



ACUTE PAEDIATRIC ASTHMA on the WARDS

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This guideline provides evidence based recommendations on the assessment and management of children with acute asthma admitted to the wards at Princess Margaret Hospital for Children for use by junior medical staff.

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1. Initial Management Considerations

1.1 [Asthma Management Flowchart](#)

1.2 Monitoring and assessment on the wards

The following are the usual parameters used to assess severity:

Symptoms	Mild	Moderate	Severe	Critical
SaO ₂	>94%	>94%	≤94%	Usually < 85%
Mental state	Normal	Normal	Agitated	Confused/drowsy
Talking	Sentences	Phrases	Words	Unable to speak
Accessory muscle use	Nil	Minor	Moderate/Marked	Maximal/exhaustion (Paradoxical thoraco-abdominal movements and marked sternomastoid use)
Dyspnoea	Mild	Moderate	Severe	Severe
Auscultation	Wheeze	Wheeze ± reduced breath sounds	Wheeze ± reduced breath sounds	Minimal breath sounds or silent chest

1.3 Investigations

- Nasopharyngeal aspirate can be considered if suggestion of viral or mycoplasma lower respiratory tract infection (e.g. crackles, poor response to therapy).
- Chest X-ray is rarely useful, should not be routinely performed and should only be considered if diagnosis is in doubt, lack of response to therapy, or suspected complications like pneumothorax.⁽¹⁻³⁾
- Blood gas analysis (preferably a venous sample at IV cannulation) should be performed when asthma is critical or severe and unresponsive to treatment.^(2, 3)

1.4 Initial Treatment

1.4.1 Salbutamol

a) via Spacer and pressurised Metered Dose inhaler (pMDI)

- Salbutamol administration via pMDI-spacer is preferred except in severe or critical asthma (see below).⁽⁴⁾
- Consider charting a course to “stretching” of time intervals between doses
 - Inhalation Charts on the wards allow stretching to occur at nurse discretion based on earlier parameters.
 - This is usually charted at a dose frequency of 30 minutely-4 hourly allowing nurse discretion to give salbutamol based on the assessment parameters listed earlier (see [monitoring and assessment](#))
 - Generally but not absolutely if ≥ 2 of the above signs [mentioned in 1.1](#) indicates a need to give salbutamol.
- The ongoing quantity of puffs administered is based on age. ^(1, 3)
 - <6 years - 6 puffs
 - 6 years and above – 12 puffs

b) Via Nebuliser

- In severe or critical asthma pMDI-spacer use may interfere with oxygen administration - making nebuliser use more practical.⁽⁴⁾
- If increasing fatigue then continuous nebulised salbutamol can be given. Review by senior staff is required in this context.

1.4.2 Oxygen

- To be commenced if SaO₂ < 94% ⁽³⁾
Increased work of breathing is not an indicator for oxygen therapy ^(1, 3)

Administer the lowest flow of oxygen required to maintain oxygen saturation $\geq 94\%$.

If oxygen therapy is commenced it should be reviewed regularly as requirement for oxygen may decrease rapidly

- If < 2L of oxygen is administered then low flow meters should be used so that oxygen flow rate can be adjusted accurately

1.4.3 Systemic corticosteroids

The majority of children will have oral treatment. A short (3 - 5 days) course of corticosteroids (Prednisolone 1 mg/kg up to 60 mg daily) is the current standard treatment for moderate to severe exacerbations.^(1-3, 5) Closely monitor response to treatment. A longer course (e.g. 7 to 10 days) may be indicated for patients who have severe exacerbations that are slow to respond to treatment.^(2, 3)

Where a diagnosis of asthma is questionable (due to lack of interval symptoms) a working diagnosis of viral wheeze is sometimes given to preschool aged children. There is currently insufficient evidence to advocate for the use of systemic corticosteroids steroids in this group.⁽⁶⁻⁸⁾

Consider contraindications before use. Contraindications may include: varicella infection, herpes simplex keratitis

1.4.4 [IV aminophylline link](#)

1.4.5 [IV salbutamol link](#)

1.4.6 [IV magnesium sulphate link](#)

1.4.7 Fluid supplementation

- Oral hydration is preferred however parenteral fluid supplementation may be required if the patient is too exhausted or too unwell to drink.
- IV fluid bolus of 10-20mL/kg of 0.9% Saline may be required in severe dehydration or hypovolaemic shock.
- In severe exacerbations IV fluids are preferred as IV cannulation will also be useful for additional assessment with baseline blood tests, particularly electrolytes and venous blood gas as well as medication administration.
- If parental fluids are used, because of the rare but known risk of the Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH), 2/3 of maintenance fluids is recommended.

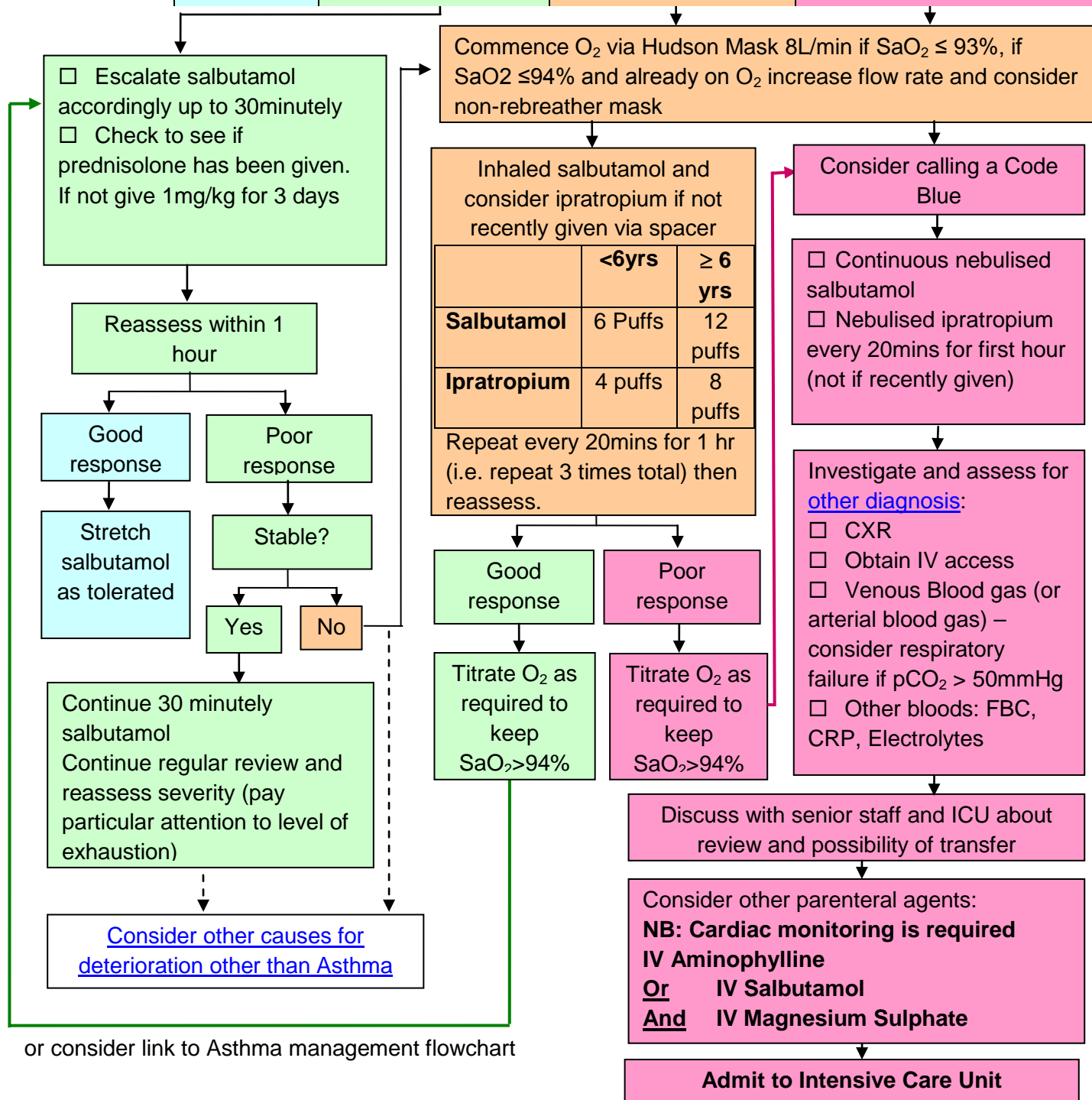
1.4.8 Preventers

- Children who are taking regular preventive medication should continue taking the same dose during an exacerbation.
- The commencement of a preventer is not of immediate concern in the acute setting and is something to discuss when considering discharge or follow up ([see discharge planning](#))

2. Assessment and management of deteriorating condition on the ward

Follow algorithm as per current severity, after examining the patient for complications

Symptoms	Mild	Moderate	Severe	Critical
SaO ₂	>93%	>93%	≤93%	Usually < 85%
Mental state	Normal	Normal	Agitated	Confused/Drowsy
Talking	Sentences	Phrases	Words	Unable to speak
Accessory muscle use	Nil	Minor	Moderate/Marked	Maximal/exhaustion
Dyspnoea	Mild	Moderate	Severe	Severe
Auscultation	Wheeze	Wheeze ± reduced	Wheeze ± reduced	Minimal breath sounds or



Important features on history

2.1 Other Causes of Deterioration Other Than Asthma (Differential Diagnosis of wheeze)

- Inhaled foreign body
 - Severe viral lower respiratory tract infection
 - Bacterial secondary infection
 - Aspiration of fluid or feed
 - Cystic fibrosis
 - Pneumonia or other consolidative process
 - Structural abnormalities e.g. Tracheomalacia, bronchomalacia, vascular ring
 - Cardiac failure
- Transient infant wheezing (refractory to management)

2.1.1 Complications:

- **Fluid Imbalance: Dehydration or fluid overload**
- **Pneumothorax**
- **Salbutamol side effects:**
 - **Increased V/Q mismatch:** Consider if early (within first 30 mins after giving salbutamol) O₂ desaturation. Patients with acute asthma have ventilation-perfusion (V/Q) mismatch. Beta 2-agonists may worsen this mismatch by causing increased blood flow in areas of the lung that are poorly ventilated. This can result in decreased SaO₂. This is easily treated with supplemental oxygen (which might only be needed for a short period of time).
Lactic acidosis: Rarely after prolonged therapy salbutamol can increase oxygen consumption in tissues especially given already limited ventilatory reserve resulting in lactic acidosis
 - **Electrolyte imbalance:** K⁺, Mg, & PO₄ are transiently decreased with high dose beta agonist therapy. Routine checking electrolytes is not necessary unless deterioration.

Other things to consider (i.e. your red flags)

Other considerations

- **Allergic rhinitis** commonly co-occurs with asthma and should be looked for. Its presence can influence management. If persistent - management with nasal **steroids, anti-histamines or allergy avoidance may be indicated. Refer to [nasal spray handout](#)**

Consider **allergy testing** whenever you diagnose asthma for the first time if the patient has symptoms of atopy. ⁽¹⁾

3. Discharge Planning

3.1 Discharge Criteria

A patient is fit to discharge when:

- **Asthma symptoms and signs are mild and improving.**
- **Oxygen saturation \geq 94% in air.**
- **Treatment can be easily managed by parent/carers at home**

3.2 Discharge check list

- Each child/young person should be given an asthma information pack
- Each child / young person should have a written [asthma action plan](#) given and explained.⁽¹⁾
- Ensure adequate supply of relievers \pm preventers.
- Check spacer and pMDI technique. Provide written advice sheets re: spacer use, cleaning, etc
- Ensure appropriate supply of oral corticosteroids if indicated, 1mg/kg/day .^(1, 2)
- Consider preventer medication⁽²⁾ (see National Management Handbook 2014 – there is a short summary at end of the document) for best choice based on patient). This can be found at: <http://www.nationalasthma.org.au>
- If preventers are to be used or commenced, ensure that your patient and their parents understand why asthma preventers are being prescribed.
- Ask about adherence to previously prescribed asthma preventers and consider reasons for possible non-adherence.
- Ask about asthma triggers and exposure to tobacco smoke. Discuss smoking cessation with parents / young person if appropriate.
- Essential: Referral for **PMH Asthma Clinical Nurse Specialist review** prior to discharge for education especially in newly diagnosed patients (Phone 9340 8713 (extension 8713 or page 8435).
- Advise parents to seek further medical attention should the patient's condition deteriorate or if there is no significant improvement within 48 hours.
- Consider lung function testing either at time of discharge and or as an outpatient. Complete Respiratory Function testing form and phone 9340 8830.⁽¹⁾
- The type of follow-up is dictated by the severity of the clinical picture. Options include follow up with the GP and treating team Paediatrician follow-up if applicable.
- GP follow up should ideally be arranged within 2-7 days.
- Patients undergoing frequent mild exacerbations require follow-up with a general paediatrician within 1-2 months⁽¹⁾
- Patients with brittle or critical asthma may warrant referral to a Respiratory Physician at PMH.⁽¹⁾
- Discharge summary has to be completed and sent out within one week of discharge.**

4. Preventers a quick guide

Preventer medication should be considered for patients with any of the following:

- severe exacerbations of asthma in the last two years^(1, 2)
- use of reliever \geq twice per week^(1, 9)
- asthma symptoms \geq twice per week^(1, 9)
- waking at least one night per week due to asthma symptoms^(1, 9)
- impaired lung function.⁽¹⁾

The following information is confined to inhaled corticosteroids, leukotriene receptor antagonists and long acting beta agonists (LABA) ^(1, 2) In children and adolescents, start preventer medication with a single agent, either low dose inhaled corticosteroids (ICS) or montelukast. ^(1, 10) The correct dose of preventer should be the lowest dose that controls symptoms, and it is essential to check correct preventer technique prior to considering dosage increases.

4.1 Inhaled Corticosteroid (ICS)

Preventers that are combined with long-acting beta-agonists (e.g. Seretide™ or Symbicort™) **should not be first line** but may be considered as step-up treatment in children 4 years and older. ^(1, 2, 11) Commence ICS at a low to medium dose ^(1, 2). A guide to equivalent levels of dosing is as follows:

Dose Level	Ciclesonide*	Beclomethasone Dipropionate**	Fluticasone Propionate**	Budesonide**
Low	80-160 microgram	100-200 microgram	100-200 microgram	200-400 microgram
Medium	160 – 320 microgram	200–400 microgram	200-400 microgram	400-800 microgram
High	320 microgram or above	Over 400 microgram	Over 400 microgram	Over 800 microgram

Table adapted from:

[National Asthma Council Australia, Asthma Management Handbook 2006, pp 27](#)

*ex actuator dose **ex valve dose

Administration of inhaled corticosteroids at or above 200 mcg of BDP–HFA daily or equivalent may be associated with systemic side-effects e.g. decrease in linear growth velocity (but not final adult height) and adrenal suppression. (reference is product information for all ICS)

4.2 Leukotriene receptor antagonists (Montelukast – Singulair™)

- May improve asthma control in selected individuals. ⁽¹⁾
- May be of use for preventing exercise induced bronchoconstriction ⁽¹⁾
- In children who have intermittent asthma induced by viral upper respiratory tract infection, a short course of oral montelukast (14 days) commenced at the onset of infection may reduce the severity of that episode. ⁽¹²⁾
- A combination of ICS and montelukast may be considered if poor control on monotherapy. ⁽¹⁾
- Dosing
 - Children 2–5 years: 4 mg chewable tablet nocte

Children 6–14 years: 5 mg chewable tablet nocte

Adults and children > 15 years: 10 mg nocte

4.3 Long-acting beta-agonists (LABAs)

LABAs should never be used alone in the treatment of asthma in children or adults.

This recommendation is based on “FDA analyses of clinical trials showing that use of these long-acting medicines (without corticosteroids) is associated with an increased risk of severe worsening of asthma symptoms, leading to hospitalization in both children and adults and death in some patients with asthma.”^(1, 2, 11, 12)

LABAs can be prescribed in children in combination with ICS (salmeterol in children 4 years and over or eformoterol in children 12 years and older, as per product license). However, there is limited evidence for their efficacy and safety in young children:^(1, 13)

There are two most popular **combination medications** in Australia are:

- fluticasone and salmeterol (Seretide[®])
- budesonide and eformeterol (Symbicort[®])
eformoterol (Oxis[®]) has a rapid onset of action and can also be used as a reliever medication.⁽¹⁴⁾

Currently, the strongest evidence of a benefit with fixed-dose combination inhaler is in patients who are already taking daily ICS and are symptomatic on moderate doses of ICS.^(1, 13)


Combined medications may also be tried if it is desirable to reduce the dose of the ICS while maintaining optimal asthma control.^(1, 13)

For more information see the Asthma Management Handbook 2014

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