Ashford and St. Peter's Hospitals
NHS Foundation Trust

Pre-school wheeze:

Management of acute attacks

&

Prevention strategies

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Guideline History		
Date	**Comments**	**Approved By**
20.06.22	First version	Departmental guidelines meeting
08.07.22	Differential diagnosis updated Outdated MgSO4 table removed	As discussed when ratified

1. Flow chart: Management of acute wheeze in pre-school child (1-5 years)
2. Flow chart: Prevention of wheeze in pre-school child (1-5 years)
3. Background
4. Treatment of acute wheeze
5. Prevention of wheeze in pre-school child
6. Supporting references, Supporting Trust Guidelines, Guideline Governance

Management of acute wheeze in pre-school child (1-5 yrs)

Confirm wheeze on auscultation
Consider other conditions
Refer to Asthma or Bronchiolitis Guidelines if appropriate

Mild
Able to talk and feed normally
SpO_2 ≥94%
Respiratory rate <40/min

Moderate- Severe Wheeze
Too breathless to talk or feed
Hypoxia
Respiratory rate >40/min

Trial of bronchodilators via spacer:
Salbutamol 2- 10 puffs
and/or
Ipatropium Bromide 1 puffs

Oxygen (aim SpO_2 94-98%)
Trial of bronchodilators via spacer with nasal cannula O_2 or nebulised with O_2
Salbutamol 2.5mg and Ipratropium Bromide 250mcg

Assess for a clinical response

Good clinical response
Back to back bronchodilators if required
Continue bronchodilators until wheeze improves

Discharge
Salbutamol 4hrly or prn

Provide spacer & training
Smoking cessation

Clinical deterioration or suboptimal response
Trial of back-to-back bronchodilators
Consider IV $MgSO_4$ 40mg/kg given over 30mins

Systemic corticosteroids (PO Prednisolone or IV Hydrocortisone) for:
Hypoxia
Severe symptoms
Atopy or 'suspected asthma'

Antibiotics for bacterial infection

Investigations & further management may include:
Escalate to Consultant, Anaesthetics, STRS
CXR for alternative cause or signs of infection
Bloods & blood gas (lactate, glucose, K+)
Fluid balance, IV fluids at full or 2/3 maintenance

Prevention of wheeze in pre-school child (1-5 yrs)

Confirm episodes of documented wheeze
Consider other conditions

Unlikely to respond to inhaled corticosteroid (ICS)

Most children

Episodes are usually triggered by infection

Treatment:

Intermittent bronchodilators via spacer (Salbutamol or Ipratropium Bromide)

Smoking cessation

Confirm inhaler technique

May respond to ICS

Fewer children

Atopic

'Suspected asthma'

Severe symptoms

Recurrent symptoms

Treatment:

Bronchodilators via spacer (Salbutamol or Ipratropium Bromide) for acute episodes

Trial of ICS (Beclomethasone 100-200mcg BD) for 6-12weeks

Confirm adherence and inhaler technique

Review after 6-12weeks.
Stop ICS if no benefit
Or continue at lowest effective dose

Smoking cessation

Avoidance & treatment of allergic triggers

3. Background:

Pre-school (1- 5 years) wheeze is common. Management of acute attacks and prevention of wheeze should be considered separately (see flowcharts)

Wheeze must be confirmed. Wheeze is a high-pitched, expiratory, whistling sound associated with increased work of breathing[1]. Wheeze is caused by lower airway obstruction. Lower airway obstruction results from bronchoconstriction, mucosal oedema, inflammation, and mucus.

Pre-school wheeze is triggered by airways infection and airways inflammation. Predominantly viral (Rhinovirus, RSV)[2] and sometimes bacterial infections (Moraxella catarrhalis, Streptococcus pneumonia, Haemophilus influenzae) can cause wheeze[2].

75% of children with pre-school wheeze are non-atopic[3] . In children who are **not atopic**, infection usually drives episodes of wheeze. These children **do not respond** well to inhaled steroids[3].

Atopic children are usually sensitised to aeroallergens and may have eosinophilia. **Atopic** children **may respond** to maintenance treatment with inhaled steroids to prevent attacks[3].

Differential diagnoses of pre-school wheeze must be considered
Common:
Bronchiolitis (usually <1yr, refer to Bronchiolitis Guideline)
Asthma (usually older child, refer to Asthma Guideline)
Croup (stridor, not wheeze)
Trauma:
Inhaled objects or liquids (CXR)
Neck injury
Safeguarding injury
Infection:
URTI, LRTI (bacterial, viral, TB)
Sytemic illness
Neoplastic:
Mediastinal tumour lymphoma, neuroblastoma, thymoma, metastatic (rare)
Cardiac:
Pulmonary plethora from left to right shunt, Pulmonary oedema from left ventricle failure, myocarditis
Gastrointestinal:
Unsafe swallowing resulting in aspiration
Anatomical:
Larynoglomalacia, Trachea and/or bronchial anomalies
Vascular ring/sling
Vocal cord dysfunction

Upper airway obstruction (adenoidal hypertrophy, obstructive sleep apnoea)

Genetic disorders:

Cystic fibrosis (moist cough)
Primary ciliary dyskinesia (often symptoms in neonatal period)
Immunodeficiencies (may present with infection)

Respiratory:

Protracted bacterial bronchitis (moist cough)
Bronchiolitis obliterans
Pulmonary fibrosis

Allergy:

Anaphylaxis

4. Treatment of acute wheeze in pre-school child (1-5 years):

Refer to Management of acute wheeze in pre-school child flow chart (above).

Oxygen:
Aim SpO_2 >94%. Oxygen via nasal prongs with bronchodilators via MDI or oxygen used to nebulise bronchodilators[4].

Inhaled Bronchodilators:
Short acting Beta-agonist (SABA): Salbutamol 2-10 puffs or 2.5mg nebulised. Back to back then hourly.
Anticholinergic: Ipratropium bromide (Atrovent) 20mcg (1 puff) via or 250 mcg nebulised every 20–30 minutes for the first 2 hours, then 250 micrograms every 4–6 hours

MDI and spacer is preferred over nebulised when possible[4]. Ensure correct spacer technique.

Assess for clinical response after 15-20mins. If ineffective, discontinue use to avoid side effects. If good clinical response, continue bronchodilators until wheeze improves.

Atrovent has slower onset and weaker bronchodilator effect than Salbutamol, but may decrease oedema and secretions. Atrovent with Salbutamol leads to greater bronchodilation than using either alone[5].

It is a myth that infants do not have Beta 2 receptors in the lung[6]. Lack of improvement with SABAs in infants is due to airway obstruction caused by mucous and oedema rather than bronchoconstriction.

Systemic corticosteroids:
Prednisolone <2 years 10mg, 2-5 years 20mg
Hydrocortisone IV 4mg/kg (max. per dose 100mg) 6 hourly until conversion to oral

Consider for:
Hypoxic, severe symptoms, atopic child, 'suspected asthma' (recurrent episodes with other triggers and/or interval symptoms)

Non-atopic children are unlikely to respond to oral corticosteroids, during acute episodes[7] . Overuse causes adverse effects without clinical benefit.

Magnesium sulphate:
$MgSO_4$ IV 40mg/kg over 30minutes. Maximum dose 2g

Consider for poor response to inhaled bronchodilators, or clinical deterioration[3] (SpO_2 <92%, RR>40/min; too breathless to talk/feed). 2nd dose can be given after 1-2hrs. Discuss with

consultant. Check serum Ca and Mg levels before giving. Cardiac and BP monitor when administrating IV $MgSO_4$. Hypotension may occur.

Nebulised $MgSO_4$ is not used. No evidence to support IV Salbutamol or IV Aminophylline except in the treatment of suspected asthma (refer to Asthma Guideline).

Preparation of intravenous $MgSO_4$: As per Medusa.

Ventilatory support:
If clinical deterioration or failure to respond to treatments. Inform consultant, anaesthetic team and STRS.

High-flow humidified nasal cannula oxygen (Vapotherm) at 1-2L/Kg/min. Older children may be uncomfortable hence start at 0.5-1L/Kg/min and titrate. Maximum flow rate delivered on the ward is 40L/min.
Continuous positive airway pressure (CPAP) cannot be used on ward
Intubation and ventilation may be required.

5. Prevention of wheeze in pre-school child (1-5 years):

Inhaled corticosteroids (ICS):
Most children with pre-school wheeze are **not atopic**[3] hence are unlikely to respond to maintenance ICS[3]. Episodes are usually infective and should be managed with intermittent bronchodilators only.

Maintence ICS in selected children reduces wheeze. Consider offering a trial of ICS for:

Severe episodes (hypoxia, tachypnoea, severe breathlessness).

Recurrent episodes. These children may be receiving multiple courses of oral steroids.

Atopic children or 'suspected asthma'. Children **responsive to maintenance ICS** may have biomarkers of airway eosinophilia[3]. Biomarkers are blood eosinophilia (>0.3 $X10^9$/l) and/or aeroallergen sensitisation (positive skin prick testing or raised specific IgE to inhaled allergens, especially if there is a suggestive history).

Offer a trial of ICS for 6-12 weeks with:
Correct inhaler technique and spacer device.
Written asthma plan (Asthma UK Child's Asthma Plan) even without a diagnosis of asthma.
Parental smoking cessation advice.
Allergen avoidance advice

After 6-12 weeks, review benefit of ICS:
Failure to improve (despite good adherence and inhaler technique), stop ICS.
Improvement, continue at lowest effective dose

Respiratory nurses can review inhaler technique ans skin prick test if needed.

Montelukast:
Leukotriene receptor antagonists (Montelukast) are often ineffective in preventing pre-school wheeze[3]. Some children experience neuropsychiatric side effects. Montelukast can be given as a trial if parents are reluctant to use ICS[3] (as per BTS Asthma Management, Step 2).

Other:
Prophylactic antibiotics are not required for prevention of pre-school wheeze. A 2-4 week course of antibiotics (Co Amoxiclav) can be used to treat protracted bacterial bronchitis (predominately cough, not wheeze). Annual intranasal flu vaccine should be encouraged.
CXR and bloods (FBC, Sp IgE) or SPT should be considered.
Investigation for other causes may include: SALT review, immune function, sweat test, ENT opinion.

6. Supporting References:

1. Bush, A., Grigg, J. and Saglani, S., 2014. Managing wheeze in preschool children. *BMJ*, *348*.
2. Saglani, S., Fleming, L., Sonnappa, S. and Bush, A., 2019. Advances in the aetiology, management, and prevention of acute asthma attacks in children. *The Lancet Child & Adolescent Health*, *3*(5), pp.354-364.
3. Makhecha, S. and Saglani, S., 2021. Diagnosis and management of wheeze in pre-school children The Pharmaceutical journal. https://pharmaceutical-journal.com/article/ld/diagnosis-and-management-of-wheeze-in-pre-school-children
4. Craig, S.S., Dalziel, S.R., Powell, C.V., Graudins, A., Babl, F.E. and Lunny, C., 2020. Interventions for escalation of therapy for acute exacerbations of asthma in children: an overview of Cochrane Reviews. *Cochrane Database of Systematic Reviews*, (8).
5. Plotnick, L. and Ducharme, F., 2000. Combined inhaled anticholinergics and beta2-agonists for initial treatment of acute asthma in children. *Cochrane database of systematic reviews*, (3).
6. Yusuf, F., Prayle, A.P. and Yanney, M.P., 2019. β2-agonists do not work in children under 2 years of age: myth or maxim?. *Breathe*, *15*(4), pp.273-276.
7. Saglani, S., Fleming, L., Sonnappa, S. and Bush, A., 2019. Advances in the aetiology, management, and prevention of acute asthma attacks in children. *The Lancet Child & Adolescent Health*, *3*(5), pp.354-364.
8. Pincheira, M.A., Bacharier, L.B. and Castro-Rodriguez, J.A., 2020. Efficacy of macrolides on acute asthma or wheezing exacerbations in children with recurrent wheezing: a systematic review and meta-analysis. *Pediatric Drugs*, *22*(2), pp.217-228.

Supporting relevant trust guidelines

Asthma Guideline (July 22)
Bronchiolitis Guideline (June 21)

Guideline Governance

a. Scope

This guideline is relevant to all staff caring for all children from 0-5 years old across the emergency department, inpatient ward and outpatient department.

b. Purpose

i. This guidelines aims to facilitate a common approach to the management of children. At times deviation from the guideline may be necessary, this should be documented and is the responsibility of the attending consultant.

ii. This guideline is subject to regular review to ensure ongoing evidence based practice.

c. Duties and Responsibilities

All healthcare professionals responsible for the care of all children 0-18years should be aware of practice according to this guideline.

d. Approval and Ratification

This guideline will be approved and ratified by the Paediatric Guidelines Group.

e. Dissemination and Implementation

i. This guideline will be uploaded to the trust intranet 'Paediatric Guidelines' page and thus available for common use.
ii. This guideline will be shared as part of ongoing education within the Paediatric Department for both medical and nursing staff.
iii. All members of staff are invited to attend and give comments on the guideline as part of the ratification process.

f. Review and Revision Arrangements

a. This policy will be reviewed on a 3 yearly basis by the appropriate persons.
b. If new information comes to light prior to the review date, an earlier review will be prompted.
c. Amendments to the document shall be clearly marked on the document control sheet and the updated version uploaded to the intranet. Minor amendments will be ratified through the Paediatric Guidelines Group. A minor amendment would consist of no major change in process, and includes but is not limited to, amendments to documents within the appendices.

g. Equality Impact Assessment

Background • Presented at departmental guidelines meeting
Dr Triveni Lall Dr Ruth Mew, Paediatric Consultant (Supervising consultant) Dr Alison Groves, Paediatric Consultant
Methodology • No impact on race and ethnic origin, disability, gender, culture, religion or belief, sexual orientation, age • Data sourced from literature search
All groups of staff and patients were taken into consideration and there is no bias towards or against any particular group.
Key Findings • Describe the results of the assessment • Identify if there is adverse or a potentially adverse impacts for any equalities groups
There is no evidence of discrimination.
Conclusion • Provide a summary of the overall conclusions
There is no evidence of discrimination.
Recommendations • State recommended changes to the proposed policy as a result of the impact assessment • Where it has not been possible to amend the policy, provide the detail of any actions that have been identified • Describe the plans for reviewing the assessment
This guideline is appropriate for use.

h. Document Checklist

To be completed (electronically) and attached to any document which guides practice when submitted to the appropriate committee for approval or ratification.

Title of the document: Pre-school wheeze: Management of acute attacks & Prevention strategies

Policy (document) Author: Dr Ruth Mew

Executive Director: N/A

		Yes/No/ Unsure/NA	Comments
1.	**Title**		
	Is the title clear and unambiguous?	**Yes**	
	Is it clear whether the document is a guideline, policy, protocol or standard?	**Yes**	
2.	**Scope/Purpose**		
	Is the target population clear and unambiguous?	**Yes**	
	Is the purpose of the document clear?	**Yes**	
	Are the intended outcomes described?	**Yes**	
	Are the statements clear and unambiguous?	**Yes**	
3.	**Development Process**		
	Is there evidence of engagement with stakeholders and users?	**Yes**	
	Who was engaged in a review of the document (list committees/ individuals)?	**Yes**	**Departmental Guidelines Meeting**
	Has the policy template been followed (i.e. is the format correct)?	**Yes**	
4.	**Evidence Base**		
	Is the type of evidence to support the document identified explicitly?	**Yes**	

		Yes/No/ Unsure/NA	Comments
	Are local/organisational supporting documents referenced?	**Yes**	
5.	**Approval**		
	Does the document identify which committee/group will approve/ratify it?	**Yes**	
	If appropriate, have the joint human resources/staff side committee (or equivalent) approved the document?	**NA**	
6.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	**Yes**	
	Does the plan include the necessary training/support to ensure compliance?	**NA**	
7.	**Process for Monitoring Compliance**		
	Are there measurable standards or KPIs to support monitoring compliance of the document?	**NA**	
8.	**Review Date**		
	Is the review date identified and is this acceptable?	**Yes**	
9.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for coordinating the dissemination, implementation and review of the documentation?	**Yes**	
10.	**Equality Impact Assessment (EIA)**		
	Has a suitable EIA been completed?	**Yes**	

Committee Approval (Paediatric Guidelines Group)			
If the committee is happy to approve this document, please complete the section below, date it and return it to the Policy (document) Owner			
Name of Chair	**Dr Claire Mitchell**	**Date**	**20.06.22**
Ratification by Management Executive (if appropriate)			
If the Management Executive is happy to ratify this document, please complete the date of ratification below and advise the Policy (document) Owner			
Date: n/a			