



## Clinical Guideline

# Extracorporeal Membrane Oxygenation (ECMO) Referrals

### Document Control Information

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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.

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## Introduction

There are six National paediatric centres offering ECMO for respiratory support in the UK: GOSH, Glenfield in Leicester, Yorkhill in Glasgow and the Freeman in Newcastle, Alderhey in Liverpool and Birmingham Children's Hospital.

All referrals for respiratory ECMO should be made through CATS - a conference call will then be set up between the CATS and ECMO Consultants on-call. Subsequent calls can be made following this process until an ECMO bed is identified.

Currently there are no commissioned regional or national paediatric mobile ECMO services.

**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
- Paediatric cardiac patients requiring assessment by the Heart Failure / Transplant teams

**Criteria for ECMO referral:**

- Failure to respond to maximal conventional treatment
- Disease is thought to be reversible (unless bridge-to-transplant)
- <14 days of high pressure ventilation
- Weight > 2.0 kg
- Newborn > 34 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, perinatal history where relevant
- Any history of arrest or hypoxia/ischaemia, including duration
- Duration and type of ventilation, (conventional/HFOV) and settings, presence of air leak
- Oxygenation index (mean airway pressure x FiO<sub>2</sub> x 100)/PaO<sub>2</sub> (in mmHg)
- Lowest pH/worst ABG, most recent ABG and SpO<sub>2</sub> (pre- and post-ductal)
- Other treatments tried (iNO, magnesium, prostin, antibiotics)
- Cardiovascular drugs/inotropes
- USS head
- End organ function
- Lab results - FBC, coagulation profile, U&Es, LFTs, serum lactate
- ECHO & ECG if performed

## 2. Initial management

- Sedate and muscle relax
- 100% O<sub>2</sub>
- Ensure no leak around ETT
- CXR (ETT position, lung fields, pneumothoraces)
- Optimise ventilation/oxygenation (increase mean airway pressure by increasing PEEP to 8-10 cm H<sub>2</sub>O; increase inspiratory time) whilst observing lung protective measures.
- Start iNO if available
- Alkalinise with NaHCO<sub>3</sub> if pCO<sub>2</sub> permits (or consider THAM). Aim for pH >7.35.
- 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).
- 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).
- Consider surfactant if an neonate

### 3. Transport considerations

- Speak to the family, give them ECMO information sheet & obtain consent for ECMO assessment. Emphasis that ECMO is a form of support not treatment.
- Check ETT position. Ensure no ETT leak.
- Commence / continue iNO 20ppm.
- Ensure adequate sedation and paralysis.
- Insert chest drain for air leak prior to transfer.
- Maintain blood pressure at upper limit of normal range for age. Use volume expansion, inotropes and vasopressors.
- 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 2017)

#### Neonatal

Condition	Survival to discharge
MAS	93 %
RDS	83 %
PPHN	76 %
Sepsis	72 %
Air leak	73 %
Pneumonia	57 %
Congenital Diaphragmatic Hernia	50 %

#### Paediatric - Respiratory

Condition	Survival to discharge
Aspiration pneumonia	67 %
Infective pneumonia (bacterial & viral)	59 – 65 %
ARDS	54 – 62 %
Acute respiratory failure	55 %

#### Risks

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