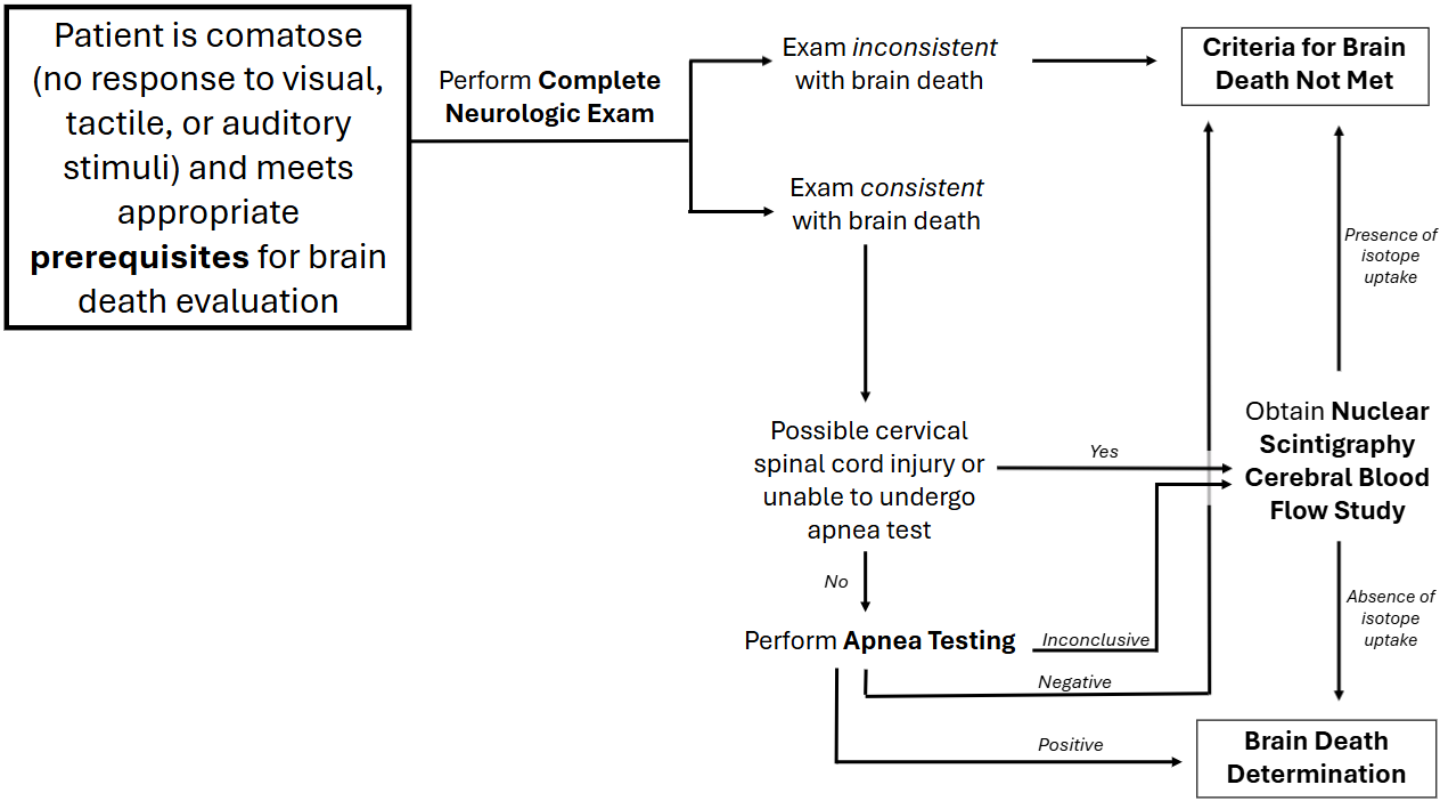
VANDERBILT UNIVERSITY MEDICAL CENTER
DIVISION OF ACUTE CARE SURGERY

Brain Death Determination



PREREQUISITES

(ALL must be met before assessing for brain death)

- ❑ Neuroimaging consistent with acute, irreversible supratentorial nervous system catastrophe
  - ❑ After surgical interventions to treat intracranial HTN wait at least 6 hours
- ❑ Core body temperature (measured via bladder, esophageal, or rectal temperature probe) ≥ 36°C
- ❑ Exclude unexplained severe metabolic, acid-base, and endocrine abnormalities such as:
  - ❑ $130 < Na^{+} < 165$
  - ❑ $70 < Glucose < 300$
  - ❑ $7 < Ca^{2+} < 11$ (or $4 < iCal < 5.5$)
  - ❑ $1.5 < Mg^{2+} < 4$
  - ❑ $Phos > 2$
  - ❑ $7.2 < pH < 7.45$
- ❑ No CNS depressant drug effects
  - ❑ Perform urine & blood toxicology screening if clinically indicated
  - ❑ If barbiturates administered, serum level must now be < 10 µg/mL)
  - ❑ Ethanol blood level ≤ 80 if clinically indicated
- ❑ No pharmacologic paralysis (if neuromuscular blocking agent administered within last 24 hours, test for muscular function using TOF)
- ❑ SBP ≥ 100 or MAP ≥ 60 (use vasopressors if necessary)

NEUROLOGIC EXAM

- ❑ Coma: patient is unresponsive to visual, auditory, and tactile stimulation
- ❑ No facial movements with noxious stimuli at supraorbital nerve and temporomandibular joint
- ❑ No seizures or posturing
- ❑ Pupillary light reflexes absent
- ❑ Corneal reflexes absent
- ❑ Oculocephalic reflexes absent (may be omitted if cervical spine integrity not ensured or severe facial or ophthalmic trauma)
- ❑ Oculovestibular reflexes absent
- ❑ Gag reflex absent
- ❑ Cough reflex absent
- ❑ No spontaneous respirations

APNEA TESTING

- ❑SBP >100 or MAP > 60 for the entirety of the test (vasopressor support may be utilized)
- ❑Adjust ventilator to provide normocapnia ($PaCO_2$ 35-45 mm Hg)
- ❑Preoxygenate with FiO_2 100% and PEEP 5 cm H_2O for > 10 min to achieve PaO_2 > 200 mm Hg
- ❑Disconnect ventilator and provide oxygen via tracheal cannula at the level of the carina at 6 L/min or attach T-piece with CPAP 5 cm H_2O
- ❑Attending physician at bedside will observe the patient for 10 minutes
- ❑Draw arterial blood gas at 10 min and then reconnect ventilator

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Apnea test is positive for brain death if:

- ❑ No respiratory effort AND
- ❑ $PaCO_2$ > 60 mm Hg or 20 mm Hg above patient's baseline

Apnea test is inconclusive for brain death if any of the following occur:

- ❑ SBP < 100 or MAP < 60
- ❑ Progressive SpO_2 decline to < 85% requiring cessation of test
- ❑ Cardiac arrhythmia with hemodynamic instability
- ❑ CO_2 < 60 or did not rise to 20 mm Hg above patient's baseline

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Apnea test is negative for brain death if:

- ❑ One or more spontaneous respirations are seen

PATIENTS < 18 YEARS OLD

- ❑ Two neurologic exams consistent with brain death completed > 12 hours apart by separate providers
- ❑ Either two separate apnea tests > 12 hours apart and administered by two different clinicians OR a nuclear scintigraphy study without evidence of isotope uptake

TRAUMA TEAM RESPONSIBILITIES UPON BRAIN DEATH

- ❑ Notify T1 attending physician & next of kin
- ❑ Notify TDS (800-969-4438) & Davidson County ME Office (615-743-1800 or 800-216-0107)

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.

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Robert Sinyard, MD MBA
Caroline T. Banes, DNP, APRN, ACNP-BC
Allan B. Peetz, MD, MPH