

NHS Children's Acute Transport Service



Clinical Guideline

Extracorporeal Membrane Oxygenation (ECMO) Referrals

Document Control Information

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Document Version	Version 3	Replaces Version	June 2013
First Introduced		Review Schedule	Annual
Active Date	January 2016	Next Review	January 2018
CATS Document Number			
Applicable to	All CATS employees		

Children's Acute Transport Service provides paediatric intensive care retrieval for Great Ormond Street, The Royal Brompton and St Mary's NHS Trusts. Funded and accountable to the North Thames Paediatric Intensive Care Commissioning Group through Great Ormond Street NHS Trust.

Cats_ecmo_2013



Introduction

There are four National paediatric centres offering ECMO for respiratory support in the UK: GOSH, Glenfield in Leicester, Yorkhill in Glasgow and the Freeman in Newcastle. There are two additional centres; Alderhey in Liverpool and Birmingham Children's Hospital if the national centres have no bed capacity. Referrals for ECMO can be made through CATS - a conference call will then be set up between the CATS and ECMO Consultants on-call.

No child will be accepted or refused for ECMO retrieval without discussion with the ECMO consultant on call.

1. Assessment

ECMO may be considered for children with the following conditions:

Respiratory or cardio-respiratory failure resulting from:

- Meconium aspiration syndrome
- Persistent pulmonary hypertension of the newborn
- Pneumonia
- Sepsis
- ARDS
- Congenital diaphragmatic hernia with severe barotrauma/air leak
- Cardiac disease including cardiomyopathy, myocarditis, arrhythmias or post-cardiac surgery

Criteria for ECMO referral:

- Failure to respond to maximal conventional treatment
- Disease is thought to be reversible (unless bridge-to-transplant)
- <10 days of high pressure ventilation (this is not absolute)
- Weight > 2.0 kg
- Newborn > 35 weeks gestation
- Oxygenation index >25
- Severe barotrauma (PIE, chest drains)
- No contraindication to systemic anticoagulation (intracranial haemorrhage)
- No lethal congenital abnormalities
- No irreversible organ dysfunction including neurological injury
- No major immunodeficiency

Information required from the referring hospital includes:

- Age, weight, gestation, diagnosis
- Any history of arrest or hypoxia/ischaemia, including duration
- Duration and type of ventilation, (conventional/HFOV) and settings.
- Oxygenation index (mean airway pressure x FiO₂ x 100)/PaO₂ (in mmHg)
- Lowest pH/worst ABG, most recent ABG and SpO₂ (pre- and post-ductal)
- Other treatments tried (iNO, magnesium)
- Cardiovascular drugs/inotropes
- USS head
- Lab results - FBC, coagulation profile, U&Es, LFTs, serum lactate
- ECHO & ECG if performed

2. Initial management

- 2.1 Sedate and muscle relax
- 2.2 100% O₂
- 2.3 Ensure no leak around ETT
- 2.4 CXR (ETT position, lung fields, pneumothoraces)
- 2.5 Optimise ventilation (increase mean airway pressure by increasing PEEP to 8-10 cm H₂O; increase inspiratory time)
- 2.6 Start iNO if available
- 2.7 Alkalinise with NaHCO₃ if pCO₂ permits (or consider THAM). Aim for pH >7.35.
- 2.8 Volume expansion, inotropic support, and vasopressors should be used to maintain mean BP in the upper limit of normal range for age (aim is to achieve Mean arterial BP > Pulmonary Pressure).
- 2.9 Consider magnesium sulphate bolus, initially 50mg/kg over 20–30 minutes (watch for hypotension) – if effective repeat dose +/- intravenous infusion (max serum magnesium level 5mmol/litre).
- 2.10 Consider surfactant if not already given.

3. Transport considerations

- 3.1 Speak to the family, give them ECMO information sheet & obtain consent for ECMO assessment. Emphasis that ECMO is a form of support not treatment.
- 3.2 Check ETT position. Ensure no ETT leak.
- 3.3 Commence / continue iNO 20ppm.

- 3.4 Ensure adequate sedation and paralysis.
- 3.5 Insert chest drain for air leak prior to transfer.
- 3.6 Maintain blood pressure at upper limit of normal range for age. Use volume expansion, inotropes and vasopressors.
- 3.7 Check central line/arterial line positions where appropriate

As a guide listed below are the survival to discharge for some of the more common conditions requiring ECMO support & the risks associated with ECMO.

Survival to hospital discharge figures (from ELSO registry international data Jan 2015)

Neonatal

Condition	Survival to discharge
MAS	94 %
RDS	84 %
PPHN	77 %
Sepsis	73 %
Air leak	74 %
Pneumonia	58 %
Congenital Diaphragmatic Hernia	51 %

Paediatric - respiratory

Condition	Survival to discharge
Aspiration pneumonia	68 %
Infective pneumonia (bacterial & viral)	59 – 65 %
ARDS	54 – 62 %
Acute respiratory failure	54 %

Risks:

Bleeding	5 – 10%
Brain damage – Severe	5%
- Mild to Moderate	20 – 25%
Severe mechanical problems with ECMO	5-10%
Infection	5-10%

4. Transport considerations – logistics

- 4.1 ECMO retrievals will include some of the sickest children you will transfer.
If you do not feel confident to undertake the retrieval on your own ask for a consultant to accompany you.
- 4.2 ECMO retrievals are often from distant locations and require air transportation. Refer to “Air Transport” guideline for details.
- 4.3 If the retrieval time is likely to be long, make sure you take food and water for the team. A tired, hungry team is unlikely to be effective. Look after yourselves.