# UAMS/CAVHS Adult Neurology Neuromuscular/EMG Curriculum **Rev. 09/04/2007**

**Summary Description of Rotation**

The educational purposes of the Adult Neurology Neuromuscular/EMG Rotation are:

1. To provide an experience that will allow the resident to increase their knowledge of anatomy of the peripheral nervous system and the clinical presentation and pathophysiology of neuromuscular disorders.
2. To provide an experience that will allow the resident to achieve understanding of electrodiagnostic studies correlating it with the basic science of neurophysiology.
3. To learn the indications for ordering, diagnostic evaluation and interpretation of EMGs.
4. To provide training and supervision that allows development of skills necessary to perform accurate electrodiagnostic studies.
5. To provide the resident with exposure to clinical evaluation and treatment of patients with neuromuscular disorders.

This rotation supplements the Friday noon lectures on clinical neurophysiology (EMG).
Supervising Faculty for the rotation are:

Stacy Rudnicki, MD (SAR) (UAMS)

W. Steven Metzer, MD (WSM) (VA)

Betul Gundogdu, MD (BG) (VA)

**Rotation Orientation**

The orientation occurs on Day 1 of the rotation by the Attending Physician and the supervising resident on the service. This written handout is provided then.

**Supervision**

Primary supervision for the rotation will be by Dr. Rudnicki.

**Mix of Diseases**

- Motor neuron disease
- Disease of the nerve root
- Diseases of the peripheral nerve, including plexus, mononeuropathy, and polyneuropathy
- Diseases of the neuromuscular junction
- Diseases of muscle

**Educational Goals Summary**

1) **By the end of the first month, you should be able to:**

Perform motor and sensory studies (including F-waves) in the median and ulnar nerves, motor studies in the tibial and peroneal nerves, and sural sensory studies;
Perform H-reflex studies;
Know the anatomy for the muscles innervated by the median, ulnar, tibial, and peroneal nerves;
Be able to formulate simple NCS/EMG reports;
Understand filter settings, sweep speeds, gain, artifact, distal latency, amplitude, conduction velocity, temporal dispersion, conduction block, differences between demyelination and axonal loss;
Memorize normal values for the routine nerves studied;
Know when EMG/NCS are useful.

2) **By the end of the 2nd month, you should be able to:**

Perform motor and sensory studies in the radial nerve, motor studies in the facial and femoral nerves, and sensory studies in the superficial peroneal nerve;
Perform blink study;
Perform repetitive nerve stimulation;
Be able to select nerves to study for a specific problem;
Be able to select muscles to study a specific problem;
Be able to describe the basics of EMG – ie, the grading/meaning of fibs/psw, MUP duration, config, amp;

**Be able to needle muscles with an attending present for help in**
evaluation of the muscles.

**Studying a patient**

You should take a patient from start to finish – that is, you should take a pertinent history, do a limited directed exam to help formulate your plan. Depending on your degree of expertise, either one of the attendings or technicians may sit with you while you do the NCS – after you gain skills, you may be left in the room on your own. After finishing the NCS, you will review them with the attending. Again, depending on your skills, either the attending will perform the EMG with you watching or they will permit you to perform the EMG while they observe. It is **YOUR** responsibility to write the report for each patient you study, and then have the attending review/correct as needed. We expect you to do this before you leave the lab. If you must get to an afternoon clinic and run out of time to do the report, then we expect you to return to the lab after your clinic to finish your report.

**Inpatient EMGs**

We expect you to participate in the performance of inpatient EMGs. Inpatients frequently have a different set of problems than what we see routinely in the lab. Since they might come in on any day at any time, you will have to be flexible with your schedule for these patients. We will page you about doing these as they come in.

**General rules of the lab**

Be on time;
Keep the lab clean – at the end of the session, you should wipe off all electrodes with alcohol, as well as the machine if you have gotten electrode gel on it;
**DO NOT BEND** the "points" on the surface electrodes or you will incur the wrath of Dr. Rudnicki (and that is not a pretty sight). These serve a purpose – they help hold the tape in fixed position and hence hold the electrode in a fixed position;
**Change sheets/ bring patients back as needed;**
Gloves are to be worn when doing EMG studies;
Be sure to dispose of the EMG needle at the conclusion of the study, do not leave it hanging on the machine.

**Assessment Summary**

Resident performance will be assessed in the six core competencies:

1. Patient Care (PC)
2. Medical Knowledge (MK)
3. Interpersonal and Communication Skills (ICS)
4. Practice Based Learning and Improvement (PBLI)
5. Professionalism (P)
6. Systems Based Practice (SBP)

At the end of the rotation, the resident should receive and/or complete the following assessments:

1. Verbal feedback from Attending Physician;
2. Written assessment of performance in the six core competencies;
3. Resident assessment of Attending Physician.

**WEEKLY SCHEDULE**

Please notify us (Drs. Metzer, Rudnicki, at the start of the month for the times you will be away; notification by email is preferred by SAR, cc copy to Deborah Fewell. Be aware that taking large blocks of vacation while on EMG dilutes out the experience substantially. One month of EMG is not enough to teach anyone, no matter how talented, how to be an electromyographer. Additional months of elective, plus doing studies at least occasionally while you are on other rotations, will be of benefit. Fellowship training is recommended for anyone who wants to become truly proficient.

Monday:
8:30-noon, ALS clinic – Dr. Rudnicki
Noon-1: Basic neuroscience conference (Program Director's Mtg., 1 Mon. per month, 11–noon
1-4: VA EMGs – Dr. Metzer or Dr. Gundogdu

Tuesday
8-noon: UAMS NMD clinic with Dr. Rudnicki, or Resident's continuity clinic
1-4: UAMS EMGs – Dr. Rudnicki, or Resident's continuity clinic

Wed:
8-12: Independent study
1-4: VA EMGs – Dr. Metzer or Dr. Gundogdu

Thursday
8-12: UAMS EMGs – Dr. Rudnicki, or Resident's continuity clinic
1-4: UAMS EMGs – Dr. Rudnicki, or Resident's continuity clinic

Friday
9:30-12: Independent study
12-1: Clinical neurophysiology conf
1-4: VA EMGs – Dr. Metzer or Dr. Gundogdu

Inpatient and emergency EMG's will be done on as needed basis.

**During your reading time**
Consider working on a case to present at the Carrel Krusen Symposium – interesting neuromuscular case conference in Dallas at the end of February

**If you would like to increase your EMG time while on your rotation**
You cannot change your VA clinic, however, for your UAMS clinic, you may be able to change it to Fridays with Dr. Schmidley, though you must get his approval before doing this.

**OTHER RESPONSIBILITIES**

- Attend all neurology conferences
- Attend your resident continuity clinic

**Reading material - See Reading List Distributed Separately.**
*Electrodiagnosis in Diseases of Nerve and Muscle*, Kimura. We (SAR & WSM) consider this a must for those who plan to do EMG in the future, though some may find it difficult to read. During your first month of EMG, the following chapters should be read: Chapters 1, 2, 3, 4, 5, 6, 7, 11, 12, 13, 16, 17, 18. Remaining chapters should be read in your additional EMG months.

Though Daube's *Clinical Neurophysiology* book is not encyclopedic, it is a reasonable place to start to learn basics. Read all of section 1, Chapters 15, 21, 22, 24,25, 26, 27, 28, 29.

A book that has really been helpful for WSM is Brown & Bolton's Clinical EMG. I think another good source of info for the residents are the CONTINUUM issues on Neurophysiology, Autonomic Disorders, and Myopathy.

AAEM Monographs – available in the EMG lab at UAMS (many are also available at the VA lab). They each cover a topic, such as "Carpal tunnel syndrome". They are NOT to be removed from the lab, but may be copied. During your first EMG month, review the ones on: Basics of NCS, Basics of EMG, carpal tunnel syndrome, ulnar neuropathy at the elbow, brachial plexopathy, radiculopathy, peroneal palsy. In your additional months, peruse the disease oriented ones such as MG, MMNCB, etc.

Review your peripheral anatomy, using the handouts you get for the neurophysiology Friday conferences.

**Conferences:**

The neuropathology rotation is associated with numerous clinical conferences directed at patient management the treatment of neurological emergencies, and general didactic reviews. Attendance is required. These conferences include:

1. Basic Neuroscience Conference (Monday 12:00- 1:00 pm- JWS Bldg., 8th floor – Lucy Library)
2. Program Director's Core Competency and Ethics Conference, 1 Monday per month, 11:00 AM - JWS Bldg., 8th floor – Lucy Library)
3. QA (M&M) Conference 1st Wed per month, 7:30 AM - JWS Bldg., 8th floor – Lucy Library)
4. Neuropathology Conference (Wednesdays 4 pm - JWS Bldg., 8th floor – Lucy Library)
5. Neuroradiology Conference (Wednesdays 5 pm - JWS Bldg., 8th floor – Lucy Library)
6. Neurology Grand Rounds (Fridays 8:15-9:30 pm- JWS Bldg., 12th floor)
7. **Clinical Neurophysiology Conference** (EEG & EMG) Fridays @ noon - JWS Bldg., 8th floor – Lucy Library)
8. Movement Disorders Conference, 1 Monday per month as scheduled, 5:00 PM - JWS Bldg., 8th floor – Lucy Library)
9. Epilepsy Journal Club, 1 Monday per month as scheduled, 5:00 PM - JWS Bldg., 8th floor – Lucy Library)
10. Stroke Journal Club, 1 Wednesday per month as scheduled, noon - JWS Bldg., 8th floor – Lucy Library)

PATIENT CARE

| Neuromuscular/ EMG Rotation (PGY2-4) Patient Care | | |
|---|---|---|
| Objectives<br>**Basic 1 Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Gather essential patient history pertinent to their examination as well as screen for potential contraindications to performing either the NCS or NEE. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>RITE<br>Program Director semi-yearly review |
| Learn basic technical and procedural skills through observation & supervised performance of primarily NCS, with an introduction to needle examination studies, for common neuromuscular disorders. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>Case log<br>Program Director semi-yearly review |
| Identify and describe abnormalities seen in common neuromuscular disorders (cervical and lumbar radiculopathy, ulnar neuropathy, carpal tunnel syndrome, peroneal neuropathy, peripheral neuropathy, myasthenia gravis and motor neuron disease) on EMG. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>Case log<br>RITE<br>Program Director semi-yearly review |
| Develop skills in examination of the peripheral nervous system & muscles in context of the neurological examination. | Direct supervision by faculty<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>NEX live patient examinations<br>Program Director semi-yearly review |
| | | |
| Objectives<br>**Additional 2nd Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Learn more advanced technical and procedural skills through supervised performance of less common NCS, needle examination studies, repetitive nerve stimulation and blink reflex. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>Case log<br>Program Director semi-yearly review |
| Identify and describe abnormalities seen in less common neuromuscular disorders (motor neuron disease, plexopathy, myasthenia gravis, myopathy) on electrophysiological testing. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>Case log<br>RITE<br>Program Director semi-yearly review |
| Refine and further develop skills in examination of the peripheral nervous system & muscles in context of the neurological examination. | Direct supervision by faculty<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>NEX live patient examinations<br>Program Director semi-yearly review |

MEDICAL KNOWLEDGE

| Neuromuscular/ EMG Rotation (PGY2-4) Medical Knowledge | | |
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| Objectives<br>**Basic 1 Month Rotation in EMG / Additional 2nd Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Develop a working knowledge of PNS and muscle anatomy. To be expanded and enhanced during 2nd month rotation. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>RITE<br>NEX live patient examinations<br>Program Director semi-yearly review<br>End of year examination |
| Describe the fundamental principles of the neuromuscular examination and apply this knowledge in completing a thorough history and neurological examination. To be expanded and enhanced during 2nd month rotation. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>RITE<br>NEX live patient examinations<br>Program Director semi-yearly review<br>End of year examination |
| Describe the pathophysiology of neuromuscular disorders, including motor neuron disease, radiculopathy, plexopathy, demyelinative & axonopathic peripheral neuropathies, entrapment neuropathies, neuromuscular junction disorders, and myopathy. To be expanded and enhanced during 2nd month rotation. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>RITE<br>Program Director semi-yearly review<br>End of year examination |
| Discuss the various treatment and management options for neuromuscular disorders and apply the latest knowledge to care for patients. To be expanded and enhanced during 2nd month rotation. | Direct supervision by faculty<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>RITE<br>NEX live patient examinations<br>Program Director semi-yearly review<br>End of year examination |
| Describe the basic neurophysiology of EMG, including the elements of a nerve conduction study and needle electrode examination. To be expanded and enhanced during 2nd month rotation. | Direct supervision by faculty neurophysiologists<br>Performance feedback<br>Independent study | Faculty rotation rating & evaluation<br>RITE<br>Program Director semi-yearly review<br>End of year examination |

INTERPERSONAL AND COMMUNICATION

| Neuromuscular/ EMG Rotation (PGY2-4) Interpersonal and Communication | | |
|---|---|---|
| Objectives<br>**Basic 1 Month Rotation in EMG / Additional 2nd Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Establish excellent rapport and communication with patients and their families. | Direct supervision by faculty<br>Performance feedback | Faculty rotation rating & evaluation<br>NEX live patient examinations<br>Program Director semi-yearly review |
| Work as an integrated member of the Neuromuscular Clinics and EMG Lab. | Direct supervision by faculty<br>Performance feedback | Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Present cases in an organized and detailed manner. | Direct supervision by faculty<br>Independent study<br>Performance feedback<br>Conferences | Faculty rotation rating & evaluation<br>NEX live patient examinations<br>Program Director semi-yearly review |
| Educate their patients and their families as appropriate to the clinical situation in a manner that is geared to the patients educational level. | Direct supervision by faculty<br>Performance feedback | Faculty rotation rating & evaluation<br>NEX live patient examinations<br>Program Director semi-yearly review |
| Demonstrate the ability to provide consultants with a report that can be easily interpreted. | Direct supervision by faculty<br>Independent study<br>Performance feedback | Faculty rotation rating & evaluation<br>Program Director semi-yearly review |

PRACTICE BASED LEARNING AND IMPROVEMENT

| Neuromuscular/ EMG Rotation (PGY2-4) Practice Based Learning and Improvement | | |
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| Objectives<br>**Basic 1 Month Rotation in EMG / Additional 2nd Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Research clinical questions regarding their patient's health problems using information technology to access on-line medical information to support their own education and to improve patient care and education. | Direct supervision by faculty<br>Independent study<br>Medline/OVID searches | Self assessment<br>Faculty rotation rating & evaluation<br>Case log (encouraged)<br>Program Director semi-yearly review |
| Evaluate the clinical literature applying knowledge of epidemiology, biostatistics, and research study design. | Direct supervision by faculty<br>Independent study<br>Medline/OVID searches | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Integrate the feedback they receive from Staff physicians such that their performance will improve as the rotation progresses. | Direct supervision by faculty<br>Independent study | Self assessment<br>Faculty rotation rating & evaluation<br>Case log (encouraged)<br>Program Director semi-yearly review |

PROFESSIONALISM

| Neuromuscular/ EMG Rotation (PGY3 or 4) Professionalism | | |
|---|---|---|
| Objectives<br>**Basic 1 Month Rotation in EMG / Additional 2nd Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Demonstrate respect, compassion, integrity, and honesty. | Direct supervision by faculty<br>Role modeling<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Demonstrate awareness of patient's concerns regarding pain and modesty during the EMG procedure. | Direct supervision by faculty<br>Role modeling<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Interact responsibly with patients and families taking into consideration age, disability, culture and gender issues. | Direct supervision by faculty<br>Role modeling<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Demonstrate exemplary interaction with their colleagues. | Direct supervision by faculty<br>Role modeling<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Demonstrate appropriate use of the EMR in regards to patient respect and confidentiality. | Direct supervision by faculty<br>Role modeling<br>HIPAA training<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Self-assess their performance and the means for improvement. | Direct supervision by faculty<br>Role modeling<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Recognize mistakes that occur and take measures to learn from them so that the do not recur. | Direct supervision by faculty<br>Role modeling<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |

SYSTEM BASED PRACTICE

| Neuromuscular/ EMG Rotation (PGY2-4) System Based Practice | | |
|---|---|---|
| Objective<br>**Basic 1 Month Rotation in EMG / Additional 2nd Month Rotation in EMG** | Teaching Methods | Assessment Strategy |
| Utilize appropriate resources to better care for their patients. | Direct supervision by faculty<br>Independent study<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Identify obstacles to good patient care, engaging other members of the health care team such as PT, OT and social work, appropriately consulting other subspecialists or generalists. | Direct supervision by faculty<br>Independent study<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Communicate with the specialized services or laboratories in order to obtain timely information on their patients. | Direct supervision by faculty<br>Independent study<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |
| Consider ethical, legal, and cost-effective standards of practice. | Direct supervision by faculty<br>Independent study<br>Performance feedback | Self assessment<br>Faculty rotation rating & evaluation<br>Program Director semi-yearly review |