

Document Control

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Paediatric Wheeze Guideline			
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1. Purpose

- 1.1. The purpose of this document is to detail the process for the treatment of the symptom of wheeze both in viral triggered wheeze, multi-triggered wheeze and asthma
- 1.2. The policy applies to Paediatric staff and all Trust staff.
- 1.3. Implementation of this policy will ensure that:
 - Children with wheeze are treated according to this guideline, in line with best practice

2. Responsibilities

- 2.1. Introduction of the new wheeze in paediatrics guideline: Paediatric doctors and nurses, ED Doctors.
- 2.2. Training of ED and Caroline Thorpe ward staff: Nurse educators and senior doctors

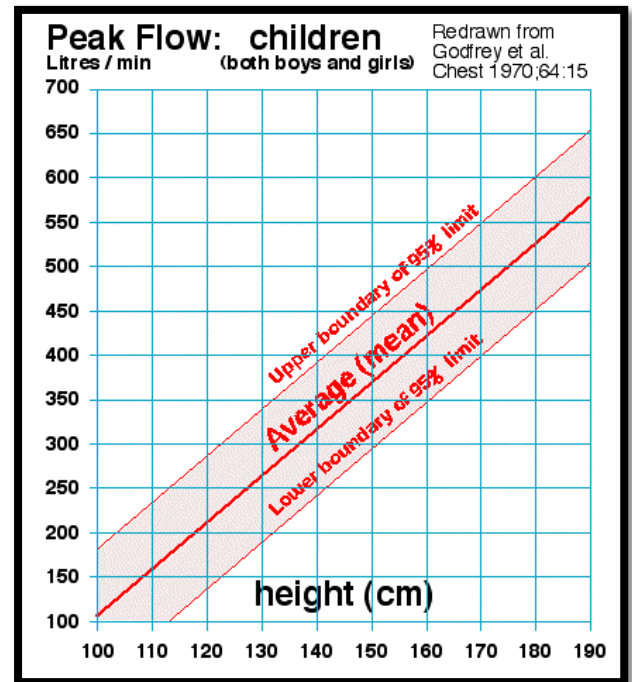
3. Governance

- 3.1. The wheeze guideline has been agreed by the Paediatric senior staff governance process
- 3.2. The wheeze guideline has been agreed in theory by the emergency department
- 3.3. This policy is in line with the guidance agreed through RD&E governance procedures.

4. Assessment of severity/Salient points in history

4.1. History should include:

- Triggers, rate of deterioration, how many puffs given and how often at home
- Interval symptoms (in between attacks)/ PMH- nocturnal cough, short of breath during activity, Atopy (ie rhinitis, eczema), family history (1st degree), smokers/ Vapers at home.
- Previous worst episode- High dependency, Intensive care
- Current “preventers”
- Control- Number of courses of steroids or antibiotics in the last 6 months/ year



4.1.1. **Peak flow** -use if child familiar/ able to do it. May ask “whats normal for you”?

4.2. Examination

4.2.1. In addition to British Thoracic Society “severity assessment” table (below) ensure you comment upon:

- Air entry
- Hyperinflation
- Accessory muscle usage – tracheal tug, intercostal and subcostal recession, abdominal breathing

Moderate acute asthma	<p>Able to talk in sentences</p> <p>SpO₂ ≥92%</p> <p>PEF ≥50% best or predicted</p> <p>Heart rate ≤140/min in children aged 1-5 years ≤125/min in children >5 years</p> <p>Respiratory rate ≤40/min in children aged 1-5 years ≤30/min in children >5 years</p>														
Acute severe asthma	<p>Can't complete sentences in one breath or too breathless to talk or feed</p> <p>SpO₂ <92%</p> <p>PEF 33-50% best or predicted</p> <p>Heart rate >140/min in children aged 1-5 years >125/min in children >5 years</p> <p>Respiratory rate >40/min in children aged 1-5 years >30/min in children >5 years</p>														
Life-threatening asthma	<p>Any one of the following in a child with severe asthma:</p> <table border="1"> <thead> <tr> <th>Clinical signs</th> <th>Measurements</th> </tr> </thead> <tbody> <tr> <td>Exhaustion</td> <td>PEF <33% best or predicted</td> </tr> <tr> <td>Hypotension</td> <td>SpO₂ <92%</td> </tr> <tr> <td>Cyanosis</td> <td></td> </tr> <tr> <td>Silent chest</td> <td></td> </tr> <tr> <td>Poor respiratory effort</td> <td></td> </tr> <tr> <td>Confusion</td> <td></td> </tr> </tbody> </table>	Clinical signs	Measurements	Exhaustion	PEF <33% best or predicted	Hypotension	SpO ₂ <92%	Cyanosis		Silent chest		Poor respiratory effort		Confusion	
Clinical signs	Measurements														
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Cyanosis															
Silent chest															
Poor respiratory effort															
Confusion															

4.3. Investigations

4.3.1. **CXR** – not routine unless:

- Persistently hypoxic (<92%)
- Persistent signs of asymmetrical air entry

4.3.2. **Blood gas** – not routine; perform if starting IV medication

- CO₂ usually low as hyperventilating
- Normal or high CO₂ can be a sign that the child is tiring
- May show low K⁺ or high lactate due to salbutamol toxicity

4.3.3. **Blood tests (infection markers)** – not necessarily needed in the majority of children with wheeze

5. Management of acute wheeze in different age groups:

5.1. Wheeze in children less than 2 years:

5.1.1. Wheezing episodes in very young children (e.g. under the age of 2 years) are often different from those in older children with asthma. They are usually due to viral infections alone and they often respond differently (or do not respond) to asthma medication.

5.1.2. In children over 12 months of age, trial of medication as follows might be indicated (see flow chart below):

- Trial of 6-10 puffs of Salbutamol 4 hourly via a MDI/spacer
- Consider the addition of nebulised Ipratropium Bromide (see dose below)
- Consider oral Prednisolone (10 mg once per day for 3 days) if needing oxygen/unwell/responding to beta₂ agonist- **otherwise minimal evidence for improvement**

It is important to re-assess 5- 10 minutes after administration of salbutamol to evaluate its effectiveness in terms of saturations and respiratory distress

- Infants (less than 12 months) who present with wheeze may have bronchiolitis in which there is no evidence for steroids, saline, antibiotics or nebulised beta₂ agonists. Please refer to a bronchiolitis guideline

Acute management of Wheeze in Under 2yrs

Assess and record Wheeze severity

- NB If a patient has signs/ symptoms across categories, always treat according to their most severe features

Moderate

- SpO2 >92%
- Audible wheeze
- Using accessory muscles
- Still drinking

Acute severe

- SpO2 <92%
- Cyanosis
- Marked respiratory distress
- Too breathless to feed

- Life threatening features include apnoea, bradycardia and poor respiratory effort
- Most infants are audibly wheezy with intercostal recession but not distressed

***** First line treatment *****

Immediate management

Oxygen via close fitting face mask or nasal prongs to achieve normal saturations (>93%)

Give trial of salbutamol- up to 10 puffs via spacer (one puff at a time inhaled separately using tidal breathing) and face mask.

Or Nebulised salbutamol 2.5mg

If poor response:

- Add 0.25mg nebulised ipratropium bromide to each salbutamol neb every 20-30 minutes for 1-2 hours

Consider: Oral prednisolone 10mg for up to 3 days if hypoxic (minimal evidence)

Monitoring

Close continuous monitoring of:

- Heart rate
- Pulse rate
- Pulse oximetry

Supportive nursing care with adequate hydration.

Consider need for CXR if:

- Hypoxic
- Persistent difference in air entry

***** Second line treatment *****

- If not responding or has any life-threatening features escalate to consultant level and consider discussion with WATCH (0300 0300 789)
- Consider alternative diagnoses. (If no response consider viral infection/ atypical bacterial infection)
- Consider second-line treatments (as per >2yrs guideline) with caution.

Acute Management of Wheeze in Children aged > 2-16

***** ASSESS AND RECORD ASTHMA SEVERITY *****

Moderate asthma	Acute severe asthma	Life-threatening asthma
Able to talk in sentences <input type="checkbox"/> SpO2 ≥ 92% <input type="checkbox"/> PEF ≥ 50% best or predicted <input type="checkbox"/> No features of severe asthma <input type="checkbox"/>	-SpO2 < 92% <input type="checkbox"/> 2-5y -HR > 140/min <input type="checkbox"/> RR > 40/min <input type="checkbox"/> >5y -HR > 125/min <input type="checkbox"/> -RR > 30/min <input type="checkbox"/> -Use of accessory neck muscles <input type="checkbox"/> -PEF 33-50% best or predicted <input type="checkbox"/>	SpO2 < 92% plus any of: -Cyanosis <input type="checkbox"/> -Altered consciousness <input type="checkbox"/> -Confusion/ agitation <input type="checkbox"/> -Poor respiratory effort <input type="checkbox"/> -Silent chest <input type="checkbox"/> -PEF < 33% best or predicted <input type="checkbox"/>

NB: If a patient has signs and symptoms across categories, always treat according to their most severe features

***** FIRST LINE TREATMENT *****

Oxygen via face mask/nasal prongs to achieve SpO2 94-98%

<ul style="list-style-type: none"> Salbutamol 2-10 puffs via spacer and mouthpiece <p style="text-align: center; background-color: #d9ead3; padding: 2px;">Reassess within 1 hour</p>	<ul style="list-style-type: none"> Salbutamol 10 puffs via spacer or nebulised salbutamol 2.5mg (2-5yrs) 5 mg (>5 yrs) If poor response add 250 microgram ipratropium bromide to every nebulised salbutamol Repeat salbutamol and ipratropium every 20 minutes for up to 2 hours according to response 	<ul style="list-style-type: none"> Nebulised salbutamol 2.5mg (2-5yrs) 5 mg (>5 yrs) plus ipratropium bromide 250 microgram Repeat every 20-30 minutes (aiming for 3 back to back in the first hour) <p style="text-align: center; background-color: #f4cccc; padding: 2px;">**Consider adding 150 mg MgSo4 to each nebuliser in first hour**</p> <p style="text-align: center; background-color: #f4cccc; padding: 2px;">(NB: for neb Mg only in >2y, sats < 92%, short duration since onset)</p> <p style="text-align: center; background-color: #f4cccc; padding: 2px;">Rv by Paediatrics consider d/wWATCH</p>
<p>Oral prednisolone</p> <p>*Cautious use <5yrs 20mg if not hypoxic or mild/ mod symptoms*</p> <p>>5yrs 30-40 mg</p>	<p>Oral prednisolone 2-5yrs 20mg, >5yrs 30-40 mg or iv hydrocortisone 4 mg/kg (max 200mg) if vomiting/ unwell</p>	

RESPONDING:
Consider Discharge Plan

NOT RESPONDING:
**** SECOND LINE TREATMENT ****

<ul style="list-style-type: none"> Continue salbutamol 1-4 hourly When 4 hourly consider discharge and wean as per discharge paperwork Seek medical advice if not controlled on above treatment Prednisolone for 3 days Provide a written asthma plan Complete discharge bundle checklist Open Access 48 hrs if concerned GP review 1 week If adding preventer or HDU <u>Consultant</u> <u>Consultant</u> follow up 6 weeks If altering medication or keen for rv consider Community nurses
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<p>Discuss with senior clinician, paediatrician or ICU</p> <p>Continue 20-30 minute nebulisers</p> <ul style="list-style-type: none"> Consider CXR and blood gas If in extremis consider IM adrenaline as per anaphylaxis Consider risks and benefits of: <ul style="list-style-type: none"> Bolus IV infusion of magnesium sulphate 40 mg/kg (max 2g) over 20 minutes Bolus IV salbutamol 15 microgram/kg Continuous IV salbutamol infusion 1-2 microgram/kg/min (200 microgram/ml solution) IV aminophylline 5 mg/kg loading dose over 20 minutes*. If child weighs over 66kgs loading dose should be given over 30 mins. Maximum dose is 500mgs (omit in those receiving oral theophyllines) followed by continuous infusion 1 mg/kg/hour Assess response before initiating each new treatment

6. Formulary

6.1. Inhaled Medication

6.1.1. **Salbutamol**

- 6.1.1.1. 2-4 puffs may be appropriate in mild cases
- 6.1.1.2. In severe non hypoxic patients 10 puffs may be most effective.
- 6.1.1.3. Remember use appropriate sized clean spacer
- 6.1.1.4. At least 5 breaths per “puff” administered

6.2. Oral Medication

6.2.1. **Prednisolone**

Please Note: Prednisolone unlikely to be helpful in children under 5 years if Sats > 92 and mild to moderate respiratory distress

- 6.2.1.1. 10 mg of prednisolone for children under 2 years of age
- 6.2.1.2. 20 mg for children aged 2–5 years
- 6.2.1.3. 30–40 mg for children older than 5 years
- 6.2.1.4. Repeat the dose of prednisolone in children who vomit and consider intravenous steroids in those who are unable to retain orally ingested medication.
- 6.2.1.5. Treatment for up to three days is usually sufficient, but the length of course should be tailored to the number of days necessary to bring about recovery.
- 6.2.1.6. Tapering is unnecessary unless the course of steroids exceeds 14 days

6.3. Nebulised Medication

6.3.1. **Salbutamol:** 2.5mg or 5mg ampoules

- 6.3.1.1. Under 5 years 2.5mgs
- 6.3.1.2. 5 years and over 5 mgs

6.3.2. **Ipratropium Bromide:** 250 micrograms

- 6.3.2.1. 250 micrograms can be given with each salbutamol nebuliser for the first 2 hours of treatment

6.3.3. **Magnesium Sulphate:** 50% IV vial (1g in 2mls)

- 6.3.3.1. Take one 50% magnesium Sulphate vial (1g in 2mls), draw up 0.3mls of magnesium and mix in nebuliser pot with along with salbutamol and Ipratropium to make triple nebuliser
- 6.3.3.2. Repeat this process above on two more occasions using same vial of magnesium sulphate as before to complete triple back-to-back nebulisers

IV Medication Magnesium sulphate ($MgSO^4$): 40mg/kg (maximum 2g). Using $MgSO^4$ 50% IV solution. Draw up required volume and make up to 20mls with water for injection or NaCl 0.9% and give over 20 minutes via syringe driver. Do not repeat in 24 hours

- 6.3.3.3. **Salbutamol:** 2-18 years 15micrograms/kg (maximum 250 micrograms). Using 500micrograms/ml salbutamol ampoule draw up required volume and make up to 10ml with water for injection and give over 10 minutes via a syringe driver. **ECG MONITORING REQUIRED**

- 6.3.3.4. **Hydrocortisone:** 4mg/kg (maximum 100mgs) every 6 hours

6.3.4. Infusions:

- 6.3.4.1. **Salbutamol:** Continuous Salbutamol Infusion for children aged 2-18 years: 1-2 microgram/kg/min. ECG monitoring is required and must be given via a dedicated line - cannot be mixed with other medications or infusions.

6.3.4.1.1. To make a 100ml bag:

- 6.3.4.1.1.1. Withdraw and discard 20ml from NaCl 0.9% 100ml bag
- 6.3.4.1.1.2. Draw up 20ml of salbutamol 5mg/5ml solution
- 6.3.4.1.1.3. Add to bag and mix well this gives a final concentration of 200microgram/ml

6.3.4.1.2. To make a 250ml bag:

- 6.3.4.1.2.1. Withdraw and discard 50ml from NaCl 0.9% 250ml bag
- 6.3.4.1.2.2. Draw up 50ml of salbutamol 5mg/5ml solution
- 6.3.4.1.2.3. Add to bag and mix well this gives a final concentration of 200microgram/ml

6.3.4.1.3. **To calculate the rate of administration:**

6.3.4.1.3.1. $0.3 \times \text{weight (kg)} = \text{rate in ml/hr} = 1 \text{ microgram/kg/min}$

6.3.4.1.3.2. Example: 15kg child $0.3 \times 15 = 4.5$

$4.5 \text{ ml/hr} = 1 \text{ microgram/kg/min}$; $9 \text{ ml/hr} = 2 \text{ microgram/kg/min}$

Please note: Patient will require 2 IV access cannulas

Check blood gas and lactate at 30mins, 2hrs and then 4 hourly whilst infusion rate is increasing

Twice daily electrolyte monitoring also required

Serum potassium is often low after multiple doses of salbutamol and should be replaced

6.3.4.2. **Aminophylline:** Loading dose: 5mg/kg (max 500mg) over 20mins (Not to be given in patients on oral theophylline). **If over 66kg loading dose over 30 mins.** A volume limit must be set on infusion device

6.3.4.2.1. Continuous Infusion:

6.3.4.2.1.1. 2 – 12 years: 1mg/kg/hour

6.3.4.2.1.2. 12-18 years: 500micrograms – 700micrograms/kg/hour

6.3.4.2.2. **To be used for loading dose and continuous infusion:**

6.3.4.2.2.1.1. Withdraw and discard 10ml from 250ml NaCl 0.9%

6.3.4.2.2.1.2. Take 10ml of aminophylline 25mg/ml injection and add to the NaCl 0.9% bag

6.3.4.2.2.1.3. This gives a final concentration of 1mg/ml

Please note: Patient will require 2 IV access cannulas

Monitor K^+ , blood gas and lactate after 1-2 hours and then 6 hourly

Daily serum theophylline level required. Target 10- 20mg/L

Compatible with IV hydration fluids containing potassium

6.4. Other

- 6.4.1. In extreme situations consider a differential diagnosis of Anaphylaxis and **IM adrenaline** may be used as per [Resus council](#)
- 6.4.2. High flow oxygen- Limited evidence but potentially [promising support](#)
- 6.4.3. Oral **Dexamethasone** can be used if prednisolone is not tolerated but do not let this stop you using IV medication if this is warranted

7. Discharge

- 7.1. Children can be discharged when stable on 4 hourly inhaled bronchodilators that can be continued at home
- 7.2. PEF and/or FEV1 should be >75% of best or predicted and SpO2 >94%.
- 7.3. Acute asthma attacks should be considered a failure of preventive therapy and thought should be given about how to help families avoid further severe episodes
- 7.4. Discharge plans should address the following (see checklist adapted from BTS bundle):
 - 7.4.1. The diagnosis
 - 7.4.2. Check inhaler technique (with appropriate size spacer)
 - 7.4.3. Consider the need for preventer treatment or optimising/adjusting previously prescribed preventer treatment
 - 7.4.4. Provide a written plan for subsequent asthma attacks with clear instructions about the use of bronchodilators and the need to seek urgent medical attention in the event of worsening symptoms not controlled by up to 10 puffs of salbutamol 4 hourly
 - 7.4.5. Assess exposure to environmental tobacco smoke or actual smoking in older children and refer to suitable agencies where appropriate
 - 7.4.6. Identify the trigger of the acute attack and discuss future management plans for exposure
 - 7.4.7. Open access for 48 hours if you have clinical concerns
 - 7.4.8. GP review in 1 week
 - 7.4.9. Consider Community nursing input if you are making alterations to medication
 - 7.4.10. Consultant follow up in 6 weeks if starting a preventer or the child needed IV therapy/ HDU
- 7.5. Preventer Medication

7.5.1. Many children with recurrent episodes of wheeze triggered by viruses do not go on to develop atopic asthma. The need for regular preventer treatment may depend on the severity and frequency of episodes. Many may not require inhaled corticosteroids. But if you do:

7.5.1.1. **Under 5 years-** especially if atopic, or eosinophilia on FBC (pre steroids):

7.5.1.1.1. Montelukast 4mg ON

Or

7.5.1.1.2. Clenil (Prescribe as brand name) 50 micrograms: 2 puffs BD

7.5.1.2. **Over 5 years**

7.5.1.2.1. Clenil (prescribe as brand name) 100 micrograms: 2 puffs BD

7.5.1.2.2. +/- Montelukast (often start with celil)

7.5.1.3. Review response after 6 weeks by Consultant/ CCN. At this point consider increasing decreasing or stopping medication

7.5.1.4. Ensure you warn of potential side effects:

7.5.1.4.1. Montelukast: sleep disturbance, mood change, GI symptoms, headache and myalgia

7.5.1.5. Discharge Checklist – to be filled out for each patient - Sticker in development (based on BTS asthma bundle)

Discharge checklist	Circle appropriate	Signature
3-4 Hours between inhalers	Yes / No	
Inhaler techniques checked	Yes / No	
Appropriate spacer provided	Yes / No	
Preventer medication reviewed: Should they be on it?	Yes / No	
Are they on an appropriate dose?	Yes / No	
Adherence to medication discussed?	Yes / No	
Written Wheeze plan given to parent/ child and discussed?	Yes / No	
Triggers discussed <ul style="list-style-type: none"> • Smoking/Vaping • Cessation advised • NSAIDS • Other (Please specify) 	Yes / No Yes / No Yes / No Yes / No	
Follow up: <ul style="list-style-type: none"> • GP/ open access 48 hrs 	Yes / No	

<ul style="list-style-type: none"> Consultant review 4-6 weeks if HDU/ changing meds 	Yes / No	
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8. Wheeze Plan

8.1. Please see current wheeze plan on resource drive

9. Monitoring Compliance with and the Effectiveness of the Guideline

Standards/ Key Performance Indicators

9.1.

9.2. Key performance indicators comprise:

-

Process for Implementation and Monitoring Compliance and Effectiveness

9.3. This guideline will be implemented immediately..

9.4. Monitoring process:

- BTS asthma/ NCAP asthma audit will be used for monitoring
- Monitoring will be undertaken by clinical and or non clinical teams.
- These will be reported to the Paediatric governance meeting.
- National audits are undertaken yearly.

10. Resources

10.1. What is a spacer and how to use it: <https://www.asthma.org.uk/advice/inhalers-medicines-treatments/inhalers-and-spacers/spacers/>

10.2. Videos how to use a spacer <https://www.asthma.org.uk/advice/inhaler-videos/tidal-breathing>

10.3. BTS asthma care bundle: <https://www.brit-thoracic.org.uk/media/70102/bts-asthma-care-bundle-april-2016-v3.pdf>

10.4. Asthma Module don't forget the bubbles
<https://dontforgetthebubbles.com/asthma-module>

11. References

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- 11.3. Bristol Guidelines
(<https://foi.avon.nhs.uk/Download.aspx?r=1&did=11537&f=Acute%20Wheeze%20Asthma%20Management-6.pdf>)
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- 11.5.2. Foster SJ, Cooper MN, Oosterhof S, et al. Oral prednisolone in preschool children with virus-associated wheeze: a prospective, randomised, double-blind, placebo-controlled trial. Lancet Respiratory Medicine 2018;6(2):97- 106. 6. British