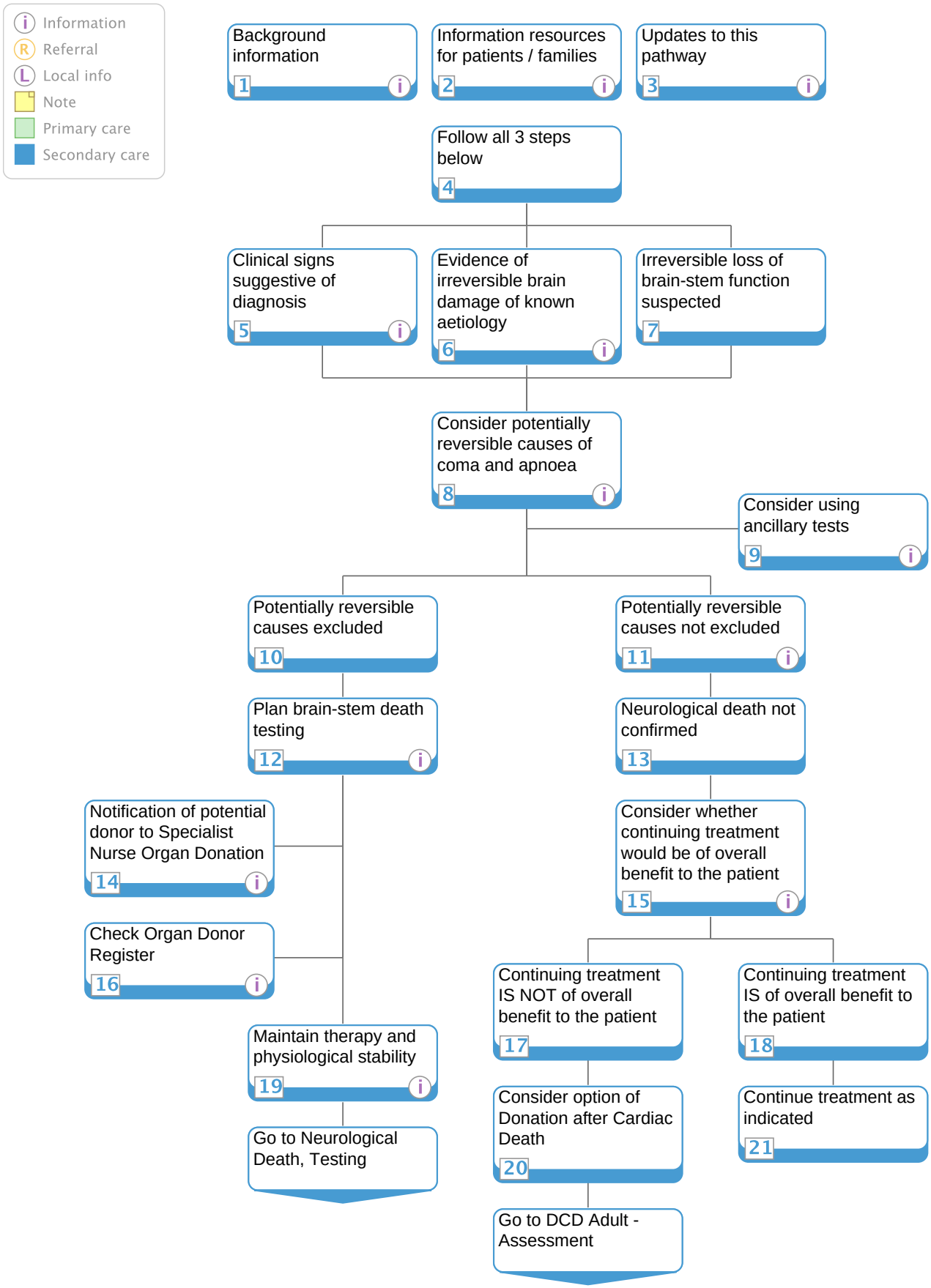
Neurological Determination of Death - Assessment and Planning, Adult

Medicine > General medicine > Neurological Determination of Death (Brain-stem Death), Adult



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IMPORTANT NOTE
Locally reviewed refers to the date of completion of the most recent review process for a pathway. All pathways are reviewed regularly every twelve months, and on an ad hoc basis if required. Due for review refers to the date after which the pathway on this page is no longer valid for use. Pathways should be reviewed before the due for review date is reached.

Neurological Determination of Death - Assessment and Planning, Adult

1 Background information

Quick info:

Neurological Determination of Death, Adult Pathway

Scope:

- Management of adult patients in whom brain-stem death is suspected.

Out of Scope:

- Paediatric patients. A clinical pathway for the neurological determination of death in paediatric patients will be available soon.

Background

- Death is considered to be a state in which an individual has simultaneously and irreversibly lost both the capacity for consciousness and the capacity to breathe. Various criteria can be used to confirm that an individual has reached the point of death, the application of which is determined by the specific clinical circumstances that are encountered. This pathway concerns the confirmation of death using neurological criteria and refers to a clinical state that is frequently referred to as brain-stem death or simply brain death. The UK criteria are based upon the premise that irreversible and complete loss of brain-stem function is sufficient of itself to result in the irreversible loss of the capacity to breathe and the capacity for consciousness, and hence use the term brain-stem death. However, guidance in many other parts of the world (e.g. North America, Australia) is concerned with whole brain death, and uses the term brain death.

Definition:

- Death following the irreversible cessation of brain-stem function.

Incidence and Prevalence:

- The incidence of patients diagnosed as dead using neurological criteria within the United Kingdom has fallen steadily since 2005.
- The UK Potential Donor Audit (PDA) that is conducted by NHS Blood and Transplant and NHS hospitals has examined the incidence of brain-stem death in the UK since 2003. The audit, which is restricted to patients aged 75 years or less and which excludes deaths on Cardiac ICUs, reveals that the number of patients (adult and paediatric) whose death is confirmed using neurological criteria has fallen from 1339 in 2004/5 to 1147 in 2008/9.
- Further information can be found at the NHS Blood and Transplant Annual Transplant Activity Report http://www.organdonation.nhs.uk/ukt/statistics/transplant_activity_report/transplant_activity_report.jsp

Reference:

Academy of Medical Royal Colleges. A Code of Practice for the Diagnosis and Confirmation of Death, October 2008. http://www.aomrc.org.uk/aomrc/admin/reports/docs/DofD-final.pdf

2 Information resources for patients / families

Quick info:

Information for families is available in Appendix 5 of 'A Code of Practice for the Diagnosis and Confirmation of Death', published by the Academy of Medical Royal Colleges:

The full document can be found at:

http://www.aomrc.org.uk/publications/reports-guidance/doc_download/42-a-code-of-practice-for-the-diagnosis-and-confirmation-of-death.html

3 Updates to this pathway

Quick info:

This is the first version of this pathway.

5 Clinical signs suggestive of diagnosis

Quick info:

All of the following clinical signs are required to suggest a possible diagnosis of brain-stem death:

- Patient is in a coma due to irreversible brain damage of known aetiology.
- Patient is ventilated

- Patient has fixed pupils, is apnoeic with no cough reflex or gag response.

Reference:

Academy of Medical Royal Colleges. A Code of Practice for the Diagnosis and Confirmation of Death, October 2008. http://www.aomrc.org.uk/aomrc/admin/reports/docs/DofD-final.pdf

6 Evidence of irreversible brain damage of known aetiology

Quick info:

- There should be no doubt that the patient's condition is due to irreversible brain damage of known aetiology.
- Data from the Potential Donor Audit reveals the following causes of brain- stem death in the UK:
  - spontaneous intracranial haemorrhage 62%
  - trauma 8%
  - hypoxic brain injury 9%
  - meningitis 3%
  - ischaemic stroke 6%
  - brain tumour 2%
  - miscellaneous 10%
- The nature of the primary diagnosis / cause of death is usually defined using a combination of clinical history and examination together with specific investigations such as CT or MR imaging, cerebral angiography, microbiological analysis of blood or cerebrospinal fluid and electroencephalography.

Reference:

Academy of Royal Medical Colleges. A Code of Practice for the Diagnosis and Confirmation of Death, October 2008. http://www.aomrc.org.uk/aomrc/admin/reports/docs/DofD-final.pdf

8 Consider potentially reversible causes of coma and apnoea

Quick info:

Consider the following prior to further examination:

- **Depressant drugs:** the recent history of what drugs have been ingested or administered should be carefully reviewed and any possibility of intoxication being the cause of the patient's comatose state should preclude a diagnosis of death. Drug intoxication represents a clinically significant reversible cause of coma, and may complicate assessment on occasions where patients have received infusions of sedative drugs as part of their critical care treatment and when their brain injury is a result of drug-induced self harm. The most problematic of circumstances are those where the identity of the intoxicating substances is unknown, where drug elimination is impaired by reduced hepato-renal function or where agents with long or context-sensitive half lives have been used. The recommended approaches to the problem of residual sedation include the following:
  - A period of observation that approximates to four times the elimination half life of the agent involved to allow effective drug elimination. This approach is best suited to circumstances where short acting agents such as propofol and alfentanil have been given to patients with normal hepatic and renal function.
  - The administration of specific antagonists such as flumazenil or naloxone in circumstances where the residual effects of opioids or benzodiazepines is suspected.
  - Plasma analysis to confirm that a suspected sedative is either not detected or at a sub-therapeutic level. This option is particularly suited for agents with long or unpredictable half lives such as thiopentone or phenobarbitone.
  - A confirmatory test to demonstrate the absence of cerebral blood flow. On occasions where plasma analysis is not available or the identity of the sedative drug is not known, clinicians may elect to supplement clinical evaluation with an assessment of cerebral blood flow, e.g. cerebral angiography, trans-cranial Doppler or radio-isotope perfusion scanning. It should be noted that whilst confirmatory tests that examine neurological electrical activity or responsiveness may be of use in other circumstances (for example, when access to the various brain-stem reflexes is restricted or when there is an associated high cervical cord injury that may confound interpretation of the apnoea test), the absence of electrical activity cannot be used to confirm death in circumstances where drug intoxication needs to be excluded.
  - Despite this general guidance, the revised Academy of Royal Medical Colleges Code of Practice remains permissive, and still gives a clinician the latitude to dismiss the influence of sedative agents in circumstances where there is independent evidence to suggest that the patient is brain-stem dead (e.g. on the basis of the CT head scan or a prolonged period of malignant intracranial hypertension).

- **Temperature, Circulatory or Metabolic or Endocrine Disorders: c**ore temperature should be > 34°C at the time of testing; temperatures between 32-34°C are occasionally associated with an impaired level of consciousness but brain-stem reflexes tend to be lost if the temperature falls below 28°C
- **Cardiorespiratory stability** should be achieved before testing (MAP>60mmHg, $PaCO_2$ <6.0 kPa, PaO_2 >10 kPa, pH 7.35 – 7.45)
- **Serum Na^+** should be between 115-160mmol/L. Note rate of change in sodium may be more relevant than it's absolute value
- **Serum K^+** should be > 2mmol/L
- **Serum PO_4^{3-} and Mg^{2+}** should be 0.5mmol/L – 3mmol/L
- **Blood glucose** should be between 3.0-20mmol/L
- **If an endocrine disturbance is suspected** (e.g. thyroid storm, myxoedema, Addisonian crisis), clinically appropriate hormonal assays should be undertaken
- **Abnormalities that are clearly the result of brain-stem death rather than its cause,** e.g. hypernatraemia that is a consequence of diabetes insipidus, do not preclude the application of clinical testing or the diagnosis of brain-stem death
- **Neuromuscular blocking agents or other causes of apnoea** (e.g. cervical cord injury, profound neuromuscular weakness)
- **Residual neuromuscular blockade** should be excluded by eliciting deep tendon reflexes and peripheral nerve stimulation. Alternatively ancillary investigations may be used to confirm the clinical diagnosis

9 Consider using ancillary tests

Quick info:

Ancillary Testing

The current Academy of Medical Royal College Code of Practice on the confirmation of death using neurological criteria is based upon the premise that this is a diagnosis that can be made clinically in the majority of cases and that only rarely should there by a need to consider a confirmatory investigation. It is similarly the case that there will be occasions when an experienced clinician may feel able to discount the relevance of potentially reversible influences such as residual sedation when there is independent evidence to suggest that the patient is brain dead (e.g. on the basis of the CT head scan or a prolonged period of malignant intracranial hypertension).

On rare occasions, clinicians may judge that brain-stem death cannot be diagnosed without an independent ancillary investigation of cerebral perfusion or function. 'A Code of Practice for the Diagnosis and Confirmation of Death' published by the Academy of Medical Royal Colleges offers the following guidance on 'ancillary testing' in paragraph 6.7:

'The accuracy of the clinical criteria for the diagnosis of death as a result of cessation of brain-stem reflexes over the past thirty years provides justification for not including the results of neurophysiological or imaging investigations as part of these criteria. However, death cannot be diagnosed by the testing of brain-stem reflexes alone in instances where a comprehensive neurological examination is not possible (e.g., extensive facio-maxillary injuries, residual sedation), where a primary metabolic or pharmacological derangement cannot be ruled out or in cases of high cervical cord injury (see section 5.3). In such cases a confirmatory test may reduce any element of uncertainty and possibly foreshorten any period of observation prior to formal testing of brain-stem reflexes.

'The various tests available, together with an assessment of their relative benefit and complexity, are listed in Appendix 3. All such investigations are prone to artifice and each has attracted its own literature defining false positive and negative rates. All ancillary investigations require appropriate training and experience both to perform and to interpret, which may not be available in all hospitals or outside normal office hours. Patients with the provisional diagnosis of irreversible cessation of brain-stem reflexes are frequently physiologically unstable and their transfer to another part of the hospital for further investigation may carry a significant risk, were the provisional diagnosis subsequently proven to be wrong. Where appropriate, such cases should be referred for a specialist neurological or neurosurgical opinion. In this situation, further time may be required before death may be confirmed. The increasingly widespread availability of spiral CT angiography may prove to be a helpful advance but further validation studies are required.'

Reference:

Academy of Medical Royal Colleges. A Code of Practice for the Diagnosis and Confirmation of Death, October 2008.
http://www.aomrc.org.uk/aomrc/admin/reports/docs/DofD-final.pdf

11 Potentially reversible causes not excluded

Quick info:

Consider likelihood and appropriateness of delaying brain-stem death testing until reversible causes can be excluded.

12 Plan brain-stem death testing

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Quick info:

- The diagnosis of death by brain-stem testing in adults should be made by at least two medical practitioners who have been registered for more than five years and are competent to undertake the tests.
- At least one of the doctors must be a Consultant.
- Testing should be undertaken by the doctors acting together. They must always be performed on two separate occasions. None of the doctors should have any conflict of interest and neither doctor should be a member of the transplant team.

Reference:

Academy of Medical Royal Colleges. A Code of Practice for the Diagnosis and Confirmation of Death, October 2008. http://www.aomrc.org.uk/aomrc/admin/reports/docs/DofD-final.pdf

14 Notification of potential donor to Specialist Nurse Organ Donation

Quick info:

Organ donation should be considered a normal part of end of life care. The option of organ donation must be explored in all suitable circumstances.

The Organ Donation Taskforce has recommended that the Specialist Nurse Organ Donation (SN-OD) be notified as soon as an intention to consider the diagnosis of brain-stem death has been made, i.e. before the tests are performed. If this has not already happened, notification should take place as soon as the diagnosis of brain-stem death has been confirmed.

Early referral and communication with the Donor Team will allow suitability for organ and / or tissue donation to be assessed. Ideally this should take place when the decision to test for brain-stem death is taken.

The only **absolute contra-indications** for organ donation are:

- known or suspected new variant Creutzfeldt–Jakob disease (nvCJD) and other neurodegenerative diseases associated with infectious agents
- known human immunodeficiency virus (HIV) disease (but not HIV infection alone)

In addition, it is highly likely that donors with the following conditions will also be declined, although there may be occasions when organs are accepted if the alternative for a specific recipient is imminent death (e.g. from fulminant hepatic failure):

- disseminated malignancy
- melanoma (except local melanoma treated > 5 years before donation)
- treated malignancy within 3 years (except non-melanoma skin cancer)
- age > 90 years
- known active tuberculosis
- untreated bacterial sepsis

On notification, the Specialist Nurse Organ Donation will typically ask for the following patient information:

- Name
- Date of birth
- Post code
- NHS no. or Community Heatlh Index no.
- Notifying clinician name, role and contact details
- Notifying hospital and unit
- Length of stay
- Primary diagnosis
- Significant clinical factors, e.g.
  - most recent urea and electrolyte and liver function test results
  - known virology
  - current instability
  - past medical history of note
  - past social history of note
- Blood group
- Next of Kin
- Next of kin location

- Other immediately relevant family information

Reference:

Department of Health. Organs for Transplants: A Report from the Organ Donation Task Force, 2008.http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_082122

15 Consider whether continuing treatment would be of overall benefit to the patient

Quick info:

This decision should:

- Be based upon a multi-disciplinary consensus that it would no longer be of overall benefit to the patient to continue or escalate life-sustaining cardio-respiratory support
- Be robust enough to bear objective scrutiny
- Adhere to a local policy on withholding and withdrawing treatment, based on national guidance
- Be documented, signed and dated in patient's notes
- Be fully independent from any subsequent discussion regarding organ donation
- Not involve members of staff potentially involved in transplantation of organs retrieved from the patient following death

Unless brought up by the family, the issue of donation should not be discussed until the decision to withdraw life-sustaining treatment has been accepted by the family.

Some hospitals will leave discussions regarding organ donation until a subsequent conversation.

Reference: 'Withholding and withdrawing - guidance for doctors', General Medical Council. http://www.gmc-uk.org/guidance/ethical_guidance/6858.asp

16 Check Organ Donor Register

Quick info:

The Organ Donor Register is checked for each referral and can be checked by:

- Specialist Nurse Organ Donation
- Any other healthcare professional, by phoning the NHS Blood and Transplant Duty Office on 0117 9757580 or 0117 9757581

Information needed to check the Organ Donor Register is:

- Name
- Date of Birth
- Address including Post code or NHS or Community Health Index No.

The Duty Office may phone back via Hospital switchboard to confirm identity and location of caller.

If required, the Duty Office can fax a copy of the Organ Donor Register entry to the donating Unit, in order to facilitate conversations with family members.

19 Maintain therapy and physiological stability

Quick info:

Brain-stem ischaemia is frequently associated with cardio-respiratory instability that is primarily the result of excessive release of endogenous catecholamines (the autonomic storm).

Guidance from the Academy of the Medical Royal Colleges indicates that it is necessary to maintain circulation and respiration prior to testing. The mean arterial pressure should be consistently >60mmHg with maintenance of normocarbia and avoidance of hypoxia, acidaemia or alkalaemia (PaCO2 <6.0KPa, PaO2 >10KPa and pH 7.35 –7.45).

Brain-stem dead patients are frequently hypovolaemic and relatively unresponsive to catecholamines. Haemodynamic stability can usually be achieved by cautious volume replacement and the introduction of a vasopressin infusion. Respiratory failure may be the result of aspiration of gastric contents or neurogenic pulmonary oedema; the latter may require aggressive lung recruitment, protective lung ventilation strategies and the use of high levels of PEEP.

Guidance from the Intensive Care Society and the Organ Donation Taskforce emphasises the importance of confirming the diagnosis of brain-stem death wherever it is suspected. The principles of physiological management in these circumstances are

similar to those that guide the physiological optimisation of the heart-beating brain-stem dead donor, further details on which can be found at: Management of brain-stem dead donor .

Reference:

Intensive Care Society. Guidelines for Adult Organ and Tissue Donation, 2004. Being updated in 2010 http://www.ics.ac.uk/intensive_care_professional/organ_and_tissue_donation_2005

Department of Health. Organs for Transplants: A Report from the Organ Donation Task Force, 2008 http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_082122

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Key Dates

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