Section 9	Clinical Policies	05/15/96 - Originated
Subject 9.15	End of Life Issues	09/05/13 - Reviewed w/ changes - Reviewed w/o changes
Policy 9.15.9	**Determination of Death**	10/15/13 - Effective Health System - Author

Determination of Death

Policy

UTMB physicians will determine death in accordance with this policy which is based on Texas law and the practice parameters recommended by the American Academy of Neurology for adults and the American Academy of Pediatrics for children (infants of 37 weeks gestation to 18 years).

Legal Standard

Texas Health & Safety Code § 671.001provides the legal standard used in determinating of death in Texas.

Standard Used in Determining Death

(a) A person is dead when, according to ordinary standards of medical practice, there is irreversible cessation of the person's spontaneous respiratory and circulatory functions.

(b) If artificial means of support preclude a determination that a person's spontaneous respiratory and circulatory functions have ceased, the person is dead when, in the announced opinion of a physician, according to ordinary standards of medical practice, there is irreversible cessation of all spontaneous brain function. Death occurs when the relevant functions cease.

(c) In cases of brain death, death must be pronounced before artificial means of supporting a person's respiratory and circulatory functions are terminated.

Limitation of Liability

A physician who determines death in accordance with (b) above is neither liable for civil damages nor subject to criminal prosecution for the physician's actions or the actions of others based on the determination of death.

A person who acts in good faith in reliance on a physician's determination of death is not liable for civil damages or subject to criminal prosecution for the person's actions.

Circulatory-respiratory criteria: Patient is pulseless, apneic and unresponsive to verbal stimuli for a period of at least 2 – 5 minutes.

Brain death criteria: To determine irreversible cessation of all functions of the entire brain including the brain stem, physicians must utilize the following procedure based on the practice parameters suggested by the American Academy of Neurology.

Section 9	Clinical Policies	05/15/96 - Originated
Subject 9.15	End of Life Issues	09/05/13 - Reviewed w/ changes - Reviewed w/o changes
Policy 9.15.9	**Determination of Death**	10/15/13 - Effective Health System - Author

Conditions that May Interfere with the Clinical Diagnosis of Brain Death

The following conditions may interfere with the clinical diagnosis of brain death. Confirmatory tests are recommended.

1. Severe facial trauma.
2. Pre-existing pupillary abnormalities.
3. Toxic levels of sedatives, aminoglycosides, tricyclic antidepressants, anticholinergics, antiepileptic drugs, chemotherapeutic agents, or neuromuscular blocking agents.
4. Sleep apnea or severe pulmonary disease resulting in chronic retention of CO_2.

Procedure for Clinical Assessment of Brain Death

The physician must evaluate the patient using steps 1-4 below. These criteria apply to both adult and pediatric patients, including term newborns, 37 weeks of gestation and greater. Criteria recommendations for pediatric patients are noted.

Step	Action
1	The Clinical Evaluation: Prerequisites: Establish irreversible and proximate cause of coma: a. neuroimaging evidence of an acute CNS catastrophe that is compatible with the clinical diagnosis of brain death. b. CNS depressant drug effect absent c. No evidence of residual paralytics d. Absence of severe acid-base, electrolyte, or endocrine disturbance. 1. Achieve normal core temperature $\geq 36^0$C (96.8^0 F). 2. Achieve normal systolic blood pressure >100 mm Hg. 3. Perform one neurologic examination For Pediatric patients: Two examinations including apnea testing separated by observation period. The same physician may perform the apneas testing but neurological examination should be performed by different attending physicians. a. Recommended observation period 1. 24 hours for neonates (37 wks – term infants 30 days of age) 4. 12 hours for infants and children (>30 days to 18 years) 5. Evaluation for brain death should be deferred for 24-48 hours following cardio-pulmonary resuscitation or other severe acute brain injuries in pediatric patients.

Step	Action

Section 9	Clinical Policies	05/15/96 - Originated
Subject 9.15	End of Life Issues	09/05/13 - Reviewed w/ changes - Reviewed w/o changes
Policy 9.15.9	**Determination of Death**	10/15/13 - Effective Health System - Author

2	The Clinical Evaluation (neurologic assessment): 1. Coma a. **Establish the absence of cerebral function:** Determine that the patient is comatose or unresponsive. There must be no cerebral motor response to pain in any extremity (nail-bed pressure and supraorbital pressure). 2. Establish the absence of brainstem reflexes: a. Pupils: The patient must exhibit no response to bright light in both eyes. Pupils may be in middle position (4 mm) or dilated (9 mm). b. Ocular movements: Ocular movement are absent after head turning and caloric testing. (Testing is done only when integrity of cervical spice and patency of external auditory canal is confirmed) 1. The oculocephalic reflex is tested by briskly rotating the head horizontally and vertically. 2. The oculovestibular reflex is tested by elevating the head to 30^0 during irrigation of each ear with 50 mL of ice water (caloric testing). Movement of the eyes should be absent during 1 minute of observation. Both sides are tested with and interval of several minutes. c. Absence of corneal reflex: demonstrated by touching the cornea with a piece of tissue paper, a cotton swab, or squirts of water. No eyelid movement should be seen. d. Absence of facial movement to a noxious stimuli: Deep pressure on the condyles at the level of he temporomandibular joints and deep pressure at the supraorbital ridge should produce no grimacing or facial muscle movement. e. Absence of pharyngeal and tracheal reflexes: Pharyngeal or gag reflex is tested after stimulation of the posterior pharynx with a tongue blade or suction device. The tracheal reflex is most reliably tested by examining the cough response to tracheal suctioning. The catheter should be inserted into the trachea and advanced to the level of the carina followed by 1 or 2 suction passes. f. For pediatric patients: Absent gag, cough, sucking and rooting reflex.

Section 9	Clinical Policies	05/15/96 - Originated
Subject 9.15	End of Life Issues	09/05/13 - Reviewed w/ changes - Reviewed w/o changes
Policy 9.15.9	**Determination of Death**	10/15/13 - Effective Health System - Author

2 continued

1. Apnea testing in Adults
   Absence of a breathing drive: Absence of a breathing drive is tested with a CO_2 challenge. Documentation of an increase in $Paco_2$ above normal levels is typical practice. It requires preparation before the test.
   a. Prerequisites:
      1. Normotension
      2. Normothermia
      3. Euvolemia
      4. Eugapnia ($PaCO_2$ 35-45 mm Hg)
      5. Absence of Hypoxia
      6. No prior evidence of CO_2 retention (i.e., chronic obstructive pulmonary disease, severe obesity).

Procedure:

Adjust vasopressors to a systolic blood pressure >=100 mm Hg.
* Preoxygenate for at least 10 minutes with 100% oxygen to a Pao_2 >200 mm Hg.
* Reduce ventilation frequency to 10 breaths per minute to eucapnia.
* Reduce positive end-expiratory pressure (PEEP) to 5 cm H_2O (oxygen desaturation with decreasing PEEP may suggest difficulty with apnea testing).
* If pulse oximetry oxygen saturation remains >95%, obtain a baseline blood gas (Pao_2, $Paco_2$, pH, bicarbonate, base excess).
* Disconnect the patient from the ventilator.
* Preserve oxygenation (e.g., place an insufflations catheter through the endotracheal tube and close to the level of the carina and deliver 100% O_2 at 6 L/min).
* Look closely for respiratory movements for 8–10 minutes. Respiration is defined as abdominal or chest excursions and may include a brief gasp.
* Abort if systolic blood pressure decreases to <90 mm Hg.
* Abort if oxygen saturation measured by pulse oximetry is <85% for >30 seconds. Retry procedure with T-piece, CPAP 10 cm H_2O, and 100% O_2 12 L/min.
* If no respiratory drive is observed, repeat blood gas (Pao_2, $Paco_2$, pH, bicarbonate, base excess) after approximately 8 minutes.
* If respiratory movements are absent and Arterial Pco_2 is >=60 mm Hg (or 20 mm Hg increase in arterial Pco_2 over a baseline normal arterial Pco_2), the apnea test result is positive (i.e., supports the clinical diagnosis of brain death).

2 **continued**	* If the test is inconclusive but the patient is hemodynamically stable during the procedure, it may be repeated for a longer period of time (10–15 minutes) after the patient is again adequately preoxygenated. **4. Apnea Testing in Pediatric Patients:** The patient must have the complete absence of documented respiratory effort (if feasible) by formal apnea testing demonstrating a PaCO2 > 60 mm Hg and > 20 mm Hg increase above baseline. a. Normalization of the pH and PaCO2, measured by arterial blood gas analysis, maintenance of core temperature >35°C, normalization of blood pressure appropriate for the age of the child, and correcting for factors that could affect respiratory effort are a prerequisite to testing. b. The patient should be preoxygenated using 100% oxygen for 5–10 minutes prior to initiating this test. c. Intermittent mandatory mechanical ventilation should be discontinued once the patient is well oxygenated and a normal PaCO2 has been achieved. d. The patient's heart rate, blood pressure, and oxygen saturation should be continuously monitored while observing for spontaneous respiratory effort throughout the entire procedure. e. Follow up blood gases should be obtained to monitor the rise in PaCO2 while the patient remains disconnected from mechanical ventilation. f. If no respiratory effort is observed from the initiation of the apnea test to the time the measured PaCO2 >60 mm Hg and >20 mm Hg above the baseline level, the apnea test is consistent with brain death. g. The patient should be placed back on mechanical ventilator support and medical management should continue until the second neurologic examination and apnea test confirming brain death is completed. h. If oxygen saturations fall below 85%, hemodynamic instability limits completion of apnea testing, or a PaCO2 level of >60 mm Hg cannot be achieved, the infant or child should be placed back on ventilator support with appropriate treatment to restore normal oxygen saturations, normocarbia, and hemodynamic parameters. Another attempt to test for apnea may be performed at a later time or an ancillary study may be

2 continued	pursued to assist with determination of brain death. i. Evidence of any respiratory effort is inconsistent with brain death and the apnea test should be terminated. **5.** For Pediatric Patients: Flaccid tone and absence of spontaneous or induced movements, excluding spinal cord events such as reflex withdrawal or spinal myoclonus.
3	**Ancillary Tests** : The following tests are **not required and cannot replace a neurologic examination**, but may be used at the physician's discretion to supplement the clinical evaluation when uncertainty exists about the reliability of parts of the neurologic examination or when the apnea test cannot be performed. a. Cerebral angiography b. Cerebral Scintigraphy – technetium Tc 99m hexametazime c. (HMPAO) d. Electroencephalography EEG Transcranial Doppler ultrasonography
4	**Documentation**: The medical record must reflect the actual time death is pronounced. Time of death is the time the arterial P_{CO_2} reached the target value or when the ancillary test has been officially interpreted.

Clinical Observations Compatible with Brain Death

The following clinical observations are **consistent** with the diagnosis of brain death and **should not** be interpreted as evidence of brainstem function:

1. Spontaneous movements of the limbs not caused by pathologic flexion or extension response.
2. Respiratory-like movements characterized by shoulder elevation and adduction, back arching, and intercostal expansion without significant tidal volume.
3. Sweating, blushing, and tachycardia.
4. Normal blood pressure without pharmacologic support or sudden increase in blood pressure.
5. Absence of diabetes insipidus.
6. The presence of deep tendon reflexes, triple flexion response, and superficial abdominal reflexes.
7. Babinski's reflex

Section 9	Clinical Policies	05/15/96 - Originated
Subject 9.15	End of Life Issues	09/05/13 - Reviewed w/ changes - Reviewed w/o changes
Policy 9.15.9	**Determination of Death**	10/15/13 - Effective Health System - Author

Period of Evaluation

If a certain period of time has passed since the onset of the brain insult to exclude the possibility of recovery (in practice, usually several hours), neurologic examination should be sufficient to pronounce brain death in adults.

For Pediatric patients: if an ancillary study used in conjunction with the first neurologic examinations supports the diagnosis of brain death, the inter-examination interval can be shortened and the second neurologic examination and apnea test can be performed and documented at any time thereafter for children of all ages.

Pronouncement of Death

Determination of death is a medical determination that does not require consent from the patient's family or a surrogate decision maker.

The pronouncing physician must pronounce death before medical means of support are terminated.

References

(1) Wijdicks EFM, et al. Evidence-based guideline update: Determining brain death in adults. Neurology 2010; 74:1911-1918.

(2) American Academy of Neurology Clinician Guideline Supplement: Practical Guidance. Update: Determining Brain Death in Adults. http://www.aan.com/Guidelines/Home/GetGuidelineContent/433

(3) American Academy of Neurology: Ancillary Testing. Update: Determining Brain Death in Adults. http://www.aan.com/Guidelines/Home/GetGuidelineContent/434

(4) Vernon's Texas Code Ann., Health & Safety Code §§671.001-.002, 692.002-010.

(5) American Academy of Pediatrics. Clinical Report Guidelines for the determination of brain death in infants and children: Update of the 1987 Task Force Recommendations. Pediatrics 2011; 128:720-740.

(6) Farrell MM, Levin DL. Brain death in the pediatric patient: Historical, sociological, medical, religious, cultural legal, and ethical considerations. Crit Care Med 1993;21:1951-1965.

(7) Farrell MM, Levin DL. Brain death in the pediatric patient: Historical, sociological, medical, religious, cultural legal, and ethical considerations. Crit Care Med 1993;21:1951-1965.

(8) Meja RE, Pollack MM. Variability in brain death determination

Section 9	Clinical Policies	05/15/96 - Originated
Subject 9.15	End of Life Issues	09/05/13 - Reviewed w/ changes - Reviewed w/o changes
Policy 9.15.9	**Determination of Death**	10/15/13 - Effective Health System - Author

References, continued

(9) practices in children. JAMA 1995;274:550-553.

IHOP Policy 9.13.34 Coordination of Resources for **Transplant** Patients and Living Donors