

Diagnosis of asthma

Asthma is a common and potentially life-threatening respiratory condition, which often presents in early childhood and can be a lifelong chronic health problem. Over a patient's life, they will attend primary care for regular monitoring of their chronic disease, for repeat prescriptions and during acute exacerbations. The current national UK guidelines on the management of asthma produced by the Scottish Intercollegiate Guidelines Network and British Thoracic Society were updated in 2014. This article will focus on the diagnosis of asthma in adults and children and is directly applicable to primary care.

The GP curriculum and diagnosis of asthma

Clinical module 3.19: Care of people with respiratory problems requires that GPs should:

- Have an understanding of the diagnostic and treatment guidelines for common respiratory diseases (asthma, chronic obstructive pulmonary disease, lung cancer) in primary care, and the role of specialist services in supporting the patient
- Know how to interpret lung function measurements performed in primary care, for example, peak expiratory flow rate, spirometry, and pulse oximetry. GPs should also be aware of the expected impact of bronchodilators on such measurements
- Ensure that patients can use the inhaled medication they are prescribed, both routinely and in an emergency

The Joint Scottish Intercollegiate Guidelines Network and British Thoracic Society (SIGN/BTS) Guidance on the Management of Asthma was initially published as a 'Living Guideline' in 2001. The latest update in October 2014 focused on revised evidence regarding supported self-management, organisation and delivery of care, and non-pharmacological management of asthma (SIGN/BTS, 2014).

The diagnosis of asthma has traditionally involved a combination of clinical symptoms, including classic daytime variability, and evidence of bronchial obstruction and reversibility using peak expiratory flow rate (PEFR) testing. More recently, there has been a shift towards using formal spirometry as a diagnostic tool for asthma in primary care. Primary-care-based spirometry services are becoming more commonplace in general practice; however, they require formal training of operators and clinician confidence to accurately interpret results.

The National Institute for Health and Care Excellence (NICE) released new draft guidance for the diagnosis and monitoring of asthma in January 2015. The guidance, which proposed a new and more detailed approach to the diagnosis of asthma, will have a clear impact on service delivery and access to investigations from primary

care. The draft is currently in consultation, and although clearly an area for future consideration, will not be directly addressed in this article.

Diagnosis of asthma in children

Clinical signs and symptoms of asthma in children can be classified into low, intermediate and high probability of asthma (see Table 1). A low probability of asthma implies that an alternative diagnosis to asthma is likely and should be explored (see Fig. 1 for flow chart). An intermediate probability implies that the diagnosis of asthma is uncertain and needs further investigation. A high probability makes a diagnosis likely, and should lead to a diagnostic treatment trial (usually inhaled bronchodilator and/or inhaled corticosteroid). The choice of treatment trial depends on the frequency and severity of symptoms.

Lung function testing in children requires their understanding, co-ordination and compliance. This is often a challenge in primary care, especially in younger children. The SIGN/BTS guidelines suggest that the majority of children aged over 5 years should be able to perform

Table 1. Clinical features indicating high and low probability of asthma in children.

Low probability of asthma	High probability of asthma
Clinical features pointing to an alternative diagnosis	Family history of atopic disorder and/or asthma
No response to a trial of therapy	Personal history of atopy
Normal PEFR or spirometry when symptomatic	Widespread wheeze on examination
Repeated normal chest examination when symptomatic	Improvement in symptoms or lung function when treated with adequate therapy
Prominent dizziness, light headedness and peripheral tingling	More than one of the following symptoms: • Wheeze • Cough • Difficulty in breathing • Chest tightness
History of moist cough	Above symptoms worse at night and early morning
Isolated cough in the absence of wheeze or difficulty in breathing	Symptom triggers may include exercise, exposure to pets, cold or damp air, emotions or laughter
Symptoms only with colds and no interval symptoms	

Adapted from SIGN/BTS (2014).

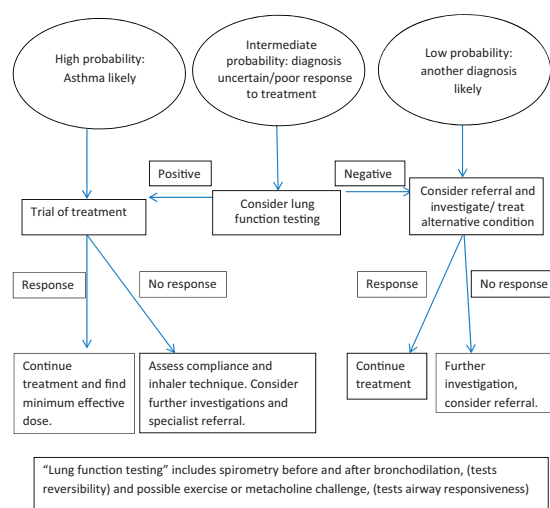


Figure 1. Diagnosis pathway of asthma in children. Reproduced from Thorax, British Thoracic Society Scottish Intercollegiate Guidelines Network. British guideline on the management of asthma, 2014;69:i1–i192 with permission from BMJ Publishing Group Ltd.

'conventional lung function testing' procedures in most settings. A FEV1/FVC (forced expiratory volume in first second/forced vital capacity) ratio less than 70% is indicative of obstructive airways disease in children (as in adults). An improvement in FEV1 greater than 12% from baseline following bronchodilator is diagnostic of

reversible airways obstruction. In children unable to perform spirometry, SIGN/BTS recommend that daytime variability in serial peak flow measurements of greater than 20% is indicative of asthma in children.

Wheezing is a common presentation for children to primary care, and not all children with wheeze will have asthma. However, asthma is an important diagnosis to consider in all children presenting with recurrent wheeze, particularly in those who have symptoms without coexisting viral respiratory tract infection and who have a family or personal history of atopy. If there is any doubt about the diagnosis or cause of wheeze in children, a specialist opinion should be sought following relevant investigations in primary care (see Box 1).

Diagnosis in adults

Similar to that in children, the diagnosis of asthma in adults is based on clinical signs and symptoms and objective lung function testing. Again, patients can be stratified into low, intermediate and high probability of asthma based on clinical features (Table 2).

In those patients categorised as having a low probability of asthma, alternative diagnoses should be considered. In patients with airflow obstruction (i.e. FEV1/FVC less than 70%), this would include chronic obstructive

pulmonary disease, bronchiectasis, and obliterative bronchiolitis. In patients without airflow obstruction, differentials may include lung cancer, sarcoid, hyperventilation, vocal cord dysfunction, rhinitis, gastroesophageal

reflux disease, cardiac failure and pulmonary fibrosis. Patients who have a high probability of asthma should undergo a treatment trial, and if successful, should then be given a diagnosis of asthma and regularly monitored (see Fig. 2 for flow chart).

Box 1. Indications for specialist referral in children.

- Unclear diagnosis
- Symptoms present from birth
- Perinatal lung pathology
- Excessive vomiting or possetting
- Persistent wet or productive cough
- Family history of unusual chest disease
- Failure to thrive
- Nasal polyps
- Unexpected clinical findings
- Failure to respond to conventional treatment (especially use of greater than 400 microgram steroid per day, or frequent courses of oral steroids).
- Parental anxiety or need for reassurance

Reproduced from Thorax, British Thoracic Society Scottish Intercollegiate Guidelines Network. British guideline on the management of asthma, 2014;69:i1–i192 with permission from BMJ Publishing Group Ltd.

It is recommended that those with an intermediate probability undergo formal spirometry. As with children, an FEV1/FVC ratio less than 70% with reversibility (greater than 12% increase in FEV1 from baseline following bronchodilation) is consistent with a diagnosis of asthma. Those who fit into the intermediate category, but have normal spirometry, should undergo further investigation and consideration of referral (see Box 2 for indications for specialist referral). The tests undertaken in secondary care will depend upon local availability and the severity of patient symptoms, and may include:

- Sputum eosinophil count
- Metacholine challenge
- Mannitol challenge
- Exhaled nitric oxide concentrations
- Full pulmonary function tests

It is important to remember that normal spirometry results in a patient who is asymptomatic at the time of testing, does not exclude a diagnosis of asthma. Variability in symptoms and clinical signs is a key feature

Table 2. Clinical features indicating high and low probability of asthma in adults.

Low probability of asthma	High probability of asthma
Coexistent cardiac disease	Family history of atopic disorder and/or asthma
Significant smoking history (greater than 20 pack years)	History of atopic disorder
Normal PEFR or spirometry when symptomatic	Widespread wheeze on examination
Repeated normal physical examination of chest when symptomatic	Improvement in symptoms or lung function when treated with adequate therapy
Dizziness, light headedness and peripheral tingling	More than one of the following symptoms: • Wheeze • Cough • Difficulty in breathing • Chest tightness
Voice disturbance	Above symptoms worse at night and early morning
Chronic productive cough in the absence of wheeze or shortness of breath	Symptom triggers may include exercise, exposure to pets, cold or damp air, emotions or laughter, or after exposure to aspirin or beta blockers
Symptoms only with colds and no interval symptoms	Unexplained peripheral blood eosinophilia, OR unexplained low FEV1 or PEFR

Adapted from SIGN/BTS (2014).

Box 2. Indications for specialist referral in adults.

- Unclear diagnosis
- Suspected occupational asthma
- Monophonic wheeze or stridor
- Unexpected clinical findings i.e. crepitations, clubbing, cyanosis
- Unexplained restrictive spirometry
- Prominent systemic features
- Chronic sputum production
- Chest X-ray abnormalities
- Marked blood eosinophilia greater than $1 \times 10^9/L$
- Poor response to treatment
- Severe asthma attack

Adapted from SIGN/BTS (2014).

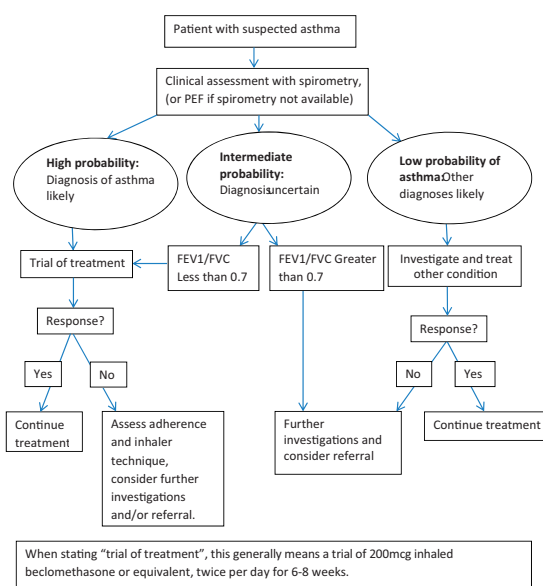


Figure 2. Diagnosis of asthma in adults.

Reproduced from Thorax, British Thoracic Society Scottish Intercollegiate Guidelines Network. British guideline on the management of asthma, 2014;69:i1–i192 with permission from BMJ Publishing Group Ltd.

of asthma, and repeated spirometry may be required in order to monitor changes in lung function over time to make a diagnosis.

Spirometry

In both adults and children, spirometry is now the preferred lung function investigation in primary care where available (a typical graph of normal and obstructive spirometry is shown in Fig. 3). The provision of spirometry in

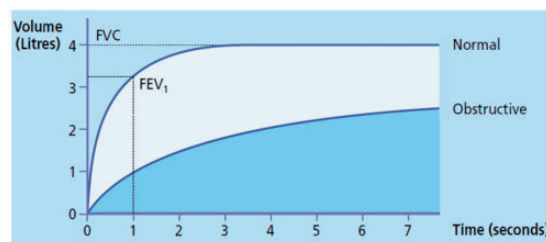


Figure 3. Graph showing FEV1 and FVC in a normal and obstructive tracing.

Reproduced from Spirometry in practice. A practical guide to using spirometry in primary care (2005), British Thoracic Society (BTS) COPD Consortium, with permission from the British Thoracic Society.

primary care is becoming more common; however, some centres still rely on direct referrals to lung function departments in secondary care for investigations. In situations where spirometry is not available or tolerated, serial peak flow measurements may still be used. Draft guidelines for the diagnosis and monitoring of asthma in adults released by NICE January 2015, suggest that repeated peak flow measurements are recorded by patients over a 2–4 week period, and more than 20% variability in serial results is regarded as a positive result.

There are no absolute contra-indications to spirometry (Levy et al., 2009). However, it is important to assess for relative contra-indications in all patients prior to testing. These relative contra-indications include:

- Haemoptysis of unknown origin
- Current lower respiratory tract infection
- Pneumothorax
- Recent myocardial infarction (within 1 month), uncontrolled hypertension or pulmonary embolism
- History of haemorrhagic stroke
- Recent thoracic, abdominal or eye surgery
- Nausea, vomiting or pain
- Confusion or dementia

Latest developments in guidelines

The NICE draft guidance is currently in consultation with no clear date of publication at the date of writing. Recent media attention has raised debate regarding the possible over-diagnosis of asthma in the community, and the feasibility of the proposed new diagnostic investigations for asthma in primary care.

We summarise the major changes to the diagnostic algorithm for asthma in children and adults from the draft NICE guidance (NICE, 2015). It is important to remember that these guidelines remain in development, and are not currently recommended practice. However, they do pose

interesting developments in asthma diagnosis for all clinicians in hospital and primary care settings.

- For children under the age of 5 years: A treatment trial should be based on clinical judgement, though performing lung function tests is recommended when the child is able to.
- For patients aged 5 years and older: Do not diagnose asthma on the basis of a single diagnostic test and instead consider the following:
 - Offer spirometry as first-line investigation
 - In accordance with the flow charts proposed by NICE, based on age, and results of spirometry, consider testing with further methods, such as bronchodilator reversibility testing, nitric oxide testing, peak flow variability and metacoline or histamine challenges.
- There also appears to be a focus on occupational asthma, with a direct question within the initial clinical assessment, and advice to refer people with suspected occupational asthma to an occupational health specialist

Key points

- Spirometry is now the first-line pulmonary function test in the diagnosis of asthma in children and adults
- Clinical features of asthma can be stratified into low, intermediate and high probability for children and adults
- Patients with a high probability of asthma should be offered a trial of treatment and regular review and follow-up, with consideration to step-down treatment as appropriate
- The majority of children over the age of 5 years should be able to perform some form of lung function test, ideally spirometry in most settings

- Draft 2015 NICE Guidelines for the diagnosis and monitoring of asthma in adults, children and young people are currently in consultation

References and further information

- BTS COPD Consortium. (2005). Spirometry in practice: A practical guide to using spirometry in primary care. Retrieved from www.brit-thoracic.org.uk/document-library/delivery-of-respiratory-care/spirometry/spirometry-in-practice/
- Department of Health. (2011). An outcomes strategy for COPD and asthma in England. Retrieved from www.gov.uk/government/uploads/system/uploads/attachment_data/file/216139/dh_128428.pdf
- Levy, M., Quainjer, P., Booker, R., Cooper, B., Holmes, S., & Small, I. (2009). Diagnostic spirometry in primary care. *Primary Care Respiratory Journal*, 18(3), 130–147. doi: 10.4104/pcrj.2009.00054
- NICE. (2015). Asthma: Diagnosis and monitoring of asthma in adults, children and young people. Retrieved from www.nice.org.uk/guidance/gid-cgwave0640/resources/asthma-diagnosis-and-monitoring-draft-guideline2
- RCGP. Clinical module 3.19: Respiratory health. Retrieved from www.rcgp.org.uk/training-exams/~media/Files/GP-training-and-exams/Curriculum-2012/RCGP-Curriculum-3-19-Respiratory-Health.ashx
- SIGN/BTS. (2014). British guideline on the management of asthma. Retrieved from www.brit-thoracic.org.uk/document-library/clinical-information/asthma/btssign-asthma-guideline-2014/

Dr Katie White

Academic GP Registrar, University of Birmingham

Email: Katiewhite20@yahoo.com

Dr Claire Cunningham

Academic GP Registrar, University of Birmingham

Dr Simon Gompertz

Consultant Respiratory Physician, Queen Elizabeth Hospital, Birmingham