



Translation of the Ministerial Decision No. (19) Of 2022, Concerning the Criteria for the Diagnosis of Death

The Minister of Health and Prevention,
After perusal of Federal Law No. 1 of 1972 on the Competencies of the Ministries and Powers of the Ministers and its amending laws,
Federal Law No. 7 of 1975 on the Regulation of the Practice of the Human Medicine Profession, and its Executive Decree,
Federal Law No. 4 of 2015 on Private Health Facilities and its amendments, and its Executive Decree,
Federal Decree-Law No. 4 of 2016 on Medical liability, and its Executive Decree,
Federal Decree-Law No. 5 of 2016 Regulating the Transplant of Human Organs and Tissues,
Cabinet Decision No. 25 of 2020 Concerning the Executive Decree of Federal Decree-Law No. 5 of 2016 Regulating the Transplant of Human Organs and Tissues,
Cabinet Decision No. 11 of 2021 Concerning the Organisational Structure of the Ministry of Health and Prevention,
Ministerial Decision No. 550 of 2017 Concerning the Criteria for the Diagnosis of Death,

Based on the public interest requirements,
Has decided:

Article (1)

Death shall be diagnosed either by complete and final cessation of the heart and breathing or by complete and final cessation of all brain functions and the physicians' decision that such cessation is irreversible, in accordance with the criteria set out in the annex of this decision hereto.

Article (2)

Ministerial Decision No. 550 of 2017 Concerning the Criteria for the Diagnosis of Death and any other provision that contradicts or is in conflict with the provisions hereof shall be abrogated.

Article (3)

This Decision shall be published in the Official Gazette of the country and it shall come into force as of the day following the date of its publication.

Issued on: 14/2/2022

Abdul Rahman bin Mohammed Al Owais
Minister of Health and Prevention

This Decision was published in the Official Gazette of the United Arab Emirates No. 722, p. 61.

**In case of any misinterpretation, the Arabic version of this legislation prevails.*





**Annex to the Decision of the Ministry of Health and Prevention No. (19) of 2022
Concerning the Criteria for the Diagnosis of Death**

First: Diagnosis of death resulting from complete and final cessation of the heart and breathing:

This diagnosis is made after ascertaining that death has occurred as a result of complete, definite and irreversible cessation of the heart and breathing as per the relevant medical standards applicable in proving death, according to the following:

- 1- Cessation of spontaneous breathing,
- 2- Absence of pulse and blood pressure,
- 3- Inability to hear the heartbeats with a stethoscope.

Second: Diagnosis of death resulting from the complete and final cessation of all brain functions:

This diagnosis is made in accordance with death by neurological criteria. This diagnosis is available at any hospital with an intensive care unit and it is performed on any patient who meets the criteria of death in accordance with the accurate medical standards related to death by neurological criteria, using the Death By Neurological Criteria Documentation Form (Appendix-1).

1- Who diagnoses the death by Neurological Criteria?

A neurologist, a neurosurgeon, an internist, an intensive care specialist, an anaesthesiologist, a paediatrician or any other specialised physician with adequate experience in diagnosing death by Neurological Criteria can perform the diagnosis.

It is strictly prohibited for transplant physicians or surgeons to take part in diagnosing Death by Neurological Criteria (DNC) in any manner whatsoever.

2- Medical aspects of death by neurological criteria:

2-1 Definition: death by Neurological Criteria is the irreversible cessation of all functions of the entire brain, including the brainstem.

2-2 Conditions and exceptions for diagnosing death by neurological criteria.

2-2-1 Prerequisites for diagnosing death by neurological criteria:

The following conditions should be satisfied prior to initiating the diagnosis of death by brain criteria:

- a. The patient should be in a coma for a specific and well-known cause.
- b. The patient should be on a ventilator and should be unable to breathe spontaneously
- c. At least 6 hours should have passed since the accident that led to the death by Neurological Criteria - clear identification of the cause of death (head injury, cerebral haemorrhage...)
- d. The patient should not be in a state of cardiovascular shock.
- e. Severe metabolic and endocrine imbalances have been corrected.
- f. There should be no response to any kind of stimuli.
- g. There should be absolutely no response and no reflexes elicited except some simple spinal cord reflexes may remain.

2-2-2 Exceptions:

- a. The patient should not be hypothermic and the internal body temperature should be equal to or higher than 36°C, prior to initiating the procedures for diagnosing death resulting from complete and final cessation of all brain functions. If the temperature is lower than that, the patient should be warmed to target temperature of 36°C or higher
- b. It should be ruled out that the patient is under the influence of sedative-hypnotics, narcotics, nervous system depressants, muscle relaxants or antidepressants. The levels of these substances in the blood or the patient's medical file should not indicate the presence of explicit levels of

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- sedatives or muscle relaxants, or at least the scientifically recognised period should have lapsed, which is fivefold half-lives of the drug after discontinuing the use of the drug with the longest half-life from among those aforementioned, in the absence of acute liver or renal failure, prior to conducting the assessment. Attached is a list of the commonly used drugs and the period equivalent to fivefold half-lives of the drug that may be taken into account when deciding death by neurological criteria (Appendix -2). A clinical pharmacist may be consulted if need be.
- Toxicological analysis should be carried out, especially in cases of traffic accidents, drug poisoning, and comas of unknown cause, and in all cases where the physician believes that there is an indication thereof. In the event that such analysis is not available, the National Centre for Regulating the Donation and Transplantation of Human Organs and Tissues should be contacted to obtain a subject matter expert opinion in this regard.
 - The patients with metabolic or endocrine disorders should be excluded.
 - There should be no indication of brain activity in the patients, such as seizures or de-cerebrate or decorticate posture.

2-3 How to diagnose death by neurological criteria?

After verifying that the prerequisites are met and making the necessary exclusions, the clinical examination is performed as shown in the document for diagnosing death by brain criteria. The results of the clinical examinations are recorded in that document and the team of examining physicians affix their signatures thereto. The examination is repeated after the lapse of the specified observation period and the death certificate is signed again by the examining medical team that consists of a committee including three specialised physicians including one neurologist ~~diseases~~ as indicated in Clause (1) under "Second" here-above (Who diagnoses the death by neurological criteria?).

If the two clinical examinations are completed to the maximum extent possible and all the tests can be completed without constraints, the apnoea test is performed as shown in Clause (2-4). If it is not possible to complete the two clinical examinations without constraints or the apnoea test cannot be performed for any reason whatsoever, it is required to perform one of the ancillary tests as shown in Clause (2-3-4) here-below to diagnose death by ~~brain~~ neurological criteria. One of the ancillary tests can likewise be used in case of insurmountable constraints and of uncertainty as to the interpretation of the presence of spinal reflexes and/ or myoclonus.

2-3-1 Initial clinical examination:

Verify that the patient is in a coma.

Assess the patient in terms of brain activity such as the presence of seizures or movements indicating de-cerebrate or decorticate posture, as a brain-dead patient does not show any of that. The presence of spinal reflexes and/ or myoclonus does not preclude death by Neurological Criteria. Test the motor response to painful stimuli. For instance, pressure on the frontal sinus area does not lead to any kind of eyebrow knitting or grimacing (Figure 1).

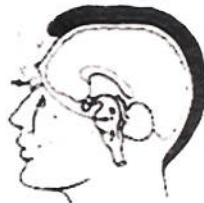


Figure (1): Testing for motor response to painful stimulus

2-3-2 Brainstem reflex test:

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After conducting the aforementioned initial assessment, the necessary tests should be performed to ensure the absence of brainstem reflexes in the following order (the presence of any of these reflexes precludes the need to complete the remaining tests):

a- Pupillary response to light:

A good and strong source of light should be directed towards the open eye, as this does not lead to any reaction, whether direct or indirect, in the other eye of the brain dead.

The test should be performed on both eyes and it should be verified that no eye drops or mydriatics of any kind were used before the test.



Figure (2): Pupillary response to light test

b- Corneal reflex:

Touch the cornea with a cotton wick as shown in Figure (3). Note that the eye does not blink in case of death by Neurological Criteria. The test should be performed on both eyes and greater pressure should be exerted on the cornea of potentially brain-dead patients.



Figure (3): Corneal reflex test

c- The oculocephalic reflex:

Stand at the head of the patient's bed. Hold the patient's head steadily with both hands in mid position. Move the head abruptly to the right and then to the left. Watch the movement of the eyes during the stages of the test by lifting the eyelids with the thumbs.



Figure (4)

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Positive oculoccephalic reflex: (Note the position of the eye in relation to the direction of the head movement)

I Head and eyes in neutral position

IIa and IIIa Eyes deviated opposite to the head movement whether to the left or to the right.

IIb and IIIb Eyes back to neutral position.

The test is positive if the eyes move in the opposite direction of the head movement. The brainstem is alive in this case and there is no need to complete the remaining tests. In case of the death of the brainstem, the eyes and the head move in the same direction.

This test should not be performed when a cervical spine fracture is suspected in a patient with a recent injury. The patient may be separated from the ventilator for 20-30 seconds during testing.

d- Vestibulo-ocular reflex (caloric test):

50 ml of cold water at zero degrees Celsius is placed alternately in the external auditory canal of the right and left ears (10-20 ml is sufficient for children). The lack of ocular movements indicates death by Neurological Criteria.

The absence of eye deviation towards the tested side indicates a break in the reflex arc due to damage to the reflex centres (brainstem) or the paralysis of the extraocular muscles. Therefore, this test should not be performed on a patient taking muscle relaxants.

The integrity of the tympanic membrane (eardrum) should be verified using an otoscope prior to initiating the test, along with verifying that there is no mechanical obstruction in the auditory canal (cerumen). If the tympanic membrane is not intact, cold air may be used instead of cold water. This test should not be performed in case of local damage to the ear.



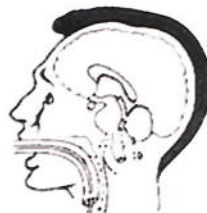
Figure (5): Caloric test

e- Stimulation of upper and lower respiratory tracts:

(Example: By suctioning pharyngeal and tracheal secretions):

The aim of the test is to stimulate the pharynx and the carina. Insert the pharyngeal and tracheal suctioning catheter up to the carina (Figure 6).

This does not provoke any reaction, such as coughing or gagging, in a brain-dead patient.



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Figure (6): Gag and Cough reflex test

2-3-3 Observation period (period between two clinical examinations):

Upon completion of the first clinical examination, the second examination is performed after the lapse of the necessary observation period specified in the protocol.

The results of the two examinations are recorded in the form for the certification of death by neurological criteria (Appendix-1) and signed by the examining physicians.

The following schedule shows the necessary observation period between the first and second clinical examinations by different age groups.

Schedule of the necessary observation period between the two clinical examinations by age

* Infants (7 day - 60 days)	48 hours
* Infants (> 60 days – 1 year)	24 hours
** Children (> 1 year until puberty)	12 hours
** Adults	30 minutes

- * It is necessary to perform two electroencephalograms separated by a time interval equal to the observation period.
** Only one electroencephalogram should be performed after completion of the first clinical examination, if needed for adult.

2-3-4 Ancillary tests:

To diagnose death by neurological criteria, one of the ancillary tests mentioned here-below should be performed in the event that the two clinical examinations cannot be completed without constraints or that an apnoea test cannot be performed for any reason whatsoever.

One of the ancillary tests may also be used in case of insurmountable constraints and of uncertainty as to the interpretation of spinal reflexes and/ or myoclonus.

- Electroencephalogram (EEG):

It should show electro-cerebral silence and the recording should be made for at least 30 minutes as per the medically agreed principles, noting that if the patient is hypothermic, his temperature should be raised before performing the EEG.

- Cerebral angiography

4-vessel conventional angiogram should show absence of intracranial arterial blood circulation of brain and common carotid arteries at the base of the skull even if it shows blood flow in the intracranial venous sinuses.

- Cerebral vascular tomography (Computed tomography angiography of the head)

- Cerebral perfusion scintigraphy (nuclear imaging of cerebral tissue perfusion)

- Transcranial Doppler

In all areas, the lack of blood flow to the brain may be established using cerebral angiography, cerebral perfusion scintigraphy or transcranial Doppler, all of which confirm the presence of irreversible brain damage, whereas cerebral ischemia and absence of cerebral blood flow, constitute proof of irreversible brain damage.

2-4 Apnea test:

This test is performed after conducting the two clinical examinations as aforementioned in Clause (2-3) and verifying the absence of brainstem reflexes and conformity thereof with Death by Neurological Criteria (DNC).

This test is performed by two specialists only once.

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If it is not possible to perform the apnoea test, one of the ancillary tests listed here-above may be performed.

How is the test performed?

This test shows that there is no spontaneous breathing. The following precautions should be taken prior to performing this test:

General considerations:

- The apnea test should be performed at a body temperature of 36°C or higher.
- Hypoxia should be avoided as it can further damage the brain.
- It should be verified that the partial pressure of carbon dioxide (PaCO₂) has reached the level of **6.7 - 8.1 kPa (50- 60 mmHg)** at the end of the patient's separation from the ventilator, as the aforementioned concentration constitutes sufficient stimulus for the respiratory centres in a brainstem that is alive.
- If the patient is in a critical condition that does not allow the performance of the apnea test at that time, the results of one of the ancillary tests mentioned in Clause (2-3-4) will be sufficient.

Steps of the test:

- Oxygenate the patient with 100% concentrated oxygen for ten minutes (The oxygen concentration increases without changing the ventilation rate.)
- Separate the patient from the ventilator and provide him with humidified flowing oxygen at the rate of 6 l/min (= 100% oxygen) using a catheter that is passed up to the carina. (It is sufficient to provide children with 1.5-2 l/min). Ensure that the catheter is not of a size that obstructs the airway. It is recommended to use a pulse oximeter during the test.
- The patient is separated from the ventilator for 10 minutes, during which the patient is monitored for any attempt to breathe, and an arterial blood sample is drawn to measure the level of the partial pressure of carbon dioxide which should be higher than 8.1 kPa (>60 mmHg) in adults and 7.6 kPa (55 mmHg) in children or should be 20 mmHg above the baseline.
- If the patient cannot be separated from the ventilator for a period of 10 minutes, he is reconnected to the ventilator and an arterial blood sample is drawn as shown in Paragraph (c) here-above.

The apnea test is considered positive if there is no respiratory movement during the time the patient is separated from the ventilator.

3- Documentation of Death by Neurological Criteria (DNC) in children:

To document death in children, the same general steps should be followed as for adults with some necessary adjustments by age, as follows:

- ❖ Infants aged 7 days - 2 months: The observation period should be extended to 48 hours and two EEGs should be performed 48 hours apart and both should show brain inactivity, i.e. electrocerebral silence.
- ❖ Infants aged 2 months - 1 year: The observation period should be extended to 24 hours and two EEGs should be performed 24 hours apart and both should show brain inactivity, i.e. electrocerebral silence, or one EEG should be performed and should show electrocerebral silence along with analysing the blood flow by CT scan or radioactive isotopes that should show the absence of cerebral blood flow.

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- ❖ Children over one year of age and until puberty: The same protocol should be followed as for adults except for the observation period, which should be at least 12 hours.
- ❖ After puberty: The same protocol should be followed as for adult



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Appendix (1)

Death by Neurological Criteria Documentation Form



Death By Neurological Criteria Documentation Form

أرفق المريض ID sticker

Please write patient details below in addition to ID sticker

Name: _____			Medical Record number: _____		
Age: _____	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Nationality: _____	Blood group: _____	Weight: _____ Kg	Height: _____ cm
Hospital Name: _____			Date of admission (DD/MM/YYYY): _____		

First Exam	First physician		Second physician	
I. PRECONDITIONS:				
1. Clinical or neuroimaging evidence of acute Central Nervous System (CNS) catastrophe that is compatible with irreversible loss of brain function.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2. ≥ 6 hours have passed since the initial insult.*	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
3. Coma with no spontaneous respiration.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> No
II. EXCLUSIONS:				
1. Hypothermia (core temperature ≤ 36°C).	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
2. Sedation or muscle relaxants (blood test or hospital record should indicate absence of significant levels of sedative drugs, muscle relaxants or intoxication).	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
3. Systolic blood pressure <100 mmHg (despite vasopressors).	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
4. Significant metabolic or endocrine causes of coma. (suggested sodium ≤ 155 mmol/L or mEq/L).	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
III. CLINICAL ASSESSMENT:				
1. Absence of any cerebrally-mediated response to auditory and tactile noxious stimulation, peripherally and in the cranium. (does not include spinal reflexes)	<input type="checkbox"/> Absent	<input type="checkbox"/> Present	<input type="checkbox"/> Absent	<input type="checkbox"/> Present
2. Absence of brain stem reflexes:				
a. Pupils response to bright light	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present
b. Corneal	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present
c. Oculocephalic (contraindicated when C-spine unstable)	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present
d. Oculovestibular (tympanic membranes must be intact) (50 ml adults 20 ml in children ice-cold water 0°C)	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present
e. Gag	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present
f. Cough	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Untestable	<input type="checkbox"/> Present

UAE Federal Law No 5/2016 article 15.2: death is determined by a committee of 3 physicians including 1 specialized in neurological disease.

First exam	Date	Time	Name	Signature	License number
First physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify: _____					
Second physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify: _____					

*Note: Recommended time interval between first and second examinations in various age groups
 • Adults: minimum of 30 minutes ** Infants (above 60 days – 1 year) 24 hours
 • Children (above one year) 12 hours ** neonate (7 days – 60 days) 48 hours



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Death By Neurological Criteria Documentation Form

Please write patient details below in addition to ID sticker

Name: _____			Medical Record number: _____		
Age: _____	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Nationality: _____	Blood group: _____	Weight: _____ Kg	Height: _____ cm
Hospital Name: _____			Date of admission (DD/MM/YYYY): _____		

Second Exam	Third physician	First or Second physician
I. PRECONDITIONS:		
1. Clinical or neuroimaging evidence of acute Central Nervous System (CNS) catastrophe that is compatible with irreversible loss of brain function.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. ≥ 6 hours have passed since the initial insult.*	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Coma with no spontaneous respiration.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
II. EXCLUSIONS:		
1. Hypothermia (core temperature ≤ 36°C).	<input type="checkbox"/> Absent <input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Present
2. Sedation or muscle relaxants (blood test or hospital record should indicate absence of significant levels of sedative drugs, muscle relaxants or intoxication).	<input type="checkbox"/> Absent <input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Present
3. Systolic blood pressure <100 mmHg (despite vasopressors).	<input type="checkbox"/> Absent <input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Present
4. Significant metabolic or endocrine causes of coma. (suggested sodium ≤ 155 mmol/L or mEq/L).	<input type="checkbox"/> Absent <input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Present
III. CLINICAL ASSESSMENT:		
1. Absence of any cerebrally-mediated response to auditory and tactile noxious stimulation, peripherally and in the cranium. (does not include spinal reflexes)	<input type="checkbox"/> Absent <input type="checkbox"/> Present	<input type="checkbox"/> Absent <input type="checkbox"/> Present
2. Absence of brain stem reflexes:		
a. Pupils response to bright light	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable
b. Corneal	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable
c. Oculocephalic (contraindicated when C-spine unstable)	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable
d. Oculovestibular (sympanic membranes must be intact) (50 ml adults 20 ml in children ice-cold water 0°C)	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable
e. Gag	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable
f. Cough	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable	<input type="checkbox"/> Absent <input type="checkbox"/> Present <input type="checkbox"/> Untestable

UAE Federal Law No 5/2016 article 15 2. death is determined by a committee of 3 physicians including 1 specialized in neurological disease

Second exam	Date	Time	Name	Signature	License number
Third physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify:					
First or Second physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify:					

Note: First or Second physician could be replaced by fourth doctor if applicable.

*Note: Recommended time interval between first and second examinations in various age groups

- Adults: minimum of 30 minutes
- Children (above one year) 12 hours
- Infants (above 60 days - 1 year) 24 hours
- neonate (7 days - 60 days) 48 hours

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Death By Neurological Criteria Documentation Form

Form number: D-10001

Please write patient details below in addition to ID sticker

Name: _____			Medical Record number: _____		
Age: _____	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Nationality: _____	Blood group: _____	Weight: _____ Kg	Height: _____ cm
Hospital Name: _____			Date of admission (DD/MM/YYYY): _____		

APNEA TEST:

- Must be performed in the presence of two physicians and done once only.
- If inconclusive and patient remains hemodynamically stable, may continue for longer period (5-10 minutes).
- If not doable due to hemodynamic instability or aborted, the reported ancillary test will be sufficient.

A. Prerequisites

1. Core temperature $\geq 36^{\circ}\text{C}$	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Systolic BP > 100 mmHg (with or without vasopressor agents)	<input type="checkbox"/> Yes <input type="checkbox"/> No
3. Arterial pCO_2 40 ± 5 mm Hg (5.3 \pm 0.7 kPa) (in patient with normal baseline PCO_2)	<input type="checkbox"/> Yes <input type="checkbox"/> No
4. Arterial pO_2 greater than 90 mm Hg (12 kPa)	<input type="checkbox"/> Yes <input type="checkbox"/> No
5. Expose chest and abdomen	<input type="checkbox"/> Yes <input type="checkbox"/> No

B. Apnea testing checklist

1. Pre-oxygenate with 100% O_2 for 10 minutes. Increase the inspired fraction of oxygen (FiO_2) without changing the ventilation rate $\text{PaO}_2 > 200$ mm Hg (26.7 kPa)	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Disconnect patient from ventilator and deliver 100% FiO_2 into the trachea via a cannula at the level of the carina. (6 L/min adults, 1.5-2 L/min children) *Abort the apnea test, immediately reconnect the ventilator and take arterial blood gas sample if any: a. Systolic BP < 90 mmHg or cardiovascular collapse despite vasopressors b. Oxygen desaturation ($< 85\%$ for > 30 seconds) c. Significant cardiac arrhythmia d. Respiratory movements are observed	<input type="checkbox"/> Yes <input type="checkbox"/> No Apnea test aborted: <input type="checkbox"/> Yes <input type="checkbox"/> No
3. Check arterial blood gases at 8-10 minutes and every 5 minutes thereafter if necessary. Reconnect the ventilator when either: a. $\text{pCO}_2 \geq 60$ mmHg (8.1 kPa) adults or ≥ 50 mmHg (7.6 kPa) children b. pCO_2 is ≥ 20 mmHg (2.7 kPa) above the patient's known baseline (in patient with high baseline PaCO_2)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No

1. ABG at baseline: pH _____ PaCO_2 _____ mmHg PaO_2 _____ mmHg	2. ABG at 10 minutes or shorter if aborted ¹ : pH _____ PaCO_2 _____ mmHg PaO_2 _____ mmHg ¹ Please specify: _____ minutes	3. ABG at 5 minutes (optional) ² : pH _____ PaCO_2 _____ mmHg PaO_2 _____ mmHg ² Refer to point b at the top of this page
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C. Apnea confirmed: absent respiratory movements over ≥ 10 minutes of observation. Yes No

APNEA TEST completed by	Date	Time	Name	Signature	License number
First physician					
Second physician					

** UAE Federal Law No. 5/2016 article 15 2: death is determined by a committee of 3 physicians including 1 specialized in neurological disease
*** One of the four clinical exams separated by mandatory waiting time for age (see footnote) to be completed by a specialist in neurological disease.
**** The final declaration needs to be signed by all three physicians who performed clinical examinations and apnea test
***** First or Second physician could be replaced by fourth doctor if applicable

*Note: Recommended time interval between first and second examinations in various age groups
• Adults: minimum of 30 minutes ** Infants (above 60 days – 1 year) | 24 hours
• Children (above one year) 12 hours ** neonate (7 days – 60 days) | 48 hours



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Death By Neurological Criteria Documentation Form

Alfa patient ID sticker

Please write patient details below in addition to ID sticker

Name:		Medical Record number:			
Age: _____	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Nationality: _____	Blood group: _____	Weight: _____ Kg	Height: _____ cm
Hospital Name:			Date of admission (DD/MM/YYYY):		

ANCILLARY TEST(S): MINIMUM one of the following tests should be done.	Report attached
1. EEG (full brain death protocol, see last page)	<input type="checkbox"/> No reactivity (>2 uV) to intense somatosensory or audiovisual stimuli. <input type="checkbox"/> Yes <input type="checkbox"/> No
2. Absence of brain circulation by any of:	
2.1 <input type="checkbox"/> Cerebral angiogram	<input type="checkbox"/> No flow <input type="checkbox"/> Yes <input type="checkbox"/> No
2.2 <input type="checkbox"/> Nuclear medicine cerebral blood flow study (technetium 99M SPECT)	<input type="checkbox"/> No flow <input type="checkbox"/> Yes <input type="checkbox"/> No
2.3 <input type="checkbox"/> Transcranial Doppler	<input type="checkbox"/> No flow <input type="checkbox"/> Yes <input type="checkbox"/> No
2.4 <input type="checkbox"/> CT cerebral angiogram (see appendix)	<input type="checkbox"/> No flow <input type="checkbox"/> Yes <input type="checkbox"/> No

Final Declaration	Date	Time	Name	Signature	License number
First physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify:					
Second physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify:					
Third physician <input type="checkbox"/> An intensivist <input type="checkbox"/> Neurologist <input type="checkbox"/> Neurosurgeon <input type="checkbox"/> Others specify:					
Fourth physician (if applicable)					

*Note: Recommended time interval between first and second examinations in various age groups
 • Adults: minimum of 30 minutes ** Infants (above 60 days – 1 year) 24 hours
 • Children (above one year) 12 hours ** neonate (7 days – 60 days) 48 hours

*In case of any misinterpretation, the Arabic version of this legislation prevails.





Death By Neurological Criteria Documentation Form

Affix patient ID sticker

Please write patient details below in addition to ID sticker

Name:			Medical Record number:		
Age: _____	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Nationality: _____	Blood group: _____	Weight: _____ Kg	Height: _____ cm
Hospital Name:			Date of admission (DD/MM/YYYY):		

Appendix

Electroencephalography

- A minimum of 8 scalp electrodes should be used.
- Inter-electrode impedance should be between 100 and 10,000 Ω .
- The integrity of the entire recording system should be tested.
- The distance between electrodes should be at least 10 cm.
- The sensitivity should be increased to at least 2 μ V for 30 minutes with inclusion of appropriate calibrations.
- The high-frequency filter setting should not be set below 30 Hz, and the low-frequency setting should not be above 1 Hz.
- Electroencephalography should demonstrate a lack of reactivity to intense somatosensory or audiovisual stimuli.

Neurology 2010;74:1911-1918.

Types and Techniques of CTA

A standard CTA acquisition uses a multislice CT scanner to acquire a helical scan (120 kV, 200 mA) from cervical vertebra C2 to vertex (timed to chase the bolus of contrast as it passes through the intracranial vessels. Intravenous contrast medium (40-120 mL) is administered in an antecubital vein or a central venous catheter with a power injector, followed by 30 mL of an isotonic saline (rate: 3-5 mL/s). CT acquisition is timed to start 5 seconds after opacification of the common carotid artery of more than 150 Hounsfield units. Axial images reconstructed with a maximum of 2.0-mm increments. Thinner slices and multi-planar reformats may also be reconstructed. For delayed phase CTA [5,6], a repeat acquisition started 55-60 seconds after starting the first scan, using the same parameters as in first scan. The delayed phase acquisition is used to confirm persistence of lack of intracranial contrast over a longer duration. The standard 1- or 2-phase CTA is limited as it provides a static volume of brain vessels images performed during 1 or 2 specified time points (snapshot views). The predetermined time point used is often unreliable in these patients due to the abnormal or delayed flow.

Can Assoc Radiol J. 2017 May;68(2):224-228.

4-point CTA score

Vessel	Lack of Opacification
Right cortical segment of middle cerebral artery	<input type="checkbox"/> Yes <input type="checkbox"/> No
Left cortical segment of middle cerebral artery	<input type="checkbox"/> Yes <input type="checkbox"/> No
Right internal cerebral vein	<input type="checkbox"/> Yes <input type="checkbox"/> No
Left internal cerebral vein	<input type="checkbox"/> Yes <input type="checkbox"/> No

AJNR Am J Neuroradiol 2009;30:1566e70. Can Assoc Radiol J. 2017 May;68(2):224-228.

7-point CTA score

Vessel	Lack of Opacification
Right pericallosal segment of middle cerebral artery	<input type="checkbox"/> Yes <input type="checkbox"/> No
Left pericallosal segment of middle cerebral artery	<input type="checkbox"/> Yes <input type="checkbox"/> No
Right cortical segments of the middle cerebral artery	<input type="checkbox"/> Yes <input type="checkbox"/> No
Left cortical segments of the middle cerebral artery	<input type="checkbox"/> Yes <input type="checkbox"/> No
Right internal cerebral vein	<input type="checkbox"/> Yes <input type="checkbox"/> No
Left internal cerebral vein	<input type="checkbox"/> Yes <input type="checkbox"/> No
vein of Galen	<input type="checkbox"/> Yes <input type="checkbox"/> No

Am J Neuroradiol 1998;19:641e7. Can Assoc Radiol J. 2017 May;68(2):224-228.

*Note: Recommended time interval between first and second examinations in various age groups

- Adults: minimum of 30 minutes
- Children (above one year) 12 hours
- Infants (above 60 days - 1 year) 24 hours
- neonate (7 days - 60 days) 48 hours



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Appendix (2)

A list of commonly used drugs and a fivefold half-life that can be considered when making a decision about Death by Neurological Criteria

	Drug	Half-life ²²	
Opioids	Fentanyl	3.3-4.1 hours	↑CPBS, Aged, Prem; ↔Child
	Oxycodone	2.1-3.1 hours	
Sedatives	Dexmedetomidine	2 hours	
	Diazepam	30-56 hours	↑Aged, LD; ↔HTH
	Lorazepam	9-19 hours	↑LD, Neo, RD; ↔Aged, CPBS, AVH; ↓Burn
	Midazolam	1.3-2.5 hours	↑Aged, Obese, LD; ↔Smoking
	Pentobarbital	15-50 hours	
	Phenobarbital	81-117 hours	↑LD, Aged; ↓Child; ↔Epilepsy, Neo
	Thiopental	8-10 hours	
	Propofol	2.3-4.7 hours	A much longer terminal t _{1/2} was reported following prolonged IV infusion.
	Zolpidem	1.7-2.1 hours	↑Aged, LD; ↔RD; ↓Child
Other	Baclofen	2.8-4.7 hours	
	Bupropion	10-11 hours (7.9-18.4)	↑Aged, LD; ↔Alcohol

AVH Acute viral hepatitis; CPBS cardiopulmonary bypass surgery; HTH Hyperthyroid; LD Chronic liver disease;
Neo neonate; Prem Premature infants; RD renal disease.

Greer DM, Shemie SD, Lewis A, et al. Determination of Brain Death/Death by Neurologic Criteria: The World Brain Death Project. JAMA. 2020;324(11):1078-1097. doi:10.1001/jama.2020.11586



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