

## Managing acute asthma in children

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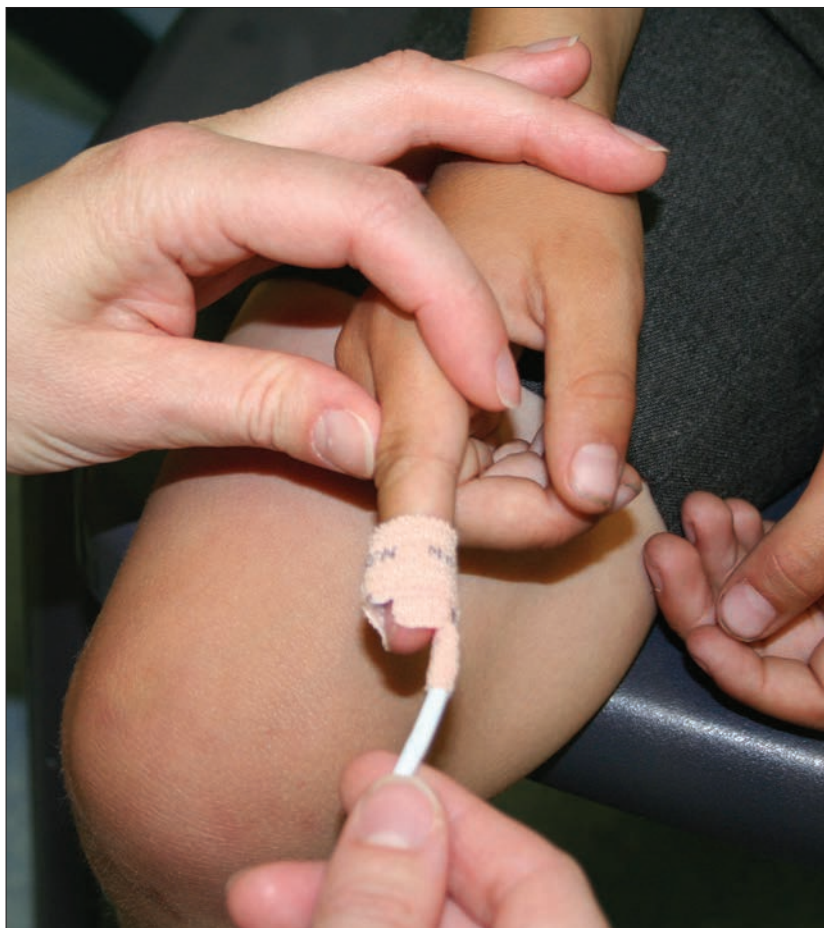
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## FIGURE 1

Pulse oximetry in a child. Accurate measurements of oxygen saturation are essential in the assessment of children with acute asthma. It is important to use the appropriate size paediatric probe to ensure accuracy



### ASTHMA IS A COMMON AND POTENTIALLY SERIOUS CONDITION THAT STILL LEADS TO AVOIDABLE

deaths.<sup>1</sup> More than one million children in the UK are receiving treatment for asthma with the vast majority managed in primary care.<sup>2</sup>

Acute asthma can be rapidly fatal. The National Review of Asthma Deaths found that 43% of patients who died from asthma had had no primary care review in the previous 12 months.<sup>1</sup> In children and young people there was a particular lack of adherence to medical advice and a lack of awareness about the risks of a poor outcome. Fewer than one quarter of patients who died from asthma had a written asthma action plan.

Teenagers with asthma, particularly those with perceived mild or moderate disease are at greater risk of acute, severe and life-threatening exacerbations.<sup>1,3</sup>

This article discusses the typical features of an acute exacerbation of asthma and recommends management in primary care based on national guidelines and other evidence.

## PRESENTATION

Viral upper respiratory tract infection is the most common cause of an asthma

**‘Teenagers, in particular those with perceived mild or moderate asthma, are at greater risk of acute, severe and life-threatening exacerbations’**

**How** do children with acute asthma present?

**How** should children be assessed?

**What** are the treatment approaches?

exacerbation. Other causes include allergen or pollutant exposure, cessation/reduction/non-compliance with medication or concomitant medication (e.g. non-selective beta blockers).<sup>4</sup> Prematurity, low birthweight, personal and family history of atopy are risk factors for recurrent wheezing. Parents should be made aware that the features listed in table 1, below, >>

## Table 1

### Features of asthma deterioration in children that parents should be aware of<sup>5</sup>

- Difficulty talking or walking
- Unable to feed
- Little relief with salbutamol
- Drop in peak flow
- Hard and fast breathing
- Coughing and wheezing a lot

indicate that their child's asthma is deteriorating.<sup>5</sup>

Typical features of moderate to life-threatening attacks as described in the BTS/SIGN guideline are outlined in table 2, below.<sup>6</sup> In some patients the signs and symptoms may be more subtle including persistent nocturnal cough, chest pain, reduced energy or appetite.

**ASSESSMENT**

All children presenting with respiratory symptoms should have a clinical history and examination focusing on the features in table 1, p11, and table 2, below. The history should also include enquiry about what rescue therapy the child has received and a review of their personalised asthma action plan. Severity of previous attacks, response to treatment during exacerbations and adherence to preventer treatment should be explored.<sup>5,6</sup>

The BTS/SIGN guideline<sup>6</sup> specifies that the accurate measurement of oxygen saturation is essential in the assessment of all children with acute wheezing (see figure 1, p11). It recommends that oxygen saturation

**Table 2**

**Features of moderate to life-threatening asthma attacks<sup>6</sup>**

**Life-threatening asthma**

- SpO<sub>2</sub> < 92%
- Peak expiratory flow < 33% best or predicted (or unable to carry out measurement)
- Poor respiratory effort
- Silent chest
- Cyanosis
- Exhaustion
- Confusion
- Hypotension

**Severe attack**

- Unable to complete sentences
- SpO<sub>2</sub> < 92%
- Peak expiratory flow 33-50% best or predicted
- Heart rate > 125/min in children aged > 5 years (> 140/min in children aged 1-5 years)
- Respiratory rate > 30/min in children aged > 5 years (> 40/min in children aged 1-5 years)
- Noticeable recession

**Moderate attack**

- Able to talk in sentences
- SpO<sub>2</sub> ≥ 92%
- Peak<sup>2</sup> expiratory flow ≥ 50% best or predicted
- Heart rate ≤ 125/min in children aged > 5 years (≤ 140/min in children aged 1-5 years)
- Respiratory rate ≤ 30/min in children aged > 5 years (≤ 40/min in children aged 1-5 years)
- Mild-moderate recession and wheeze

**Table 3**

**Summary of BTS/SIGN recommendations on the management of acute asthma<sup>6</sup>**

**All children with features of life-threatening asthma or SpO<sub>2</sub> < 94%**

- Administer high flow oxygen via a tight-fitting face mask or nasal cannula

**Children with severe or life-threatening asthma or SpO<sub>2</sub> < 92%**

- Administer frequent doses of 2.5-5 mg salbutamol via an oxygen-driven nebuliser
- If symptoms are refractory to the initial dose of beta<sub>2</sub> agonist, add ipratropium bromide (250 micrograms/dose mixed with the nebulised beta<sub>2</sub> agonist solution)
- Administer oral prednisolone, see table 4, below
- Arrange ambulance transfer to hospital

**Children with mild to moderate asthma**

- Administer 2 to 4 puffs of salbutamol (100 micrograms) via a pMDI plus spacer device
- Increase to 10 puffs in more severe exacerbations
- Administer single puffs one at a time with five tidal breaths in between
- Administer oral prednisolone, see table 4, below

Further details on the general practice management of acute asthma in children aged 2-5 years and > 5 years can be found in Annex 5, p165 of the full guideline<sup>6</sup>

probes and monitors should be available for use by all healthcare professionals assessing acute asthma in primary care.<sup>6</sup> It is important to use the appropriate size paediatric probe to ensure accuracy.

The following clinical signs should be checked and recorded:

- Pulse rate
- Respiratory rate, degree of breathlessness, and oxygen saturation
- Use of accessory muscles of respiration
- Amount of wheezing
- Conscious level and degree of agitation

It is important to be aware that clinical signs sometimes correlate poorly with the degree of airway obstruction.<sup>5</sup> In some cases of acute severe asthma, children may not appear distressed.<sup>7</sup> It may be that the patient's inhaler technique is at fault. Those who are unable to use their inhaler correctly are at increased risk of poor control and subsequent exacerbations.<sup>8</sup>

**Table 4**

**Suggested oral dose of prednisolone<sup>6</sup>**

Age	Prednisolone dose
Under 2 years	10 mg
2-5 years	20 mg
Older than 5 years	30-40 mg

**TREATMENT**

Essential equipment for managing paediatric asthma emergencies in primary care is listed in box 1, below.

Children with acute asthma should receive prompt and appropriate management in the primary care setting, see table 3, above. Inhaled short-acting beta agonists such as salbutamol relax airway smooth muscle and relieve obstruction.<sup>6</sup> In asthma, the early use of steroids has been proven to reduce the need for hospital admission and prevent a relapse in symptoms after initial presentation.<sup>9</sup> The treatment course of oral prednisolone is usually three days

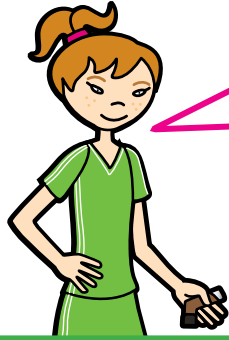
**Box 1**

**Essential equipment for managing paediatric asthma emergencies in primary care**

- BTS/SIGN guideline app on smart phone (see Useful information box, p15)
- Paediatric pulse oximeter
- Oxygen
- Peak flow meter, and predicted values for height, age and gender
- Various size paediatric spacer devices
- Nebulisation equipment (oxygen driven)
- Short-acting beta agonists (e.g. salbutamol - via a pMDI or as nebulised solution)
- Ipratropium bromide solution

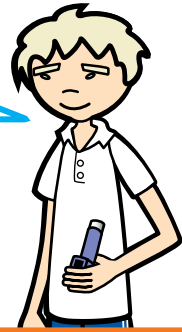


# My Asthma Plan



Your asthma plan tells you when to take your asthma medicines.

And what to do when your asthma gets worse.



Name: \_\_\_\_\_

## 1 My daily asthma medicines

- My preventer inhaler is called \_\_\_\_\_ and its colour is \_\_\_\_\_
- I take \_\_\_\_\_ puff/s of my preventer inhaler in the morning and \_\_\_\_\_ puff/s at night. I do this every day even if I feel well.
- Other asthma medicines I take every day:  
\_\_\_\_\_  
\_\_\_\_\_
- My reliever inhaler is called \_\_\_\_\_ and its colour is \_\_\_\_\_. I take \_\_\_ puff/s of my reliever inhaler (usually blue) when I wheeze or cough, my chest hurts or it's hard to breathe.
- My best peak flow is \_\_\_\_\_

## 2 When my asthma gets worse


I'll know my asthma is getting worse if:

- I wheeze or cough, my chest hurts or it's hard to breathe, or
- I'm waking up at night because of my asthma, or
- I'm taking my reliever inhaler (usually blue) more than three times a week, or
- My peak flow is less than \_\_\_\_\_

**If my asthma gets worse, I should:**

Keep taking my preventer medicines as normal.

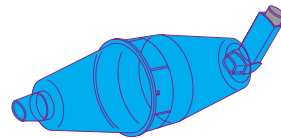
And also take \_\_\_\_\_ puff/s of my blue reliever inhaler every four hours.

 **If I'm not getting any better doing this** I should see my doctor or asthma nurse today.

Does doing sport make it hard to breathe?



**If YES**  
I take:  
\_\_\_\_\_  
puff/s of my reliever inhaler (usually blue) beforehand.



**Remember to use my inhaler with a spacer (if I have one)**



# My Asthma Plan

## 3 When I have an asthma attack

### I'm having an asthma attack if:

- My blue reliever inhaler isn't helping, or
- I can't talk or walk easily, or
- I'm breathing hard and fast, or
- I'm coughing or wheezing a lot, or
- My peak flow is less than \_\_\_\_\_

### When I have an asthma attack, I should:

**Sit up** – don't lie down. Try to be calm.

Take one puff of my reliever inhaler **every 30 to 60 seconds** up to a total of 10 puffs.

### My asthma triggers:

Write down things that make your asthma worse

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### I need to see my asthma nurse every six months

Date I got my asthma plan:

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Date of my next asthma review:

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Doctor/asthma nurse contact details:

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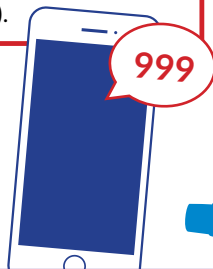
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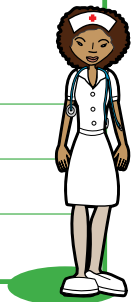
**Even if I start to feel better,** I don't want this to happen again, so I need to see my doctor or asthma nurse today.



**If I still don't feel better and I've taken ten puffs,** I need to call **999** straight away. If I am waiting longer than 15 minutes for an ambulance I should take another \_\_\_\_\_ puff/s of my blue reliever inhaler every 30 to 60 seconds (up to 10 puffs).



Make sure you have your reliever inhaler (usually blue) with you. You might need it if you come into contact with things that make your asthma worse.



### Parents – get the most from your child's action plan

Make it easy for you and your family to find it when you need it

- **Take a photo** and keep it on your mobile (and your child's mobile if they have one)
- **Stick a copy** on your fridge door
- **Share** your child's action plan with school, grandparents and babysitter (a printout or a photo).

### You and your parents can get your questions answered:

Call our friendly expert nurses  
**0300 222 5800**  
(9am – 5pm; Mon – Fri)

Get information, tips and ideas  
**www.asthma.org.uk**



## key points

### SELECTED BY

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**More than one million children in the UK are receiving** treatment for asthma with the vast majority managed in primary care. The National Review of Asthma Deaths found that 43% of patients who died from asthma had had no primary care review in the previous 12 months. Fewer than one quarter of patients who died from asthma had a written asthma action plan. In children and young people there was a particular lack of adherence to medical advice and a lack of awareness about the risks of a poor outcome. Teenagers with asthma, particularly those with perceived mild or moderate disease are at greater risk of acute, severe and life-threatening exacerbations.

**Features of asthma deterioration in children that** parents should be aware of include: difficulty talking or walking, unable to feed, little relief with salbutamol, a drop in peak flow, hard and fast breathing, and coughing and wheezing a lot. In some patients the signs and symptoms may be more subtle including persistent nocturnal cough, chest pain, reduced energy or appetite. It is important to be aware that clinical signs sometimes correlate poorly with the degree of airway obstruction. In some cases of acute severe asthma, children may not appear distressed.

**The BTS/SIGN guideline specifies that the accurate** measurement of oxygen saturation is essential in the assessment of all children with acute wheezing. It recommends that oxygen saturation probes and monitors should be available for use by all healthcare professionals assessing acute asthma in primary care. It is important to use the appropriate size paediatric probe to ensure accuracy.

**Any patient who presents to the GP practice with any** features of a moderate exacerbation should be referred to an emergency department for further assessment and monitoring. It can be helpful to consult the emergency assessment and treatment pages on the BTS/SIGN asthma guideline smart phone app. Features of life-threatening asthma include: SpO<sub>2</sub> < 92%, peak expiratory flow < 33% best or predicted, poor respiratory effort, silent chest, cyanosis, exhaustion, confusion, and hypotension.

**All patients with asthma should have a personalised** asthma action plan and be informed about how to respond in the event of deteriorating asthma control. Patients who have experienced acute asthma episodes should be reviewed as soon as practically possible. Each primary care practice should have a named healthcare professional for asthma care standards and staff education and ensure that their systems encourage and enable swift access to advice and clinical assessment. Practices should consider developing a high risk register for those patients who have had previous serious/life-threatening exacerbations.

with no need to taper the dose. It can be challenging to remember doses and vital sign parameters for different age groups and it can be helpful to consult the emergency assessment and treatment pages on the BTS/SIGN asthma guideline smart phone app (see Useful information box, below).

The use of inhaled corticosteroids as an alternative or additional treatment to oral steroids is not recommended.<sup>6</sup> Dexamethasone is now being used as an alternative steroid in some secondary care centres for mild to moderate acute asthma exacerbations although it is not yet recommended by BTS/SIGN. There is some evidence that it has a similar efficacy but lower cost than prednisolone. Another advantage is that a number of studies have demonstrated that only a single dose is required.<sup>10</sup>

### REFERRAL

Any patient who presents to the GP practice with any features of a moderate exacerbation should be referred to an emergency department for further assessment and monitoring.<sup>6</sup> Have a lower threshold for referral if there are social concerns, recent hospital admissions or it is late afternoon/evening.

### IMPROVING OUTCOMES

Childhood asthma remains a common and at times life-threatening condition. While the vast majority of patients are appropriately managed in primary care the National Review of Asthma Deaths did highlight that some deficiencies were found in almost 50% of fatal cases. Primary Care Respiratory Society UK has developed key recommendations as a strategic guide to try to improve outcomes in asthma, see below.<sup>1</sup>

- All patients with asthma should have a personalised asthma action plan and be informed about how to respond in the event of deteriorating control (see figure 2, pp13-14).

- Patients who have experienced acute asthma episodes should be reviewed as soon as practically possible. Good communication with secondary care is essential to follow up patients promptly who have had recent hospital attendances or inpatient stays. These reviews should be conducted by clinicians trained in asthma care who should be particularly aware of the factors that place patients at higher risk of exacerbation and death

- Each primary care practice should have a named healthcare professional for asthma care standards and staff education

- In the event of acute asthma

exacerbation, practices should ensure that their systems encourage and enable swift access to advice and clinical assessment

- Practices should consider developing a high risk register for those patients who have had previous serious/life-threatening exacerbations

- Local clinical commissioning groups should ensure that GPs, out of hours providers and walk-in centres are aware of, and follow, the BTS/SIGN guideline.

**Competing interests:** None

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### Useful information

#### Asthma UK

[www.asthma.org.uk](http://www.asthma.org.uk)

#### BTS/SIGN. SIGN 153. The British guideline on the management of asthma.

Copies of the full guideline and quick reference guide can be downloaded from: [www.sign.ac.uk](http://www.sign.ac.uk)

#### The BTS/SIGN asthma guideline app for smart phones

<https://search.itunes.apple.com/WebObjects/MZContentLink.woa/wa/link?path=apps%2fsignguidelines>

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