**APPENDIX I**

**COMPETENCY MATRIX**

**NEURODIAGNOSTIC TECHNOLOGY PROGRAM GRADUATE COMPETENCIES**

**List the course(s) and specific objective(s) that includes instruction in each competency.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CONTENT AREA**  **Graduate competencies for all NDT programs** | | | | **COURSE # (s)** | **OBJECTIVE #(s)** |
| **Group 1:**  Graduate competencies for all neurodiagnostic technology programs {Electroencephalography (EEG)}, which also must include the introductory competencies for Evoked Potential Studies (EP), Polysomnography Studies (PSG), Nerve Conduction Studies (NCS), Long Term Monitoring (LTM), and Intraoperative Neurophysiological Monitoring (IONM) | | | | | |
| **a. ELECTROENCEPHALOGRAM (EEG)**  Entry-level competency is evidenced by a graduate’s knowledge and ability in the following areas: | | | | | |
| **1.** | **Providing a safe recording environment by:** | | |  |  |
|  | a) | verifying the identity of each patient according to the most recent Joint Commission Standards; | |  |  |
|  | b) | cleaning and disinfecting electrodes after each procedure; | |  |  |
|  | c) | following Standard Precautions and Transmission-Based Precautions for infection control; | |  |  |
|  | d) | attending to the patient needs appropriately; | |  |  |
|  | e) | recognizing/responding to life-threatening situations; | |  |  |
|  | f) | obtaining and maintaining valid CPR certification; | |  |  |
|  | g) | following established laboratory protocols for sedation; | |  |  |
|  | h) | complying with lab protocols for emergency and disaster situations; | |  |  |
|  | I) | complying with hazardous material handling procedures; | |  |  |
|  | j) | maintaining instrument/equipment in good working order; | |  |  |
|  | k) | evaluating each testing situation; | |  |  |
|  | l) | taking appropriate precautions to ensure electrical safety, including reporting signs of worn or frayed cables; and, | |  |  |
|  | m) | ensuring that the laboratory or testing site adheres to appropriate regulatory and legal standards. | |  |  |
| **2.** | **Establishing and maintaining a professional, caring rapport with the patient and the patient's family by:** | | | | |
|  | a) | using personal communication skills to achieve patient relaxation/cooperation; | |  |  |
|  | b) | explaining at an age appropriate level all test procedures including activation procedures; | |  |  |
|  | c) | explaining the electrode application method (paste, collodion, etc.); | |  |  |
|  | d) | interacting at all times on a level appropriate to patient's age and mental capacity as well as interacting with parents, guardians and other caretakers; | |  |  |
|  | e) | maintaining respect and patient confidentiality; | |  |  |
|  | f) | adhering strictly to HIPPA and hospital guidelines regarding patient confidentiality; and, | |  |  |
|  | g) | demonstrating appropriate ethical professional behaviors. | |  |  |
| **3.** | **Determining the patient’s physical, mental and emotional condition by:** | | | | |
|  | a). | assessing the patient's mental age, mental state, and comprehension level; | |  |  |
|  | b) | noting the patient's overall physical condition; | |  |  |
|  | c) | recognizing and using appropriate method of electrode application; | |  |  |
|  | d) | ascertaining the patient's capacity to cooperate with activation procedures; | |  |  |
|  | e) | deciding if hyperventilation is contraindicated; | |  |  |
|  | f) | accommodating for disabilities or special needs; | |  |  |
|  | g) | evaluating the need for additional physiological monitors; | |  |  |
|  | h) | documenting unusual or inappropriate behavior suggestive of seizure or other event; and, | |  |  |
|  | i) | examining the possible need for restraints or emergency intervention. | |  |  |
| **4.** | **Preparing a basic data form that includes:** | | | | |
|  | a) | obtaining patient information (e.g., name, age, ID number, doctor); | |  |  |
|  | b) | documenting time, date, and graduate's name or initials; | |  |  |
|  | c) | noting pertinent patient history and familial medical history; | |  |  |
|  | d) | listing current medications/sedation and time of last dosage; | |  |  |
|  | e) | noting time of last meal, handedness and sleep; | |  |  |
|  | f) | noting time, date, aura, and circumstances of first and last seizure or symptoms; | |  |  |
|  | g) | assessing and documenting frequency, duration and symptoms of event/seizures; | |  |  |
|  | h) | specifying the patient's mental, behavioral, and consciousness states; | |  |  |
|  | i) | illustrating skull defects or anomalies (if any); | |  |  |
|  | j) | documenting any alteration from laboratory procedure and protocol; and, | |  |  |
|  | k) | illustrating any modifications in electrode placement. | |  |  |
| **5.** | **Applying electrodes by following a method that includes:** | | | | |
|  | a) | measuring and marking the head using the 10/20 measurement system; | |  |  |
|  | b) | adjusting electrode placement for anatomical defects or anomalies and documenting appropriately; | |  |  |
|  | c) | prepping patient's scalp prior to electrode application; | |  |  |
|  | d) | applying electrodes with paste or with collodion/electrolyte or other materials per protocol; and, | |  |  |
|  | e) | verifying electrode impedances are balanced and consistent with nationally accepted NDT guidelines. | |  |  |
| **6.** | **Demonstrating knowledge of EEG recording technology by:** | | | | |
|  | a) | accurately applying appropriate filter and sensitivity settings and making adjustments; | |  |  |
|  | b) | performing instrument calibration; | |  |  |
|  | c) | justifying amplifier processing as it relates to digital systems; | |  |  |
|  | d) | reviewing calibration results according to specified system and ensuring calibration results are acceptable to proceed with recording; and, | |  |  |
|  | e) | correcting or reporting deviations as appropriate. | |  |  |
| **7.** | **Obtaining a standard EEG that includes**: | | | | |
|  | a) | at least 20 minutes of technically acceptable recording (120 pages); | |  |  |
|  | b) | eye opening and closing to check effects of stimuli on EEG; | |  |  |
|  | c) | hyperventilation for a minimum of 3 minutes where appropriate (5 minutes in absence); | |  |  |
|  | d) | performing photic stimulation at frequencies appropriate for history and reactivity; | |  |  |
|  | e) | determining need for mental stimulation/assessment procedures; | |  |  |
|  | f) | recording at least one check of electrode impedance; | |  |  |
|  | g) | recording natural drowsiness and sleep, if possible; | |  |  |
|  | h) | noting of montage, filters, paper speed, & sensitivity setting changes; and, | |  |  |
|  | i) | documenting observed behavior, clinical seizure manifestations, etc. | |  |  |
| **8.** | **Customizing the recording procedure by:** | | | | |
|  | a) | evaluating reason for referral, history, and observed waveforms; | |  |  |
|  | b) | utilizing techniques to bring out or enhance clinical symptoms; | |  |  |
|  | c) | selecting montages appropriate for abnormalities seen and/or expected; | |  |  |
|  | d) | selecting appropriate instrument settings; | |  |  |
|  | e) | encouraging drowsiness and sleep; | |  |  |
|  | f) | applying additional electrodes to localize abnormal activity; | |  |  |
|  | g) | monitoring respiration if appropriate; and, | |  |  |
|  | h) | monitoring ECG rhythms for abnormality. | |  |  |
| **9.** | **Following appropriate technical criteria when recording:** | | | | |
|  | a) | electrocerebral inactivity (brain death); | |  |  |
|  | b) | neonatal EEG; | |  |  |
|  | c) | pediatric EEG | |  |  |
|  | d) | in intensive care or cardiac units; and, | |  |  |
|  | e) | in surgical areas or operating rooms. | |  |  |
| **10.** | **Differentiating artifacts from cerebral waveforms by:** | | | | |
|  | a) | recognizing possible artifactual waveforms; | |  |  |
|  | b) | documenting (on the recording) patient movements; | |  |  |
|  | c) | applying/recording leads for eye potentials or other physiological potentials (e.g., respiration, EKG, EMG); | |  |  |
|  | d) | replacing electrodes exhibiting questionable activity or contact; and, | |  |  |
|  | e) | troubleshooting for possible electrical interference. | |  |  |
| **11.** | **Completing the EEG recording by:** | | | | |
|  | a) | removing electrode paste/glue from the patient's scalp and hair using safety precautions; | |  |  |
|  | b) | describing clinically significant behavior witnessed while in the presence of the patient; | |  |  |
|  | c) | documenting sedation used, dosage, and effects (if applicable); | |  |  |
|  | d) | reviewing EEG for appropriate documentation of amplifier settings and montage changes; and, | |  |  |
|  | e) | storing information on appropriate media. | |  |  |
| **12.** | **Demonstrating knowledge of EEG clinical correlations by:** | | | | |
|  | a) | explaining functional neuroanatomy and neurophysiology; | |  |  |
|  | b) | describing medication effects on the EEG background and waveforms; | |  |  |
|  | c) | recognizing and using medical terminology and accepted abbreviations; | |  |  |
|  | d) | defining signs and symptoms for adult neurological disorders; | |  |  |
|  | e) | defining signs and symptoms for pediatric neurological disorders; | |  |  |
|  | f) | characterizing seizure manifestations and classifications; and, | |  |  |
|  | g) | identifying psychiatric and psychological disorders. | |  |  |
| **13.** | **Describing the benefit of future ongoing professional development for continuing competence post-graduation through the:** | | | | |
|  | a) | review of neurodiagnostic procedures with the interpreting physician on a regular basis; and, | |  |  |
|  | b) | acquisition of continuing education units (CEU). | |  |  |
| **14.** | **Applying the principles of electronics and mathematics of recording EEGs by accurately:** | | | | |
|  | a) | describing how differential amplifiers work; | |  |  |
|  | b) | computing voltage and frequency of waveforms; | |  |  |
|  | c) | calculating the duration of waveforms; | |  |  |
|  | d) | illustrating the polarity of the waveforms; | |  |  |
|  | e) | defining impedance; and, | |  |  |
|  | f) | describing analog to digital conversion. | |  |  |
| **15.** | **Demonstrating the appropriate use of the:** | | | | |
|  | a) | 60 Hertz filter; | |  |  |
|  | b) | filter settings; | |  |  |
|  | c) | sensitivity settings; and, | |  |  |
|  | d) | paper speed or equivalent. | |  |  |
| **16.** | **Explaining the:** | | | | |
|  | a) | similarities/differences of referential and bipolar montages; | |  |  |
|  | b) | effect of digital filters and waveform displays; | |  |  |
|  | c) | effect of electrode types and electrode material composition; and, | |  |  |
|  | d) | effect of malfunctioning equipment. | |  |  |
| **17.** | **Accurately recognizing:** | | | | |
|  | a) | normal/normal variant awake and asleep patterns for each age range; | |  |  |
|  | b) | abnormal awake and asleep patterns for each age range; | |  |  |
|  | c) | EEG patterns for levels of consciousness; and, | |  |  |
|  | d) | clinical seizure patterns. | |  |  |
| **b. INTRODUCTORY EVOKED POTENTIAL STUDIES (EP)** | | | | | |
| Competency at the introductory level is evidenced by a graduate’s knowledge and ability in the following areas: | | | | | |
|  | 1) | explaining common indications for auditory, visual, and somatosensory evoked potentials; | |  |  |
|  | 2) | defining the anatomy, physiology, and pathology of selected sensory organs, nerves, and nerve pathways; | |  |  |
|  | 3) | explaining the generators of evoked potentials; | |  |  |
|  | 4) | stating the principles of stimulation and accurate placement of recording electrodes; | |  |  |
|  | 5) | measuring waveforms and distances used in evoked potential studies; | |  |  |
|  | 6) | reporting criteria that may cause significant changes occurring during evoked potential recordings; | |  |  |
|  | 7) | specifying clinical correlations of evoked potential abnormalities; | |  |  |
|  | 8) | defining the concepts of near field and far field potentials; | |  |  |
|  | 9) | identifying artifacts encountered during evoked potential studies and basic techniques for troubleshooting; and, | |  |  |
|  | 10) | explaining concepts of amplitude, latency, and interpeak latency measurements. | |  |  |
| **c.** | **INTRODUCTORY POLYSOMNOGRAPHY STUDIES (PSG)** | | | | |
| Competency at the introductory level is evidenced by a graduate’s knowledge and ability in the following areas: | | | | | |
|  | 1) | accurately recognizing all sleep stages; | |  |  |
|  | 2) | accurately explaining (verbal or in writing) the indications for monitoring PSG; | |  |  |
|  | 3) | initiating a technically adequate PSG by: | |  |  |
|  |  | a) | discussing the electrode selection and montages used in PSG |  |  |
|  |  | b) | measuring and applying electrodes according to guidelines |  |  |
|  |  | c) | performing patient and instrument calibrations according to guidelines, and |  |  |
|  |  | d) | obtaining a ten minute baseline recording; |  |  |
|  | 4. | explaining (verbal or written) common sleep disorders and treatment options; and, | |  |  |
|  | 5. | performing the multiple sleep latency test (MSLT) and the maintenance of wakefulness test (MWT). | |  |  |
| **d.** | **INTRODUCTORY NERVE CONDUCTION STUDIES (NCS)** | | | | |
| Competency at the introductory level is evidenced by a graduate’s knowledge and ability in the following areas: | | | | | |
|  | 1) | identifying basic peripheral nerve and muscle anatomy and physiology; | |  |  |
|  | 2) | describing the general scope of neuromuscular disorders (e.g., neuron, axon, myelin sheath, neuromuscular junction, and muscle); | |  |  |
|  | 3) | explaining the principles of stimulation and accurate placement of recording electrodes; and, | |  |  |
|  | 4) | defining the principles of measuring waveforms and distances used in routine nerve conduction studies. | |  |  |
| **e.** | **INTRODUCTORY LONG TERM MONITORING (LTM)** | | | | |
| Competency at the introductory level is evidenced by a graduate’s knowledge and ability in the following areas: | | | | | |
|  | 1) | explaining indications for long-term monitoring for epilepsy and basic LTM procedures, including: | |  |  |
|  |  | a) | ambulatory EEG |  |  |
|  |  | b) | monitoring with surface leads and intracerebral leads using video/EEG and |  |  |
|  |  | c) | continuous EEG intensive care monitoring; |  |  |
|  | 2) | recognizing and explaining instrumentation for long-term monitoring; | |  |  |
|  | 3) | explaining treatment options for epilepsy; and, | |  |  |
|  | 4) | identifying common seizure patterns. | |  |  |
| **f.** | **INTRODUCTORY INTRAOPERATIVE NEUROPHYSIOLOGICAL MONITORING (IONM)** | | | | |
| Competency at the introductory level is evidenced by a graduate’s knowledge and ability in the following areas: | | | | | |
|  | 1) | explaining common indications for intraoperative neurophysiological EEG, evoked potential and neuromuscular monitoring; | |  |  |
|  | 2) | recognizing criteria for significant changes during intraoperative monitoring; | |  |  |
|  | 3) | defining effects of common anesthetic agents; and, | |  |  |
|  | 4) | stating common effects of physiological variables on onitoring results. | |  |  |