**NEUROLOGICAL DETERMINATION OF DEATH (PEDIATRIC)**

- **Infant < 1 year**
- **Newborn > 36 weeks gestation, < 30 days**

Causes of cerebral insult: 

Barbiturates: 
- Absence: ___
- Presence: ___ stopped on ___-___-___ at ___:___
  Serum level: ___ mmol/L

Other(s) drug(s): 
- Absence: ___
- Presence: ___ stopped on ___-___-___ at ___:___
  Specify: ___

Bilateral visualization of eardrums: 
- Yes: ___
- No: ___ If no, reason: ___

### Hemodynamic status

<table>
<thead>
<tr>
<th>Time of Exam</th>
<th>EXAM 1</th>
<th>EXAM 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>_____ / _____</td>
<td>_____ / _____</td>
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<tr>
<td>HR</td>
<td>_____</td>
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### Glasgow Coma Scale 3/15

- Yes: ___
- No: ___

### Neurological exam (procedure on the back)

- Motor response to pain
  - Central: ___ Absent | ___ Present
  - Peripheral: ___ Absent | ___ Present

- Pupillary response to light
  - Right: ___ Absent | ___ Present
  - Left: ___ Absent | ___ Present

- Corneal response
  - Right: ___ Absent | ___ Present
  - Left: ___ Absent | ___ Present

- Oculo-cephalic response
  - Right: ___ Absent | ___ Present
  - Left: ___ Absent | ___ Present

- Vestibulo-ocular response (caloric)
  - Right: ___ Absent | ___ Present
  - Left: ___ Absent | ___ Present

- Cough reflex
  - Absent: ___
  - Present: ___

- Pharyngeal (gag) reflex
  - Absent: ___
  - Present: ___

- Suck reflex (newborn only)
  - Absent: ___
  - Present: ___

### Apnea test (procedure on the back)

- At 0 min:
- At 10 min:
- Test stopped at: ___ min Reason: ___
- Respiratory effort: ___ Yes | ___ No
  - min Reason: ___

### Ancillary tests (procedure on the back)

- Intracranial blood flow
  - Angiography: ___
  - Nuclear scan: ___

### Neurological determination of death confirmation

**NOTE:** the official date and time of death correspond to the date and time of the first exam.

<table>
<thead>
<tr>
<th>PHYSICIAN 1</th>
<th>PHYSICIAN 2</th>
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<tbody>
<tr>
<td>Determination of death:</td>
<td>YYY-MM-DD</td>
</tr>
<tr>
<td>Place:</td>
<td>hh:mm</td>
</tr>
<tr>
<td>Physician's name:</td>
<td></td>
</tr>
<tr>
<td>Practice number:</td>
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<tr>
<td>Signature:</td>
<td></td>
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</tbody>
</table>

Date d'entrée en vigueur: 2012-10-25
NEUROLOGICAL DETERMINATION OF DEATH (NDD)
(PEDIATRIC)

SECTION 1 Key consideration
1. According to existing laws, to proceed with post-mortem organ donation, death must be declared by two (2) physicians. For these two (2) age categories, the first and second declaration (confirmed by clinical examination, including an apnea test) must be performed at two (2) different moments. For infants, there is no fixed interval to comply regardless of the primary etiology. For newborn at term, the first declaration should be delayed 48 hours after birth and for the second declaration, the interval should be ≥ 24 hours regardless of the primary etiology.

SECTION 2 Physicians declaring brain death
1. Physicians declaring brain death must be licensed to practice in the province of Quebec. This excludes physicians who are only on an educational register. The authority to perform NDD cannot be delegated. Physicians must have the knowledge and skills required for management of patients with severe brain injury. In the case of a NDD for post-mortem donation, physicians must be independent of retrieval or transplantation teams.

SECTION 3 Minimum clinical criteria
1. Established etiology
Absence of clinical neurological function with a known, proximate cause that is irreversible. There must be a definite clinical or neuro-imaging evidence of an acute central nervous system (CNS) event that is consistent with the irreversible loss of neurological function.

2. Deep coma
A lack of spontaneous movements and absence of movement originating in the CNS such as: cranial nerve function, CNS mediated motor response to pain in any distribution, seizures, decortication and decerebration. Spinal reflexes, or motor responses confined to spinal distribution, may persist.

3. Absence of confounding factors
   a) Unresuscitated shock.
   b) Hypothermia (temperature < 34ºC infant, < 36 ºC newborn, by central line, rectal, esophageal or gastric measurements).
   c) Severe metabolic disorders capable of causing a potentially reversible coma. If the primary etiology does not fully explain the clinical picture, and if in the treating physician’s judgment the metabolic abnormality may play a role, it should be corrected or an ancillary test should be performed.
   d) Peripheral nerve or muscle dysfunction or neuro-muscular blockage potentially accounting for unresponsiveness.
   e) Clinically significant drug intoxications (e.g. alcohol, barbiturates, sedatives);

N.B.: Therapeutic levels or therapeutic dosing of anti-convulsants, sedatives and analgesics do not preclude the diagnosis.

Specific to cardiorespiratory arrest
Neurological assessments may be unreliable in the acute post-resuscitation phase after cardiorespiratory arrest. In case of acute hypoxic-ischemic brain injury, clinical evaluation for NDD should be delayed for 24 hours otherwise, an ancillary test must be performed.

Physicians are cautioned to review confounding issues in the context of the primary etiology and examination. Clinical judgment is the deciding factor.

SECTION 4 Procedure
1. Two (2) clinical exams are to be performed by two (2) physicians who are not part of the transplant and organ removal teams.
2. Glasgow Coma Scale ≥ 3.
3. No confounding factors.
4. Absence of response to painful central (sternal rub) or peripheral stimulation.
5. Absence of abnormal movements like decortication and decerebration or convulsion (excluding spinal reflexes).

Conception: Enfant-Jésus Hospital, GHA, Quebec, February 2002.

6. Absence of brainstem reflexes.
7. Pupillary response to light (IIIº et IIIº pairs) pupils are not-reactive to light and dilated at ≥ 4 mm.
8. Corneal response (Vº et VIIº pairs): Touch each cornea with a tissue. Movement of eyelids or jaw exclude the possibility of brain death.
9. Vestibulo-ocular response (caloric test) (IIIº, VIIº et VIIIº pairs):
   a) Position the patient’s head horizontally at a 30º angle.
   b) Verify the integrity of the inner ear. Irrigate one ear canal with a minimum of 50 cc of ice water. Wait five (5) minutes and repeat the test on the opposite side. (Any eye movement excludes brain death.)
   c) DO NOT proceed with the following exam if there is presence or suspicion of basal skull fracture or if the cervical spine x-ray has not been validated by the radiologist.
10. Oculo-cephalic response (doll’s eyes) (IIIº, VIIº et VIIIº pairs):
    a) When moving the head abruptly from side to side, if the eyes move in the opposite direction, that excludes brain death.
    b) Insert a suction catheter into the endotracheal tube and stimulate the carina; any effort to cough excludes NDD.
11. Pharyngeal response
    a) Stimulate the posterior wall of the pharynx: gag reflex excludes brain death.
    b) Insert a suction catheter into the endotracheal tube and stimulate the carina; any effort to cough excludes NDD.
12. Respiratory response
    a) Absence of respiratory effort based on the apnea test.

SECTION 5 Apnea test
1. Check ABG’s. Suggested starting values: PaCO2 35 - 45 mmHg and pH 7.35 - 7.40.
2. Optimal performance requires a period of pre-oxygenation with 100% O2 delivered for 15-20 minutes.
3. Disconnect the ventilator and insert a catheter into the endotracheal tube to deliver 100% of O2 at 6 L/min. If the patient is at risk for hypoxia, we suggest you use the following method: add 10 cm H2O PEEP valve at the distal extremity of the T-Piece before beginning the apnea test.
4. For a period of 10 minutes, the certifying physician observes the patient for the presence of any respiratory movement.
5. At the end of the observation period, do another ABG’s before reconnecting the ventilator. Insofar as the patient remained apneic and meets the three (3) criterias, that means that the respiratory reflex is absent. The apnea test is POSITIVE.
6. Thresholds at completion of the apnea test should be:
   • PaCO2 ≥ 60 mmHg
   • PaCO2 ≥ 20 mmHg above the pre-apnea test level
   • pH ≤ 7.28
   ◆ If the ABG’s values are obtained before the specified period of 10 minutes because of instability, the apnea test is VALID.

SECTION 6 Ancillary tests
1. NDD can be confirmed by ancillary testing when minimum clinical criteria cannot be completed or confounding factors cannot be corrected.

Demonstration of the global absence of intracranial blood flow is considered the standard for determination of death by ancillary test. The following prerequisite conditions must be met prior to ancillary testing:
   a) Established etiology.
   b) Deep coma.
   c) Absence of unresuscitated shock or hypothermia.

Currently validated techniques are the four (4) vessels cerebral angiogram or the radionuclide cerebral blood flow imaging. EEG is no longer recommended.