NHS South Yorkshire Integrated Care Board

South Yorkshire Children & Young People's Alliance

Guideline for Management of Acute Asthma in Children

Clinical Guideline

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Purpose of Guidance

This guideline has been created for use in acute hospital settings, as part of implementing the National Asthma Bundle of Care across South Yorkshire Integrated Care System footprint and improving outcomes for children & young people. The Guideline will positively impact our population through both short-term improvement in asthma care and longer-term decrease in outcome variability.

This part of the guidelines covers management of Acute Asthma in Children which is a common presentation in paediatric units and will ensure standardisation of care and equity for all of our children and young people in the region. The Guideline is based on the current national recommendations and best available evidence.

The specific objectives of the guideline when managing acute asthma in children is to reduce the need for intubation and ventilation by maximising medical management and to optimise prevention of further episodes when discharged from the hospital.

Scope of Guidance

This pathway is intended for the use of staff working in the four acute hospital trusts providing children's services in the South Yorkshire Integrated Care Board:

- Barnsley Hospitals NHS Foundation Trust
- Doncaster & Bassetlaw Hospitals NHS Foundation Trust
- Rotherham NHS Foundation Trust
- Sheffield Children's NHS Foundation Trust

This includes but is not limited to Doctors, Nurses, and Allied Health Professionals providing care to children in the paediatric departments and the Emergency departments. Individual local hospitals may opt to deviate from these guidelines by obtaining approval from their local Clinical Governance Committees.

The document may be referred to by other Trusts at their discretion but does not replace or override any guidance intended to be used therein approved by their local Clinical Governance.

This document is not intended for use in Primary Care or other non-Acute environments.

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Version Control

This is a controlled document. Whilst this document may be printed, the electronic version posted on the **Healthier Together Staff Hub** is the controlled copy. Any printed copies of this document are not controlled.

Date	Version	Comments	Changes Made
21 June 2024	1 [Original]	First Edition	Based on feedback

Key Definitions

Acute asthma:

Acute asthma is the progressive worsening of asthma symptoms, including breathlessness, wheeze, cough, and chest tightness. An acute exacerbation (attack) is marked by a reduction in baseline objective measures of pulmonary function, such as peak expiratory flow rate and FEV1.

Children:

Age 1 – 16 yrs.

DGH:

District General hospital in the South Yorkshire Integrated Care Board

Introduction & Background

Acute Asthma is a common condition with clear, evidence based, national guidelines to help manage acute exacerbations (attacks). In addition, asthma is one of the commonest chronic paediatric conditions that presents to hospital. Most asthma attacks severe enough to require hospitalisation develop relatively slowly over a period of six hours or more. In children, intermittent wheezing attacks are usually triggered by viral infections and response to asthma medication may be inconsistent. Low birth weight and/or prematurity may be risk factors for recurrent wheeze.

This guideline is for the management of acute asthma attacks in children in hospitals in the South Yorkshire Integrated Care Board and is based on the British Guideline on the Management of Asthma, updated 2019 (BTS). The BTS guidelines were developed by respiratory experts, and involved representation from Asthma UK.

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Recommendations, Summary

There are 3 steps DURING a hospital asthma attack management:

1) Nursing and Medical assessment of severity i.e. Triage (Refer to Nursing/medical Assessment/Triage Form)
2) Initiation of emergency management as per guideline according to the **severity** and **age** of the child (Refer to the emergency treatment guidelines
3) **The asthma discharge care bundle and the implementation of all its content before discharge.**

Admission Criteria

Decision about admission depends on severity of asthma and should be made by trained clinicians after repeated assessment of the response to bronchodilator treatment.

Mild and Moderate exacerbation:	Severe exacerbation:
Admission criteria: 1. Children with persistent moderate exacerbation on arrival at the hospital following treatment by GP or at home. 2. Children attending the ED department with mild to moderate exacerbation who responded poorly to bronchodilator treatment. 3. **Lower threshold for admission if:** • Attack in late afternoon or at night • Previous severe attack requiring hospital admission • Recent hospital admission e.g. during the previous 6 months • Concern over social circumstances or ability to cope at home.	• **Always admit** • Admission is in the HDU cubicle on the ward or appropriate area in the Children assessment or resuscitation area in the Emergency Department. • If there is continuing poor response or worsening: Inform consultant & if not already there. consider transfer to HDU /resus area

Life threatening asthma:

- Nurse the patient in the resuscitation area in the Emergency Department/Children assessment or the HDU cubicle on the ward.
- **Always inform consultant AND anaesthetist.**
- If transferred to PICU, HDU or resuscitation area, to remain there until either:
  (1) There is a good response and sustained improvement in which case return patient to the ward **OR**
  (2) If intubation is required, they are stabilised and transferred to PICU unit, via Embrace if in DGH hospital.

Initiate treatment according to severity and age: →	**1. Regular bronchodilator treatment** **2. Early systemic steroids, given within one hour of attendance**

Subsequent clinical Management of acute asthma (medical and nursing):

1. Initially review every 15-30 minutes, re-categorise and treat until sustained improvement.
2. Consider escalation of treatment for poor response as detailed in the guidelines, do not delay escalation if needed.
3. Always refer to the management guideline section in the acute Asthma management guidelines and/or on the intranet.
4. Document every time when a patient is reviewed and treatment changed (Each entry must be timed, dated and signed):
   1-Indicate relevant symptoms, signs and changes in condition (i.e. same, improving or worsening)
   2-Management and changes in treatment
   3-Variation from guidelines & why?

Discharge criteria: Ensure all the following before discharge

1. SpO2 ≥95% on air	2. Improving asthma symptoms
3. Ensure stable on 4 hourly inhaled treatment	4. PEF >75% of best or predicted, (if possible)

Discharge planning:

The nursing staff will Initiate and complete the Asthma Discharge Care Bundle as soon as the patient starts showing sustained improvement and implement all its content before discharge. Ensure the patient is reviewed by asthma nurse or the ward asthma link nurse before discharge. Follow the advice and give leaflet of the "Going Home Plan" there is one for children and one for young people.

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Clinical Management: Acute Care

1. Clinical Assessment of Severity: Nursing and Medical Triage

Before children can receive appropriate treatment for an acute asthma attack in any setting, it is essential to assess accurately the severity of their symptoms. The clinical severity of an acute exacerbation is based upon clinical judgement of the signs and symptoms observed and is subdivided into 3 categories i.e. mild-to-moderate, severe and life-threatening exacerbations. However, clinical signs correlate poorly with the severity of airways obstruction as some children with acute severe asthma do not appear distressed.

Nursing and Medical Triage to categorise level of severity of Paediatric Acute Asthma:

- **Should be used for all children (age 1 – 16 yrs.) who are thought to have acute wheeze related to underlying asthma in the Emergency Department, Children Assessment Unit and the Children wards.**
- **Refer to an example of the full Triage Form, Appendix 1 on Page 14.**
- **The following clinical signs should be recorded:**

Pulse rate: Increasing tachycardia generally denotes worsening asthma; a fall in heart rate in life-threatening asthma is a preterminal event. Tachycardia may also be linked to salbutamol treatment.
Resp. rate and degree of breathlessness: Too breathless to complete sentences in one breath or to feed
Use of accessory muscles: Best noted by palpation of neck muscles
Amount of wheezing: Might become biphasic or less apparent with increasing airways obstruction
Degree of agitation and conscious level: Always give calm reassurance.
Pulse oximetry (SpO2): Low SpO2 after initial bronchodilator treatment indicates more severe asthma. Consider intensive inpatient treatment if SpO2 <92% in air after initial bronchodilator treatment.
Peak expiratory flow: Can be of benefit in assessing children who are familiar with its use. The best of three PEF measurements, ideally expressed as a percentage of personal best, can be useful in assessing the response to treatment. A measurement of <50% predicted PEF or FEV1 with poor improvement after initial bronchodilator treatment is predictive of a more prolonged asthma attack. **Refer to page 15 for normal and predicted PEF.**

[The following information is included in the Triage form, refer to an example of the full form in Appendix 1]

If patient has signs and symptoms across categories, always treat according to their most severe features (Exception, isolated tachycardia if salbutamol has already been given, in which case use clinical judgement)

Yes, to all of the following: • **Oxygen Saturation ≥ 92%** ☐ • PEFR (best or predicted): ≥75%(mild) ☐ ≥50% (moderate) ☐ • Able to talk in sentences ☐ • Mild/moderate recession and accessory muscle use ☐ • HR: ≤140/min (1–5years) ☐ ≤125/min (>5 years) ☐ • RR: ≤40/min (1–5 years) ☐ ≤30/min (>5 years) ☐	•**Oxygen Saturation < 92%** ☐ •Too breathless to talk or eat ☐ • Severe recession/accessory muscle use ☐ •HR >140/min (1-5 years) ☐ >125/min (>5 years) ☐ •RR >40/min (1-5 years) ☐ >30/min (>5years) ☐ •Peak flow 33-50% best or predicted (>5 years, if possible) ☐ •Agitated /distressed ☐	**Oxygen Saturation < 92% plus any of:** •Peak flow < 33% best or predicted (if possible) ☐ •Poor respiratory efforts ☐ •Silent chest ☐ •Confusion/Drowsy ☐ •Cyanosis ☐ •Hypotension ☐ •Bradycardia ☐
Mild-to- Moderate exacerbation ☐	**Severe exacerbation** ☐	**Life threatening asthma** ☐
• **Salbutamol up to 10 puffs via spacer ± facemask** • **Call Dr. (child to be seen within 30 minutes)** •Are Safe to discharge when only requiring Salbutamol every 4 hours.	**Oxygen via facemask/nasal prongs to achieve normal saturation (aim: 94-98%)** **Nebulised Salbutamol (2-5 years: 2.5 mg; >5 years: 5mg) with oxygen** •**Call Dr. (child to be seen within 10 minutes)** •Inform Paediatric Registrar •Always admit	•**Doctor to see child URGENTLY** •Admit to Resuscitation room or High dependency/intensive care area •Inform Paediatric Registrar; Call for senior support & Inform Anaesthetist
Always reassess 20 minutes after first treatment and again as guided by response and refer to guidelines		
Most children with acute asthma seen at the hospital who are already receiving inhaled steroids are considered for oral steroids. **If requires systemic steroids, this MUST be given within 1 hour of arrival; Tick here if given** ☐		

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2. Additional History

During treatment establish additional history as follows:

- History of current episode, including details of any treatment given prior to A&E admission.
- Previous HDU/PICU admissions.
- Number of ED attendances in last 12 months with wheeze.
- Number of admissions with wheeze in last 12 months.
- Number of courses of steroids in last 12 months.
- Nocturnal symptoms.
- Exercise symptoms.
- Specific triggers (e.g. viral infections, cold weather, allergens).
- Missed school because of wheeze
- Medications (Inhalers? Montelukast? Adrenaline auto-injector? Other medications?) – try and establish compliance and if correct technique.
- Document inhaler and spacer name and strength.
- Establish co-existing conditions and potential exacerbating factors e.g. eczema, rhinitis, hay fever, atopic family, food allergies, household smokers, domestic and environmental pollution.
- The smoking status of the patient, applies to patients aged 11 years and over on the date of arrival include the following: never smoked, never smoked and current vaper, ex-smoker, ex-smoker and current vaper, current smoker, regularly exposed to second-hand smoke
- Usual peak flow rate if known

3 Emergency Treatment of Children with Acute Asthma:

Optimal therapy is targeted at reducing bronchoconstriction, airway inflammation and mucus plugging, with the aim of treatment to correct hypoxia and reverse airflow obstruction. This is usually achieved through medical management although on occasions mechanical ventilation may be required, which is not without its risks, in particular that of air leak. Optimising medical therapy to improve symptoms is paramount in reducing the need for mechanical ventilation and this is usually successful. However, intubation may be required if there is significant respiratory or cardiovascular compromise or evidence of exhaustion, and should be performed by the most experienced person present, normally this will be the anaesthetist.

Emergency treatment of children with acute exacerbation of asthma is according to severity and age of the child as detailed below:

- **There are three levels of severity of acute exacerbation, refer to Triage form, Appendix 1:**
  - **Mild-to-Moderate**
  - **Severe**
  - **Life threatening asthma**
- **There are three age groups (Click below to access the relevant guidelines, pages 8-10):**

3.1 Children > 5 years of age

3.2 Children between 2-5 years

3.3 Infants less than 2 years

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3.1 Management of Acute Asthma in Children > 5 Years in The Hospital

Management of Acute Asthma in Children in Hospital

(Emergency Department, Children Assessment Unit and Wards)

Age >5 years

ASSESS AND RECORD ASTHMA SEVERITY (Refer to triage form, Appendix 1)

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

Mild-to-Moderate asthma	Acute severe asthma	Life-threatening asthma
•**SpO2 ≥92% plus all of:** •No clinical features of severe Asthma •PEFR (best or predicted): ≥75%(mild); ≥50% (moderate)	•**SpO2 <92%** •Too breathless to talk or eat •Severe recession/accessory muscle use •Heart rate >125/min •Respiratory rate >30/min •Peak flow 33-50% best or predicted (>5 years, **if possible**) •Agitated /distresse	**SpO2 <92% plus any of:** •Silent chest •Poor respiratory effort •Exhaustion •Confusion/Drowsy •Cyanosis •Peak flow < 33% best or predicted (**if possible**) •Hypotension •Bradycardia

First-line treatments

•Give Salbutamol up to 10 puffs inhaled via spacer ± facemask* •**Consider:** Oral prednisolone 30-40 mg **or** Oral Dexamethasone 0.6mg/ kg (maximum dose 16mg) ** ****Oral Dexamethasone is local not national guidance**	1-Give Oxygen via face mask/nasal prongs to achieve SpO2 94–98% 2-Give salbutamol 5 mg **and** ipratropium bromide 250 micrograms via nebuliser (preferably oxygen-driven) or if nebuliser not available, via spacer* 3-Give Oral prednisolone 30–40 mg **or** IV hydrocortisone 4 mg/kg (maximum 100mg) if Vomiting or oral unsafe **or** Oral Dexamethasone 0.6mg/kg (maximum dose 16mg) **	
Reassess within 1 hour	•**If poor response** repeat Nebulised Salbutamol **and** ipratropium every 20-30 minutes for 1–2 hours •**If had salbutamol hourly for 4 hours needs escalation-seek senior help i.e. ST4+**	•Consider adding 150 mg magnesium sulphate **to each** salbutamol/ipratropium nebuliser **in first hour (Maximum 3 doses).** •**Discuss with senior clinician, PICU team or Paediatrician**

ASSESS RESPONSE TO INITIAL TREATMENT ALWAYS WITHIN 20 MINUTES AND RECTEGORISE SEVEREITY

Record respiratory rate, heart rate, oxygen saturation and PEF/FEV every 1-4 hours

Second-line treatments

RESPONDING:	NOT RESPONDING:
•Continue Salbutamol 1–4 hours, increase interval between doses based on assessment •If used, continue ipratropium bromide 4-6 hourly until stable and **stop before discharge**. •Discharge when stable on 4-hourly treatment •if used, continue prednisolone 30–40 mg daily until recovery (minimum 3–5 days) •If discharged without admission, no further steroid is required if using dexamethasone. If the patient returns to their GP, it is important that GP should use further steroids (if required) as per their local standard practice. ➢ **At discharge, Complete the Hospital Asthma care bundle: (Refer to Appendix 3):** •Request asthma Nurse review in admitted patient •Ensure stable on 4–hourly inhaled treatment •Review the need for regular treatment and the use of inhaled steroids •Review inhaler technique •Provide a written asthma action plan for treating future attacks •Advise parents to arrange GP follow up within 2 days •Arrange paediatric **or** asthma nurse clinic follow up in 4 weeks	•Continue 20–30 minute nebulisers •Consider chest X-ray and blood gases •Discuss with senior clinician, paediatrician or PICU •Consider admission to HDU/PICU •Can still give IV Hydrocortisone or oral prednisolone course if improvement is slow or worsen after Oral Dexamethasone. ➢ **Consider risks and benefits of (Always Refer to BNFc and local drug preparation guidelines if available):** •**Bolus IV infusion of magnesium sulphate** 40 mg/kg (Maximum dose 2 g) over 20 minutes •**Bolus IV salbutamol** over 10 minutes if not already given: Dose 15 micrograms/kg (Maximum dose 250 micrograms) •**Continuous IV salbutamol infusion** (Use 200 micrograms/ml solution): Dose is 1–5 micrograms/kg/min •**IV aminophylline** 5 mg/kg **loading dose** over 20 minutes (Maximum dose 500 mg and omit in those receiving oral theophyllines) **followed by Continuous IV infusion, dose**: - Child 1 month -11 years 1 mg/kg/hour - Child 12-17 years 0.5-0.7 mg/kg/hour •Assess response before initiating each new treatment

* Salbutamol via spacer given one puff at a time, inhaled separately using tidal breathing; according to response, give another puff every 60 seconds up to a maximum of 10 puffs; **Oral Dexamethasone is local not national guidance.

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3.2 Management of Acute Asthma in Children 2- 5 years in The Hospital

Management of Acute Asthma in Children in Hospital

(Emergency Department, Children Assessment Unit and Wards)

Age 2–4 years

ASSESS AND RECORD ASTHMA SEVERITY (Refer to triage form, Appendix 1)

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

Mild-to-Moderate asthma	Acute severe asthma	Life-threatening asthma
•**SpO2 ≥92% plus all of:** •No clinical features of severe asthma	•**SpO2 <92%** •Too breathless to talk or eat •Severe recession/accessory muscle use •Heart rate >140/min •Respiratory rate >40/min •Agitated /distressed	**SpO2 <92% plus any of:** •Silent chest •Poor respiratory effort •Exhausion •Confusion/drowsy •Cyanosis •Hypotension •Bradycardia

First-line treatments

•Give Salbutamol up to 10 puffs inhaled via spacer ± facemask* •**Consider:** Oral prednisolone 20 mg **or** Oral Dexamethasone 0.6mg/kg (max 16mg)** ****Oral Dexamethasone is local not national guidance**	1-Oxygen via face mask/nasal prongs to achieve SpO2 94–98% 2-Give salbutamol 2.5 mg **and** ipratropium bromide 250 micrograms via nebuliser (preferably oxygen-driven) and repeat every 20–30 minutes 3-Give Oral prednisolone 20 mg **or** IV hydrocortisone 4mg/kg if vomiting or oral Not safe (Maximum 100 mg) **or** Oral Dexamethasone 0.6mg/kg (max 16mg)**	
Reassess within 1 hour	•If poor response repeat Nebulised Salbutamol and ipratropium bromide every 20-30 minutes for 1–2 hours •If had salbutamol hourly for 4 hours needs escalation-seek senior help i.e. ST4+	•Consider adding 150mg magnesium sulphate to each salbutamol/ipratropium nebuliser in first hour (**Maximum 3 doses).** •**Discuss with senior clinician, PICU team or Paediatrician**

ASSESS RESPONSE TO INITIAL TREATMENT ALWAYS WITHIN 20 MINUTES AND RECTEGORISE SEVEREITY

Record respiratory rate, heart rate, oxygen saturation and PEF/FEV every 1-4 hours

Second-line treatments

RESPONDING:	NOT RESPONDING:
•Continue Salbutamol 1–4 hours as necessary, if on nebuliser change to spacer when significantly improved and increase interval between doses based on assessment. •If used, continue ipratropium bromide 4-6 hourly until stable and **stop before discharge**. •Discharge when stable on 4–hourly treatment •Continue prednisolone 20 mg daily until recovery (minimum 3–5 days). •If discharged without admission, no further steroid is required if using dexamethasone. If the patient returns to their GP, it is important that GP should use further steroids (if required) as per their local standard practice. ➢ **At discharge, Complete the Hospital Asthma Care Bundle (Refer to Appendix 3):** •Request asthma Nurse review in admitted patient •Ensure stable on 4–hourly inhaled treatment •Review the need for regular treatment and the use of inhaled steroids. •Review inhaler technique. •Provide a written asthma action plan for treating future attacks. •Advise parents to arrange GP follow up within 2 days. •Arrange paediatric or asthma nurse clinic follow up in 4 weeks.	•Continue 20–30 minute nebulisers •Consider chest X-ray and blood gases •Discuss with senior clinician, paediatrician or PICU •Consider admission to HDU/PICU •Can still give IV Hydrocortisone or oral prednisolone course if slow improvement or deteriorate after Oral dexamethasone ➢ **Consider risks and benefits of (Always refer to BNFc or local drug preparation guidelines if available):** •**Bolus IV infusion of magnesium sulphate** 40 mg/kg (Maximum dose 2 g) over 20 minutes. •**Bolus IV salbutamol** over 10 minutes, if not already given: -Dose for child > 2 years 15 micrograms/kg (Maximum dose 250 micrograms in a child 2-17 Years) •**Continuous IV salbutamol** infusion (Use 200 micrograms/ml solution): Dose is 1–5 micrograms/kg/min •**IV aminophylline** 5 mg/kg **loading dose** over 20 minutes (Maximum loading dose 500mg and omit in those receiving oral theophyllines) **followed by Continuous IV infusion**, dose: - Child 1 month -11 years 1mg/kg/hour - Child 12-17 years 0.5-0.7mg/kg/hour •Assess response before initiating each new treatment

* Salbutamol via spacer given one puff at a time, inhaled separately using tidal breathing; according to response, give another puff every 60 seconds up to a maximum of 10 puffs; **Oral Dexamethasone is local not national guidance

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3.3 Management of Acute Asthma in Children < 2 Years in The Hospital

Management of Acute Asthma in Children in Hospital

(Emergency Department, Children Assessment Unit and wards)

Infants Aged < 2 years *

ASSESS AND RECORD ASTHMA SEVERITY

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

Mild-to-Moderate asthma

- SpO_2 ≥92%
- Audible wheezing
- Using accessory muscles
- Still feeding

Acute severe asthma

- SpO_2 <92%
- Cyanosis
- Marked respiratory distress
- Too breathless to feed

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

First-line treatments

Immediate management

Oxygen via close-fitting face mask or nasal prongs to achieve SpO_2 94–98%

Give trial of Salbutamol:

- via spacer and face mask (given one puff at a time inhaled separately using tidal breathing; according to response, give another puff every 60 seconds up to a maximum of 10 puffs)

- **or** via nebuliser (preferably oxygen-driven) salbutamol 2.5 mg

- Repeat Salbutamol every 1–4 hours if responding
- **If poor response:** Add 250 microgram nebulised ipratropium bromide to each Salbutamol nebuliser every 20–30 minutes for 1–2 hours

Monitoring

Continuous close monitoring of:

- heart rate
- pulse rate
- pulse oximetry

- Supportive nursing care with adequate hydration and support of feeding
- Consider the need for a chest X-ray and Blood gas.

Second-line treatments

- **If not responding or has any life-threatening features, discuss with senior paediatrician or PICU team**
- Consider alternative diagnoses
- Consider second-line treatments as per older children with extreme caution, **(Always Refer to Appendix 3 for drug preparation and more details)**
- Consider additional respiratory support e.g. High flow and CPAP

*Management of acute asthma in children under 1 year should be under the direction of a respiratory/paediatrician.

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4. Criteria for Escalation to Tertiary PICU from a DGH

Escalation to tertiary PICU will be indicated when intubation and ventilation is anticipated. It is important to ensure maximal medical therapy is in place before intubation as this will often negate the need for ventilation.

Discuss with PICU via EMBRACE (contactable via the hospital switchboard, in SCH, call them directly) earlier if there continues to be clinical deterioration despite maximal medical therapy. Intubation and ventilation of patients with severe acute asthma is high risk. There is a risk of increasing bronchospasm, hypotension (have fluid boluses pre-prepared) and barotrauma.

After discussion with PICU via EMBRACE non-invasive ventilation, if available, may be an option to consider prior to intubation. The indications for intubation include:

1. Persistent hypoxia +/- rising hypercapnia despite maximal medical treatment
2. Increasing respiratory distress despite maximal medical therapy.
3. Depressed level of consciousness or progressive agitation
4. Respiratory or cardiorespiratory arrest

The use on non-invasive ventilatory support such as High Flow or CPAP should only be after discussion with EMBRACE.

5. Intravenous (IV) Therapy for Acute Asthma

- All patients receiving IV therapy require cardiac and blood pressure monitoring as the medications can cause arrhythmias and hypotension.
- Potassium should be monitored if on salbutamol and IV fluid should include potassium as salbutamol forces potassium back into cells and can become depleted with continuous use.
- All patients on maintenance IV salbutamol or aminophylline treatment will need escalating to HDU level care or tertiary PCCU if indicated

6. Further Steroids in Admitted Children

1. If Dexamethasone **was used initially** and **improvement is slow** then consider giving Prednisolone 1mg/kg/day for 3-5 days or IV Hydrocortisone (Change to oral Prednisolone when starts improving and tolerating eating and drinking
2. In children who show **secondary deterioration**, additional steroids in the form of IV Hydrocortisone or oral Prednisolone course may be considered/used sooner. Reassess/re-categorise and treat according to response.
3. If not responding- consider alternative diagnosis e.g. infection, foreign body etc. or complications such as lung collapse, pneumothorax etc.

7. Patient Monitoring and Investigations

As listed above certain monitoring is needed when on IV therapy, also during admission it is important to monitor the following:

1. **Course of the asthma attack** i.e. worsening or responding to treatment.
2. **The need for escalation of care e.g. admission to the HDU or PICU via EMBRACE**
3. **Blood gas measurements:** Should be considered if there are life-threatening features not responding to treatment. Use arterialised finger prick sample. A more easily obtained free flowing venous blood $PaCO_2$ of <6 kPa (45 millimeters of mercury) excludes hypercapnia. Normal or raised $PaCO_2$ levels are indicative of worsening asthma.
4. **Need for Chest X-rays:** Not routinely indicated. Indicated if there is subcutaneous emphysema, persisting unilateral signs suggesting pneumothorax, lobar collapse or consolidation and/or life-threatening asthma not responding to treatment. Be aware of differential diagnoses like foreign bodies especially when it is first severe episode and atypical findings and initiate investigation as needed.
5. Potassium should be monitored if on frequent salbutamol nebulisers or IV Salbutamol.

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8. Spacing Bronchodilator Therapy

As the clinical picture improves, inhaled treatment can be spaced. **Those children who have had a more severe episode may require more cautious spacing of treatment.** For example:

- If the child is on hourly nebulised Salbutamol treatment- when there is sustained improvement space first to 2-hourly then with further improvement 3-hourly.
    - When the child is **stable on 3 hourly** nebulised Salbutamol this can then be changed to 4 hourly Salbutamol pMDI treatment via a Volumatic.
- If the child is on pMDI Salbutamol via a Volumatic when clinically ready this can be spaced from 10 puffs 2 hourly to 6 puffs 3-4 hourly based on response.
- Children on MART regimens should revert to these at the time of discharge.

Children who are not improving and still on hourly treatment after 4 hours will need ST4+ medical review to re-assess and consider alternative diagnosis before moving to next treatment level.

9. Discharge and Discharge Checklist

Initiate the asthma discharge bundle and ensure all the contents are addressed, and the **Form** is signed before discharge. This includes the following:

- Request Respiratory Nurse review before discharge if inpatient.
- Inhaler technique checked.
- If discharged without admission, no further steroid is required if using dexamethasone.
  NB: If using prednisolone give a total of 3 days, a longer course may be given ONLY when advised by a senior member of staff, i.e. a registrar and above. *
- Consider starting preventer therapy or stepping up current treatment
- Written Asthma/Wheeze plan given to parents/carers. **
- Asthma education discussed with child and parents/carers.
- Discharge medication prescribed and dispensed (if needed).
- Smoking cessation advice for child and parents/carers (if applicable).
- Parents/carers advised to see GP in 48 hours and information leaflet given.
- Referral to the Respiratory nurse and/or follow up in consultant clinic (to be seen within 4 weeks after discharge.)
- Follow the advice and give leaflet of the "Going Home plan" there is one for children and one for young people.

*More hospitals are now using Dexamethasone as an option for oral steroid in the treatment of asthma – this is a local, not national guidance. This guidance is a Barnsley Hospital guideline and if the patient returns to their GP, it is important that the GP should use further steroids (if required) as per their local standard guidelines and practice. Refer to the note regarding Further Steroid treatment in Admitted Children when dexamethasone was used Page 12.

**An Asthma action plan should include instructions to give Salbutamol (100 micrograms pMDI) 2-6 puffs every 4-6 hours for 1-2 days, after this Salbutamol can be returned to as required dosing as in the asthma home care plan. A rescue dose of 10 puffs can be used in an emergency, but stress that if this is needed, further help should be sought immediately.

***Follow the advice and give leaflet of the "Going Home plan" Appendix 5 on page 19, there is one for children and one for young people..

An example of a discharge care bundle **TO BE COMPLETED** is in Appendix 4, page 16 this can easily be digitalised and completed electronically.

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Appendix 1

An example of Acute Asthma Assessment Triage Form

Paediatric Acute Asthma Nursing and Medical Assessment/Triage

(Use asthma guidelines for all children (age 1 – 16 yrs.) who are thought to have acute wheeze related to underlying asthma in the children's Ward, Children's Assessment Unit and Emergency Department)

Name:..... DOB:..... age:..... Department / Ward:..... Hospital Unit No:..... NHS No:..... (Sticker)	Ward/CAU/ED (specify):..... Consultant..... Assessment Date:..... Time:..... Known asthma patient: Yes ☐ No ☐ Previous severe asthma attacks: Yes ☐ No ☐
Treatment before attendance:	
***Patient is on Open Door policy: Yes ☐ No ☐ If Yes, Triage and inform Paediatric Doctors urgently**	

First observations following arrival at the hospital: - Date:..... Time:.....

	Time		Time
HR/min:.....		BP..... mmHg	
RR/min:.....		PF L/min (>5 yrs.)..... L/min	
Sa02% in Air:..... In Oxy:..... If in Oxygen, amount:.....		Previous best PFR ..... L/min. If not available, Predicted PF .....L/min.	

Nursing/Triage assessment to categorise severity and plan of treatment

Always refer to the Asthma management guidelines. Please tick (√) as appropriate

If patient has signs and symptoms across categories, always treat according to their most severe features (Exception, isolated tachycardia if salbutamol has already been given, in which case use clinical judgement)

Yes, to all of the following: • **Oxygen Saturation ≥ 92%** ☐ • PEFR (best or predicted): ≥75%(mild) ☐ ≥50% (moderate) ☐ • Able to talk in sentences ☐ • Mild/moderate recession and accessory muscle use ☐ • HR: ≤140/min (1–5years) ☐ ≤125/min (>5 years) ☐ • RR: ≤40/min (1–5 years) ☐ ≤30/min (>5 years) ☐	•**Oxygen Saturation < 92%** ☐ •Too breathless to talk or eat ☐ • Severe recession/accessory muscle use ☐ •HR >140/min (1-5 years) ☐ >125/min (>5 years) ☐ •RR >40/min (1-5 years) ☐ >30/min (>5years) ☐ •Peak flow 33-50% best or predicted (>5 years, if possible) ☐ •Agitated /distressed ☐	**Oxygen Saturation < 92% plus any of:** •Peak flow < 33% best or predicted (if possible) ☐ •Poor respiratory efforts ☐ •Silent chest ☐ •Confusion/Drowsy ☐ •Cyanosis ☐ •Hypotension ☐ •Bradycardia ☐
Mild-to- Moderate exacerbation ☐	**Severe exacerbation** ☐	**Life threatening asthma** ☐
• **Salbutamol up to 10 puffs via spacer ± facemask** • **Call Dr. (child to be seen within 30 minutes)** •Are Safe to discharge when only requiring Salbutamol every 4 hours.	**Oxygen via facemask/nasal prongs to achieve normal saturation (aim: 94-98%)** **Nebulised Salbutamol (2-5 years: 2.5 mg; >5 years: 5mg) with oxygen** •**Call Dr. (child to be seen within 10 minutes)** •Inform Paediatric Registrar •Always admit	•**Doctor to see child URGENTLY** •Admit to Resuscitation room or High dependency/intensive care area •Inform Paediatric Registrar; Call for senior support & Inform Anaesthetist
Always reassess 20 minutes after first treatment and again as guided by response and refer to guidelines		
Most children with acute asthma seen at the hospital who are already receiving inhaled steroids are considered for oral steroids. **If requires systemic steroids, this MUST be given within 1 hour of arrival; Tick here if given** ☐		

Name:..... **Signature:**..... **Date:**..... **Time:**.....

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Appendix 2

Normal Values of Peak Flow for Children

Instructions:

1- Measure the child's height

2- The predicted normal PEFR (Peak Expiratory Flow Rate) value will be reflected by the closest reading corresponding to the child's height.

3- **The severity of asthma attack and interpretation of PEFR (best or predicted):**

- **Mild Asthma: ≥75%**
- **Moderate Asthma: 50 -75%**
- **Severe Asthma: 33-50 %**
- **Life-threatening Asthma: < 33%**

Predicted Peak Flow (PEF) Rates (L/min) For Children

Height (cm)	Normal Predicted	75 % Predicted	50% Predicted	33% Predicted
0.85	87	65	44	29
0.90	95	71	48	31
0.95	104	78	52	34
1.00	115	86	58	38
1.05	127	95	64	42
1.10	141	106	71	47
1.15	157	118	79	52
1.20	174	131	87	57
1.25	192	144	96	63
1.30	212	159	106	70
1.35	233	175	117	77
1.40	254	191	127	84
1.45	276	207	138	91
1.50	299	224	150	99
1.55	323	242	162	107
1.60	346	260	173	114
1.65	370	278	185	122
170	393	295	197	130

Normal PEF values in children correlate best with height; with increasing age, larger differences occur between the sexes. These predicted values are based on the formulae given in Lung Function by J.E. Cotes (Fourth Edition), adapted for EU scale Mini-Wright peak flow meters by Clement Clarke.
Date of preparation – 7th October 2004

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Appendix 3

An example of Asthma Discharge Care Bundle

Should be completed by nursing staff before discharging the patient

Name: DOB: Hospital Unit No: NHS No: Address: (**Sticker**)	GP:……. Consultant: ……. Relatives: **Telephone contact**: Others (H/V; S/W; School Nurse; etc.)
Date of attendance/admission: ……/……/……. Date of discharge: ……/……/…….Department/Ward:…….	

Asthma Discharge Care bundle during the hospital episode (Inpatient):

Discharge Care bundle:	**Please Tick (V)**	Date and signature
Inhaler technique checked	☐	
Medication explained and reviewed	☐	
Compliance with treatment discussed	☐	
Personalised Patient Asthma Action Plan issued/reviewed	☐	
Triggers avoidance including air pollution are discussed	☐	
Smoking status of the patient, applies to patients aged 11 years and over on the date of arrival, tick as appropriate: Never smoked ☐ Never smoked and current vaper ☐ Ex-smoker ☐ Ex-smoker and current vaper ☐ Current smoker ☐ If applicable, cigarette smoking cessation advice addressed	☐	
Parents/carers smoke or vape If applicable, cigarette smoking cessation and advice addressed	☐ ☐	
Advised to arrange an appointment with GP within 2 working days (D1)	☐	
Prescribed oral steroids Yes No	☐	
Going home plan discussed and leaflet given	☐	
The patient required 2 courses of oral steroids within previous 12 months, Yes ☐ No ☐ If yes arrange secondary care follow up	☐	
The patient has a life-threatening episode. Yes ☐ No ☐ If yes arrange secondary care follow up care	☐	
Referral to respiratory nurse Yes ☐ No ☐		
Paediatric or asthma nurse follow up in 4 weeks Yes ☐ No ☐		

Explanation of medication to be taken at home

Treatment	**Dose**	**Frequency**	**Device/Route**

Discharge completed by Nurse's Name: ……

Nurse signature: …… Date: ……

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Appendix 4

Patient Asthma Action Plan

My Triggers are:

- Colds/Viruses ☐
- Weather changes ☐
- Cigarette smoke ☐
- Air pollution ☐
- Dust mites ☐
- Pollen ☐
- Exercise ☐

List other triggers which make your asthma worse:

To get the most out of this plan

- Take a photo
- Stick it on the fridge
- A copy of this plan is available to download from the Healthier Together website: sybhealthiertogether.nhs.uk

School

- Let your school know you have asthma
- Make sure you have a reliever inhaler and spacer available in school.

IMPORTANT

It is important to take your treatment as directed by your Doctor or Nurse.

Please remember to bring your medications, spacer and asthma plan with you when you visit your doctor or nurse.

Additional Information:
DISCHARGE ADVICE following hospital admissions and A&E visits

I need to take _____ using my spacer:

- **6 puffs every 4 hours for 24 hours;**
- **4 puffs every 4-6 hours for 24 hours;**
- **2 puffs every 4-6 hours until I am well.**

I need to take Prednisolone _____ mgs for _____ days.

I need to arrange to see my GP within 2 days (48 hours) after I have been discharged from hospital.

EASY

My Asthma Plan

Your Name:

Asthma/Practice Nurse Name:

Consultant Name:

Date issued:

Date of next review:

How to contact your Asthma Team:

MY ASTHMA IS GOOD IF I:

- Have no cough
- Have no wheeze
- Can play or exercise as usual
- Am sleeping well
- Am going to school

To keep my asthma under control, I need to take my treatment every day.

Preventer:

Additional Medication:

Reliever:

I only need my reliever inhaler very occasionally.

Parent(s)/Caregiver(s)
Your child is at risk of a life threatening attack if they do not take their medications as prescribed.

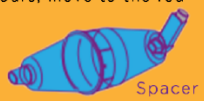
MY ASTHMA IS NOT AS GOOD IF I:

- Cough especially at night
- Wheeze
- Have chest tightness
- Feel breathless
- Am unable to play
- Have difficulty sleeping
- Need my reliever more than 3 times a week

I must continue taking my regular daily medicines and also start taking:

2 to 4 puffs of my reliever _____ (1 puff at a time) every 4 hours using the spacer.

If the blue inhaler is not lasting for 4 hours, move to the red plan NOW!



Spacer

Parent(s)/Caregiver(s)
If your child still feels unwell after 24 hours, you need to make an URGENT appointment with your GP Practice or Out of Hours.

I AM HAVING AN ASTHMA ATTACK IF:

- I am struggling to breathe
- I am coughing a lot, feel tight in my chest and wheezy
- I am unable to walk or speak in full sentences

If I am needing my reliever more often than 4 hourly, I should tell an adult immediately.

I must take one puff of my reliever every 30-60 seconds up to 10 puffs.

If there is no improvement by 10 minutes, I must seek emergency medical advice (dial 999).

Even if I start feeling better, I should see my doctor or nurse today.

When your asthma is well-controlled, you are likely to need less than 3 reliever inhalers per year.

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Appendix 5

Going Home Plan for children

Going Home Plan for Children – Symptom Management After an Asthma Attack

Your child should now be feeling better than when they first came in. They should not need to use the blue salbutamol (reliever) inhaler as much anymore. You can now:

Contact Telephone number .....

Return details (if appropriate) .....
.....
.....

Give your child their usual preventer inhaler every day
Keep taking oral corticosteroids if prescribed

- ✓ **Look out for signs** that show your child needs their blue inhaler - struggling to breathe, coughing a lot, tight chest, wheezy **or** their peak flow (if measured) is dropping.
- ✓ **If needed, give 2 puffs of the blue (rescue/reliever) inhaler via a spacer**, one puff at time and wait 5 minutes, repeat if necessary until you have given up to 6 puffs.
- ✓ Your child should now feel much better, and **this should last at least 4 hours**. Your child should be needing their blue inhaler less and less.
- ✓ You can stop giving your child the blue (reliever) inhaler when they feel better. There is no need to slowly decrease their blue (rescue/reliever) inhaler if they are well.
- ✓ **If the blue inhaler is not lasting for 4 hours or your child still has symptoms after 6 puffs of blue (rescue/reliever) inhaler move to the red box**

If your child is still struggling to breathe after 6 puffs of the blue (reliever) inhaler
or
Needs the blue inhaler more than every 4 hours…

They are not getting better; **you need to take emergency action now:**

Sit them up (don't lie them down), loosen tight clothing, stay calm.

Give up to 10 puffs of the blue (reliever) inhaler via a spacer, 1 puff at a time and **seek urgent medical attention** - call 111, see a doctor today or go to A&E (even if feeling better)

If 10 puffs of blue (reliever) inhaler have not helped (Your child is still struggling to breath) **- You should:**

Call 999 and whilst waiting for the ambulance give 1 puff of their blue (reliever) inhaler via a spacer, every 30-60 seconds. For each puff ask your child to take 5 breaths in and out through the spacer.

Within 48 hours - Your child should have a post-attack review with either your GP or practice nurse to check they are getting better. Please contact your GP surgery to arrange this.
Within 4 weeks - You will need to ensure that your child has a follow up appointment arranged with your GP, nurse or in the asthma clinic for a full asthma review. See your child's personalised asthma action plan for further information.

Version 1.0 Jan 24

Going Home Plan for Young People

Going Home Plan for Young People – Symptom Management After an Asthma Attack

You should now be feeling better than when you first came in. You should not need to use the blue salbutamol (reliever) inhaler as much anymore. You can now:

Contact Telephone number .....

Return details (if appropriate) .....
.....
.....

Take your usual preventer inhaler every day
Keep taking oral corticosteroids if prescribed

- ✓ **Look out for signs** that you need your blue inhaler - struggling to breathe, coughing a lot, tight chest, wheezy **or** your peak flow (if measured) is dropping.
- ✓ **If needed, take 2 puffs of the blue (rescue/reliever) inhaler via a spacer**, one puff at time and wait 5 minutes, repeat if necessary until you have taken up to 6 puffs.
- ✓ You should now feel much better, and **this should last at least 4 hours**. You should be needing your blue inhaler less and less.
- ✓ You can stop taking your blue (reliever) inhaler when you feel better. There is no need to slowly decrease your blue (rescue/reliever) inhaler if you are well.
- ✓ **If the blue inhaler is not lasting for 4 hours or you still have symptoms after 6 puffs of blue (rescue/reliever) inhaler move to the red box**

If you are still struggling to breathe after 6 puffs of the blue (reliever) inhaler
or
Need the blue inhaler more than every 4 hours…

You are not getting better; **you need to take emergency action now:**

Sit up (don't lie down), loosen tight clothing, stay calm.

Take up to 10 puffs of the blue (reliever) inhaler via a spacer, 1 puff at a time and **seek urgent medical attention** - call 111, see a doctor today or go to A&E (even if feeling better)

If 10 puffs of blue (reliever) inhaler have not helped (You are still struggling to breath) **- You should:**

Call 999 and whilst waiting for the ambulance take 1 puff of your blue (reliever) inhaler via a spacer, every 30-60 seconds. For each puff take 5 breaths in and out through the spacer.

Within 48 hours - You should have a post-attack review with either your GP or practice nurse to check you are getting better. Please contact your GP surgery to arrange this.
Within 4 weeks - You will need to ensure that you have a follow up appointment arranged with your GP, nurse or in the asthma clinic for a full asthma review. See your personalised asthma action plan for further information.

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Communication & Training

Staff made aware of the guidelines and training is provided by referring to the content of this guidance and the nursing, asthma nurses, pharmacy and medical staff

Roles and responsibilities are as follows:

Nursing staff:

- To follow the guidance included in this guideline

Medical staff looking after children:

- To follow the guidance included in this guideline

Anaesthetists:

- To attend when their presence is requested

Pharmacy:

- To check the drug doses and support as needed

Monitoring Compliance

Feedback from staff and Audit of compliance with guidelines
The National Asthma Audit

Review Timeline

Approved on: 21 June 2024
Review on: 21 March 2027
DO NOT USE AFTER: 21 June 2027

References

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3. Acute Asthma Management Guideline for Infants Greater than 2 Years Old. Reference: 1613v4 Approved: February 2023, Review due: February 2028
4. Wheeze Pathway: North Middlesex University Hospital NHS Trust.
5. Sheffield Children's Hospital. Acute Asthma and Viral Wheeze. Reference: 1874v2.Review Due: January 2024
6. Acute Asthma Management Guideline for Infants Greater than 2 Years Old. Reference: 1613v4. Review due: February 2028
7. BNF for children
8. **Acknowledgment to all staff and colleagues in the SY ICS Asthma Group.**

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