

# Brain Death Policies: Determining Death by Neurologic Criteria



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# Purpose

- ▶ Facilitate accurate and appropriate determination of brain death
- ▶ Timely diagnosis
- ▶ Preserving the donation opportunity
- ▶ Minimize cost of critical care

# Uniform Determination of Death Act (UDDA)

- “An individual who has sustained either
  - irreversible cessation of circulatory and respiratory functions, or
  - irreversible cessation of all functions of the entire brain, including the brain stem, is dead.
  - A determination of death must be made with accepted medical standards.”

# Resources

- ▶ Published guidelines
  - ▶ <http://www.neurology.org/content/74/23/1911>
  - ▶ <http://pediatrics.aappublications.org/content/pediatrics/128/3/e720.full.pdf>
- ▶ State laws – determination of death
  - ▶ <http://www.braindeath.org/law.htm>
- ▶ CMS regulations: <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/GuidanceforLawsAndRegulations/Transplant-Laws-and-Regulations.html>
- ▶ LifeCenter Northwest
  - ▶ Clinical reference for exams/procedures/tests
  - ▶ Hospital procedure for approving policies

# Stakeholders

- ▶ Neurosurgeons
- ▶ Neurologists
- ▶ Intensivists
- ▶ Critical care nurses
- ▶ Respiratory therapy
- ▶ Medical ethicist
- ▶ Spiritual care
- ▶ Administrators

# AAN Guidelines

- I. The clinical evaluation (pre-requisites)
  - A. Establish irreversible and proximate cause of coma
    - ▶ History
    - ▶ Examination
    - ▶ Neuroimaging
    - ▶ Laboratory testing

# AAN Guidelines

- ▶ **What is an adequate observation period to ensure that cessation of neurologic function is permanent?**

- ▶ **Conclusion.** There is insufficient evidence to determine the minimally acceptable observation period to ensure neurologic functions have ceased irreversibly.

# AAN Guidelines

- ▶ Eliminate reversible causes of encephalopathy
  - ▶ Normal or near normal core temperature ( $>36^{\circ}\text{C}$ )
  - ▶ SBP  $> 100$  mm Hg
  - ▶ CNS depressants
  - ▶ Neuromuscular blockade
  - ▶ Severe electrolyte, acid-base, or endocrine disturbances

# AAN Guidelines

## ▶ Perform at least one neurologic examination

- ▶ Sufficient to pronounce brain death in most US states.
- ▶ 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), one neurologic examination should be sufficient to pronounce brain death. However, some US state statutes require two examinations.
- ▶ Legally, all physicians are allowed to determine brain death in most US states. Neurologists, neurosurgeons, and intensive care specialists may have specialized expertise. It seems reasonable to require that all physicians making a determination of brain death be intimately familiar with brain death criteria and have demonstrated competence in this complex examination. Brain death statutes in the US do differ by state and institution. Some US state or hospital guidelines require the examiner to have certain expertise.

# II. Clinical Examination

## A. Coma

- ▶ Lack all evidence of responsiveness
  - Absent eye opening or eye movement to noxious stimuli
  - Absent motor response to noxious stimuli
    - Spinally mediated reflexes and false-positive triggering of the ventilator may occur in brain dead individuals
    - Expertise required to differentiate between retained motor response associated with brain activity

## B. Absence of Brainstem Reflexes

Name	CN/ Area	Compromising Factors	Findings Consistent with Brain Death
Pupillary size and response	I & II Midbrain	Atropine Ocular or facial trauma	Unresponsive to bright light 4 – 9 mm Bilateral
Oculocephalic (Doll's eyes)	III, IV, VII Pons & midbrain	Cervical vertebral or SCI	Absent
Oculovestibular (Cold caloric)	III, IV, VI, VIII Pons & midbrain	Ruptured tympanic membrane Occluded auditory canal	Absent
Corneal	III, V, VII Pons	Ocular or facial trauma	Absent
Cough/Gag	IX & X Medulla	Heavy sedation & NMB	Absent

# C. Apnea

- ▶ Apnea test
  - ▶ Prerequisites
    - ▶ SBP > 100 mm Hg
    - ▶ Normothermia
    - ▶ Euvolemia
    - ▶ Eucapnia (35 – 45 mm Hg)
    - ▶ Absence of hypoxia
    - ▶ No evidence of CO<sub>2</sub> retention
  - ▶ Insufficient evidence to determine the comparative safety of techniques
- ▶ Normalize PaCO<sub>2</sub>
  - ▶ Pre-oxygenate X 10 min.
  - ▶ PEEP 5 cm H<sub>2</sub>O
  - ▶ Obtain baseline ABG
  - ▶ Disconnect from MV
  - ▶ O<sub>2</sub> via catheter to carina @ 6 L
  - ▶ Observe chest/abdomen
  - ▶ 8 – 10 minutes
    - ▶ Stop for ↓ BP or SpO<sub>2</sub> < 85% x 30s
  - ▶ Obtain ABG
  - ▶ Reconnect to MV
  - ▶ Results
    - ▶ No movement of chest or abdominal wall
    - ▶ PaCO<sub>2</sub> elevation ≥ 20 mm Hg from baseline or reaching a threshold of 60 mm Hg

# III. Ancillary Tests

- ▶ If unable to complete neurologic exam
- ▶ Shorten duration of observation period
- ▶ Not required
- ▶ 4-vessel cerebral angiography
- ▶ Radionuclide cerebral perfusion scanning
- ▶ Diagnostic EEG
- ▶ TCD
- ▶ CT angiography
- ▶ MRI/magnetic resonance angiography (MRA)

## IV. Documentation

- ▶ The time of brain death is documented in the medical record
  - ▶ Time the arterial  $\text{PCO}_2$  reached the target value
  - ▶ In patients with an aborted apnea test, the time of death is when the ancillary test has been officially interpreted.
- ▶ Federal and state law requires notification of OPO for imminent death or those who have died in the hospital



# Other Considerations

- ▶ Unequivocal that brain dead is dead
  - ▶ “The identification of brain death is a medical determination. The authority of surrogates, health care agents, and guardians to make medical decisions ceases at death. Termination of medical interventions is the appropriate response to declaration of death. It does not require consent from the patient’s decision-maker(s). Permission to terminate interventions is not requested from the decision-maker(s) since **it burdens the family** with the misconception that they have some responsibility for whether or not the death occurs.”

# Table Discussions and Report-out



- ▶ Brain death work-up prerequisites
- ▶ Brain death exam
- ▶ Family considerations