ASTHMA – ACUTE MANAGEMENT

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- This document provides guidance on the assessment, management and follow up of acute asthma in children > 1 year of age.
- When managing an acute exacerbation consider the severity, risk factors for a severe exacerbation and prior asthma control
- Asthma education throughout the admission is key to reducing recurrent asthma exacerbations
- Consider adding in a preventer medication in all children aged ≥6 years who have had a moderate or severe asthma exacerbation or in children of any age who have frequent asthma symptoms
- It is important to identify and ensure follow- up of those experiencing or at risk of serious asthma exacerbations and poorly controlled asthma

Related Information

- **Australian Asthma Handbook (AAH V2.2)**: https://www.asthmahandbook.org.au/diagnosis/children

CHANGE SUMMARY

- Revision of the Asthma flow chart in line with the Australian National Asthma Handbook Version 2.2 (AAH 2.2)
- Updating of the dose and administration instructions for medications used in the management of asthma.
- Updated flow chart in management of severe exacerbation
- Updated tables for Asthma Control and Frequency between flare-ups

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st November 2023	**Review Period**: 3 years
Team Leader:	Head of Department/Staff Specialist	**Area/Dept**: Respiratory SCH & CHW

READ ACKNOWLEDGEMENT

- Clinical staff caring for children with acute asthma should read and acknowledge they understand the contents of this document.

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1 Background

- Asthma is an inflammatory condition of the airways characterised by reversible airway obstruction and bronchospasm. The diagnosis of asthma should be considered in children who present with wheeze, cough or difficulty breathing. Episodic respiratory symptoms such as viral-induced wheezing and cough are very common in children, particularly under 3 years.
- Pre-school Wheeze Action Plan (available in Powerchart)
- AAH 2.2: Assessing the pattern of symptoms in children 1-5 years
- AAH 2.2: Managing wheeze and asthma in children 1-5 years
- Response to treatment may differ, and should not be extrapolated from older asthmatics
- Every acute presentation with asthma or childhood wheeze provides an opportunity to assess underlying asthma control, whether preventer therapy is indicated and provide an asthma action plan, asthma education, and arrangements for follow up.

This document aims to outline management pathways for acute asthma. Further background and links to other resources (relevant AAH 2.2 sections) are provided throughout the document.

2 Assessment of Asthma/ Childhood wheeze

History[1]:

- Duration and severity of acute episode
- Likely trigger of acute episode (e.g. viral URTI, allergy, passive smoking, exercise)
- Medication received to treat acute episode - dosages, delivery method, frequency, time of last dose, oxygen and respiratory support required and treatment response
- Assess asthma control prior to exacerbation onset using AAH 2.2 criteria[1]:
  - Regular asthma medications, modes of delivery and compliance
  - Previous Emergency Department visits/ hospitalisations/ ICU admissions
  - Symptom frequency
  - Short Acting Beta Agonist (SABA) requirements
  - Oral steroid frequency/courses
- Past medical history including history of allergic rhinitis and eczema
- Allergies/ anaphylaxis
- Family history (particularly history of atopy)
- Social history including tobacco and/or vaping use

Risk factors for a serious exacerbation include:

- History of poorly controlled asthma or significant interval symptoms
- Previous ICU admission for asthma
- Re-presentation very soon after discharge from hospital
- Recurrent admissions
- Poor compliance with regular preventer
- Overuse of SABA and/or underuse of preventer medicine
- Nocturnal symptoms
- Two or more courses of oral steroid, or 1 or more asthma hospitalisations in the last 12 months
- Social factors such as: disadvantaged socioeconomic status (SES)/ poor health literacy/ Aboriginal and Torres Strait Islander background

Examination:

Wheeze is not a good marker of severity. Chest may be quiet to auscultation in severe asthma

The best measures of severity are:

- General appearance/ mental state
- Work of breathing (accessory muscle use, recession), prolonged expiratory phase, Respiratory Rate (RR) and posturing.

Initial O_2 saturations in air, tachycardia (may be due to β agonist treatment) and ability to talk are helpful but less reliable signs.

3 Assessment and Initial Management of Acute Asthma[1]

Initial Severity Assessment and Management Treat in the highest category in which any symptoms occur			
Symptoms	**Mild** Likely to go home	**Moderate** Possible admission	**Severe / Life Threatening** Will be admitted
Oximetry in Air	>94%	90% - 94%	<90%
Heart rate	Close to normal range for age	Mild- moderate Tachycardia for age	Marked tachycardia – beware bradycardia
Age-appropriate ability to talk	Sentences or long vigorous cry	Phrases or Shortened Cry	Words/ Weak Cry or Unable to Speak/ Cry
Wheeze Intensity	Variable	Moderate to loud	Often quiet Life threatening – silent chest
Accessory Muscle Use	None or very mild	Mild to moderate	Moderate to Severe
Altered Consciousness	Alert Age Appropriate	Easily engaged Age appropriate	May be Agitated, Confused or Drowsy
Cyanosis in Air	None	None	May be Cyanosed
Treatment Options **(Treatments to be considered)**	⇩	⇩	**Get senior help and notify ICU** ⇩ **Consultant/Fellow**
Oxygen	To maintain SpO_2 >94%	To maintain SpO_2 >94%	To maintain SpO_2 >94% *Consider NIV (see table below for airway management in life threatening asthma)*
Salbutamol **Metered Dose Inhaler (MDI) & spacer**	**Review frequently and repeat when required**	Every 20 min x 3 **Repeat as required**	Every 20 min x 3 **Reassess** **OR**
Salbutamol nebulised	If child does not tolerate MDI & spacer or co-condition prevents use of spacer	If child does not tolerate MDI & spacer or co-condition prevents use of spacer	Continuous nebulised salbutamol **Reassess**
Systemic corticosteroids	Consider oral prednisolone depending on history and response to treatment	Consider oral Prednisolone OR Single dose Dexamethasone (alternative to Prednisolone)	IV Methylprednisolone OR if above unavailable then IV hydrocortisone **(alternative)**
Ipratropium **(3 doses always with salbutamol)**	No	Consider 3 doses at 20-minute intervals	Consider 3 doses at 20-minute intervals
No OR Poor Response to Treatment	Check diagnosis and treat as per Moderate	Check diagnosis and treat as per *Severe and Life Threatening*	**Immediate senior review – Notify Consultant/ Fellow**
IV Magnesium sulfate	Not applicable	Consider IV magnesium sulfate (if administered, treat as 'severe/ life threatening)	Give IV magnesium sulfate
IV Aminophylline	Not applicable	Not applicable	Consider as 3rd line agent. *Preferential to IV salbutamol Consult ICU
IV Salbutamol	Not applicable	Not applicable	Consider as 3rd line agent Consult ICU
Investigations	Nil (routinely) required	Nil (routinely) required	UEC, VBG, CMP, FBC, Consider CXR
Intravenous Fluids	Not required	Not usually required	Maintenance IV fluids with potassium
Observation and Review	HR, RR & SpO_2 pre and post treatment. MO review prior to discharge.	HR, RR and SpO_2 monitoring pre and post treatment Regular medical review as clinically indicated	Continuous cardiorespiratory monitoring (ECG, RR and SpO_2) documentation of observations. Regular medical review as clinically indicated
Disposition	Home if salbutamol required less frequently than 3 hourly. See Ongoing Management and Discharge" below.	Home if salbutamol required less frequently than 3 hourly. See "Discharge Criteria". If not then admit to ward. See Admission below.	Notify / consult ICU Admit to ward bed or ICU

For drug doses and summary see: Medications in Acute Asthma

4 Admission

Children unable to be weaned to ≥3 hourly salbutamol or requiring oxygen require admission.

Admission should also be considered if there are concerns that parents/carers are unable to manage current exacerbation at home or risk factors of serious exacerbation are identified.

- Transfer to ward once stable on 1 hourly salbutamol
- Notify ward registrar prior to transfer to the ward
- Consider Criteria Led Discharge after review by admitting consultant/fellow
- At CHW some children can be admitted to ED Short Stay Unit (EDSSU) (discuss suitability with ED senior at the time)

- Notify admitting Consultant
  - Children should be admitted under a General Paediatrician, unless currently managed by a Respiratory physician.
  - At CHW:
    - Children on IV bronchodilators can only be admitted to PICU (usually under General Paediatrician and Respiratory consultation requested). If child is known to Respiratory Physician, discuss patient with their team
  - At SCH:
    - Children on IV bronchodilators (not being admitted to ICU) should receive a Respiratory consult on the ward or be admitted under a Respiratory Physician

5 ED Management – Child Presenting with Life Threatening Asthma

DRSABCDE approach
Call for Help call 2222 Code Blue
Get SENIOR ED STAFF / ICU SUPPORT

AIRWAY	• Ensure open and clear
BREATHING ADEQUATE	• Follow "severe asthma" flowchart above (red column)
BREATHING INADEQUATE	• CALL FOR SENIOR HELP • Sit upright • **CPAP 8-10cm H_2O via full-face mask with oxygen and inline salbutamol nebuliser** • Assess degree of chest expansion and aeration • Assess for air leak and tension/simple pneumothorax • Consider anaphylaxis and if suspected- or patient is *in extremis* - give IMI **adrenaline** (1:1,000), 0.01 mL/kg (max 0.5 mL) • Have a low threshold for commencing an adrenaline infusion 0.1 microg/kg/min IV /Intraosseous (IO) as bronchodilator • Give **methylprednisolone** 2 mg/kg (IV/IO) **loading dose** (Max dose 60 mg) • Give **magnesium sulfate** 0.2 mmol/kg IV/IO over 20 min (Max dose 8 mmol) • Give aminophylline 5-10 mg/kg IV **loading dose** over 30 – 60 minutes +/- infusion (max dose 500 mg)
RESPIRATORY ARREST	• Bag Mask Ventilation (with anaesthetic circuit or laerdal bag with Positive End Expiratory Pressure (PEEP) valve) with PEEP of ~10cm H_2O while preparing for intubation with inline salbutamol nebuliser (may need 2- person technique) **NB.** *Intubating the airway may worsen bronchospasm, and muscle relaxant will definitely impair expiration, therefore, intubation should generally be reserved for apnoeic patients. Consider bag-mask ventilation or BiPAP via full-face mask as temporising strategy to reverse possible CO_2 narcosis* **Intubation guide** • Use an appropriately sized cuffed ET tube if available to minimise leakage. **Induction drugs** • For sedation: Ketamine (some bronchodilatory properties, haemodynamicallystable) +/- midazolam or fentanyl • For paralysis: Suxamethonium or rocuronium (generally, avoid morphine and pancuronium as these may cause histamine release). For drug doses use Resus calculator for your specific site. • Hand-bag once intubated • Assess degree of chest expansion, aeration and time for expiration • Chest may become extremely overinflated and non-compliant - placing hands either side of the chest and actively squeezing ('decompressing') the chest on expiration will enhance expiration • Ongoing sedation – ketamine infusion or midazolam • Monitor end tidal CO_2, however, this may under-read due to delay to reaching 'end-expiration' **Suggested starting ventilator settings** • Ventilating patients with severe airway obstruction is notoriously difficult – consult an expert (ED/ICU/Anaesthetic consultant) early • An initial tidal volume of 6 mL/kg is a reasonable starting point and assess for adequate chest wall excursion • Aim to limit PIP < 30cm H_2O- may need to extend inspiratory time • Increased airway resistance will require a longer-than-usual inspiratory and expiratory time (with a slower respiratory rate). These times are best adjusted using the flow graph on the ventilator display (or auscultating the chest) looking at end inspiratory/expiratory flow. • RR ~50% of usual for age • (PEEP) is usually set at either 0cmH_2O (to encourage expiratory flow) or 10cmH_2O (to overcome 'auto-PEEP')
CIRCULATION	• Assess pulse and rhythm • If unwell for some time, may be dehydrated due to poor intake • Gas-trapping can lead to over-distension and elevated intrathoracic pressure, with potential decreased venous return. Patients may become haemodynamically unstable with positive-pressure ventilation. Consider active manual chest 'decompression' • Prepare a bolus dose of adrenaline and a fluid bolus in case of haemodynamic collapse • Intraosseous (IO) / Intravenous (IV) access

6 Medications in Acute Asthma [1-6]

Medication	Dose	Route	Dose Limit	Preparation/Additional information
Salbutamol (MDI) inhaler 100 micrograms / puff	*6 months - 6 years old*: 600 microg/dose (6 puffs) *≥ 6 years old*: 1,200 microg/dose (12 puffs)	Inhalation via spacer	*< 6 years old*: 600 microg/dose (6 puffs) *≥ 6 years old*: 1200 microg/dose (12 puffs)	Spacer plus mask for children aged 4 years and younger Meds4KidsAMH-CDC
Salbutamol Nebules 2.5 mg/2.5 mL 5 mg/2.5 mL	*6 months - 6 years old*: 2.5mg / 2.5mL *≥ 6 years old*: 5mg/2.5mL	Nebulised	*<6 years old*: 2.5 mg/dose *≥ 6 years old*: 5 mg/dose	**Intermittent nebulisation**: add sodium chloride 0.9% up to 4 mL **Continuous nebulisation**: place 5 mL undiluted solution into the nebuliser with minimum Oxygen flow of 6-8 L/min and 'top up' to keep the canister ½ - 2/3 full to create the optimal size salbutamol microspheres. This process is repeated for approximately 1 hour and then review management.
Prednisolone 5 mg/mL liquid 1 mg, 5 mg, 25 mg tablets	*Mild/Moderate*: 1mg/kg/day (3-5 days) *Severe/ life threatening*: Day 1 = 2mg/kg Day 2 onwards for the remainder of the 3 to 5 day course = 1mg/kg/day	Oral	50 mg/day	**Mild / moderate**: Usual dose 1 mg/kg/day for a total of 3-5 days **Severe and life threatening** (consider intravenous steroids see below*): In severe asthma, increased doses and duration can be considered and the dose may need to be weaned more slowly.
Dexamethasone 500 microgram and 4 mg tablets as dexamethasone base (scored) 1 mg/mL oral suspension as dexamethasone base, 10 mL (Fridge item: manufactured at CHW pharmacy)	1 month-18 years: 0.3 mg- 0.6 mg/kg as a SINGLE DOSE **(Alternative to prednisolone)** AMH-CDC	Oral	16 mg **Do not use for >2 day**	**Alternative to prednisolone as a single dose.** May be repeated the next day if required. **Do not use for >2 days**.
***Methylprednisolone sodium succinate** **(1st preference)**	*First dose*: 2 mg/kg/dose (stat/load) *Then:* 1 mg/kg/dose	IV	60 mg/dose	PIMH Link 6 hourly on **day 1** 12 hourly on **day 2** Once daily from **day 3** for total 5 days (if required) or change to oral prednisolone

(40 mg, 125 mg, 500 mg, 1000 mg vials)				
***Hydrocortisone** **(2nd preference OR alternative if methylprednisolone unavailable)** (100 mg, 250 mg vials)	4 mg/kg/dose	IV	100 mg/dose	PIMH Link 6 hourly on **day 1** 12 hourly on **day 2** **Once daily from day 3** for total 5 days (if required) OR change to oral prednisolone
Ipratropium (MDI) 21 micrograms/puff	*6 months - 6 years old*: 4 puffs (=84 microg) *> 6 years old*: 8 puffs (=168 microg)	Inhalation via spacer	*< 6 years old*: 84 microg/dose (4 puffs) *≥ 6 years old*: 168 microg/dose (8 puffs)	Spacer plus mask for younger children Usually given as 3 doses, 20 minutes apart in severe/ life-threatening exacerbations Based on clinical need, frequency can be increased to every 4-6 hourly
Ipratropium (Nebulised) 250 micrograms/mL 500micrograms/mL	*6 months - 6 years old*: 250microg (added to nebulised salbutamol) *> 6 years old*: 500microg (added to nebulised salbutamol)	Nebulised	*< 6 years old*: 250microg *≥ 6 years old*: 500microg	Usually given as 3 doses, 20 minutes apart in severe/ life-threatening exacerbations Based on clinical need, frequency can be increased to every 4-6 hourly
Magnesium sulfate (IV) 2 mmol/mL, 5 mL, 10mL Magnesium sulfate concentrated	0.2mmol/kg/dose	IV	8 mmol/dose	Diluted in compatible fluid (1/2 NS, G10W, G5/NS, NS) over 20 mins) Note: IV salbutamol and IV magnesium sulfate are not compatible and need to be administered viaseparate lines. **CHW** - ED/ICU/CSSU and HB **SCH** - C3W//ED/ICU
Adrenaline 1:1000 1 mg/mL	*For Anaphylaxis*: 10 microg/kg/dose OR 0.01 mL/kg/dose	IM	500 microg Or 0.5 mL (1:1000) Repeat dose every 5 mins as needed	PIMH Link Anaphylaxis Algorithm Administer undiluted into anterolateral aspect of thigh
Adrenaline 1:1000 1 mg/mL	0.1 microg/kg/min	Infusion		PIMH Link
Aminophylline (IV) 25 mg/mL, 10 mL ampoule	**Loading** *1–18 years:* IV: 5–10 mg/kg. **Maintenance**	Loading IV infusion	Loading (single dose) maximum 500mg/dose	3rd line agent PIMH Link Dilute to a maximum concentration of 1 mg/mL with glucose 5% or sodium chloride 0.9%.

	1–9 years: IV 6 mg/kg every 6hours. *>9–12 years*: IV 5 mg/kg every 6hours. *>12–18 years:* IV 3–4 mg/kg every 6hours. **Maintenance: continuous IV infusion** *1–9 years:* IV infusion 0.9–1.1mg/kg/hour. *>9–12 years:* IV infusion 0.7mg/kg/hour. *>12–18 years:* IV infusion 0.5–0.7mg/kg/hour.	Maintenance Intermittent IV boluses Maintenance: continuous IV infusion	Maintenance Intermittent IV boluses maximum 500 mg/dose	Loading dose: infuse over 30-60minutes **Maintenance dose:** infuse over 60 minutes. If child is already on theophylline, check plasma concentration first; if unable to do so, omit loading dose. Younger children are more likely to require doses at the upper end of the range due to increased clearance. **Maintenance: intermittent IV boluses** ED/ICU/CSSU and HB at CHW, Medical ward C3W/MAU/ED/ICU at SCH **Maintenance: continuous IV infusion** ED / ICU only
Salbutamol IV Ventolin: 0.5 mg/mL 500microgram/mL Ventolin Obstetric: 1 mg/mL @CHW = 1000 microgram/mL	*IV Infusion*: 5 microg/kg/min *Loading dose/IV bolus*: 15 microg/kg (max-300 microg) over 10 minutes	IV infusion IV bolus	*Infusion*: 200microg/minute *Bolus*: 60microg/minute Do not exceed 12 mL/hr for patients > 40kg (max weight for dose calculation)	3rd line agent PIMH Link AMH-CDC Note: IV salbutamol and IV magnesium sulfate are not compatible. Administered in separate line

7 Medications: Information and Considerations[1-6]

7.1 Oxygen

Consider oxygen therapy if saturations are ≤ 94% and monitor by continuous oximetry. Duration of oxygen therapy depends on response to treatment[1].

7.2 See SCHN Oxygen Therapy and Delivery Devices Practice Guideline Salbutamol

Inhaled β-2 agonists remain the first-line bronchodilator therapy in the management of acute asthma. In mild, moderate and severe asthma, delivery should be by a MDI and spacer **(4 years and under require a mask)**. Delivery via nebuliser should be used in severe/ life threatening asthma and those with moderate asthma responding poorly to spacer delivery.

Alert: Inhaled salbutamol vs IV salbutamol

There is no evidence that IV salbutamol offers any advantage over inhaled salbutamol. Its use should be limited to severe/ life threatening asthma, in consultation with the on-call Consultant/ Fellow (ED, General Medicine or Respiratory) and ICU.

NOTE: When IV salbutamol infusion is commenced, continue inhaled salbutamol hourly (consider toxicity). Salbutamol toxicity clinically presents with tachycardia, tachypnoea and fine tremors. On blood testing the patient may have hypokalaemia, hyperlactataemia and metabolic acidosis. This assessment should be made before pausing Salbutamol therapy. Hypokalaemia rapidly corrects when salbutamol dosing reduces.

NOTE: Refer to the salbutamol resources below where required:

- Paediatric Injectable Medicines Handbook – Salbutamol
- Salbutamol - AMH Children's Dosing Companion (hcn.com.au)
- Meds4Kids – Salbutamol

Nursing considerations

Patients receiving IV salbutamol must have:

- Continuous monitoring and observations documented as per the Clinical Emergency Response System (CERS) policy and regular medical review as clinically indicated.
- Consider insertion of a sampling line if requiring regular blood investigations.
- Serum potassium checked at commencement of infusion, repeated at 2 hours then12 hourly.
- Must be administered using a syringe infusion pump.
- Drug name must be entered digitally into infusion pump and always displayed. Use pre-programmed infusion drug libraries where available.
- The medication and administration line must be labelled according to the NSW Health Medication Handling Policy Directive [PD2022_032].

7.3 Corticosteroids

- The effectiveness of systemic corticosteroid therapy in asthma is well established. Administer early in moderate- severe / life-threatening asthma and considered in children with mild asthma who have had limited response to salbutamol alone.
- Systemic corticosteroids may not be effective in acute preschool wheeze and should be reserved for children with a history of atopy, family history of atopic asthma or with severe bronchodilator–unresponsive wheeze.

7.4 Ipratropium

- Most effective in moderate-severe asthma when added to frequent nebulised salbutamol.
- Can also be used via a spacer in moderate to severe asthma responding poorly to the initial dose of salbutamol.

7.5 Magnesium Sulfate

Intravenous magnesium sulfate

- Can be given in addition to bronchodilators and corticosteroids in children with moderate – severe / life-threatening asthma not responding to inhaled bronchodilators
- Use in under 2 years generally not recommended, however may be prescribed after careful consideration by a consultant.
- Is well tolerated. Minor side effects include epigastric or facial warmth; flushing, pain and numbness at infusion site; dry mouth and malaise.
- Rapid IV infusion may precipitate hypotension, nausea, respiratory depression and cardiac arrhythmias (consider fluid bolus prior to prevent possible hypotension).
- The consultant of the primary treating team, ED Fellow/Consultant and / or ICU Fellow / Consultant should be aware of all patients receiving IV magnesium sulfate.
- These patients should be cared for by an experienced paediatric registered nurse. **At CHW:** ED, ICU, CSSU or HBW and **at SCH:** C3W, MAU, ED or ICU.
- Consult Respiratory team during the admission.

Nursing considerations

- Patients receiving IV magnesium sulfate must have:
  - Continuous cardio respiratory monitoring (ECG, SpO_2 and RR)
  - Regular medical review as clinically indicated.
  - Blood pressure recorded at commencement, midway and end of infusion.
  - Administer as an infusion over 20 minutes.

7.6 Aminophylline[3]

Aminophylline provides additional benefit to children with severe acute asthma already on large doses of nebulised salbutamol and systemic corticosteroids.

- Aminophylline is the IV form of theophylline. 1 mg of aminophylline = 0.8 mg of theophylline.
- Theophylline is a drug with a narrow therapeutic range and requires careful administration as side effects can occur even at therapeutic levels.
- Therapeutic range: 10-20 mg/L
- Check theophylline level 4-6 hours after the initial intermittent dose, and every 12 hours if continuing (prior to giving next dose)
- Check for previous interactions and recent doses of aminophylline - doses should be adjusted based on drug levels of theophylline.
- 0.6 mg/kg aminophylline is expected to raise plasma theophylline concentration by 1 microgram/mL.
- Overweight or obese patients should be dosed according to ideal body weight (50th percentile weight for age or appropriate weight for age and height according to growth charts).
- Common side effects include sinus tachycardia, nausea and vomiting even at therapeutic levels. This should not lead to discontinuation of therapy.
- Dysrhythmias other than sinus tachycardia are rare unless there is concurrent hypokalaemia (salbutamol can exacerbate). Seizures are rare with therapeutic levels. Diuresis can occur.
- Patients receiving aminophylline infusions should be cared for by an experienced appropriately skilled registered nurse. **At CHW:** ED, ICU, CSSU and HBW and **at SCH:** C3W, MAU, ED or ICU.
- The consultant of the primary treating team, ED Fellow/Consultant and / or ICU Fellow / Consultant should be aware of all patients receiving aminophylline infusions.

Nursing considerations:

- Patients receiving IV aminophylline must have:
  - Continuous cardio respiratory monitoring (ECG, SpO2 and RR) during administration. Then hourly documentation of HR, RR, BP and continuous SpO_2 on completion of infusion until Medical review and patient considered stable.
  - Monitor infusion site regularly for signs of extravasation.
  - Regular medical review as clinically indicated.
  - Intermittent doses of IV aminophylline must only be administered as an infusion over 1 hour.

8 Investigations

Chest X-Ray

- **Rarely necessary in the management of acute asthma in children**, however consider if:
  - persistent focal signs
  - subcutaneous emphysema
  - exclude a significant complication such as pneumothorax, pneumonia or lung collapse
  - new onset wheezing of undetermined aetiology or chronic persistent wheezing not responding to treatment (In ED, discuss with supervising consultant/fellow)

Lung Function

- Lung function testing is not recommended in the management of acute asthma.[1]

Continuous Pulse Oximetry

- Can be a valuable adjunct to clinical assessment. See SCHN Oxygen Therapy and Delivery Devices Practice Guideline.

9 Asthma Control and Frequency Between Flare-Ups[1]

Poor asthma control is a well-recognised risk factor for asthma exacerbation. Assessing control outside the acute exacerbations is an important part of overall management. **If the child has poor control and/or management, consider a referral to a Paediatric or Respiratory Physician.**

- Assessment of control (when starting or changing preventer therapy) can be based on symptoms +/- lung function. Validated checklists or questionnaires can be used to determine the need for step-up or step-down treatment according to the level of control (good, partial or poor).
- The following 2 tables provide a guide for the differences in good, partial, poor control[1]

9.1 Asthma Control Children (6 years and older)

Good Control	Partial Control	Poor Control
All of: • Daytime symptoms* ≤ 2 days per week *(lasting only a few minutes & rapidly relieved by bronchodilator)* • No limitations of activities • No symptoms during night or when wakes up • Need for reliever ≤ 2days per week#	**Any of:** • Daytime symptoms* >2 days per week *(lasting only a few minutes & rapidly relieved by bronchodilator)* • Any limitation of activities • Any symptoms during night or when wakes up • Need for reliever > 2 days per week#	**Either of:** • Daytime symptoms* >2 days per week *(lasting from minutes to hours or recurring, and partially or fully relieved by bronchodilator)* **OR** • ≥ 3 features of partial control within the same week

** wheezing or breathing problems OR wheeze or breathlessness during exercise, vigorous play or laughing; waking with symptoms of wheezing or breathing problems. Note: Recent asthma control is based on symptoms over the previous 4 weeks. Individual risk factors for future asthma outcomes should also be assessed and considered in management.*
 # Not including SABA taken prophylactically before exercise Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks. Source AAH (2022) ID 16

9.2 Asthma Control Adolescents

Good Control	Partial Control	Poor Control
All of: • Daytime symptoms* ≤ 2 days per week • Need for reliever# ≤2days per week *AND* • No limitations of activities • No symptoms during night or on waking	**One or two of:** • Daytime symptoms* >2 days per week • Need for reliever# > 2days per *week AND* • Any limitation of activities • Any symptoms during night or on waking	**Three or more of:** • Daytime symptoms* >2 days per week • Need for reliever# >2days per *week AND* • Any limitation of activities • Any symptoms during night or on waking

** wheezing or breathing problems OR wheeze or breathlessness during exercise, vigorous play or laughing; waking with symptoms of wheezing or breathing problems. Note: Recent asthma control is based on symptoms over the previous 4 weeks. Individual risk factors for future asthma outcomes should also be assessed and considered in management.*
 # Not including SABA taken prophylactically before exercise Note: Recent asthma symptom control is based on symptoms over the previous 4 weeks. Source AAH (2022) ID33

The frequency of, and symptoms between flare-ups of asthma are also factors in determining the need to commencement or review preventative therapy.

Refer to formal criteria in the Australian Asthma Handbook, "Classification of asthma and indications for initiating preventer treatment in children aged 6-11" table for a guide indicating the requirement of preventer treatment in relation to the frequency and severity of asthma flare-ups[1]

Regular asthma preventer should be considered in all children aged >6 years who have had at least 1 moderate or severe asthma exacerbation. Regular asthma preventer is indicated in all children regardless of age who have had multiple exacerbations or have frequent asthma symptoms.

A combination of long-acting beta- agonist (LABA) and inhaled corticosteroids (ICS) budesonide/formoterol (SMART) is beneficial in Adolescents and should be considered. See National Asthma Council Symbicort (SMART) action plans.

10 Reducing Medication and Asthma Action Plans

Discharge plans provide parents/carers with short and long term management plans:

- Reducing or Weaning Medication Plan provides short-term instructions on reliever use, oral corticosteroids and/or preventer medications immediately post discharge.
- Asthma Action Plan (AAP) provides information to identify early or worsening signs of asthma and how to manage with reliever medications.
- Consider initiating regular asthma preventer, if the child is not on one already.
- Reducing Medication Plan and/ or AAP in Powerchart
- School and Child Services Action Plan for Asthma Flare-up in Powerchart or parent/carers resource pack

11 Ongoing Management and Discharge

11.1 Criteria-Led Discharge

- Can be initiated in ED at CHW and C3W at SCH.
- Children with acute asthma should be considered ready for discharge when clinically stable on 3rd hourly bronchodilator and not requiring supplemental oxygen
- Oximetry should not be used as the primary criterion for discharge as it remains unclear what is a “satisfactory” level.

11.2 Discharge Requirements

At discharge patients/ parents should have had asthma education and demonstrated correct use of asthma delivery device.

They should also receive:

- Discharge summary
- Discharge medications
- Asthma Action Plan
- Reducing Medication Plan
- ‘Asthma and your child’ A Resource Pack for parents/carers
- Follow-up arrangements with General Practitioner and / or a Paediatrician or Respiratory Physician.
- Consider lung function testing as an outpatient.

Note: Those admitted to ICU should have a referral to ‘High Risk Asthma Clinic’ at SCH or ‘Chest and Asthma Clinic’ at CHW (depending on place of residence), if not already known to a Respiratory Physician

12 Education

12.1 Education

The provision of asthma education is the responsibility of all health professionals and should commence at presentation.

Review parental/carer (and child's where appropriate) asthma knowledge, skills and confidence, including inhaler technique and understanding of Asthma Action Plan/ Reducing Medication Plan.

Education resources for children with asthma include:

- Asthma and your child: A resource pack for parents and carers
- Asthma and your child: eBook
- Asthma DVD (CHW inpatients: via one view system- General education-Specialty asthma education)
- SCHN asthma fact sheets
  - Parent/Carer Asthma Information: online live monthly webinars (SCH)
  - Asthma Action plan, resource pack and audio visual videos in other languages
  - School and Children's Services Action Plan for Asthma Flare-Up
  - Asthma delivery device videos
  - Free information and support service with Asthma Educator – Call 1800 278 462 Asthma Australia
- **CHW**: Refer to the SCHN Asthma fact sheets and CHW respiratory services.
- **SCH**: Refer to Aiming for Asthma Improvement in Children

Further information; refer to educational checklists in the Australian Asthma Handbook:

- Childhood Asthma Education Checklist
- Troubleshooting Checklist

12.2 Smoking and Vaping Cessation

Smoking and/or Vaping Cessation Brief Intervention is opportunistic advice from a health professional to parent, carer or adolescent.

- Smoking Cessation Documentation in Powerchart
- The 5A's provide an evidence based framework for structuring smoking cessation interventions in the health care setting.

Resources:

- Australian Asthma Handbook on Smoking and Asthma Management
- Vaping resources

Refer to any of the following:

- SCHN KidsQuit Smoking Cessation
- Stop Smoking Program- Department of Respiratory Medicine Prince of Wales Hospital Ph: 02 9382 4641
- National QUITLINE or iCANQUIT web site or phone 137848.
- Consider discussion with the CICADA team for support and advice (particularly if any other substance use concerns)

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