Standard

Standard Three: Suspected Brain Death / Electro Cerebral Silence (ECS)
Minimum Technical Standards Clinical Electroencephalography

INTRODUCTION:

The following recommendations represent the minimum standards for electrocerebral silence (ECS) EEG recording and are consistent with the Core Entry-to-Practice Competencies for the Profession of Electroencephalography Technology.

Recording at minimum Standards should not give pride to the EEG department working at this level and cannot ensure a satisfactory test. Minimum standards provide barely adequate fulfillment of responsibilities to the patient and the referring physician. To the minimum standards have been added recommendations to improve standardization of procedures and also facilities interchange of recordings and assessment among laboratories in North America. More detail is provided in recommendations from the international federation of Clinical Neurophysiology (Minimal Technical Requirement for Performing Clinical Electroencephalography, ACNS 2008 ) (Deuschl and Eisen, 1999.)

For the purpose of this document, electrocerebral silence or electrocerebral inactivity is defined as no electrographic activity greater than 2 microvolts (uv) when recorded from scalp electrodes. The electroencephalogram (EEG) is not an essential test in the diagnosis of brain death. The findings of electrocerebral silence is however of some confirmatory value. The diagnosis of brain death should be made according to the guidelines published in the Canadian Medical Association Journal and in agreement with provincial requirements.

The following recommendations have been prepared using published guidelines by the International Federation of Societies for Electroencephalography and Clinical Neurophysiology and the American Clinical Neurophysiology Society as well as standards of practice in various textbooks.

ELECTROCEREBRAL SILENCE RECORDINGS

A: Requirements
   1.0 Staff
   2.0 Equipment
   3.0 Electrical Safety

B: Recording Procedure
   1.0 Patient Preparation
   2.0 Documentation
   3.0 Monitoring and controlling physiologic and nonphysiologic artifacts.
   4.0 Testing Reactivity
   5.0 Testing Integrity of Recording System
   6.0 Recording Parameters
A: Requirements

1.0 Technologist
Must be performed by a Registered Technologist.

2.0 Equipment

2.1 The EEG equipment should adhere to the following parameters: (Task Force of The Canadian Society of Clinical Neurophysiologists, 2002):
- Screen resolution: at least 4-pixels per vertical millimeter and at least 1024 x 1280 pixels
- Sampling rate: 200 samples per second per channel, 12 bits or greater
- Common mode rejection: 100 dB or greater at each amplifier output
- Inter-channel cross talk: less than 1%, i.e. 40 dB down or less
- Horizontal scaling: one second of time occupy 25-35 mm and contain at least 120 data points per channel, scaling at 0.5, 2 and 4 times should be feasible
- Vertical display: minimum spacing of 10 mm between channels
- Filter: wide band-pass of 0.1 to 100Hz

2.2 EEG recording must be digital systems. Playback systems should show montage, filter settings, vertical voltage scale, horizontal time scale, technologist’s comments, event markings, and page number or time. The playback unit should allow for post-hoc selection of montages, filters and sensitivity (American Clinical Neurophysiology Society Guideline eight, 2006).

2.3 Amplification and channel acquisition must be available for a minimum of 24 and preferably 32 channels for extra derivation recording.

3.0 Electrical Safety

3.1 As indicated in CAET Standard One – Routine Adult.

B: Recording Procedure

1.0 Patient Preparation
1.1 A complete set of 10-20 electrode set must be utilized
1.2 Interelectrode impedances should be under 5,000 ohms and greater than 100 ohms.
1.3 Interelectrode distance should be at least 10 centimetres.
1.4 Additional monitoring should be performed for physiologic and non-physiologic artefacts, including Electrocardiogram (EKG),

2.0 Documentation

2.1 The following must be documented, patient name, date of birth, hospital or patient identification number, date and time of recording, medications and sedation prior to and during procedure, patient’s temperature, patient history; current, previous, pertinent family history. Any metabolic conditions or the presence of any drugs which could potentially alter the function of the central nervous system. Name of Registered Technologist.
3.0 Monitoring and controlling physiologic and nonphysiologic artifacts.

3.1 Artifacts from the patient and the environment can be differentiated from brain activity by using non-cephalic electrodes placed 10 cm apart on the dorsum of the hand. Filter settings and impedances should be equivalent to scalp electrodes.

3.2 All artifacts must be eliminated or proven and documented accordingly. Turning off and unplugging IVAC, warming blanket, bed, air mattress, etc., and temporarily turning off the ventilator may be required.

3.3 When muscle potentials obscure the recording, a neuromuscular blocking agent should be utilized under the supervisor on the electroencephalographer.

4.0 Testing Reactivity

4.1 Reactivity must be assessed using intense somatosensory, auditory and visual stimuli, using a bright light, loud sound and intense stimulation of the nail bed and trapezius muscle or supraorbital nerve.

6.0 Testing Integrity of Recording System

6.1 Integrity of the entire recording should be tested, including touching each electrode to create an artefact on the recording.

7.0 Recording Parameters

7.1 Filter settings should be appropriate for the assessment of ECS. Sensitivity must be increased from 7uv/mm to at least 2 uv/mm for at least 20 minutes of the of 30 minute recording

Repeat EEG if any doubt about ECS.
References:
CAET Minimum Standards 2008