



NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING ELECTROENCEPHALOGRAPHY (EEG)

Electroencephalography (EEG) technologists practice in accordance with the facility policy and procedure manual which details every aspect and type of recording.

ASET - The Neurodiagnostic Society presents this document to provide the national criteria for evaluating competencies for neurodiagnostic technologists performing EEG.

The elements for quality patient care and interaction as well as basic knowledge and technical performance are covered. The technical components include those defined in the American Clinical Neurophysiology Society (ACNS) 2016 Guideline 1: Minimum Technical Requirements for Performing Clinical EEG published in the *Journal of Clinical Neurophysiology*, Volume 33, Number 4, August 2016.

Section I: EEG Core Knowledge Statements

The neurodiagnostic technologist who performs EEG procedures (referred to as EEG technologist in this document) has the knowledge base to interact with the patient and obtain a quality, interpretable EEG recording that will yield information about the brain's neuronal activity. The technologist possesses the appropriate knowledge level of diseases to correlate patient history and clinical symptoms to determine appropriate maneuvers to be performed during the EEG.

TECHNICAL SKILLS AND OTHER ABILITIES:

1.1 The EEG technologist provides a safe recording environment by:

- Verifying identity of patient per institutional protocol (e.g., two patient identifiers).
- Inquiring about any allergies or skin sensitivities prior to electrode application process.
- Disinfecting electrodes after each procedure according to established best practices, facility protocols, with consideration for using disposable products¹.
- Following standard precautions for infection prevention according to facility protocols¹.
- Observing patient safety and comfort protocols as established by facility protocols.
- Maintaining current certification in basic life support (BLS) and following facility protocols for respiratory or cardiopulmonary crisis.

- Following HIPAA policy and facility procedures for cybersecurity and safety of electronic records.
- Recognizing/responding to life-threatening situations.
- Following facility policy and procedures for safety procedures, patient isolation and sedation.
- Complying with facility policy and procedures for emergency and disaster situations and with hazardous material handling procedures according to safety data sheets (SDS).
- Maintaining instrument/equipment in good working order, including annual biomedical safety checks.
- Taking appropriate precautions to ensure electrical safety making sure no wires are frayed, extension cords are not in use, 3-pronged grounded plugs are in use; and damaged cords and outlets are reported and removed from use until properly repaired according to facility policy and procedure.

1.2 The EEG technologist establishes rapport with the patient and the patient's family/caretaker 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 for patient's age and cognitive ability.
- Maintaining respect and patient confidentiality.

1.3 The EEG technologist evaluates the patient to:

- Assess cognitive abilities, mental state, and comprehension level, such as following commands, understanding the procedure.
- Note the patient's overall physical condition.
- Determine appropriate method of electrode application.^{2,3}
- Ascertain the patient's capacity to cooperate with activation procedures.
- Determine if hyperventilation/photic stimulation is contraindicated.
- Accommodate for disabilities or special needs.
- Determine the need for additional physiological monitors.
- Recognize, respond to and document behavior suggestive of seizure or nonepileptic event.
- Determine the possible need for assistance or emergency intervention.

1.4 The EEG technologist prepares patient demographics that include:

- Patient's information (name, age, medical record number, DOB, referring physician, etc.)
- Recording time, date and technologist's name or initials
- Pertinent patient history and familial medical history
- Previous EEG reports
- Current medication/sedation and time of last dosage
- Time of last meal
- Time, date, aura and circumstances of last seizure or symptoms
- Patient's mental and behavioral status and consciousness states
- Diagram of skull defects or anomalies (if any)
- Diagram of any modifications in electrode placement

1.5 The EEG technologist follows a method of electrode application that includes:

- Following the American Clinical Neurophysiology Society (ACNS) guidelines for head measurement, utilizing the International 10–20 and 10–10 Systems for electrode application.
- Assessing skin condition of the scalp prior to electrode application.
- Adjusting electrode placement for anatomical defects or anomalies.
- Properly cleaning the electrode site to reduce skin impedance prior to scalp electrode application.^{2, 3}
- Applying surface electrodes with EEG conductive paste or with collodion and electrolyte and utilizing additional techniques to appropriately and safely secure electrodes as needed (i.e., headwrap).
- Verifying surface electrode impedances measure below 10 kΩ and are balanced.
- Applying and appropriately securing electrodes to record EEG.

Section II: Instrumentation

2.1 The EEG technologist verifies the integrity of the EEG instrument by:

- Checking the calibration of system amplifiers.
- Verifying standard filter settings.
- Verifying sensitivity settings.
- Performing a biological (i.e., bio-cal) signal.
- Observing the first 30 seconds of the recording from the primary system- reference montage when instrumental and biological calibration cannot be performed.
- Correcting or reporting deviations to standard settings as appropriate.

2.2 The EEG technologist applies the principles and concepts of EEG instrumentation to recording by:

- Understanding the effect of differential amplifiers on EEG recording.
- Computing voltage and frequency of waveforms.
- Calculating the duration of waveforms.
- Understanding and calculating the polarity of waveforms.
- Understanding the importance of balanced impedances.
- Understanding the concept and application of time constants to the EEG.
- Understanding analog to digital conversion.

2.3 The EEG technologist knows how digital waveforms are affected by:

- 50/60 Hertz filter
- Filter settings (sensitivity)
- Referential and bipolar montages
- Electrodes type and electrode material composition
- Malfunctioning equipment

Section III: Recording Principles

3.1 The EEG technologist obtains a standard EEG that includes:

- A minimum of 20 minutes of technically acceptable recording, and utilizing longitudinal bipolar, transverse bipolar and referential montages following ACNS Guideline 3.
- Eye opening and closing to provide adequate sample for determining posterior dominant rhythm (i.e., background) and check effects of stimuli on the EEG.
- Hyperventilation, unless contraindicated, for a minimum of 3 minutes.
- Photic stimulation at frequencies appropriate for history and reactivity and recognizing photoparoxysmal changes.
- Minimum recording of one-minute post hyperventilation/photic stimulation.
- Mental stimulation/assessment procedures.
- Periodic checks of electrode impedance.
- Natural drowsiness and sleep, if possible.
- Notations of montage, filters, display speed and sensitivity setting changes.
- Notations of observed behavior, clinical seizure manifestations, patient positioning, etc.

- Minimum recording of 2 minutes post- any questionable event.

3.2 The EEG technologist customizes the recording procedure by:

- Identifying information from the patient history to anticipate, prepare for and correlate EEG activity with clinical symptoms.
- Utilizing techniques to elicit and/or enhance clinical symptoms.
- Selecting montages appropriate for abnormalities seen and/or expected.
- Selecting appropriate instrument settings, i.e., filters, sensitivity, timebase.
- Encouraging drowsiness and sleep.
- Applying additional electrodes and adjusting montage, if needed, to localize abnormal activity.
- Recording respiration if appropriate.
- Recording ECG rhythms.

3.3 The EEG technologist differentiates artifacts from cerebral waveforms by:

- Understanding and differentiating physiologic from non-physiologic artifact and documents accordingly.
- Documenting (on the recording) patient positioning, movements (twitching, jerking, etc.).
- Applying electrodes to monitor artifact, (e.g., EOG for eye movement, arm/leg leads for muscle artifact, etc.).
- Replacing electrodes exhibiting questionable activity.
- Troubleshooting electrical interference.

3.4 The EEG technologist:

- Reports critical test results* to the interpreting physician and supervisor and documents this communication according to facility policy and procedures.
- Documents relevant medications and dosages.
- Documents amplifier settings and montage changes.
- Removes electrode paste/collodion/adhesive from the patient's scalp and hair.

Section IV: Knowledge Base Statements

4.1 The EEG technologist understands (has a working knowledge of):

- Medication effects on the EEG background and waveforms
- Medical terminology and accepted abbreviations according to facility and ACNS

nomenclature

- Signs, symptoms, and EEG correlates for adult neurological disorders
- Signs, symptoms, and EEG correlates for pediatric neurological disorders
- Seizure manifestations, classifications, and EEG correlates
- Psychiatric and psychological disorders and EEG correlates.

4.2 The EEG technologist understands and follows technical criteria according to ACNS

Guidelines for:

- Recording electrocerebral inactivity (brain death)
- Recording EEG for all patient populations
- Recording EEG in all clinical environments.

4.3 The EEG technologist recognizes:

- Normal variants, awake and asleep patterns for each age range
- Abnormal awake and asleep patterns for each age range
- EEG patterns for levels of consciousness
- Clinical and nonconvulsive seizure patterns.

4.4 The EEG technologist possesses the knowledge base necessary to correlate patient history and clinical symptoms to determine the appropriate electrode application and recording parameters in the following disease processes:

- Seizure classification
- Stroke
- Trauma
- Encephalopathy
- Altered consciousness.

4.5 The technologist maintains and improves knowledge and skills by:

- Reviewing EEG tracings with experienced mentor(s) on a regular basis.
- Reading journal articles.
- Studying textbooks related to the field.
- Attending continuing education courses, webinars, seminars, conferences, etc. in neurodiagnostics.

*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

References:

1. Bonner & Davidson. Infection Prevention: 2020 Review and Update for Neurodiagnostic Technologists. *Neurodiagn J.* 2020. Mar;60(1):11–3, and Technical Tips: Keeping It Clean During COVID-19. *Neurodiagn J.* 2020. Sep;60(3):195–207.
2. ASET Position Statement. Skin Safety During EEG Procedures – A Guideline to Improving Outcome. 2016. https://www.aset.org/files/public/Skin_Safety_During_EEG_Procedures.pdf
3. ASET Position Statement on Skin Safety during EEG Procedures – A Guideline to Improving Outcome Addendum: Neonatal Continuous EEG. 2017. https://www.aset.org/files/public/Neonatal_Skin_Safety_Addendum.pdf

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