



Competency Statements – Electroencephalography (EEG)

These competency statements assume a University education including a bachelor of biomedical science or similar including major components of human anatomy and physiology.

Underpinning Knowledge

The following areas of knowledge are topics that relate to the competency statements required to perform an EEG. These areas of knowledge are not included in the statements as topics that require competence in performance but would assist in a better understanding of the competencies required.

- Anatomical structures and function of the central nervous system
- Maturation and development of the central nervous system
- Cerebral circulatory system
- The neurological examination
- Neuro-imaging techniques
- Diseases of the nervous system including but not limited to
 - Epilepsy
 - Inflammatory processes/infections
 - Cerebro-degenerative disorders
 - Metabolic disorders
 - Drug effects on the nervous system
 - Space occupying lesions
- Medications used for treatment of diseases of the nervous system
- Verbal and written communication skills
- Health and ethical principles

To perform an EEG

1. Core Knowledge
2. Preparation
3. Patient Care
4. Equipment
5. Electrode application
6. Recording techniques
7. Additional recording measurements
8. Interpreting the data
9. Completing the EEG
10. Factual report
11. Managing the recorded data

Appendix

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1. Core knowledge

The Neurophysiology Health Worker must be able to demonstrate an understanding of specialised knowledge in the following areas:

- Define major anatomical structures and function of the major brain regions
- Describe the effects of diseases of the nervous system on the EEG including but not limited to
 - Epilepsy
 - inflammatory processes/infections
 - neuro-degenerative disorders
 - metabolic disorders
 - drug effects
 - space occupying lesions
 - cerebrovascular disease
- Identify the use of EEGs during surgical procedures
- Describe analogue to digital conversion recording techniques
- Identify bandwidth and frequency response characteristics
- Identify and explain the implication and use of frequency filters
- Explain the function and purpose of differential amplifiers
- Define common mode rejection ratio and understand its function and purpose
- Identify the recording parameters and how they differ from display parameters including sensitivity and filters
- Identify advantages and disadvantages of different types of electrodes
- Discuss sterilising procedures including high risk infectious diseases according to current Workplace Health and Safety (WH&S) and Infection Control (IC) regulations
- Identify the need to chloride and re-chloride silver electrodes
- Discuss the chemical and electrolytic process to chloride and de-chloride silver electrodes
- Explain the measurement of impedance
- Identify the importance of equal and low impedances in electrode application

2. Preparation

The Neurophysiology Health Worker must be competent in the following areas of EEG preparation:

- Identify the process for patients to attend and leave the clinic.
- Prepare consumables appropriately
- Perform routine maintenance of equipment.
- Prepare and check equipment is working according to manufacturer's specifications.
- Identify and correct minor equipment faults.
- Identify the process for repair of more complex faults.
- Prepare the environment according to WH&S regulations.
- Register correct data for patient.
- Identify sufficient recording space for the recording
- Identify ethical issues that may occur during the recording
- Obtain appropriate patient consent

3. Patient Care

The Neurophysiology Health Worker must be competent in the following areas of EEG patient care:

- Introduce self and others present
- Identify correct patient, correct procedure
- Evaluate clinical and patient information on the request form noting:
 - age of the patient
 - special care requirements
 - obtain relevant clinical history including
 - personal medical history,
 - description of episode,
 - medications,
 - family history
 - last meal
 - handedness
 - indication for the test
- Demonstrate appropriate patient interaction
 - according to age, clinical state and cultural differences
 - provide sufficient pre-test information
 - gain sufficient pre-test information
 - explain the procedure including answering questions
- Identify the need to adapt the EEG procedure according to the information provided including
 - additional activation techniques
 - omit activation procedures based on contraindications
 - additional recording techniques
- Identify the need and demonstrate the testing of the patient's responsiveness and memory during suspected electrographic seizures
- Recognise and respond when assistance is required including
 - behavioural difficulties

- clinical seizure
- clinical state
- other medical emergencies
- demonstrate patient confidentiality
- obtain and register video and audio consent
- position patient for adequate accessibility, relaxed state and patient comfort

4. Equipment

The Neurophysiology Health Worker must be competent in the following areas of EEG equipment:

- Electrodes
 - prepare and clean electrodes for use according to WH&S and IC regulations
 - store electrodes appropriately
- Amplifiers
 - identify and explain the implication and use of frequency filters on the EEG
 - identify the routine acquisition parameters
 - explain the technique of referential recording
 - explain the importance of the ground electrode
- Software
 - enter identifying data and other data, according to workplace protocol
 - start, pause and end recording
 - alter recording and display parameters
 - annotate recording during and after recording
 - display data from any added electrodes
 - edit and archive recordings

5. Electrode Application

The Neurophysiology Health Worker must be competent in the following areas of EEG electrode application:

- Accurately apply electrodes according to The 10/20 Electrode Placement System
 - measure and mark the patient's head according to The 10/20 Electrode Placement System
 - explain the consequences of inaccurate electrode measurement and placement
 - prepare skin for application of recording electrodes adhering WH&S and IC regulations
 - explain the importance of good electrode application
 - identify advantages and disadvantages of different types of application – surface electrodes with paste, surface electrodes with Collodion, sub-dermal needle electrodes, other
 - demonstrate appropriate stability of electrode application for the length of recording
 - apply additional electrodes where appropriate
 - identify and implement infection control procedures
 - observe and apply standard precautions for contact, droplet and airborne infection risks when applying, removing and cleaning electrodes

6. Recording

The Neurophysiology Health Worker must be competent in the following areas of EEG recording:

- Connect electrodes to the pre-amplifier
 - connect electrodes to the pre-amplifier according to electrode placement
 - arrange leads & pre-amplifier to minimise environmental artefacts
- Identify the appropriate electrode impedance for EEG
 - define the required impedance level for recording
 - measure electrode impedance
 - identify and adjust impedance levels when required
- Perform calibration and machine check
 - record a calibration signal for appropriate length of time before and after recording
 - define the value of the input calibration signal
 - explain the importance and the information provided by the calibration signal including display alignment, sensitivity, linearity, centring, damping, high frequency filters, low frequency filters, time constant, display speed, machine noise
 - all electrode check – explain the relevance and appropriateness
- Define the machine settings used for EEG
 - define the machine settings including sensitivity, filters, display speed
 - explain the relevance of the machine settings to the recording
 - use machine settings according to departmental protocols
 - alter machine control settings when appropriate
 - set video and audio recording device to capture patient appropriately
- Identify the montages used for EEG recording
 - define The EEG Convention
 - explain the importance of the system reference electrode
 - identify and explain
 - different montage derivation types
 - bipolar
 - common reference
 - common average reference
 - source reference
 - advantages and disadvantages of different montage derivation types
 - best use for different montage derivation types
 - localisation for different montage derivation types
 - identify pitfalls of different common reference positions
 - Identify different montage configurations and explain the advantages and disadvantages or best use for each.
 - use a range of pre-set recording montages including anterior-posterior, transverse and common reference montages
 - create and use independent montage or alter existing montage in appropriate setting

- Perform activation techniques
 - explain and demonstrate the use of activation techniques appropriately
 - visual
 - hyperventilation
 - photic stimulation
 - sleep deprivation
 - auditory
 - tactile
 - other
 - identify contra-indications for activation procedure
 - instruct the patient for the activation procedure
 - identify patient response to activation procedures
 - identify and respond to patient response where necessary
- Recognise artefacts
 - identify artefacts and their source
 - instrumental and or environmental artefacts
 - physiological artefacts
 - eliminate or minimise artefact
- Record an EEG
 - define appropriate length of recording
 - identify departmental EEG procedure protocol
 - apply independent clinical judgement for recording procedure where appropriate
- Annotate the recording
 - annotate accurately and clearly
 - changes to montages and machine settings
 - patient clinical state and clinical events
 - clinical changes or lack of clinical changes during an electrographic seizure
 - artefacts and steps to eliminate or reduce
 - identify the importance of clinical correlation to the recording

7. Additional recording measurements

The Neurophysiology Health Worker must be competent in recording additional measurements in conjunction with the EEG.

- Record ECG
 - identify the importance of recording ECG in conjunction with the EEG
 - correlate to EEG
- Record respiration
 - identify when recording respiration in conjunction with the EEG is required
 - correlate to EEG
- Record Eye movements
 - identify when recording eye movements in conjunction with the EEG is required
 - correlate to EEG
- Record surface EMG
 - identify when recording surface EMG in conjunction with the EEG is required
 - correlate to EEG

- Record body/limb movement
 - identify when recording body/limb movement in conjunction with the EEG is required
 - correlate to EEG

8. Interpret the EEG recording

The Neurophysiology Health Worker must be competent in the following areas of EEG Interpretation:

- Interpret EEG waveforms
 - identify normal waveforms including wake and sleep patterns, and normal variants appropriate for age
 - identify and act on patterns with appropriate activation, modification of display settings and or montage to enhance presentation and or clarification
 - recognise abnormal waveforms including focal, lateralising and or generalised abnormalities
 - recognise localised normal and abnormal features
 - recognise electrographic seizures
 - recognise specific EEG abnormalities relating to clinical conditions including
 - epilepsies
 - encephalopathies, generalised and focal
 - space occupying lesions
 - metabolic disorders
 - Creutzfeldt Jacob Disease (CJD)
 - recognise EEG patterns that require immediate medical attention
 - status epilepticus
 - subclinical non convulsive seizures
 - electro-cerebral silence
 - recognise ECG patterns that require immediate medical attention
 - significant cardiac rhythm disturbance
 - identify expected changes with relevant medications

9. Completing the EEG

The Neurophysiology Health Worker must be competent in the following areas of completing the EEG:

- Check electrode integrity
- Validate recording on completion
- Remove electrodes according to different applications according to WH&S and IC regulations and patient comfort.
- Remove electrolyte from patient
- Assist patient as required
- Inform patient of the process for obtaining results
- Dispose of materials according to waste management, WH&S and IC regulations
- Clean recording electrodes in accordance with WH&S and IC regulations

10. Factual report

The Neurophysiology Health Worker must be competent in the following areas of factual report writing:

- Describe the waveforms by means of
 - frequency
 - amplitude
 - distribution
 - temporal occurrence
 - reactivity
- Format the report in a brief and concise manner including
 - patient state
 - posterior dominant rhythm
 - background activity
 - normal variants and abnormal waveforms
 - effect of activation technique
 - times at which examples of uncertain or infrequent findings occur
 - relevant clinical observations
- Provide technical report, accompanying paperwork and recording to Neurologist for reporting

11. Managing the recorded data

- Edit recording
- Archive recording
- Maintain database of recording

Appendix – Stakeholders

Stakeholders

- ANTA Inc. Members
- Document Development Committee
- Document Development Committee Advisory Group
- Other interested parties

Document Development Committee (2014-2015)

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Advisory Committee

The document development committee identified a group of key stakeholders to view the draft documents for feedback. The advisory group was made up of technologists, scientists and neurologists working in the neurophysiology industry around Australia. The comments from this group were considered, compared against the reference material and included where appropriate.

Members Feedback

On completion of the final draft the document was put out to all members of ANTA Inc. for feedback. The comments from members were considered, compared against the reference material and included where appropriate.

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