform abnormalities. Hyperventilation had little effect on the resting record. Intermittent photic stimulation did not elicit a well-developed driving response.

Interpretation:
This is a normal EEG.

1. The diagnosis should be listed individually and numbered in a new paragraph. Depending on which attending physician is assigned to read, the resident may be required to give diagnoses utilizing the Mayo Classification of EEG diagnosis.
2. When describing the EEG, several key notations must be made. This includes the type of recording (i.e., portable or resting; number of channels; total time; awake or awake and sleep). Also, the background rhythms must be described, whether it is slow or of normal frequency. Any localizing or lateralizing abnormalities should be included. Any prominent artifacts, such as eye movements or a glossokinetic potential artifact, should be mentioned. Any epileptiform abnormalities, such as sharp waves, spikes, PLEDs, or seizures must be noted. The driving response to photic stimulation must be mentioned. The resident must note if the patient has any clinically abnormal movements or is appropriately responsive. A thorough description of the EEG must be provided, and much of what is described will depend on the case. An understanding of critical data to include in the description is gained through experience in interpreting and generating reports.
3. The interpretation/conclusion is the most important aspect of the report. If the EEG is normal, it must be simply stated; if abnormal, the findings must be briefly summarized, and when indicated, a clinical correlation included. For example, if the EEG was performed for a patient with mental status changes, and the EEG revealed generalized slowing, the interpretation could state, “This is an abnormal EEG revealing diffuse slowing of the background rhythms. This type of pattern may be seen with toxic/metabolic encephalopathies. There were no epileptiform abnormalities.”
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<td>Jul 29</td>
<td>Nerve Conduction Techniques, Chapter 4, Shin J Oh.</td>
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<td>Oct 14</td>
<td>AAEM Minimonograph #12: Common Peroneal Mononeuropathy at the Fibular Head, Asa J. Wilbourn</td>
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<td>Nov 11</td>
<td>AAEM Case Report #20: Hereditary Motor and Sensory Neuropathy, Type 1, DA Chad, Nov. 1989.</td>
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<td>Nov 25</td>
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**Journal Clubs TBA**

**Additional Readings**

## MUSCLE/NERVE CONFERENCE
**Tuesday, 3:30-4:30 PM**

**Didactic Sessions - NP Library; Glass Slide Conferences - A509**

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<thead>
<tr>
<th>DATE</th>
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<tr>
<td>Jul 6, 2010</td>
<td>How to Read a Muscle Biopsy</td>
<td>Lacomis</td>
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<tr>
<td>Jul. 13</td>
<td>Muscle Pathology: Basics</td>
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<td>Jul. 20</td>
<td>Overview of Nerve Pathology: Paraffin and Plastic Sections</td>
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<td>Aug. 3</td>
<td>Overview of Nerve Pathology: Teased Fibers and EM</td>
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<td>Aug. 10</td>
<td>Inflammatory Myopathies: DM</td>
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<td>Aug. 17</td>
<td>Inflammatory Myopathies: IBM</td>
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<td>Aug. 24</td>
<td>Inflammatory Myopathies: PM and Mimics</td>
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<td>Aug. 31</td>
<td>ICU Weakness</td>
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<td>Sep. 7</td>
<td>Toxic Myopathies: Cholesterol lowering agents, Corticosteroids, chloroquine and colchicine</td>
<td>Taavoni and Palangio</td>
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<td>Sep. 14</td>
<td>Myotonic Dystrophy 1 and 2</td>
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<td>Oct. 5</td>
<td>Limb-Girdle Muscular Dystrophies (didactic)</td>
<td>Taavoni</td>
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<td>Oct. 12</td>
<td>Anterior Horn Cell Diseases – Inherited, excluding ALS</td>
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<td>Oct. 19</td>
<td>Anterior Horn Cell Diseases – ALS</td>
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<td>Oct. 26</td>
<td>Misc. Dystrophies: FSH and Emery-Dreifuss</td>
<td>Palangio</td>
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<td>Nov. 2</td>
<td>Misc. Dystrophies: OPD, Bethlem</td>
<td>Patterson</td>
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<td>Nov. 9</td>
<td>Misc. Dystrophies: Distal Dystrophies, Myofibrillar Myopathies</td>
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<td>Nov. 16</td>
<td>Glass Slides</td>
<td>Plowey</td>
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<td>Congenital Myopathy 1 (Nemaline Rod and Central Core)</td>
<td>Patterson</td>
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<td>Congenital Myopathy 2 (Minicore, Centronuclear)</td>
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<td>Dec. 7</td>
<td>Congenital Muscular Dystrophies (didactic)</td>
<td>Abdel-Hamid</td>
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<td>Mitochondrial Myopathies</td>
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<td>Glycogen and Lipid Storage Myopathies</td>
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<td>Dystrophinopathies</td>
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<td>Guillain-Barre Syndrome</td>
<td>Palangio</td>
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<td>Jan 18</td>
<td>CIDP</td>
<td>Taavoni</td>
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<td>Jan. 25</td>
<td>CMT 1 AND 2</td>
<td>Patterson</td>
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<td>Feb. 1</td>
<td>CMT X AND CMT 4, Intermediate CMTs</td>
<td>Patterson</td>
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<td>Feb. 8</td>
<td>Diabetic Neuropathies</td>
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<td>Feb. 15</td>
<td>Sensory Neuropathies</td>
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<td>Feb. 22</td>
<td>Paraneoplastic and Neoplastic neuropathy</td>
<td>Palangio</td>
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### EEG/Epilepsy Conferences

**EEG Conference:** Each week Dr. Richard Brenner and the epilepsy faculty will review EEGs showing a variety of normals, normal variants, artifacts, seizures, and other important data of which all residents and fellows in neurology should be aware. The conference is held at UPMC Presbyterian and teleconferenced to Children’s Hospital. Relevant clinical scenarios and cases will be discussed in conjunction with these EEGs. Fellows and residents are expected to attend and will be asked at random to interpret and discuss various EEG findings. Fellows are also expected to give PowerPoint™ presentations on pertinent topics assigned to the by Dr. Brenner. Throughout the year, various faculty members will give didactic lectures on the following topics:

**Topics include:**
- Characteristics of normal and elderly adult EEG
- Characteristics of normal EEG in children
- Neonatal EEG: normal findings, development, and major abnormal findings
- Benign EEG variants
- Focal EEG abnormalities
- EEG in anoxic encephalopathies
- EEG in dementias and CJD
- Parameters used for EEG in coma
- Findings in coma and prognostic implications
- Findings in encephalitis
- Findings in drug-induced and toxic encephalopathies,
- Video EEG monitoring,
- Ambulatory EEG monitoring
- Intracranial EEG
- Intraoperative electrocorticography
- Continuous EEG monitoring
- Physiology of Sleep
- Polysomnography
- Sleep Disorders

**Evoked Potentials**
- Principles of Signal Averaging
- Visual Evoked Potentials
- Brainstem Auditory Evoked Potentials
- Somatosensory Evoked Potentials

In addition, epilepsy faculty provides EEG conferences in July and August during the core neurology lecture series. These lectures consist of the following:
- Polarity, montages and localization (Dr. Van Cott)

<table>
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<td>Mar. 1</td>
<td>Vasculitic Peripheral Neuropathy</td>
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<td>Neuropathy and Paraproteinemia (MGUS, MAG, POEMS) –Not Amyloid</td>
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<td>Apr 19</td>
<td>Leprosy and Neuropathy</td>
<td>Lacomis</td>
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</table>
• Artifact: eyes movement, muscle, glossokinetic, nonphysiologic (Dr. Brenner)
• Recognizing epileptiform discharges – focal spikes, sharp waves (Dr. Brenner)
• Cellular basis of EEG activity (Dr. Brenner)
• Activation methods (Dr. Brenner)
• Dipoles (Dr. Brenner)
• EEG Voltage Fields (Dr. Brenner)

**Epilepsy Surgery Conference** is weekly on Mondays from 4:00 to 5:00 at Children’s Hospital and teleconferenced to UPMC Presbyterian.

This conference is a multi-disciplinary conference in which the fellows, epilepsy and neurosurgical faculty participate. It concentrates on patients being evaluated for epilepsy surgery and patients undergoing video EEG and other forms of long term monitoring. The conference also addresses the results of imaging, lesions and language localization, and surgical planning.

**REQUIRED AANEM RESOURCES**

[www.aanem.org](http://www.aanem.org)

**AANEM Practice Issues and Position Statements** (see [www.aanem.org](http://www.aanem.org))
2. Reporting Results of Needle EMGs and NCSs
3. Referral Guidelines for Electrodiagnostic Medicine Consultations
4. Risks in Electrodiagnostic Medicine
5. The Role of Intraoperative Monitoring Team
6. Expert Witness Testimony
7. Guidelines for Ethical Behavior Relating to Clinical Practice Issues in Electrodiagnostic Medicine
8. Recommended Educational Requirements for the Practice of Electrodiagnostic Medicine
9. Credentialing of Physicians as Electrodiagnostic Medicine Consultants

**AANEM Practice Issues and Advocacy** (updated 10/10; please view website, www.aanem.org)
1. Guidelines for Somatosensory Evoked Potentials
2. Practice Parameter for Electrodiagnostic Studies in Carpal Tunnel Syndrome: Summary Statement
3. Practice Parameter for Needle Electromyographic Evaluation of Patients with Suspected Cervical Radiculopathy: Summary Statement
4. Practice Parameter for Electrodiagnostic Studies in Ulnar Neuropathy at the Elbow: Summary Statement
5. Somatosensory Evoked Potentials: Clinical Uses
6. Distal Symmetric Polyneuropathy
7. Tarsal Tunnel Syndrome
8. Consensus Statements on: IVIG in the Treatment of Neuromuscular Conditions, Criteria for Diagnosis of Multifocal Motor Neuropathy, and Diagnosis of Partial Conduction Block

**ETHICS**
Suggested Reading

NEUROMUSCULAR DISEASE


ANATOMY, PHYSIOLOGY, AND PATHOLOGY


JOURNALS
- American Journal of Physical Medicine and Rehabilitation
- Annals of Neurology
- Archives of Neurology
- Archives of Physical Medicine and Rehabilitation
- Brain
- Clinical Neurophysiology
- Electromyography and Clinical Neurophysiology
- Journal of Clinical Neuromuscular Diseases
- Journal of Clinical Neurophysiology
- Journal of the Neurological Sciences
- Journal of Neurology, Neurosurgery and Psychiatry
- Muscle & Nerve
- Neurology
- Pediatric Neurology

AAEM publications

SUGGESTED ACNS RESOURCES
www.acns.org (updated 10/10)
- Guidelines for Technical Standards for Pediatric EEG
- EEG Recordings in Brain Death
- Standards of Practice in EEG
- Standard Electrode Position Nomenclature
- Standard Montages
- Guidelines for Writing EEG and Evoked Potentials Reports
- Evoked Potentials, VEPs, SSEPs
- Long-term Monitoring
- Intraoperative Monitoring

Suggested Reading – EEG and Evoked Potentials

Suggested Reading – Epilepsy