

# ELECTRONEURODIAGNOSTIC PROGRAM GRADUATE COMPETENCIES

The following graduate competencies for performing an electroencephalogram (EEG) and additional electroneurodiagnostic procedures, including introductory level Evoked Potential Studies (EP), Polysomnography Studies (PSG), Nerve Conduction Studies (NCS), Intraoperative Neurophysiological Monitoring (IONM), and Long Term Monitoring (LTM) are recommended as standards for the education of post-secondary students in electroneurodiagnostic (END) programs. Employers can expect the graduates of CAAHEP-accredited END programs to be competent in the areas defined below.

## I. ELECTROENCEPHALOGRAPH (EEG)

### A. The graduate provides a safe recording environment by:

1. verifying identity of patient;
2. cleaning electrodes after each procedure;
3. following universal precautions for infection control;
4. attending to patient needs appropriately;
5. recognizing/responding to life-threatening situations;
6. being certified to perform CPR;
7. following laboratory protocols for sedation;
8. complying with lab protocols for emergency and disaster situations;
9. complying with hazardous material handling procedures;
10. maintaining instrument/equipment in good working order; and
11. taking appropriate precautions to ensure electrical safety.

### B. The graduate establishes rapport with the patient and patient's family by:

1. using personal communication skills to achieve patient relaxation/cooperation;
2. explaining all test procedures including activation procedures;
3. explaining the electrode application method (paste, collodion, etc.);
4. interacting on a level appropriate to patient's age and mental capacity; and
5. maintaining respect and patient confidentiality.

### C. The graduate evaluates the patient to:

1. determine the patient's mental age, mental state, and comprehension level;
2. note the patient's overall physical condition;
3. decide appropriate method of electrode application;
4. ascertain the patient's capacity to cooperate with activation procedures;
5. determine if hyperventilation is contraindicated;
6. accommodate for disabilities or special needs;
7. determine the need for additional physiological monitors;
8. document unusual or inappropriate behavior suggestive of seizure or other event; and
9. determine the possible need for restraints or emergency intervention.

### D. The graduate prepares a basic data sheet ("tech sheet") that includes:

1. patient information (name, age, ID number, doctor, etc.);
2. recording time, date, and graduate's name or initials;
3. noting pertinent patient history and familial medical history;
4. listing current medications/sedation and time of last dosage;
5. noting time of last meal;
6. noting time, date, aura, and circumstances of last seizure or symptoms;
7. specifying the patient's mental, behavioral, and consciousness states;
8. diagramming skull defects or anomalies (if any); and
9. diagramming any modifications in electrode placement.

### E. The graduate's electrode application follows a method that includes:

1. measuring and marking the head following the 10/20 measurement system;
2. adjusting electrode placement for anatomical defects or anomalies;
3. prepping patient's scalp prior to electrode application;

4. applying electrodes with paste or with collodion and electrolyte; and
5. verifying electrode impedances are balanced and below 5,000 Ohms.

**F. The graduate has basic knowledge of analog EEG technology.**

**G. The graduate documents the working condition of a digital EEG instrument by:**

1. calibrating system amplifiers;
2. verify standard filter settings;
3. verify sensitivity settings;
4. inputting a biological (bio-cal) signal to all channels; and
5. corrects or reports deviations as appropriate.

**H. The graduate obtains a standard EEG that includes:**

1. at least 20 minutes of technically acceptable recording (120 pages);
2. eye opening and closing to check effects of stimuli on EEG;
3. hyperventilation for a minimum of 3 minutes;
4. photic stimulation at frequencies appropriate for history & reactivity;
5. mental stimulation/assessment procedures;
6. periodic checks of electrode impedance;
7. natural drowsiness and sleep, if possible;
8. notations of montage, filters, paper speed, & sensitivity setting changes; and
9. notes on observed behavior, clinical seizure manifestations, etc.

**I. The graduate customizes the recording procedure by:**

1. evaluating reason for referral, history, and observed waveforms;
2. utilizing techniques to bring out or enhance clinical symptoms;
3. selecting montages appropriate for abnormalities seen and/or expected;
4. selecting appropriate instrument settings;
5. encouraging drowsiness and sleep;
6. applying additional electrodes to localize abnormal activity;
7. monitoring respiration if appropriate; and
8. monitoring ECG rhythms for abnormality.

**J. The graduate understands and follows technical criteria for:**

1. recording electrocerebral inactivity (brain death);
2. recording neonatal EEG;
3. recording pediatric EEG; and
4. recording in intensive care or cardiac care units.

**K. The graduate differentiates artifacts from cerebral waveforms by:**

1. recognizing possible artifactual waveforms;
2. documenting (on the recording) patient movements;
3. applying/recording leads for eye potentials or other physiological potentials (ie. respiration, EMG);
4. applying/recording leads for ECG;
5. replacing electrodes exhibiting questionable activity or contact; and
6. troubleshooting for possible electrical interference.

**L. When the EEG recording is finished the graduate:**

1. removes electrode paste/glue from the patient's scalp and hair;
2. describes clinically significant behavior;
3. documents sedation used, dosage, and effects (if applicable); and
4. reviews EEG for appropriate documentation of amplifier settings & montage changes.

**M. The graduate understands (has a working knowledge of):**

1. functional neuroanatomy and neurophysiology;
2. medication effects on the EEG background and waveforms;
3. medical terminology and accepted abbreviations;
4. signs, symptoms, and EEG correlates for adult neurological disorders;

5. signs, symptoms, and EEG correlates for pediatric neurological disorders;
6. seizure manifestations, classifications, and EEG correlates;
7. psychiatric and psychological disorders; and
8. other knowledge as detailed in the ABRET Electroencephalographic Technology Practice Analysis.

**N. The graduate maintains and improves knowledge and skills by:**

1. reviewing EEG tracings with EEGer on a regular basis;
2. reading journal articles;
3. studying text books related to the field; and
4. attending continuing education courses in electroneurodiagnostics.

**O. The EEG graduate applies the principles of electronics and mathematics to recording by:**

1. knowing how differential amplifiers work;
2. computing voltage and frequency of waveforms;
3. calculating the duration of waveforms;
4. understanding the polarity of the waveforms;
5. understanding impedance; and
6. understanding analog to digital conversion.

**P. The graduate knows how waveform displays are affected by:**

1. 60 Hertz filter;
2. filter settings;
3. sensitivity settings;
4. paper speed;
5. referential and bipolar montages;
6. digital filters;
7. electrode types and electrode material composition; and
8. malfunctioning equipment.

**Q. The graduate recognizes:**

1. normal and normal variant awake and asleep patterns for each age range;
2. abnormal awake and asleep patterns for each age range;
3. EEG patterns for levels of consciousness; and
4. clinical seizure patterns.

**The following competencies are only for an introductory level of competence and are not intended to encompass all of the knowledge and skills needed to perform advanced EEG, Evoked Potentials, Polysomnography, Nerve Conduction Studies, Intraoperative Neurophysiological Monitoring, or Long Term Monitoring. Graduates are encouraged to pursue the additional study that is required for competent performance on an advanced level.**

## **II. INTRODUCTORY EVOKED POTENTIAL STUDIES (EP)**

**A. The graduate must:**

1. have knowledge of the common indications for auditory, visual, and somatosensory evoked potentials;
2. understand the anatomy, physiology, and pathology of selected sensory organs, nerves, and nerve pathways;
3. be capable of recording all three basic modalities of evoked potential studies: visual, brainstem auditory, and somatosensory;
4. understand the generators of evoked potential;
5. understand the principles of stimulation and accurate placement of recording electrodes;
6. understand the principles of measuring waveforms and distances used in evoked potential studies;
7. be familiar with the criteria for significant changes occurring during evoked potential recordings;
8. have knowledge of the clinical correlations of evoked potential abnormalities;
9. understand the concepts of near field and far field potentials, and appropriately identify EP – responses as being either near or far field;

10. have a general understanding of the effects of medications and other physiological variables on test results;
11. have knowledge of artifacts encountered during evoked potential studies and basic techniques for troubleshooting; and
12. be familiar with absolute and interpeak latencies of waveforms and how they are used.

### **III. INTRODUCTORY POLYSOMNOGRAPHY STUDIES (PSG)**

#### **A. The graduate must be capable of:**

1. recognizing sleep stages;
2. understanding the montages used in polysomnography;
3. initiating a technically adequate PSG by:
  - a) preparing the patient;
  - b) calibrating the patient and instrumentation; and
  - c) obtaining a ten minute baseline recording.
4. a basic understanding of common sleep disorders and treatment options; and
5. performing the multiple sleep latency test (MSLT) and the maintenance of wakefulness test (MWT).

### **IV. INTRODUCTORY NERVE CONDUCTION STUDIES (NCS)**

#### **A. The graduate must:**

1. understand the anatomy and physiology of selected muscles and nerves;
2. have knowledge of neuromuscular disorders;
3. understand the principles of stimulation and accurate placement of recording electrodes; and
4. understand the principles of measuring waveforms and distances used in routine nerve conduction studies.

### **V. INTRODUCTORY INTRAOPERATIVE NEUROPHYSIOLOGICAL MONITORING (IONM)**

#### **A. The graduate must:**

1. have knowledge of the common indications for intraoperative neurophysiological EEG, evoked potential and neuromuscular monitoring;
2. be aware of the criteria for significant changes during intraoperative monitoring;
3. have a general understanding of the effects of common anesthetic agents; and
4. have a general understanding of the effects of physiological variables on monitoring results.

### **VI. INTRODUCTORY LONG TERM MONITORING (LTM)**

#### **A. The graduate must:**

1. understand the indications for long-term monitoring for epilepsy and basic LTM procedures including:
  - a) ambulatory EEG;
  - b) monitoring with surface leads and intracerebral leads using video/EEG; and
  - c) continuous EEG - intensive care monitoring.
2. have knowledge of the instrumentation for long-term monitoring;
3. have knowledge of treatment options for epilepsy; and
4. recognize common seizure patterns.