

DEATH DETERMINATION BY NEUROLOGIC CRITERIA (DNC)

ADULT AND PEDIATRIC

Unique identifier number: _____

- Adult (≥ 18 years)
- Pediatric (< 18 years)
 - Newborn: 37 weeks (corrected gestational age) to less than two months (< 2 months)
 - Infant: 2 months to less than one year (< 1 year)
 - Child: One year to less than 18 years (< 18 years)

Devastating brain injury severe enough to cause death : _____

	1 st Determination	2 nd Determination
Clinical assessment		
Absence of confounders (see Page 2)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of consciousness (Glasgow Coma Scale 3)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of central and peripheral motor responses (excluding spinal reflexes)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of bilateral pupillary response to light	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of bilateral corneal reflexes	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of bilateral vestibulo-ocular reflexes (caloric)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of cough reflex	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of gag (pharyngeal) reflex	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Additional reflexes – Newborn only		
Absence of rooting reflex	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of sucking reflex	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Apnea testing		
Arterial blood gas at start of test (baseline):	pH : PaCO ₂ :	pH : PaCO ₂ :
Arterial blood gas at completion of test:	pH : PaCO ₂ :	pH : PaCO ₂ :
Final values: PaCO ₂ ≥ 60 mm Hg (≥ 20 mm Hg above the baseline level) and pH ≤ 7.28	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Absence of breathing or respiratory efforts	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Ancillary investigation		
Ancillary test:	<input type="checkbox"/> Radionuclide brain perfusion study <input type="checkbox"/> CT- Angiography <input type="checkbox"/> CT- Perfusion <input type="checkbox"/> Transcranial Doppler <input type="checkbox"/> Other: _____	<input type="checkbox"/> Radionuclide brain perfusion study <input type="checkbox"/> CT- Angiography <input type="checkbox"/> CT- Perfusion <input type="checkbox"/> Transcranial Doppler <input type="checkbox"/> Other: _____
Absence of intracerebral blood flow / perfusion	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Death by neurologic criteria confirmation	1st Declaring physician	2nd Declaring physician
Date and time of death:	_____ : _____ YYYY-MM-DD hh:mm	_____ : _____ YYYY-MM-DD hh:mm
Site:	_____	_____
Physician's name (print):	_____	_____
Permit number:	_____	_____
Signature:	_____	_____

Physicians declaring death

- For organ donation, two (2) physicians are required to determine death. Clinicians can perform the clinical assessment concurrently. However, it is recommended that a death determination by neurologic criteria (DNC) is performed at the recovery center.
- For DNC determination, physicians must hold a full and current licensure for independent medical practice in the province of Quebec. This excludes physicians who are only on an educational register.
- Physicians must have the skill and knowledge in the management of patients with devastating brain injury and in DNC.
- For organ donation, both clinicians determining death must be independent of retrieval or transplantation teams.

Prerequisites for death determination

- There must be an established cause of devastating brain injury severe enough to cause death and supported by neuroimaging evidence.
- Potential confounders of an accurate clinical assessment must have been considered and excluded.

Date and time of death by neurologic criteria

- The official date and time of death is recorded as the time of completion of the first determination.
- If DNC is established by clinical assessment, the time of death corresponds to the time the blood sample was drawn which complete the apnea test.
- If ancillary investigation is required, the time of death is documented as the time that the ancillary investigation was completed.
- If the recommended sequence is not respected (e.g., ancillary investigation is performed prior to the clinical assessment), the time of death is recorded as the time the last required test is performed.

Relative confounders – Delay clinical assessment or consider ancillary investigation (list is not exhaustive)

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> • Hypothermia (induced or environmental exposure) • Sustained hemodynamic instability • Decompressive craniectomy • Drugs taken in an overdose setting, e.g.: <ul style="list-style-type: none"> - Illicit substances and alcohol - Muscle relaxants - Antidepressants - Anti-epileptics | <ul style="list-style-type: none"> • Severe metabolic, endocrine and/or electrolyte imbalances/abnormalities including but not limited to: <ul style="list-style-type: none"> - Hyper/hyponatremia - Hypophosphatemia - Hypoglycemia - Hyper/hypomagnesemia - Hypokalemia - Hyper/hypothyroidism - Liver and/or renal dysfunction | <ul style="list-style-type: none"> • Pharmacologic neuromuscular blockade • Therapeutic or neuroprotective sedatives, e.g.: <ul style="list-style-type: none"> - Benzodiazepines - Propofol - Barbiturates |
|--|--|--|

Absolute confounders – Ancillary investigation required (list is not exhaustive)

- | | |
|--|--|
| <ul style="list-style-type: none"> • Severe facial trauma, ocular trauma, an ophthalmia • Spinal cord injury | <ul style="list-style-type: none"> • Neuromuscular disorders • Skull fractures, basal skull fracture with hemotympanum |
|--|--|

Particularities concerning specific brain lesions

Isolated infratentorial brain injury: A clinical assessment is necessary but not sufficient for DNC in patients with isolated infratentorial brain injury without supratentorial involvement. Ancillary investigation is required to determine death in this scenario.

Hypoxic-ischemic injury: We suggest delaying the DNC clinical assessment for **at least 48 hours** from the time of return of spontaneous circulation post-cardiac arrest for patients with hypoxic-ischemic injury who do not have imaging evidence consistent with devastating brain injury.

Clinical assessment

All components of the clinical assessment for death determination by neurologic criteria must be performed, as much as possible, and require the following:

- Absence of consciousness shown by a lack of arousal and awareness in response to external stimuli
- Absence of brainstem function as shown by cranial nerve testing
- Absence of the capacity to breathe shown by formal apnea testing

If the clinical assessment is complete and consistent with death, then this is sufficient for DNC determination.

- Pediatric:**
- **Newborn:** It is recommended to wait **at least 24 hours** between the two (2) clinical assessments.
 - **Infant:** It is recommended to complete the two (2) clinical assessments **at different times**. There is no recommended minimum time interval between clinical assessments.

Ancillary investigation

- Indications for ancillary investigation include:
- Confounding conditions that cannot be resolved
 - Inability to complete a valid clinical assessment, including apnea testing
 - Uncertainty in the interpretation of possible spinally mediated movements
 - Isolated infratentorial brain injury without supratentorial involvement

Ancillary investigation alone is not sufficient to determine death and will not override a clinical assessment that is inconsistent with death.

Adult: Ancillary tests recommended for adults are transcranial Doppler, computed tomography (CT) perfusion, CT angiography or radionuclides brain perfusion study employing a lipophilic radiopharmaceutical.

- Pediatric:**
- **Child and infant:** Radionuclide brain perfusion study is the **only** ancillary test recommended.
 - **Newborn:** Ancillary investigation is **not recommended**.

For any questions regarding the declaration of death by neurologic criteria (DNC), please contact Transplant Québec.