NHS CATS
Children's Acute Transport Service

Clinical Guideline

Extracorporeal Membrane Oxygenation (ECMO) Referrals

Document Control Information

Author	M O'Callaghan, T Thiruchelvam E Randle, L Chigaru	**Author Position**	ECMO Coordinator, CICU Consultant CATS Consultants
Document Owner	M Clement	**Document Owner Position**	CATS Operational and Nursing Lead
Document Version	Version 7	**Replaces Version**	Version 6
First Introduced	2006	**Review Schedule**	2 yearly
Active Date	2026	**Next Review**	2028
CATS Document Number			
Applicable to	All CATS employees		

Introduction

There are six nationally commissioned paediatric centres offering ECMO for respiratory support in the UK: GOSH, Glenfield in Leicester, Yorkhill in Glasgow, the Freeman in Newcastle, Alder Hey in Liverpool and Birmingham Children's Hospital. Other centres provide cardiac ECMO and may provide support when capacity is required.

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 transport 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 +/- barotrauma/air leak
- Persistent pulmonary hypertension of the newborn +/- barotrauma/air leak
- Congenital diaphragmatic hernia
- Pneumonia
- Sepsis
- ARDS
- Airway anomalies
- Paediatric cardiac patients requiring assessment by the Heart Failure / Transplant teams
- Acute decompensated heart failure/ Cardiogenic shock

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 > 36 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 including prenatal risk stratification and parental counselling 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_2 x 100)/PaO_2 (in mmHg)
- Lowest pH/worst ABG, most recent ABG and SpO_2 (pre- and post-ductal)
- Other treatments tried (iNO, surfactant, magnesium, prostin, antibiotics)
- Cardiovascular/vasoactive drugs
- USS head (neonates)
- End organ function
- Lab results - FBC, coagulation profile, U&Es, LFTs, serum lactate
- CXR, ECHO & ECG if performed

2. Initial management for neonatal hypoxic respiratory failure.

- Sedate and muscle relax
- 100% O_2
- 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_2O; increase inspiratory time) whilst observing lung protective measures. Start iNO if appropriate
- Consider alkalinisation for PPHN with $NaHCO_3$ if pCO_2 permits (or consider THAM). Aim for pH >7.35
- Consider volume expansion and vasoactive support. 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)

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. It may be reasonable to insert a throat pack (see throat pack guidance)
- 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 and/or vasoactive drugs
- 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 January 2020-December 2024)

Neonatal

Condition	Survival to discharge
Meconium Aspiration Syndrome	92 %
Respiratory Distress Syndrome	81 %
Persistent Pulmonary Hypertension of the Newborn	74 %
Sepsis	46 %
Air leak	50 %
Pneumonia	54 %
Congenital Diaphragmatic Hernia	58 %

Paediatric - Respiratory

Condition	Survival to discharge
Aspiration pneumonia	63 %
Infective pneumonia (bacterial & viral)	75-78 %
ARDS	70 %
Acute respiratory failure	67 %

Risks

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