



CATS

Children's Acute Transport Service



Clinical Guidelines

Acute Severe Asthma

Document Control Information

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Assessment

Past history

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

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 talk or feed	Silent Chest, Cyanosis
Pulse >125 if >5years >140 if 1-5 years	Hypotension
Respiratory Rate >30 if >5 years >40 if 1-5 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. upper airway obstruction, foreign body, pneumothorax, collapsed lobe, pneumonia, mediastinal mass, myocarditis.
Perform chest x-ray.

Initial management of severe asthma

Oxygen

Children with severe or life-threatening asthma or $\text{SpO}_2 < 90\%$ should receive high flow oxygen via a tight-fitting mask or nasal cannula to achieve oxygen saturations of $> 92\%$.

Nebulised bronchodilators

Children with severe or life-threatening asthma should receive frequent or 'back-to-back' nebulisers of salbutamol (2.5-5mg) driven by oxygen. Add ipratropium bromide nebulisers. Usual dose of ipratropium is 250 mcg (500 mcg for age 12-17 years).

Magnesium sulphate (150mg) nebuliser can be considered following initial 3x salbutamol and ipratropium nebulisers for children with $\text{spO}_2 < 92\%$ requiring oxygen.

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 (maximum dose 100mg).

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.

Intravenous bronchodilators

Either of the following may be used:

- **Aminophylline**

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.

- **Salbutamol**

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 with a continuous infusion in refractory asthma at 0.5 - 1mcg/kg/min (*maximum rate 20mcg/min*). Higher doses should be discussed with CATS. Salbutamol nebulisers should be stopped while on continuous infusion.

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.

Indications for intubation

Blood gas analysis is not a substitute for clinical assessment.

Consider intubation in any child with the following:

- Reduced respiratory effort
- Reduced conscious level
- Worsening hypoxaemia

Intubation

- The most experienced person available should intubate the child.
- Pre-oxygenate.
- 10ml/kg bolus balanced isotonic crystalloid (or 0.9% sodium chloride) available— careful reassessment after each fluid bolus.
- You will need a tight fitting ETT as necessary airway pressures may be high. Use a cuffed tube.
- Consider modified rapid sequence induction with ketamine 1-2 mg/kg (has some bronchodilator activity) and suxamethonium 1-2 mg/kg or rocuronium 1mg/kg
- Avoid morphine and atracurium (histamine release)

Management following intubation

- Capnography should be used to confirm tube placement and for ongoing monitoring of end-tidal CO₂.
- Sedate and muscle relax for ventilation.

- Sedate with fentanyl and midazolam infusions
- Ketamine may be used, use stat doses initially before considering if ketamine infusion is required.
- Inhalational agents such as sevoflurane (have bronchodilator properties) may also be used for ongoing sedation. Vecuronium can be used for muscle relaxation.
- Pursue a pressure limited permissive hypercapnoea strategy ($\text{pH} \geq 7.2$)
 - Aim PIP < 35 cm H₂O (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 (10ml/kg crystalloid with careful reassessment after 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 potassium and lactate.

Transport considerations

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

References

1. ALSG (2023). Advanced Paediatric Life Support: A Practical Approach to Emergencies, 7th Edition.
2. BNF for children (2024). British National Formulary for children.
3. BTS (2019). British Thoracic Society and Scottish Intercollegiate Guidelines Network. 'British Guideline on the Management of Asthma'.
4. NICE (2021). Asthma: diagnosis, monitoring and chronic asthma management. National Institute for Health Care and Excellence.