

Adult Brain Death Testing Guide

To be read in conjunction with: Australian and New Zealand Intensive Care Society (ANZICS) 2013, *The ANZICS statement on death and organ donation*, edition 3.2 pages 17 – 26

Brain death is established by:

Irreversible coma + irreversible loss of brain stem reflexes and respiratory centre function or by demonstration of cessation of intracranial blood flow.

Preconditions

Along with the evidence of sufficient intracranial pathology that demonstrates global injury, the following preconditions also need to be met:

- Normothermia – Core temp $\geq 35^{\circ}\text{C}$
- Normotension – MAP $> 60\text{mmHg}$
- Exclusion of effects of sedative drugs
- Intact neuromuscular function
- Absence of severe electrolyte, metabolic or endocrine disturbance
- Ability to adequately examine brain stem reflexes
- Ability to perform apnoea testing.

Observation

Neurological observations, with a GCS 3, must be documented for 4 consecutive hours preceding clinical brain death testing with relative preconditions being met. It is recommended that in cases of acute hypoxic-ischemic brain injury (such as cardiac arrest), clinical brain death testing is delayed for 24 hours post rewarming. Brain death may be determined via radiological examination prior to this.

Formal examination

2 separate sets of clinical testing must be performed, with at least one of the medical practitioners being employed as a specialist. Testing can be performed consecutively,

Test	Test and response	Remarks	Equipment required
Coma	Apply stimuli in the cranial nerve distribution (pressure over the supra-orbital nerve) and all four limbs (deep nail bed pressure) and trunk (sternal rub) observing for motor responses.	Spinal reflexes may be present in patients with brain death	Nil
Pupillary light reflex Cranial nerves II & III	Shine bright light into eye and look for a pupillary constrictor response	Pupils must be $\geq 4\text{mm}$ in diameter, cataract or iris surgery is not a contraindication	Neuro torch or similar
Corneal reflex Cranial nerves V & VII	Touch the corneas with soft cotton wool and examine the eyes for blinking or a withdrawal response	Touching the sclera only is not sufficient	Sterile Cotton wool rolled to a tip
Reflex response to pain in the trigeminal distribution Cranial nerves III, IV, VI & VIII	Apply pain over the trigeminal distribution (pressure over the supra-orbital nerve). Observe for facial or limb movement		Nil
Vestibulo-Ocular reflex Cranial nerves III, IV, VI	Confirm that eardrum is visible. Elevate head of bed 30° . Instil 50mL of ice-cold water into ear canal. Observe for eye movement for 60secs	Ruptured eardrum does not invalidate the test.	Otoscope Ice cold water 50mL Syringe +/- attachment Water receptacle

Gag reflex Cranial nerves IX & X	Stimulate the posterior pharyngeal wall on both sides. Observe for gag response.	Oral intubation may make reflex difficult to discern	Tongue depressor or cotton swab
Cough / Tracheal reflex Cranial nerve X	Stimulate the trachea-bronchial wall. Observe for cough response.	This reflex cannot be assessed in patients with high cervical cord injury.	In-line suction catheter or Y-suction catheter
Apnoea test Only proceed if the above reflexes are absent.	Conducted last so that a high PaCO ₂ does not confound the testing of other cranial nerves	Apnoea must persist in the presence of an adequate stimulus to spontaneous ventilation PaCO ₂ > 60mmHG and a pH < 7.30	Provide Oxygen supplement via T-piece system / Ambu-bag while ETCO ₂ is connected to the end of the ETT OR Y-Suction catheter connected to O ₂ supply running at ~ 5L/min – to be inserted through ETT superior to the carina. Assess patient for spontaneous breathing. ABG sampling equipment.

Observations compatible with brain death

The following do not preclude determination of brain death:

- Spinal reflexes – these can be spontaneous or elicited by stimulation and may include movements
- Sweating, blushing, tachycardia
- Normal blood pressure without the need for pharmacological support
- Absence of diabetes insipidus

Observations incompatible with brain death

The following are incompatible with brain death:

- Decerebrate or decorticate posturing
- True extensor or flexor responses to painful stimuli
- Seizures

Certification of brain death when clinical criteria cannot be met

Radionuclide imaging can also be used to demonstrate an absence of cerebral blood flow if brain death is unable to be determined clinically. Prior to proceeding with any investigation a clinical examination should be performed to ensure absence of responsiveness (GCS 3), brain-stem reflexes and spontaneous breathing. Any evidence of brain stem function will preclude proceeding with a contrast study.

Situations where brain death may not be able to be determined clinically:

- No clear cause for coma
- Possible metabolic or drug effects
- Cranial nerves cannot be adequately tested
- Cervical cerebral or cord injury
- Cardiovascular instability or severe hypoxemic respiratory failure precluding the apnoea test.

Confirmation of brain death following radionuclide imaging requires 3 doctors – a Radiologist and 2 ICU Drs.

Documentation

All observations are to be recorded in the patient's medical records and the **Certification of Brain Death** form (**Form F**) completed.

The time of completion of the second set of brain death testing or review of radionuclide scan defines the time of death, and is documented as such.