

SIGN 158

British guideline on the management of asthma

Quick reference guide

First published 2003

Revised edition published July 2019



British
Thoracic
Society

NHS
SCOTLAND

This Quick Reference Guide provides a summary of the main recommendations in **SIGN 158 British guideline on the management of asthma**.

Recommendations are graded **A B C D** to indicate the strength of the supporting evidence. Good practice points ✓ are provided where the guideline development group wishes to highlight specific aspects of accepted clinical practice.

Details of the evidence supporting these recommendations can be found in the full guideline, available on the SIGN website: www.sign.ac.uk.

This Quick Reference Guide is also available as part of the SIGN Guidelines app.

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SIGN and BTS consent to the photocopying of this guideline for the purpose of implementation in the NHS in England, Wales, Northern Ireland and Scotland.

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Diagnosis

The diagnosis of asthma is a clinical one. The absence of consistent gold-standard diagnostic criteria means that it is not possible to make unequivocal evidence-based recommendations on how to make a diagnosis of asthma.

Definition and overarching concepts

Central to all definitions is the presence of symptoms (more than one of wheeze, breathlessness, chest tightness, cough) and of variable airflow obstruction.

- There is no single diagnostic test for asthma
- Diagnosis is based on clinical assessment supported by objective tests that seek to demonstrate variable airflow obstruction or the presence of airway inflammation
- Both the clinical assessment of symptoms and signs, and objective tests have significant false positive and false negative rates
- Tests influence the probability of asthma but do not prove a diagnosis
- Asthma status and the outcome of diagnostic tests for asthma vary over time

C Compare the results of diagnostic tests undertaken whilst a patient is asymptomatic with those undertaken when a patient is symptomatic to detect variation over time.

Practical approach to diagnosis

The diagnosis of asthma in children and adults is based on the recognition of a characteristic pattern of respiratory symptoms, signs and test results and the absence of any alternative explanation for these.

Diagnosis

Initial structured clinical assessment

The predictive value of individual symptoms or signs is poor, and a structured clinical assessment including all information available from the history, examination and historical records should be undertaken. Factors to consider in an initial structured clinical assessment include:

Episodic symptoms

More than one of the symptoms of wheeze, breathlessness, chest tightness and cough occurring in episodes with periods of no (or minimal) symptoms between episodes. Note that this excludes cough as an isolated symptom in children. For example:

- a documented history of acute attacks of wheeze, triggered by viral infection or allergen exposure with symptomatic and objective improvement with time and/or treatment
- recurrent intermittent episodes of symptoms triggered by allergen exposure as well as viral infections and exacerbated by exercise and cold air, and emotion or laughter in children
- in adults, symptoms triggered by taking non-steroidal anti-inflammatory medication or beta blockers.

An historical record of significantly lower FEV₁ or PEF during symptomatic episodes compared with asymptomatic periods provides objective confirmation of the obstructive nature of the episodic symptoms.

Wheeze confirmed by a healthcare professional on auscultation

It is important to distinguish wheezing from other respiratory noises, such as stridor or rattly breathing.

Repeatedly normal examination of chest when symptomatic reduces the probability of asthma.

Evidence of diurnal variability

Symptoms which are worse at night or in the early morning.

Atopic history

Personal history of an atopic disorder (ie eczema or allergic rhinitis) or a family history of asthma and/or atopic disorders, potentially corroborated by a previous record of raised allergen-specific IgE levels, positive skin-prick tests to aeroallergens or blood eosinophilia.

Absence of symptoms, signs or clinical history to suggest alternative diagnoses (including but not limited to COPD, dysfunctional breathing, obesity).

Diagnosis

Assess probability of asthma based on initial structured clinical assessment

High probability

Adults and children with a typical clinical assessment including recurrent episodes of symptoms (attacks), wheeze heard by a healthcare professional, historical record of variable airflow obstruction and a positive history of atopy and without any features to suggest an alternative diagnosis have a high probability of asthma.

- ✓ In patients with a high probability of asthma:
 - record the patient as likely to have asthma and commence a carefully monitored initiation of treatment (typically 6 weeks of inhaled corticosteroids)
 - assess the patient's status with a validated symptom questionnaire ideally corroborated by lung function tests (FEV₁ at clinic visits or by domiciliary serial peak flows to capture times with/without symptoms)
 - with a good symptomatic and objective response to treatment, confirm the diagnosis of asthma and record the basis on which the diagnosis was made
 - if response is poor or equivocal, check inhaler technique and adherence, arrange further tests and consider alternative diagnoses.

Low probability

Adults and children who do not have any of the typical features on initial structured clinical assessment or who have symptoms suggestive of an alternative diagnosis have a low probability of asthma.

- ✓
 - If there is a low probability of asthma and/or an alternative diagnosis is more likely, investigate for the alternative diagnosis reconsidering asthma if the clinical picture changes or an alternative diagnosis is not confirmed.
 - If reconsidering asthma, undertake or refer for further tests to investigate for a diagnosis of asthma.

Intermediate probability

Adults and children who have some, but not all, of the typical features of asthma on an initial structured clinical assessment or who do not respond well to a monitored initiation of treatment have an intermediate probability of asthma

D Spirometry, with bronchodilator reversibility as appropriate, is the preferred initial test for investigating intermediate probability of asthma in adults, and in children old enough to produce reliable results on testing.

- ✓ In adults and children with an intermediate probability of asthma and airways obstruction identified through spirometry, undertake reversibility tests and/or a monitored initiation of treatment assessing the response to treatment by repeating lung function tests and objective measures of asthma control.

- ✓ In adults and children with an intermediate probability of asthma and normal spirometry results, undertake challenge tests and/or measurement of FeNO to identify eosinophilic inflammation.

- ✓ In children with an intermediate probability of asthma who cannot perform spirometry:
 - consider watchful waiting if the child is asymptomatic
 - offer a carefully monitored trial of treatment if the child is symptomatic.

Diagnosis

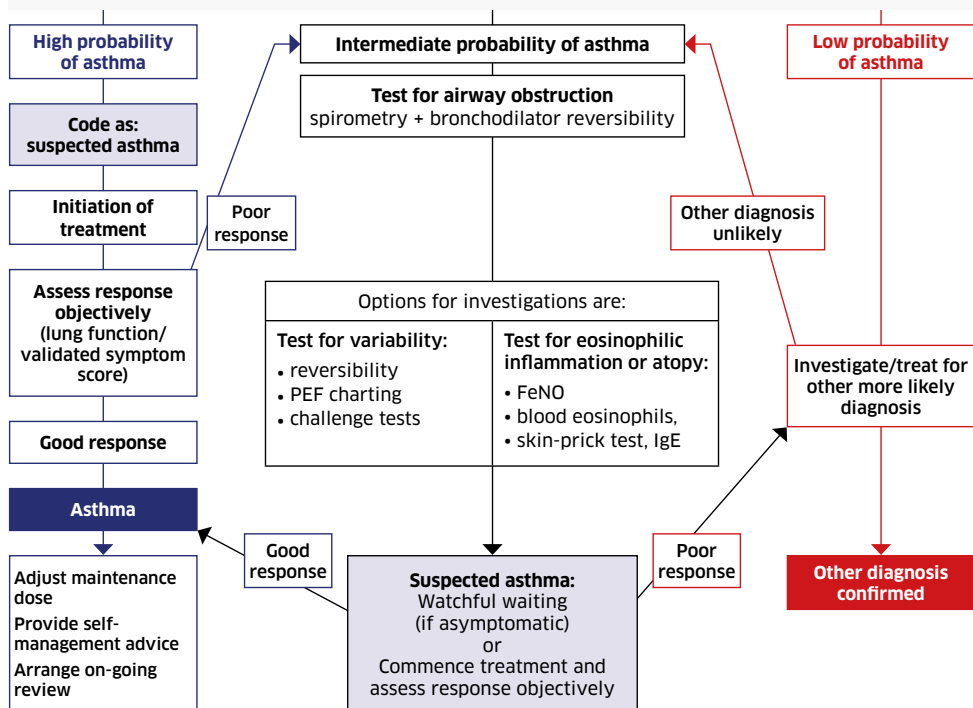
Diagnostic algorithm

Presentation with respiratory symptoms: wheeze, cough, breathlessness, chest tightness¹

Structured clinical assessment (from history and examination of previous medical records)

Look for:

- recurrent episodes of symptoms
- symptom variability
- absence of symptoms of alternative diagnosis
- recorded observation of wheeze
- personal history of atopy
- historical record of variable PEF or FEV₁



¹ In children under 5 years and others unable to undertake spirometry in whom there is a high or intermediate probability of asthma, the options are monitored initiation of treatment or watchful waiting according to the assessed probability of asthma.

Diagnosis

Diagnostic indications for referral

At any point in the diagnostic algorithm, there may be a need for referral for additional investigations and/or specialist advice. Some key indications for referral to specialist care are given below.

Adults	Children
Refer for additional investigation and specialist advice if:	
Diagnosis unclear	Diagnosis unclear
Suspected occupational asthma (symptoms that improve when patient is not at work, adult-onset asthma and workers in high-risk occupations)	
Poor response to asthma treatment	Poor response to monitored initiation of asthma treatment
Severe/life-threatening asthma attack	Severe/life-threatening asthma attack
'Red flags' and indicators of other diagnoses	
Prominent systemic features (myalgia, fever, weight loss)	Failure to thrive
Unexpected clinical findings (eg crackles, clubbing, cyanosis, cardiac disease, monophonic wheeze or stridor)	Unexplained clinical findings (eg focal signs, abnormal voice or cry, dysphagia, inspiratory stridor)
Persistent non-variable breathlessness	Symptoms present from birth or perinatal lung problem
Chronic sputum production	Excessive vomiting or possetting
Unexplained restrictive spirometry	Severe upper respiratory tract infection
Chest X-ray shadowing	Persistent wet or productive cough
Marked blood eosinophilia	Family history of unusual chest disease
	Nasal polyps
Patient or parental anxiety or need for reassurance	
Organisation of diagnostic services	
C Streamlined referral pathways should be developed for tests which are not routinely available in primary care.	

Monitoring

Asthma is best monitored by routine clinical review on at least an annual basis by a healthcare professional with appropriate training in asthma management. The review can be undertaken in primary and/or secondary care according to clinical need and local service arrangements.

- ✓ The core components of an asthma review that should be assessed and recorded on at least an annual basis are current symptoms, future risk of attacks, management strategies, supported self management, and growth in children.

Monitoring current asthma symptom control

- ✓ When asking about asthma symptoms, use specific questions, such as the Royal College of Physicians ‘3 Questions’ or questions about reliever use, with positive responses prompting further assessment with a validated questionnaire to assess symptom control.
- ✓ Whenever practicable, children should be asked about their own symptoms; do not rely solely on parental report.

Assessing risk of future asthma attacks

It is possible to identify adults and children (aged 5 and over) with asthma who are at increased risk of an asthma attack and to stratify the degree of risk associated with different markers.

D	B	D	Assess risk of future asthma attacks at every asthma review by asking about history of previous attacks, objectively assessing current asthma control, and reviewing reliever use.
	B	D	In children, regard comorbid atopic conditions, younger age, obesity, and exposure to environmental tobacco smoke as markers of increased risk of future asthma attacks.
D			In adults, regard older age, female gender, reduced lung function, obesity, smoking, and depression as markers of a slightly increased risk of future asthma attacks.

Supported self management

Asthma action plans

Self-management education incorporating written personalised asthma action plans (PAAPs) improves health outcomes for people with asthma.

A All people with asthma (and/or their parents or carers) should be offered self-management education which should include a written personalised asthma action plan and be supported by regular professional review.

A In adults, written personalised asthma action plans may be based on symptoms and/or peak flows: symptom-based plans are generally preferable for children.

- ✓
- A hospital admission represents a window of opportunity to review self-management skills. No patient should leave hospital without a written personalised asthma action plan.
 - An acute consultation offers the opportunity to determine what action the patient has already taken to deal with the asthma attack. Their self-management strategy may be reinforced or refined and the need for consolidation at a routine follow up considered.
 - A consultation for an upper respiratory tract infection or other known trigger is an opportunity to rehearse with the patient their self management in the event of their asthma deteriorating.
 - Education should include personalised discussion of issues such as trigger avoidance and occupational exposure to support people and their families living with asthma.
 - Every opportunity should be taken to remind patients and carers of the importance of achieving a smoke-free environment.
 - Brief simple education linked to patient goals is most likely to be acceptable to patients.

Self management in specific patient groups

A Self-management education, supported by a written personalised asthma action plan, should be offered to all patients on general practice 'active asthma' registers.

A Primary care practices should ensure that they have trained professionals and an environment conducive to providing supported self management.

A Prior to discharge, inpatients should receive written personalised asthma action plans, given by healthcare professionals with expertise in providing asthma education.

B Culturally appropriate supported self-management education should be provided for people with asthma from ethnic minority groups. Addressing language barriers is insufficient.

Adherence and concordance

D Adherence to long-term asthma treatment should be routinely and regularly addressed by all healthcare professionals within the context of a comprehensive programme of accessible proactive asthma care.

D To assess adherence, ask specific questions about medication use and assess prescribing and any other data available. Explore attitudes to medication as well as practical barriers to adherence in a non-judgemental way.

Implementation in practice

B Commissioners and providers of services for people with asthma should consider how they can develop an organisation which prioritises and actively supports self management. This should include strategies to proactively engage and empower patients and train and motivate professionals as well as providing an environment that promotes self management and monitors implementation.

Non-pharmacological management

There is a common perception amongst patients and carers that there are numerous environmental, dietary and other triggers of asthma and that avoiding these triggers will improve asthma and reduce the requirement for pharmacotherapy. Evidence that non-pharmacological management is effective can be difficult to obtain and more well-controlled intervention studies are required.

Primary prevention

Primary prevention relates to interventions introduced before the onset of disease and designed to reduce its incidence.

A Measures to reduce in utero or early life exposure to single aeroallergens, such as house dust mites or pets, or single food allergens, are not recommended for the primary prevention of asthma.

A For children at risk of developing asthma, complex, multifaceted interventions targeting multiple allergens may be considered in families able to meet the costs, demands and inconvenience of such a demanding programme.

B In the absence of any evidence of benefit and given the potential for adverse effects, maternal food allergen avoidance during pregnancy and lactation is not recommended as a strategy for preventing childhood asthma.

There is insufficient evidence to make a recommendation relating to the following as a strategy for preventing childhood asthma:

- maternal dietary supplementation during pregnancy
- the use of dietary probiotics in pregnancy.

C Breast feeding should be encouraged for its many benefits, including a potential protective effect in relation to early asthma.

C Obese and overweight children should be offered weight-loss programmes to reduce the likelihood of respiratory symptoms suggestive of asthma.

B Current and prospective parents should be advised of the many adverse effects which smoking has on their children including increased wheezing in infancy and increased risk of persistent asthma.

Secondary prevention

Secondary prevention relates to interventions introduced after the onset of disease to reduce its impact.

B Physical and chemical methods of reducing house dust mite levels in the home (including acaricides, mattress covers, vacuum cleaning, heating, ventilation, freezing, washing, air filtration and ionisers) should not be routinely recommended by healthcare professionals for the management of asthma.

B People with asthma and parents of children with asthma should be advised about the dangers of smoking and second-hand tobacco smoke exposure, and be offered appropriate support to stop smoking.

B Weight-loss interventions (including dietary and exercise-based programmes) should be considered for overweight and obese adults and children with asthma to improve asthma control.

A Air ionisers are not recommended for the treatment of asthma.

A Breathing exercise programmes (including face-to-face physiotherapist-taught methods and audiovisual programmes) can be offered to adults with asthma as an adjuvant to pharmacological treatment to improve quality of life and reduce symptoms.

Pharmacological management

The aim of asthma management is control of the disease. Complete control is defined as:

- no daytime symptoms
- no night-time awakening due to asthma
- no need for rescue medication
- no asthma attacks
- no limitations on activity including exercise
- normal lung function (in practical terms FEV₁ and/or PEF >80% predicted or best)
- minimal side effects from medication.

Approach to management

1. Start treatment at the level most appropriate to initial severity.
2. Achieve early control.
3. Maintain control by:
 - increasing treatment as necessary
 - decreasing treatment when control is good.

✓ Before initiating a new drug therapy practitioners should check adherence with existing therapies, check inhaler technique and eliminate trigger factors.

Intermittent reliever therapy

A B D Prescribe an inhaled short-acting β_2 agonist as short-term reliever therapy for all patients with symptomatic asthma.

Regular preventer therapy

A A A Inhaled corticosteroids are the recommended preventer drug for adults and children for achieving overall treatment goals.

A A A Give inhaled corticosteroids initially twice daily (except ciclesonide which is given once daily).

A A Once-a-day inhaled corticosteroids at the same total daily dose can be considered if good control is established.

B Clinicians should be aware that higher doses of inhaled corticosteroids may be needed in patients who are smokers or ex-smokers.

Summary tables categorising inhaled corticosteroids by dose in adults and children for different types of inhaler are included in the full guideline (Tables 12 and 13) and are available to download separately from the asthma guideline web page at www.sign.ac.uk.

Initial add-on therapy

Before initiating a new drug therapy practitioners should recheck adherence and inhaler technique and eliminate trigger factors.

A The first choice of add-on therapy to inhaled corticosteroids in adults is an inhaled long-acting β_2 agonist, which should be considered before increasing the dose of inhaled corticosteroids.

B In children aged five and over, an inhaled long-acting β_2 agonist or a leukotriene receptor antagonist can be considered as initial add-on therapy.

Pharmacological management

Combination inhalers

In efficacy studies, where there is generally good adherence, there is no difference in efficacy in giving inhaled corticosteroid and a long-acting β_2 agonist in combination or in separate inhalers. In clinical practice, however, it is generally considered that combination inhalers aid adherence and also have the advantage of guaranteeing that the long-acting β_2 agonist is not taken without the inhaled corticosteroid.

- ✓ Combination inhalers are recommended to:
- guarantee that the long-acting β_2 agonist is not taken without inhaled corticosteroid
 - improve inhaler adherence.

Additional controller therapies

If control remains poor on low-dose (adults) or very low-dose (children aged five and over) inhaled corticosteroids plus a long-acting β_2 agonist, recheck the diagnosis, assess adherence to existing medication and check inhaler technique before increasing therapy.

D D

If asthma control remains suboptimal after the addition of an inhaled long-acting β_2 agonist then:

- increase the dose of inhaled corticosteroids from low dose to medium dose in adults or from very low dose to low dose in children (5-12 years), if not already on these doses.
- or
- consider adding a leukotriene receptor antagonist.

Specialist therapies

- ✓ All patients whose asthma is not adequately controlled on recommended initial or additional controller therapies should be referred for specialist care.

Decreasing treatment

- ✓
- Regular review of patients as treatment is decreased is important. When deciding which drug to decrease first and at what rate, the severity of asthma, the side effects of the treatment, time on current dose, the beneficial effect achieved, and the patient's preference should all be taken into account.
 - Patients should be maintained at the lowest possible dose of inhaled corticosteroid. Reduction in inhaled corticosteroid dose should be slow as patients deteriorate at different rates. Reductions should be considered every three months, decreasing the dose by approximately 25–50% each time.

Exercise induced asthma

- ✓ For most patients, exercise-induced asthma is an expression of poorly-controlled asthma and regular treatment including inhaled corticosteroids should be reviewed.

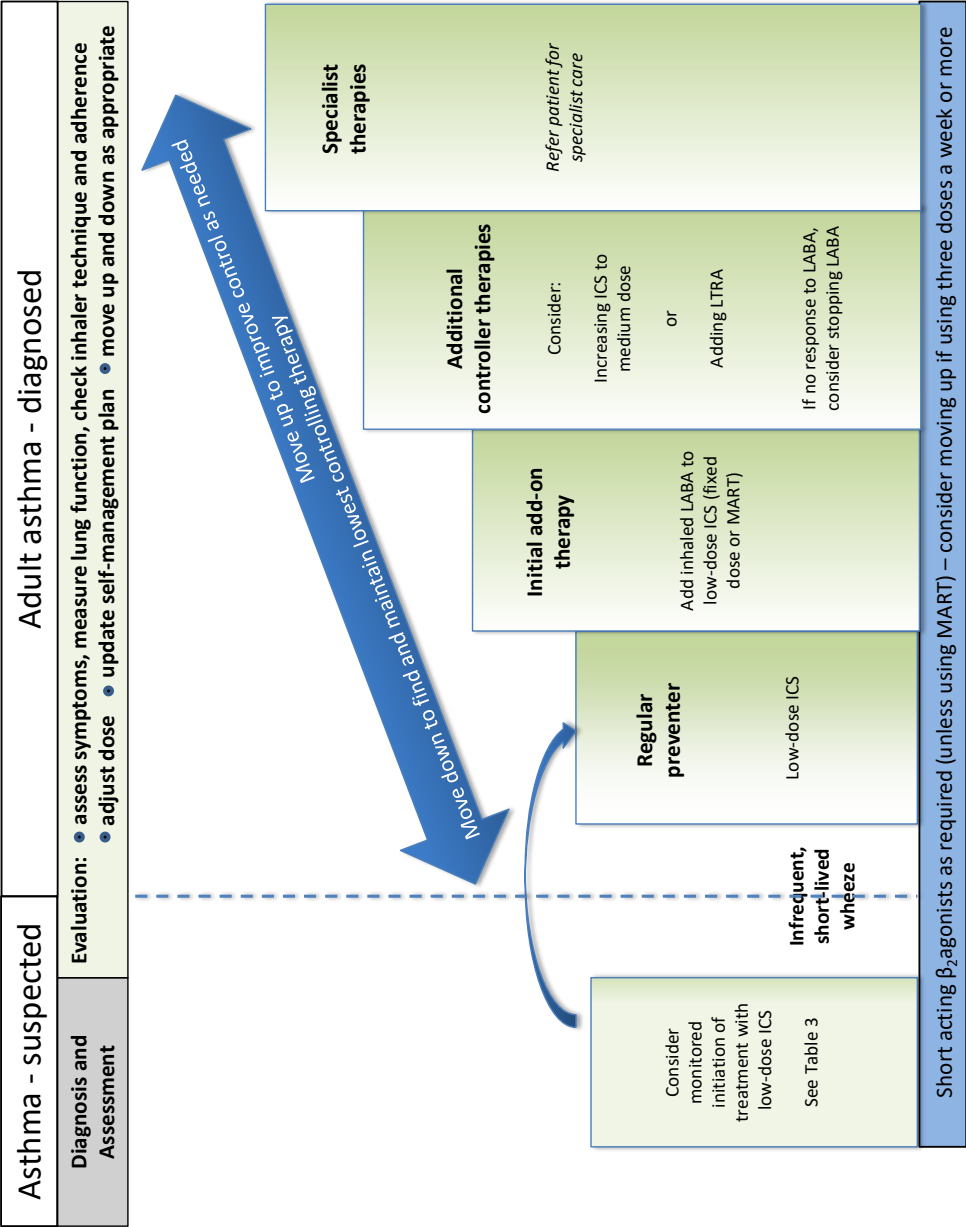
**A C
A C
C C
C C**

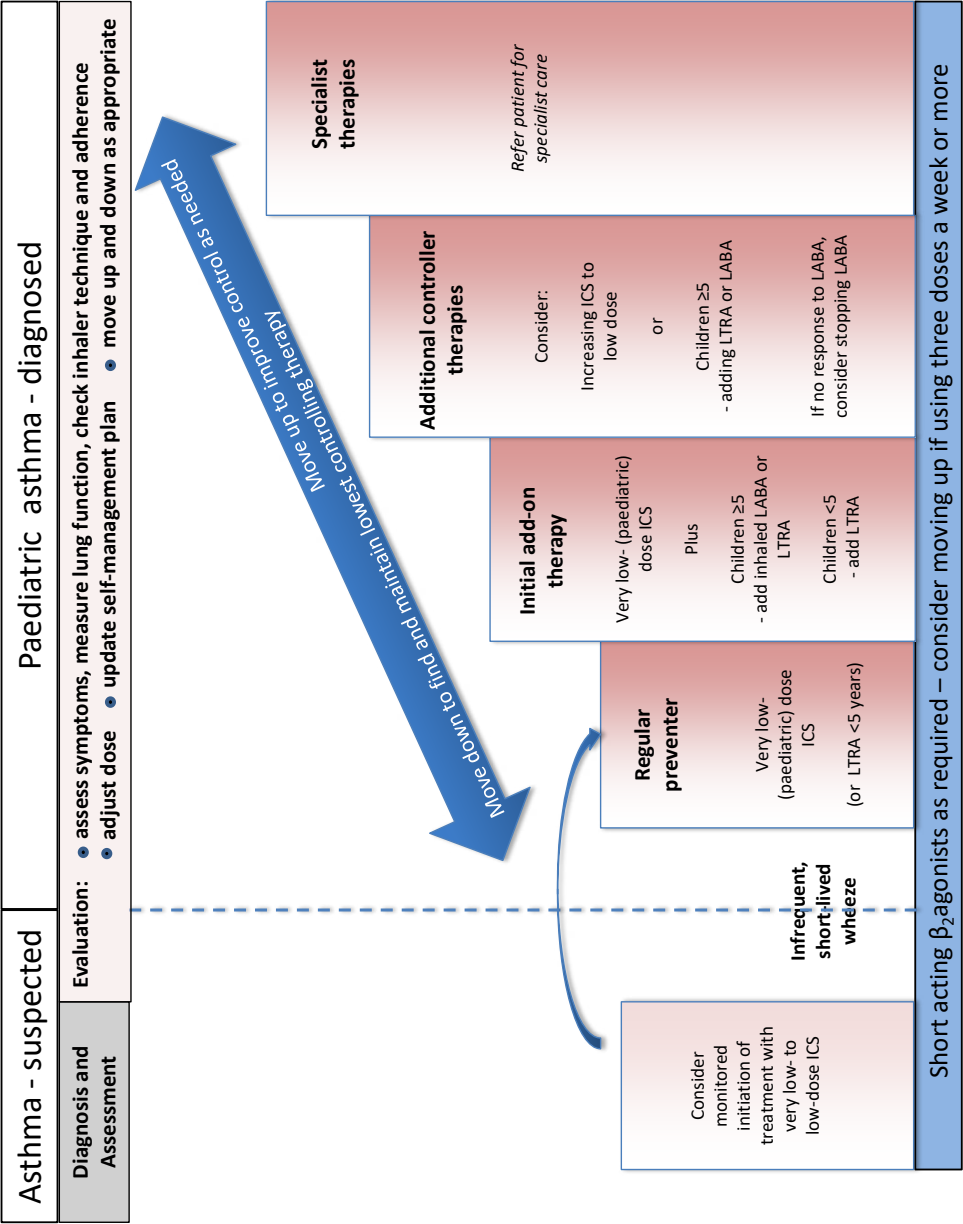
If exercise is a specific problem in patients taking inhaled corticosteroids who are otherwise well controlled, consider adding one of the following therapies:

- leukotriene receptor antagonists
- long-acting β_2 agonists
- sodium cromoglicate or nedocromil sodium
- theophyllines.

A A

Immediately prior to exercise, inhaled short-acting β_2 agonists are the drug of choice.





Inhaler devices

Technique and training

- B** ✓ ✓ Prescribe inhalers only after patients have received training in the use of the device and have demonstrated satisfactory technique.

β_2 agonist delivery

Acute asthma

- A** **A** **B** Children and adults with mild and moderate asthma attacks should be treated with a pMDI + spacer with doses titrated according to clinical response.

Stable asthma

- A** In children aged 5–12, a pMDI + spacer is as effective as any other hand-held inhaler.

- A** In adults, a pMDI ± spacer is as effective as any other hand-held inhaler, but patients may prefer some types of DPI.

Inhaled corticosteroids for stable asthma

- A** In children aged 5–12, a pMDI + spacer is as effective as any other hand-held inhaler.

- A** In adults, a pMDI ± spacer is as effective as any DPI.

Prescribing devices

- ✓
- The choice of device may be determined by the choice of drug.
 - If the patient is unable to use a device satisfactorily an alternative should be found.
 - The patient should have their ability to use the prescribed inhaler device (particularly for any change in device) assessed by a competent healthcare professional.
 - The medication needs to be titrated against clinical response to ensure optimum efficacy.
 - Reassess inhaler technique as part of the structured clinical review.
- ✓ Generic prescribing of inhalers should be avoided as this might lead to people with asthma being given an unfamiliar inhaler device which they are not able to use properly.
- ✓ Prescribing mixed inhaler types may cause confusion and lead to increased errors in use. Using the same type of device to deliver preventer and reliever treatments may improve outcomes.

Inhaler devices in children

In young children, little or no evidence is available on which to base recommendations.

- ✓ In children, a pMDI and spacer is the preferred method of delivery of β_2 agonists and inhaled corticosteroids. A face mask is required until the child can breathe reproducibly using the spacer mouthpiece. Where this is ineffective a nebuliser may be required.

Management of acute asthma in adults

Assessment of severe asthma

- B** Healthcare professionals must be aware that patients with severe asthma and one or more adverse psychosocial factors are at risk of death.

Initial assessment

Moderate acute asthma

- increasing symptoms
- PEF >50–75% best or predicted
- no features of acute severe asthma

Acute severe asthma

Any one of:

- PEF 33–50% best or predicted
- respiratory rate $\geq 25/\text{min}$
- heart rate $\geq 110/\text{min}$
- inability to complete sentences in one breath

Life-threatening asthma

In a patient with severe asthma any one of:

- PEF <33% best or predicted
- SpO₂ <92%
- PaO₂ <8 kPa
- 'normal' PaCO₂ (4.6–6.0 kPa)
- altered conscious level
- exhaustion
- arrhythmia
- hypotension
- cyanosis
- silent chest
- poor respiratory effort

Near-fatal asthma

Raised PaCO₂ and/or requiring mechanical ventilation with raised inflation pressures

Initial assessment of symptoms, signs and measurements

Clinical features Severe breathlessness (including too breathless to complete sentences in one breath), tachypnoea, tachycardia, silent chest, cyanosis or collapse

None of these singly or together is specific and their absence does not exclude a severe attack

PEF or FEV₁ PEF or FEV₁ are useful and valid measures of airway calibre. PEF expressed as a % of the patient's previous best value is most useful clinically. In the absence of this, PEF as a % of predicted is a rough guide

Pulse oximetry Oxygen saturation (SpO₂) measured by pulse oximetry determines the adequacy of oxygen therapy and the need for arterial blood gas (ABG) measurement. The aim of oxygen therapy is to maintain SpO₂ 94–98%

Blood gases (ABG) Patients with SpO₂ <92% or other features of life-threatening asthma require ABG measurement

Chest X-ray Chest X-ray is not routinely recommended in patients in the absence of:

- suspected pneumomediastinum or pneumothorax
- suspected consolidation
- life-threatening asthma
- failure to respond to treatment satisfactorily
- requirement for ventilation

Management of acute asthma in adults	
Criteria for admission	
B	Admit patients with any feature of a life-threatening or near-fatal asthma attack.
B	Admit patients with any feature of a severe asthma attack persisting after initial treatment.
C	Patients whose peak flow is greater than 75% best or predicted one hour after initial treatment may be discharged from ED, unless there are other reasons why admission may be appropriate.
Treatment of acute asthma	
Oxygen	β_2 agonist bronchodilators
C	A
<ul style="list-style-type: none"> Give controlled supplementary oxygen to all hypoxaemic patients with acute severe asthma titrated to maintain an SpO_2 level of 94–98%. Do not delay oxygen administration in the absence of pulse oximetry but commence monitoring of SpO_2 as soon as it becomes available. 	<ul style="list-style-type: none"> Use high-dose inhaled β_2 agonists as first-line agents in patients with acute asthma and administer as early as possible. Reserve intravenous β_2 agonists for those patients in whom inhaled therapy cannot be used reliably.
A	✓
<ul style="list-style-type: none"> In hospital, ambulance and primary care, nebulisers for giving β_2 agonist bronchodilators should preferably be driven by oxygen. 	<ul style="list-style-type: none"> In patients with acute asthma with acute severe or life-threatening features the nebulised route (oxygen-driven) is recommended.
A	A
<ul style="list-style-type: none"> In hospital, ambulance and primary care, nebulisers for giving β_2 agonist bronchodilators should preferably be driven by oxygen. 	<ul style="list-style-type: none"> In patients with severe asthma that is poorly responsive to an initial bolus dose of β_2 agonist, consider continuous nebulisation with an appropriate nebuliser.
Steroid therapy	Ipratropium bromide
A	B
<ul style="list-style-type: none"> Give steroids in adequate doses to all patients with an acute asthma attack. 	<ul style="list-style-type: none"> Add nebulised ipratropium bromide (0.5 mg 4–6 hourly) to β_2 agonist treatment for patients with acute severe or life-threatening asthma or those with a poor initial response to β_2 agonist therapy.
✓	
<ul style="list-style-type: none"> Continue prednisolone (40–50 mg daily) until recovery (minimum 5 days). 	
Other therapies	Referral to intensive care
A	Refer any patient:
<ul style="list-style-type: none"> Nebulised magnesium sulphate is not recommended for treatment of adults with acute asthma. 	<ul style="list-style-type: none"> requiring ventilatory support with acute severe or life-threatening asthma, who is failing to respond to therapy, as evidenced by: <ul style="list-style-type: none"> deteriorating PEF persisting or worsening hypoxia hypercapnia ABG analysis showing \downarrow pH or \uparrow H^+ exhaustion, feeble respiration drowsiness, confusion, altered conscious state respiratory arrest.
B	
<ul style="list-style-type: none"> Consider giving a single dose of IV magnesium sulphate to patients with acute severe asthma (PEF $<50\%$ best or predicted) who have not had a good initial response to inhaled bronchodilator therapy. 	
✓	
<ul style="list-style-type: none"> Magnesium sulphate (1.2–2 g IV infusion over 20 minutes) should only be used following consultation with senior medical staff. 	
B	
<ul style="list-style-type: none"> Routine prescription of antibiotics is not indicated for patients with acute asthma. 	
Follow up	
✓	
<ul style="list-style-type: none"> It is essential that the patient's primary care practice is informed within 24 hours of discharge from the emergency department or hospital following an asthma attack. Keep patients who have had a near-fatal asthma attack under specialist supervision indefinitely. A respiratory specialist should follow up patients admitted with a severe asthma attack for at least one year after the admission. 	

Management of acute asthma in children aged 1 year and over¹

Acute severe	Life-threatening
<p>SpO₂ <92% PEF 33–50% best or predicted</p> <ul style="list-style-type: none"> • Can't complete sentences in one breath or too breathless to talk or feed • Heart rate >140/min (1-5 years) <i>or</i> >125/min (>5 years) • Respiratory rate >40/min (1-5 years) <i>or</i> >30/min (>5 years) 	<p>SpO₂ <92% PEF <33% best or predicted</p> <ul style="list-style-type: none"> • Exhaustion • Hypotension • Cyanosis • Silent chest • Poor respiratory effort • Confusion

Criteria for admission

✓	Increase β_2 agonist dose by giving one puff every 30–60 seconds, according to response, up to a maximum of ten puffs
✓	Parents/carers of children with an acute asthma attack at home and symptoms not controlled by up to 10 puffs of salbutamol via a pMDI and spacer, should seek urgent medical attention.
✓	If symptoms are severe additional doses of bronchodilator should be given as needed whilst awaiting medical attention.
✓	Paramedics attending to children with an acute asthma attack should administer nebulised salbutamol, using a nebuliser driven by oxygen if symptoms are severe, whilst transferring the child to the emergency department.
✓	Children with severe or life-threatening asthma should be transferred to hospital urgently.
B	Consider intensive inpatient treatment of children with SpO₂ <92% in air after initial bronchodilator treatment.

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
- Respiratory rate and degree of breathlessness – ie too breathless to complete sentences in one breath or to feed
- Use of accessory muscles of respiration – best noted by palpation of neck muscles
- Amount of wheezing – which might become biphasic or less apparent with increasing airways obstruction
- Degree of agitation and conscious level – always give calm reassurance

NB Clinical signs correlate poorly with the severity of airways obstruction. Some children with acute severe asthma do not appear distressed.

Initial treatment of acute asthma

Oxygen

✓	Children with life-threatening asthma or SpO ₂ <94% should receive high-flow oxygen via a tight-fitting face mask or nasal cannula at sufficient flow rates to achieve normal saturations of 94–98%.
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¹ Management of acute asthma in children under 1 year should be under the direction of a respiratory paediatrician.

Management of acute asthma in children aged 1 year and over¹

Bronchodilators

A Inhaled β_2 agonists are the first-line treatment for acute asthma in children.

- ✓ Discontinue long-acting β_2 agonists when short-acting β_2 agonists are required more often than four hourly.

A A pMDI + spacer is the preferred option in children with mild to moderate asthma.

B Individualise drug dosing according to severity and adjust according to the patient's response.

A If symptoms are refractory to initial β_2 agonist treatment, add ipratropium bromide (250 micrograms/dose mixed with the nebulised β_2 agonist solution).

- ✓ Repeated doses of ipratropium bromide should be given early to treat children who are poorly responsive to β_2 agonists.

C Consider adding 150 mg magnesium sulphate to each nebulised salbutamol and ipratropium in the first hour in children with a short duration of acute severe asthma symptoms presenting with an $\text{SpO}_2 < 92\%$.

Steroid therapy

A Give oral steroids early in the treatment of acute asthma attacks in children.

- ✓
- Use a dose of 10 mg prednisolone for children under 2 years of age, 20 mg for children aged 2–5 years and 30–40 mg for children >5 years. Those already receiving maintenance steroid tablets should receive 2 mg/kg prednisolone up to a maximum dose of 60 mg.
 - Repeat the dose of prednisolone in children who vomit and consider intravenous steroids in those who are unable to retain orally ingested medication.
 - Treatment for up to three days is usually sufficient, but the length of course should be tailored to the number of days necessary to bring about recovery. Tapering is unnecessary unless the course of steroids exceeds 14 days.

Second line treatment of acute asthma

B Consider early addition of a single bolus dose of intravenous salbutamol (15 micrograms/kg over 10 minutes) in a severe asthma attack where the patient has not responded to initial inhaled therapy.

A Aminophylline is not recommended in children with mild to moderate acute asthma.

B Consider aminophylline for children with severe or life-threatening asthma unresponsive to maximal doses of bronchodilators and steroids.

B In children who respond poorly to first-line treatments, consider the addition of intravenous magnesium sulphate as first-line intravenous treatment (40 mg/kg/day).

Discharge planning and follow up

Children can be discharged when stable on 3–4 hourly inhaled bronchodilators that can be continued at home. PEF and/or FEV_1 should be >75% of best or predicted and $\text{SpO}_2 > 94\%$.

- Arrange follow up by primary care services within two working days
- Arrange follow up in a paediatric asthma clinic at about one month after admission
- Arrange referral to a paediatric respiratory specialist if there have been life-threatening features.

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

Difficult asthma

Difficult asthma is defined as persistent symptoms and/or frequent asthma attacks despite treatment with:

- high-dose ICS (adults) or medium-dose ICS (children) plus a LABA (age 5 and over) or LTRA; or
- medium-dose ICS (adults) or low-dose ICS (children) plus a LABA (age 5 and over) or LTRA and an appropriate additional therapy; or
- continuous or frequent use of oral steroid

Assessing difficult asthma

- D** Patients with difficult asthma should be systematically evaluated, including:
- confirmation of the diagnosis of asthma, and
 - identification of the mechanism of persisting symptoms and assessment of adherence to therapy.

- D** This assessment should be facilitated through a dedicated multidisciplinary difficult asthma service, by a team experienced in the assessment and management of difficult asthma.

Factors contributing to difficult asthma

Poor adherence

- C** Healthcare professionals should always consider poor adherence to maintenance therapy before escalating treatment in patients with difficult asthma.

Psychosocial factors

- C** Healthcare professionals should be aware that difficult asthma is commonly associated with coexistent psychological morbidity.

- D** Assessment of coexistent psychological morbidity should be performed as part of a difficult asthma assessment. In children this may include a psychosocial assessment of the family.

- D** Dysfunctional breathing should be considered as part of the assessment of patients with difficult asthma.

Monitoring airway response

- B** In patients with difficult asthma, consider monitoring induced sputum eosinophil counts to guide steroid treatment.

Asthma in adolescents

Key elements of working effectively with adolescents in the transition to adulthood include: seeing them on their own, separate from their parents/carers, for part of the consultation, and discussing confidentiality and its limitations.

Prevalence of asthma in adolescence

Asthma is common in adolescents but is frequently undiagnosed because of underreporting of symptoms.

- ✓ Clinicians seeing adolescents with any cardiorespiratory symptoms should ask about symptoms of asthma.

Diagnosis and assessment

Symptoms and signs of asthma in adolescents are no different from those of other age groups.

Exercise-related wheezing and breathlessness are common asthma symptoms in adolescents but only a minority show objective evidence of exercise-induced bronchospasm. Other causes such as hyperventilation or poor fitness can usually be diagnosed and managed by careful clinical assessment.

Non-pharmacological management

- ✓ Adolescents with asthma (and their parents and carers) should be encouraged to avoid exposure to environmental tobacco smoke and should be informed about the risks and urged not to start smoking.
- ✓ Adolescents with asthma should be asked if they smoke personally. If they do and wish to stop, they should be offered advice on how to stop and encouraged to use local NHS smoking cessation services.
- ✓ Healthcare professionals should be aware that complementary and alternative medicine use is common in adolescents and should ask about its use.

Pharmacological management

Specific evidence about the pharmacological management of adolescents with asthma is limited and is usually extrapolated from paediatric and adult studies. Pharmacological management of asthma is covered on pages 10–13.

Specific evidence about inhaler device use and choice in adolescents is also limited. Inhaler devices are covered on page 14.

Inhaler devices

- ✓ Adolescent preference for inhaler device should be taken into consideration as a factor in improving adherence to treatment.
- ✓ As well as checking inhaler technique it is important to enquire about factors that may affect inhaler device use in real life settings, such as school.
- ✓ Consider prescribing a more portable device (as an alternative to a pMDI with spacer) for delivering bronchodilators when away from home.

Asthma in adolescents

Long-term outlook and entry into the workplace

Young adults with asthma have a low awareness of occupations that might worsen asthma (eg exposure to dusts, fumes, spray, exertion and temperature changes, see page 24).

- ✓ Clinicians should discuss future career choices with adolescents with asthma and highlight occupations that might increase susceptibility to work-related asthma symptoms.

Organisation and delivery of care

B School-based clinics may be considered for adolescents with asthma to improve attendance.

B Peer-led interventions for adolescents in the school setting should be considered.

- ✓ Integration of school-based clinics with primary care services is essential.

Transition to adult-based health care

Transition to adult services is important for all adolescents with asthma, irrespective of the asthma severity. Transition should be seen as a process and not just the event of transfer to adult services. It should begin early, be planned, involve the young person, and be both age and developmentally appropriate.

Patient education and self management

Effective transition care involves preparing adolescents with asthma to take independent responsibility for their own asthma management. Clinicians need to educate and empower adolescents to manage as much of their asthma care as they are capable of doing while supporting parents to gradually hand over responsibility for management to their child.

Adherence

- Adherence with asthma treatment and with asthma trigger avoidance is often poor in adolescents. When directly asked, most adolescents admit they do not always follow their treatment plans.
- Strategies to improve adherence emphasise the importance of focusing on the individual and their lifestyle and using individualised asthma planning and personal goal setting.

Asthma in pregnancy

Several physiological changes occur during pregnancy which could worsen or improve asthma. Pregnancy can affect the course of asthma, and asthma and its treatment can affect pregnancy outcomes.

B Women should be advised of the importance of maintaining good control of their asthma during pregnancy to avoid problems for both mother and baby.

C Monitor pregnant women with moderate/severe asthma closely to keep their asthma well controlled.

✓ Advise women who smoke about the dangers for themselves and their babies and give appropriate support to stop smoking.

Drug therapy in pregnancy

The following drugs should be used as normal during pregnancy:

- C** • short-acting β_2 agonists
- C** • long-acting β_2 agonists
- B** • inhaled corticosteroids
- C** • oral and intravenous theophyllines.

C Use steroid tablets as normal when indicated during pregnancy for women with severe asthma. Steroid tablets should never be withheld because of pregnancy. Women should be advised that the benefits of treatment with oral steroids outweigh the risks.

C If leukotriene receptor antagonists are required to achieve adequate control of asthma then they should not be withheld during pregnancy.

Acute asthma in pregnancy

C In pregnant patients, give drug therapy for acute asthma as for non-pregnant patients including systemic steroids and magnesium sulphate.

D Acute severe asthma in pregnancy is an emergency and should be treated vigorously in hospital.

D In pregnant patients with acute asthma, deliver high-flow oxygen immediately to maintain saturation 94–98%.

- ✓
- Continuous fetal monitoring is recommended for pregnant women with acute severe asthma.
 - For women whose asthma is poorly controlled during pregnancy there should be close liaison between the respiratory physician and obstetrician, with early referral to critical care physicians for women with acute severe asthma.

Asthma in pregnancy

Management during labour

✓ If anaesthesia is required, regional blockade is preferable to general anaesthesia in women with asthma due to the potential risk of bronchospasm with certain inhaled anaesthetic agents.

D Use prostaglandin F2α with extreme caution in women with asthma because of the risk of inducing bronchoconstriction.

- ✓
- Advise women:
 - that an acute asthma attack is rare in labour
 - to continue their usual asthma medications in labour.
 - Women receiving steroid tablets at a dose exceeding prednisolone 7.5 mg per day for >2 weeks prior to delivery should receive parenteral hydrocortisone 100 mg 6–8 hourly during labour.
 - In the absence of an acute severe asthma attack, reserve Caesarean section for the usual obstetric indications.

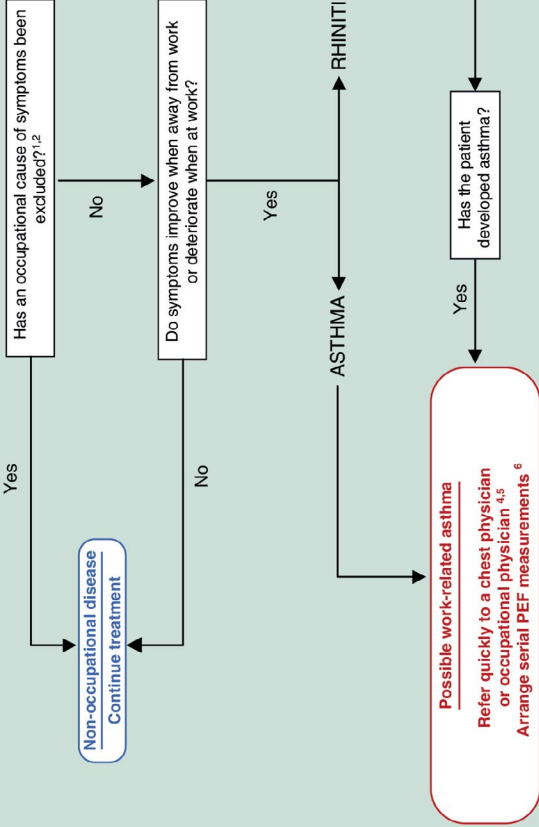
Drug therapy in breastfeeding mothers

C Encourage women with asthma to breastfeed

C Use asthma medications as normal during lactation in line with manufacturers' recommendations.

High risk work² includes:

- baking
- pastry making
- spray painting
- laboratory animal work
- healthcare
- dentalcare
- food processing
- welding
- soldering
- metalwork
- woodwork
- chemical processing
- textile, plastics and rubber manufacture
- farming and other jobs with exposure to dusts and fumes



1. At least 1 in 10 cases of new or reappearance of childhood asthma in adult life are attributable to occupation.
2. Enquire of adult patients with rhinitis or asthma about their job and the materials with which they work.
3. Rhino-conjunctivitis may precede IgE-associated occupational asthma; the risk of developing asthma being highest in the year after the onset of rhinitis.
4. The prognosis of occupational asthma is improved by early identification and early avoidance of further exposure to its cause
5. Confirm a diagnosis supported by objective criteria and not on the basis of a compatible history alone because of the potential implications for employment.
6. Arrange for workers whom you suspect of having work-related asthma to perform serial peak flow measurements at least four times a day.

Organisation and delivery of care

Educating clinicians

There is strong evidence that educating clinicians can improve health outcomes for patients. Interventions need to be of sufficient intensity to engage with, and change, the way practices are organised.

- B Training for primary care clinicians should include educational outreach visits using multifaceted programmes that include consultation training including goal setting.**

Structured review

Proactive clinical review of people with asthma improves clinical outcomes. Evidence for benefit is strongest when reviews include discussion and use of a written personalised asthma action plan (PAAP).

- A In primary care, people with asthma should be reviewed regularly by a nurse or doctor with appropriate training in asthma management. Review should incorporate a written action plan.**

- ✓ It is good practice to audit the percentage of patients reviewed annually. Consider focusing on particular groups such as those overusing bronchodilators, patients on higher dose therapies, those with asthma attacks or from groups with more complex needs.

Asthma clinics

There is insufficient evidence to make a recommendation about the provision of care through primary care asthma clinics or specialist asthma clinics. Within primary care, structured reviews may be delivered as appointments in routine surgeries, or within a dedicated asthma clinic.

Interventions involving specific groups

School-based interventions

- B Consider a multifaceted approach to school-based asthma education programmes targeting children's healthcare professionals as well as the children themselves.**

Ethnicity/culture-based interventions

- C Establish intensive clinic-based programmes for people from ethnic minority groups who have attended emergency care.**

Lay-led interventions

- A Lay-led self-management programmes for people with asthma are not recommended.**

Pharmacist-led interventions

Evidence for pharmacist-led interventions is lacking and further high-quality randomised trials testing pharmacist-led interventions to improve asthma outcomes are needed.

Telehealthcare

Telehealthcare to support self management, eg using automated reminders, computer-based games or telemonitoring, can improve process outcomes such as knowledge and self-efficacy/self-management skills. The effect of such approaches on clinical outcomes is, however, inconsistent and they generally have no effect on unscheduled use of healthcare resources.

- C Telehealthcare may be considered as an option for supporting self management.**



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