NHS Children's Acute Transport Service

Clinical Guidelines

Acute Severe Asthma

Document Control Information

Author	E Randle	**Author Position**	CATS Consultant
Document Owner	E Polke	**Document Owner Position**	Co-ordinator
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Applicable to	**All CATS employees**		

1. Assessment

1.1 Past history

- Frequency of attacks
- Routine medications
- Number of courses of steroids
- Previous ICU admissions + intubations

1.2 Current status

- Duration of attack
- Assessment of severity (see below)
- Treatment (dose/frequency of nebs, IV therapy, steroids)

Acute severe	**Life threatening**
Can't complete sentences in one breath or too breathless to feed	Silent Chest, Cyanosis
Pulse >120 if >5years >130 if 2-5 years	Hypotension
Respiratory Rate >30 if >5 years >50 if 2-5 years	Poor respiratory effort Exhaustion Confusion or Coma
PEFR* <50% best	PEFR* <33% best
Saturations <92% in room air	<92% in high flow oxygen

* PEFR very difficult to interpret in young/dyspnoeic patients

If severely unwell or first attack, consider alternative diagnoses, i.e. pneumothorax, collapsed lobe, foreign body, upper airway obstruction or pneumonia. Perform chest x-ray.

2. Initial management of severe asthma

2.1 Oxygen

Children with severe or life threatening asthma or SpO_2<94% should receive high flow oxygen via a tight fitting mask or nasal cannula to achieve oxygen saturations of 94-98%.

2.2 Nebulised bronchodilators

Children with severe or life threatening asthma should receive frequent or 'back to back' doses of salbutamol (2.5 - 5mg). Add ipratropium bromide nebulisers. Usual dose of ipratropium is 250 mcg (125 mcg for <2 years).

2.3 Steroid therapy

Steroids should be given early. Benefits are seen in 3-4 hours. In severe asthma, 4 mg/kg of intravenous hydrocortisone should be given 4 hourly, since most children are unable to tolerate oral prednisolone.

2.4 Intravenous salbutamol

Consider early addition of a 15 mcg/kg bolus of salbutamol given over 20 minutes **(maximum 250 mcg).** In children <2 years old, the loading dose is 5 mcg/kg over 20 minutes.

Follow this up with a continuous infusion in refractory asthma at 1mcg/kg/min **(maximum rate 20mcg/min)**. Higher doses should be discussed with CATS.

Reduce infusion rate if side effects occur: lactic or metabolic acidosis, tachycardia, arrhythmias, tremor, severe hypokalaemia, hyperglycaemia and hypophosphataemia.

Note: increasing tachypnoea on IV salbutamol may indicate toxicity and metabolic acidosis rather than worsening of asthma.

Patients on intravenous salbutamol should have continuous ECG monitoring and regular monitoring of potassium and lactate.

2.5 IV Aminophylline

Aminophylline may be useful in children with refractory severe or life threatening bronchospasm.

5 mg/kg loading dose (maximum 500 mg) should be given over 20 minutes with ECG monitoring.

A loading dose must not be given to patients on oral theophylline treatment.

The loading dose is usually followed by a continuous infusion at 1mg/kg/hour (0.5 – 0.7 mg/kg/hr if >12 years).

Theophylline levels should be sent 4-6 hours after starting aminophylline; target 10-20mg/litre.

2.6 IV Magnesium Sulphate

Magnesium sulphate may be useful as an adjunct in acute severe asthma. 40-50 mg/kg should be given by slow infusion over 30 minutes. This may be repeated in 1-2 hours.

Serum magnesium level measurement is indicated if further doses are being considered. Hypotension caused due to vasodilatation is the most common side effect; have a fluid bolus ready.

Current (2019) NICE guidelines suggest that inhaled magnesium may be useful added to inhaled bronchodilators in the first hour with children presenting with acute severe asthma and oxygen saturations less than 92%.

3. Indications for intubation

Blood gas analysis is not a substitute for clinical assessment.

3.1 Consider intubation in any child with the following:

- Reduced respiratory effort
- Reduced conscious level
- Worsening hypoxaemia

3.2 Intubation

- The most experienced person available should intubate the child
- Pre-oxygenate
- 10 - 20 mls/kg crystalloid/colloid bolus
- You will need a tight fitting ETT as necessary airway pressures may be high. Consider a cuffed tube
- Consider modified rapid sequence induction with ketamine 1 - 2 mg/kg (has some bronchodilator activity) and suxamethonium 1 - 2 mg/kg
- Avoid morphine and atracurium (histamine release)

4. Management following intubation

- Sedate and muscle relax for ventilation. A combination of midazolam and ketamine, or fentanyl and midazolam can be used for sedation. Vecuronium can be used for muscle relaxation. Inhalational agents such as sevoflurane (have bronchodilator properties) may also be used for ongoing sedation
- Pursue a pressure limited permissive hypercapnoea strategy (pH $\geq$ 7.2)
    - Aim PIP < 35 cm H_2O (to minimise risk of barotrauma)
    - Aim tidal volume 5-7 ml/kg
    - Low rate (10 - 15 bpm)
    - I: E ratio of at least 1:2
- PEEP of 5-7 is often necessary
- High thoracic pressure may compromise venous return resulting in hypotension; give fluid bolus
- Regular chest physiotherapy and suctioning for mucus plugging
- Check CXR for ETT position and to exclude pneumothorax, insert chest drain if pneumothorax present
- Monitor for potassium and lactate

5. Transport considerations

- Watch for pneumothorax, auto-PEEP and mucus plugging
- If child desaturates, disconnect ventilator, bag, auscultate and consider manual decompression

References:

Based on 'British Guideline on the Management of Asthma'. British Thoracic Society and Scottish Intercollegiate Guidelines Network. September 2016.

Children's' British National Formulary 2016.