Managing acute asthma in children 1–5 years in primary care

Read first

- Definition and classification of asthma exacerbations

Recommendation

Rapidly assess the severity of the acute asthma episode by observation and pulse oximetry.

Perform the assessment while preparing to administer salbutamol (and oxygen, if needed).

Table

Immediate treatment of acute asthma in children 1–5 in primary care

	Mild–moderately severe	Severe	Life-threatening
Description	All of: Can walk (for younger children, can move about) Can speak in phrases (for younger children, can vocalise) SpO_2 (room air) >94%	Any of: Unable to complete sentences in one breath due to breathlessness Use of accessory muscles of neck or intercostal muscles/tracheal tug/subcostal recession during inspiration Obvious respiratory distress SpO_2 (room air) ≤94%	Any of: Reduced consciousness/collapse, exhaustion Cyanosis Poor respiratory effort SpO_2 (room air) <90% Poor respiratory effort, soft/absent breath sounds
Immediate treatment	Give salbutamol 2–6 actuations (100 microg per actuation) via pMDI and spacer (tidal breathing), plus mask if needed Repeat salbutamol 4–12 actuations every 20–30 minutes for the first hour, if needed (sooner if needed)	Arrange transfer to acute care Give salbutamol 6 actuations (100 microg per actuation) via pMDI and spacer (tidal breathing), plus mask if needed If patient cannot breathe through spacer with mask, give 2.5 mg nebule via nebuliser Start oxygen supplementation if SpO_2 <92% on room air Titrate to target 92–96% Repeat salbutamol 6 actuations at least every 20 minutes for first hour (3 doses) and as needed	Arrange transfer to acute care Give salbutamol 2 x 2.5 mg nebules via continuous nebulisation driven by oxygen Maintain SpO_2 to target 92–96%

Additional information

pMDI: pressurised metered-dose inhaler; SpO_2: oxygen saturation measured by pulse oximetry

Sources & rationale

Recommendation type: Consensus recommendation

References

Shi C, Goodall M, Dumville J, et al. The accuracy of pulse oximetry in measuring oxygen saturation by levels of skin pigmentation: a systematic review and meta-analysis. BMC Med 2022; 20: 267.

Notes

Pulse oximetry may overestimate oxygen saturation in people with higher levels of skin pigmentation.[Shi 2022]

Recommendation

If signs of severe or life-threatening acute asthma, call ambulance while starting bronchodilator treatment, and supplemental oxygen (if needed).

Sources & rationale

Recommendation type: Consensus recommendation

Recommendation

Give salbutamol (100 microg per actuation) via pMDI and spacer (with mask if needed), using tidal breathing method.

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Additional information

pMDI: pressurised metered-dose inhaler; SpO_2: oxygen saturation measured by pulse oximetry

Alert Do not use IV or oral salbutamol

Alert Monitor for salbutamol toxicity (e.g. tachycardia, tachypnoea, metabolic acidosis, hypokalaemia)

Alert Closely monitor level of consciousness, fatigue, oxygen saturation, respiratory rate and heart rate. If symptoms do not respond, call for an ambulance

Sources & rationale

Recommendation type: Consensus recommendation

In in children aged 5 and younger with acute asthma symptoms or acute wheeze, salbutamol improves symptoms, reduces work of breathing, and increases oxygen saturation.[Petersen 2025]

In older children and adults, repeated administration of inhaled SABA every 20 minutes for the first hour is effective for rapidly achieving bronchodilation in mild-to-moderate asthma exacerbations.[GINA 2025]

Salbutamol delivered via a pMDI with spacer is at least as effective as salbutamol delivered via nebuliser in preschool children with viral-induced wheezing or acute asthma who do not require mechanical ventilation.[Mitselou 2016]

The use of nebulisers may increase the risk of viral transmission.[Hui 2009, Biney 2024, Goldstein 2021]

Oral salbutamol or intravenous salbutamol are not recommended.

References

Biney IN, Ari A, Barjaktarevic IZ, et al. Guidance on mitigating the risk of transmitting respiratory infections during nebulization by the COPD Foundation Nebulizer Consortium. Chest 2024; 165: 653-668.

Global Initiative for Asthma (GINA). Global Strategy for Asthma Management and Prevention, 2025. Available from: www.ginasthma.org

Goldstein KM, Ghadimi K, Mystakelis H, et al. Risk of transmitting coronavirus disease 2019 during nebulizer treatment: a systematic review. J Aerosol Med Pulm Drug Deliv 2021; 34: 155-170.

Hui DS, Chow BK, Chu LC, et al. Exhaled air and aerosolized droplet dispersion during application of a jet nebulizer. Chest 2009; 135: 648-654.

Mitselou N, Hedlin G, Hederos CA. Spacers versus nebulizers in treatment of acute asthma – a prospective randomized study in preschool children. J Asthma 2016; 53: 1059-62.

Storgaard Petersen R, Hallas H, Brustad N, Chawes B. Short-term efficacy of inhaled short-acting beta-2-agonists for acute wheeze/asthma symptoms in preschool-aged children: a systematic review and meta-analysis. Thorax. 2025; 80: 349-357.

Resources

National Asthma Council's video on how to use a metered dose inhaler (puffer) with a spacer for children

National Asthma Council Australia's fact sheet on spacers for pressurised metered-dose inhalers

RACGP's Infection prevention and control guidelines for general practices and other office-based and community-based practices

Notes

Tidal breathing method:

1. Connect spacer to pMDI plus tightly fitting mask connected to the spacer mouthpiece.

2. Release 1 actuation of salbutamol into the spacer.

3. Watch the child breathe in and out for 4 breaths.

4. Release 1 more actuation of salbutamol into the spacer and repeat until all required actuations delivered.

If the child cannot breathe through a spacer using either the mouthpiece or a mask, use a nebuliser with mask.

Use a cardboard disposable spacer or a new spacer (± facemask) afterwards given to the patient. Prime new spacers (unless anti-static) before use by releasing at least 10 actuations of salbutamol into the spacer.

Recommendation

If oxygen saturation <92% while breathing room air, start oxygen supplementation and titrate saturation to target 92–96%.

Use a simple mask (flow rate 5 L/min) or nasal prongs (flow rate 3 L/min).

Sources & rationale

Recommendation type: Consensus recommendation

There is very little evidence available to inform recommendations for oxygen saturation targets in children with asthma. Recommended targets differ between major Australian paediatric teaching hospitals.

Delivery methods include simple mask (flow rate 5 L/min) or nasal prongs (flow rate 3 L/min).[GWACAHS 2023] A minimum flow rate of 5 L/min for oxygen masks is necessary to avoid rebreathing of carbon dioxide.

The normal range oxygen saturation levels measured by pulse oximetry in children is generally stated as 95–100%, one study reported a normal range of 97–100% in healthy children without asthma aged approximately 5–13 years.[Elder 2015]

Some guidelines recommend pulse oximetry alarms to be set at 92% low and 99% high when a child is receiving oxygen therapy.[SCHN 2024] Others recommend targets of 94–98% [RCHM 2020] or >95% for children. Saturations of 100% should be avoided in patients receiving supplemental O_2 (acceptable in a child breathing room air).[SCHN 2024]

Some guidelines suggest that, in a child recovering after acute asthma, SpO_2 in the low nineties due to ventilation/perfusion mismatch is acceptable if the child is clinically improving.[RCHM 2020, RCHM 2023]

There is no physiological basis for the application of low flow oxygen therapy to a child with normal SpO2 while breathing room air and increased work of breathing.[SCHN 2024]

References

Elder JW, Baraff SB, Gaschler WN, et al. Pulse oxygen saturation values in a healthy school-aged population. Pediatr Emerg Care 2015; 31: 645-647.

Government of Western Australia Child and Adolescent Health Service. Community Health clinical nursing manual. Oxygen administration. [Reviewed 26 October 2023].

The Royal Children's Hospital Melbourne. Nursing guidelines. Oxygen delivery [webpage] [Approved December 2020].

The Royal Children's Hospital Melbourne. Acute asthma. [webpage] [last updated July 2023]

The Sydney Children's Hospitals Network. Oxygen therapy and delivery devices. Practice guideline. Guideline No: 2015-9085 v5. 15 November 2024.

Shi C, Goodall M, Dumville J, et al. The accuracy of pulse oximetry in measuring oxygen saturation by levels of skin pigmentation: a systematic review and meta-analysis. BMC Med 2022; 20: 267.

Resources

The Royal Children's Hospital Melbourne's guidance on **oxygen delivery**

The Sydney Children's Hospitals Network's **practice guideline on oxygen therapy and delivery devices**

Notes

Mask and spacer can be applied over nasal prong oxygen to deliver inhaled bronchodilator [RCHM 2023]

Pulse oximetry may overestimate oxygen saturation in people with higher levels of skin pigmentation.[Shi 2022]

Recommendation

Complete the assessment when feasible after starting salbutamol and oxygen (if required).

Table

Secondary severity assessment of acute asthma in children 1–5 in primary care

	Mild–moderate (all of):	Severe (any of):	Life-threatening (any of):
Consciousness	Alert	N/A	Drowsy or unconscious
Speech	Can talk or vocalise	Can only speak a few words in one breath	Cannot vocalise due to dyspnoea
Posture	Can walk or crawl	Lethargic	Collapsed or exhausted
Breathing	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
Skin colour	Normal	N/A	Cyanosis
Respiratory rate	Normal	Tachypnoea	Bradypnoea (indicates respiratory exhaustion)
Heart rate	Normal	Tachycardia	Cardiac arrhythmia or Bradycardia (may occur just before respiratory arrest)
Chest auscultation	Wheeze or Normal lung sounds	N/A	Silent chest or Reduced air entry
Oxygen saturation	>94%	90–94%	<90% or Clinical cyanosis

Additional information

N/A: Not applicable – may be the same as moderate and does not determine severity category

Perform a physical examination including auscultation, vital signs, and repeated pulse oximetry.

Complete a brief history, including:

- reliever taken for this episode before presentation (dose, number of doses, time of last dose)
- current asthma medicines (regular and as-needed, including type of devices used)
- assessment of adherence to ICS (if prescribed)
- what triggered this episode, if known (e.g. allergies, immediate hypersensitivity, medicines, respiratory infections)
- presence of coexisting conditions
- exposure to environmental smoke/vaping.

Alert Acute asthma is rarely triggered by food allergies, but confirmed food allergy is a risk factor for fatal or life-threatening asthma

Sources & rationale

Recommendation type: Consensus recommendation

The association of asthma and food allergy is a risk factor for fatal and near-fatal allergic reactions to food allergens.[Burks 2012]

References

Burks AW, Tang M, Sicherer S, et al. ICON: food allergy. J Allergy Clin Immunol 2012; 129: 906-920.

Recommendation

If dyspnoea/increased work of breathing is not relieved within 5 minutes, repeat bronchodilator dose, and arrange transfer to emergency department.

Sources & rationale

Recommendation type: Consensus recommendation

Recommendation

Start systemic corticosteroids only if hospital admission required.

Children 1–5: prednisone/prednisolone 1 mg/kg orally each morning for 3 days

Sources & rationale

Recommendation type: Consensus recommendation

For children aged 1–5 years, systemic corticosteroids should generally be limited to those with severe acute wheezing. The Thoracic Society of Australia and New Zealand 2010 position statement on the use of corticosteroids in children [van Asperen 2010] recommended that the use of systemic corticosteroids in preschool children, particularly those with intermittent viral induced wheezing, should be limited to those with wheeze severe enough to need admission to hospital.

Evidence

In preschool children with acute viral-induced wheezing, there is inconsistent evidence for the benefits of systemic corticosteroids.[Foster 2018, Panickar 2009] Oral corticosteroids may be beneficial in children younger than 6 years with frequent acute wheezing or asthma, but evidence does not strongly support their use in this age group.[Castro-Rodriguez 2016]

After an acute asthma episode, treatment with systemic corticosteroids (intramuscular corticosteroids, oral prednisone/prednisolone, or oral dexamethasone) at discharge from the emergency department reduces the risk of relapse in children.[Castro-Rodriguez 2015, Kirkland 2018] However, systemic corticosteroids are not recommended for children 1–5 years unless the acute episode was severe enough to require hospital admission.

Doses

In children the majority of studies in children have used 1–2 mg/kg of oral prednisolone (maximum 60 mg) given initially then 1 mg/kg per day. Evidence does not support the use of higher doses.[Normansell 2016] Current consensus favours 1 mg/kg.

In children, a 3-day course of prednisone/prednisolone is generally as effective as a 5-day course.[Chang 2008]

Most studies evaluating oral dexamethasone in children have used 0.6 mg/kg per dose on one or two consecutive days. [Paniagua 2017] Dexamethasone has a longer half-life than prednisone/prednisolone. Longer courses may cause more pronounced mineralocorticoid adverse effects. Oral dexamethasone treatment should not exceed 2 days. In children it may be associated with less vomiting than prednisone/prednisolone.[Paniagua 2017, Bravo-Soto 2017, Meyer 2014, Keeney 2014, Cronin 2016]

Safety

Short-term use of oral corticosteroids to treat acute asthma is often well tolerated in children,[Rowe 2001, Smith 2003, Rowe 2007] but may be associated with mood changes, nocturia, and difficulty sleeping.

In the long term, short courses of oral corticosteroids to manage asthma exacerbations are associated with increased lifetime risk of osteoporosis, pneumonia, cardiovascular or cerebrovascular diseases, cataract, sleep apnoea, renal impairment, depression/anxiety, type 2 diabetes, and weight gain.[Price 2018]

References

Bravo-Soto GA, Harismendy C, Rojas P et al. Is dexamethasone as effective as other corticosteroids for acute asthma exacerbation in children? Medwave 2017; 17: e6931.

Castro-Rodriguez, J. A., Rodrigo, G. J., Rodriguez-Martinez, C. E.. Principal findings of systematic reviews for chronic treatment in childhood asthma. J Asthma 2015; 52: 1038-1045.

Castro-Rodriguez JA, Beckhaus AA, Forno E. Efficacy of oral corticosteroids in the treatment of acute wheezing episodes in asthmatic preschoolers: Systematic review with meta-analysis. Pediatric pulmonology 2016; 51: 868-76.

Chang, A B, Clark, R, Sloots, T P, et al. A 5- versus 3-day course of oral corticosteroids for children with asthma exacerbations who are not hospitalised: a randomised controlled trial. Med J Aust 2008; 189: 306-310.

Cronin JJ, McCoy S, Kennedy U et al. A randomized trial of single-dose oral dexamethasone versus multidose prednisolone for acute exacerbations of asthma in children who attend the emergency department. Ann Emerg Med 2016; 67: 593-601.e3.

Foster SJ, Cooper MN, Oosterhof S, Borland ML. Oral prednisolone in preschool children with virus-associated wheeze: a prospective, randomised, double-blind, placebo-controlled trial. Lancet Respir Med 2018; 6: 97-106.

Keeney GE, Gray MP, Morrison AK et al. Dexamethasone for acute asthma exacerbations in children: a meta-analysis. Pediatrics 2014; 133: 493-9.

Kirkland SW, Vandermeer B, Campbell S et al. Evaluating the effectiveness of systemic corticosteroids to mitigate relapse in children assessed and treated for acute asthma: A network meta-analysis. J Asthma 2018: 1-12.

Meyer JS, Riese J, Biondi E. Is dexamethasone an effective alternative to oral prednisone in the treatment of pediatric asthma exacerbations? Hosp Pediatr 2014; 4: 172-80.

Normansell R, Kew KM, Mansour G. Different oral corticosteroid regimens for acute asthma. Cochrane Database Syst Rev 2016; Issue 5: CD011801.

Paniagua N, Lopez R, Muñoz N, et al. Randomized trial of dexamethasone versus prednisone for children with acute asthma exacerbations. J Pediatr 2017;191:190-196.e1.

Panickar J, Lakhanpaul M, Lambert PC, et al. Oral prednisolone for preschool children with acute virus-induced wheezing. N Engl J Med 2009; 360: 329-328.

Price DB, Trudo F, Voorham J, et al. Adverse outcomes from initiation of systemic corticosteroids for asthma: long-term observational study. J Asthma Allergy 2018; 11: 193-204.

Rowe BH, Spooner C, Ducharme F, et al. Early emergency department treatment of acute asthma with systemic corticosteroids. Cochrane Database Syst Rev 2001; Issue 1: CD002178.

Rowe BH, Spooner C, Ducharme F, et al. Corticosteroids for preventing relapse following acute exacerbations of asthma. Cochrane Database Syst Rev 2007; Issue 3: CD000195.

Smith M, Iqbal S, Elliot TM et al. Corticosteroids for hospitalised children with acute asthma. Cochrane Database Syst Rev 2003; Issue 2: CD002886.

van Asperen PP, Mellis CM, Sly PD, et al. The role of corticosteroids in the management of childhood asthma. The Thoracic Society of Australia and New Zealand, 2010. Available from: https://thoracic.org.au/clinical-documents/asthma

Notes

Dispense only one course, to avoid overuse or inappropriate use of systemic corticosteroids.

Recommendation

After respiratory distress or increased work of breathing has resolved and symptoms have stabilised, ensure the child can be observed for at least 4 hours.

The supervising person (e.g. primary care nurse or parent/carer) should call an ambulance if symptoms recur.

Sources & rationale

Recommendation type: Consensus recommendation

Recommendation

After symptoms have resolved, arrange follow-up within 3–5 days, comprehensive asthma review 2 weeks later, and provide an interim asthma action plan.

Provide written instructions to use an adequate dose of ICS, to use reliever as needed, to continue oral prednisone/prednisolone, and to call ambulance or go to the emergency department if symptoms recur.

Sources & rationale

Recommendation type: Consensus recommendation

Checkup at day 3–5 aims to check adherence to oral corticosteroids (if prescribed) and ICS.

The purposes of comprehensive asthma review after resolution of the exacerbation are:

- to identify what triggered the acute asthma episode and assess other risk factors
- to review the child's written asthma action plan
- to review the child's reliever use since the acute exacerbation and give instructions to use reliever only as needed
- to review the treatment regimen and prescribe or adjust inhaled corticosteroid
- to check inhaler technique and correct it, if necessary
- to assess whether the person has other risk factors for asthma exacerbations
- to offer specialist review if the child has had more than one emergency visit to health services for acute asthma within the previous 12 months or repeated courses of systemic corticosteroids.

Notes

Information on assessing and reviewing asthma in children 1–5 years

Consideration

If anaphylaxis identified or suspected, manage with adrenaline.

Doses using ampoule (1:1,000) and syringe:

≤2 years (up to 10 kg): 0.1 mL IM into lateral mid-thigh

2–3 years (approximately 15 kg): 0.15 mL IM into lateral mid-thigh

4–6 years (approximately 20 kg): 0.2 mL IM into lateral mid-thigh

Sources & rationale

Recommendation type: Adapted from ASCIA 2024

Anaphylaxis should be suspected when asthma-like respiratory symptoms are accompanied by either of the following features:[ASCIA 2024]

- Acute onset (minutes to hours) with simultaneous involvement of the skin, mucosal tissue, or both (e.g. generalized hives, pruritus or flushing, swollen lips-tongue-uvula)
- Acute onset of hypotension or bronchospasm or laryngeal involvement after exposure to a known or highly probable allergen for that patient (minutes to several hours), even in the absence of typical skin involvement.

References

ACAQH. Immediate injection of intramuscular adrenaline. Quality statement 2. Australian Commission on Safety and Quality in Health Care. https://www.safetyandquality.gov.au/standards/clinical-care-standards/acute-anaphylaxis-clinical-care-standard/quality-statements/immediate-injection-intramuscular-adrenaline

ASCIA. Acute management of anaphylaxis. 2024, Australasian Society of Clinical Immunology and Allergy.

Resources

Australian Prescriber's Anaphylaxis: emergency management for health professionals wallchart

ASCIA Guidelines: Acute management of anaphylaxis

Notes

When anaphylaxis is suspected adrenaline should be given immediately,[ACAQH 2025] and before considering salbutamol. [ASCIA 2024]

Consideration

If the child is unresponsive, cannot inhale bronchodilators, or is considered to be in peri-arrest, consider adrenaline.

Doses as for anaphylaxis (see above) Sources and rationale

Sources & rationale

Recommendation type: Consensus recommendation

Adrenaline is not used routinely in the management of severe acute asthma.

Its use should be reserved for situations where inhaled salbutamol cannot be given in a patient with respiratory arrest or pre-arrest status, or when anaphylaxis is suspected.

Practice point

There are two methods for inhaling reliever from a pMDI plus spacer.

The standard, recommended method (single-breath technique) is to take a single slow deep breath after each actuation into the spacer, then hold the breath for 5 seconds. Younger children need a mask attached to the spacer.

The alternative method (tidal breathing) is used during acute exacerbations, when people usually cannot coordinate actuation and breathing. One actuation is released into the spacer at a time, and the patient takes multiple breaths, breathing in and out through the spacer mouthpiece.

The tidal breathing method is usually used in EDs to deliver SABA in acute asthma, but parents should revert to the preferred single-breath technique after discharge.

Resources

National Asthma Council Australia information paper: Inhaler technique for people with asthma or COPD (2018)
https://files.nationalasthma.org.au/resources/Inhaler-Technique-info-paper-20180607-web.pdf

Video: How to use a metered dose inhaler (puffer) with a spacer for children
https://www.nationalasthma.org.au/living-with-asthma/how-to-videos/how-to-use-a-puffer-with-a-spacer-for-children

National Asthma Council Australia's fact sheet on spacers for pressurised metered-dose inhalers
https://files.nationalasthma.org.au/resources/NAC047-Spacers-for-Pressurised-Metered-Dose-Inhalers-Information-Sheet-2025_Web.pdf

Practice point

Wheezing infants younger than 12 months old should not be treated for acute asthma.

Acute wheezing in this age group is most commonly due to acute viral bronchiolitis.

Arrange immediate transfer to an emergency department.

Resources

PREDICT's Australasian bronchiolitis guideline (2025)

https://www.predict.org.au/bronchiolitis-guideline/