ACUTE ASTHMA
MANAGING ACUTE ASTHMA IN CLINICAL SETTINGS

For detailed guidance and information, see asthmahandbook.org.au/acute-asthma/clinical

Acute asthma management is based on:

- assessing severity (mild/moderate, severe or life-threatening) while starting bronchodilator treatment immediately
- administering oxygen therapy, if required, and titrating oxygen saturation to target of 92–95% (adults) or at least 95% (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 is transferred to an intensive care unit or admitted to hospital
- observing the patient for at least 1 hour after dyspnoea/respiratory distress has resolved, providing post-acute care and arranging follow-up.

Notes
Definitions of severity classes for acute asthma used in this Handbook may differ from those used in published clinical trials and other guidelines that focus on, are or restricted to, the management of acute asthma within emergency departments or acute care facilities. In this Handbook, the severity of flare-ups and acute asthma is defined consistently across all Australian clinical settings (including community-based clinics and emergency departments). Accordingly, 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 assessed as ‘mild’ acute asthma within acute services).
In this Handbook, the categories of ‘mild’ and ‘moderate’ acute asthma have been merged to avoid confusion between terminologies traditionally used at different levels of the health system. Mild acute asthma can usually be managed at home by following the person’s written asthma action plan.

Table. Rapid primary assessment of acute asthma in adults and children

<table>
<thead>
<tr>
<th>Mild/Moderate</th>
<th>Severe</th>
<th>Life-threatening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can walk, speak whole sentences in one breath (For young children: can move around, speak in phrases) Oxygen saturation &gt; 94%</td>
<td>Any of these findings: 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 dyspnoea Obvious respiratory distress Oxygen saturation 90–94%</td>
<td>Any of these findings: Reduced consciousness or collapse Exhaustion Cyanosis Oxygen saturation &lt;90% Poor respiratory effort, soft/absent breath sounds</td>
</tr>
</tbody>
</table>

Notes
The severity category may change when more information is available (e.g. pulse oximetry, spirometry) or over time.
The presence of pulsedus 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 judgement should be applied.
Definitions of severity classes for acute asthma used in this handbook may differ from those used in published clinical trials and other guidelines that focus on, are or restricted to, the management of acute asthma within emergency departments or acute care facilities.

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**IMMEDIATELY**

**ASSESS SEVERITY AND START BRONCHODILATOR**

**Table:** Rapid primary assessment of acute asthma in adults and children

<table>
<thead>
<tr>
<th>Mild/Moderate</th>
<th>Severe</th>
<th>Life-threatening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can walk and speak whole sentences in one breath</td>
<td>Any of: unable to speak in sentences, visibly breathless, increased work of breathing, oxygen saturation 90-94%</td>
<td>Any of: drowsy, collapsed, exhausted, cyanotic, poor respiratory effort, oxygen saturation less than 90%</td>
</tr>
<tr>
<td>Give 4-12 puffs salbutamol (500 mcg per actuation) via pMDI plus spacer</td>
<td>Give 12 puffs salbutamol (500 mcg per actuation) via pMDI plus spacer OR Use intermittent nebulisation if patient cannot breathe through spacer: Give 5 mg nebulised salbutamol. Drive nebuliser with air unless oxygen needed. Start oxygen if oxygen saturation less than 95%. Titrate to target oxygen saturation of 95-95%</td>
<td>Give 3-5 mg nebulised salbutamol via continuous nebulisation. Start oxygen if oxygen saturation less than 95%. Titrate to target oxygen saturation of 95-95%</td>
</tr>
</tbody>
</table>

**WITHIN MINUTES**

**REASSESS SEVERITY**

**Table:** Secondary severity assessment of acute asthma in adults and children aged 6 years and over

In non-acute care settings, arrange immediate transfer if no improvement

**CONTINUE BRONCHODILATOR**

- Repeat dose every 20-30 mins for first hour if needed or sooner as needed
- Repeat dose every 20 minutes for first hour (3 doses) or sooner as needed
- Continuous nebulisation until dyspnoea improves. Then consider changing to pMDI plus spacer or intermittent nebuliser (doses as for Severe)

**IF POOR RESPONSE, ADD IPRAPROPION BROMIDE**

- 8 puffs (160 mcg) via pMDI (21 mcg/actuation) OR 500 mcg nebulised via nebuliser: add 2 doses of salbutamol
- Give dose every 20 minutes for first hour. Repeat every 4-6 hours as needed

**CONSIDER OTHER ADD-ON TREATMENT OPTIONS**

**Table:** Add-on treatment options for acute asthma

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

**WITHIN FIRST HOUR**

**START SYSTEMIC CORTICOSTEROIDS**

- Oral prednisolone 2.5-50 mg. Then continue 5-10 days
- OR, if oral route not possible: Hydrocortisone 100 mg IV every 6 hours

**1 HOUR**

**REASSESS RESPONSE TO TREATMENT (1 HOUR AFTER STARTING BRONCHODILATOR)**

- Dyspnoea resolved
- Symptoms and signs unresolved
- Persisting severe or life-threatening acute asthma

**AFTER 1-HOUR CHECK**

**OBSERVE**

- for more than 1 hour after dyspnoea resolved

**POST-ACUTE CARE**

- Ensure person (or carer) is able to monitor and manage asthma at home
- Provide oral prednisolone for 5-10 days
- Ensure person has regular inhaler preventer
- Check and coach in correct inhaler technique
- Provide spacer if needed
- Provide pre-hospital asthma action plan
- Advise/arrange follow-up review

**TRANSFER TO HIGHER-LEVEL CARE**

- OR

**DISCUSS TRANSFER OR RETRIEVAL WITH SENIOR MEDICAL STAFF**

**ARRANGE HOSPITAL ADMISSION**

**CONTINUE BRONCHODILATOR AND ADD-ON TREATMENT**

**Table:** Add-on treatment options for acute asthma

**Figure:** Managing acute asthma in adults
Figure. Managing acute asthma in children

**ASSESS SEVERITY AND START BRONCHODILATOR**

**Mild/Moderate**
- Can walk and speak whole sentences in one breath
- Young children: can move about and sleep in normal room
- Give salbutamol (100 mcg per puff via MDI or 2 puffs via MDI spacer (plus mask for younger children)) 4 puffs and over; ≤ 4 puffs 0-5 years 2-6 puffs

**Severe**
- Any of unable to speak in sentences
- Labored breathing
- Increased work of breathing
- Oxygen saturation ≤ 95%
- Give salbutamol (100 mcg per puff via MDI or 2 puffs via MDI spacer (plus mask for younger children)) 4 puffs and over; ≤ 4 puffs 0-5 years 2-6 puffs

**Life-threatening**
- Any of: drowsy, collapsed, restless, cyanosis, thick respiratory effort, oxygen saturation ≤ 93%

Give salbutamol via continuous nebulization driven by oxygen
- 4 puffs and over: use 2-3 mg nebulizer
- 0-5 years: use 2-1.5 mg nebulizer

Start oxygen if oxygen saturation ≤ 93%

Tolerate to target oxygen saturation of at least 95%

**ARRANGE IMMEDIATE TRANSFER TO HIGHER-LEVEL CARE**

Heads of units/medical directors

Ventilator if required (CPAP or noninvasive ventilation)

Figure: Initial management of life-threatening acute asthma in adult and children

**REASSESS SEVERITY**

- In non-acute care settings, arrange immediate transfer if no improvement

**CONTINUE BRONCHODILATOR**

- Repeat dose every 20-30 minutes for first hour if needed

**IF POOR RESPONSE, ADD IPRATROP R BROMIDE**

- 4 puffs and over: 0.5 mg (300 mcg via pMDI or 22 mcg/actuation) 0-5 years 4 puffs (300 mcg via pMDI or 22 mcg/actuation)
- 4 puffs and over: 500 mcg nebulizer via nebulizer added to nebulized salbutamol
- 0-5 years: 250 mcg nebulizer via nebulizer added to nebulized salbutamol

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

**CONSIDER OTHER ADD-ON TREATMENT OPTIONS**

- Add on treatment options for acute asthma
- An urgent immediate transfer to higher-level care if no improvement or worsening

**START SYSTEMIC CORTICOSTEROIDS**

- Oral prednisolone 3 mg/kg oral maximum 30 mg then 1 mg/kg on days 2 and 3
- Oral or rectal if possible
- Hydrocortisone IV initial dose 8-10 mg/kg (max 500 mg), then 4-5 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 (max 60 mg), then 1 mg/kg every 6 hours on day 1, then every 12 hours on day 2, then once on day 2
- For children 0-3 years, oral/systemic corticosteroids (oral inhaled steroidnation responds to initial bronchodilator treatment)

**REASSESS RESPONSE TO TREATMENT (1 HOUR AFTER STARTING BRONCHODILATOR)**

- No breathing difficulty
- Breathing difficulty persists

**ARRANGE HOSPITAL ADMISSION**

**CONTINUE BRONCHODILATOR AND ADD-ON TREATMENT**

- Table: Add on treatment options for acute asthma

**POST-ACUTE CARE**

- Ensure parents are able to transfer and manage asthma at home
- Provide oral prednisolone for 3-3 days
- Emphasis on regular inhaled preventer if indicated
- Check and teach correct inhaler technique
- Provide spacer if needed
- Provide influenza asthma action plan
- Arrange/schedule follow-up review

**TRANSFER TO HIGHER-LEVEL CARE**

- OR
- DISCUSS TRANSFER OR RETENTION WITH SENIOR MEDICAL STAFF
Figure. Initial management of life-threatening acute asthma in adults and children

Note: This figure shows in more detail the first stages ('immediate' and 'within minutes') shown in the figures Managing acute asthma in adults and Managing acute asthma in children.

SEVERITY ASSESSED AS LIFE-THREATENING ACUTE ASTHMA

- Any of these findings:
  - drowsy
  - collapsed
  - exhausted
  - cyanotic
  - poor respiratory effort
  - soft/absent breath sounds
  - oxygen saturation < 90%

GIVE SALBUTAMOL VIA CONTINUOUS NEBULISATION

CHILDREN 0–5 YEARS

- Salbutamol 2 x 2.5 mg nebulises at a time
- Use oxygen to drive nebuliser
- Maintain SaO₂ 95% or higher

CHILDREN 6–12 YEARS

- Salbutamol 2 x 5 mg nebulises at a time
- Use oxygen to drive nebuliser
- Maintain SaO₂ 95% or higher

ADULTS AND ADOLESCENTS

- Salbutamol 2 x 5 mg nebulises at a time
- Use oxygen to drive nebuliser
- Titrate oxygen to target SaO₂ = 92%

*Piped oxygen or oxygen cylinder fitted with a high-flow regulator (6 L/min)

ARRANGE IMMEDIATE TRANSFER TO HIGHER-LEVEL CARE AREA
NOTIFY SENIOR STAFF

REASSESS IMMEDIATELY AFTER STARTING SALBUTAMOL

- Marked improvement
- Some improvement
- No improvement or worsening

- VENTILATE
- NPPV OR INTUBATION AS REQUIRED

CONTINUE SALBUTAMOL AND MONITORING

ADD IPRATROPIUM BROMIDE

- Adults, adolescents and children 6 years and over: 500 mcg
- Children 0–5 years: 250 mcg

CONTINUE BRONchodilATOR AND MONITORING

- When breathing improves, consider changing salbutamol route of delivery:
  - pMDI PLUS SPACER
    - Adults and children 6 years and over: 12 puffs (100 mcg/actuation) every 20 minutes
    - Children 0–5 years: 6 puffs (100 mcg/actuation) every 20 minutes
  - or
  - INTERMITTENT NEBULISATION
    - Adults and children 6 years and over: 5 mg nebulise every 20 minutes
    - Children 0–5 years: 2.5 mg nebulise every 20 minutes

REASSESS SEVERITY

CONSIDER THE NEED FOR NPPV OR INTUBATION AND VENTILATION

ARRANGE TRANSFER/RETREVAL TO ICU

- Salbutamol IV infusion can be considered in critical care units. Follow your hospital/organisation's protocol for dosage and delivery.
  - Monitor blood electrolytes, heart rate and acid/base balance (blood lactate)
  - Salbutamol toxicity can occur with either the inhaled or IV route of administration. Risk may be increased when the inhaled and IV routes are used concomitantly.
<table>
<thead>
<tr>
<th>Mild/Moderate (all of):</th>
<th>Severe (any of):</th>
<th>Life-threatening (any of):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speech</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can finish a sentence in one breath</td>
<td>Can only speak a few words in one breath</td>
<td>Can't speak</td>
</tr>
<tr>
<td><strong>Posture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can walk</td>
<td>Unable to lie flat due to dyspnoea Sitting hunched forward</td>
<td>Collapsed or exhausted</td>
</tr>
<tr>
<td><strong>Breathing</strong></td>
<td>Respiratory distress is not severe</td>
<td>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')</td>
</tr>
<tr>
<td><strong>Consciousness</strong></td>
<td>Alert</td>
<td>Drowsy or unconscious</td>
</tr>
<tr>
<td><strong>Skin colour</strong></td>
<td>Normal</td>
<td>Cyanosis</td>
</tr>
<tr>
<td><strong>Respiratory rate</strong></td>
<td>&lt;25 breaths/min</td>
<td>≥25 breaths/min</td>
</tr>
<tr>
<td>Brachymene (indicates respiratory exhaustion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Heart rate</strong></td>
<td>Adults: &lt;110 beats/min Children: normal range</td>
<td>Adults: ≥110 beats/min Children: tachycardia</td>
</tr>
<tr>
<td>Cardiac arrhythmia or Bradycardia (may occur just before respiratory arrest)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chest auscultation</strong></td>
<td>Wheeze or Normal lung sounds</td>
<td>Silent chest or Reduced air entry</td>
</tr>
<tr>
<td><strong>Oxygen saturation</strong></td>
<td>&gt;94%</td>
<td>90-94%</td>
</tr>
<tr>
<td>(pulse oximetry)</td>
<td></td>
<td>&lt;90% or Clinical cyanosis</td>
</tr>
<tr>
<td><strong>Blood gas analysis</strong></td>
<td>Not indicated</td>
<td>Not indicated</td>
</tr>
<tr>
<td>(adults, if performed)</td>
<td></td>
<td>PaCO₂ &lt;60 mmHg PaCO₂ &gt;50 mmHg# PaCO₂ within normal range despite low PaO₂ pH &lt;7.35#</td>
</tr>
</tbody>
</table>

† 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 hypercappnoea indicates that the patient is tiring and may need ventilatory support.
PaCO₂ carbon dioxide partial pressure on blood gas analysis; PaO₂ oxygen partial pressure on blood gas analysis

_Australian Asthma Handbook v1.1 asset ID: 63_
### Table. Secondary severity assessment of acute asthma in children 0–5 years

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

<table>
<thead>
<tr>
<th>Mild/Moderate (all of):</th>
<th>Severe (any of):</th>
<th>Life-threatening (any of):</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Speech</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can talk or vocalise</td>
<td>†</td>
<td>Unable to vocalise due to dyspnoea</td>
</tr>
<tr>
<td><strong>Posture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can walk or crawl</td>
<td>Lethargic</td>
<td>Collapsed or exhausted</td>
</tr>
<tr>
<td><strong>Breathing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory distress is not severe</td>
<td>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')</td>
<td>Severe respiratory distress or Poor respiratory effort</td>
</tr>
<tr>
<td><strong>Consciousness</strong></td>
<td>Alert</td>
<td></td>
</tr>
<tr>
<td></td>
<td>†</td>
<td>Drowsy or unconscious</td>
</tr>
<tr>
<td><strong>Skin colour</strong></td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>†</td>
<td>Cyanosis</td>
</tr>
<tr>
<td><strong>Respiratory rate</strong></td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tachypnoea</td>
<td>Bradypnoea (indicates respiratory exhaustion)</td>
</tr>
<tr>
<td><strong>Heart rate</strong></td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tachycardia</td>
<td>Cardiac arrhythmia or Bradycardia (may occur just before respiratory arrest)</td>
</tr>
<tr>
<td><strong>Chest auscultation</strong></td>
<td>Wheeze or Normal lung sounds</td>
<td>Silent chest or Reduced air entry</td>
</tr>
<tr>
<td><strong>Oxygen saturation (pulse oximetry)</strong></td>
<td>&gt;94%</td>
<td>90-94%</td>
</tr>
</tbody>
</table>

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

*Australian Asthma Handbook* v1.1 asset ID: 64

### Appendix

**Normal respiratory and heart rates in children**

<table>
<thead>
<tr>
<th></th>
<th>Heart rate (beats/minute)</th>
<th>Respiratory rate (breaths/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 year</td>
<td>110–160</td>
<td>30–40</td>
</tr>
<tr>
<td>1–2 years</td>
<td>100–150</td>
<td>25–35</td>
</tr>
<tr>
<td>2–5 years</td>
<td>95–140</td>
<td>25–30</td>
</tr>
<tr>
<td>5–12 years</td>
<td>80–120</td>
<td>20–25</td>
</tr>
<tr>
<td>12–18 years</td>
<td>60–100</td>
<td>15–20</td>
</tr>
</tbody>
</table>


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<table>
<thead>
<tr>
<th>Agent</th>
<th>Recommended use in acute asthma</th>
<th>Administration and dosage</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaled Ipratropium bromide</td>
<td>Second-line bronchodilator if inadequate response to salbutamol</td>
<td>Via pMDI 21 mcg/actuation every 20 minutes for first hour Repeat every 4–6 hours for 24 hours</td>
<td>Use spacer (plus mask, if patient cannot use mouthpiece)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adults and children 6 years and over: 8 puffs Children 0–5 years: 4 puffs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Via nebuliser every 20 minutes for first hour Repeat every 4–6 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adults and children 6 years and over: 500 mcg nebulide Children 0–5 years: 250 mcg nebulide</td>
<td>If salbutamol is delivered by nebuliser, add to nebuliser solution</td>
</tr>
<tr>
<td>IV magnesium sulphate</td>
<td>Second-line bronchodilator in severe or life-threatening acute asthma, or when poor response to repeated maximal doses of other bronchodilators</td>
<td>IV infusion over 20 minutes Adults: 10 mmol Children 2 years and over: 0.1–0.2 mmol/kg (maximum 10 mmol)</td>
<td>Avoid magnesium sulfate in children younger than 2 years Dilute in compatible solution</td>
</tr>
<tr>
<td>IV salbutamol (only in ICU)</td>
<td>Third-line bronchodilator in life-threatening acute asthma that has not responded to continuous nebulised salbutamol after considering other add-on treatment options</td>
<td>Follow hospital/organisation’s protocol Use only in critical care units (e.g. emergency department, intensive care unit/high-dependency unit) Monitor blood electrolytes, heart rate and acid/base balance (blood lactate) Reduce initial dose for older adults. Consider dose reduction for those with impaired renal function. Impaired liver function may result in accumulation of unmetabolised salbutamol</td>
<td></td>
</tr>
<tr>
<td>Non-Invasive positive pressure ventilation</td>
<td>Consider if starting to tire or signs of respiratory failure</td>
<td></td>
<td>Do not sedate patient If no improvement, intubate and start mechanical ventilation</td>
</tr>
</tbody>
</table>