

Minimising the risk of acute asthma in children

PETER WARK BMed, FRACP, PhD

JODI HILTON BMed, FRACP



A diagnosis of asthma is important before preventive treatment can be commenced in children after an acute asthma episode. Careful continuing assessment of the severity of the child's condition is needed to determine the risk of future episodes.

Asthma affects one in 10 children and adults in Australia. Although there has been a decrease in mortality since the 1990s, 411 people died from asthma in Australia in 2009.¹ Australia has a mortality rate that remains among the highest in the world.¹ Since the late 1980s there has also been a decline in hospital admissions due to asthma. Much of this has been attributed to the development of a greater awareness of asthma in primary care and the use of effective therapies, particularly inhaled corticosteroids in controlling asthma.² Unfortunately, this has also led to the perception that nothing more needs to be done. However, in Australia in 2010-11 there were 37,830 hospitalisations for asthma and it was still the most common cause of acute hospital admission in children aged 0 to 4 years.³

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Professor Wark is a Senior Staff Specialist in the Department of Respiratory and Sleep Medicine, John Hunter Hospital, Newcastle; and Conjoint Professor, Centre for Asthma and Respiratory Disease Hunter Medical Research Institute, University of Newcastle. Dr Hilton is a Senior Staff Specialist in Paediatric Respiratory and Sleep Medicine at the John Hunter Children's Hospital, Newcastle, NSW.

KEY POINTS

- Acute asthma remains a common and potentially serious problem for children in Australia.
- In order to manage and prevent acute asthma, a diagnosis of asthma is required and needs to be considered outside the context of the acute event.
- Acute asthma is a potentially life-threatening event and all children with asthma and their families need to have access to inhaled salbutamol with a holding chamber spacer and know how to use these in the context of acute asthma.
- A child with acute asthma needs to be closely observed to assess the response to therapy: in those not responding to inhaled bronchodilators, initially consider 'add-on' therapy with inhaled ipratropium bromide and/or intravenous magnesium sulfate.
- A three-day course of systemic corticosteroids should be considered for all children aged 6 years or older.
- Systemic corticosteroids are not as effective in children aged 0 to 5 years and should only be used in those with severe acute episodes where hospitalisation is considered.
- Before discharge from hospital after an acute asthma episode, all patients and their families should: have access to and be able to use inhaled salbutamol in a spacer or holding chamber (with a face mask if appropriate for younger children); be given and know how to follow a written asthma action plan; and have planned follow up with their GP in the community.

TABLE 1. INITIAL PREVENTER TREATMENT FOR CHILDREN AGED 0 TO 5 YEARS*

Age group	Pattern of symptoms	Management options
0 to 12 months	Intermittent symptoms or viral-induced wheeze	Regular preventer treatment is not recommended
	Multiple-trigger wheeze	Refer to specialist
1 to 2 years	Intermittent symptoms or viral-induced wheeze	Regular preventer treatment is not recommended
	Persistent asthma or multiple-trigger wheeze	Consider a treatment trial with sodium cromoglycate 10 mg three times daily and review response in two to four weeks Consider a treatment trial of low-dose inhaled corticosteroids only if wheezing symptoms are disrupting child's sleep or play; review response in four weeks
2 to 5 years	Infrequent intermittent symptoms or viral-induced wheeze	Regular preventer treatment is not recommended
	Persistent mild asthma or episodic viral-induced wheeze with frequent symptoms, or multiple-trigger wheeze	Consider regular treatment with montelukast 4 mg once daily and review response in two to four weeks If symptoms do not respond, consider regular treatment with a low dose of an inhaled corticosteroid and review response in four weeks
	Moderate-to-severe persistent asthma or moderate-to-severe multiple-trigger wheeze	Consider regular treatment with a low dose of an inhaled corticosteroid and review response in four weeks

* Reproduced with permission from *Australian Asthma Handbook* (2014).⁹ Asset ID: 20.

Mortality and hospital admissions represent the tip of the iceberg in regard to the morbidity associated with acute asthma. Acute asthma exacerbations also have a marked effect on patients and their families, leading to prolonged and severe worsening of symptoms, as well as loss of time from work or school.⁴ The importance of acute asthma is being increasingly recognised and this has led to a move away from assessing asthma with regards to long-term severity alone, and guidelines now incorporate the importance of controlling symptoms and minimising the risk of acute exacerbations.⁵

Prevention of acute asthma requires a diagnosis of asthma

Although prevention of acute asthma has become a major goal of asthma treatment, the most effective preventer agents in children are inhaled corticosteroids and leukotriene receptor antagonists such as montelukast. Therefore, a prior diagnosis of asthma and use of the drug before an acute asthma episode are required to

prevent further acute episodes. It is important to have an accurate diagnosis of asthma.

Unfortunately, a clear diagnosis of asthma is often difficult to make in preschool children, because it relies on clinical history and examination. Standard measures of lung function used to diagnose asthma in older children and adults are not available to this age group.

In the preschool age group, the variable nature of asthma is most obvious and has led investigators to classify these children according to clinical presentation, rather than giving them a diagnosis of asthma. The Tucson Children's Respiratory Study classified these early childhood groups as:⁶

- **transient infant wheezers.** These children wheeze only in the first two to three years of life and do not go on to have difficulties later; this probably represents reduced airway calibre rather than asthma.
- **nonatopic virus-induced wheezers.** Children who present with acute wheeze will largely belong in this group, but a high proportion do not go on to have recurring symptoms in later childhood.

- **atopic wheezers.** These children often have a family history of allergic disease, evidence of atopy or allergic sensitisation and other allergic diseases, such as allergic rhinitis or eczema. The most common trigger for their acute events is also usually a viral infection (making differentiation from nonatopic virus-induced wheezers in the acute setting difficult); this group are more likely to have ongoing problems with asthma in later childhood.

The investigators in the Tucson Children's Respiratory Study developed an asthma predictive index (API) to be applied at age 3 years. This has both 'stringent criteria' and 'loose criteria'. The major criteria are a diagnosis of eczema and parental asthma. Minor criteria are allergic rhinitis (other indices have used positive skin prick test instead of allergic rhinitis), wheezing apart from colds and eosinophilia more than 4%. A positive loose API is any parental report of wheezing, with one major and two minor criteria. This confers a fourfold greater risk of asthma between

the ages of 6 and 13 years. A positive stringent API is parental reporting of frequent wheezing, with the same number of major and minor criteria. This results in a sevenfold increased risk of asthma between the ages of 6 and 13 years.

The API, however, has some real-world limitations. Overall, its sensitivity to diagnose asthma in children over the age of 13 years is low and it has not been prospectively validated in a clinical setting. As a consequence, although the API is of interest, it cannot be recommended for routine application to clinical practice to determine which children will go on to develop asthma.

In an effort to address the problem of diagnosis in the preschool wheezers group, a European Respiratory Society (ERS) taskforce was set up to standardise definitions, assessments and treatment that could be used in clinical practice.⁷ The taskforce proposed that clinicians use the following terms:

- episodic (viral) wheeze to describe children who wheeze intermittently with viral infections but are well between episodes
- multiple-trigger wheeze to describe children who wheeze both during and outside discrete viral episodes.

The ERS proposed the use of intermittent montelukast as first-line therapy for children with viral-induced wheeze and low-dose inhaled corticosteroids for those with multiple-trigger wheeze.

Although this approach is more easily applied than the API in the clinical setting, the taskforce authors acknowledged its significant limitations, especially in justifying treatment choices. An Australian study demonstrated that a single assessment of a child as having viral or multiple-trigger wheeze could not reliably predict that the child would remain within this classification, with more than half the children changing classification over a 12-month period.⁸

In view of the difficulties in the diagnosis of asthma in children, the *Australian Asthma Handbook* (AAH) defines asthma clinically as ‘the combination of variable respiratory symptoms (e.g. wheeze, shortness of breath, cough and chest tightness) and excessive variation in lung function, i.e. variation in expiratory airflow that is greater than that seen in healthy children’.⁹

The AAH also states that the clinical diagnosis of asthma in children involves the consideration of:

- history of recurrent or persistent wheeze
- presence of allergies or family history of asthma and allergies

TABLE 2. INITIAL PREVENTER TREATMENT FOR CHILDREN AGED 6 YEARS OR OVER*

Pattern of symptoms [†]	Management options
Infrequent intermittent asthma	Regular preventer treatment is not recommended
Frequent intermittent asthma	Consider a treatment trial with montelukast 5 mg once daily; assess response after two to four weeks. A cromone (sodium cromoglycate or nedocromil) can be trialled as an alternative
Mild persistent asthma	Consider a treatment trial with montelukast 5 mg once daily; assess response after two to four weeks
	If inadequate response after checking adherence, consider a treatment trial with inhaled corticosteroid (low dose). A cromone (sodium cromoglycate or nedocromil) can be trialled as an alternative
Moderate-to-severe persistent asthma	Consider a treatment trial with regular inhaled corticosteroid (low dose); assess response after four weeks

* Reproduced with permission from *Australian Asthma Handbook* (2014).⁹ Asset ID: 16.

[†] Pattern of symptoms when not taking regular preventer treatment.

- absence of physical findings that suggest an alternative diagnosis
- tests that support the diagnosis (e.g. spirometry in children able to perform the test)
- a consistent clinical response to an inhaled bronchodilator or preventer.⁹

Which children should be treated to prevent acute asthma?

In children, the decision to treat asthma is naturally made after a diagnosis has been reached, with the broad goals being to reduce the child’s symptoms and the impact of asthma on their quality of life. This decision needs to be balanced against the difficulties of regular treatment. Preventing acute asthma is also an important goal for doctors and parents, especially after a serious episode has occurred. Treatment of children with asthma is closely guided by the pattern and severity of symptoms, as well as being influenced by the child’s age. The AAH recommendations for treatment are therefore divided into age groups – children aged 0 to 5 years (Table 1) and children aged 6 years and over (Table 2).

In the younger cohort, in which virus-induced wheeze predominates, the role of regular asthma preventers in preventing acute wheezing episodes is not clear, and it has been observed that many of these children will not go on to develop asthma at later ages. In children aged 6 years and older, the persistence of asthma symptoms and their pattern of response become much more like those seen in adults. The treatment recommendations are therefore similar to those for adults (Table 2).

Asthma Action Plan

Paediatric Asthma Clinical Nurse Consultant
Name _____
Contact No _____
Doctor's name _____

Regular daily medication
Preventer medication (Do **NOT** stop giving these)
One puff of fluticasone 125 mg via a volumatic spacer every night

If a cold develops	→	2 puffs of salbutamol via a volumatic spacer morning and night Antihistamine at night if nose is blocked, runny or snuffly Nasal corticosteroid if prescribed/as prescribed
If a cough/wheeze develops	→	4 to 6 puffs of salbutamol three or four times a day Continue antihistamine and nasal corticosteroid if prescribed/as prescribed
If breathless	→	Up to 12 puffs of salbutamol via a volumatic spacer three to four hourly Continue antihistamine and nasal corticosteroid if prescribed/as prescribed SEE YOUR LOCAL DOCTOR

If needing relieving medication (e.g. salbutamol)

<p>3rd to 4th hourly: Continue treatment Consult your doctor Doctor's name _____ Contact No _____</p>	<p>Closer than 3rd hourly: First give relieving medication Then go to hospital</p>
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Figure 1. An example of a written patient asthma action plan.

Before implementing a step up in therapy in either age group when symptoms persist or increase in frequency, reconsider whether the diagnosis of asthma is correct and whether the child and parent know how to correctly administer the medication and are compliant with what has been prescribed.

Managing asthma flare ups begins at home

An acute asthma episode, especially when severe, can be terrifying for children and families. Fortunately, therapies for acute asthma are effective and in most cases relieve symptoms quickly, preventing the development of more serious complications.

The first step in preventing severe acute episodes of asthma is to ensure that patients and their families recognise the warning signs for acute asthma, are aware of what can trigger the child's

asthma, and know how to quickly and effectively administer bronchodilators to relieve symptoms. An asthma action plan is a crucial part of this process and it is recommended that every child and their family should be given a written action plan and be educated in how to use it.¹⁰ The plan should include the following:

- a list of the child's usual medications (i.e. names of medicines, doses, when to take each dose), including treatment for related conditions such as allergic rhinitis
- clear instructions on what to do in all the following situations:
 - when asthma is getting worse (e.g. when needing more reliever than usual, waking up with asthma experiencing more symptoms than usual, asthma is interfering with usual activities)
 - when asthma symptoms worsen substantially (e.g. when needing reliever again within three hours, experiencing increasing difficulty breathing, waking often at night with asthma symptoms)
 - during an asthma emergency
- instructions on when and how to get medical care (including contact telephone numbers and when to call for an ambulance)
- the name and contact details of the child's emergency contact person.

An example of a written action plan is given in Figure 1. Other examples and templates are available to download and use from www.nationalasthma.org.au/asthma-tools/asthma-action-plans and www.asthmaaustralia.org.au/asthma_action_plan.aspx.

Managing the acutely wheezy child in primary and emergency care

A child can be presented with acute asthma either to their GP or a hospital emergency department. However, the principles of assessing and treating children with acute asthma are the same in the two settings. This process needs to be dynamic and responsive to their often rapidly changing needs. The AAH outlines the principles of acute asthma management as follows:⁹

- assessing severity (mild/moderate, severe or life-threatening) while starting bronchodilator treatment immediately
- administering oxygen therapy, if required, and titrating

1. CLASSIFICATIONS OF SEVERITY OF ACUTE ASTHMA IN CHILDREN***Mild/moderate**

- Can walk, speak whole sentences in one breath
- Young children can move around, speak in phrases
- Oxygen saturation >94%
- Normal respiratory rate
- Heart rate normal
- Wheeze with good air entry on chest auscultation, may be normal

Severe (any of these)

- Use of accessory muscles of neck or intercostal muscles or 'tracheal tug' during inspiration or subcostal recession ('abdominal breathing')
- Unable to complete sentences in one breath due to breathlessness
- Obvious respiratory distress
- Oxygen saturation 90 to 94%
- Increased respiratory rate
- Heart rate increased

Life-threatening (any of these)

- Reduced consciousness or collapse
- Exhaustion
- Cyanosis
- Oxygen saturation <90%
- Poor respiratory effort, soft/absent breath sounds
- Increased or reduced respiratory rate
- Heart rate increased or decreased
- May have poor air entry or a silent chest

* Reproduced with permission from *Australian Asthma Handbook* (2014).⁹ Asset ID: 74.

- oxygen saturation to a target of at least 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

- the patient is admitted to hospital or transferred to an intensive care unit
- observing the patient for at least one hour after dyspnoea/respiratory distress has resolved, providing post-acute care and arranging follow up.

Assess severity

Definitions of severity classes for acute asthma vary across the literature, especially between clinical trials and guidelines that focus on the management of patients with acute asthma within emergency departments. In the AAH, the severity of flare ups (worsening asthma) and severity of acute asthma are defined consistently across all Australian clinical settings, including community clinics and emergency departments (Box 1).⁹ The classification of flare ups and the classification of acute asthma overlap; for example, 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 assessed as 'mild' acute asthma within acute services. Mild asthma flare ups or mild acute episodes of asthma should be able to be managed by children and their families without the need to escalate treatment beyond their action plans. For this reason the classification of severity in acute asthma has been divided into mild/moderate, severe and life-threatening to better reflect the response required to treat patients with acute asthma.

The acute assessment of the patient needs to be carried out quickly and should not prevent the prompt commencement of treatment with either bronchodilators or the administration of oxygen. Similarly, if oxygen has been commenced it does not need to be withdrawn to measure oxygen saturations or to analyse arterial blood gases. Oximetry is now central to the assessment of acute asthma in children and adults. It does have some limitations and clinical assessment is just as important, particularly in regard to the child's work of breathing and distress. When supplemental oxygen is being administered the

oxygen saturations may remain elevated, although asthma can still be acutely life-threatening.

An overview of the assessment and treatment of acute asthma in children is provided in the flowchart.

Treat with salbutamol

Short-acting beta-agonists, such as salbutamol, are the most effective immediate interventions for patients with acute asthma. Salbutamol should be administered without delay. The doses recommended vary according to age (Boxes 2 and 3), and should be repeated as needed in response to acute symptoms. With the exception of life-threatening asthma, it is recommended that salbutamol be delivered using a pressurised metered-dose inhaler (puffer) and volumatic holding chamber or spacer, with a face mask where appropriate in the young child (Figure 2). When dyspnoea prevents the child from making a full inspiratory effort, the tidal breathing technique should be used for delivery. Delivery via puffer and spacer is as effective at relieving symptoms and leads to less systemic absorption of salbutamol, with fewer side effects, as compared with use of a nebuliser.¹¹ Salbutamol dosing has moved away from the weight-based approach (20 kg cut-off) to an age-based threshold (6 years) for the higher dose of salbutamol in an effort to simplify treatment.

The exception is in children with acute life-threatening asthma, in whom the AAH recommends delivering salbutamol via continuous nebulisation driven by oxygen until the child's ability to breathe improves. The treating doctor should then reassess and when the child's condition improves, return to the use of a puffer and spacer.

Assess and reassess

The keys to treating children with acute asthma are a rapid primary clinical assessment, institution of immediate therapy with salbutamol and oxygen as needed, and close observation. Reassessment is needed as an

MANAGING ACUTE ASTHMA IN CHILDREN (AUSTRALIAN ASTHMA HANDBOOK)*

IMMEDIATELY

Assess severity and start bronchodilator (see Box 1)

Mild/moderate

Can walk and speak whole sentences in one breath (young children can move about and speak in phrases)

Give salbutamol (100 µg per actuation) via pMDI plus spacer (plus mask for younger children)
6 years and over: 4 to 12 puffs
0 to 5 years: 2 to 6 puffs



Asthma is less likely to be the cause of wheezing in infants less than 12 months old. Monitor closely. If symptoms do not respond, reconsider the diagnosis and contact a paediatrician

Severe

Any of: unable to speak in sentences, visibly breathless, increased work of breathing, oxygen saturation 90 to 94%

Give salbutamol (100 µg per actuation) via pMDI plus spacer (plus mask for younger children)
6 years and over: 12 puffs
0 to 5 years: 6 puffs

OR

If patient cannot breathe through spacer and mask, give salbutamol via intermittent nebulisation driven by oxygen:

6 years and over: 5 mg nebule
0 to 5 years: 2.5 mg nebule

Start oxygen if oxygen saturation less than 95%

Titrate to target oxygen saturation of at least 95%

Life-threatening

Any of: drowsy, collapsed, exhausted, cyanotic, poor respiratory effort, oxygen saturation less than 90%

Give salbutamol via continuous nebulisation driven by oxygen

6 years and over: use 2 x 5 mg nebules

0 to 5 years: use 2 x 2.5 mg nebules

Start oxygen if oxygen saturation less than 95%

Titrate to target oxygen saturation of at least 95%

Arrange immediate transfer to higher-level care
Notify senior staff; ventilate if required (NPPV or intubate and ventilate) (Figure Asset ID: 94)

WITHIN MINUTES

Reassess severity (Table Asset IDs: 63 and 64)

In nonacute care settings, arrange immediate transfer if no improvement

Continue bronchodilator

Repeat dose every 20 to 30 minutes for first hour if needed (or sooner as needed)

Repeat dose every 20 minutes for first hour (three doses) or sooner as needed

Continuous nebulisation until breathing difficulty improves

Then consider changing to pMDI plus spacer or intermittent nebuliser (doses as for Severe)

If poor response, add ipratropium bromide

6 years and over: 8 puffs (160 µg) via pMDI (21 µg per actuation)
0 to 5 years: 4 puffs (80 µg) via pMDI (21 µg per actuation)

OR

6 years and over: 500 µg nebule via nebuliser added to nebulised salbutamol
0 to 5 years: 250 µg nebule via nebuliser added to nebulised salbutamol

Give dose every 20 minutes for first hour. Repeat every 4 to 6 hours as needed

Consider other add-on treatment options

CONTINUED OVERLEAF

MANAGING ACUTE ASTHMA IN CHILDREN (AUSTRALIAN ASTHMA HANDBOOK) continued*

Consider other add-on treatment options (Table Asset ID: 61)

Arrange immediate transfer to higher-level care if no improvement or worsening

WITHIN FIRST HOUR

Start systemic corticosteroids

Oral prednisolone 2 mg/kg (maximum 50 mg) then 1 mg/kg on days 2 and 3

OR, if oral route not possible

Hydrocortisone IV initial dose 8 to 10 mg/kg (maximum 300 mg), then 4 to 5 mg/kg every 6 hours on day 1, then every 12 hours on day 2, then once on day 3

OR

Methylprednisolone IV initial dose 2 mg/kg (maximum 60 mg), then 1 mg/kg every 6 hours on day 1, then every 12 hours on day 2, then once on day 3

⚠ For children 0 to 5 years, avoid systemic corticosteroids if mild/moderate wheezing responds to initial bronchodilator treatment

ONE HOUR

Reassess response to treatment (1 hour after starting bronchodilator)

Perform spirometry (if child capable)
Repeat pulse oximetry

AFTER ONE HOUR CHECK

No breathing difficulty

Breathing difficulty persists

Observe
for more than 1 hour after breathing difficulty resolves

Arrange hospital admission

Continue bronchodilator and add-on treatment
(Table Asset ID: 61)

Reassess

Breathing difficulty persists

Persisting severe or life-threatening acute asthma

No breathing difficulty for more than 1 hour

- Post-acute care**
- Ensure parents are able to monitor and manage asthma at home
 - Provide oral prednisolone for 3 to 5 days
 - Ensure child has regular inhaled preventer if indicated
 - Check and coach in correct inhaler technique
 - Provide spacer if needed
 - Provide interim asthma action plan
 - Advise/arrange follow-up review

Transfer to higher-level care OR Discuss transfer or retrieval with senior medical staff

Abbreviations: IV = intravenous; NPPV = noninvasive positive pressure ventilation; pMDI = pressurised metered-dose inhaler.
* Reproduced with permission from *Australia Asthma Handbook* (2014).⁹ Asset ID: 67.

WARNING SYMBOL: © SARAHDESIGN85/DOLLAR PHOTO CLUB



Figure 2. Delivery of salbutamol using a pressurised metered-dose inhaler and spacer with face mask.

ongoing process, usually within minutes. The treating doctor needs to quickly establish whether the child is responding to treatment and then adjust treatment accordingly. This then becomes the secondary clinical assessment.

When response to initial treatment with salbutamol does not result in clinical improvement then consideration can be given to 'add-on' therapies. In children, the addition of inhaled ipratropium bromide has been shown to improve symptoms and lung function at least in the short term; it is easy to administer and is probably the first of these therapies to consider.¹²

The dose of ipratropium bromide for children aged 6 to 12 years is eight puffs (21 µg/actuation) via pressurised metered-dose inhaler and spacer every 20 minutes for the first hour.⁹ This is repeated four to six hourly for 24 hours as needed. If a nebuliser is being used to deliver salbutamol, then 500 µg ipratropium bromide can be added to the nebulised solution every 20 minutes for the first hour and repeated four to six hourly as needed.

For children aged 0 to 5 years, four puffs (21 µg/actuation) of ipratropium bromide is given via pressurised metered-dose inhaler and spacer (and mask if needed) every 20 minutes for the first hour, and repeated four to six hourly for 24 hours as needed. If a nebuliser is being used to deliver salbutamol, then 250 µg ipratropium bromide can be added to the nebulised solution every 20 minutes for the first hour and repeated

four to six hourly as needed.

The other 'add-on' therapy to consider in children older than 2 years is the administration of intravenous (IV) magnesium sulfate. Recently several trials assessed the benefit of IV magnesium sulfate in the treatment of asthma in both adults and children and these results were summarised in a recent meta-analysis.¹³ IV magnesium sulfate has been used in four randomised controlled trials in children, all patients who have persistent symptoms despite initial treatment with bronchodilators. The meta-analysis showed that in children, magnesium sulfate led to a significant improvement in both lung function and the need for hospital admission, an effect that was greater than that seen in adults. The AAH now recommends that in children 2 years and older with a poor response to initial bronchodilator therapy, IV magnesium sulfate should be considered.⁹ Magnesium sulfate 0.1 to 0.2 mmol/kg diluted in saline to a maximum dose of 10 mmol as a single infusion should be given over 20 minutes or longer. However, there is no evidence supporting the use of IV magnesium sulfate in children younger than 2 years and it is therefore not recommended routinely for this age group.

The use of IV salbutamol or aminophylline, although clinically effective, is no longer regarded as first-line treatment for acute asthma in either children or adults. Because of the difficulty of administration and potential toxicity, these drugs are reserved for use in patients with life-threatening refractory asthma, where the clinician is experienced in their use and the patient can be closely monitored, such as in an intensive care unit.

Treat with systemic corticosteroids

Systemic corticosteroids should be considered for all children aged 6 years and older who present with acute asthma. A single dose of oral prednisone 2 mg/kg (up to a maximum of 50 mg) on day one, then 1 mg/kg on days two and three, has been shown to be effective in shortening exacerbation time and reducing the chance of

2. ACUTE TREATMENT WITH SALBUTAMOL FOR CHILDREN AGED 0 TO 5 YEARS*

Mild/moderate

- Give salbutamol[†] two to six puffs (100 µg per actuation) via pMDI and spacer plus mask
- Repeat every 20 to 30 minutes for the first hour if needed (sooner, if needed to relieve breathlessness)

Severe

- Give salbutamol[†] six puffs (100 µg per actuation) via pMDI and spacer plus mask
- If patient unable to breathe through a spacer, give 2.5 mg nebules via nebuliser
- Start supplementary oxygen if oxygen saturation <95%
- Titrate to 95% or higher
- Repeat salbutamol as needed. Give at least every 20 minutes for first hour (three doses)

Life-threatening

- Give salbutamol 2 x 2.5 mg nebules via continuous nebulisation driven by oxygen
- Maintain oxygen saturation at 95% or higher
- Arrange immediate transfer to higher-level care
- When dyspnoea improves, consider changing to salbutamol via pMDI plus spacer or intermittent nebuliser (doses as for severe acute asthma)

* Reproduced with permission from *Australian Asthma Handbook* (2014).⁹ Asset ID: 81.

[†] Give one puff at a time followed by four breaths.

Abbreviation: pMDI = pressurised metered-dose inhaler.

re-presentation with acute asthma.¹⁴ There is no clear evidence that oral corticosteroids are any less effective than IV corticosteroids, and the oral route is preferred. However, if corticosteroids need to be administered intravenously give either of the following:

- hydrocortisone IV initial dose 8 to 10 mg/kg (maximum 300 mg) then 4 to 5 mg/kg every six hours on day one, then every 12 hours on day two,

3. ACUTE TREATMENT WITH SALBUTAMOL FOR CHILDREN AGED 6 YEARS AND OLDER*

Mild/moderate

- Give salbutamol† four to 12 puffs (100 µg per actuation) via pMDI and spacer
- Repeat every 20 to 30 minutes for the first hour if required (sooner, if needed to relieve breathlessness)

Severe

- Give salbutamol† 12 puffs (100 µg per actuation) via pMDI and spacer
- If patient unable to breathe through a spacer, give 5 mg nebule via nebuliser
- Start oxygen therapy if oxygen saturation <95% and titrate to target:
 - adults: 92 to 95%
 - children: 95% or higher
- Repeat salbutamol as needed. Give at least every 20 minutes for first hour (three doses)

Life-threatening

- Give salbutamol 2 x 5 mg nebules via continuous nebulisation driven by oxygen
- Maintain oxygen saturations:
 - adults: 92% or higher
 - children: 95% or higher
- Arrange immediate transfer to higher-level care
- When dyspnoea improves, consider changing to salbutamol via pMDI plus spacer or intermittent nebuliser

* Reproduced with permission from *Australian Asthma Handbook* (2014).⁹ Asset ID: 80.

† Give one puff at a time followed by four breaths.

Abbreviation: pMDI = pressurised metered-dose inhaler.

once daily on day three and, if needed, once daily on days four and five

- methylprednisolone IV initial dose 2 mg/kg (maximum 60 mg) then 1 mg/kg every six hours on day one, then every 12 hours on day two, once daily on day three and, if needed, once daily on days four and five.

Recent trials that examined the use of short courses of oral corticosteroids in

children aged 0 to 5 years, especially in those with transient viral wheeze, have not shown them to be effective for either acute treatment or preventing acute asthma.^{15,16} Therefore, their use is recommended only in children with severe acute episodes, usually requiring hospitalisation.

After the event

Acute asthma may resolve quickly, especially in response to the rapid administration of bronchodilators. However, a period of observation is needed to ensure that the child remains stable and is safe to go home. It is recommended that they be observed for at least an hour to ensure the acute event has resolved. Before the child and their family leave, the following points need to be considered:

- they should be given inhaled salbutamol and have access to a spacer device (with a face mask if indicated), as well as demonstrated confidence in their use
- they should have a written asthma action plan as defined earlier
- they should be considered for the commencement of regular preventer therapy as previously defined (Tables 1 and 2)
- they should be followed up by their usual GP in the community
- they should be given a follow-up appointment or be referred on to receive suitable asthma education.

Conclusion

Acute asthma remains an important medical problem in Australia today and is still one of the most frequent causes for presentation to GPs and emergency departments. All doctors working in primary care and emergency departments need to be familiar with the acute management of patients with asthma.

To prevent acute asthma, there needs to be a diagnosis in place and careful consideration of the role of preventive therapy; this remains the role of the GP, especially after an acute event. Although diagnosis can be difficult in the 0 to 5 year age group

and relatively few children will require regular treatment, close follow up is needed.

Acute asthma, although potentially a terrifying event for the child and family, can be quickly and effectively managed. The child needs to be rapidly assessed for severity and treatment started with inhaled salbutamol, where the goal is to quickly relieve symptoms and prevent further deterioration. Additional therapies are now available in the acute setting where response is partial and a decision needs to be made about the use of systemic corticosteroids.

Once the acute episode has resolved, the treating doctor needs to ensure the child can be managed safely in the future, is able to use their inhaled device and has a written action plan and appropriate follow up.

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References

A list of references is included in the website version (www.medicinetoday.com.au) and the iPad app version of this article.

COMPETING INTERESTS: Professor Wark is Associate Editor and one of the writers of the *Australian Asthma Handbook*. Dr Hilton: None.

ONLINE CPD JOURNAL PROGRAM

What factors are taken into consideration when making a clinical diagnosis of asthma?



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Minimising the risk of acute asthma in children

PETER WARK BMed, FRACP, PhD; JODI HILTON BMed, FRACP

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