



# ASET

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## **National Competencies for Performing Evoked Potential Studies**

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The American Society of Electroneurodiagnostic Technologists, Inc. presents this document to provide national criteria for evaluating competencies for performing evoked potential 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.

Basic knowledge and technical performance, as well as quality patient care and patient interaction, were considered. The technical components include those defined in the publication *Guidelines in EEG, Evoked Potentials, and Polysomnography 1994*, authored by the American Clinical Neurophysiology Society (formerly the American EEG Society). The general patient care competencies (the first two statements) were established in 1997 with the "National Competencies for Performing an Electroencephalogram."

The technologist provides a safe recording environment by:

- verifying identity of the patient
- cleaning electrodes after each procedure
- following universal precautions for infection control
- attending to patient needs appropriately
- recognizing/responding to life-threatening situations
- being certified to perform cardiopulmonary resuscitation
- following laboratory protocols for sedation
- complying with lab protocols for emergency and disaster situations
- maintaining instrument/equipment in good working order
- taking appropriate precautions to ensure electrical safety.

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

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

The 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 technologist prepares a patient data sheet that includes:

- patient information (name, age, gender, ID number, doctor, etc.)
- procedure number, recording time, date, and technologists name or initials
- significant, relevant medical history and clinical findings specific to the modality studied
- patient's mental, behavioral, and consciousness states
- all patient medications
- 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 SSEP.

The technologist's 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 patient's scalp and skin prior to electrode application
- using standard disc type electrodes or needle electrodes, as appropriate
- using additional electrodes or modified placements as needed or as indicated by lab policy
- applying disc electrodes with paste or with collodion and electrolyte
- verifying that electrode impedance's are balanced and below 5000 Ohms.

The 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 possible
- having all equipment checked for safety at least twice per year or more frequently as needed or as indicated by lab policy
- maintaining individual equipment logs (safety checks, break downs, repairs, and such).

The 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 recommended standard or lab policy.

The 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 non-physiologic
- identifying source of the artifact (poor electrode application, malfunctioning stimulator, or positioning of cables)
- calculating frequency in Hz 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 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 laboratory policy.

The 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, & recording techniques unique to hostile environments (ICU,OR, radiology suites)
- EP normative data.

The 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 & recording parameters on EP waveforms  
electrode impedance and its importance  
electrical safety.

The technologist maintains and improves knowledge and skills by:  
reviewing EP records with clinical neurophysiologist on a regular basis  
reading journal articles  
studying text books related to the field  
attending continuing education courses in clinical neurophysiology  
participating in quality assurance/improvement reviews.

The technologist records a technically adequate Brainstem Auditory Evoked Potential 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  
expressing click intensity measures in equivalent units of dBSL, dBHL 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 & other patients whenever indicated.

The technologist obtains a technically adequate *Somatosensory Evoked Potential* 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  
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 & 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

The technologist obtains a technically adequate *Visual Evoked Potential* by:  
obtaining relevant ophthalmologic and neurologic history

using a montage that records responses from both hemispheres  
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  
adequately resolving peaks N75, P100, 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.