

# South Australian Paediatric Clinical Practice Guidelines

## Acute Asthma in Children

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### Note:

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

### Explanation of the aboriginal artwork:

The aboriginal artwork used symbolises the connection to country and the circle shape shows the strong relationships amongst families and the aboriginal culture. The horse shoe shape design shown in front of the generic statement symbolises a woman and those enclosing a smaller horse shoe shape depicts a pregnant woman. The smaller horse shoe shape in this instance represents the unborn child. The artwork shown before the specific statements within the document symbolises a footprint and demonstrates the need to move forward together in unison.



### **Cultural safety enhances clinical safety.**

**To secure the best health outcomes, clinicians must provide a culturally safe health care experience for Aboriginal children, young people and their families. Aboriginal children are born into strong kinship structures where roles and responsibilities are integral and woven into the social fabric of Aboriginal societies.**

**Australian Aboriginal culture is the oldest living culture in the world, yet Aboriginal people currently experience the poorest health outcomes when compared to non-Aboriginal Australians.**

**It remains a national disgrace that Australia has one of the highest youth suicide rates in the world. The over representation of Aboriginal children and young people in out of home care and juvenile detention and justice system is intolerable.**

**The cumulative effects of forced removal of Aboriginal children, poverty, exposure to violence, historical and transgenerational trauma, the ongoing effects of past and present systemic racism, culturally unsafe and discriminatory health services are all major contributors to the disparities in Aboriginal health outcomes.**

**Clinicians can secure positive long term health and wellbeing outcomes by making well informed clinical decisions based on cultural considerations.**

The term 'Aboriginal' is used to refer to people who identify as Aboriginal, Torres Strait Islanders, or both Aboriginal and Torres Strait Islander. This is done because the people indigenous to South Australia are Aboriginal and we respect that many Aboriginal people prefer the term 'Aboriginal'. We also acknowledge and respect that many Aboriginal South Australians prefer to be known by their specific language group(s).



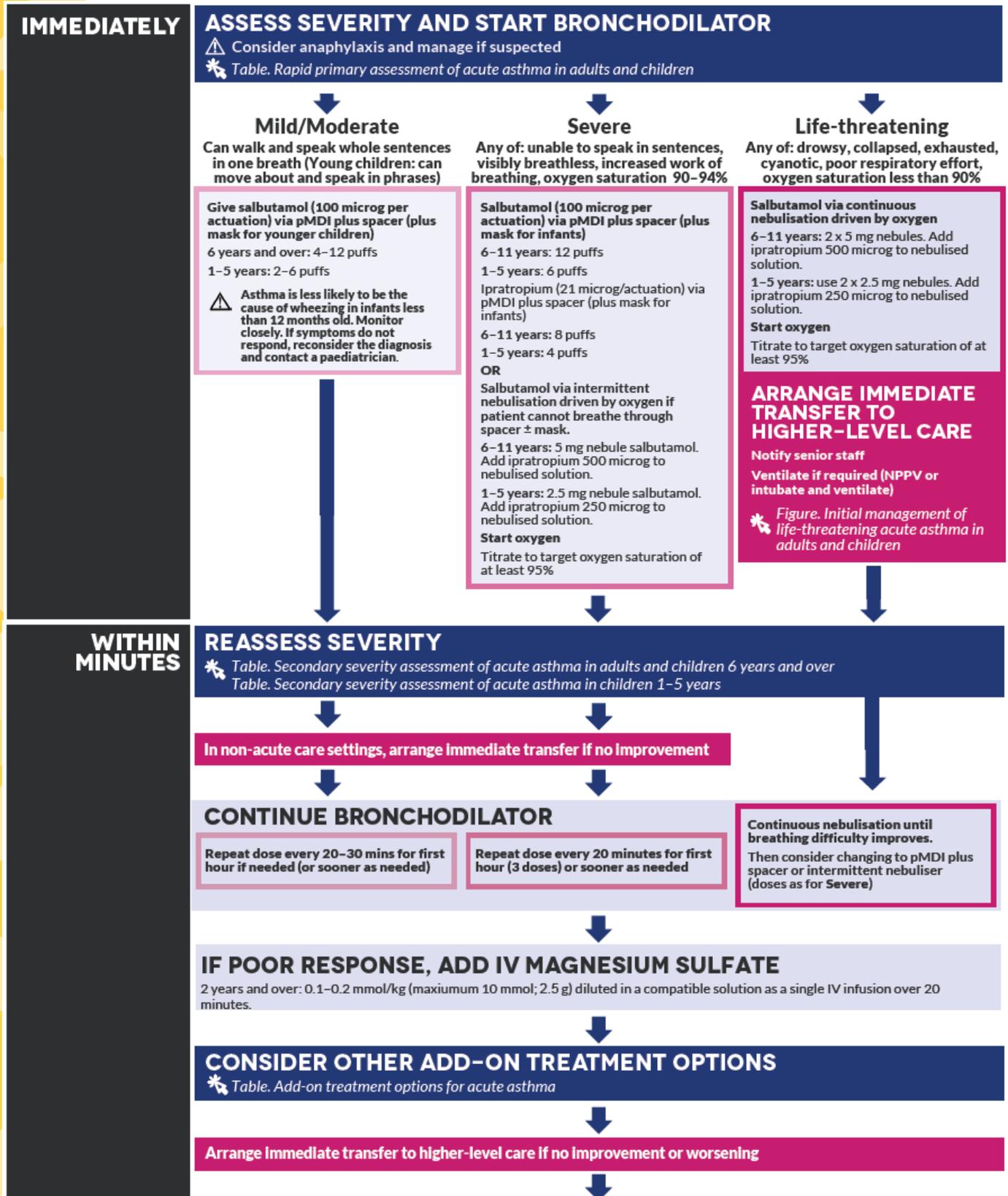
## Purpose and Scope of PCPG

The Acute Asthma in Children Guideline is primarily aimed at medical staff working in any of primary care, local, regional, general or tertiary hospitals. It may however assist the care provided by other clinicians such as nurses. The information is current at the time of publication and provides a minimum standard for the assessment (including investigations) and management of Acute Asthma in Children; it does not replace or remove clinical judgement or the professional care and duty necessary for each specific case.



## Management of acute asthma in children

Figure 1: [Managing acute asthma in children](#) (Australian Asthma Handbook).



\*cont. over page

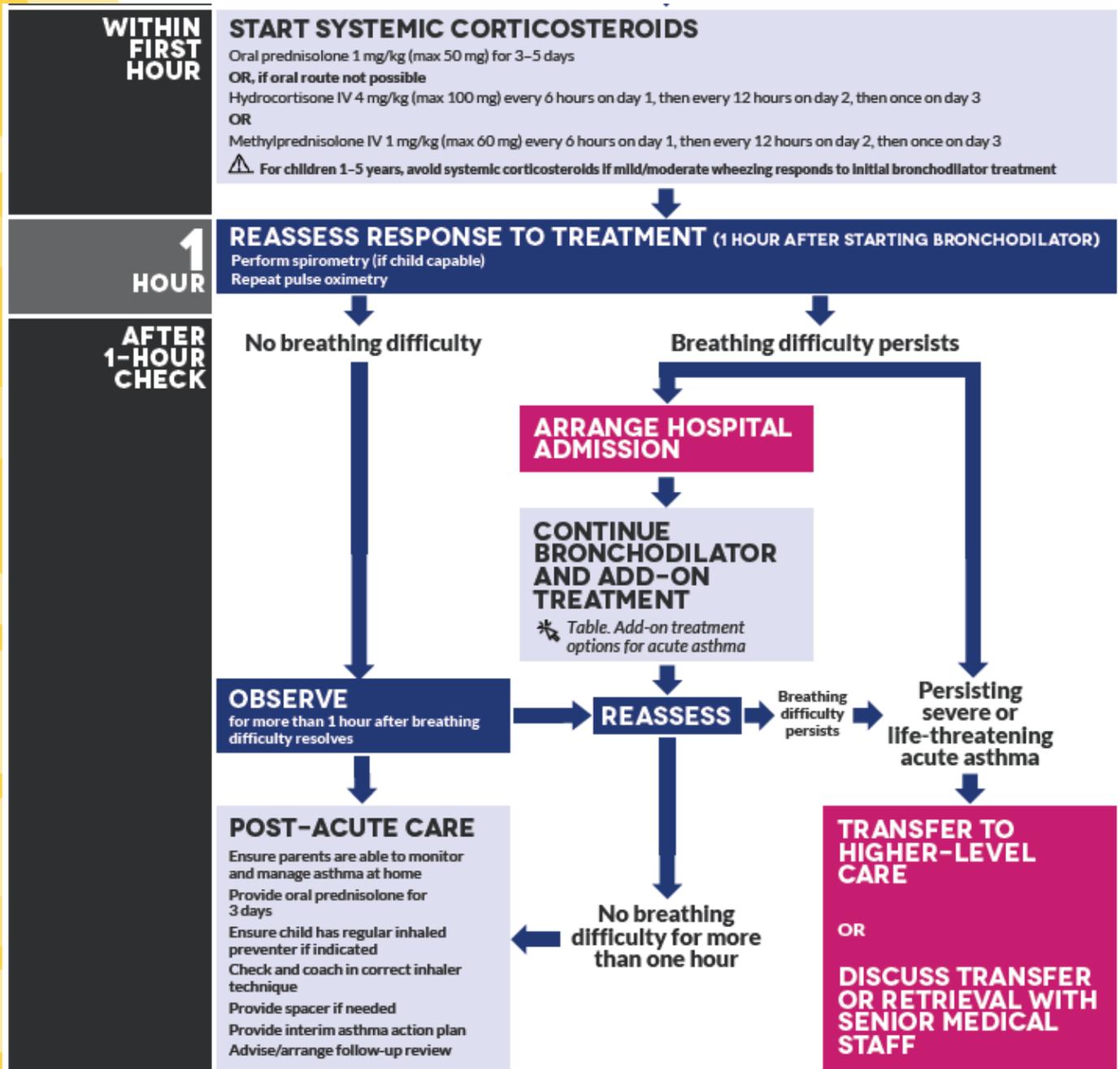
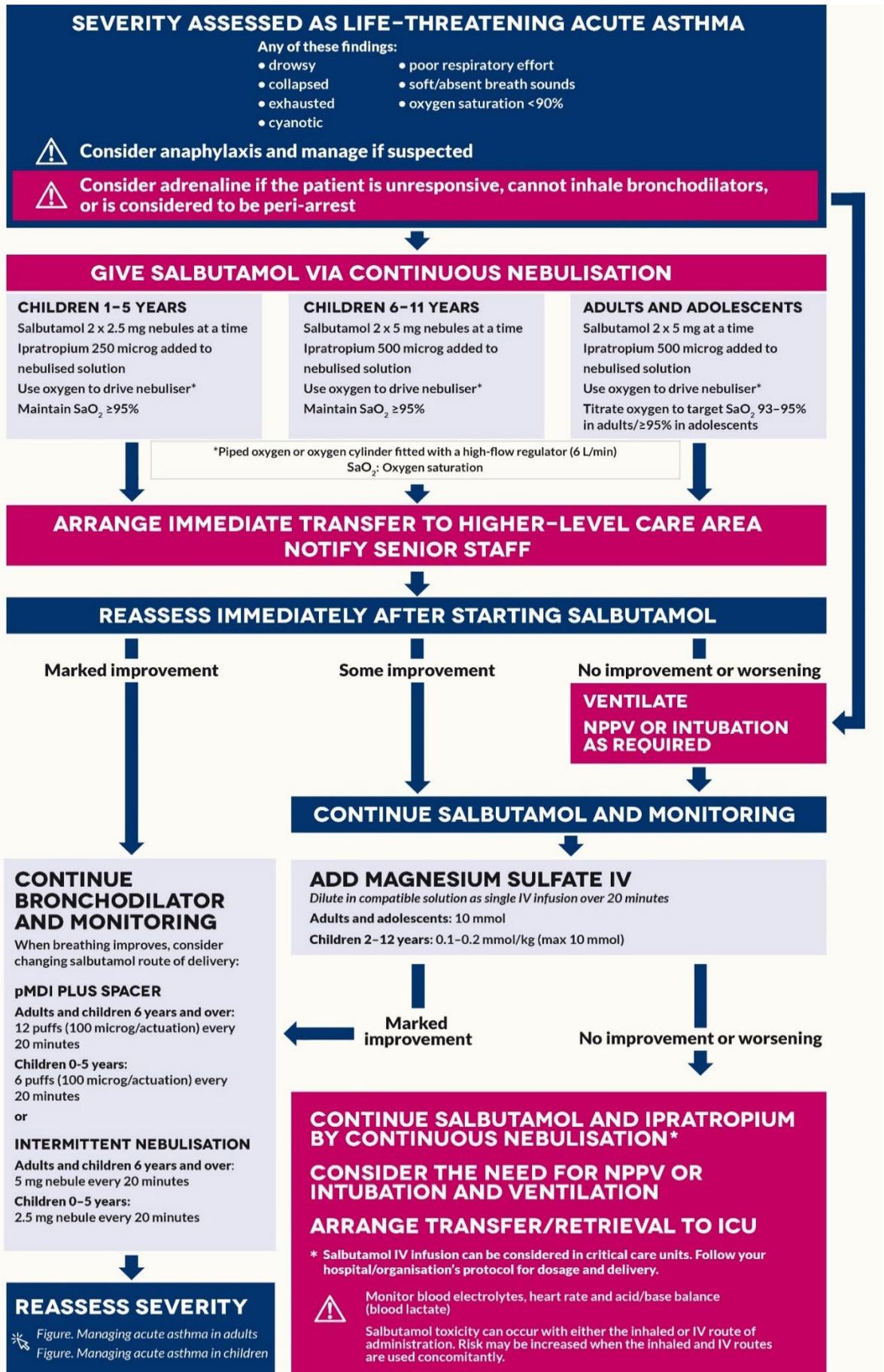


Figure 2: [Initial management of life-threatening acute asthma in children](#) (Australian Asthma Handbook)



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## Important points

Acute asthma management in children, adolescents and adults is based on:

- > assessing severity (mild/moderate, severe or life-threatening) while starting bronchodilator treatment immediately
- > administering oxygen therapy if peripheral capillary oxygen saturation measured by pulse oximetry (SpO<sub>2</sub>) is less than 92% in adults or less than 95% in children
- > completing observations and assessments (when appropriate, based on clinical priorities determined by baseline severity)
- > administering systemic corticosteroids within the first hour of treatment
- > **repeatedly** reassessing response to treatment and either continuing treatment or adding on treatments, until acute asthma has resolved or patient has been transferred to an intensive care unit or admitted to hospital
- > observing the patient for at least 3 hours after respiratory distress or increased work of breathing has resolved
- > providing post-acute care and arranging follow-up to reduce the risk of future flare-ups.

**Notes:** The classification of acute asthma severity differs between clinical settings. The definitions of mild/moderate, severe and life-threatening acute asthma used in the Australian Asthma Handbook may differ from those of some published clinical trials and other guidelines.

The terms 'exacerbation', 'flare-up', 'attack' and 'acute asthma' are used differently by patients and clinicians, and in different contexts.

The classification of flare-ups and the classification of acute asthma overlap (e.g. a flare-up is considered to be at least 'moderate' if it is troublesome enough to cause the patient or carers to visit an emergency department or seek urgent treatment from primary care, yet it might be described as 'mild' acute asthma within acute services).

## Abbreviations

CXR	Chest X-Ray
ED	Emergency Department
HDU	High Dependency Unit
ICS	Inhaled Corticosteroid
ICU	Intensive Care Unit
LABA	Long Acting Beta Agonist
MDI	Metered Dose Inhaler
MET	Medical Emergency Team
PFT	Pulmonary Function Tests
NAC	National Asthma Council
PICU	Paediatric Intensive Care Unit
SAAS	South Australian Ambulance Service
SABA	Short Acting Beta Agonists
SPT	Skin Prick Test
WCH	Women's and Children's Hospital



## Introduction

Asthma is one of the most common conditions in childhood. At any point in time 1 in 9 Australian children will have the diagnosis.

- > It is one of the most common causes for presentation to primary care, emergency departments and for admission to hospital.
- > Asthma exacerbations (flare ups) are often precipitated by viral infection.
- > The diagnosis of asthma is usually clinical and should be considered in a child with cough, wheeze or difficulty breathing but may be aided by response to bronchodilators, past medical history and pulmonary function tests.
- > Children who present with an acute episode of asthma may have had recurrent or persistent symptoms for some time. An acute presentation provides an opportunity to review long term management and any problems should be identified and arrangements made for continuing care.

## Exclusions

Most children should be managed according to this guideline. The following children may need to be managed differently:

- > Patients admitted to PICU / HDU with life-threatening asthma.
- > Patients who have underlying medical conditions which may affect their respiratory status (e.g. other respiratory disease, heart disease, neuromuscular disorders).
- > Infants under 1 year of age.

## Assessment

### History

Where appropriate and possible, a pre-printed template for asthma assessments should be used. The following areas should be covered unless previously recorded:

- > Acute presenting history
  - o Duration and nature of symptoms
  - o Trigger/s (including upper respiratory tract infections, exercise, [thunderstorm asthma](#)). NB. Sudden onset of symptoms after insect sting or ingestion of food/medication may suggest anaphylaxis / not just asthma.
  - o Treatment already given and response (dose, number of doses, time of last reliever dose).
  - o Parental understanding of the treatment of acute episodes.
- > Past asthma history
  - o When diagnosed
  - o Previous admissions including to PICU, number of ED presentations/ GP visits
  - o Known triggers.
  - o Interval symptoms – assess past Asthma control. See [Appendix 2](#)
  - o Smoking exposure – home environment
  - o Medicine and device history including current and past treatment
  - o Adherence to preventer medicines
  - o Other atopic conditions including food allergies, anaphylaxis and or allergic rhinitis
  - o Past diagnostic tests – CXR, PFTs, SPT, bloods.



If previously diagnosed:

- Who currently manages the child's asthma
- Dates of last review and next planned review

> Standard history as per any other patient

- Past medical history
- Family history
- Immunisations
- Medications
- Allergies
- Psychosocial history
- Developmental history

## Examination

Key points to be noted include:

Degree of respiratory distress (see [primary](#) and [secondary](#) assessment table)

- Airway patency (ie. audible wheeze / stridor)
- Respiratory rate - compare to age-appropriate normal ranges
- Work of Breathing - use of accessory muscles and recession
- Auscultation – to assess breath sounds / air entry
- Ability to talk in phrases, sentences or words
- Posture or position
- Colour / Circulation
- Ability to tolerate food and fluids
- Oxygen saturation

> Mental state (alertness and responsiveness)

> Heart rate - compare to age-appropriate normal ranges ([see Appendix 1](#)). Remember that  $\beta$ 2-agonists (Salbutamol, Terbutaline, and Eformoterol) will increase the heart rate.

## Additional information

**Peak flow has little use in acute asthma.  
Clinical assessment is the best indicator of severity.**

## Assessing response to treatment

Reassess response to bronchodilators after each dose. Check with auscultation assessment of chest prior to administration of salbutamol and then if possible 5 minutes afterwards. Continue to check response throughout treatment.

## Consider alternative diagnosis

- > The presence of wheeze does not necessarily mean a child has asthma or will develop asthma.
- > Wheezing in infants less than 12 months is most commonly due to viral bronchiolitis and or airway malacia.
- > Wheezing in children aged 1-5 years is usually associated with viral upper respiratory tract infections.



## Investigations

Generally, no investigations are required in assessing acute asthma; however these tests below may be indicated for further clarification of presentation.

- > **Chest x-ray** – Not routinely required. Consider in patients presenting with first episode of wheeze, particularly if doubt about diagnosis. Children with known asthma do not require a CXR unless there is a suspicion of pneumothorax, foreign body aspiration or major collapse/consolidation. Some degree of asymmetry of signs is common.
- > **Blood tests (including blood gases)** – not routinely required. Electrolyte monitoring may be required for severe episodes or those concerned with Salbutamol toxicity.
- > **Nasopharyngeal aspirate for respiratory viruses** – may be taken where identifying viral pathogen (e.g. illness not classical of asthma) or for cohorting / infection control purposes.
- > **Pulmonary Function Tests (also known as Spirometry)**
  - **NB: Patients with moderate - severe acute asthma should not perform spirometry.**
  - Children aged 6 and older may be able to perform spirometry reliably.
  - Spirometry can be performed in primary care and or at an accredited respiratory function laboratory. It is important that reliable equipment and appropriately trained staff are available.
  - If a diagnosis of asthma is uncertain or the degree of medication responsiveness is questionable a pre- and post-bronchodilator response using Spirometry could be indicated in the acute setting.
  - Spirometry may be arranged in a hospital setting to check degree of obstruction and treatment response prior to discharge (if the child is able to perform reproducible results).
  - Alternatively, a referral for a spirometry test in an outpatient setting might be recommended once the child has recovered from their acute flare up.



## Management

### Assessment for acute asthma

#### Primary severity assessment

<http://www.asthmahandbook.org.au/acute-asthma/clinical/primary-assessment>

Mild/Moderate	Severe	Life-threatening
<p>Can walk, speak whole sentences in one breath</p> <p>(For young children: can move around, speak in phrases)</p> <p>Oxygen saturation &gt;94%</p>	<p><b>Any</b> of these findings:</p> <ol style="list-style-type: none"> <li>1. Use of accessory muscles of neck or intercostal muscles or 'tracheal tug' during inspiration or subcostal recession ('abdominal breathing')</li> <li>2. Unable to complete sentences in one breath due to dyspnoea</li> <li>3. Obvious respiratory distress</li> <li>4. Oxygen saturation 90–94%</li> </ol>	<p><b>Any</b> of these findings:</p> <ol style="list-style-type: none"> <li>1. Reduced consciousness or collapse</li> <li>2. Exhaustion</li> <li>3. Cyanosis</li> <li>4. Oxygen saturation &lt;90%</li> <li>5. Poor respiratory effort, soft/absent breath sounds</li> </ol>

#### Notes:

The severity category may change when more information is available (e.g. pulse oximetry, spirometry) or over time.

The presence of pulsus paradoxus (systolic paradox) is not a reliable indicator of the severity of acute asthma.

If oxygen therapy has already been started, it is not necessary to cease oxygen to measure pulse oximetry.

Oxygen saturation levels are a guide only and are not definitive; clinical judgment should be applied.

Definitions of severity classes for acute asthma used may differ from those used in published clinical trials, those based on severity of flare ups as well as other guidelines that focus on, are or restricted to, the management of acute asthma within emergency departments or acute care facilities.

A patient is usually recommended to seek a hospital / acute care facility if needing a reliever more frequently than 3 hourly and or has the above worsening symptoms.



## Secondary severity assessment

<http://www.astmahandbook.org.au/table/show/64>

<http://www.astmahandbook.org.au/table/show/63>

**Table - Secondary severity assessment of acute asthma in children aged 1-5 years**

**Note:** If features of more than one severity category are present, record the higher category as overall severity level

	Mild/Moderate (all of)	Severe (any of)	Life-threatening (any of)
<b>Consciousness</b>	Alert	†	Drowsy or unconscious
<b>Speech</b>	Can talk or vocalise	†	Unable to vocalise due to dyspnoea
<b>Posture</b>	Can walk or crawl	Lethargic	Collapsed or exhausted
<b>Breathing</b>	Respiratory distress is not severe	Paradoxical chest wall movement: inward movement on inspiration and outward movement on expiration (chest sucks in when person breathes in) or Use of accessory muscles of neck or intercostal muscles or 'tracheal tug' during inspiration or Subcostal recession ('abdominal breathing')	Severe respiratory distress or Poor respiratory effort
<b>Skin colour</b>	Normal	†	Cyanosis
<b>Respiratory rate</b>	<a href="#">Normal</a>	<a href="#">Tachypnoea</a>	<a href="#">Bradypnoea</a> (indicates respiratory exhaustion)
<b>Heart rate</b>	<a href="#">Normal</a>	<a href="#">Tachycardia</a>	<a href="#">Cardiac arrhythmia</a> or <a href="#">Bradycardia</a> (may occur just before respiratory arrest)
<b>Chest auscultation</b>	Wheeze or Normal lung sounds	†	Silent chest or Reduced air entry
<b>Oxygen saturation (pulse oximetry)</b>	>94%	90–94%	<90% or Clinical cyanosis

† Not applicable – may be the same as moderate and does not determine severity category.



# Acute Asthma in Children

**Table - Secondary severity assessment of acute asthma in children 6 years and over**

**Note:** If features of more than one severity category are present, record the higher (worse) category as overall severity level.

	Mild/Moderate (all of)	Severe (any of)	Life-threatening (any of)
<b>Consciousness</b>	Alert	†	Drowsy or unconscious
<b>Speech</b>	Can finish a sentence in one breath	Can only speak a few words in one breath	Can't speak
<b>Posture</b>	Can walk	Unable to lie flat due to dyspnoea Sitting hunched forward	Collapsed or exhausted
<b>Breathing</b>	Respiratory distress is not severe	Paradoxical chest wall movement: inward movement on inspiration and outward movement on expiration (chest sucks in when person breathes in) or Use of accessory muscles of neck or intercostal muscles or 'tracheal tug' during inspiration or Subcostal recession ('abdominal breathing')	Severe respiratory distress or Poor respiratory effort
<b>Skin colour</b>	Normal	†	Cyanosis
<b>Respiratory rate</b>	<25 breaths/min	≥25 breaths/min	<a href="#">Bradypnoea</a> (indicates respiratory exhaustion)
<b>Heart rate</b>	Children: <a href="#">normal range</a>	Children: <a href="#">tachycardia</a>	<a href="#">Cardiac arrhythmia</a> or <a href="#">Bradycardia</a> (may occur just before respiratory arrest)
<b>Chest auscultation</b>	Wheeze or Normal lung sounds	†	Silent chest or Reduced air entry
<b>Oxygen saturation (pulse oximetry)</b>	>94%	90–94%	<90% or Clinical cyanosis
<b>Blood gas analysis (adults, if performed) ‡</b>	Not indicated	Not indicated	<a href="#">PaO<sub>2</sub></a> <60 mmHg <a href="#">PaCO<sub>2</sub></a> >50 mmHg <sup>§</sup> <a href="#">PaCO<sub>2</sub></a> within normal range despite low <a href="#">PaO<sub>2</sub></a> pH <7.35 <sup>#</sup>
<b><a href="#">FEV<sub>1</sub></a></b>	> 50% predicted or personal best	> 50% predicted or personal best	

† Not applicable – may be the same as moderate and does not determine severity category

‡ Perform blood gas analysis only if clinically indicated

§ The presence of hypercapnoea indicates that the patient is tiring and may need ventilatory support.

# Metabolic acidosis (often associated with hypokalaemia) may occur with increased work of breathing and with high-dose salbutamol.



## Medication Doses and Add on Treatments

\* Refer to individual prescribing guidelines in your area for each administration

<p><b>Hydrocortisone (IV)</b></p>	<p><b>Option 1:</b> hydrocortisone <b>IV</b> 4 mg/kg (maximum 100 mg) every 6 hours on day 1 then reduce (every 12 hours on day 2, once daily on day 3 and, if needed, once daily on days 4–5) or switch to oral prednisolone.</p> <p><b>Option 2:</b> methylprednisolone <b>IV</b> 1 mg/kg (maximum 60 mg) every 6 hours on day 1 then reduce (every 12 hours on day 2, once daily on day 3 and, if needed, once daily on days 4–5) or switch to oral prednisolone.</p>
<p><b>Ipratropium bromide (Inhaled)</b></p>	<p><b>1-5 years:</b> 4 puffs via MDI (21microgram/puff) or 250microgram nebulised.</p> <p><b>≥6 years:</b> 8 puffs via MDI (21microgram/puff) or 500microgram nebulised.</p> <p><b>Note:</b> Ipratropium bromide dries out secretions and may worsen mucous plugging by virtue of increased tenacity of airway mucus.</p>
<p><b>Magnesium Sulphate (IV)</b> (Second line bronchodilator in severe or life threatening asthma, or when poor response to maximal doses of Bronchodilators)</p>	<p>Children 2 years and over - 0.1- 0.2 mmol/kg/dose (maximum dose 10 mmol).</p> <p>IV infusion over 20 minutes. IV MgSO4 may be associated with hypotension.</p> <p>IV Aminophylline, magnesium and salbutamol must be given via separate IV lines.</p>
<p><b>Aminophylline</b> (Third-line bronchodilator in life-threatening acute asthma that has not responded to continuous nebulised salbutamol after considering other add-on treatment options)</p>	<p><b>Severe acute asthma</b></p> <p>Adjust maintenance dose according to plasma theophylline concentration.</p> <p>Local protocols may differ from the doses below.</p> <p><b>Loading</b></p> <p>If child is already on theophylline, check plasma concentration first; if unable to do so, omit loading dose.</p> <p>A dose of 0.6 mg/kg aminophylline is expected to raise plasma theophylline concentration by 1 microgram/ml (5.5 micromol/L).</p> <p><b>1-12 months:</b> IV 5mg/kg.</p> <p><b>1-18 years:</b> IV 5-10 mg/kg (maximum 500mg). Younger children are more likely to require doses at the upper end of the range due to increased clearance.</p>



<p><b>Aminophylline</b></p> <p>(Third-line bronchodilator in life-threatening acute asthma that has not responded to continuous nebulised salbutamol after considering other add-on treatment options)</p>	<p><b>Maintenance: continuous IV infusion PICU only</b></p> <table border="1"> <tr> <td><b>6 weeks - 6 months</b></td> <td>IV infusion 0.5 mg/kg/hour</td> </tr> <tr> <td><b>6 – 12 months</b></td> <td>IV infusion 0.7 mg/kg/hour</td> </tr> <tr> <td><b>1 – 9 years</b></td> <td>IV infusion 0.9-1.1 mg/kg/hour</td> </tr> <tr> <td><b>9 – 12 years</b></td> <td>IV infusion 0.7 mg/kg/hour</td> </tr> <tr> <td><b>12-18 years</b></td> <td>IV infusion 0.5-0.7 mg/kg/hour</td> </tr> </table>	<b>6 weeks - 6 months</b>	IV infusion 0.5 mg/kg/hour	<b>6 – 12 months</b>	IV infusion 0.7 mg/kg/hour	<b>1 – 9 years</b>	IV infusion 0.9-1.1 mg/kg/hour	<b>9 – 12 years</b>	IV infusion 0.7 mg/kg/hour	<b>12-18 years</b>	IV infusion 0.5-0.7 mg/kg/hour
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<b>12-18 years</b>	IV infusion 0.5-0.7 mg/kg/hour										
<p><b>Prednisolone (Oral)</b></p>	<p>For children aged 6-11 years with acute asthma (and children aged 1–5 if acute wheezing is severe), start systemic corticosteroids within 1 hour of presentation (unless contraindicated).</p> <p>Give prednisolone 1 mg/kg (maximum 50 mg) orally each morning for 3 days.</p> <p>It is usually not necessary to taper the dose unless the duration of treatment exceeds 2 weeks.</p> <p><b>Note:</b> A longer course (e.g. 5 days) may be needed for severe cases.</p> <ul style="list-style-type: none"> <li>• <b>For children aged 1-5 years, systemic corticosteroids should generally be limited to those with severe acute wheezing to avoid over-use (particularly for those with intermittent viral-induced wheezing).</b></li> </ul>										
<p><b>Salbutamol (Inhaled)</b></p> <p><b>NB.</b> The use of a MDI with a spacer is the recommended administration route in acute asthma</p> <p>⊗ Do not prescribe oral salbutamol. Inhalation is the recommended route for delivering relievers for all children and adults.</p>	<p><b>&lt; 6 years</b> - 6 puffs (600 microgram) via spacer or 2.5mg nebulised</p> <p><b>≥ 6 years</b> -12 puffs (1200 microgram) via spacer or 5mg nebulised</p> <p><b>Administration of salbutamol by health professionals for a patient with acute asthma</b></p> <p><b>Ensure patient sitting upright.</b></p> <ul style="list-style-type: none"> <li>&gt; Use a salbutamol pressurised metered-dose inhaler (100mcg/actuation) with a spacer.</li> <li>&gt; Shake inhaler and insert upright into spacer.</li> <li>&gt; Place mouthpiece between the person's teeth and ask them to seal lips firmly around mouthpiece.*</li> <li>&gt; Fire one puff into the spacer.</li> <li>&gt; Ensure the child takes 4 'normal tidal breaths' in and out of the spacer.</li> <li>&gt; Remove the spacer from mouth. Shake the inhaler after each puff before actuating again. (This can be done without detaching the pressurised metered-dose inhaler from the spacer.)</li> </ul> <p>*For small children (&lt; 4years of age) who cannot form a tight seal with their lips around the spacer mouthpiece, attach a well-fitted mask to the spacer.</p> <p><b>Please be aware that different dosages of Salbutamol are recommended for patients and carers giving asthma first aid in the community.</b></p> <p>For example <b>Asthma First Aid 4x4x4</b> (See <a href="#">Appendix 5</a>) variety of templates</p>										



<p><b>Salbutamol nebulisation (Inhaled)</b></p> <p><b>NB:</b> The use of nebulisers increases the risk (to staff and patients) of nosocomial aerosol infection. If using a nebuliser, follow your organisation's infection control protocols to minimise spread of respiratory tract infections.</p>	<p><b>Driving nebuliser</b></p> <p>Nebulisers can be driven by air, piped oxygen, or an oxygen cylinder fitted with a high-flow regulator capable of delivering &gt;6 L/min.</p> <p><b>Intermittent nebulisation</b></p> <p>Children 6 years and over: 5 mg nebule</p> <p>Children 0–5 years: 2.5 mg nebule</p> <p><b>Continuous nebulisation using nebules</b></p> <p>Put two nebules into nebuliser chamber at a time and repeat to refill when used up.</p> <p>Children 6 years and over: use two 5 mg nebules (10 mg) at a time</p> <p>Children 0–5 years: use two 2.5 mg nebules (5 mg) at a time</p> <p>If using oxygen to drive a nebuliser, do not exceed 8–10 L/minute and avoid over-oxygenation (increases risk of hypercapnoea).</p>
<p><b>Salbutamol (IV)</b></p> <p>Third line bronchodilator in life-threatening acute asthma that has not responded to continuous nebulised salbutamol after considering add on treatment options</p> <p><b>NB.</b> Only in ICU</p>	<p><b>Children 2–12 years up to 40 kg:</b></p> <p>As infusion: 5 microg/kg/minute for 1 hour then reduce to 1 microg/kg/minute</p> <p>As infusion with bolus: 5–15 microg/kg over 10 minutes then 1 microg/kg/minute. Adjust for response.</p> <p>As bolus: 5–15 microg/kg over 10 minutes. Repeat if required.</p> <p><b>Children &gt;40 kg:</b></p> <p>As infusion: Loading dose 200–300 microg over 1 minute then 5 microg/minute (adjust for response; usual rate 10–20 microg/minute)</p> <p>As bolus: 200–300 microg over 1 minute. Repeat after 15 minutes as required.</p> <p>*Refer to local guidelines for administration</p> <p><b>Monitor for salbutamol toxicity</b> (e.g. Tachycardia, tachypnoea, metabolic acidosis, hypokalaemia) – which may occur with frequent doses of inhaled or IV Salbutamol.</p>



## Admission and discharge criteria

### Discharge from Emergency Department or other acute care setting

- > Patients may be discharged home if:
  - Tolerating 3 hours between bronchodilator doses or as per asthma discharge criteria as per individual Local Health network policies and procedures.
  - Normal oxygen saturations >94% and normal vital signs ([appendix 1](#)) (within age appropriate limits) in air.
  - Sensible carers and easy access to medical care in the event of an acute deterioration.
- > Parent / Carer Asthma Education
  - All patients & families should have their level of asthma knowledge reviewed and appropriate education given upon every review.
  - Patients and families should go home with written education material including;
    - Asthma Action Plan (See [Appendix 5](#) for variety of templates)
    - Recovery or Asthma Discharge Plan (See [Appendix 3](#))
    - School and Childcare plans if needed (See [Appendix 5](#))
  - It is the medical officer's responsibility to ensure they discuss the weaning discharge plan and asthma action plan with the patients / care givers. (See [Appendix 5](#) for variety of templates)
  - Advise GP review in 3 days and make a second appointment 3-4 weeks later as per National Asthma Council Asthma D/C plan – (see [Appendix 3](#)) severe asthma, consider specialist referral – see [Appendix 4](#)
  - Advise parents to seek further medical attention should the child's condition deteriorate or if there is no significant improvement within 48 hours. Parents should be educated on recognising signs of deterioration. (See [Appendix 5 Asthma First Aid](#))
- > Discharge medications
  - Salbutamol initially 3-4 hourly with a weaning plan over the next 3-4 days.
  - Continue oral Prednisolone to finish 3 days (no need for a weaning dose for courses less than 14 days).
  - Utilise pharmacists for medication education (if available).
- > Inhaler device and spacer technique should be checked before discharge.
- > Families with the below criteria can be referred to Asthma Australia for education – [www.asthmaaustralia.referrals](http://www.asthmaaustralia.referrals). Group education sessions can be arranged.
  - Newly diagnosed asthma (> 2 years)
  - Culturally & Linguistically Diverse Patients with English as a second language
  - Patients not linked in with regular GP support
  - Frequent hospital presentations with asthma
- > Consider preventive treatment if there are frequent acute episodes or interval symptoms between acute episodes (more than one disturbed night per week, difficulty participating in physical activities or bronchodilator use on more than two days per week).
- > Consider treating allergic rhinitis if also uncontrolled.



## In children, consider admitting patient to hospital if (any of):

- hypoxia at presentation
- respiratory distress/increased work of breathing unresolved 1–2 hours after presentation
- a history of **ICU** admission for asthma
- presentation for acute asthma within the past 4 weeks
- frequent presentations for acute asthma (e.g. several over previous year)
- high recent use of beta<sub>2</sub> agonists
- patient cannot be monitored adequately at home or cannot easily return to hospital if needed
- confirmed food allergy
- other risk factors for adverse outcomes.

## Consider admission to HDU/PICU/MedSTAR Kids retrieval

- > Signs of critical asthma severity,
- > requiring continuous nebulisers for >1 hour without improvement,
- > requiring Salbutamol more frequently than every 30 minutes after 2 hours,
- > hypoxia despite maximal oxygen or raised CO<sub>2</sub>.

All patients admitted with life threatening asthma (severe enough to require PICU/ HDU admission) are recommended to have an inpatient **Paediatric Respiratory Physician** assessment and have intensive asthma education and care coordination.

Utilise Respiratory Nurse Consultant if available or accredited Asthma Nurse Educators.

## Inpatient management

Review regularly as dictated by degree of severity.

Hypoxia may be the result of significant airway obstruction due to factors such as atelectasis and or mucous plugging of the airways. Slow weaning of oxygen and a longer course of steroids may be indicated in this patient group.

High Flow oxygen may also lead to drying of the upper airways leading to worsening broncho-constriction. The use of humidified oxygen might mitigate this.

## Weaning Salbutamol

- > Wean by extending time between doses by 30-60 mins aiming for 3 hours or greater between doses.
- > A medical review is required if a patient deteriorates or requires more frequent Salbutamol than previously or if their oxygen requirement increases.
- > The use of Salbutamol nebuliser is contraindicated if a patient requires Humidified High Flow Nasal Cannula oxygen (HHFNC).



## Discharge from hospital

- > Patients can be safely discharged if they are stable after two consecutive three hour periods between Salbutamol doses.
- > Some Hospitals use a Criteria Led Discharge template.

### Medications upon discharge

Discharge medications:

- > Salbutamol usually 3-4 hourly with a weaning plan over the next 3-4 days.
- > Continue oral Prednisolone to finish 3 days (no need for a weaning dose for courses less than 14 days).
- > Preventer if required.

Preventive treatment should be commenced if there are interval symptoms between acute episodes (nocturnal symptoms, difficulty participating in physical activities, or bronchodilator use on more than two days per week). It should also be considered if there are frequent acute episodes.

If commencing preventive treatment emphasise the importance of ongoing review with General Practitioner / health professional; and arrange follow up if none is in place.

### Follow Up

- > Advise GP review in 3 days and make a second appointment 3-4 weeks later as per National Asthma Council Asthma D/C plan (see [Appendix 3](#)).
- > Consider specialist referral for patients with severe or difficult to control asthma. (See [Appendix 4](#)).
- > Patients with the following should also be considered for referral to an asthma educator or a community asthma nurse:
  - Newly diagnosed asthma
  - Poorly controlled asthma
  - Severe asthma e.g. requiring PICU
  - Adherence issues
  - Concerns regarding home management
  - Patients from a non-English speaking background
- > Encourage SA Ambulance cover.
- > Advise re smoking cessation and trigger avoidance as necessary
- > Recommend annual flu vaccine for children with asthma and their parents /care givers in addition to routine immunisations.



## Information and Resources available

 <p><a href="http://www.asthmaaustralia.org.au/sa/home">www.asthmaaustralia.org.au/sa/home</a></p>	<ul style="list-style-type: none"> <li>• Asthma Assist - Free Call 1800 ASTHMA (1800 278 462) Monday – Friday 0900 – 1700</li> <li>• Patient Education Referral Service:</li> <li>• <a href="https://www.asthmaaustralia.org.au/sa/about-asthma/resources/patient-education-referral-service">https://www.asthmaaustralia.org.au/sa/about-asthma/resources/patient-education-referral-service</a></li> <li>• <a href="https://www.asthmaaustralia.org.au/sa/about-asthma/resources/coach/your-asthma-coach">https://www.asthmaaustralia.org.au/sa/about-asthma/resources/coach/your-asthma-coach</a></li> <li>• Mobile Asthma Australia Apps – Apple iPhones and iPads</li> <li>• An <i>Asthma Control Pack</i> should ideally be given to each patient at diagnosis. They can be ordered from the website.</li> </ul>
 <p><a href="https://www.nationalasthma.org.au/">https://www.nationalasthma.org.au/</a></p>	<ul style="list-style-type: none"> <li>• <a href="#">Australian Asthma Handbook</a></li> <li>• <a href="#">Managing Acute Asthma in Clinical Setting</a></li> <li>• <a href="#">Asthma Action Plan Library</a></li> <li>• <a href="#">Health Professional Education and Training</a></li> </ul>
<p><b>Lung Foundation Australia</b></p>	<p><a href="http://lungfoundation.com.au/">http://lungfoundation.com.au/</a></p>
<p><b>QuitSA</b></p>	<p><a href="http://www.quitsa.org.au">www.quitsa.org.au</a></p>
<p><b>SA Ambulance</b></p>	<p><a href="http://www.saambulance.com.au">www.saambulance.com.au</a> (see <i>products and services</i>)</p>
<p><b>ASCIA</b></p>	<p><a href="https://www.allergy.org.au/">https://www.allergy.org.au/</a></p>
<p><b>Companion documents</b></p>	<p><a href="#">Department for Education and Child Development Healthcare forms</a>, including asthma specific forms and medication authority. Medical Director compatible forms can be downloaded.</p>

## References

The South Australian statewide guideline on the management of acute asthma is based on the British Thoracic Society & Scottish Intercollegiate Guidelines Network, British Guideline on the Management of Asthma, Revised June 2009.

No additional literature searches were conducted.

### Other guidelines reviewed:

- > National Asthma Council of Australia – Australian Asthma Handbook Version 2.0 accessed online
- > NSW Asthma Guideline - NSW Department of Health 2004
- > Starship Paediatric Health Clinical Practice Guidelines - Management of acute asthma and Management of life-threatening asthma (content reproduced with the permission of Dr Raewyn Gavin)
- > Royal Children's Hospital guideline - Asthma (Acute) Guideline (past draft content reproduced with the permission of Dr Mike South)

### Other information sources:

- > Asthma Australia. State of Asthma in South Australia, September 2018
- > Advanced Paediatric Life Support manual 4th edition
- > Bonafide CP, Brady PW, Keren R, Conway PH, Marsolo K, Daymont C. (2013). Development of heart and respiratory rate percentile curves for hospitalized children. *Pediatrics*, 131 (4), e1150-e1157).
- > Royal Children's Hospital Paediatric Pharmacopoeia 13th Edition - accessed online
- > Rowe BH, Bretzlaff J, Bourdon C, Bota G, Blitz S, Camargo CA. Magnesium sulfate for treating exacerbations of acute asthma in the emergency department. *Cochrane Database of Systematic Reviews* 2000, Issue 1
- > National Asthma Council Australia. Leukotriene receptor antagonists in the management of childhood asthma. Melbourne: National Asthma Council Australia, 2010
- > Sunit Singhi, Joseph L. Mathew and Paul Torzillo What is the role of subcutaneous adrenaline in the management of acute asthma? *International Child Health Review Collaboration*
- > Women's and Children's Hospital IV Salbutamol guidelines – WCH Pharmacy Dept 12/6/09
- > Australian Medicines Handbook – accessed online: <https://childrens.amh.net.au/>
- > British National Formulary for Children - 2010-2011



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## Document Ownership & History

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Approval Date	Version	Who approved New/Revised Version	Reason for Change
02/08/21	V3.3	Domain Custodian, Clinical Governance, Safety and Quality	Minor amendment: Included commencing Corticosteroids within first hour and decrease maximum MgSO4 dose to 2g; aligning with Australian Asthma Handbook.
01/02/21	V3.2	Chair, SA Child & Adolescent Health Community of Practice	Minor amendment: Change to IV salbutamol regimen
11/05/20	V3.1	Chair, SA Child & Adolescent Health Community of Practice	Minor amendment (Appendix 4) Lyell McEwin Hospital added to list of <i>Public Paediatric Specialist Referral Centres</i>
15/08/19	V3	SA Health Safety & Quality Strategic Governance Committee	Formally reviewed in line with 1-5 year scheduled timeline for review.
01/07/13	V2	SA Health Safety & Quality Strategic Governance Committee	Formally reviewed in line with 1-5 year scheduled timeline for review.
24/01/12	V1	SA Health Safety & Quality Strategic Governance Committee	Original approved version



## Appendices

### APPENDIX 1 – Paediatric Normal Ranges

#### Normal respiratory and heart rates in children

	Heart rate (beats/minute)	Respiratory rate (breaths/minute)
<1 year	110-160	30-40
1-2 years	100-150	25-35
2-5 years	95-140	25-30
5-12 years	80-120	20-25
12-18 years	60-100	15-20

Source: Samuels M, Wieteska S. (Eds) *Advances paediatric life support: the practical approach*. 5<sup>th</sup> edn. Wiley-Blackwell, Oxford, 2011



# South Australian Paediatric Clinical Practice Guidelines

## Acute Asthma in Children

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### APPENDIX 2 – [Definition of Levels of Recent Asthma Symptom Control in Children \(Regardless of Current Treatment Regime\)](#) (Australian Asthma Handbook)

Table. Definition of levels of recent asthma symptom control in children (regardless of current treatment regimen)

Good control	Partial control	Poor control
<p>All of:</p> <ul style="list-style-type: none"> <li>Daytime symptoms<sup>†</sup> ≤2 days per week (lasting only a few minutes and rapidly relieved by rapid-acting bronchodilator)</li> <li>No limitation of activities<sup>‡</sup></li> <li>No symptoms<sup>§</sup> during night or when wakes up</li> <li>Need for <a href="#">SABA</a> reliever<sup>#</sup> ≤2 days per week</li> </ul>	<p>Any of:</p> <ul style="list-style-type: none"> <li>Daytime symptoms<sup>†</sup> &gt;2 days per week (lasting only a few minutes and rapidly relieved by rapid-acting bronchodilator)</li> <li>Any limitation of activities<sup>*</sup></li> <li>Any symptoms during night or when wakes up<sup>††</sup></li> <li>Need for <a href="#">SABA</a> reliever<sup>#</sup> &gt;2 days per week</li> </ul>	<p>Either of:</p> <ul style="list-style-type: none"> <li>Daytime symptoms<sup>†</sup> &gt;2 days per week (lasting from minutes to hours or recurring, and partially or fully relieved by <a href="#">SABA</a> reliever)</li> <li>≥3 features of partial control within the same week</li> </ul>

[SABA](#): short-acting beta<sub>2</sub> agonist

<sup>†</sup> e.g. wheezing or breathing problems

<sup>‡</sup> child is fully active; runs and plays without symptoms

<sup>§</sup> including no coughing during sleep

<sup>#</sup> not including doses taken prophylactically before exercise. (Record this separately and take into account when assessing management.)

<sup>\*</sup> e.g. wheeze or breathlessness during exercise, vigorous play or laughing

<sup>††</sup> e.g. waking with symptoms of wheezing or breathing problems

#### Notes:

Recent asthma control is based on symptoms over the previous 4 weeks. Each child's risk factors for future asthma outcomes should also be assessed and taken into account in management.

Validated questionnaires can be used for assessing recent symptom control:

[Test for Respiratory and Asthma Control in Kids \(TRACK\)](#) for children < 5 years

[Childhood Asthma Control Test \(C-ACT\)](#) for children aged 4–11 years

Last reviewed version 2.0



South Australian Paediatric Clinical Practice Guidelines

# Acute Asthma in Children

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## APPENDIX 3 - Acute Asthma Discharge Plan for Children



Hospital No. ....  
Surname .....  
First name .....  
D.O.B. .... Sex .....

Asthma discharge plan

## Going home after a severe asthma attack

For children aged 1–11 years

This asthma discharge plan was prepared on: \_\_\_\_\_ day \_\_\_\_\_ month \_\_\_\_\_ year 20\_\_\_\_

You have been given this plan because your child has been treated for asthma in the emergency department or hospital.

This plan explains what to do until you visit your usual doctor for an asthma check-up.

You will be given inhalers and medicines for your child to take and you will be shown how to use them.

### Important safety information

Follow these instructions carefully.

If your child uses a preventer every day (inhaler or tablets), keep using it as well as taking any new medicines we give you.

### Your medicines

[Strike out any that do not apply]	Name of medicine <small>[Write brand name and strength, if known]</small>	When and how to take it <small>[Strike out instructions that do not apply]</small>
Reliever (salbutamol)	[[space for free text]]	Use the reliever inhaler when the child has asthma symptoms (breathing problems or a tight feeling in the chest).  Take 2 puffs (1 puff at a time), using a spacer.  If the child needs to use the reliever again within 4 hours, see your GP or go to the emergency department.
Prednisolone	[[space for free text]]	Take __ tablets every morning with food for __ days. Take __ mL every morning with food for __ days. [[space for free text]]
Preventer	[[space for free text]]	Take __ puffs __ times each day [[space for free text]]
Other	[[space for free text]]	[[space for free text]]
Other	[[space for free text]]	[[space for free text]]

Draft: 5 December



## **APPENDIX 4 – Public Paediatric Specialist Referral Centres**

- > Women's and Children's Hospital - General Medicine and Respiratory outpatients
- > Flinders Medical Centre - General Medicine outpatients
- > Lyell McEwin Hospital
- > Modbury Hospital
- > Mt Gambier Hospital
- > Pt Augusta Hospital

There are many private paediatricians in Adelaide and Regional Centres.

## **Emergency Services**

- > MedSTAR Kids – South Australian emergency retrieval and advice service.  
Call 13STAR (137827) 24 hours per day

## **APPENDIX 5 – Action Plan and Asthma First Aid**

- > Provide and explain Asthma Action Plan
  - [Department for Education Health Care Plans](#)
  - National Asthma Council Asthma Action Plan Library
  - National Asthma Council Translated Asthma Action Plans (other languages)
- > Provide and explain Discharge plan or Recovery Plan (ensuring the parent/care giver knows the medication management plan post discharge)
- > Discharge summary (generally sent through to the patients' lead General Practitioner)
- > Spacer equipment and / or mask (supplied by the hospital, purchased from Home Equipment Centre or at a local pharmacy)
  - Check puffer and spacer technique is correct.
  - [Utilise medication videos as teaching tools to assess device technique](#)
  - Promote and encourage preventer adherence

