1.0 PURPOSE
The purpose of this Determination of Death Policy is:

1.1 To provide guidelines and protocols to apply in cases in which life support systems are being utilized for patients within INTEGRIS facilities (INTEGRIS) or in cases in which organ donation after the patient’s death by neurological criteria is anticipated.


2.0 POLICY
2.1 Only an adult or pediatric neurologist, neurosurgeon, or intensivist with clinical privileges on the Medical Staff of the respective INTEGRIS facility is authorized to make the determination of death. Exceptions must be approved by the Medical Executive Committee and Board of the specific facility, consistent with Medical Staff Bylaws.

2.2 No physician on any transplant team will be involved in the determination of death of any potential transplant donor.

2.3 A determination of death must be made in accordance with acceptable medical standards. Death is to be pronounced before any organ is removed for purposes of transplantation.

3.0 SCOPE
This policy applies to INTEGRIS Health facilities, their Medical and Clinical Departments and their respective Medical Staff Members.

4.0 DEFINITIONS
4.1 “Death,” for purposes of this Policy, is a clinical diagnosis based on a medical examination, and may be supported by laboratory studies. Death may be certified in an individual who has sustained either:

   a) irreversible cessation of circulatory and respiratory function, or

   b) irreversible cessation of all functions of the entire brain, including the brain stem, when the proximate cause is known and demonstrably irreversible.

5.0 PROCEDURES
5.1 Documentation in the Adult (≥ 18 years of age) Patient’s Medical Record, Physician(s) pronouncing death by neurological criteria shall complete, sign and date the Death by Neurological Criteria Checklist (“Checklist”). The Checklist will be placed in the progress notes of the patient’s medical record.
NOTE: The Death by Neurological Criteria Checklist will become a permanent part of the patient's medical record and is the required documentation for declaration of death by neurological criteria for patients 18 years of age or older. See Appendix C attached.

5.2 Documentation in the Pediatric (< 18 years of age) Patient’s Medical Record. Physician(s) pronouncing death by neurological criteria for patient’s less than 18 years of age shall complete, sign and date the Pediatric Death by Neurological Criteria Checklist (“Pediatric Checklist”). The Pediatric Checklist will be placed in the progress notes of the patient’s medical record. The Pediatric Death by Neurological Criteria Checklist will become a permanent part of the patient’s medical record and is the required documentation for declaration of death by neurological criteria for patients less than 18 years of age. See Appendix D.

6.0 CLINICAL PROTOCOLS

6.1 Required prerequisites for the determination of death by neurological criteria include ALL of the following:

a) Clinical or neuroimaging evidence of an acute catastrophe which is compatible with the diagnosis of brain death;

b) Exclusion of complicating medical conditions that in the clinical judgment of the examining physician may confound clinical assessment (no severe electrolyte, acid-base or endocrine disturbance);

c) No drug intoxication as well as an absence of neuromuscular blockage;

d) Core temperature ≥ 36°C (96.8°F) in adults, >35°C (95°F) in pediatrics; and,

e) Systolic blood pressure ≥100 mmHg in adults, not less than two (2) standard deviations below the age appropriate norm in pediatrics.

6.2 Irreversible cessation of all function of the entire brain shall include ALL of the following:

a) Cerebral functions are absent and no cerebral motor response to supraorbital pressure and nail bed pressure stimuli in any extremity. Supraorbital ridge pressure is suggested in the examination of cases with spinal cord injury. Decerebrate and decorticate posturing are not compatible with brain death.

b) Absence of brain stem reflexes, as follows:

1) Non-reactive pupils with no consensual response to light. Pupils should be midsized or larger. Care should be take that atropine or other drugs that block the pupillary response to light have not be given;

2) Absence of corneal reflexes;

3) Absence of oculocephalic reflex (testing only when no fracture or instability of the cervical spine is apparent);
4) Absence of oculovestibular responses;

5) Absence of grimace to deep pain;

6) Absence of gag reflex; and

7) Absence of cough reflex.

c) A positive apnea test is reflected by no respiratory movement with a documented PaCO₂ greater than or equal to 60 mmHg or an increase of 20 mmHg over a normal baseline value. See Appendix A. If unable to perform apnea testing, please refer to confirmatory testing described in Sections 6.3 and 6.4 below.

d) The findings of the neurological examination described in Section 6.2 above must be confirmed and remain unchanged for an appropriate observation period for patients less than 18 years of age. The observation period may be age specific. See Appendix D.

6.3 Confirmatory/Ancillary testing “can be used when uncertainty exists about reliability of parts of the neurologic examination or the apnea tests cannot be performed”¹ and may reduce the observation period. Confirmatory/Ancillary tests include the following:*

a) Electroencephalography with criteria as adopted by the American Electroencephalographic Society,

b) Technetium-99m hexamethylpropyleneamineoxime brain scan,

c) Transcranial Doppler ultrasonography, and

d) Conventional cerebral angiography.

6.4 Confirmatory/Ancillary Tests for Patients Less Than 18 years of age: See Appendix D

6.5 The following conditions may interfere with the clinical diagnosis of brain death, so that the diagnosis cannot be made with certainty on clinical grounds alone. Confirmatory tests are recommended:

a) Toxic level of any sedative drug, aminoglycoside, tricyclic antidepressant, anticholinergics, antiepileptic drugs, chemotherapeutic agents or neuromuscular blocking agents;

b) High or supra therapeutic levels of sedative analgesic, or anti-epileptic drugs;


* Confirmatory tests in order of sensitivity Conventional cerebral angiography, electroencephalography, transcranial Doppler ultrasonography, technetium-99m, hexamethylpropyleneamineoxime brain scan, somatosensory evoked potentials. According to the American Academy of Neurology electroencephalography technetium-99m hexamethylpropyleneamineoxime brain scan and conventional angiography are the preferred tests.¹
c) Any level of neuromuscular blocking agent;

d) Severe facial trauma;

e) Pre-existing pupillary abnormalities; and

f) Chronic CO₂ retention.

6.6 Death can only be pronounced if:

a) Using current available means of diagnosis and treatment, the pathological processes are deemed irreversible; and,

b) Good and sufficient evidence exists that the cause of the loss of all brain functions is irreversible.
APPENDIX A

APNEA TEST

Apnea test is to be performed by a physician with clinical privileges on the Medical Staff of an INTEGRIS facility.

The Apnea Test is to be used in conjunction with the physical examination to document death. It should be performed after all other clinical evaluations have been completed.

Prerequisites for a valid Apnea Test:

- Core temperature > 36°C or 96.8°F (adults); > 35°C or 95°F (pediatrics)
- Systolic Blood Pressure > 100 mmHg (or age appropriate)
- Euvolemia
- Normal PaCO₂ and PaO₂

Apnea Testing Procedures:

- Preoxygenate with FiO₂ of 100% to obtain PaO₂ ≥ 200 mmHg
- Draw baseline ABG’s
- Disconnect ventilator and deliver 100% oxygen by endotracheal cannula at 6 liters/min.
- If the PaCO₂ rises > 60 mmHg or after an increase of 20 mmHg over the normal baseline value, and no spontaneous respiratory effort is observed, the apnea test is considered positive (and supports the diagnosis of brain death).
- If respiratory movements are observed, the apnea is considered negative (and does not support the diagnosis of brain death).
- If the patient becomes hemodynamically unstable or significant oxygen desaturation occurs during the test.
APPENDIX B

AGE-DEPENDENT OBSERVATION PERIOD

<table>
<thead>
<tr>
<th>Age</th>
<th>Hours Between 2 Examinations*</th>
<th>Recommended Number of EEGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult ≥ 18 years</td>
<td>Second Exam Optional **</td>
<td>Not required unless components of the exam cannot be performed</td>
</tr>
</tbody>
</table>

* If hypoxic encephalopathy present, observation for 24 hours is recommended. The observation time may be reduced if any EEG shows ECI (electrocerebral inactivity) or a radionuclide study is negative for CBF (cerebral blood flow).

According to the American Academy of Neurology:

** Perform 1 (one) neurologic examination…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), 1 (one) neurologic examination should be sufficient to pronounce brain death…

“…all physicians making a determination of brain death (should) be intimately familiar with brain death criteria and have demonstrated competence in this complex examination…”

APPENDIX C

Death by Neurological Criteria Checklist – Adult

Clinical Status:

Physician: _____________________________________________________________

Patient Name: __________________________________________  Date of Birth:  ______________

Etiology of coma: ______________________________________________________

Duration of coma at time of exam: ____________________________  Hours

Absence of (check each):

Sedation

Hypotension (BP sys <100 or age appropriate) ______

Hypothermia (temp < 36°C or 96.8°F) ______

Neuromuscular blockade ______

Blocked ear canal(s) ______

Metabolic or endocrine disorder (severe) ______

Death by Neurological Criteria Checklist:

1. _____ No spontaneous movements

2. _____ No cranial nerve motor responses (spontaneous or to stimuli)

3. _____ No seizures, decorticate, or decerebrate posturing

4. Brainstem reflexes:
   a. _____ absence of pupillary light reflexes (bilateral)  Pupil size Right _____
   b. _____ absence of corneal reflexes (bilateral)  Left _____
   c. _____ absence of oculovestibular reflexes (bilateral)
   d. _____ absence of oculocephalic reflexes (“doll eyes”)
   e. _____ absence of gag reflex
   f. _____ absence of cough reflex to ET suctioning

5. Apnea Test:
   a. _____ absence of spontaneous respiratory movements
   b. _____ baseline PaO₂  _____ baseline PaCO₂  _____ baseline pH  _____ temperature
   c. _____ apnea after _____ minutes  _____ Yes  _____ No
   apnea after PaCO₂ maximum of _______________

Page 7 of 11
6. **Confirmatory/Ancillary Test:**
   a. **Specify:** ________________________________________________
      Ancillary testing is required if any of the following:
      1. any component of the examination or apnea testing cannot be completed;
      2. there is uncertainty about the results of the neurologic examination; or
      3. a medication effect may be present.

   **Interpretation of Exam:**
   Patient is dead by neurological criteria _____ Yes _____ No

---

**EXAMINER ATTESTATION**

This patient meets the criteria of death by neurological criteria.

Signature: __________________________________________________________

Printed Name: _______________________________________________________

Date: _______________ Time: ________________________ AM / PM
GUIDELINES FOR USE OF DEATH BY NEUROLOGICAL CHECKLIST

Duration of coma:
- Evaluation should be performed at least six (6) hours after trauma or hemorrhage and at least twenty-four (24) hours after onset of anoxic injury.

Absent Brainstem Reflexes:
- In the absence of known prior pupillary defects, pupils should be midpoint to dilated (4-8 mm).
- Oculovestibular reflexes tested after irrigation of ear canal with 50 ml of cold water; blocked ear canals may negate testing.
- Doll’s eye maneuver should not be done in patients with known or suspected cervical spine injury.

Apnea Test:
- Patient should have core temperature > 36°C / 96.8°F (adults); > 35°C / 95°F (pediatrics)
- Normal PaCO₂ at baseline.
- Normal PaO₂ or, preferably, PaO₂ > 200 mmHg after 100% pre-oxygenation.
- Respiratory effort should be checked in 8-10 minutes (PaCO₂ increases ~ 2-3 mmHg/minute).
- Apnea test is positive if there is no respiratory effort at PaCO₂ > 60 mmHg, or after increase of 20 mmHg over baseline value.

Confirmatory/Ancillary Test:
- Adults see section 6.3 and 6.5.
- Pediatrics see Appendix D.

Repeat Exam:
- A second exam is required for pediatric patients < 18 years of age. See Appendix D.
- A repeat exam in an adult ≥ 18 years of age is optional.

References:
## APPENDIX D  
**Pediatric Death by Neurologic Criteria Checklist**

Two physicians must perform independent neurologic examinations. A single physician may perform the two (2) apnea tests.

<table>
<thead>
<tr>
<th>Age of Patient</th>
<th>Timing of first exam</th>
<th>Inter-exam interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term newborn 37 weeks gestational age and up to 30 days old</td>
<td>□ First exam may be performed 24 hours after birth OR following cardio pulmonary resuscitation or other severe brain injury</td>
<td>□ At least 24 hours interval shortened because ancillary study (section 4) is consistent with brain death</td>
</tr>
<tr>
<td>31 days to 18 years old</td>
<td>□ First exam may be performed 24 hours following cardiopulmonary resuscitation or other severe brain injury</td>
<td>□ At least 12 hours OR interval shortened because ancillary study (section 4) is consistent with brain death</td>
</tr>
</tbody>
</table>

### Section 1. PREREQUISITES for brain death examination and apnea test

**A. IRREVERSIBLE AND IDENTIFIABLE Cause of Coma (Please check)**

- □ Traumatic brain injury  
- □ Anoxic brain injury  
- □ Known metabolic disorder  
- □ Other (Specify)

**B. Correction of contributing factors that can interfere with the neurologic examination**

<table>
<thead>
<tr>
<th></th>
<th>Exam One</th>
<th>Exam Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Core Body Temp is over 95°F (35°C)</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>b. Systolic blood pressure or MAP is acceptable range (Systolic BP not less than 2 standard deviations below age appropriate norm) based on age</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>c. Sedative/analgesic drug effect excluded as a contributing factor</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>d. Metabolic intoxication excluded as a contributing factor</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>e. Neuromuscular blockade excluded as a contributing factor</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
</tbody>
</table>

**If ALL prerequisites are marked YES, then proceed to Section 2, OR Confounding variable was present. Ancillary study was therefore performed to document brain death. (Section 4)**

### Section 2. Physician Examination (Please check)

<table>
<thead>
<tr>
<th></th>
<th>Exam One Date/Time:</th>
<th>Exam Two Date/Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Flaccid tone, patient unresponsive to deep pain stimuli</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
<tr>
<td>b. Pupils are midposition or fully dilated and light responses are absent</td>
<td>□ Yes □ No □ Yes □ No</td>
<td></td>
</tr>
</tbody>
</table>
| c. Corneal, cough, gag reflexes are absent  
Sucking and rooting reflexes are absent (in neonates and infants) | □ Yes □ No □ Yes □ No |
| d. Oculovestibular reflexes are absent | □ Yes □ No □ Yes □ No |
| e. Spontaneous respiratory effort while on mechanical ventilation is absent | □ Yes □ No □ Yes □ No |

□ The ______________________ (Specify) element of the exam could not be performed because Ancillary study (EEG) or radionuclide (CBF) was therefore performed to document brain death. (Section 4)
Section 3. APNEA Test

No spontaneous respiratory efforts were observed despite final PaCO₂ > 60 mmHg and a ≥ 20 mmHg increase above baseline (Examination One). No spontaneous respiratory efforts were observed despite final PaCO₂ ≥ 60 mmHg and a ≥ 20 mmHg increase above baseline (Examination Two).

Pretest PaCO₂: Apnea duration: __________ min
Posttest PaCO₂: Apnea duration: __________ min

Apnea test is contraindicated or could not be performed to completion because ____________________________________________

Ancillary study (EEG or radionuclide CBF) was therefore performed to document brain death (Section 4)

Section 4. ANCILLARY testing is required when 1) any components of the examination or apnea testing cannot be completed; 2) if there is uncertainty about the results of the neurologic examination; or 3) if a medication effect may be present.

Ancillary testing can be performed to reduce the inter-examination period; however, the second neurologic examination is required. Components of the neurologic examination that can be performed safely should be completed in close proximity to the ancillary test.

Date/Time: __________________________________________

☐ Electroencephalogram (EEG) report documents electrocerebral silence OR ☐ Cerebral Blood Flow (CBF) study report documents no cerebral perfusion

☐ Yes ☐ No

☐ Yes ☐ No

Section 5. Signatures

Examiner One

I certify that my examination is consistent with cessation of function of the brain and brainstem. Confirmatory exam to follow.

______________________________          ____________________          ____________________          ________
(Printed Name)                                              (Signature)                                             ____________________          ________
(Specialty)                                                     (Pager #:License #)                   (Date mm/dd/yyyy)                  (Time)

Examiner Two

I certify that my examination and/or ancillary test report confirms unchanged and irreversible cessation of function of the brain and brainstems. The patient is declared brain dead at this time.

Date/Time of Death: __________________________________________

______________________________          ____________________          ____________________          ________
(Printed Name)                                              (Signature)                                             ____________________          ________
(Specialty)                                                     (Pager #:License #)                   (Date mm/dd/yyyy)                  (Time)