

# Severe Asthma (in children aged $\geq 2$ years)

**Past History:** • Frequency of attacks • Routine medication • Number of courses of steroids  
• Previous ICU admissions and intravenous bronchodilators • Compliance

ASSESS SEVERITY	AGE 2-5 YEARS		AGE >5 YEARS	
	Severe asthma	Life-threatening asthma	Severe asthma	Life-threatening asthma
	<ul style="list-style-type: none"> <li>SpO<sub>2</sub> &lt;92%</li> <li>Too breathless to talk</li> <li>Heart rate <math>\geq 140</math>/min</li> <li>RR &gt;40/min</li> <li>Use of accessory muscles</li> </ul>	<ul style="list-style-type: none"> <li>SpO<sub>2</sub> &lt;92% and any of:                             <ul style="list-style-type: none"> <li>Silent chest</li> <li>Poor resp. effort</li> <li>Agitation</li> <li>Altered consciousness</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>SpO<sub>2</sub> &lt;92%</li> <li>PEF 33-50% best/predicted</li> <li>Heart rate <math>\geq 125</math>/min</li> <li>RR &gt;30/min</li> <li>Use accessory muscles</li> </ul>	<ul style="list-style-type: none"> <li>SpO<sub>2</sub> &lt;92% and any of:                             <ul style="list-style-type: none"> <li>PEF &lt;33% best or predicted</li> <li>Silent chest</li> <li>Poor respiratory effort</li> <li>Altered consciousness</li> </ul> </li> </ul>

## LIFE-THREATENING FEATURES: CONSULTANT PAEDIATRIC & ANAESTHETIC REVIEW + CALL NECTAR

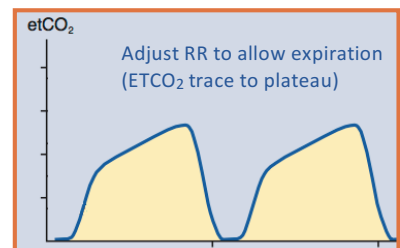
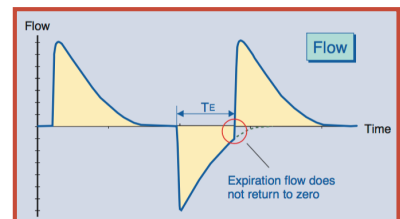
FIRST LINE
<p>OXYGEN to maintain SpO<sub>2</sub> <math>\geq 94\%</math>.</p> <p>BRONCHODILATORS (repeat doses every 20-30 minutes for 2h if necessary)</p> <ul style="list-style-type: none"> <li>Salbutamol MDI 10 puffs via spacer (with mask if &lt;5y) (if O<sub>2</sub> not needed)</li> <li>Nebulised salbutamol: 2.5mg if <math>\leq 5</math>yr; 5mg if &gt;5yr</li> <li>Nebulised ipratropium bromide: 250microcg (500microcg if &gt;12yr)</li> </ul> <p>STEROIDS (give within first hour of presentation):</p> <ul style="list-style-type: none"> <li>Oral prednisolone: 20mg if <math>\leq 5</math>yr, 40mg if &gt;5yr (prednisolone 2mg/kg if on maintenance steroids, MAX 60mg)</li> <li>IV hydrocortisone 4mg/kg if unable to take or tolerate oral prednisolone</li> </ul>

Chest x-ray to look for:
<ul style="list-style-type: none"> <li>Atelectasis</li> <li>Consolidation</li> <li>Pneumothorax</li> <li>Alternative diagnosis (airway compression, foreign body, haemangioma)</li> <li>Subcutaneous emphysema</li> </ul>

SECOND LINE THERAPIES
<p><b>Worsening status:</b> Chest x-ray. ECG monitoring. Consider arterial blood gas. <i>URGENT REVIEW BY CONSULTANT PAEDIATRICIAN</i></p> <p>SALBUTAMOL</p> <ul style="list-style-type: none"> <li>15microg/kg (max 250microg) IV bolus over 10min</li> <li>Followed by infusion 0.5-1microg/kg/min. Monitor K<sup>+</sup>/lactate</li> <li>Toxicity often observed at doses &gt;20mcg/min. Discuss higher doses with NECTAR. Side effects: agitation, tremor, <math>\uparrow</math>HR, <math>\downarrow</math>K<sup>+</sup>, lactic acidosis.</li> </ul> <p>MAGNESIUM SULPHATE (if <math>\geq 2</math>yr)</p> <ul style="list-style-type: none"> <li>IV magnesium sulphate 40mg/kg (max 2g) over 20min. May cause <math>\downarrow</math>BP</li> </ul> <p>AMINOPHYLLINE</p> <ul style="list-style-type: none"> <li>5mg/kg (max 500mg) over 20min then 1mg/kg/h (0.5mg/kg/h if &gt;12yr)</li> <li>Omit loading if on oral theophylline. Monitor ECG and levels.</li> <li>Therapeutic margin narrow (side effects common)</li> </ul> <p>HYDROCORTISONE: Repeat dose at 6-hours</p>

After intubation, consider:
<ul style="list-style-type: none"> <li>Fentanyl 1-5mcg/kg/h</li> <li>Midazolam 1-2mcg/kg/min</li> <li>Ketamine 0.5-3mg/kg/h (bronchodilator)</li> </ul> <p>Inhalational agents (e.g. isoflurane, sevoflurane) have bronchodilator properties and can be used for sedation</p> <p>For paralysis, use rocuronium or vecuronium</p> <p>AVOID atracurium/morphine</p>

<p><b>Consider intubation on clinical grounds if:</b></p> <ul style="list-style-type: none"> <li>SpO<sub>2</sub> &lt; 92% despite high flow/face mask O<sub>2</sub> after 1<sup>st</sup> &amp; 2<sup>nd</sup> line therapy</li> <li>Hypercarbia - CO<sub>2</sub> &gt; 6kpa (rare in acute asthma = sign of fatigue)</li> <li>Reduced conscious level • Poor air entry / silent chest</li> </ul> <p><b>Intubation = high risk (difficult to ventilate after securing airway)</b></p> <ul style="list-style-type: none"> <li>Tight fitting ETT will be necessary. Consider cuffed tube</li> <li>Pre oxygenate adequately (3 min). 10-20mL/kg fluid bolus</li> <li>Ketamine (1-2mg/kg IV) / rocuronium (1mg/kg IV then infusion 0.5mg/kg/hr)</li> <li>BP may fall if dynamic hyperinflation / air trapping: may need further volume</li> <li>Post intubation CXR mandatory</li> </ul>
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<p><b>Initial ventilation principles:</b> Use pressure control ventilation when paralysed</p> <ul style="list-style-type: none"> <li>Sufficient peak pressure (PIP) to move chest. Limit PIP to &lt;35cmH<sub>2</sub>O</li> <li>PEEP 5cmH<sub>2</sub>O. Aim SpO<sub>2</sub> &gt;90%. High CO<sub>2</sub> acceptable (7-10kPa)</li> <li>SLOW RATE 10-15bpm (flow should reach zero before next breath)</li> <li>Allow enough time for expiration (I:E ratio of at least 1:3)</li> <li>End tidal CO<sub>2</sub> may not correlate with PaCO<sub>2</sub> (dead space)</li> <li>If ventilation difficult: hand ventilate with enough pressure to move chest</li> </ul>
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<p>Watch for:</p> <ul style="list-style-type: none"> <li>pneumothorax • auto-PEEP</li> <li>mucus plugging</li> </ul>
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<p>This guideline is based on SIGN 141 (October 2014)</p>
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