

Form for the Diagnosis of Death using Neurological Criteria {abbreviated guidance version}

This form is consistent with and should be used in conjunction with, the AoMRC (2008) *A Code of Practice for the Diagnosis and Confirmation of Death* and has been endorsed for use by the following institutions: Faculty of Intensive Care Medicine, Intensive Care Society and the National Organ Donation Committee.

HOSPITAL ADDRESSOGRAPH or

Surname
First Name
Date of Birth
NHS Number

Date and time:	Patient Location:
Doctor One, Name and Designation	Doctor Two, Name and Designation
Name.....	Name.....
Signature.....	Signature.....
Grade.....	Grade.....

Evidence for Irreversible Brain Damage of known Aetiology

Primary Diagnosis:.....

Evidence for Irreversible Brain Damage of known Aetiology:

.....
.....

Exclusion of Reversible Causes of Coma and Apnoea

	1 st Test Dr One	1 st Test Dr Two	2 nd Test Dr One	2 nd Test Dr Two
Is the coma due to depressant drugs? Drug Levels (if taken):	Yes / No	Yes / No	Yes / No	Yes / No
Is the patient's body temperature $\leq 34^{\circ}\text{C}$?	Yes / No	Yes / No	Yes / No	Yes / No
Is the coma due to a circulatory, metabolic or endocrine disorder?	Yes / No	Yes / No	Yes / No	Yes / No
Is the apnoea due to neuromuscular blocking agents, other drugs or a non brain-stem cause (eg. cervical injury, profound neuromuscular weakness)?	Yes / No	Yes / No	Yes / No	Yes / No

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Patient Name:

NHS Number:

Tests for Absence of Brain-Stem Function

Brain-Stem Reflexes

	1 st Test Dr One Examining	1 st Test Dr Two Observing	2 nd Test Dr One Observing	2 nd Test Dr Two Examining
Do the pupils react to light?	Yes / No	Yes / No	Yes / No	Yes / No
Is there any eye movement when each cornea is touched in turn?	Yes / No	Yes / No	Yes / No	Yes / No
Is there any eye movement during caloric testing in each ear?	Yes / No	Yes / No	Yes / No	Yes / No
Is there any motor response when supraorbital pressure is applied?	Yes / No	Yes / No	Yes / No	Yes / No
Is the gag reflex present?	Yes / No	Yes / No	Yes / No	Yes / No
Is the cough reflex present?	Yes / No	Yes / No	Yes / No	Yes / No

Apnoea Test

Arterial Blood Gas pre apnoea test: (Starting paCO ₂ should be > 6.0 KPa) (Starting pH should be <7.4)	1 st Test Starting paCO ₂ : Starting pH:		2 nd Test Starting paCO ₂ : Starting pH:	
Is there any spontaneous respiration within 5 (five) minutes following disconnection from the ventilator?	Yes / No	Yes / No	Yes / No	Yes / No
Arterial Blood Gas Result post apnoea test: (paCO ₂ rise should be > 0.5 KPa)	1 st Test Final paCO ₂ :		2 nd Test Final paCO ₂ :	

Ancillary Investigations Used to Confirm the Diagnosis

Is there a need for any ancillary investigations?	Yes / No	Yes / No
If yes please outline the results of these investigations:		

Completion of Diagnosis

Are you satisfied that death has been confirmed following the irreversible cessation of brain-stem-function?	Yes / No	Yes / No
Legal time of death is when the 1 st Test indicates death due to the absence of brain-stem reflexes.	Date: Time: Dr One initials	Date: Time: Dr One initials
Death is confirmed following the 2 nd Test.	Dr Two initials	Dr Two initials

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It remains the duty of the two doctors carrying out the testing to be satisfied with the aetiology, the exclusion of all potentially reversible causes, the clinical tests of brain-stem function and of any ancillary investigations so that each doctor may independently confirm death following irreversible cessation of brain-stem function.

Guidance Summary of the AoMRC Code of Practice

The diagnosis of death by neurological criteria should be made by at least two medical practitioners who have been registered for more than five years and are competent in the conduct and interpretation of brain-stem testing. At least one of the doctors must be a consultant. Testing should be performed completely and successfully on two occasions with both doctors present.

Evidence for Irreversible Brain Damage of Known Aetiology

- There should be no doubt that the patient's condition is due to irreversible brain damage of known aetiology.
- Occasionally it may take a period of continued clinical observation and investigation to be confident of the irreversible nature of the prognosis. The timing of the first test and the timing between the two tests should be adequate for the reassurance of all those directly concerned.
- It is suggested that there is a minimum of twenty-four hours, of continued clinical observation, in patients where anoxic damage following cardiorespiratory arrest, is the aetiology of the brain injury, and if treatment included induced hypothermia, the observation period should commence following re-warming to normothermia.

Children (one examining doctor should normally be a paediatrician or should have experience with children and one of the doctors should not be primarily involved in the child's care)

- **Older than 2 months:** This guideline can be used in children older than 2 months of age.
- **Between thirty seven weeks gestation to 2 months of age:** given the current state of knowledge, it is rarely possible to confidently diagnose brain-stem death in this age group.
- **Infants below 37 weeks gestation:** the concept of brain-stem death is inappropriate for infants in this age group.

Drugs

- The patient should not have received any drugs that might be contributing to the unconsciousness, apnoea and loss of brainstem reflexes (narcotics, hypnotics, sedatives or tranquillisers); nor should they have any residual effect from any neuromuscular blocking agents (atracurium, vecuronium or suxamethonium).
- Renal or hepatic failure may prolong metabolism / excretion of these drugs.
- Where there is any doubt specific drug levels should be carried out (midazolam should be less than < 10mcg/L, thiopentone <5mg/L), residual neuromuscular blockade should be tested for by peripheral nerve stimulation. Alternatively ancillary investigations may be used to confirm the clinical diagnosis.

Temperature, Circulatory, Metabolic or Endocrine Disorders

- If the core temperature is $\leq 34^{\circ}\text{C}$ brain stem testing cannot be carried out.
- Prior to testing the mean arterial pressure should be consistently >60mmHg (or age appropriate parameters for children) with maintenance of normocarbia and avoidance of hypoxia, acidaemia or alkalaemia ($\text{PaCO}_2 < 6.0\text{KPa}$, $\text{PaO}_2 > 10\text{KPa}$ and $\text{pH } 7.35 - 7.45$).
- Serum Na^+ should be between 115-160mmol/L; Serum K^+ should be $> 2\text{mmol/L}$; Serum PO_4^{3-} and Mg^{2+} should not be profoundly elevated ($> 3.0\text{mmol/L}$) or lowered ($< 0.5\text{mmol/L}$) from normal.
- Blood glucose should be between 3.0-20mmol/L and should be tested prior to each brain-stem test.
- If there is any clinical reason to expect endocrine disturbances then it is obligatory to ensure appropriate hormonal assays are undertaken.

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Brain Stem Reflexes

- Pupils should be fixed in diameter and unresponsive to light.
- There should be no corneal reflex (care should be taken to avoid damage to cornea).
- Nystagmus or any eye movement should not occur when each ear is instilled, over one minute, with 50mls of ice cold water, head 30°. Each ear drum should be clearly visualised before the test.
- There should be no motor response within the cranial nerve or somatic distribution in response to supraorbital pressure. Reflex limb and trunk movements (spinal reflexes) may still be present.
- There should be no gag reflex following stimulation to the posterior pharynx or cough reflex following suction catheter placed down the trachea to the carina.

Apnoea Test

- End tidal carbon dioxide can be used to guide the starting of each apnoea test but should not replace the pre and post arterial paCO_2 .
- Oxygenation and cardiovascular stability should be maintained through each apnoea test.
- **Ensure the $\text{paCO}_2 > 6.0 \text{ KPa}$ and the $\text{pH} < 7.4$.** In patients with chronic CO_2 retention, or those who have received intravenous bicarbonate, ensure the $\text{paCO}_2 > 6.5 \text{ KPa}$ and the $\text{pH} < 7.4$.
- Disconnect the patient from the ventilator and administer oxygen via a catheter in the trachea at a rate of $> 6 \text{ L/minute}$. If oxygenation is a problem consider the use of a CPAP circuit.
- There should be no spontaneous respiration within a minimum of 5 (five) minutes following disconnection from the ventilator.
- **Confirm that the PaCO_2 has increased from the starting level by more than 0.5 KPa .**
- At the conclusion of the apnoea test, manual recruitment manoeuvres should be carried out before resuming mechanical ventilation and ventilation parameters normalised.

Ancillary Investigations

- Ancillary investigations are **NOT** required for the diagnosis and confirmation of death using neurological criteria. Any ancillary or confirmatory investigation should be considered **ADDITIONAL** to the fullest clinical testing and examination to the best of the two doctors capabilities in the given circumstances.

Organ Donation

- National professional guidance advocates the confirmation of death by neurological criteria wherever this seems a likely diagnosis and regardless of the likelihood of organ donation.
- NICE guidance recommends that the specialist nurse for organ donation (SN-OD) should be notified at the point when the clinical team declare the intention to perform brain-stem death tests and this is supported by GMC guidance.

References

- Academy of Medical Royal Colleges (2008) "A Code of Practice for the Diagnosis and Confirmation of Death" <http://www.aomrc.org.uk>
- GMC (2010) "Treatment and care towards the end of life." www.gmc-uk.org/guidance/ethical_guidance/end_of_life_care.asp
- Heran *et al* (2008) "A review of ancillary tests in evaluating brain death." *Can J Neurol Sci*; 35:409–19
- NICE (2011) "Organ Donation for Transplantation" <http://guidance.nice.org.uk/CG135>
- Report from the Organ Donation Taskforce (2008) "Organs for Transplant" http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_082122
- Map of Medicine <http://organdonor.mapofmedicine.com/>
- Wijdicks E (2001) "The Diagnosis of Brain Death" *NEJM* 344:1215-21.

Form authorship and feedback

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