

## The 'jigsaw puzzle' approach to building a diagnostic picture of asthma in primary care over time

There is no single objective diagnostic test for asthma. Instead, we suggest an approach of collecting and assembling pieces of clinical information to create a diagnostic picture, like making a jigsaw puzzle. These pieces should include demonstration of symptom and airway variability and/or bronchodilator responsiveness over time, to support a clinical diagnosis. This process becomes easier with experience, as patterns become more recognisable. For those clinicians less confident with diagnosing asthma, this desktop helper demonstrates how to build the picture with the patient over time, ideally involving several scheduled appointments.

### INTRODUCTION

Asthma is a clinical syndrome consisting of symptoms of wheeze/noisy breathing, chest tightness and breathlessness, sometimes with cough, which vary in intensity and over time (fig 1).<sup>1</sup> Asthma is one of the most common chronic diseases seen in primary care and the most common chronic disease in children. The reported prevalence of asthma varies between countries, ranging from 1% to as high as 18% of the population.<sup>2</sup> Achieving the correct diagnosis is essential to ensure patients receive the right care including pharmacological treatment with inhaled medications and non-pharmacological interventions [Asthma Right Care]. The combination of the lack of a single diagnostic test and the heterogeneous and variable nature of symptoms over time poses a diagnostic challenge. A particular challenge is that lung function tests, such as peak flow or FEV<sub>1</sub>/FVC and bronchodilator responsiveness (reversibility) testing, are frequently normal when a patient is asymptomatic and thus best performed when the patient is symptomatic. An additional challenge is that some of the clinical signs and symptoms experienced by people being investigated for possible asthma may overlap with other respiratory diseases and disorders, or may not fit the diagnosis of asthma (fig 2). However, unlike these, asthma symptoms vary over time, often daily or by location. For these reasons, assembling a diagnostic picture of asthma requires collation of supporting evidence to build a picture over time, like a jigsaw puzzle. Pieces are assembled from symptoms, history, examination and investigations, with the key pieces being tests that identify airway variability and bronchodilator responsiveness of expiratory airflow limitation (airway dysfunction) (fig 3).<sup>1,2,4,5</sup> Alternative diagnoses should be considered if the key piece or pieces do not fit. Diagnosis

of asthma requires understanding of (1) the presentation, including the patient's reason(s) for a visit to primary care; (2) symptoms, including an evaluation of historical respiratory symptoms, identified triggers and other treatable risk factors; and physical examination, including at least nose, throat, skin, lung, heart, respiratory rate, pulse rate and rhythm and pulse oximetry (where available); (3) history, including personal, occupational and family history and (4) objective test results. The jigsaw puzzle approach combines these elements over time and prioritises those elements that support a diagnosis of asthma and identifies pieces that do not fit, requiring the clinician to think again. No puzzle will be 100% complete, but the picture should be clear enough to allow a diagnosis (fig 4).

### BUILDING A PICTURE OVER TIME TO ACHIEVE DIAGNOSIS OF A VARIABLE DISEASE

#### Must do

Build the picture by asking the patient their reason(s) for coming now for a visit to primary care, and evaluating current and historical respiratory symptoms. If the patient is not symptomatic, consider serial peak flow (PEF) monitoring over time (e.g. 2 weeks). If the patient is symptomatic, administering 2-4 puffs of SABA (preferably through a spacer), preceded (and followed) by peak flow readings (if possible), should induce both a rapid improvement in symptoms and an improvement

Figure 1: Asthma cardinal symptoms - wheeze, cough, chest tightness, breathlessness

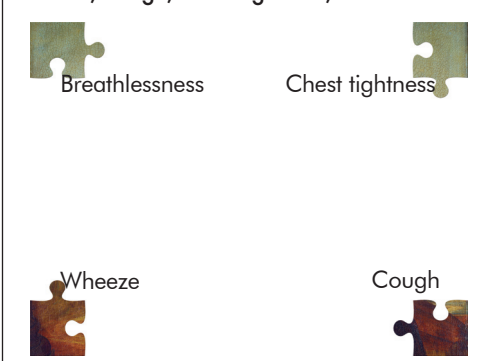


Figure 2: Pieces that do not fit the diagnosis of asthma

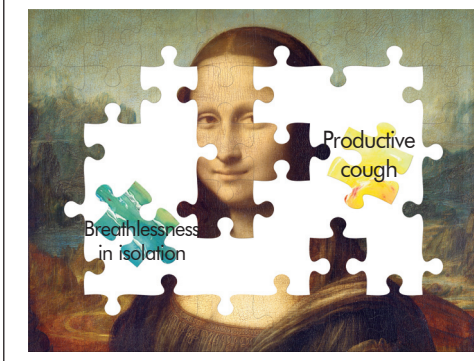


Figure 3: Available tests of airways dysfunction confirm our reasoning

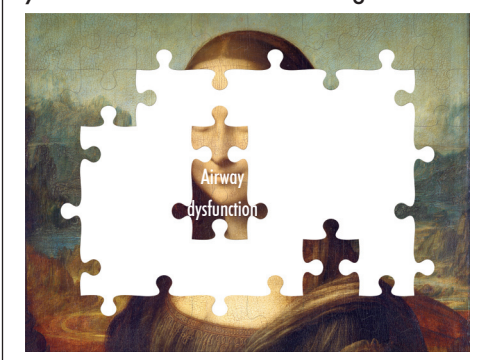
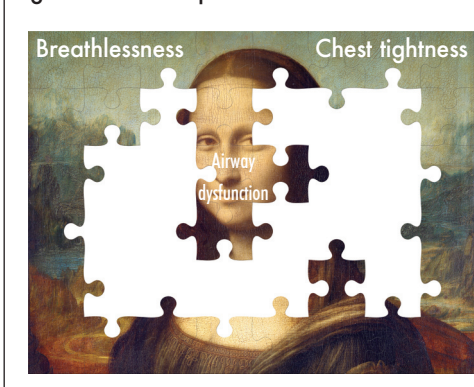


Figure 4: A clear picture



## Box: Building the picture: Presentation, symptoms, history and objective tests to support or refute a diagnosis of asthma

<b>Presentation (fig 1)</b>	<p>Identify the reason or reasons the person has come to see you. <i>What can I do for you today?</i></p> <p><b>Follow-up prompts:</b> Do you have these symptoms every day? Are they worse at night? On exercise? When is the first time you can remember [feeling breathless]? Do your symptoms go away for periods of time?</p>
<b>Symptoms and physical examination</b>	<p>Ask more broadly about the range of respiratory symptoms the person might be experiencing, especially those typical of asthma they might not have mentioned such as <b>breathlessness, chest tightness, wheeze or noisy breathing, cough, nasal symptoms.</b></p> <p><i>Do you have any other symptoms? Do you cough even when you're feeling otherwise well? Do you have symptoms at night? Are there times when you don't have symptoms?</i></p> <p><b>Follow-up prompts:</b> Have you noticed anything that triggers your symptoms or makes them worse (examples could include: viral infections, exercise, allergen exposure, changes in weather/season, laughter, irritants, strong smells)? Are your symptoms worse or better on days you are at work or doing certain activities? Are you exposed to (tobacco) smoke? Have you ever been treated in hospital or elsewhere for acute severe breathlessness? Have you ever been given an inhaled medication for breathlessness?</p> <p><b>Perform a physical examination</b> including at least nose, throat, skin, lung, heart, BMI, respiratory rate, pulse rate and rhythm and pulse oximetry where available</p>
<b>Pieces that don't fit (fig 2)</b>	<p><b>Symptoms suggesting an alternative diagnosis may include</b> isolated cough, especially in conjunction with haemoptysis, chronic sputum production, chest pain, breathlessness associated with dizziness, light-headedness or peripheral tingling, fever, anorexia, weight loss. These symptoms suggest considering alternative diagnoses. Consider TB, lung cancer, dysfunctional breathing (with normal airways function), bronchiectasis, gastro oesophageal reflux disease (GORD) etc.</p>
<b>History</b>	<p><b>Ask about their personal history and living conditions</b></p> <p><i>How often have you had this before? Are your symptoms worse at certain times of the year? Do you get hay fever? Do you have eczema now, or as a child? What do you do for work? What are your hobbies? Do you sneeze and get a runny nose when you are exposed to dust, smoke, cold air or pollution? Did you have repeated respiratory infections (colds or chest infections) when you were younger? Do you or anyone in your house or work smoke? Do you have an open fire for cooking or heating at home? Is there mould in your house?</i></p> <p><b>Follow-up prompts:</b> Does anyone else in your family have similar problems? Can you tell me about your present and past jobs? Are there any industrial polluting facilities near where you live? What do you do when you are not working?</p> <p><b>History suggesting an alternative diagnosis may include</b> family history of/or other chronic respiratory conditions eg cystic fibrosis, TB, pulmonary fibrosis, heart failure</p>
<b>Objective tests (fig 3)</b>	<p><b>Suggested objective tests that support the diagnosis</b></p> <p>Tests for airway bronchodilator responsiveness:<sup>2</sup></p> <ul style="list-style-type: none"> <li>Perform a peak flow test, administer 200-400 mcg of inhaled salbutamol/albuterol, or an ICS/formoterol preparation containing at least 4.5mcg formoterol; repeat the peak flow test after 10-15 mins (after you have seen the next patient). A change of <math>\geq 20\%</math> is consistent with asthma<sup>2,3</sup></li> <li>Measure PEF before, during and after 2-4 weeks of anti-inflammatory treatment (either with an ICS inhaler or an ICS/formoterol inhaler)<sup>1</sup>; if there is a positive response, but peak flow has not been monitored, consider withdrawing anti-inflammatory treatment (if no relapse, asthma is unlikely, if relapse, restart treatment)</li> </ul> <p>Tests for variable expiratory airflow limitation:<sup>2,6</sup></p> <ul style="list-style-type: none"> <li>Serial peak flow monitoring for 2-4 weeks, twice daily and including weekends and holidays if possible especially if occupational factors are suspected<sup>a</sup></li> <li>Microspirometry</li> <li>Spirometry with reversibility<sup>b</sup> (gold standard; may require referral to a hospital specialist or diagnostic service)</li> </ul> <p>Other tests that may contribute:</p> <ul style="list-style-type: none"> <li>Allergic sensitisation testing (skin prick tests and/or specific IgE). There is no role for total IgE testing.</li> <li>Testing for biomarkers of underlying inflammation:             <ul style="list-style-type: none"> <li>Blood eosinophils</li> <li>Fractionated exhaled nitric oxide (FeNO) may be useful to rule in asthma and to monitor airway inflammation and guide treatment decision-making</li> </ul> </li> <li>Challenge tests (may be done in secondary care) mannitol, methacholine, histamine, exercise and cold</li> </ul> <p><b>Objective tests suggesting an alternative diagnosis include</b> absence of bronchodilator responsiveness/variable expiratory airflow limitation on objective testing</p>

<sup>a</sup>Clear and repeated evidence of 20% variability of PEF collected using a PEF diary; <sup>b</sup>Criteria for reversibility: post-bronchodilation FEV<sub>1</sub> or FVC improvement of 10%

in the peak flow reading. Objective demonstration of bronchodilator responsiveness of airway obstruction through spirometry is the gold standard approach for a diagnosis of asthma but relies on the patient being unstable or symptomatic when the test is performed and availability. In some settings, a near-patient testing device such as an electronic microspirometer can also be used.

### Next steps (fig 4)

If the picture is clear, record your criteria for making the diagnosis and the date in the health record and initiate guideline-based treatment including an anti-inflammatory inhaler<sup>2</sup>. If the person continues to have symptoms or is not improving, perform a structured review (see DTH2) to enable them to (re)gain and maintain control. This might require a review of the diagnosis.

### References

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