Hospital: .....

NHS Blood and Transplant

Integrated Care Plan for the Referral and Consideration of Paediatric / Neonatal Deceased Organ and Tissue Donation

24 hr. referral service

[*add regional pager number*]

HOSPITAL ADDRESSOGRAPH or
Surname
First Name
Date of Birth
NHS Number

Provenance: This Integrated Care Plan was adapted and produced by a working party of the Paediatric Subgroup of the National Organ Donation Committee, NHSBT and ratified on 22/09/17. Comments should be directed to reinout.mildner@nhs.net or angie.scales@nhsbt.nhs.uk

Objective of Care:

- To ensure all families are given the opportunity to consider organ and/or tissue donation where appropriate, in line with GMC (2011) guidance.[1]
- To provide clinical guidelines for the management of children and infants from 37 weeks' gestational age and above who are potential organ and/or tissue donors.

Early identification of potential paediatric donors

Referral criteria as per NICE guidance (2011)[2] NHSBT best practice guidance (2012)[12] and local hospital policy

Identify potential organ donors as **early** as possible

Base identification on **either** of the following criteria, while recognising that clinical situations vary.

The **intention to withdraw life-sustaining treatment** in mechanically ventilated children with a life-threatening or life-limiting condition, which will, or is expected to, result in circulatory death.

A decision is made to perform neurological determination of death tests.

Initiate discussions with the specialist nurse for organ donation at the time the above criteria are met. **24 hr. referral service** [add regional pager number] Ensure this is discussed with the consultant in charge.

Clinically stabilise the child in an appropriate critical care setting while the assessment for donation is performed.

Provided that delay is in the patient's overall best interests, life-sustaining treatments should not be withdrawn or limited until the child and family's wishes around organ donation have been explored and the clinical potential for the child to donate has been assessed in accordance with legal[4] and professional[1,2,5,6] guidance.

The above referral criteria are in accordance with NICE (2011)[3] and NHSBT best practice guidance (2012).[8]

The NICE criteria also recommend the use of clinical trigger factors, to prompt *Early Identification and Referral*, in patients who have had a catastrophic brain injury, defined as: the absence of one or more cranial nerve reflexes (e.g. one fixed pupil) *and* a Glasgow Coma Scale score of 4 or less that is not explained by sedation unless there is a clear reason why the above clinical triggers are not met. NICE recognises that a proportion of the patients who are identified by these clinical triggers will survive. Contact between the clinical team treating the potential donor and the SN-OD before the decision has been made to withdraw life-sustaining treatment is ethically acceptable[4].

PAEDIATRIC / INFANT

Child's Name:	NHS Number:

Guidance and Accountability Notes for Using this Care Plan:

- This Care Plan must be read in association with any local guidelines or policies. All drugs are the responsibility of the prescribing physician and must be checked against any local pharmacy guidance.
- This Care Plan forms part of the child's record of care and is completed in addition to all other nursing and medical documentation. This Care Plan should be stored within the patient's medical notes.
- Care Plans are heavily informed by clinical knowledge and expertise. They are designed to assist clinical judgment, not replace it.
- Children fulfilling the NICE (2011) 'Early identification of potential donors' referral criteria as given at the front of this document, should be placed on this Care Plan.
- If a care activity is not fully completed, please give rationale in the relevant notes/variance section of the document.
- This Care Plan may be audited by the Hospital Trust.

Supporting Documentation and Evidence Based Best Practice used within this Care Plan: check for updates

1. GMC (2010) "Treatment and care towards the end of life." www.gmc-uk.org/guidance/ethical_guidance/end_of_life_care.asp
2. NICE (2011) "Organ Donation for Transplantation" http://guidance.nice.org.uk/CG135
3. UK DEC (2011) "An Ethical Framework for Controlled Donation after Circulatory Death" http://www.bts.org.uk/Documents/Publications/An%20Ethical%20framework%20for%20controlled%20donation%20after%20circulatory%20death%20-%20Full%20Report.pdf
4. Department of Health (2009) "Legal Issues Relevant to Non-heartbeating Organ Donation." www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_108825
5. DCD consensus meeting report, available from https://www.bts.org.uk/Documents/Guidelines/Active/DCD%20for%20BTS%20and%20ICS%20FINAL.pdf
6. Report from the Organ Donation Taskforce (2008) "Organs for Transplant" http://www.nhsbt.nhs.uk/to2020/resources/OrgansfortransplantsTheOrganDonorTaskForce1streport.pdf
7. Academy of Medical Royal Colleges (2008) "A Code of Practice for the Diagnosis and Confirmation of Death" http://www.bts.org.uk/Documents/A%20CODE%20OF%20PRACTICE%20FOR%20THE%20DIAGNOSIS%20 AND%20CONFIRMATION%20OF%20DEATH.pdf
8. HTA (2009) "Code of practice 2 - Donation of solid organs for transplantation" http://www.hta.gov.uk/legislationpoliciesandcodesofpractice/codesofpractice/code2donationoforgans.cfm
9. NHSBT (2013) "Donor Optimisation Guideline for the Management of the Brain-stem Dead Donor (Adult)." http://www.odt.nhs.uk/pdf/donor_optimisation_guideline.pdf
10. Academy of Medical Royal Colleges (2015.) Ethical issues in paediatric organ donation – a position paper by the UK Donation Ethics Committee (UKDEC).
11. NHS Blood and Transplant (2012) Timely Identification and Referral of Potential Organ Donors: A Strategy for Implementation of Best Practice.
13. NHS Blood and Transplant (2013) Approaching the Families of Potential Organ Donors: Best Practice Guidance.
14. College of Emergency Medicine and British Transplantation Society (2011) Report of a Workshop on The Role of Emergency Medicine in Organ.
15. PICS standards (2015) http://picsociety.uk/wp-content/uploads/2016/02/PICS_standards_2015_.pdf
16. RCPCH (2015). The diagnosis of death by neurological criteria (DNC) in infants less than two months old. http://www.rcpch.ac.uk/system/files/protected/page/DNC%20Guide%20FINAL.pdf
17. Larcher V. et al. on behalf of RCPCH (2015) Making Decisions to Limit Treatment in Life-limiting and Life-threatening Conditions in Children: a framework for practice. Arch Dis Child; 100: s1 - s23.

Child's Name:	NHS Number:

All staff recording in this document must complete the signature box below so that initials or signature only are needed throughout the Plan.

Print First Name and Surname	Role	Signature	Initial	Pager / Bleep, Location/Extension

Persons Responsible Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	1	**Potential Donor Identification** • Child meets NICE, 'Early identification of potential donors' referral criteria [2]. • Inform Consultant team(s) involved of planned referral to SN-OD • Discuss with SN-OD via 24-hour pager [*add regional pager no.*] Name of SN-OD spoken to: …… – Ensure you have the child's notes, including: NHS number/hospital number, date of birth, postcode, blood results and latest observations. – If appropriate the SN-OD will check the Organ Donation Register and advise on the child's status (or call **0117 – 975 7580**) – Member of SN-OD team will attend if agreed.

NOTES / VARIANCE

Child's Name:	NHS Number:

Date Time	Please follow the appropriate Potential Donor Care Plan below, as identified by the NICE 'Early identification of potential donors' referral criteria and as agreed by the SN-OD and Consultant (or most senior doctor if delegated).		
Persons Responsible Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	2	**A decision is made to perform neurological determination of death testing.** ☐ **Donation after Neurological Determination of Death (DBD) may be possible.** **Go to page 5**	**The intention to withdraw life-sustaining treatment in children with a life-threatening or life-limiting condition which will, or is expected to, result in circulatory death.** ☐ **Donation after Circulatory Death (DCD) may be possible.** **Go to page 15**
		Tissue Donation may be possible. **Go to page 23**	**No Donation possible.** **Go to page 24**
		Early Notification of Potential Donor, please re-refer when… (Please detail plan for re-referral below)	**Other. (Please document below)**

NOTES / VARIANCE

PAEDIATRIC / INFANT

Child's Name:	NHS Number:

Donation after Neurological Determination of Death (DBD)

Date Time	**Activity Number**	**Activity**
Persons Responsible Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	**DBD 1**	**Referral Check** • A decision is made to perform neurological determination of death testing. • Check SN-OD has been notified (SN-OD may attend). • The SN-OD will begin assessing the patient's suitability for donation prior to discussion with the family. • Ensure the child's Consultant teams involved in care have been informed.

Date Time	**DBD 2**	**Normal homeostasis is maintained until neurological determination of death testing (NDT) is appropriate.** • Maintain mandatory and protective ventilation (Tidal Volume (VT) 6-8mls/kg), • Maintain $PaCO_2$ 5.0-6.5 kPa, pH 7.35 –7.45 or [H+] 45-35 nmols/L and PaO2 8-14 kPa or SaO2 >95% on minimal FiO_2. • Maintain Mean Arterial Pressure (MAP) appropriate for age. Consider insertion of central line and start inotropes. If central access is deemed inappropriate, start peripheral inotrope infusion. • Aim Na 130-155mmol/L and monitor for signs of Diabetes Insipidus (DI): If DI, administer DDAVP or vasopressin infusion (for doses see page 12). Consider IV fluids as per local fluid resuscitation guideline. • If there are any plans to carry out ancillary investigations or drug levels, explore early.
Persons Responsible Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**		

NOTES / VARIANCE

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	**DBD 3**	**Discussion with family regarding plan for neurological determination of death testing.** (See Appendix 1) • Doctor, Nurse and SN-OD plan the discussion with the family in advance and prepare for neurological determination of death testing. • SN-OD (if present) is introduced to the family where appropriate and agreed with clinician. Example: "[SN-OD Name] is a specialist nurse who supports families in this situation." • Discussion of donation is **not initiated** at this time unless initiated by the family. See **Appendix 1.** • Neurological death testing is explained to the family by the Doctor and SN-OD. It is important the family understand that the neurological death tests may confirm that their child has died. • Family offered the option to witness neurological determination of death testing.
NOTES / VARIANCE		

Date Time Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	**DBD 4**	**Preparation for neurological determination of death testing** **Refer to Diagnosis of Death using Neurological Criteria testing form** (See Appendix 2a / b) • **Prepare Equipment** – Pen torch – Gauze – 50ml bladder syringe, inco-pad / kidney bowl (to collect injected water) – Ice cold water – Otoscope with ear pieces – Yankauer sucker – Suction catheter + oxygen tubing / appropriate anaesthetic hand ventilation circuit (if PEEP required) – Blood gas syringes (pre and post apnoea test x2) **Prepare the Patient** • Prior to neurological testing the following ABG should be maintained at PaCO2 < 6.0 kPa, PaO2 >10 kPa and pH 7.35 - 7.45. • Pre-oxygenation and ABG should be adjusted as per guidance prior to the apnoea testing element of the tests (see ref 7 &16).

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	**DBD** **5**	**1st and 2nd neurological determination of death testing undertaken** One of the examining doctors should be a consultant, additionally in children, one of the doctors 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. A complete set of tests should be performed on each occasion, i.e., a total of two sets of tests will be performed. The tests, in particular the apnoea test, are therefore performed only twice in total. Whilst NDT may be carried out 12-24 hours apart, there is no requirement for this and this should not be prolonged. See **Appendix 2a /b** for an abbreviated testing forms, which has been endorsed for use by UK PICS and the Paediatric Subgroup of the National Organ Donation Committee. This is designed for use by clinicians experienced in confirming death using neurological determination of death criteria. **Consider carrying out a recruitment manoeuver after each apnoea test.**

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DBD 6**	**1st and 2nd tests consistent with neurological death?** **Yes** • Nurse, Doctor and SN-OD inform family the outcome of the neurological determination of death tests, as per plan. • Family given time to accept the result. • Rarely, organ donation may be discussed at this stage if deemed appropriate. Usually, this requires another meeting if the family is not deemed ready (see DBD 7). **No** • Nurse, Doctor and SN-OD inform family the outcome of the neurological death test, as per plan. • If the plan is to retest at a later time, it is advised to start a new Deceased Donation Plan. • If retesting not planned, consider Donation after Circulatory Death (DCD) and start DCD Plan (page 15).	☐ **YES** ☐ **NO**

NOTES / VARIANCE

Child's Name:	NHS Number:

Contraindications to Deceased Organ Donation
Are best decided through consultation with the SN-OD

Date Time Dr / Nurse **Achieved** ☐ **Signature / Initial the Box**	**DBD 7**	**Approach regarding organ donation** (See Appendix 1) **Planning** The SN-OD will have checked the Organ Donation Register and is able to advise on the patient's status. • A multi-disciplinary team should plan the approach. This may include local faith representative(s) and/or family support worker where relevant. • **Clarify any coronial / legal or safeguarding issues.** If subject of a child safeguarding investigation, notify key professionals as per local policy at this stage. Document outcome in medical notes. • Identify key family members. • Identify a setting suitable for private and compassionate discussion. **The approach** • Doctor, Nurse and SN-OD (and others as agreed) approach the family. • **Confirm understanding of the results of the neurological death tests and that death has occurred, before discussing donation.** • Once professionals involved agree that the family has understood and is felt to be ready, information is given on process of end of life care including organ donation and the family is given the opportunity to ask questions. • If the family needs time on their own, the SN-OD remains available to provide support to the family and the staff.

NOTES / VARIANCE

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** **Signature/ Initial the Box**	**DBD 8**	**Outcome of family decision** • Document outcome of family decision • SN-OD will take consent / authorisation, undertake child assessment with family and will answer any outstanding questions.
NOTES / VARIANCE		

PLEASE CONTINUE BASED ON OUTCOME OF FAMILY DECISION				
Date Time Doctor **Achieved** **Signature/ Initial the Box**	**DBD 9**	**Proceeding with DBD** **Continue**	**Tissue Only Donation Pathway** **Go to page 23**	**No Donation Pathway** **Go to page 24**

Date Time Dr / Nurse **Achieved** **Signature/ Initial the Box**	**DBD 10**	**Consent / authorisation and formal clarification of any outstanding coronial / legal or safeguarding issues.** • Further discussion with family, Nurse and SN-OD. • Consent / authorisation and child assessment paperwork completed. In case of neonate, maternal assessment as appropriate. • Consultant and/or SN-OD will seek approval from H.M. Coroner / Procurator Fiscal, if required and not previously clarified, and document any discussion in the medical notes.
NOTES / VARIANCE		

Child's Name:	NHS Number:

Date Time Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DBD 11**	**Initial investigations** Additional blood samples and investigations, including tissue typing and microbiology, will be required as advised by SN-OD. SN-OD will advise on quantity, will arrange requesting and arrange transport of samples as required.

Date Time Dr / Nurse / SN-OD **Achieved** ☐ **Signature/ Initial the Box**	**DBD 12**	**To assess cardiac and/or respiratory function (SN-OD will advise if not required)** • Request CXR and document findings. • ECG performed post neurological death confirmation and reported by a senior clinician. • ECHO performed post neurological death confirmation and findings documented. Cardiologist or Echo technician to clarify with SN-OD which measurements are required.

  For Information only	**DBD 13**	**SN-OD Activities – For information only** • Detailed physical examination completed by SN-OD with the support of the bedside nurse. • Organ/tissue matching commenced (can be a prolonged process (>6 hours) and SN-OD will advise on progress). • External Organ Retrieval Teams organised plus Local Theatres and Anaesthetist where required. • SN-OD to keep family informed and supported.

Proceed to Donor Optimisation

Donor Optimisation Care Bundle – Paediatric (37 wks CGA - 15 yrs)

Patient Name_____ Date of Birth_____

Unit Number_____ Date _____

Cardiovascular

	Y	N/A
1. Monitor cardiovascular state aim for normal parameters[1]	☐	■
2. Measure CVP (4 – 10 mmHg) (if suitable access available)	☐	☐
3. Review intravascular fluid status and correct hypovolaemia with isotonic fluid boluses (10mls/kg aliquot)	☐	■
4. Measure central venous oxygen saturation (maintain >70%)	☐	■
5. Measure cardiac output if appropriate (non-invasive monitoring is appropriate if availiable)	☐	☐
6. Commence vasopressin where vasopressor required, wean or stop catecholamine pressors as able	☐	☐
7. Commence dopamine / noradrenaline to maintain MAP as required	☐	☐
8. Introduce adrenaline / dobutamine if echo indicates poor cardiac function	☐	☐
9. Consider esmolol / labetalol in cases of persistent hypertension in the absence of vasopressors.	☐	☐

Respiratory

(>1 month old - pH > 7.25 $PaO_2 \geq 10$ kPa)

(37wk CGA - <1 month old pH >7.2 PaO2 >8kPa)

1. Perform lung recruitment manoeuvres (following apnoea tests, disconnections, suctions, de-saturations).	☐	■
2. Review ventilation, ensure lung protective strategy (Tidal volumes 6– 8ml/kg (< 1month old 4-6mls/kg) and optimum PEEP (5 – 10 cm H_2O), PIP <30cmH_20)	☐	■
3. Maintain regular chest physio incl. suctioning as per unit protocol	☐	■
4. Maintain 30 – 45 degrees head of bed elevation	☐	■
5. If appropriate use a cuffed endotracheal tube and ensure it is adequately inflated (consider changing to cuffed tube if indicated)	☐	☐
6. Patient positioning (side, back, side) as per unit protocol	☐	■
7. Where available, and in the context of lung donation, perform bronchoscopy, bronchial lavage and - toilet for therapeutic purposes	☐	☐

Fluids and metabolic management

	Y	N/A
1. Review fluid administration. IV crystalloid maintenance fluid (or NG water where appropriate) to maintain Na^+ < 150 mmol/l	☐	■
2. Maintain urine output between 1.0 – 2.0ml/kg/hr (If > 4ml/kg/hr, consider Diabetes insipidus and treat promptly with vasopressin and/or DDAVP.)	☐	■
3. Administer methylprednisolone	☐	■
4. Start insulin infusion if necessary to maintain blood sugar (4 –12 mmol/l)	☐	■
5. Continue NG feeding as appropriate, ensure prescribed gastric protection as unit policy	☐	☐
6. Correct electrolyte abnormalities (maintain Na, K, Ca, Phos, and Mg within normal ranges)	☐	■

Thrombo-embolic prevention

1. Ensure prevention measures in place as per unit policy	☐	☐

Lines, Monitoring and Investigations (if not already completed)

1. Insert arterial line	☐	■
2. Continue hourly observations as per critical care policy	☐	■
3. Perform CXR (post recruitment procedure where possible)	☐	■
4. Perform a 12-lead ECG	☐	■
5. Send Troponin level in all cardiac arrest cases (and follow-up sample where patient in PICU > 24 hours)	☐	☐
6. Where available, perform an echocardiogram	☐	☐

Other

1. Maintain normothermia using active warming /cooling where required	☐	■
2. Review and stop all unnecessary medications	☐	■
3. Consideration for blood sampling volumes [2]	☐	■
4. Family considerations and support throughout	☐	■

Donor optimisation care bundle - paediatric Bibliography / References

1. European Paediatric Advanced Life Support 4th ed (2016). European Resuscitation Council. Lippincott Williams & Wilkins

2. SOP 5058 – Neonatal and Infant Organ Donation

3. Rozenfeld V, Cheng JW. The role of vasopressin in the treatment of vasodilation in shock states. Ann Pharmacother. 2000; 34:250-4

4. Ralston.C & Butt. W Continuous vasopressin replacement in diabetes incipidus. Arch Dis. Child. 1990 65; 896-897 doi 10.1136/adc.65.8.896

5. Malleroy GB Jr, Schecter MG, Elidemir O, Management of the Paediatric Organ donor to optimise lung donation. Paediatric Pulmonol. 2009 Jun; 44(6):536-46

5. Paediatric Formulary Committee. *BNF for Children* (2015 -2016) London: BMJ Group, Pharmaceutical Press, and RCPCH Publications; (2015)

6. Optimisation care bundle http://www.odt.nhs.uk/pdf/dbd_care_bundle.pdf

7. Shemie. S Organ donation management in Canada; recommendations of the forum on medical management to optimise donor organ potential. 2006. Mar 14; 174(6):s13-s30

Systolic BP - Age specific ranges (mmHg) – EPALS guidance[1]	
0-1 month	50-60 mmHg
1-12 months	70-80 mmHg
1-10 years	70+(2 x age(yrs)) to 90+(2 x age(yrs))
> 10 yrs	90-120 mmHg

Drug	**Standard infusion**	**Diluent**	**Rate of infusion**	**Dose**
Dopamine	15mg/kg in 50mls (max 800mg in 50ml)	NaCl 0.9% OR Glucose 5%	1ml /hr = 5 micrograms/kg/min	<10 micrograms/kg/min
Noradrenaline	0.3mg / kg in 50mls (max concentration 8mg in 5ml)	Glucose 5%/ Na Cl 0.9%	1ml/hr = 0.1 micrograms/kg/min (of standard infusion)	0-0.5 micrograms/kg/min (maximum rate = 5mls/hr of standard infusion)
Vasopressin/ Argipressin	20 units in 50ml diluent	NaCl 0.9% / Glucose 5%	0.0003 units/kg/min = 0.045ml/kg/hr	0.0003-0.001units/kg/min (Max dose 6 u/hr)[3]
Vasopressin – treatment for Diabetes Insipidus [4]	2-5 units / litre diluent	NaCl 0.9% / Glucose 5%	ml for ml replacement of urine output	N/A
Adrenaline	0.3mg /kg in 50ml	Glucose 5%	1 ml /hr = 0.1micrograms/kg/min (of standard infusion)	0-0.5micrograms/kg/min
Dobutamine	30mg/kg in 50mls	Glucose 5%, 10% / Nacl 0.9%	1ml/hr = 10micrograms/kg/min	5-20 micrograms/kg/min

Esmolol	10mg/ml (pre-diluted)	50-300 micrograms/kg/min (max 500 micrograms/kg/min)	IV continuous infusion – titrated to response
Labetalol	5mg/ml (neat)	0.5 – 3 milligrams/kg/hr (max 5 milligrams/kg/hr)	IV continuous infusion – titrate to response

Drug	**Dose**	**Administration**
Methylprednisolone	15milligrams/kg (max 1g)	IV infusion over 1 hour
DDAVP (desmopressin)	1 month – 12 years 400 nanograms 12-18 years 1-4 micrograms	IV bolus
Insulin (50 units in 50ml)	0.1units/kg/hr	IV continuous infusion – titrated to response

Donor Optimisation Care Bundle – Paediatric (37 wks CGA - 15 yrs)

Patient Name_____ Date of Birth_____

Unit Number_____ Date _____

Physiological Parameters / Goals Tick ✓ = achieved, x = not achieved Contact SNOD / Recipient Centre for advice and / or support

	O/A	+1hr	+2hrs	+4hrs	+6hrs	+8hrs	+10hrs	+12hrs	+14hrs	+16hrs	+18hrs
Target Systolic BP (primary goal) ……mmHg	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
CVP 4 – 10 mmHg (secondary goal)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
$PaO_2 \geq 10.0$ kPa (>1month) (37wk CGA - < 1month old PaO2 >8 kPa and pH> 7.2) $FiO_2 < 0.4$ as able	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
$PaCO_2$ 5 – 6.5 kPa (or higher as long as pH > 7.25)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mixed central venous oxygen saturation >60%	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cardiac index > 2.5 - 6 l/min/m^2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
$ScvO_2$ > 70%	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
SVRI 400– 1200 dynes*sec/cm^5/m^2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Temperature 36 – 37°C	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Blood glucose 4.0 – 12 mmol/l	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Maintain Na < 150mmol/l	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Urine output 1- 2 ml/kg/hour	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Signature / Print Name											
Date / Time											

Date Time Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DBD 14**	**Mementos** • Mementos (handprints, and locks of hair offered). If requested these are facilitated by the Nurse and SN-OD at an appropriate time. • Offer spiritual or religious support – consider baptism or appropriate religious/cultural ceremony
Child's Name:		NHS Number:

Date Time Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DBD 15**	**Organ Retrieval** • Organ retrieval operation • Last offices performed as per local policy. • Family are given the option to return to see their child following the retrieval and participate in last offices.

Date Time Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DBD 16**	**Final Activities** • Patient transferred to the mortuary. • If tissues to be donated this will be facilitated in the mortuary as agreed. • SN-OD will provide donation outcome information to staff and family as agreed.

Child's Name:	NHS Number:

Donation after Circulatory Death (DCD)

Date Time	Activity Number	Activity
Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 1**	**The Withdrawal Decision** • The intention is to withdraw life-sustaining treatment in a child with a life-threatening or life-limiting condition, which will, or is expected to, result in *imminent* circulatory death. • Two senior doctors, who should both have been registered for at least five years, and at least one of whom should be a consultant, should verify that further active life-sustaining treatment is no longer of overall benefit to the patient[3]. • Ensure the child's Consultant team(s) is (are) informed of and in agreement with withdrawal of life sustaining treatment (WLST) decision and referral for potential DCD. • Consultant has documented the above clearly in the patient's medical notes, including the planned method of withdrawal.

NOTES / VARIANCE

Child's name	NHS Number

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 2**	**Referral Check** • Check SN-OD has been notified. • SN-OD will assess and advise on medical suitability for DCD • The SN-OD will check the Organ Donation Register and advises on the patient's status. • If suitable, SN-OD will attend. • If medically unsuitable for DCD, tissue donation may still be possible. Tissue services can be contacted on **01514279813** or in Scotland the SNBTS should be contacted on **07659107029.** Alternatively contact can be made via the SN-OD **[** *add regional pager no* **]**. See Tissue Only Donation Pathway (page 23).

Contraindications to Deceased Organ Donation – if yes proceed to DCD 6
(These are best decided through consultation with the SN-OD)

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 3**	**Family discussion regarding withdrawal decision (See Appendix 1)** **These activities are best explored in conjunction with DCD 4.** • SN-OD (if present) introduced to family where appropriate and agreed with clinician. • Consultant undertakes full explanation to the family of why the multidisciplinary team believes that WLST is in the overall benefit of their child. • If family is accepting and in agreement with the withdrawal of life sustaining treatment, Consultant undertakes explanation of the withdrawal process. Alternatively, this may require another meeting if the family is not deemed ready. • This must be documented clearly in the patient's medical notes, including the planned method of withdrawal. • Do not resuscitate order should be in place, according to local policy.

NOTES / VARIANCE

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 4**	**Approach regarding organ donation** **(See Appendix 1)** **Planning** • The SN-OD will check the Organ Donation Register and advise on the patient's status, if not done so already. • A multi-disciplinary team should plan the approach. This may include local faith representative(s) and/or family support worker where relevant. • **Clarify any coronial / legal or safeguarding issues**. If subject of a child safeguarding investigation, notify key professional as per local policy at this stage. Document outcome in medical notes. • Identify key family members. • Identify a setting suitable for private and compassionate discussion. **The approach** • Doctor, Nurse and SN-OD approach the family (rarely this may form part of the initial conversation as per DCD 3 but more usually is decoupled from that conversation according to family's acceptance and understanding). • **Confirm understanding and acceptance of the plan to withdraw life-sustaining treatment, before discussing donation.** • Once professionals involved agree that the family has understood and is felt to be ready, information is given on process of end of life care including organ donation and the family is given the opportunity to ask questions. • If the family needs time on their own, the SN-OD remains available to provide support to the family and the staff.

NOTES / VARIANCE

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 5**	**Outcome of family decision** • Doctor, SN-OD and Nurse return to family (as agreed) to answer further questions and hear outcome of family decision. • Document outcome. • SN-OD will take consent / authorisation, undertake child assessment with family and will answer any outstanding questions.

Child's Name:	NHS Number:

PLEASE CONTINUE BASED ON OUTCOME OF FAMILY DECISION				
Date Time Dr / nurse **Achieved** **Signature/ Initial the Box**	**DCD 6**	**Proceeding with DCD** **Continue**	**Tissue Only Donation Pathway** **Go to page 23**	**No Donation Pathway** **Go to page 24**

Date Time Dr / Nurse **Achieved** **Signature/ Initial the Box**	**DCD 7**	**Consent / authorisation and formal clarification of any outstanding coronial / legal or safeguarding issues.** • Further discussion with family, Nurse and SN-OD • Consent / authorisation and child assessment paperwork completed. • Consultant and/or SN-OD will seek approval from H.M. Coroner / Procurator Fiscal, if required and not previously clarified, and document any discussion in the medical notes.

NOTES / VARIANCE

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 8**	**New care plan and treatment goals** • The child will continue to be cared for as per local end of life guidance and in accordance with GMC and RCPCH guidance.[1,17] • **Treatment decisions must continue to be in the child's best interests.** In a child whose family wants him/her to be a donor, actions to facilitate donation will usually be in the child's best interests provided the actions do not cause harm or distress, or place them at significant risk of experiencing harm or distress.[10] • Decide on place of continued care / place of withdrawal of life-sustaining treatment as per local agreement. • The end of life care plan for a child on the DCD care plan should include a plan for how to proceed if the time to death following WLST is incompatible with successful donation, and the family and all staff (donor and retrieval teams) should be fully informed. • SN-OD and Consultant agree physiological goals and limits of premorbid interventions (e.g. inotropes & fluid for BP management, FiO2). Goals and Limits agreed: …… …… …… **A useful guide to timelines and responsibilities of the team can be seen in Appendix 3.** • Any request for further investigations on behalf of the retrieval team (e.g. ABG on 100% O2, CXR) requires consultant approval (or most senior medical doctor if delegated) and this may require further discussion with family.

Date Time Nurse **Achieved** ☐ **Initial the Box**	**DCD 9**	**Initial investigations** • Additional blood samples and investigations, including tissue typing and microbiology, will be required as advised by SN-OD. • SN-OD will advise on quantity and will arrange requesting, and arrange transport of samples as required.

Child's Name:	NHS Number:

Date Time **For informa-tion only**	**DCD 10**	**SN-OD Activities – For information only** • Detailed physical examination completed by SN-OD with the support of the bedside nurse. • Patient registered with ODT duty office as a donor. • Organ/tissue matching commenced (can be a prolonged process (>6 hours) and SN-OD will advise on progress). • Positive microbiology may limit or exclude donation, SN-OD to advise. • External Organ Retrieval Teams organised plus Local Theatres and Anaesthetist. (No anaesthetist required unless lung donation). • SN-OD to keep family informed of provisional timings to enable them to prepare for WLST.

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 11**	**Family Care** • Mementos (handprints, and locks of hair offered). If requested these are facilitated by the Nurse and SN-OD at an appropriate time. • Offer spiritual or religious support – consider baptism or appropriate religious/cultural ceremony

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 12**	**Withdrawal** • When retrieval team have set up in theatre, the nominated medical personnel will prepare the family for WLST. • **The process of organ donation must not compromise the child's comfort and dignity at the end of life.** • Comfort measures should be administered or continued as per usual practice, local end of life guidelines and in accordance with GMC guidance[1] and RCPCH guidance[17]. • WLST as per agreed plan. Any concerns from the team should be escalated to the Consultant in charge. • The bed and bed area prepared for transfer to theatre. • Family who wish to be present are in attendance. • Clinician is available to diagnose and confirm death. **Time of Withdrawal of Life-Sustaining Treatment:** Date……Time…… • SN-OD will notify retrieval team of exact time of WLST. • Family kept updated and supported throughout by the bedside nurse and SN-OD. • SN-OD will make discrete observations of child's monitors. • Family will be informed when asystole occurs.

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 13**	**Confirmation of Death** Death will be diagnosed following 5 minutes of monitored asystole and in accordance to the AoMRC Code of Practice[7] **Time of Death:** Date……Time…… Prolonged time from WLST to asystole may preclude solid organ donation. SN-OD will advise on this. Following confirmation of death, the child will immediately be transferred to theatre, as agreed with the family.

Date Time **For Information only**	**DCD 14**	**Organ Retrieval – For information only** • The organ retrieval operation will be carried out by the National Organ Retrieval Team (NORS) and an anesthetist may be requested to support tracheal intubation where DCD lung donation is occurring. • Additional guidance regarding this will be made available from the SNOD. • This is supported by SN-OD and where appropriate other NHSBT staff

Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**DCD 15**	**If the time to death following treatment withdrawal is incompatible with successful transplantation** • As per DCD 8, the end of life care guide should include how to proceed if the time to death following WLST is incompatible with successful transplantation. • Tissue donation may still be possible. See Tissue Only Donation (see page 23).

Child's Name:	NHS Number:

Date Time Dr / Nurse **Achieved** **Signature/ Initial the Box**	**DCD 16**	**Final Activities** • Last offices performed as per local policy. • Family are given the option to return to see their child following the retrieval and participate in last offices. • Child transferred to the mortuary or other place of care as agreed in advance such as hospice. • If tissues to be donated this will be facilitated in the mortuary as agreed. See Page 23. • SN-OD will provide donation outcome information to staff and family as agreed.

Child's Name:	NHS Number:

Tissue Only Donation Pathway

Date Time	Activity Number	Activity
Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**TD 1**	**All deceased children can be referred / considered for Tissue Donation.** National Referral Centre (NRC) for Tissue Donation is available on pager (24 hours) **01514279813.** In Scotland SNBTS can be contacted on **07659107029.** A comprehensive assessment will need to be made to ensure Tissue Donation is possible, so please have the notes, and child's charts with you including: • GP information • Past medical history • Next of Kin Contact Details • Medication & Fluids administered in the last few days on ICU • The NRC will advise if the child can be considered for potential tissue donation and advise on the subsequent sequence of events • **NRC will not contact the family without their knowledge, so a discussion regarding the option for tissue donation will need to occur.** This discussion can be held with the family by a member of the nursing or medical team as deemed appropriate. • Document the outcome of discussion with the family & inform NRC of the outcome as agreed **In the case of non-proceeding DCD** if the SN-OD has taken consent / authorisation for tissue donation from family then copies of consent / authorisation, and Patient Assessment document to stay with the patient if transferred to the ward, and ward staff at handover to be made aware that the National Referral Centre (NRC) must be contacted when the child dies. Paperwork to accompany the patient to the mortuary. **Time of Death:** Date……Time…… • Last offices performed • Mementos (handprints, and locks of hair offered). If requested these are facilitated by the Nurse and/or SN-OD at an appropriate time. **If tissue donation is to proceed, the child must be transferred to the mortuary within 6 hours of death.** **Time of Transfer to Mortuary:** Date……Time……

PAEDIATRIC / INFANT – Tissue Only

Child's Name:	NHS Number:

No Donation Pathway		
Date **Time**	**Activity Number**	**Activity**
Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**ND 1**	**Family Care** • Document outcome of any discussion with family. • Family thanked for considering donation, if appropriate. • Mementos (handprints, and locks of hair offered). If requested these are facilitated by the Nurse and/or SN-OD at an appropriate time. • Offer spiritual or religious support. • If appropriate, inform local Eye Retrieval Nurse of family decision not to donate to prevent second contact.
Date Time Dr / Nurse **Achieved** ☐ **Signature/ Initial the Box**	**ND 2**	**Life-sustaining treatment withdrawn.** • SN-OD may remain present to support family and staff.
Date Time Dr / Nurse / SN-OD **Achieved** ☐ **Signature/ Initial the Box**	**ND 3**	**Last Offices performed as per local policy.** • Child transferred to the mortuary or other agreed lace of care such as hospice.

Child's Name:	NHS Number:

Date and Time	Activity Number	MDT Notes	Signature / Initial

GLOSSARY

ABG	Arterial Blood Gas
AoMRC	Academy of Medical Royal Colleges
AST	Aspartate aminotransferase
BSD	Brain Stem Death
BP	Blood Pressure
Ca	Calcium
CJD	Creutzfeldt–Jakob Disease
CVC	Central Venous Catheter
CVP	Central Venous Pressure
CPP	Cerebral Perfusion Pressure
CXR	Chest X-Ray
DDAVP	Desmopressin
DCD	Donation after Circulatory Death
DI	Diabetes Insipidus
DVT	Deep Vein Thrombosis
ECG	Electrocardiogram
ECHO	Echocardiography
FBC	Full Blood Count
FiO_2	Fraction of Inspired Oxygen
GMC	General Medicine Council
GTN	Glyceryl Trinitrate
HTA	Human Tissue Authority
HTA (2004)	Human Tissue Act (2004)
HIV	Human Immunodeficiency Virus
K	Potassium
kPa	Kilopascal
PaO_2	Partial Pressure of Oxygen
$PaCO_2$	Partial Pressure of Carbon Dioxide
PEEP	Positive End Expiratory Pressure
RIJ	Right Internal Jugular
MAP	Mean Arterial Pressure
MC&S	Microscopy, Culture and Sensitivity
MDT	Multi-disciplinary Team
Mg	Magnesium
mmHg	Millimetres of Mercury
Na	Sodium
NHSBT	NHS Blood and Transplant
NICE	National Institute for Health and Clinical Excellence
O_2	Oxygen
ODT	Organ Donation & Transplantation
SN-OD	Specialist Nurse-Organ Donation
SpO_2	Pulse Oximeter Oxygen Saturation
T3	Triiodothyronine
VT	Tidal Volume
WLST	Withdrawal of life sustaining treatment

Appendix 1:
Approaching the families of potential donors

Planning

Who: Consultant, SN-OD and nurse

Why:

- Clarify clinical situation
- Seek evidence of prior consent (eg ODR or other)
- Identify key family members by name
- Define key family issues
- Agree a process of approach and who will be involved
- Agree timing and setting, ensuring these are appropriate to family needs
- Involve others as required, eg faith leaders

When and where: in private and before meeting the family to confirm understanding and acceptance of loss.

Confirming understanding and acceptance of loss

Potential DBD donor: ensure the family understand that death has occurred. Spend time with the concept, using diagrams or scans if necessary.

Potential DCD donor: ensure the family understand and accept the reasons for treatment withdrawal and the inevitability of death thereafter. Donation should only be raised at this point if it is clear that a family has understood and accepted their loss. If this is not the case, suggest a break.

Discussing donation

Only consider the transition to organ donation when it is clear that a family have accepted their loss and are ready to consider the next steps.

- Provide specific information on process before expecting a response
- Avoid negative, apologetic, manipulative or coercive language
- Emphasise the benefits of transplantation – the ability to save lives
- Sensitively explore an initial 'No', some of which are a result of misconceptions.
- **For patients on the ODR, or who have given their legal consent in other ways, eg donor card:** sensitively explain that consent for donation has already been given; do not mislead the family into believing that their consent is also required
- **For patients whose wishes are not known in advance:** use open questions to ascertain patient's and family's wishes; avoid styles that focus exclusively upon the wishes of the patient (because the law passes responsibility for decision making to the family when the patient's wishes are not known).

Appendix 2a: Form for Neurological Determination of Death 2 months – 18 years old

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, Paediatric Intensive Care Society and National Organ Donation Committee: Paediatric Subgroup.

HOSPITAL ADDRESSOGRAPH or

Surname
First Name
Date of Birth
NHS

Primary Diagnosis:

Evidence for Irreversible Brain Damage of Known Aetiology:

Diagnostic caution is advised in certain 'Red Flag' patient groups. See Page 3 for details

Exclusion of Reversible Causes of Coma and Apnoea				
	1st Test Dr One	1st Test Dr Two	2nd Test Dr One	2nd 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 ≤34°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 (e.g. cervical injury, any neuromuscular weakness)?	Yes / No	Yes / No	Yes / No	Yes / No

Tests for Absence of Brain-Stem Reflexes				
	1st Test Dr One	1st Test Dr Two	2nd Test Dr One	2nd Test Dr Two
Do the pupils react to light?	Yes / No	Yes / No	Yes / No	Yes / No
Is there any eyelid movement when each cornea is touched in turn?	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**
Is there any eye movement during or following caloric testing in each ear?	**Yes / No**	**Yes / No**	**Yes / No**	**Yes / No**

Patient Name: **NHS Number:**

Apnoea Test				
	1st Test Dr One	**1st Test Dr Two**	**2nd Test Dr One**	**2nd Test Dr Two**
Arterial Blood Gas pre apnoea test check: (Starting $PaCO_2 \geq 6.0$ kPa and starting pH <7.4)	**1st Test Starting $PaCO_2$:** **Starting pH:**		**2nd 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: $PaCO_2$ should rise > 0.5 kPa .	**1st Test Final $PaCO_2$:** ***Perform lung recruitment***		**2nd Test Final $PaCO_2$:** ***Perform lung recruitment***	
Document any Ancillary Investigations Used to Confirm the Diagnosis or any required Clinical Variance from AoMRC (2008) Guidance				

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 1st Test indicates death due to the absence of brain-stem reflexes. **Death is confirmed following the 2nd Test.**	**Date:** **Time:** **Dr One** **Name** **Grade** **GMC Number** **Signature** **Dr Two** **Name** **Grade** **GMC Number** **Signature**	**Date:** **Time:** **Dr One** **Name** **Grade** **GMC Number** **Signature** **Dr Two** **Name** **Grade** **GMC Number** **Signature**

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 and RCPCH Guidance

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. Both doctors should be competent in the diagnosis of death by neurological criteria it is recommended that one of the doctors should be a paediatrician and at least one should be a consultant.

Testing should be performed completely and successfully on two occasions with both doctors present. Doctor One may perform the tests while Doctor Two observes; this would constitute the first set. Roles may be reversed for the second set.

Diagnostic caution is advised in the following 'Red Flag' patient groups.
(Based on the literature and unpublished case reports.)

1. Testing **<6 hours** of the loss of the last brain-stem reflex
2. Testing **<24 hours** where aetiology primarily anoxic damage
3. **Hypothermia** (24-hour observation period following re-warming to normothermia recommended)
4. Patients with **any neuro-muscular disorders**
5. **Steroids** given in space occupying lesions such as abscesses
6. Prolonged **fentanyl** infusions
7. Aetiology **primarily** located to the **brain-stem or posterior fossa**

Evidence for Irreversible Brain Damage of Known Aetiology

- There should be no doubt that the child'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. **If in doubt wait and seek advice.**

Drugs

- The child should not have received any drugs that might be contributing to the unconsciousness, apnoea and loss of brainstem reflexes (narcotics, hypnotics, sedatives or tranquillisers). Where there is any doubt specific drug levels should be carried out (midazolam less than < 10mcg/L, thiopentone <5mg/L). Alternatively consider ancillary investigations.
- There should be no residual effect from any neuromuscular blocking agents (atracurium, vecuronium or suxamethonium), consider the use of peripheral nerve stimulation.
- Renal or hepatic impairment and immaturity may prolong metabolism / excretion of these drugs.

Temperature, Circulatory, Metabolic or Endocrine Disorders

- Prior to testing aim for: temperature > 34°C, mean arterial pressure should be consistently maintained at age appropriate levels, maintenance of normocarbia and avoidance of hypoxia, acidaemia or alkalaemia (PaCO2 <6.0 kPa, PaO2 >10 kPa and pH 7.35-7.45).
- Serum Na^+ should be between 115-160 mmol/L; Serum K^+ should be > 2 mmol/L; Serum PO_4^{3-} and Mg^{2+} should not be profoundly elevated (>3.0 mmol/L) or lowered (<0.5 mmol/L) from normal.
- Blood glucose should be between 3.0-20 mmol/L before 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.

Brain Stem Reflexes

- Pupils should be fixed in diameter and unresponsive to light.
- There should be no corneal (blink) reflex (care should be taken to avoid damage to cornea).
- Eye movement should not occur when each ear is instilled, over one minute, with 20 -50 mls 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.
- **Confirm $PaCO_2$ ≥6.0 kPa and pH < 7.4.** In patients with chronic CO_2 retention, or those who have received intravenous bicarbonate, confirm $PaCO_2$ >6.5 kPa and the pH <7.4 .
- Either use a CPAP circuit (eg Mapleson C or Ayres T piece) or disconnect the patient from the ventilator and administer oxygen via a catheter in the trachea at a rate of 2-6L/minute.
- 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 carried out 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 and PICS Standards 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.

Further Reading

Academy of Medical Royal Colleges (2008) "A Code of Practice for the Diagnosis and Confirmation of Death" www.aomrc.org.uk

GMC (2010) "Treatment and care towards the end of life." www.gmc-uk.org

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" www.nice.org.uk

Report from the Organ Donation Taskforce (2008) "Organs for Transplant" www.webarchive.nationalarchives.gov.uk

Paediatric Intensive Care Society (2014) "PICS Organ Donation Standards" http://picsociety.uk/resources/

Wijdicks E (2001) "The Diagnosis of Brain Death" NEJM 344:1215-21

Form authorship and feedback

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Appendix 2b: Form for Neurological Determination of Death in infants < 2 months old

This form is consistent with and should be used in conjunction with, the AoMRC[1] (2008) *A Code of Practice for the Diagnosis and Confirmation of Death* and RCPCH (2015) *The diagnosis of death by neurological criteria in infants less than two months old*[2] and has been endorsed for use by the following institutions: Paediatric Intensive Care Society and National Organ Donation Committee: Paediatric Subgroup.

HOSPITAL ADDRESSOGRAPH or

Surname
First Name
Date of Birth
NHS

Examining Doctors
The diagnosis of death by neurological criteria should be made by at least two medical practitioners. Both medical practitioners should have been registered with the General Medical Council (or equivalent Professional Body) for more than five years and be competent in the assessment of a patient who may be deceased following the irreversible cessation of brain-stem function and competent in the conduct and interpretation of the brain-stem examination. Both doctors should be competent in the diagnosis of death by neurological criteria, both should be paediatricians or paediatric intensivists and one should be a consultant. Clinicians unfamiliar with the test should seek advice from Neonatal or Paediatric Intensivists in Regional Units. Testing should be undertaken by the nominated doctors acting together and must always be performed on two occasions. A complete set of tests should be performed on each occasion, i.e., a total of two sets of tests will be performed. Doctor One may perform the tests while Doctor Two observes; this would constitute the first set. Roles may be reversed for the second set. The tests, in particular the apnoea test, are therefore performed only twice in total.
Preconditions
The following preconditions should be met prior to testing: • The infant is comatose and mechanically ventilated for apnoea.[1] • The diagnosis of structural brain damage has been established or the immediate cause of coma is known and in particular: ➢ Drugs are not the cause of coma ➢ Neuromuscular blockade has been demonstrably reversed ➢ Hypothermia does not exist (temp >34°C) ➢ There is no endocrine or metabolic disturbance that could be the primary cause of the state of unresponsiveness.[1] An additional precondition to be taken in this patient population: • In post-asphyxiated infants, or those receiving intensive care after resuscitation, whether or not they have undergone hypothermia, there should be a period of at least 24 hours of observation during which the preconditions necessary for the assessment for DNC should be present before clinical testing for DNC. If there are concerns about residual drug-induced sedation, then this period may need to be extended.[2]

Diagnostic caution is advised in the following 'Red Flag' patient groups. (Based on the literature and unpublished case reports.) For advice in difficult circumstances contact the local or regional Clinical Lead for Organ Donation, or regional paediatric / neonatal intensive care unit.

1. Testing **<6 hours** of the loss of the last brain-stem reflex	4. Patients with **any neuro-muscular disorders**	6. Prolonged **fentanyl** infusions
2. Testing **<24 hours** where aetiology primarily anoxic damage	5. **Steroids** given in space occupying lesions such as abscesses	7. Aetiology **primarily** located to the **brain-stem or posterior fossa**
3. **Hypothermia** 24-hour observation period following re-warming to normothermia		

Evidence for Irreversible Brain Damage of Known Aetiology

- There should be no doubt that the infant'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. **If in doubt wait and seek advice**.

Drugs

- The infant should not have received any drugs that might still be contributing to the unconsciousness, apnoea and loss of brainstem reflexes (narcotics, hypnotics, sedatives or tranquillisers). Where there is any doubt specific drug levels should be carried out (midazolam less than <10 mcg/L, thiopentone <5 mg/L).
- There should be no residual effect from any neuromuscular blocking agents (atracurium, vecuronium or suxamethonium), consider the use of peripheral nerve stimulation.
- Renal or hepatic impairment and immaturity may prolong metabolism / excretion of these drugs.

Temperature, Circulatory, Metabolic or Endocrine Disorders

- Prior to testing aim for: temperature >34°C, mean arterial pressure should be consistently >37mmHg, maintenance of normocarbia and avoidance of hypoxia, acidaemia or alkalaemia ($PaCO_2$ <6.0 kPa, PaO_2 >10 kPa and pH 7.35–7.45).
- Serum Na^+ should be between 115-160 mmol/L; Serum K^+ should be >2 mmol/L; Serum PO_4^{3-} and Mg^{2+} should not be profoundly elevated (>3.0 mmol/L) or lowered (<0.5 mmol/L) from normal.
- Blood glucose should be between 3.0-20mmol/L before 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.

Brain Stem Reflexes

- Pupils should be fixed in diameter and unresponsive to light.
- There should be no corneal (blink) reflex (care should be taken to avoid damage to cornea).
- Eye movement should not occur when each ear is instilled, over one minute, with 20-50 mls 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 Testing

- End tidal carbon dioxide can be used to guide the start 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.
- **Confirm $PaCO_2$ ≥5.3 kPa**
- Either use a CPAP circuit (e.g. Neopuff or Ayres T piece) or disconnect the patient from the ventilator and administer oxygen via a catheter in the ETT at a rate of 2-6 L/minute.
- There should be no spontaneous respiration over the time period required for the child's pCO2 to rise. It is recommended that the period of observation should be at least 5 minutes providing haemodynamic stability can be maintained.
- **Confirm that the $PaCO_2$ has increased from the starting level by more than 2.7 kPa to greater than 8.0 kPa**. The lack of spontaneous respiratory effort in response to this hypercarbic stimulus is the most important clinical observation during the apnoea test in this population of patients.
- At the conclusion of the apnoea test, manual recruitment manoeuvres should be carried out before resuming mechanical ventilation and ventilation parameters normalised.

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.[3,4,6]

- NICE guidance and PICS Standards 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.[3,4,5]

References

1. Academy of Medical Royal Colleges (2008) "A Code of Practice for the Diagnosis and Confirmation of Death" www.aomrc.org.uk
2. Royal College of Paediatrics and Child Health (2015) "The diagnosis of death by neurological criteria in infants less than two months old" www.rcpch.ac.uk
3. GMC (2010) "Treatment and care towards the end of life." www.gmc-uk.org
4. NICE (2011) "Organ Donation for Transplantation" www.nice.org.uk
5. Report from the Organ Donation Taskforce (2008) "Organs for Transplant" www.webarchive.nationalarchives.gov.uk
6. Paediatric Intensive Care Society (2014) "PICS Organ Donation Standards" http://picsociety.uk/resources/

Form authorship and feedback

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Primary Diagnosis:

Evidence for Irreversible Brain Damage of Known Aetiology:

Diagnostic caution is advised in certain 'Red Flag' patient groups. See Page 1 for details.

Exclusion of Reversible Causes of Coma and Apnoea				
	1st Test Dr One	1st Test Dr Two	2nd Test Dr One	2nd Test Dr Two
Is the coma due to depressant drugs? Drug Levels (if taken):	Yes / No	Yes / No	Yes / No	Yes / No
Is the infant's body temperature ≤34°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 (*e.*g. cervical injury, any neuromuscular weakness)?	Yes / No	Yes / No	Yes / No	Yes / No

Tests for Absence of Brain-Stem Reflexes				
	1st Test Dr One	1st Test Dr Two	2nd Test Dr One	2nd Test Dr Two
Do the pupils react to light?	Yes / No	Yes / No	Yes / No	Yes / No
Is there any eyelid movement when each cornea is touched in turn?	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
Is there any eye movement during or following caloric testing in each ear?	Yes / No	Yes / No	Yes / No	Yes / No

Apnoea Test				
	1st Test Dr One	1st Test Dr Two	2nd Test Dr One	2nd Test Dr Two
Arterial Blood Gas pre apnoea test check: (Starting $PaCO_2 \geq 5.3$ kPa)	**1st Test Starting $PaCO_2$:**		**2nd Test Starting $PaCO_2$:**	
Arterial Blood Gas Result post apnoea test: $PaCO_2$ shows a clear raise of >2.7 kPa (>20 mmHg) above the baseline to >8.0 kPa (60 mmHg).	**1st Test Final $PaCO_2$:** ***Perform lung recruitment***		**2nd Test Final $PaCO_2$:** ***Perform lung recruitment***	
Was there spontaneous respiration during the apnoea test? **(To diagnose death using neuro-logical criteria, ALL answers should be NO)**	**Yes / No**	**Yes / No**	**Yes / No**	**Yes / No**

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 1st Test indicates death due to the absence of brain-stem reflexes. **Death is confirmed following the 2nd Test.**	**Date:** **Time:** **Dr One** **Name** **Grade** **GMC Number** **Signature** **Dr Two** **Name** **Grade** **GMC Number** **Signature**	**Date:** **Time:** **Dr One** **Name** **Grade** **GMC Number** **Signature** **Dr Two** **Name** **Grade** **GMC Number** **Signature**

Appendix 3: Timelines and Responsibilities in Donation after Circulatory Death as per the UK Donation Ethics Committee[4]