

**NEUROLOGICAL  
DETERMINATION OF DEATH  
(ADULT AND CHILD ≥ 1 YEAR)**

Cause of cerebral insult: \_\_\_\_\_

Barbiturates:  Absence  Presence stopped on \_\_\_\_\_ at \_\_\_\_ : \_\_\_\_ h Serum level: \_\_\_\_\_ mmol/L  
YYYY-MM-DD hh:mm

Other(s) drug(s):  Absence  Presence stopped on \_\_\_\_\_ at \_\_\_\_ : \_\_\_\_ h Specify: \_\_\_\_\_  
YYYY-MM-DD hh:mm

Bilateral visualization of eardrums:  Yes  No If no, reason: \_\_\_\_\_

	EXAM 1				EXAM 2			
<b>Hemodynamic status</b>								
At the time of the exam	BP _____ / _____		BP _____ / _____		HR _____		HR _____	
	T° _____		T° _____					
<b>Glasgow Coma Scale 3/15</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No					
<b>Neurological exam (procedure on the back)</b>								
Motor response to pain - central (excluding spinal reflexes) - peripheral	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Response to pain (cranial nerves territory)	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Pupillary response to light - right	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
- left	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Corneal response - right	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
- left	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Oculo-cephalic response - right (not to be done if trauma)	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
- left	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Vestibulo-ocular response - right (caloric)	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
- left	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Cough reflex	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
Pharyngeal (gag) reflex	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
<b>Apnea test (procedure on the back)</b>	pH	PaO <sub>2</sub>	PaCO <sub>2</sub>	SaO <sub>2</sub>	pH	PaO <sub>2</sub>	PaCO <sub>2</sub>	SaO <sub>2</sub>
At 0 min:								
At 10 min:								
Test stopped at:	_____ min Reason : _____				_____ min Reason : _____			
Respiratory effort	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Ancillary tests (procedure on the back)</b>	Reason :				Reason :			
Intracranial blood flow:	<input type="checkbox"/> Angiography	<input type="checkbox"/> Nuclear scan	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Angiography	<input type="checkbox"/> Nuclear scan	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
<b>Neurological determination of death confirmation</b>	NOTE: the official date and time of death correspond to the date and time of the first exam.							
	<b>PHYSICIAN 1</b>				<b>PHYSICIAN 2</b>			
Determination of death:	_____ YYYY-MM-DD _____ hh:mm				_____ YYYY-MM-DD _____ hh:mm			
Place:	_____				_____			
Physician's name:	_____				_____			
Practice number:	_____				_____			
Signature:	_____				_____			

### SECTION 1 Organ donation legal criteria

1. Neurological determination of death
2. Family consent
3. Coroner agreement if required

### 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 purpose of 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 (core temperature < 34°C, 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 or organ removal teams. The **two (2)** exams can also be performed simultaneously if in a retrieval center.
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).
6. Absence of brainstem reflexes.

7. **Pupillary response to light** (II<sup>e</sup> et III<sup>e</sup> pairs) pupils are not-reactive to light and dilated at ≥ 4 mm.
8. **Corneal response** (V<sup>e</sup> et VII<sup>e</sup> pairs): Touch each cornea with a tissue. Movement of eyelids or jaw exclude the possibility of brain death.
9. **Vestibulo-ocular response (caloric test)** (III<sup>e</sup>, VI<sup>e</sup> et VIII<sup>e</sup> pairs):
  - a) Position the patient's head horizontally at a 30° 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.)
10. **Oculo-cephalic response (doll's eyes)** (III<sup>e</sup>, VI<sup>e</sup> et VIII<sup>e</sup> pairs):
  - a) When moving the head abruptly from side to side, if the eyes move in the opposite direction, that excludes brain death.
    - ◆ **DO NOT** proceed with the following exam if there is presence of suspicion of basal skull fracture or if the cervical spine x-ray has not been validated by the radiologist.
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 reflex based on the apnea test.

### SECTION 5 Apnea test

1. Check ABG's. Suggested starting values: PaCO<sub>2</sub> 35 - 45 mmHg and pH 7.35 - 7.40.
  2. Optimal performance requires a period of pre-oxygenation with 100% O<sub>2</sub> delivered for **15-20 minutes**.
  3. Disconnect the ventilator and insert a catheter into the endotracheal tube to deliver 100% of O<sub>2</sub> at 6 L/min. If the patient is at risk for hypoxia, we suggest you use the following method: add 10 cm H<sub>2</sub>O 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:
    - PaCO<sub>2</sub> ≥ 60 mmHg
    - PaCO<sub>2</sub> ≥ 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.**