NEURODIAGNOSTIC TECHNOLOGY PROGRAM
GRADUATE COMPETENCIES FOR EVOKED POTENTIAL STUDIES (EP) ADD-ON

The following graduate competencies for performing evoked potential studies (EP) have been established as the standards for th education of post-secondary students in neurodiagnostic technology (NDT) programs with an EP add-on. Employers can expect the graduates of a CAAHEP-accredited NDT with EP add-on program to demonstrate entry-level competency in the EP areas identified below.

CONTENT AREA

A. The graduate provides a safe recording environment by:
1. verifying identity of the 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 cardiopulmonary resuscitation;
7. following laboratory protocols for sedation;
8. complying with lab protocols for emergency and disaster situations;
9. maintaining instrument/equipment in good working order; and,
10. 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. accommodate for disabilities and/or special needs;
3. note the patient's overall physical condition;
4. decide appropriate method of electrode application;

D. The graduate prepares a patient data sheet that includes:
1. patient information (name, age, ID number, doctor, etc.);
2. procedure number, recording time, date, and graduates name or initials;
3. significant, relevant medical history and clinical findings specific to the modality studied;
4. patient's mental, behavioral, and consciousness states;
5. all patient medications; and,
6. results of other clinical studies relevant to the EP modality being tested, such as audiogram for BAEP, visual field testing for VEP, and nerve conduction studies for SEP.

E. The graduate follows a method of electrode application that includes:
1. measuring the patient's head using the International 10/20 system and/or Queen's Square method of electrode placement as appropriate for the evoked potential;
2. cleaning patient's scalp and skin prior to electrode application;
3. using standard disc type electrodes or needle electrodes, as appropriate;
4. using additional electrodes or modified placements as needed or as indicated by lab policy;
5. applying disc electrodes with paste or with collodion and electrolyte; and,
6. verifying that electrode impedance's are balanced and below 5000 ohms.

F. The graduate verifies the integrity of the Evoked Potential instrument by:
1. calibrating with a square pulse of appropriate amplitude and using parameters that will be used for the recording;
2. recognizing and correcting malfunctions seen with calibration, if possible;
3. having all equipment checked for safety at least twice per year or more frequently as needed or as indicated by department policy; and,
4. maintaining individual equipment logs (safety checks, break downs, repairs, and such).

G. The graduate obtains a standard EP record that includes:
1. clearly resolved waveforms;
2. at least two replications demonstrating consistency of latency and amplitude measurements;
3. use of appropriate recording and stimulus parameters;
4. additional electrode derivations and other techniques as needed to enhance or clarify the abnormality; and,

5. obligate peaks displayed according to recommended standard or department policy.

H. The graduate identifies and eliminates or reduces artifacts contaminating the waveforms by:

1. checking the quality of the raw signal regularly or whenever needed;
2. understanding the meaning and significance of artifact rejection;
3. understanding the relationship of signal to noise ratio;
4. recognizing whether the artifact is physiologic or non-physiologic;
5. identifying source of the artifact (poor electrode application, malfunctioning stimulator, or positioning of cables);
6. calculating frequency in Hz of rhythmic artifacts and understanding the effects of aliasing; proper grounding of the patient and equipment; and,
7. enhancing signal to noise ratio by increasing the number of sweeps.

I. When the EP recording is finished, the graduate:

1. removes electrode paste/glue from patient's scalp, hair and skin;
2. prepares a detailed test data worksheet that includes: montage; time and voltage calibration scales; filter settings; side stimulated; stimulus parameters-type, (polarity, rate, duration, delay, masking, intensity, and visual angle); number of trials averaged; polarity convention; and other modality-specific relevant information such as visual acuity, hearing thresholds, limb length and height;
3. documents sedation used, dosage, and effect (if applicable);
4. marks the obligate peaks and documents their latencies and amplitudes;
5. prepares hard copy of the waveforms; and,
6. stores information on electronic media according to department policy.

J. The graduate understands:

1. recommended criteria for assessing evoked potential abnormalities and maturation of EP components, basic electricity and electronics concepts;
2. basic functional neuroanatomy and neurophysiology;
3. anatomy of EP systems and generators of EP components;
4. medical terminology and accepted abbreviations
5. EP correlates of certain clinical conditions such as neurologic, orthopedic, neurosurgical, and audiologic disorders;
6. pathologic and non-pathologic factors affecting EPs;
7. the technical aspects, electrical hazards, & recording techniques unique to hostile environments (ICU,OR, radiology suites);
8. EP normative data; and,
9. other knowledge as detailed in the ABRET Evoked Potential Technology Practice Analysis.

K. The graduate applies the principles and concepts of EP instrumentation to the recording by understanding:

1. signal averaging and noise reduction;
2. analog to digital conversion including amplitude resolution, sampling rate, analysis time, sampling interval (dwell time), and Nyquist frequency;
3. the function of differential amplifiers including input impedance, common mode rejection, polarity convention, and gain;
4. effects of stimulus & recording parameters on EP waveforms;
5. electrode impedance and its importance; and,
6. electrical safety.

L. The graduate maintains and improves knowledge and skills by:

1. reviewing EP records with clinical neurophysiologist on a regular basis;
2. reading journal articles and studying text books related to the field;
3. attending continuing education courses in clinical neurophysiology; and,
4. participating in quality assurance/improvement reviews.

M. The graduate records a technically adequate Brainstem Auditory Evoked Potential by:

1. obtaining relevant audiologic, neurologic, and/or neurosurgical history, hearing loss, ear infections, dizziness, tinnitus, etc.;
2. assessing the patient's ear canals;
3. establishing hearing thresholds;
4. correlating elevations in thresholds with any existing hearing loss or conditions of ear structures;
5. noting the results of prior hearing evaluations;
6. using a montage derivation of vertex to ipsilateral and vertex to contralateral ears;
7. choosing the appropriate timebase, number of stimuli, sensitivity and bandpass settings;
8. choosing the appropriate click polarity, rate and intensity;
9. expressing click intensity measures in equivalent units of dBSL, dBHL or dBSPL;

10. adequate resolution of obligate waves I, III, and V;
11. using techniques to enhance wave I resolution such as an ear to ear montage derivation or using an ear canal electrode or increasing stimulus intensity;
12 measuring and calculating the absolute latencies, amplitudes and interpeak intervals of obligate peaks;
13. masking of opposite ear and understanding its use and effects; and,
14. performing a latency intensity series for auditory assessment in infants & other patients whenever indicated.

N. The graduate obtains a technically adequate Somatosensory Evoked Potential (SEP) by:

1. obtaining relevant neurologic, orthopedic, and/or neurosurgical history or any other relevant pathway specific information such as the presence of peripheral neuropathy;
2. selecting appropriate timebase, sensitivity and bandpass settings;
3. applying the appropriate stimulating electrodes: active cathode over the nerve and anode placed distally;
4. properly grounding the patient to reduce stimulus artifact;
5. selecting current of sufficient intensity and duration to elicit a motor twitch from the appropriate areas of stimulation;
6. using a montage that records responses from multiple levels of the pathway such as peripheral nerve, spinal cord, subcortical, and cortical responses;
7. adequately resolving of the obligate components of Erbs Point, N13, P14, N18, and N20 of the median nerve SEP;
8. adequately resolving of the obligate components of popliteal fossa, lumbar, N34, and P37 of the posterior tibial nerve SEP;
9. marking waveforms & calculating the absolute latencies, amplitudes and interpeak intervals of the obligate components;
10. calculating peripheral nerve conduction velocity; and,
11. using additional techniques that clarify the abnormalities seen.

O. The graduate obtains a technically adequate Visual Evoked Potential (VEP) by:

1. obtaining relevant ophthalmologic and neurologic history;
2. using a montage that records responses from both hemispheres;
3. assessing the patient's visual acuity;
4. selecting an adequate check size and positioning the patient at a distance from the pattern stimulator appropriate for the desired visual angle;
5. close monitoring of the patient's attention during the test;
6. performing the study with the same parameters and conditions used for normative studies including ambient light, pattern luminance and contrast;
7. adequately resolving peaks N75, P100, N145;
8. adequately resolving a "W" shaped waveform;
9. measuring and calculating the absolute latency, amplitude, amplitude ratios and intraocular latency difference of P100;
10. using flash stimuli in selected patients when use of pattern reversal stimulus is not possible;
11. understanding the limitations of use of flash stimuli; and,
12. using hemifield testing when indicated to clarify asymmetries or other abnormalities.