



**Supporting Instruction # & Title:** CC.02.004.01.01 Brain Death, Guidelines for Tests to be Considered/Employed  
**Procedure # & Title:** CC.02.004.01 Pronouncement of Death  
**Effective Date:** 11/14/2012

### **GUIDELINES FOR TESTS FOR DETERMINATION OF BRAIN DEATH**

One privileged physician, not necessarily a neurologist, may declare brain death.

Two privileged physicians, one to perform the testing and the other to certify the time of death (neither necessarily neurologists), must participate if organ donation is planned. The physicians will complete the Brain Death Checklist (#CC.02.004.01.02) with a minimum of six (6) hours between examination #1 and examination #2. If confirmatory testing is done, the minimum time between examinations is two (2) hours.

The three components of brain death determination are:

1. Coma
2. Absence of brain stem reflexes, and
3. Apnea.

Confirmatory testing may or may not be required depending on the results of clinical testing.

Attempt notification of the next of kin that determination of brain death is being made.

**If any answer to the following questions is “no”, “uncertain”, or “cannot be adequately tested”, then brain death cannot be declared without confirmatory testing.**

#### **1. Coma:**

***a) Is the cause of the coma known and sufficient to account for the irreversible loss of all brain function?***

Note: severe head injury, stroke, fulminant liver failure, s/p cardiac arrest are examples

***b) Are CNS depressant drugs, neuromuscular blocking agents, hypothermia (<32 C), severe clinically relevant metabolic derangements, and hypotension (MAP < 55mm Hg) reasonably excluded as reversible causes?***

Note: levels of drugs do not need to be zero, but rather in such a range that it can be concluded that the drugs are not interfering with the assessment. Pressors may be used for hemodynamic support. Cerebral angiography is the confirmatory test of choice when the presence of drugs precludes the determination of brain death.

***c) Is there absence of response to pain in all extremities?***

Note: nail bed pressure and supraorbital pressure suffice.

#### **2. Brain stem reflexes**

***a) Are all movements attributable to spinal cord function?***

Note: posturing and shivering in the absence of neuromuscular blockade or learned movements in response to pain in any extremity or the head preclude the diagnosis of brain death. Deep tendon reflexes including stereotypic triple flexor responses in the lower

extremities are compatible with brain death. Spontaneous slow movements of an arm or leg, bizarre movements of entire spinal origin, coordinated movements with shoulder elevation and adduction, back arching, finger flexion, and the appearance of intercostal muscle contraction without detectable tidal volumes, may occur in brain dead patients. The "Lazarus sign" may develop in brain dead patients when the ventilator is disconnected; the head and torso may flex and for a few seconds rise from the bed with arms outstretched then falls back, and the body remains permanently flaccid in the supine position.

**b) Pharyngeal: Is there absence of cough with stimulation of the posterior pharynx or with tracheal suctioning?**

**c) Pupillary: Is there absence of pupillary light responses and are pupils between 4 and 9mm?**

Note: preexisting eye surgery that resulted in distortion of the pupil may preclude testing.

**d) Ocular: Is there absence of caloric responses to iced water after visual examination of the tympanic membranes, and absence of oculoccephalic reflex?**

Note: rule out cervical spine fracture first. Use 50cc cold water and observe for one minute, and wait 5 minutes before testing the other ear.

**e) Facial: Is there absence of corneal reflex?**

Wait a minimum of two hours between repeat testing if a confirmatory test will be used, six hours if a confirmatory test will not be used, and twenty-four hours if the coma is due to hypoxic brain injury. If both tests support brain death, proceed with the apnea test.

### 3. **Apnea Test:**

**a) Does the apnea test support brain death?**

All patients must have: temp > 36.4 degrees C, SBP >90, euvolemia or positive fluid balance over the previous six hours,  $paO_2 >80$ , and  $pCO_2$  approximately 40 (or patient's baseline) in order to proceed with the apnea test

#### **Steps:**

- 1) Deliver 100%  $O_2$  via ventilator for 10 minutes
- 2) Obtain ABG
- 3) Disconnect ventilator
- 4) Monitor  $O_2$  sats continuously
- 5) Deliver 100%  $O_2$  via canula at 6L/min, placed through the ET tube to the level of the carina.
- 6) Observe for 10 minutes. If spontaneous respiratory efforts are observed, the test precludes the diagnosis of brain death and the patient is immediately reconnected to the ventilator. If the patient develops hemodynamic instability, hypoxemia, or arrhythmias, immediately obtain an ABG, and immediately reconnect the patient to the ventilator.
- 7) At the conclusion of 10 minutes, obtain another ABG, and then reconnect the patient to the ventilator while awaiting results.

Interpretation: respiratory efforts preclude brain death. If the  $pCO_2$  is >60 (in those with baseline  $pCO_2$  about 40) increases by >20 (in those with baseline mild hypercarbia, the test supports brain death. If neither occur, the test is inconclusive and a confirmatory test must be used.

Note: sleep apnea and severe pulmonary disease resulting in a chronically elevated  $pCO_2$  may render the apnea test unreliable and necessitate the use of confirmatory testing

### **Confirmatory testing**

- a) Angiography (conventional, CT, MR, radio nucleotide)- brain death confirmed by absence of intracerebral filling at the level of the carotid bifurcation or the Circle of Willis
- b) EEG-absence of electrical activity for 30 minutes
- c) Trans cranial Doppler - small systolic peaks in early systole with diastolic flow, or reverberating flow is consistent with brain death. Note that some patients have absence of Doppler signals due to skull thickness. Absence of Doppler signals does not necessarily support brain death.
- d) The medical record must document the etiology and irreversibility of the coma, the absence of response to pain, the absence of brain stem reflexes during two separate exams, a positive apnea test, and justification for and results of confirmatory testing.

The ventilator will be disconnected after the conclusion of testing demonstrating brain death and appropriate visitation by family, if organ donation will not occur. If organ donation will potentially occur, maintain the ventilator and seek additional instructions for maintenance of the donor prior to the operating room.