



## **NATIONAL COMPETENCY SKILL STANDARDS FOR PERFORMING ICU/cEEG MONITORING**

**ICU/cEEG 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 national criteria for evaluating competencies for performing studies associated with continuous EEG monitoring in Intensive Care Units (ICU/cEEG). The original document, developed in 2011, was revised for consistency in terminology with the new Scope of Practice and approved by the ASET Board of Trustees in March 2021.

In addition to advanced EEG knowledge and technical performance, quality patient care and patient/staff interaction were considered. The technical components include those defined in ASET's published competency criteria documents: *National Competency Skill Standards for Performing an Electroencephalogram* and *National Competency Skill Standards for Long-Term Monitoring in Epilepsy*.

### **Section I: ICU/cEEG Monitoring Core Knowledge Statements**

The ICU/cEEG technologist has attained the advanced level of technical knowledge and skills as well as the cognitive ability necessary to interact with the critical care patient and staff to ensure a high-quality ICU/cEEG recording that provides reliable information about the continuous electrophysiology of the brain.

Understands the processes and protocols for both in-house and remote monitoring, such as protocols for urgent communication, critical values\* for each patient/ physician preference, establishing communications with each facility's nursing staff for updates on medications and changes in treatment plan for each patient, equipment troubleshooting, IT communication, hand off procedures, using different remote access platforms, etc.

Understands the importance of timely live data monitoring and works with IT to ensure there are no serious delays in network (i.e., speed, connectivity, firewall, etc.) between live acquisition and data available for review at remote monitoring units that could potentially impact patient care.

## **TECHNICAL SKILLS AND OTHER ABILITIES:**

### **1.1 The ICU/cEEG technologist:**

- Follows the American Clinical Neurophysiology Society (ACNS) guidelines for head measurement, utilizing the International 10–20 System and/or 10–10 System for electrode application.
- Selects electrode application method appropriate to the patient’s clinical condition and monitoring paradigm.
- Is highly skilled in EEG pattern recognition seen in critically ill patients.
- Is familiar with ACNS standardized ICU EEG nomenclature<sup>2</sup> and can provide a technical description to the electroencephalographer, physicians and nursing staff caring for the patient.
- Possesses skills and cognitive abilities in videography.
- Possesses knowledge and skills in EEG data reformatting and artifact reduction techniques.
- Understands computer operations and networking, when applicable, sufficient to do basic troubleshooting/report to information technology support services.
- Is able to work quickly and proficiently under stressful conditions.
- Is knowledgeable of the criteria for medically induced coma.
- Is certified in Basic Life Support (BLS) and follows facility policy and procedures for respiratory or cardiopulmonary crisis.
- Knows head wrapping techniques for securing electrodes against displacement during patient care or ancillary testing.
- Follows facility policy and procedures for infection prevention<sup>3,4</sup> including sterile techniques relevant to the patient and equipment.
- Follows facility policy and procedures for safety procedures, patient isolation and sedation.
- Follows HIPAA policy and facility procedures for cybersecurity and safety of electronic records.

### **1.2 The ICU/cEEG technologist comprehends:**

- Principles of critical care monitoring and relevant clinical application as reflected in current literature.

- Medical terminology and accepted abbreviations in ICU/cEEG.
- Electronic concepts relative to ICU/cEEG equipment and patient safety.
- Functional neuroanatomy and neurophysiology relevant to critical care monitoring.
- Anatomical correlation of EEG waveforms.
- Electrophysiologic parameters and correlates of clinical conditions found in critical care patients such as: convulsive and nonconvulsive seizures, altered levels of consciousness, coma, sedation titration, vasospasm, intracerebral hemorrhage/pressure (ICP) and encephalopathy.
- Therapeutic hypothermia protocol.
- The utility of current medications used in critical care; their clinical and electrophysiologic effects.
- The clinical value and application of additional neurodiagnostic procedures performed on critical care patients, i.e., evoked potential studies (EPs), transcranial doppler studies (TCDs), etc.

### **1.3 The ICU/cEEG technologist recognizes indications for ICU/cEEG, such as:**

- Monitoring the patient's current electrophysiologic status and evolution.
- Diagnosis of clinical and subclinical seizures and non-convulsive status epilepticus.
- Traumatic brain injury, intracranial hemorrhage, cerebral ischemia, altered mental state or encephalopathy.
- Levels of coma (burst suppression), and importance of vital signs and potential effect on EEG tracing.
- Therapeutic hypothermia after cardiopulmonary arrest.
- Subarachnoid hemorrhage (SAH), ischemia/vasospasm.
- Quantification of seizures.
- Localization of EEG abnormalities.

### **1.4 The ICU/cEEG technologist is knowledgeable about ICU/cEEG recording and networking options, such as:**

- The need for additional scalp electrodes.
- Options for recording, i.e., live EEG data and trending screens.
- The use of remote monitoring networking capabilities within the facility, if relevant.

- The use of remote monitoring networking capabilities outside the facility, if relevant.

**1.5 The ICU/cEEG technologist understands details of ICU/cEEG instrumentation, such as:**

- Types of recording and storage media.
- Concepts of digital recording including appropriate sampling rates, aliasing, Nyquist frequency, sampling skew, amplitude resolution and horizontal resolution (analysis time), digital video specifications.
- Effects of recording parameters (filters, gain/sensitivity) on EEG waveforms.
- Electrical safety issues of equipment.

**1.6 The ICU/cEEG technologist is skilled in overseeing the operation of ICU/cEEG monitoring daily tasks including:**

**1.6a Procedure Assessment Confirmation**

- Correct patient identification (two patient identifiers), room and equipment used.
- Skin integrity at electrode site<sup>5</sup>.
- Electrode attachment security.
- Appropriate electrode impedance measurements.
- Appropriate recording parameters and bedside waveform display, including trending.

**1.6b Documentation**

- Electrode placement and any additional electrodes placed.
- Diagram update of skull defects, surgical sites, edema, intracranial pressure, monitor location, etc.
- Any skin breakdown, according to facility policy and procedures.
- System malfunction and corrective measures taken.
- Medication/dosage changes.
- Most recent neuroassessment and clinical changes.
- Convulsive or nonconvulsive seizure/event, time and date.
- Monitoring (shift) report summarizing number of events, types of events, relevant EEG background changes, precautions necessary, additional procedures ordered and any other relevant information which is available for review by staff caring for the patient.

- Baseline ICU monitoring values: vital signs i.e., temperature, blood pressure, heart rate, SpO<sub>2</sub>.
- cEEG analysis and technical description.

### **1.6c cEEG Monitoring**

- Follows ACNS guidelines and facility protocols for continuous monitoring in ICU<sup>1</sup>.
- Continuously monitors patient's EEG, video and audio in real time, or reviews trends and EEG data periodically if intermittent monitoring.
- Reviews patient chart and communicates with ICU staff for updates in patient's critical test results, critical values, treatment plan and medications.
- Maintains monitoring log for each patient.
- Recognizes and documents critical test results.
- Alerts appropriate ICU staff of seizures and critical test results\* immediately according to facility protocol.
- Follows facility protocol for communication and patient safety.
- Follows facility protocols for Hand off during shift changes.
- Prepares a monitoring report (i.e., shift report) for review by staff taking care of patient during the course of cEEG monitoring, summarizing number of events, types of events, special studies needed, precautions necessary, and any other relevant information.

### **1.6d Data Review / Analysis**

- Follows ACNS guidelines and facility protocols for cEEG and video data review<sup>1</sup>.
- Reviews patient's chart notes daily or/and at shift change.
- Intermittent data review (provides periodic trending analysis, and reviews/or EEG and video data review periodically) at minimum every 12 hours or according to facility protocols and procedures.
- Continuous real time EEG and video review: reviews, clips and annotates EEG data in real time according to facility policy and procedures.
- Selects cEEG data for physician review, interpretation and clinical correlation according to department data editing policy.
- Identifies and accurately describes the chronology of clinical correlates during an event.
- Selects 2 to 3 minutes of baseline recording before and after an event.

- Follows facility protocols for EEG annotation, clipping and archiving of data.
- Transfers data between local and network drives from acquisition to review station for data review and permanent storage.
- Provides preliminary technical report to electroencephalographer at minimum every 12 hours, according to facility protocols.
- Completes preliminary, daily and final cEEG reports.

### **1.6e Communication**

- Communicates with ICU staff regarding skin breakdown or other patient care safety issues.
- Immediately alerts ICU team of the occurrence of nonconvulsive and/or convulsive seizure activity or critical pattern change during continuous monitoring or during the monitoring period reviewed intermittently according to facility policy and procedures.
- Immediately reports critical test results\* to the interpreting physician, nursing staff and/or supervisor and documents this communication according to facility policy and procedures.
- Responds to event button alerts, annotates the record and ensures communication of events to physician.
- Periodic update to attending physician(s) and nursing staff according to facility policy and procedures.
- Periodic data analysis update to the electroencephalographer regarding cEEG and patient clinical condition, at least every 12 hours if no urgent notification is warranted, or according to facility policy and procedures.
- Obtains updates from patient, family/caretaker and/or nursing staff regarding changes in patient's level of consciousness and clinical behavior according to facility policy and procedures.

### **1.7 RECOMMENDATIONS:**

- Successful completion of national board examinations (ABRET) in EEG (R. EEG T.) and long-term monitoring (CLTM).
- Knowledge of procedures unique to critical care monitoring.
- Specific training on equipment for critical care EEG recording.
- Advanced knowledge of trending and quantitative EEG.
- Specific training in networks, remote access to recording equipment and review station.

### **1.8 The ICU/cEEG technologist maintains and improves knowledge and skills by:**

- Reviewing cEEG monitoring recordings with the electroencephalographer.
- Reading journal articles.
- Attending webinars.
- Attending didactic continuing education courses in clinical neurophysiology and electroencephalography.
- Studying textbooks related to the specialty of ICU/cEEG monitoring.
- Participating in ICU “rounds”, in-services and department conferences on ICU/cEEG monitoring.
- Completing online courses.
- Participating in quality assurance/improvement activities and reviews.
- Achieving LTM certification and meeting recertification requirements.

## **SECTION II: ICU/CEEG MONITORING PROCEDURE**

### **2.1 The ICU/cEEG technologist ensures the integrity of cEEG equipment and supplies by:**

- Ensuring electrodes and other supplies and equipment that have direct patient contact are cleaned and disinfected according to facility infection prevention policy and procedures.
- Performing digital calibration of EEG and all ancillary recording instruments according to ACNS guidelines, according to facility policy and procedures.
- Performing equipment safety evaluation according to facility policy and procedures.
- Ensuring audio/video equipment are functioning properly.
- Ensuring event button is tested and functioning properly.
- Confirming adequate storage space on recording instruments, servers or other data storage devices to record a minimum of 24 hours of continuous data.
- Confirming computer connectivity.

### **2.2 The ICU/cEEG technologist acquires information and evaluates the patient prior to the procedure by:**

- Reviewing patient’s medical record.
- Interviewing patient and family/caregiver as appropriate.
- Communicating with physicians and nursing staff caring for the patient.

- Collaborating with the electroencephalographer.
- Viewing previously recorded neurodiagnostic test data.
- Determining and accommodating the patient's age-specific needs.
- Determining and accommodating the patient's needs specific to level of alertness and physical limitations.
- Providing appropriate patient/family/caregiver/staff education regarding the procedure and expectations of the monitoring process.

### **2.3 The ICU/cEEG technologist prepares patient demographics that include:**

- Patient demographic information (name, age, ID number, referring physician, etc.).
- Procedure information: number, recording time, date, technologist's initials.
- Significant relevant medical history and clinical findings specific to procedure.
- Patient's neuro-assessment baseline state and level of consciousness.
- All relevant patient medications.
- Baseline ICU monitoring values: ICP, blood pressure, heart rate, ventilation.
- Results of studies relevant to cEEG (i.e., MRI, CT, SPECT, angiogram, other neurodiagnostic studies, etc.).

### **2.3 The ICU/cEEG technologist ensures a method of electrode application that includes:**

- Applying full 10–20 or 10–10 System electrode placement according to facility policy and procedures.
- Knowing how to select alternate electrode sites, as needed, to avoid scalp IVs, head wounds, halos, etc.
- Following facility policy and procedures regarding infection prevention during patient preparation that includes maintaining sterility of head wounds, incisions and intracranial monitor areas.
- Selecting appropriate method of electrode application.
- Using disposable products when possible (i.e., using MRI/CT scan-safe electrodes when possible).
- Assessing the risk for skin breakdown at the electrode application site and using appropriate electrode application technique for patients at risk (edema, cardiac patients, hypoperfusion, neonates) according to facility policy and procedures.
- Ensuring placement of appropriate recording reference and ground electrodes in



digital recording systems.

- Securing headbox/transmitter system to protect against disconnection during patient movement.

#### **2.4 The ICU/cEEG technologist obtains a baseline cEEG recording from all electrodes used during the cEEG procedure and:**

- Verifies electrode recording integrity.
- Assesses adequacy of scalp site used for recording reference location.
- Determines set-up and recording protocol including montage derivations appropriate for the patient.
- Uses recording and stimulus parameters appropriate for cEEG.
- Is able to reformat data, adding electrode derivations and montages or other techniques that enhance or clarify the EEG abnormality.
- Uses sequential montages according to facility policy and procedures or ACNS guidelines.
- Displays most appropriate montage on bedside monitor for staff reference, i.e., anterior/posterior chain.
- Reviews baseline with ICU staff as appropriate according to facility policy and procedure.

#### **2.5 The ICU/cEEG technologist communicates with ICU staff regarding:**

- Type of electrodes used and related precautions (i.e., subdermal needle electrodes).
- How to move patient without jeopardizing electrode security.
- Disconnecting electrodes appropriately, i.e., to transport patient for imaging studies.
- Documenting events and comments into the computer.
- The need for sedatives, muscle relaxants and/or anesthetics.
- Type of networking connections used and how to correct loss of connectivity.
- Who to contact regarding equipment issues.
- Who to contact regarding clinical issues.
- How to troubleshoot electrodes if necessary.

#### **2.6 The ICU/cEEG technologist identifies and eliminates or reduces artifacts contaminating the recording of cEEG and video by:**

- Analyzing the quality of the recording.
- Recognizing artifact as physiologic or non-physiologic.
- Ensuring proper grounding of patient and equipment.
- Correcting, eliminating, or monitoring artifact as appropriate.
- Documenting artifacts that cannot be avoided, i.e., chest percussions, sternal rub, oscillating bed, etc.
- Performing established protocol to confirm stimulus induced electrographic changes.
- Optimizing equipment amplifier parameters.
- Adequately articulating hardware and software settings to support and provide guidance for bio-med troubleshooting.

**2.7 The ICU/cEEG technologist ensures the following after completion of the cEEG procedure:**

- Disconnection of patient from monitoring equipment and removal of electrodes.
- Documentation of any skin breakdown according to facility policy and procedures.
- Proper disposal of disposable electrodes and procedure products.
- Proper cleaning/disinfecting/sterilizing of reusable application products according to facility policy and procedures.
- Proper cleaning/disinfecting of cEEG equipment according to facility policy and procedures.
- Restocking cEEG supplies according to facility policy and procedures.
- Relocation of equipment to assigned storage area.
- Completing and maintaining patient documentation for charges, statistics and medical records.

\* 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)

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