

# Opinion

## Diagnosis of Asthma in Children

### Introduction

Recurrent cough and wheeze are very common in childhood. In the International Study of Asthma and Allergies in Childhood study the prevalence of current wheeze in 13-14 year olds in the UK was 25%, with 40% of these children having features suggesting significant symptoms.<sup>1</sup> The prevalence in 6-7 year olds was 21% with half having severe features.

Children with recurrent respiratory symptoms may have asthma – i.e. reversible airways obstruction associated with allergic inflammation of the airways and responsive to treatment with inhaled beta agonists and corticosteroids – but there are many other causes of these symptoms and the diagnosis must be made with care. Under-diagnosis of asthma was well documented twenty years ago, but this has probably now given way to over-diagnosis, particularly in children under five.<sup>2,3</sup> Cohort studies have shown that there is a common syndrome or “phenotype” of recurrent viral associated wheeze which is self limiting, responds poorly to treatment and resolves before school age.<sup>4</sup> However, children with asthma still go unrecognised. It is important to document the basis for a diagnosis of asthma in the records.<sup>5</sup>

### Clinical assessment

Diagnosis of asthma in children involves pattern recognition based on a thorough history and examination supplemented if possible by respiratory function tests.<sup>6,7</sup> On the basis of as full a dataset as possible, clinicians can identify children with high, intermediate and low probability of having asthma.<sup>6</sup>

Children with asthma have recurrent cough, wheeze, chest tightness or difficulty in breathing. Symptoms may be brought on by colds, exercise, or exposure to dust, grass pollen or animals. The clinical presentation is often during an acute episode of symptoms but the history needs to include both the features of the acute illness and an assessment of previous respiratory symptoms. We are looking for symptoms suggestive of asthma as well as features that might suggest alternative diagnoses. Common things that are not asthma include recurrent rhinitis with postnasal drip, viral associat-

ed wheeze in under fives, pertussis or pertussis-like post-viral cough and – in older children – hyperventilation with anxiety. Rare but important things which are not asthma include cystic fibrosis, bronchiectasis, persistent bacterial bronchitis, TB and HIV infection. Similarly, careful history taking and examination enables an assessment of the response to treatment at review appointments.

### History and examination

#### Features suggestive of asthma

See Table 1.

#### Features suggestive of other diagnoses

See Table 2.

### Investigations

Video recording of cough and wheeze episodes is increasingly available to parents using home movie equipment or mobile phones and may be very helpful for assessing intermittent symptoms.

Chest X ray is not necessary in suspected asthma, but should be arranged where there are clinical features suggestive of a different and more serious diag-

**Table 1. Features suggestive of asthma**

| Symptoms  | Tips   |
|---|--|
| Recurrent illness with cough and wheeze but without major systemic upset  | Look at the medical record and ask about previous chest illnesses                    |
| Less troublesome interval symptoms of cough or wheeze at night, or brought on by exercise or exposure to common triggers. | Ask how the child is when well   |
| Clear history of good response to asthma treatments in previous episodes.   |  |
| Personal history of eczema or hay fever, or asthma, eczema or hay fever in the family                                     |  |
| Signs   | Tips   |
| Widespread wheeze on auscultation   | Examination may be completely normal between episodes                                |
| Chest shape abnormality – pectus carinatum, Harrison's sulcus   | May be seen in chronic undertreated asthma but also in other chronic chest diseases. |
| Eczema  |  |

**Table 2. Features suggestive of other diagnoses**

| Symptoms   | Possible alternative diagnosis                                   |
|--|--|
| Symptoms with colds only – no interval symptoms or wheeze                | Postnasal drip, viral associated                                 |
| Cough only with no documented wheeze or shortness of breath              |  |
| Severe paroxysmal cough without wheeze                                   | Pertussis  |
| History of a choking episode at onset                                    | Inhaled foreign body   |
| Persistent or recurrent loose cough / sputum production                  | Cystic fibrosis, bronchiectasis, persistent bacterial bronchitis |
| Significant systemic upset – fever, anorexia – with episodes             |  |
| Failure of response to asthma treatments                                 |  |
| Symptoms from birth  | Congenital heart or lung abnormality                             |
| Prominent tingling, dizziness and lightheadedness                        | Hyperventilation   |
| Frequent or persistent vomiting or diarrhoea                             | Gastro-oesophageal reflux or cystic fibrosis                     |
| Family history of serious or unusual chest disease                       | TB, HIV, cystic fibrosis   |
| Signs  | Possible alternative diagnosis                                   |
| Finger clubbing  | Chronic infection, cystic fibrosis                               |
| Heart murmur   | Congenital heart disease   |
| Focal chest signs - localised crackles or altered breath sounds          | Infection  |
| Failure to thrive – growth faltering on chart of height/weight           |  |
| Repeated absence of wheezing on auscultation during symptomatic episodes |  |

nosis. Temporary focal lung abnormalities on chest X ray can occur in asthma due to mucous plugging of airways, but their presence or persistence should raise suspicion of other diagnoses.

In children old enough to perform simple respiratory function tests (peak flow measurement, spirometry) an attempt to obtain objective evidence of reversible airways obstruction should always be made.

### Peak flows

Peak flow measurement should be demonstrated and recorded in all children old enough to do it, though their value depends on effort and motivation. Most parents are prepared to do a peak flow diary for 2-3 weeks which may provide valuable supportive evidence of variable airways obstruction or response to treatment. Parents can be asked to measure the child's peak flow before and after six minutes running. Repeated variability of >20% correlating with symptoms is supportive of an asthma diagnosis. Because of the need for child and parental co-operation the results of peak flow testing should be interpreted with caution as part of the whole clinical picture. Serial peak flow measurements on their own do not reliably rule the diagnosis in or out.<sup>3</sup>

Spirometry with reversibility testing using a bronchodilator can be performed in children over 5-7 years: it provides more information than a peak flow measurement but cannot be done as often. FEV<sub>1</sub>/FVC ratio of <0.7 before bronchodilator implies significant airway obstruction. An increase of FEV<sub>1</sub> of >12% after bronchodilator supports an asthma diagnosis.

Peak flow and spirometry are usually normal between episodes in children with asthma. Persistent symptoms with no evidence of airways obstruction on repeated testing suggests an alternative diagnosis and the need for referral.

### Trial of therapy

A trial of therapy is very helpful in making a diagnosis of asthma and should be done using adequate doses of inhaled beta agonist and inhaled corticosteroid (usually 400mcg daily of beclometasone-equivalent, though larger doses may be needed in very young children to compensate for poor inhaler technique) given by metered dose inhaler and spacer with careful teaching of technique. Treatment should be continued for at least four weeks and response assessed at a further visit. Apparent success should lead to the inhaled steroid being stepped down or stopped to see whether symptoms recur. This is important for distinguishing between asthma and spontaneous remission of viral associated symptoms.

Where diagnostic doubt remains children should be referred for further specialist investigation before applying a diagnos-

### BTS /SIGN Guidelines

The new guidelines advocate an approach based on the probability of an asthma diagnosis

**High probability** – trial of treatment and assess response.

**Intermediate probability** – consider three options:

- watchful waiting with review (if symptoms mild),
- trial of treatment with review,
- spirometry and reversibility testing. Where there is objective evidence of airways obstruction a trial of therapy should be conducted.

Failure of response to treatment not rectified by attention to inhaler technique and compliance should lead to referral for further testing. This may include tests of atopic status, tests for eosinophilic airway inflammation and for bronchial hyper-responsiveness or investigations for alternative conditions. Referral for these tests should also be considered if symptoms persist but there is no evidence of airways obstruction on spirometry.

**Low probability** – if more serious diagnoses are suspected refer for investigation. If the likely diagnosis is viral associated symptoms or post nasal drip watchful waiting is appropriate.

**For a full discussion of asthma diagnosis with supporting evidence see**

British Thoracic Society Scottish Intercollegiate Guidelines Network British Guideline on the Management of Asthma. *Thorax* 2008;**63**:Suppl IV

### Criteria for Referral

- Diagnosis not clear.
- Response to treatment inexplicably poor.
- Continuing need for inhaled steroid dosage above 400mcg daily beclometasone equivalent.
- Symptoms from birth or perinatal problems.
- Excessive vomiting or possetting.
- Persistent wet or productive cough.
- Failure to thrive.
- Persistent or recurrent severe upper respiratory tract infection.
- Nasal polyps.
- Family history of unusual chest disease.
- Parental anxiety or need for reassurance.

tic label which may be inaccurate, and continuing with treatment which may be ineffective or potentially harmful.

### Mistakes in asthma diagnosis and how to avoid them

#### Premature labelling

We risk applying the asthma label prematurely to pre-school children after a few self limiting episodes of viral induced wheeze or a post-viral cough if we mistakenly attribute resolution of symptoms to treatment which is then continued unnecessarily. We can avoid this by realising that these self limiting conditions are common in the under fives, and that they does not need treatment. If we do use asthma treatments in this situation we should use a symptom label – like “wheezing” or “cough” – or code as ‘suspected asthma’ so that someone later does not think we have made a firm diagnosis. If there is a very good response to regular treatment we should try discontinuing it to see if symptoms recur. When we take over the care of a child with asthma we should make sure that the diagnosis was soundly based in the first place –

go over the history, look in the records.

### Missing rare serious conditions.

It is easy to miss rare conditions like inhaled foreign body, cystic fibrosis, bronchiectasis, ciliary dyskinesia, TB, HIV, congenital immune deficiency or other congenital heart or lung abnormalities and treat common symptoms as asthma. We can avoid this by taking a careful history, examining the child, plotting growth in height and weight, obtaining objective evidence of airways obstruction when possible and carefully assessing response to treatment. We should arrange a chest X ray and refer for specialist opinion if we suspect alternative diagnoses.

### Getting the diagnosis right but overestimating the severity

Paediatric asthma clinics all receive referrals of older children on very intensive asthma treatment whose asthma proves to be mild or moderate but who have superimposed symptoms due to hyperventilation, anxiety or laryngeal dysfunction (glottic wheeze). Occasionally anxiety attacks or simple physical unfitness is diagnosed as asthma in children who do not have asthma at all. We can avoid this by bearing these possibilities in mind in our clinical assessment, and arranging tests of airway obstruction (spirometry or peak flow charting) which may be bizarre or inconsistent – or (rarely) very carefully faked – in these situations. Holistic medicine is not just for adults and we should be aware of the stresses and difficulties that our young patients may be experiencing.

### Missing the diagnosis of asthma

This is the old problem, less common now, of children having recurrent illness with cough and wheeze which is either not presented by the parents because they fear an asthma diagnosis, or mistakenly treated with repeated courses of antibiotics by doctors. We can avoid this by remembering that asthma still gets missed and keeping the possibility in mind.

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