Determination of Death by Neurological Criteria

PRE-EVALUATION

Patient is suspected to meet criteria for neurological death\(^1,2\)
- Patient has irreversible cessation of all functions of the entire brain, including the brain stem
- Cerebral imaging correlates with suspicion of brain death

Stop all medications that may interfere with the diagnosis of brain death, per discretion of Intensivist/Neurologist

Potential brain death, notify:
- LifeGift\(^4\)
- Dayshift ICU Nurse Manager/Nursing Off-Shift Administrator (NOSA)
- Hospital Administrator

EVALUATION (to be performed by Attending Intensivist, Neurologist, or Neurosurgeon)

- Assess for absence of the following:
  - Pupil reaction to light in both eyes
  - Corneal reflexes
  - Ocular movement with head turning (oculocephalic reflex) when no apparent cervical spine injury exists and ocular movements after caloric testing with ice water (oculovestibular reflex)
  - Bulbar function (jaw reflex)
  - Oropharyngeal reflex (gag and cough reflex)
  - Pain reflex
- Perform apnea test, unless contraindicated (see Appendix D)
  - Note: Apnea test should not be performed if:
    - Patient has a comorbid condition that prevents demonstration of spontaneous respiratory effort or
    - Patient would be placed at undue risk to develop cardiac arrest

- Conduct a multidisciplinary family meeting to discuss suspected brain death
- Inform nursing and initiate consults for assistance and counseling as appropriate
  - Social work
  - Chaplain
- If questioned/opposed by the patient’s representative/family, contact Administration, Ethics, Risk Management, and Legal services as needed\(^3\)
- Physician and clinical team must be aware of culture and trust issues raised by the family in any discussions

See Page 2 for further testing

\(1\) See Appendix A for Death by Neurological Criteria Checklist

\(2\) See Appendix B for Neurological Criteria for Brain Death

\(3\) The family or any treating physician may request an Ethics consult under Clinical Ethics Consultation Policy (MD Anderson Institutional Policy # CLN0461)

\(4\) LifeGift should be notified at time of death, or when death is known to be imminent to make an independent assessment of suitability [Refer to Determination of Medical Appropriateness Policy (MD Anderson Institutional Policy # CLN0557)]

Stop all medications that may interfere with the diagnosis of brain death, per discretion of Intensivist/Neurologist

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.

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Determination of Death by Neurological Criteria

Conduct an ancillary test (if clinical exam is inconclusive or unable to perform apnea test):

- Nuclear medicine brain scan with vascular flow
- Brain Death Protocol electroencephalogram (EEG)
- Transcranial doppler ultrasonography (TCD)
- CT angiogram head with and without contrast

Note: Ancillary studies are not required to establish brain death and are not a substitute for the neurologic examination. Choice of a single ancillary test is based on physician’s discretion and availability.

Second clinical examination performed by a second physician following time duration between clinical exams as listed in Appendix C:

- Absence of the following:
  - Pupil reaction to light in both eyes
  - Corneal reflexes
  - Ocular movement with head turning (oculocephalic reflex) when no apparent cervical spine injury exists and ocular movements after caloric testing with ice water (oculovestibular reflex)
  - Bulbar function (jaw reflex)
  - Oropharyngeal reflex (gag and cough reflex)
  - Pain reflex

- Perform apnea test unless contraindicated (see Appendix D)

Note: Apnea test should not be performed if:

- Patient has a comorbid condition that prevents demonstration of spontaneous respiratory effort or
- Patient would be placed at undue risk to develop cardiac arrest

1 The following conditions may interfere with the clinical diagnosis of brain death:

- Severe facial trauma
- Pre-existing pupil abnormalities
- Toxic levels of aminoglycosides, tricyclic antidepressants, anticholinergics, antiepileptic drugs, or chemotherapeutic agents
- Anesthetic levels of opiates and sedatives
- Neuromuscular blocking medications
- Sleep apnea or severe pulmonary disease resulting in chronic retention of carbon dioxide
- Therapeutic hypothermia treatment
- Mydriatic medications

Is an ancillary exam necessary or preferred?

Yes

No

See Findings on Page 3
Determination of Death by Neurological Criteria

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**FINDINGS**

Criteria for neurological death met?

**No**

continue management based on clinical judgment

**Yes**

Pronounce death in accordance with policy, document time in medical record, and discontinue nursing assessments¹,²,³

**NOTIFY LifeGift⁴ of death**

**ACTIONS**

- Conduct multidisciplinary family meeting to discuss patient’s death and planned removal of mechanical support
- Inform nursing and initiate consultation for assistance and counseling as appropriate
  - Social work
  - Chaplain
- If planned removal of mechanical support is questioned/opposed by the patient’s representative/family, contact Administration, Ethics, Risk Management, and Legal services, as needed⁵
- Physician and clinical team must be aware of culture and trust issues raised by the family in any discussions

**Proceed with discontinuation of life support**

- Planned discontinuation of life-sustaining measures⁶
- Nursing care for hygiene and family support

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¹ If the practitioner is unwilling to pronounce the patient’s death, the Medical Director and/or the appropriate hospital Executive Officer shall be notified [Refer to Accommodating Closely Held Personal and/or Religious Beliefs Policy (MD Anderson Institutional Policy # ADM0260)]

² See Care of the Deceased Policy (MD Anderson Institutional Policy # CLN1084)

³ See Pronouncement of Death by an Advanced Practice Provider Policy (MD Anderson Institutional Policy # CLN0509)

⁴ LifeGift should be notified at time of death, or when death is known to be imminent to make an independent assessment of suitability [Refer to Determination of Medical Appropriateness Policy (MD Anderson Institutional Policy # CLN0557)]

⁵ The family or any treating physician may request an Ethics consult under Clinical Ethics Consultation Policy [MD Anderson Institutional Policy # CLN0461]

⁶ The time between pronouncement of death and discontinuation of mechanical support should not exceed 6 hours. Under rare circumstances, the time period may be extended by 24-48 hours on a case by case basis, following consultation with Legal services.
APPENDIX A: Death by Neurological Criteria Checklist

☐ Pre-Evaluation

☐ Family Meeting #1
Attendees/discussed with:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

☐ Notify LifeGift of potential Brain Death

☐ Clinical Examination #1

☐ Apnea Testing (Pediatric Considerations)
or

☐ Apnea test aborted
Reason:

________________________________________________________________________
________________________________________________________________________

☐ Continued Clinical Management

☐ Apnea Testing (Adult and Pediatric Considerations)
or

☐ Apnea test aborted
Reason:

________________________________________________________________________
________________________________________________________________________

☐ Notify LifeGift of Death

☐ Pronounce Death in accordance with policy
☐ Document time in medical record

☐ Family Meeting #2
Attendees/discussed with:

________________________________________________________________________

☐ Planned removal of Life Support

☐ Organ Donation Procedures through LifeGift

☐ Documentation of all of the above in the Medical Record

☐ Documentation of all of the above in the Medical Record

Name of physician and signature (Exam 1)

Name of physician and signature (Exam 2)

Date & time

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Name of physician and signature

Date & time

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APPENDIX B: Physical Criteria Necessary to Accompany Determination of Neurologic Death

All of the following physical criteria must be met:

- Patient older than seven (7) days of age
- Rule out drug intoxication and reversible metabolic conditions that may obscure brain function; patient needs to be off all sedative medications or medications that reduce brain metabolic rate (e.g., propofol, fentanyl, midazolam, barbiturates, etc.) which might obscure the exam
- Patient’s body temperature > 36°C (96.8°F)
- Systolic blood pressure (SBP):
  - Adults and children ≥ 10 years old: SBP ≥ 100 mmHg
  - Children 1-9 years old: SBP > [70 + (2 x age in years)] mmHg
  - Infant < 1 year old: SBP > 70 mmHg
  - Newborns < 28 days old: SBP > 60 mmHg

APPENDIX C: Minimum Time Duration Between Clinical Exams

<table>
<thead>
<tr>
<th>Age</th>
<th>Hours Between Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term birth (37 weeks gestation) – 1 month</td>
<td>24</td>
</tr>
<tr>
<td>1 month – 18 years</td>
<td>12</td>
</tr>
<tr>
<td>&gt; 18 years</td>
<td>6</td>
</tr>
</tbody>
</table>

Per American Academy of Pediatrics (AAP) and American Academy of Neurology (AAN) Guidelines
**APPENDIX D: Conducting Apnea Test**

**Step 1:**
A. In adults, adjust vasopressors to a systolic blood pressure (SBP) ≥ 100 mmHg.
   In children, if hemodynamically unstable prior to or during apnea test, adjust vasopressor support to acceptable mean arterial pressure for age.
   Then:
B. Give patient 100% oxygen for at least 10 minutes prior to starting the test. Manage ventilator rate to achieve PaCO₂ 45 mmHg. If not achievable, abort apnea test.

**Step 2:**
Obtain baseline arterial blood gases (ABGs) then disconnect the patient from the ventilator.¹,²

**Step 3:**
Once disconnected, insert oxygen source into endotracheal tube (ETT), and give patient oxygen at flow rate of 6 L/minute (loose fitting catheter through ETT for children).

**Step 4: Observation/Evaluation**
A. If patient exhibits any of the following: hypoxia, arrhythmia, or hypotension (SBP persistently < 90 mmHg in adults and children 10 years of age or older despite adjustment of vasopressors; for younger children use Appendix B for blood pressure parameters). Abort test immediately and draw ABGs.³
B. If no symptoms as listed in ‘A’, continue observation for required time period.
C. Observe adult and pediatric patients carefully for respiratory effort for ten (10) minutes. Draw ABG’s at the end of the observation time period and review results.²

<table>
<thead>
<tr>
<th>Observations</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to complete due to physical condition</td>
<td>→ Continue with clinically appropriate management</td>
</tr>
</tbody>
</table>
| Respiratory movements absent and the partial pressure of carbon dioxide (PaCO₂) ≥ 60 mmHg or increases by 20 mmHg from baseline normal¹ PaCO₂ | → Apnea test is satisfactorily completed and positive (supports the clinical diagnosis of brain death)  
→ If not, result indeterminate; consider an additional ancillary test  
→ If result is inconclusive and patient is hemodynamically stable, consider continuing the test for a longer period (11-15 minutes)³ |

¹ Note: Responsible attending physician (Intensivist, and/or Neurologist/Neurosurgeon) present at the bedside immediately prior to disconnecting the patient from the ventilator and during the apnea test
² Point of care testing is recommended
³ Children: if the rise in PaCO₂ fails to reach 60 mmHg, perform the test again for a duration of 15 minutes
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SUGGESTED READINGS


MD Anderson Institutional Policy # ADM0260 – Accommodating Closely Held Personal and/or Religious Beliefs Policy

MD Anderson Institutional Policy # CLN1084 – Care of the Deceased Policy

MD Anderson Institutional Policy # CLN0461 – Clinical Ethics Consultation Policy

MD Anderson Institutional Policy # CLN0557 – Determination of Medical Appropriateness Policy

MD Anderson Institutional Policy # CLN0509 – Pronouncement of Death by an Advanced Practice Provider Policy


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