# Guideline

## Stabilisation and transfer of an infant with a suspected duct-dependent cardiac lesion

## 1 Scope

For use within the Acute Neonatal Transfer Service (ANTS) for the East of England.

## 2 Purpose

To provide guidance for the safe management of infants with suspected duct-dependent lesions during transfer to a cardiac centre.

## 3 Definitions and abbreviations

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| ANTS | Acute Neonatal Transfer Service |
| CATS | Children's Acute Transport Service |
| ECG | electrocardiograph |
| Echo | echocardiograph |
| TGA | transposition of the great arteries |

## 4 Introduction

Most infants in the East of England with suspected duct-dependent cardiac lesions will be transferred by CATS to a cardiac centre for further management. On occasion however, ANTS may be asked to undertake these transfers either because:

1) The infant is otherwise stable eg suspected coarctation of the aorta, on prostin, with stable cardiorespiratory parameters.

2) The infant is unstable and CATS are unable to respond in a timely manner eg suspected transposition of the great arteries (TGA).

The decision to undertake these transfers will be made on a case by case basis following careful discussion between the referring consultant and the ANTS and CATS consultants, ideally via a conference call.

Cardiac lesions may have been diagnosed antenatally or present within the first few days of life. Some of the differential diagnoses include:

- **Duct dependent systemic circulation:**

  - Coarctation of the aorta
  - Critical aortic stenosis
  - Hypoplastic left heart syndrome

- **Duct dependent pulmonary circulation:**
  - Pulmonary atresia
  - Critical pulmonary stenosis
  - Tricuspid atresia
  - Tetralogy of Fallot

- **Duct dependent pulmonary and systemic circulation:**
  - Transposition of great arteries

- **Differential diagnosis of cyanosis:**
  - Persistent Pulmonary Hypertension of the Newborn (PPHN)
  - Primary pulmonary disease
  - Sepsis
  - Metabolic disorders
  - Methaemoglobinaemia

## 5 History and examination

**Duct-dependent cardiac lesions are a heterogeneous group of conditions and can therefore present in a variety of ways**:

- Cyanosis not improving despite supplemental oxygen
- Acute cardiorespiratory collapse with cardiogenic shock and/or hypoxia
- Apnoea
- Feeding difficulties due to increased breathlessness
- Signs of heart failure: eg tachycardia, tachypnoea, hepatomegaly
- Murmur (not always present)
- Absent/ weak femoral pulses

**Important details to be taken at time of referral include:**

- Antenatal scans and family history
- History of labour, delivery and resuscitation
- Time course of signs/ symptoms
- Cyanosis - present from birth or time of onset
- Perfusion, pulses and four limb blood pressures
- Presence of murmur
- Presence of hepatomegaly

- Blood gases and lactate levels
- Chest X-ray: cardiac ratio, contour and vasculature
- ECG if suspicion of arrhythmia (rarely diagnostic of individual lesions)
- Echo findings if available

## 6 Stabilisation - check ABC

**Airway and breathing**:

- Indications for intubation:
  - Apnoea
  - Shock
  - Severe respiratory failure
- If intubated, ensure baby is well sedated e.g. with a morphine infusion at 10-30mcg/kg/hr.
- Monitor pre and post ductal saturations (right hand and either foot) – this may help to differentiate between cyanotic cardiac lesions and PPHN.
- Discuss saturation target with a paediatric cardiologist – the appropriateness of supplemental oxygen will be dependent on the underlying diagnosis.
- Consider a trial of inhaled Nitric Oxide if pulmonary hypertension is suspected.
- Gas: monitor $pCO_2$ and lactate.

**Circulation**:

- Ensure good IV access (site umbilical lines if possible or 2 x IV cannulae).
- Treat hypotension initially with 10mls/kg of normal saline.
- If persistent hypotension, start Dopamine (can be started peripherally) then further inotropes guided by response and discussion with ANTS consultant/ paediatric cardiologist.
- Echocardiogram if possible at referring centre.
- 4 limb blood pressure.
- ECG if concerns regarding possible arrhythmia.

**Use of Prostaglandin E2 (Dinoprostone)**:

- Commence at 5-10 nanograms/ kg/ minute to maintain duct patency.

- Can be run centrally or peripherally but needs dedicated line (not to be run with other infusions).
- Higher doses (up to 100 nanograms/kg/minute) may be needed to re-open a duct that has closed – these should only be given on the advice of a paediatric cardiologist.
- Side effects include:
  - Hypotension
  - Hypoglycaemia (check blood sugar 2 hourly initially)
  - Apnoea (usually at doses >10nanograms/kg/minute)
    - this may prompt intubation prior to transfer
  - Fever

## 7 Potential complications during stabilisation & transfer

- **Apnoea**
  - rarely occurs with prostaglandin doses <10nanograms/kg/min.
  - usually responds to stimulation/airway positioning but may require additional respiratory support.
- **Acute desaturation episode**
  - Assess chest movement/air entry for respiratory causes e.g. blocked ETT, secretions, pneumothorax.
  - Check that prostin infusion is running at correct dose with no leaks.
  - Is there an associated drop in blood pressure? This may be the primary problem and the saturations may improve once this is rectified – consider a fluid bolus or increase in inotrope dose.
  - Use caution when increasing the $FiO_2$ in response to desaturation as this may actually be deleterious in some cardiac lesions. It can cause rapid changes in pulmonary vascular resistance, leading to pulmonary overcirculation and a subsequent drop in systemic blood pressure.
- **Hypotension**
  - Check all infusions are running and at the correct dose.
  - Consider a fluid bolus and/or increase in inotrope dose.
  - Consider repeating a gas to exclude significant acidosis as a contributing factor – improving the pH by optimising ventilation and/ or giving sodium bicarbonate may improve efficacy of the inotropes.
- **Cardiac arrhythmias**

- Congenital cardiac lesions place infants at increased risk of arrhythmias. Whilst these are relatively uncommon, they may be problematic and occur more frequently in certain lesions e.g. Ebstein's anomaly.
- Infants with significant/ prolonged arrhythmias are likely to be moved by the CATS team but if encountered unexpectedly during transfer, seek urgent advice from the ANTS consultant who will liaise with the paediatric cardiologist. It may be appropriate to divert to the nearest NICU to stabilise the infant.

## 8 Monitoring compliance with and the effectiveness of the document

The ANTS team will monitor compliance with this document by undertaking regular audits which will be reported back to the consultants and lead nurse.

The effectiveness of the document will be monitored by review of any reported incidents via the lead nurse for risk. These incidents will be shared with the team and consideration given to adjusting the guideline if concerns are identified.

## 9 References

1. Children's Acute Transport Service guideline:http://site.cats.nhs.uk/wp-content/uploads/2016/01/cats_chd_2015.pdf
2. Auckland District Healthboard Newborn Guidelines: http://www.adhb.govt.nz/newborn/Guidelines/Cardiac/AntenatallyDiagnosedCHD.htm
3. NCCU Clinical Guidelines, Neonatal Cardiac Conditions, King Edward Memorial/ Princess Margaret Hospitals, Perth, Western Australia: http://www.kemh.health.wa.gov.au/services/nccu/guidelines/index.htm#sec14

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