Guideline for children with an anterior mediastinal mass & respiratory compromise in a regional hospital

Call PICU: 1800 222 378

- Many children with anterior mediastinal masses have a delayed presentation, often with respiratory embarrassment
- Failure to identify mediastinal compression may have catastrophic consequences if not recognized before intubation
- This guide aims to assist in the recognition, stabilization & transfer of children with symptomatic mediastinal compression
- Early discussion with PICU & Haematology / Oncology via the 1800 222 378 referral line is essential

Clinical signs & symptoms

Absence of clinical signs/symptoms does not eliminate risk of collapse

Signs of mediastinal Compression:

- Inc. WOB / ↑**RR** / Dyspnoea (ask older children)
- **Orthopnoea** (ask/assess ability to lie flat)
- **Wheeze / stridor** (may be positional/unilateral or may have new diagnosis of 'asthma'. **Stridor highly predictive of difficult intubation**
- History of: Cough (may be chronic), syncopal episodes
- **Superior vena cava syndrome**
  - Face/neck swelling
  - Dilated veins in SVC distribution
  - Conjunctival injection
  - Check Pemberton's (raise arms above head=facial engorgement)

Signs associated with underlying disease

- Fever / night sweats/ weight loss
- Poor feeding / anorexia
- Lymphadenopathy / pallor

Key investigations

- CXR AP + lateral (may show widened mediastinum)
- Laboratory investigations:
  - FBC + Blood film
  - Blood gas
  - U&E inc. Creatinine /LFT/CRP
  - Uric acid + LDH

Additional investigations (if resources and time allow)

- CT thorax – **DO NOT** proceed if signs of mediastinal compression or if patient cannot comfortably lie flat
- ECHO - If formal ECHO unavailable, trained ED/ICU delivered point of care ultrasound (POCUS) can be extremely useful to assess for
  - Tamponade/pericardiac effusion
  - LV function

For children with signs of respiratory/cardiac compromise, the priority is timely transfer to CHI for definitive care. If there is impending collapse this will be a time critical transfer & IPATS will not activate if >60min away from CHI

Initial stabilisation & management

Optimal positioning: Ask/watch child to assess preferred position – likely to be sitting up/favouring one side (may be prone)

Airway/Breathing: Level of support will depend on level of distress. Aim to keep O_2 saturations between 94% - 98%

- Mild distress/hypoxia – **HFNCC** 2L/Kg/min up to 15Kg or 30L/min if ≥ 15Kg as tolerated
- Moderate/severe distress / hypoxia – **NIV**. Start CPAP 3-4cmH_20 as tolerated. Titrate up as required/tolerated
- Intubation only indicated in life threatening respiratory failure due to high risk of cardiac arrest and/or complete airway occlusion. Outside of cardiopulmonary arrest - **Please discuss with PICU if intubation is felt to be required**

Circulation:

- PIV/IO x2. **Do not delay transfer for CVC/Arterial line insertion**
- Insert lines below the diaphragm where possible i.e., cannula in foot/Femoral CVC
- Fluid resuscitate if required – titrate 5-10ml/kg balanced crystalloid (Hartmanns) to effect
- Prepare adrenaline and noradrenaline infusions per local pump policy and have these connected to patient
- Prepare resuscitation medications/push dose pressors for transfer – see pre departure checklist for guidance

Other considerations:

- **Some children will require IV Methylprednisolone – please discuss with CHI Haem/Onc Consultant before transfer**
- Keep NPO. Commence maintenance IVF as per policy or as directed by accepting CHI Haematology/Oncology Consultant
- Provide analgesia as required. Intranasal/IV fentanyl can be used safely in small aliquots for procedures if required

In case of impending collapse where intubation is deemed necessary

- Call for senior help. Call 1800 222 378 for ongoing PICU support during intubation if required
- Expect a difficult intubation and review paediatric DAS CICV guideline – see overleaf for link & prepare equipment
- **Resuscitate before intubation** – have push dose pressors available + adrenaline running before induction of anaesthesia
- Awake fibreoptic intubation/Inhalational induction/Titrated Ketamine with maintenance of spont. Vent. are possible options
- In the event of life-threatening airway compromise, consider:
  - Repositioning – usually lying on the tumour side or prone
  - Rigid bronchoscopy
  - Waking patient and supporting with BiPAP for transfer

Respiratory Support tools

HFNC Hamilton Set Up Guide

NIV setup Guide Respireo mask 3-20Kg

NIV setup Guide MiniME2 >20Kg

Pre-Intubation Checklist

Intubation Equipment Sizing Guide

Invasive Ventilation setup <15Kg

Invasive Ventilation setup >15Kg

Paediatric Ventilation Guide

DAS CICV Guideline

Critical Infusions

These infusions are a guide to those commonly used. Choice of medication, dose and route lie with the medically responsible clinician

NON- SCI infusion table

CHI - SCI infusion table

CI

All medication dosing/route information can be found on the CHI 'Clinibee' app

CHI SCI Standard Concentrations PICU/Theatre: CONTINUOUS INFUSIONS AND LOADING DOSES (Version 4 Feb 2019)					Rate Calc (mL/hour)	Required Dose / Default Rate (ml/hour) / Default Start Dose	
Drug	**Category**	**Weight Band**	**SCI (Normal)**	**Diluent**	**Usual Dose Range**	**Default Dose and Rate Calculator** *All Weights in kg - rounding can occur*	
						Default Start	**Default Rate (mL/hr)**
Adrenaline	Cardio	All ≤5kg	1mg/50mL	Glucose 5%w/v	0 -0.1microgram/kg/min	0.05microgram/kg/min	0.15 x Wt
		>5 - ≤10kg	3mg/50mL	NaCl 0.9%w/v			0.05 x Wt
		All >10kg	6mg/50mL	Glucose 10%w/v			0.025 x Wt
Noradrenaline	Cardio	All ≤5kg	1mg/50mL	Glucose 5%w/v	0 -0.1microgram/kg/min	0.05microgram/kg/min	0.15 x Wt
		>5 - ≤10kg	3mg/50mL	NaCl 0.9%w/v			0.05 x Wt
		All >10kg	6mg/50mL				0.025 x Wt
Midazolam *(Large volume neat solution may be given using 250ml empty bag for patients > 20kg)*	CNS	≤2.5kg	10mg/50mL	Glucose 5%w/v	Sedation:	1microgram/kg/min	0.3 x Wt
		>2.5 - ≤5kg	25mg/50mL	NaCl 0.9%w/v	0-4microgram/kg/min		0.12 x Wt
		>5 - ≤10kg	50mg/50mL	Glucose 10%w/v	Status Epilep:		0.06 x Wt
		>10- ≤20kg	50mg/50mL		0-24microgram/kg/min		0.06 x Wt
		>20kg	100mg/50mL				0.03 x Wt
Morphine	CNS	≤2.5kg	2.5mg/50mL	Glucose 5%w/v	Neonate:	20microgram/kg/hr	0.4 x Wt
		>2.5 - ≤5kg	5mg/50mL	NaCl 0.9%w/v	0-20microgram/kg/hr		0.2 x Wt
		>5 - ≤10kg	10mg/50mL	Glucose 10%w/v	>1mth old:		0.1 x Wt
		>10 - ≤20kg	20mg/50mL		0-40microgram/kg/hr		0.05 x Wt
		>20kg	50mg/50mL				0.02 x Wt

Frequently used intermittent medications

Doses for quick reference only – please prescribe using the CHI 'CLINIBEE' app or after direct consultation with accepting consultant

Fluid Bolus: Hartmann's Solution 5-10ml/kg
Ca Gluconate 10% w/v: 0.11mmol/kg (max 4.5mmol) (**Target iCa of 1.2-1.4)**
Hydrocortisone: 2mg/kg (max up to 100mg)
Phenylephrine Bolus: (5-20mcg/kg – max 500mcg)
Synchronised D/C Shock: 1-2J/kg

In case of cardiac arrest

Adrenaline IV/IO/IM 10mcg/kg (0.1ml/kg 1:10,000)
Amiodarone – (VT/VF after shock 3&5) - 5mg/kg
Atropine – 20mcg/kg (min dose 100mcg, max 600mcg)
D/C shock – VT/VF 4J/kg
AED – Paediatric attenuated if 1-8yrs / Adult >8yr

Useful Checklists & Resources

Stabilisation of child in Adult ICU

PICU Referral Tool

Pre-Departure Checklist

P37 Activation Guide

Time Critical Pre-Departure Checklist

Child with anterior mediastinal mass

To be completed by referring team prior to departure

Contact the accepting PICU intensivist via

1800 222 378 for advice during transfer

IPATS Irish Paediatric Acute Transport Service

CCRS Critical Care & Retrieval Services

Airway / Ventilation Considerations

Child on NIV/HFNCC:

- NGT inserted and attached to bile bag for drainage ☐
- Appropriate size intubation equipment available for transfer ☐
- HFNCC: Suggest 2L/Kg/min ≤15Kg. 30L/min if >15Kg ☐
- CPAP: Suggest starting at low PEEP 3/4cm$H_2$0 for tolerance and inc. as required to PEEP of 5-7cm$H_2$0 ☐

Intubated Child:

- Appropriately Sized ETT & NGT well secured ☐
- CXR performed & ETT & NGT position reviewed ☐
- $ETCO_2$ & O_2 sats visible on transport monitor targeting ETC02 4.5-6Kpa & Sats 94-98% ☐
- Appropriately sized ETT suction catheters available (uncuffed ETT size x2 = Catheter French) i.e., 3.5 cuffed ETT has same internal diameter as a 4.0 uncuffed ETT ∴ (4 x 2) = 8 F suction catheter ☐

If intubated, please ensure a blood gas (cap/ven/art) is measured once on transport ventilator.
Please use the IPATS oxygen calculator to ensure sufficient oxygen for the transfer

Circulation Considerations

It is always recommended that cardiac arrest medications are brought in addition to, and kept separate from, those suggested below

- Working Vascular Access x2 (IV/IO) ☐
- Continuous ECG monitoring on transport monitor ☐
- NIBP set to auto q3-5min if no art line ☐
  Please do not delay transfer for art line insertion
- Individualised approach to BP management. Discuss targets with PICU before departure ☐
- Maintenance & rescue fluid available ☐
- **Adrenaline and noradrenaline infusions** Prepared and connected to patient even if not immediately required. ☐
- If already on adrenaline infusion, prepare vasopressin as third line agent ☐
- Has discussion re need for methylprednisolone occurred and dose given if requested? ☐

Push dose pressors: (to correct hypotension) ☐

Choice & dose at discretion of medically responsible consultant. Caution recommended with use of pure alpha agonists in this context – adrenaline usually first line.

1. Adrenaline **1:100,000** ☐
   Add 1ml Adrenaline 1:1,000 to 99ml NS
   = 10mcg/ml solution (label clearly)
   Dose - 0.1ml/kg = 1mcg/kg per dose
2. Ephedrine diluted to conc. of 3mg/ml
   Dose – 1-12yr = 500mcg/kg
   Dose - >12yr = 3-7.5mg
3. Phenylephrine 100mcg/ml
   Dose - >1mo - 12yrs = 5-20mcg/kg
   Dose - >12yrs = 100-500mcg/kg

Fluid boluses: 5-10ml/kg Hartmann's Solution. Titrate fluids to effect. Watch for signs of fluid overload and stop fluids if evident (pulmonary oedema/inc. liver edge)

Sedation / Neurological Considerations

Tolerance of NIV or procedural sedation: ☐
If required, intermittent fentanyl 0.5-1mcg/kg or ketamine 0.25-0.5mg/kg can be administered.
Low dose infusions of same are also generally well tolerated if required

Intubated Children: ☐
Morphine 20mcg/kg/hr + midazolam 2mcg/kg/min suggested starting doses
Avoid propofol if any haemodynamic compromise

Suggested bolus CNS medications for transfer

Use & dose at discretion of medically responsible consultant.

Due to potentially delayed central circulation, please titrate doses and allow additional time for metabolism and eventual effect.

Have push dose pressor of choice available when administering any sedation bolus

Recommended drugs for intubation include: ☐
Ketamine 0.5-1mg/kg (titrated/repeated to effect)
Rocuronium 0.6-1.2mg/kg
+/- Fentanyl 1-2mcg/kg (titrated/repeated to effect)

Further Reading / Resources

1. Anaesthesia for patients with Mediastinal Masses: https://www.mcgill.ca/anesthesia/files/anesthesia/wk_5a_slinger_14_anterior_mass.pdf

2. Scrace B., McGregor K. Anterior mediastinal masses in paediatric anaesthesia. World Federation of Societes of Anaesthesiologists, 2015 https://resources.wfsahq.org/atotw/anterior-mediastinal-masses-in-paediatric-anaesthesia/

3.

4. Blank, R.S. and de Souza, D.G. (2011) 'Anesthetic management of patients with an anterior mediastinal mass: continuing professional development', *Canadian journal of anaesthesia = Journal canadien d'anesthesie*, 58(9), p. 853. https://dokumen.tips/documents/anesthetic-management-of-patients-with-an-anterior-management-of-patients-with.html?page=1

5. Leung, K.K.Y.[1,,2]; Ku, S.W.[1]; Chigaru, L.[3]; Hon, K.L.[1]. INTERHOSPITAL TRANSPORT OF CHILDREN WITH MEDIASTINAL MASS. Pediatric Critical Care Medicine 22 (Supplement 1 3S):p 125-126, March 2021. https://journals.lww.com/pccmjournal/Fulltext/2021/03001/P0205____1035__INTERHOSPITAL_TRANSPORT_OF_CHILDREN.264.aspx

6. Tan A, Nolan JA. Anesthesia for children with anterior mediastinal masses. Paediatr Anaesth. 2022 Jan;32(1):4-9. doi: 10.1111/pan.14319. Epub 2021 Nov 14. Limited access.

Document Details	
Document Type:	Clinical Guideline
Document Name:	**Management and transport of children with anterior mediastinal mass in a regional hospital**
Document Location:	www.ipats.ie
Version:	1.0 July 2023
Effective From:	August 2023
Review Date:	August 2025
Author:	Dr Cathy Gibbons, Dr Dominika Karlicka
Approved by:	Dr Cathy Gibbons consultant paediatric intensivist CHI/NASCCRS, Dr Dermot Doherty Consultant paediatric Anaesthesiologist CHI/NASCCRS Dr Siobhan Whelan Consultant Paediatric Intensivist CHI Prof Aenghus O'Marcaigh Consultant Paediatric Haematologist CHI
Related Documents:	

The Irish Paediatric Acute Transport Service (IPATS) in conjunction has produced this clinical guideline with the PICU & Haematology departments in CHI. It has been designed for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.

This guideline represents the views of IPATS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.