

Determining Brain Death

PREREQUISITES

(ALL must be met before assessing for brain death)

- Neuroimaging evidence of acute, irreversible central nervous system (CNS) catastrophe (traumatic brain injury)
- No severe electrolyte, acid-base, or endocrine abnormalities
- pH <7.45
- No CNS depressant drug effects (perform toxicology screening if suspected; if barbiturates administered previously, serum level should now be <10 µg/mL)
- No pharmacologic paralysis (test using electric stimulation if paralytics administered previously)
- Core temperature ≥36°C
- Systolic blood pressure ≥100 mm Hg or mean arterial pressure ≥60 mm Hg (vasopressors may be used)

NEUROLOGIC EXAM

(ALL criteria must be met for brain death*)

- Coma
- No facial movement with noxious stimuli at supraorbital nerve and temporomandibular joint
- No seizures or posturing
- Pupillary light reflexes absent
- Corneal reflexes absent
- Oculocephalic reflexes absent (*testing may be omitted if cervical spine integrity not ensured)
- Oculovestibular reflexes absent
- Gag reflex absent
- Cough reflex absent with tracheal suctioning
- No spontaneous respirations

Possible Cervical spinal cord injury

No

APNEA TESTING

- SBP ≥100 mm Hg or MAP ≥60 mm Hg (vasopressors may be used)
- Adjust ventilator to provide normocapnia (PaCO₂ 35–45 mm Hg)
- Preoxygenate with FiO₂ 1.0 and PEEP 5 cm H₂O for >10 min to achieve PaO₂ >200 mm Hg
- Provide oxygen via tracheal cannula at the level of the carina at 6 L/min or attach T-piece with CPAP 5 cm H₂O
- Disconnect ventilator for 10 min (attending physician must be present the entire time)
- Draw arterial blood gas at 10 min and then reconnect ventilator

Apnea test is positive for brain death if

- No respiratory effort AND
- pCO₂ ≥60 mm Hg, or 20 mm Hg above baseline

Yes

Aborted or unable to be performed (sustained SpO₂ <85%, hemodynamic instability)

NUCLEAR SCINTIGRAPHY CEREBRAL BLOOD FLOW STUDY

- Order in eStar: "Nuclear Medicine brain min 4 static w vascular flow"
- Absence of isotope uptake indicates no cerebral perfusion and confirms brain death

If the patient is <18-years-old, please see page 2 for additional required steps.

BRAIN DEATH

PEDIATRIC PATIENTS

For patients <18-years-old, brain death may be declared via either of the following routes.

1. If the neurologic exam and apnea test are consistent with brain death (as in the algorithm on page 1), a second neurologic exam and apnea test must be performed at least 12 hours later. This second exam/test should be conducted by a different attending physician.
2. If apnea testing cannot be completed, nuclear scintigraphy may be performed.

TRAUMA TEAM RESPONSIBILITIES UPON BRAIN DEATH

- Notify T1 attending physician.
- Notify next-of-kin.
- Notify Tennessee Donor Services (800-969-4438).
- Complete Brain Death Note in eStar, which must be cosigned by the attending.
- Call Davidson County Medical Examiner's Office (615-743-1800 or 800-216-0107).
- Complete Report of Death and Death Summary in eStar.

REFERENCES

- Greer DM, Shemie SD, Lewis A, Torrance S, Varelas P, Goldenberg FD, Bernat JL, Souter M, Topcuoglu MA, Alexandrov AW, et al. Determination of brain death/death by neurologic criteria: The World Brain Death Project. *JAMA* 2020;324(11):1078–97.
- Nakagawa TA, Ashwal S, Mathur M, Mysore M; Society of Critical Care Medicine, Section on Critical Care and Section on Neurology of American Academy of Pediatrics; Child Neurology Society. Clinical report—guidelines for the determination of brain death in infants and children: an update of the 1987 task force recommendations. *Pediatrics* 2011;128(3):e720–40.
- Wijdicks EF, Varelas PN, Gronseth GS, Greer DM; American Academy of Neurology. Evidence-based guideline update: determining brain death in adults: report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology* 2010;74(23):1911–8.

Last updated on June 28, 2023

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