



## **NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING EVOKED POTENTIAL STUDIES**

**Evoked Potential (EP) providers practice in accordance with the facility policy and procedure manual which details every aspect and modality of testing.**

The American Society of Electroneurodiagnostic Technologists, Inc. presents this document to provide national criteria for evaluating competencies for performing evoked potential (EP) studies. These National Competencies were established following analysis of survey data collected in the Spring of 1998. The tabulation was completed by Robert L. Clark & Associates, of Silver Spring, Maryland. This document was updated in the Fall of 2010 according to nationally recognized and accepted criteria and approved by ASET's Board of Trustees in March 2011.

The elements for quality patient care and interaction as well as basic knowledge and technical performance were considered. The technical components include those defined in the American Clinical Neurophysiology Society (ACNS) 2006 Revisions to the Evoked Potential Guidelines published in the *Journal of Clinical Neurophysiology*, Volume 23, Number 2, April 2006.

### **Section I: Evoked Potential Core Knowledge**

The evoked potential (EP) technologist has a level of technical knowledge of electrical conduction of motor and sensory nerves in the human body. The technologist possesses the appropriate knowledge level of diseases to correlate patient history and clinical symptoms to determine appropriate evoked potential studies to be performed.

#### **Technical Skills and Other Abilities:**

##### **The EP technologist provides a safe recording environment by:**

- verifying identity of the patient
- cleaning electrodes after each procedure
- following standard precautions for infection control per facility policy and procedures
- attending to patient needs as established by facility policy and procedures
- recognizing/responding to life-threatening situations
- being certified to perform cardiopulmonary resuscitation
- following facility policy and procedures for sedation
- complying with facility policy and procedures for emergency and disaster situations maintaining instrument/equipment in good working order
- taking appropriate precautions to ensure electrical safety.

##### **The EP technologist establishes rapport with the patient and patient's family by:**

- using personal communication skills to achieve patient relaxation/cooperation
- explaining all test procedures

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- explaining the electrode application method (paste, collodion, etc.)
- interacting on a level appropriate to patient's age and mental capacity.

### **The EP technologist evaluates the patient to:**

- determine the patient's mental age, mental state, and comprehension level
- accommodate for disabilities and/or special needs
- note the patient's overall physical condition
- decide appropriate method of electrode application.

### **The EP technologist prepares a patient data sheet that includes:**

- patient's information (name, age, gender, ID number, doctor, etc.)
- procedure number, recording time, date, and technologist's name or initials
- significant, relevant medical history and clinical findings specific to the modality studied
- patient's mental, behavioral, and present clinical complaints
- all medications
- results of other clinical studies relevant to the EP modality being tested, such as audiogram for brainstem auditory evoked potential (BAEP), visual field testing for visual evoked potential (VEP), and nerve conduction studies for somatosensory evoked potential (SSEP).

### **The EP technologist:**

- reports critical care results\* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures.

### **The EP technologist follows a method of electrode application that includes:**

- measuring the patient's head using the International 10–20 System and/or Queens Square method of electrode placement as appropriate for the evoked potential
- cleaning the patient's scalp and skin prior to electrode application
- using surface electrodes or needle electrodes, as appropriate
- using additional electrodes or modified placements as needed or as indicated by facility policy and procedures
- applying surface electrodes with paste or with collodion and electrolyte
- verifying that electrode impedances are balanced and below 5000 Ohms.

### **The EP technologist verifies the integrity of the evoked potential instrument by:**

- calibrating with a square pulse of appropriate amplitude and using parameters that will be used for the recording
- recognizing and correcting malfunctions seen with calibration, if more frequently as needed or as indicated by facility policy and procedures
- maintaining individual equipment logs (safety checks, breakdowns, repairs, and such).

### **The EP technologist obtains a standard EP record that includes:**

- clearly resolved waveforms
- at least two replications demonstrating consistency of latency and amplitude measurements
- use of appropriate recording and stimulus parameters
- additional electrode derivations and other techniques as needed to enhance or clarify the abnormality
- obligate peaks displayed according to facility policy and procedures.

**The EP technologist identifies and eliminates or reduces artifacts contaminating the waveforms by:**

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

**When the EP recording is finished, the EP technologist:**

- removes electrode paste/glue from patient's scalp, hair, and skin
- 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
- documents sedation used, dosage, and effect (if applicable)
- marks the obligate peaks and documents their latencies and amplitudes
- prepares hard copy of the waveforms
- stores information on electronic media according to facility policy and procedures.

**The EP technologist understands:**

- recommended criteria for assessing evoked potential abnormalities and maturation of EP components
- basic electricity and electronics concepts
- basic functional neuroanatomy and neurophysiology
- anatomy of EP systems and generators of EP components
- medical terminology and accepted abbreviations
- EP correlates of certain clinical conditions such as neurologic, orthopedic, neurosurgical, and audiologic disorders
- pathologic and non-pathologic factors affecting EPs
- the technical aspects, electrical hazards, and recording techniques unique to hostile environments (ICU, OR, radiology suites)
- EP normative data.

**The EP technologist applies the principles and concepts of EP instrumentation to the recording by understanding:**

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

**The EP technologist maintains and improves knowledge and skills by:**

- reviewing EP records with clinical neurophysiologist on a regular basis
- reading journal articles
- studying textbooks related to the field
- attending continuing education courses in clinical neurophysiology
- completing online EP courses
- participating in quality assurance/improvement reviews
- participating in professional organizations for neurodiagnostics
- achieving EP certification and meeting recertification requirements.

**Section II: Brainstem Auditory Evoked Potential**

**The EP technologist records a technically adequate Brainstem Auditory Evoked Potential (BAEP) by:**

- obtaining relevant audiologic, neurologic, and/or neurosurgical history – hearing loss, ear infections, dizziness, tinnitus, etc.
- assessing the patient's ear canals
- establishing hearing thresholds
- correlating elevations in thresholds with any existing hearing loss or conditions of ear structures
- noting the results of prior hearing evaluations
- using a montage derivation of vertex to ipsilateral and vertex to contralateral ears
- choosing the appropriate timebase, number of stimuli, sensitivity, and bandpass settings
- choosing the appropriate click polarity, rate, and intensity according facility policy and procedures.
- expressing click intensity measures in equivalent units of dB SL, dB HL, or dB SPL
- adequate resolution of obligate components Waves I, III, and V
- 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
- measuring and calculating the absolute latencies, amplitudes, and interpeak intervals of obligate peaks
- masking of opposite ear and understanding its use and effects
- performing a latency intensity series for auditory assessment in infants and other patients whenever indicated.

**Section III: Somatosensory Evoked Potential**

**The EP technologist obtains a technically adequate Somatosensory Evoked Potential (SSEP) by:**

- obtaining relevant neurologic, orthopedic, and/or neurosurgical history or any other relevant pathway specific
- information such as the presence of peripheral neuropathy
- selecting appropriate timebase, sensitivity, and bandpass settings according to facility policy and procedures
- applying the appropriate stimulating electrodes: active cathode over the nerve and anode placed distally
- properly grounding the patient to reduce stimulus artifact

- selecting current of sufficient intensity and duration to elicit a motor twitch from the appropriate areas of stimulation
- using a montage that records responses from multiple levels of the pathway such as peripheral nerve, spinal cord, subcortical, and cortical responses
- adequately resolving of the obligate components of Erbs Point, N13, P14, N18, and N20 of the median nerve SSEP
- adequately resolving of the obligate components of popliteal fossa, Lumbar, N34, and P37 of the posterior tibial nerve SSEP
- marking waveforms and calculating the absolute latencies, amplitudes, and interpeak intervals of the obligate components
- calculating peripheral nerve conduction velocity
- using additional techniques that clarify the abnormalities seen.

#### **Section IV: Visual Evoked Potential**

**The EP technologist obtains a technically adequate Visual Evoked Potential (VEP) by:**

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

\* Critical test results – any values/interpretations where delays in reporting may result in serious adverse outcomes for patients. MA Coalition for Prevention of Medical Errors; [www.macoalition.org/document/CTRPractices.pdf](http://www.macoalition.org/document/CTRPractices.pdf)

*-- Approved by ASET Board of Trustees, March 2011*

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