

Improving the management of chronic asthma in children

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FIGURE 1
 Child asthma action plan (page 1 of 2), Asthma UK. The template can be downloaded free from the Asthma UK website: www.asthma.org.uk

1 My usual 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 when I wheeze or cough, my chest hurts or it's hard to breathe.
- My best peak flow is _____

2 My asthma is getting worse if...

- I wheeze or cough, my chest hurts or it's hard to breathe, **or**
- I need my reliever inhaler (usually blue) three or more times a week, **or**
- My peak flow is less than _____, **or**
- I'm waking up at night because of my asthma (this is an important sign and I will book a next day appointment)

If my asthma gets worse, I will:

- Take my preventer medicines as normal
- And also take _____ puff/s of my blue reliever inhaler every four hours
- See my doctor or nurse within 24 hours if I don't feel better

URGENT! If your blue reliever inhaler isn't lasting for four hours you are having an asthma attack and you need to take emergency action now (see section 3)

Other things to do if my asthma is getting worse

Remember to use my spacer with my inhaler if I have one.

(If I don't have one, I'll check with my doctor or nurse if it would help me)

3 I'm having an asthma attack if...

- My reliever inhaler isn't helping or I need it more than every four hours, **or**
- I can't talk, walk or eat easily, **or**
- I'm finding it hard to breathe, **or**
- I'm coughing or wheezing a lot or my chest is tight/hurts, **or**
- My peak flow is less than _____

If I have an asthma attack, I will:

- Call for help**
- Sit up** – don't lie down. Try to be calm.
- Take one puff of my reliever inhaler (with my spacer if I have it) **every 30 to 60 seconds** up to a total of 10 puffs.
- If I don't have my blue inhaler, or it's not helping, I need to call 999 straightaway.**
- While I wait for an ambulance I can use my blue reliever again, every 30 to 60 seconds (up to 10 puffs) if I need to.

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 need my blue inhaler to do any sport or activity, I need to see my doctor or asthma nurse.

How should asthma control be assessed?

What are the goals of treatment?

Which children should be referred?

APPROXIMATELY 1.1 MILLION CHILDREN IN THE UK, AGED 5 TO 16 YEARS, ARE TREATED FOR ASTHMA.¹

Despite the common nature of asthma, there is no gold standard test to diagnose the condition. As a result, overdiagnosis and underdiagnosis are common especially when relying on history and clinical examination alone.²

Confirming the diagnosis is a critically important step in chronic asthma management. Misdiagnosis in children often arises because respiratory symptoms are common in this age group. These are frequently non-specific³ and often represent episodes of prolonged viral respiratory tract infections mimicking clinical symptoms similar to those of asthma.

The NICE guidelines recommend a diagnostic algorithm in those ≥ 5 years old in whom a diagnosis of asthma is

suspected. Spirometry, reversibility and FeNO testing are first-line tests in the diagnostic algorithm.⁴

The British Thoracic Society/Scottish Intercollegiate Guidelines Network (BTS/SIGN) 2019 guidelines⁵ recommend spirometry and bronchodilator reversibility testing if asthma probability is intermediate, and lung function testing after a trial of treatment where probability of asthma is high. Spirometry is often normal when the child's asthma is stable and repeat testing may be required. Spirometry and bronchodilator reversibility testing are particularly useful when a child ≥ 5 years old is brought to the practice with symptoms.

While some school-age children will become asymptomatic over time most simply slip out of the healthcare system. The International Study of Asthma and Allergies in Childhood (ISAAC) showed that one-third of 12-14 year olds in UK

secondary schools who reported frequent nocturnal wheeze in the past year had no diagnosis of asthma and denied receiving inhaler therapy.⁶ The 2014 UK National Review of Asthma Deaths reported that many of the failings in routine GP care were worse for children than adults.⁷ In addition, salbutamol overuse, a risk factor for fatal asthma, is prevalent in UK teenagers with asthma.⁸

Many children with asthma managed in primary care have poor asthma control and abnormal lung function.⁹ Children in the UK with asthma have the highest rate of severe asthma attacks of any high-income country in Europe.¹⁰ More than 150,000 children have severe asthma attacks each year,¹¹ taking up large numbers of GP consultations in the surgery and out of hours¹² and 26,000 require hospital admission. This is identified as a health priority in the 2019 NHS Long Term Plan.¹³

PRESENTATION

Children are brought to their GP with parental reported symptoms including episodes of shortness of breath; often in conjunction with colds, intermittent episodes of wheezing, chest tightness and periodic nocturnal dry cough. Frequently symptoms are non-specific. Results from observational studies in children show that of all the respiratory symptoms wheeze, especially wheeze heard by a healthcare professional, has the highest sensitivity and specificity for asthma. Cough and breathing difficulty are much less specific for asthma.^{14,15}

In cases where cough is the predominant symptom, asthma is less likely and the majority of children with dry cough do not have asthma.³ To complicate matters further parents often report symptoms of wheezing in their children that on closer examination turn out to be something else such as, upper airway ‘rattles’ occurring with viral respiratory tract infections or upper airway abnormalities or stridor often in relation to (recurrent) croup.¹⁶

ASSESSING ASTHMA CONTROL

The 2019 BTS/SIGN guidelines,⁵ the Global Initiative for Asthma (GINA)

strategy document¹⁷ and the Quality and Outcomes Framework (QOF)¹⁸ recommend annual asthma reviews in patients prescribed asthma medication in the previous 12 months.

The validated Asthma Control Test (ACT) for children aged 12 years and over (five questions) and the Children’s Asthma Control Test (cACT) for children aged 4-11 years (seven questions) should be used to assess current asthma control based on four-week recall. Both are free to download in several languages for clinical purposes (www.healthylondon.org/resource/london-asthma-toolkit/hospital-care/asthma-control-tests).

A recent large UK primary care study showed that the widely used Royal College of Physicians three questions (RCP3Q) has limited utility to assess asthma control in children.¹⁹ Using asthma control questionnaires including the ACT is now recommended in the 2020/21 QOF.¹⁸

Asthma control test scores correlate poorly with lung function and measures of airway inflammation such as FeNO in children⁹ and should not be used in isolation.

MONITORING

BTS/SIGN,⁵ QOF,¹⁸ NICE⁴ and the NICE asthma quality standards²⁰ all recommend lung function testing, using spirometry or peak expiratory flow (PEF) variability measurements, as part of the annual asthma review. It must be emphasised that there is no evidence to support single PEF measurements.

All PEF recommendations relate to PEF variability obtained over two weeks in the form of a peak flow diary. FeNO monitoring in children with asthma is not recommended by any guideline due to a lack of definitive evidence that this test is useful to guide patient management.

The 2019 update of the BTS/SIGN asthma guidelines⁵ sets out recommendations for the annual asthma monitoring review in detail (see table 1, below). An asthma review should establish current asthma control, and future risk of an asthma attack as most attacks are preventable with better asthma care.²¹ The risk of future asthma attacks should be assessed by asking about history of previous attacks, objectively assessing current asthma control, and reviewing rescue short-acting beta₂-agonist (SABA) use.²²

Inhaler technique and adherence to preventer medication as well as SABA use should be reviewed and a personalised written asthma action plan completed with the family, see figure 1, p11. The child or young person should be involved as appropriate for their age.

Asthma reviews in primary care are frequently conducted as ‘tick box exercises’ and a recent Asthma UK survey suggests that only one-third of patients receive adequate care.²³ Reviews often fail to identify those at risk of poor outcomes because of an overreliance on current symptoms alone.^{21,24}

A major concern is that children on a practice asthma register are often not brought to their annual asthma review, another that frequently children are not placed on practice asthma registers despite receiving regular prescriptions for asthma preventer treatments.²⁴

MANAGEMENT

Management approaches are based on the assumption that the diagnosis of asthma has been confirmed.

Recommendations for the escalation of asthma preventer treatment are regularly updated by the BTS/SIGN guidelines⁵ and GINA guidelines (annually).¹⁷

Treatment goals

The aim of asthma treatment is to

Table 1

BTS/SIGN 2019 components of an asthma review⁵

Parameters	Suggested assessment
Current symptom control	<ul style="list-style-type: none"> ● Bronchodilator use ● Validated symptom score ● Time off work/school due to asthma
Future risk of attacks	<ul style="list-style-type: none"> ● Past history of asthma attacks ● Oral corticosteroid use ● Prescription data: frequent short-acting beta₂-agonists and infrequent inhaled corticosteroids ● Exposure to tobacco smoke
Tests/investigations	<ul style="list-style-type: none"> ● Lung function (spirometry or peak expiratory flow) ● Growth (height and weight centile) in children
Management	<ul style="list-style-type: none"> ● Inhaler technique ● Adherence (self report, prescription refill frequency) ● Non-pharmacological management (trigger avoidance, breathing exercises) ● Pharmacological management - consider multimorbidity and polypharmacy
Supported self-management	<ul style="list-style-type: none"> ● Education/discussion about self-management ● Provision/revision of a written personalised asthma action plan

key points

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Despite the common nature of asthma, there is no gold standard test to diagnose the condition. As a result, overdiagnosis and underdiagnosis are common especially when relying on history and clinical examination alone. NICE guidelines recommend a diagnostic algorithm in those ≥ 5 years old in whom a diagnosis of asthma is suspected. Spirometry, reversibility and FeNO testing are first-line tests in the diagnostic algorithm. The BTS/SIGN guidelines recommend spirometry and bronchodilator reversibility testing if asthma probability is intermediate, and lung function testing after a trial of treatment where probability of asthma is high. Spirometry is frequently normal when the child's asthma is stable and repeat testing may be required. Spirometry and bronchodilator reversibility testing are particularly useful when a child ≥ 5 years old is brought to the practice with symptoms.

The validated Asthma Control Test (ACT) for children aged 12 years and over and the Children's Asthma Control Test (cACT) for children aged 4-11 years should be used to assess current asthma control based on four-week recall. Asthma control test scores correlate poorly with lung function and measures of airway inflammation such as FeNO in children and should not be used in isolation.

At the annual asthma review the risk of future asthma attacks should be assessed by asking about history of previous attacks, objectively assessing current asthma control, and reviewing rescue short-acting beta₂-agonist (SABA) use. Lung function testing, using spirometry or peak expiratory flow variability measurements, is recommended. Inhaler technique and adherence to preventer medication as well as SABA use should be reviewed and a personalised written asthma action plan completed with the family. The child or young person should be involved as appropriate for their age.

Children whose asthma is not controlled despite regimens involving moderate doses of daily inhaled corticosteroids (ICS) should be carefully reviewed using a structured primary care approach. The 'SIMPLES' approach has been developed for adults with difficult asthma but many of its elements also apply to children. Enquire about exposure to tobacco smoke, other trigger factors, lifestyle issues particularly in teenagers, check inhaler technique and provide asthma education and adherence support.

If control remains poor despite daily moderate dose ICS regimens and a structured primary care approach to uncontrolled asthma has failed to improve control, children should be referred to specialist care to confirm the diagnosis and for further phenotyping. A primary care asthma review should be carried out within two working days in all children treated for a severe asthma attack.

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control symptoms and reduce the risk of severe asthma attacks. Specific aims are to achieve:

- No daytime/nighttime symptoms
- No acute healthcare attendances
- No limitations to exercise
- No need for rescue medications
- Normal lung function

Principles of asthma treatment

- Treatment with daily low-dose inhaled corticosteroids (ICS) and SABA as needed is highly effective at controlling asthma symptoms and reducing asthma attacks
- Children should be reviewed 4-8 weeks after treatments have been altered to ensure that the new treatment regimen is effective
- A spacer device should always be prescribed with regular metered dose inhalers

Stepping up: Pharmacological escalation treatment recommendations have been published by BTS/SIGN,⁵ GINA¹⁷ and NICE⁴ with subtle differences. Broadly speaking, ICS should be the first choice preventer treatment in most children.

Where children are uncontrolled on regular low-dose ICS, a leukotriene receptor antagonist (LTRA) can be added (licensed from 6 months of age). This needs to be reviewed after 4-8 weeks and if not effective, the LTRA should be stopped. Alternatively, a LABA can be added (licensed from age four years). Again, if there is no clinical benefit after 4-8 weeks the LABA should be stopped.

Stepping down: Consider stepping down patients who have been asymptomatic and attack free for ≥ 6 months.

Additional considerations: Adherence is poor in most children and adolescents, especially those with intermittent symptoms.^{17,25} A recent study conducted in Leicestershire primary care showed that ICS prescription issue in school-age children on the practice asthma registers was below 50% in more than half the children.²⁵ Some of these children are at risk of a severe asthma attack. SABA overuse, especially in adolescents is well recognised and a risk factor for fatal asthma attacks.⁸

Taking this into consideration, BTS/SIGN and GINA no longer recommend treatment of asthma in children from six years with a SABA alone, unless the asthma is mild, defined as symptoms less than twice a month with no risk factors for asthma attacks. Even in children with mild asthma, it is important to consider adding low-dose

ICS to the asthma action plan every time the SABA is needed.

As needed ICS-SABA: In children with mild persistent asthma, who have long periods with no symptoms, and where adherence has been discussed with the family, as needed ICS-SABA, or ICS-LABA, should be considered to reduce the risk of severe asthma attacks, especially in those where overuse of SABA is evident.

The TREXA study, a placebo controlled randomised controlled trial (RCT) in children aged 5-18 years with moderate persistent asthma, showed that the group on regular daily ICS with SABA rescue did best. The SABA rescue alone group did worst.²⁶ However, in the as needed (rescue) ICS-SABA group, fewer children who took two puffs of ICS with every two puffs of SABA rescue had severe asthma attacks compared with the SABA rescue alone group.

These data suggest that children are better protected from severe asthma attacks with a combination of ICS-SABA rescue treatment compared with SABA alone.

As needed ICS-LABA: In adolescents with persistent poor adherence, as needed therapy with low-dose ICS-LABA can also be considered. This would abolish the need for separate ICS and SABA inhalers.

A recent RCT in patients with asthma from age 12 years showed that while regular daily ICS is superior to as needed low-dose ICS-LABA at controlling symptoms, low-dose ICS-LABA as needed was as effective as regular daily ICS at reducing asthma attacks.²⁷

Maintenance and reliever (MART) therapy: This option should be considered in adolescents who overuse their SABA inhaler. The treatment consists of twice daily inhaled low dose ICS-LABA usually as budesonide-formoterol combination (maintenance) with ICS-LABA as rescue medication when needed (reliever). This should substantially limit the need for the SABA rescue inhaler. A recent post-hoc analysis of all the clinical trials investigating the effectiveness of MART involving 12-17 year olds using low-dose budesonide-formoterol found that this treatment was effective, safe and well tolerated.²⁸

A single study investigated MART (using low-dose budesonide-formoterol) therapy in children aged 4-11 years. Asthma attacks requiring medical intervention were reduced by more than 70% with the MART regimen versus daily fixed-dose budesonide and SABA rescue.²⁹ MART in children has been included as a treatment option by



NICE. The NICE guidance states that if asthma is uncontrolled in children aged 5-16 years on a paediatric low-dose ICS and a LABA as maintenance therapy, consider changing to a MART regimen with a paediatric low maintenance ICS dose.⁴ However, this treatment is not currently licensed in the UK in children under 12 years and despite the NICE recommendation should probably be avoided for now, given the licensing issue.

With all regimens employing ICS-LABA combinations as rescue treatment, dose limits need to be discussed with the families and documented in the written asthma action plan to ensure maximum daily doses, of LABA in particular, but also ICS, are not exceeded. Prescription issue should be reviewed at least annually.

Preschool children

Children under five years are a complex and difficult group with the highest attendance in primary care and hospital emergency departments of any age group with breathing difficulties.³⁰

A lack of reliable diagnostic tests and frequent respiratory illnesses that can result in prolonged symptoms add to the challenge.

Treatment options are limited and only approximately half respond to ICS treatment. In children where recurrent episodes of wheezing are documented or wheeze is heard by a healthcare professional and other diagnoses are unlikely, treatment with very low- or low-dose ICS is warranted. An LTRA can be added if symptoms are not controlled despite ICS treatment.

Asthma should not be diagnosed based solely on an improvement in symptoms after treatment with ICS and/or LTRA.

PERSISTENT POOR CONTROL

Children whose asthma is not controlled despite regimens involving moderate doses of daily ICS should be carefully reviewed using a structured primary care approach. The 'SIMPLES' approach has been developed for adults with difficult asthma but many of its elements also apply to children.³¹ Enquire about exposure to tobacco smoke, other trigger factors, lifestyle issues particularly in teenagers, check inhaler technique and provide asthma education and adherence support.

A review of the patient's prescription records is essential. If poor preventer medication adherence is suspected, the importance of regular preventer usage should be emphasised and reasons for

poor adherence should be explored. Consider asking parents to supervise children using their inhalers or changing the inhaler type if the young person is embarrassed about carrying a spacer device.

If the child's asthma remains uncontrolled despite this intervention a referral to specialist care should be considered for further assessment and phenotyping.

IMPROVING OUTCOMES

It is essential to ensure that the diagnosis is correct. Regular ICS use should be aimed for and the need for SABA limited. Children with a confirmed diagnosis and those prescribed asthma medication in the previous 12 months should be invited to attend for an annual asthma review.

At every review asthma control and the risk of future asthma attacks should be assessed. Inhaler technique should be checked and objective evidence of adherence to preventer medication and the amount of rescue (SABA) medication prescribed reviewed.

The mutually agreed written personalised asthma action plan should be reviewed and updated where necessary. Lung function using spirometry or PEF variability with a two-week peak flow diary should be checked.

If control remains poor despite daily moderate dose ICS regimens and a structured primary care approach to uncontrolled asthma has failed to improve control children should be referred to specialist care to confirm the diagnosis and for further phenotyping.

A primary care asthma review should be carried out within two working days in all children treated for a severe asthma attack as per NICE asthma quality standards.²⁰

Competing interests: Dr Erol Gaillard has undertaken consultancy work for Boehringer Ingelheim with fees paid to the institution (University of Leicester). He has received investigator led research grants from Circassia, Gilead and Chiesi and undertaken research collaboration with Medimmune

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Useful information

Asthma UK
www.asthma.org.uk