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Acute Asthma – Inpatient Care

Aim

Evidence-based management of children with acute asthma exacerbations

Definition of terms

Metered Dose Inhaler (MDI)
Paediatric Intensive Care Unit (PICU)
Paediatric Respiratory Assessment Measure (PRAM)
Oxygen Saturations (SpO₂)
Carbon dioxide (pCO₂)
Blood Pressure (BP)
Electrocardiogram (ECG)
Continuous Positive Airway Pressure (CPAP)
Bi-level Positive Airway Pressure (BIPAP)
Intermittent Positive Pressure Ventilation (IPPV)

Target Patient Population

This guideline applies to patients (2 years +) who have been admitted with an exacerbation of asthma not requiring PICU admission. It does not deal with the management of bronchiolitis or laryngotracheobronchitis. Children < 12 months of age presenting with wheeze are most likely to have bronchiolitis. Preschoolers should only be given steroids for wheeze that is bronchodilator responsive and/or requiring admission.

Target Users

This guide is directed at health-care professionals engaged in the care of in-patients with acute exacerbations of asthma.

Assessment

Medical History: Family history of asthma, atopy, or allergic disease is common.

Enquire specifically about the following:

- duration and nature of symptoms;
- treatments used (relievers, preventers);
- trigger factors (including upper respiratory tract infection, allergy, passive smoking);
- pattern and course of previous acute episodes e.g. admission or ICU admissions
- parental understanding of the treatment of acute episodes; and the presence of interval symptoms.
- Asthma control e.g. frequency of salbutamol use, nocturnal cough, exercise tolerance, course of steroids

Consider other causes of wheeze e.g. bronchiolitis, aspiration, foreign body, anaphylaxis.

Initial Assessment

Using a validated Paediatric Asthma clinical score (the Paediatric Respiratory Assessment Measure or PRAM) to classify the initial severity of respiratory distress in children causes an in improvement in the usage of evidence-based medications and lowers the rates of hospitalisation.^{1,2} PRAM is a 12-point clinical scoring rubric that captures a patient's asthma severity using a combination of scalene muscle contraction, suprasternal retractions, wheezing, air entry and oxygen saturation.¹

PRAM Scoring Table and Notes				
Criteria	Description	Score	Notes	
O2 saturation	≥95%	0	O2 saturation must be measured with the patient breathing ambient air until stabilisation of the oximetry value for at least 1 minute. 1. TURN OFF supplementary oxygen 2. If SpO2 falls to <92% you can turn oxygen back on immediately as they have automatically scored maximum (2) points.	
	92-94%	1		
	<92%	2		
Suprasternal Retraction	Absent	0	The suprasternal retraction is visible Retraction in drawing of the skin above the sternum and between the sternocleidomastoid muscle with every intake of breath. <i>This is a visual assessment</i>	
	Present	2		
Scalene muscle Contraction	Absent	0	The scalenes are deep cervical muscles located in the floor of the lateral aspect of the neck. Scalene contraction cannot be seen. This is a palpable assessment. Land mark for locating scalene muscles in the triangle bordered by the clavicle (in the front), the trapezius (in the back) and neck (medially) in line with the ear lobe. Occurs in about 10% of all patients – only those with severe asthma exacerbations.	
	Present	2		
Air Entry	Normal	0	**In cases of asymmetry, the most severely affected lung field determines the rating. Use lung fields to grade air entry. Lung field = two contiguous VERTICAL auscultation zones of the Major Lobes: Right anterior lung field: Upper and Middle Zones Right posterior lung field: Upper and Lower Zones Left anterior lung field: Upper and Lower Zones Left posterior lung field: Upper and Lower Zones	
	Decreased at base	1		
	Decreased at apex and the base	2		
	Minimal or absent	3		
Wheezing	Absent	0	Use auscultation zones to grade wheeze. At least two auscultation zones must be affected to influence the rating The most severely affected zones will determine the rating criterion	
	Expiratory only	1		
	Inspiratory (±expiratory)	2		
	Audible without Stethoscope or Silent Chest (min or no air entry)	3		
Severity	Mild	Moderate	Severe	Life Threatening
PRAM score	0-3	4-7	8-12	Respiratory - silent chest, exhaustion, cyanosis, increasing hypoxia Neurological - agitation, confusion, drowsiness Cardiovascular - marked tachycardia, bradycardia PRAM Score is irrelevant & consider causes

Investigations

- Chest x-ray is not generally required. Reserve for Fever without focus, Focal exam, concern for Foreign body, Failure to improve or Failing to oxygenate (life threatening episode) ³
- In the case of patients with diffuse bilateral wheeze, bacterial infection is rarely implicated. Antibiotics are only rarely needed in acute asthma as pneumonia is uncommon. Without a fever, serious bacterial infection is unlikely. ⁴
- In the severe or critical episode, a venous blood gas measurement may be useful. However, a normal venous pCO₂ value does not rule out a critical problem and should be interpreted with caution.
- Arterial blood gas and spirometry are **NOT** required in the assessment of acute asthma in children.
- Electrolytes for potassium levels may be indicated.

Admission Criteria

- Severe/Life threatening episode should be assessed for admission to PICU
- Mild/moderate episode which fails to respond to ED treatment
- Complicated episode (e.g. pneumothorax)
- Previous episode requiring PICU
- Social reasons e.g. poor parental understanding of inhaler technique or concerns regarding compliance with asthma action plan on discharge
- Co-morbidity causing clinical concern

Transition to ward and ongoing care

- Patients transferring to the ward should:
 - Not require continuous nebulised salbutamol
 - Not require salbutamol more frequently than hourly
 - Have received appropriate dose of steroids (1-2mg/kg up to a max of 40mg)
- Patients on 1 hourly salbutamol
 - Continuous monitoring of O₂ saturations and heart rate
 - Supplemental O₂ to keep saturations 94-98%⁵
 - Hourly observations taken prior to administration of salbutamol
- Deterioration on the ward
 - Give dose of salbutamol and review after 20 minutes
 - If no improvement then give two further doses 20 minutes apart (i.e. 3 doses over an hour)
 - If patient improves then reassess one hour earlier than last assessment (e.g. if on 3 hourly salbutamol then review after 2 hours)
 - If patient fails to improve then give continuous nebulised salbutamol and request PICU review
 - Consider loading dose on Magnesium sulphate on the ward
 - Consider trial of High-Flow O₂ ^{6,7} (up to 2L/kg and fiO₂ 40%)
- Weaning salbutamol
 - Dose should be prescribed with a dosing range e.g. 1-2 hourly, 2-4 hourly and 4-6 hourly
 - Nursing staff may space out Salbutamol within the prescribed range as tolerated by the child once weaned off supplemental oxygen

Administration of Bronchodilators

- Studies show that administration of salbutamol via a spacer are as effective as via a nebuliser⁸
- Salbutamol should be given via MDI with appropriate spacer device and at an appropriate dose
 - Aerochamber for children 1-5 years
 - Volumatic for children >5 who can comply
 - 6 puffs for those aged 1-5 years. 10-12 puffs for those aged >5 years.
- Consider switching to MDI with spacer if not requiring supplemental oxygen and clinically improving.

Discharge Criteria

Clinical Findings	<ul style="list-style-type: none"> • Tolerating salbutamol MDI via spacer four hourly • No recession at four hours after the last bronchodilator treatment; • Good air movement on auscultation • Oxygen saturations in room air $\geq 94\%$ • Acceptable oral intake
Discharge Management	<ul style="list-style-type: none"> • Provide written asthma action plan for all patients^{9,10} • Ensure parental education performed regarding action plan, inhaler technique and triggers prior to discharge • Bronchodilator (MDI) therapy weaning plan clearly communicated to family. • If requiring Salbutamol more often than every 4 hours post discharge they should return to hospital • Steroid treatment: A single dosage of dexamethasone or 3 days of prednisolone is usually sufficient^{11,12} (for bronchodilator responsive wheeze < 5 years old)

Further consideration	<ul style="list-style-type: none">• Arrange follow-up as appropriate considering severity of initial presentation, overall control and family's knowledge• Consider escalation of preventative therapy as per BTS asthma guideline⁵
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Companion Documents

- [Acute Asthma – ED Care](#)
- [Parental Information leaflet on Asthma Information and Action Plan](#)

Links to useful websites

- CHI Drug Formulary: <http://www.mobanode.mobi/formulary/desktop/drugDosages.php>
- PRAM on line: <https://www.mdcalc.com/pediatric-respiratory-assessment-measure-pram-asthma-exacerbation-severity>
- Asthma Society of Ireland- Written Asthma Action Plan¹⁴: <https://www.asthma.ie/document-bank/asthma-action-plan-0>

[Link to References](#)