

Context for the session

The Intended Learning Outcomes are:

- Discuss common causes of breathlessness and describe their key clinical features
- Demonstrate how to gather a well-rounded impression of a patient presenting with breathlessness
- Formulate a differential diagnosis in a patient presenting with breathlessness
- Demonstrate an examination of the respiratory system

Students will have covered the following in the two-week breathlessness block:

In **Case-Based Learning** a 26-year-old female bakery assistant who is a non-smoker taking over the counter ibuprofen for a sprained ankle with an acute asthma attack admitted to hospital; and her 66-year-old grandfather with severe chronic obstructive pulmonary disease (COPD).

In **Lectures, workshops and practical** learnt about:

- Pathophysiology of shortness of breath including symptoms and signs of hypoxia and hypercapnia, type I and type II respiratory failure, interpreting a vitalograph (to differentiate between obstructive and restrictive lung diseases) and arterial blood gas results
- Common disorders of the bronchi and bronchioles (asthma, acute and chronic bronchitis/COPD, bronchiectasis, bronchial carcinoma)
- Common disorders of the lung parenchyma, including pneumonia, pulmonary embolism, pulmonary oedema secondary to LVF, pneumoconiosis and fibrosis (including cystic fibrosis), extrinsic allergic alveolitis, emphysema, pulmonary metastases.
- Diseases of the pleura (pleural effusion, empyema, pleural plaque, mesothelioma, pneumothorax)
- Pathophysiology of heart failure and causes (including bacterial endocarditis), common symptoms, difference between right and left ventricular failure, ventricular dilatation (mitral valve insufficiency), complications, investigations (chest X-ray, echocardiogram and B-Type natriuretic peptide). Pharmacological principles of treatment using the Frank-Starling curve
- Haematological and biochemical investigations of breathlessness, including FBC, D-dimer, U&E, Bone profile, ABG, Troponin, B-natriuretic peptide, Carboxyhaemoglobin, Methaemoglobin
- Signs, symptoms, investigations and complications of common respiratory infections and tuberculosis. Common pathogens responsible for community-acquired, aspiration and hospital-acquired pneumonia.
- Pathology and clinical signs and symptoms of: cardiac tamponade, carbon monoxide poisoning, cyanide poisoning, brainstem stroke, opiate overdose, Guillain-Barré syndrome, myasthenic crisis, kyphoscoliosis, circumferential burns of the thorax, transection of the spinal cord above levels C3,4,5,
- Public Health: role of behaviour change (including brief interventions), empowerment and social change in health improvement and role of medical practitioners.

Specifics for breathlessness in GP clinical contact

Introduction

As part of the “Breathlessness” theme this fortnight, we would like you to discuss with your group how patients with dyspnoea present in practice. What you focus on depends on the patient(s) that you have invite to attend.

As with the previous sessions:

- refer to the [Year 2 GP handbook](#), which covers the information common to all sessions.
- use the suggested session plan below as a guide on how to use your time with your group

Allow time for:

- introductions (reflecting on any learning/action points from the previous session, chest pain)
- student-led interaction with patient(s), and
- summing up at the end/planning for next time (abdominal symptoms)

Suggested session plan

AM	PM	Activity	Details
0900	1400	Introduction 30 mins	<ul style="list-style-type: none">•Take register•Check in with your students•Review the session plan and learning objectives•Brainstorm topic
0930	1430	Clinical interview 45 mins	Students practise taking a clinical history with a patient and presenting this to the GP/group, considering clinical reasoning.
1015	1515	Break 10 minutes	
1025	1525	Examination 45 mins	Students consider/practice relevant clinical examination and summarising findings to the GP/group
1110	1610	Break 10 minutes	
1120	1620	Debrief 30 minutes	<ul style="list-style-type: none">•Discuss the day’s cases & draw out learning points•Discuss “my patient”, as appropriate•Tutor Feedback
1150	1650	Wrap up 10 mins	<ul style="list-style-type: none">•Summarise learning points and identify new learning needs•Plan for next time
1200	1700	Close	<ul style="list-style-type: none">•Submit register

The above is only a guide, and GP teachers are at liberty to use the time flexibly, according to the patients met and group's needs.

(Expert) patients

Suitable patients for the block are:

- Patients with chronic or recurrent conditions causing breathlessness such as asthma or COPD (to tie in with case-based learning); otherwise any patient with history of chronic breathlessness secondary to bronchiectasis, cystic fibrosis, fibrosing alveolitis, lung cancer.
- Patients with a previous episode of breathlessness e.g. pneumonia, pulmonary embolism, pneumothorax.

For examination, any patient with relevant history (does not need to have current chest signs).

Tasks

Ask the students to reflect on their learning from the previous block (chest pain) and how it might apply to breathlessness.

Assess their learning needs for this session: what have students learnt during their breathlessness case-based learning, what do they feel confident in, and what do they want to revisit?

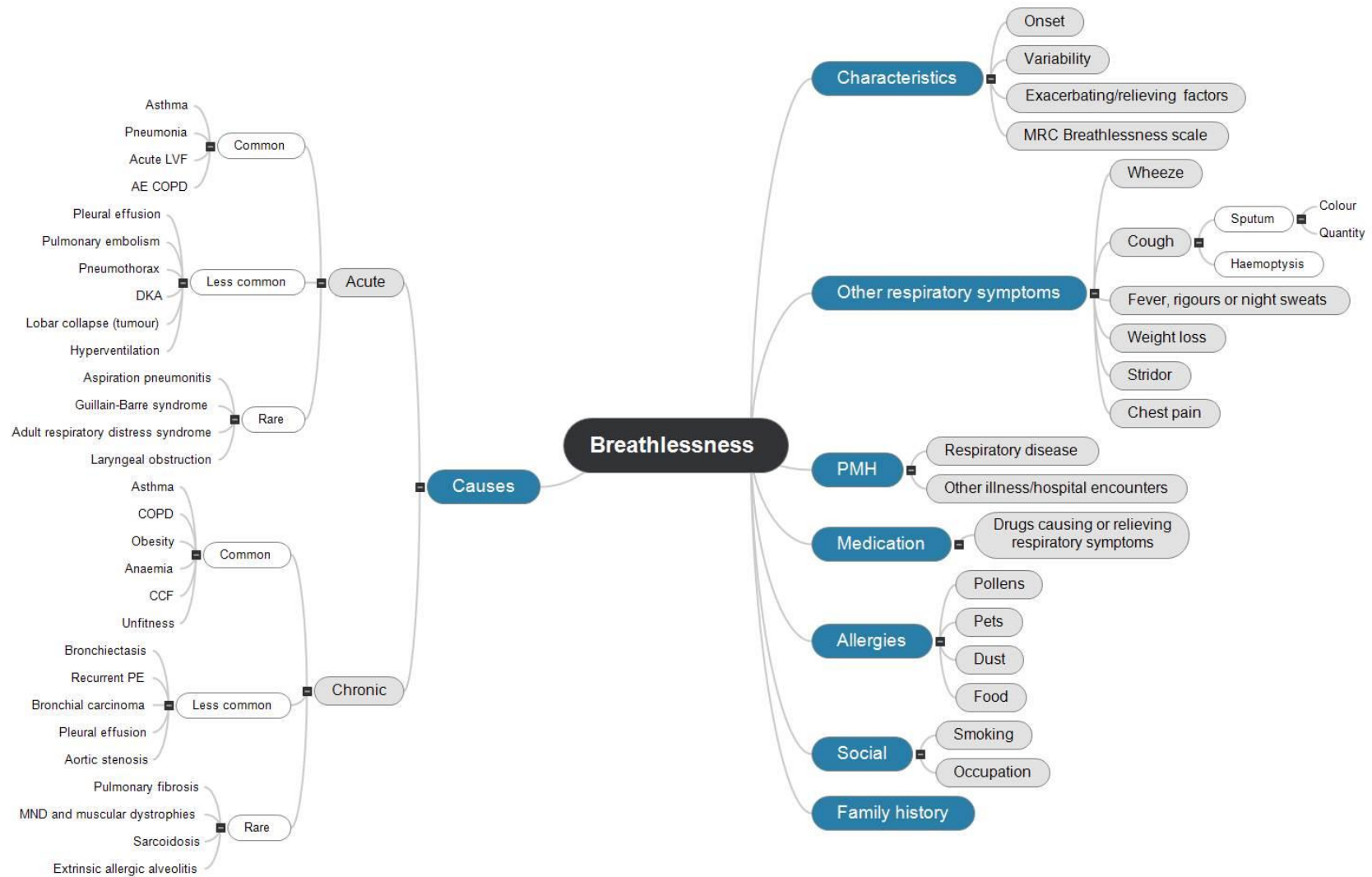
Recreating the mind maps with your group if you like (they are given to guide, not dictate what to cover), prepare for the session by:

- Brainstorm how you assess breathlessness and possible causes of breathlessness (acute and chronic) – history and examination
- Identify how to differentiate between different causes, e.g. what is the difference between asthma and COPD and how do we diagnose these conditions?

Ask your group how much examination practice they have had and what they would like to learn.

- Please run through a systematic examination with your students, as they have little other chance to practice.
- How do you measure a patient's peak expiratory flow?

Please note that although students need to be able to consider wider differential diagnoses for breathlessness, this session focus on respiratory causes.





Student information

Introduction

You will meet and interview one or more patient who has past or on-going breathing difficulties, and you will practice the routine respiratory examination. You are likely to meet patients with a history of: COPD, Asthma, Lung Cancer, Pleural Effusion, or previous Pneumonia, Pulmonary embolism or Pneumothorax.

Gathering information on breathlessness

Ask about

- Pattern of symptoms: gradual/sudden onset; stable or getting worse; variability (with exercise or by time of day)
- Exacerbating/relieving factors
- Orthopnoea?
- Paroxysmal exertional dyspnoea?

Grade the degree of breathlessness using the modified MRC scale:

Grade	Dyspnoea	Impact
0	No dyspnoea	Not troubled by breathlessness except on strenuous exercise
1	Slight dyspnoea	Troubled by shortness of breath when hurrying on a level surface or walking up a slight hill
2	Moderate dyspnoea	Walks slower than normal due to age on a level surface due to breathlessness or has to stop for breath when walking on a level surface at own pace
3	Severe dyspnoea	Stops for breath after walking 100 yards or after a few minutes on a level surface
4	Very severe dyspnoea	Too breathless to leave the house or becomes breathless while dressing or undressing

Ask about other respiratory symptoms (including their pattern, variability and factors that make them better or worse):

- Wheeze (clarify what people mean by “wheeze” – classically, a “musical sound” made by the turbulent flow of air through constricted bronchioles)
- Cough
- Sputum (quantity, colour – any blood?)
- Ankle swelling

Other associated symptoms:

- Chest pain (angina, MI, PE)
- Fever (consider infection exacerbation of chronic cause of breathlessness)
- Palpitations
- Calf pain or swelling (DVT complicated by PE)
- Change in voice or stridor
- Loss of appetite or weight

Systems review

Past medical history. In context of the respiratory system the following are important to note:

- Atopy, coronary heart disease, hypertension, connective tissue diseases.
- Previous cancers +/- chest radiotherapy. Malignancy raises the risk of recurrence, metastases, thromboembolism and radiotherapy for lung cancer can cause radiation pneumonitis.

Social history. Smoking is a risk factor for COPD and lung cancer. Think about occupational exposure to dust/flour/chemicals/ asbestos.

Medications. Any medications (e.g. methotrexate or amiodarone) that can have adverse respiratory effects?

Family history: Atopy? Conditions that may run in the family e.g. Alpha-1 antitrypsin deficiency can result in lung disease.

ICEIE. Assess the impact on the patient — how is the breathlessness affecting your patient's functioning?

Respiratory examination



Prepare (WIPPPE)

- **W**ash hands
- **I**ntroduce yourself and identify patient
- **P**ermission – explain procedure and gain consent
- **P**osition – 45° (cardiovascular and respiratory)
- **P**ain – check that the patient is comfortable
- **E**xposure – adequately expose the whole upper torso (or at least from the bottom of the sternum to thorax)

General observation: Look at the patient and around the bed (if in hospital/in their home) for any clues as to what is going on: sputum pot, supplemental oxygen, GTN spray or other medication, walking aids, catheter etc.

- Do they appear to be in pain?
- Do they look unwell?
- Is the patient cyanosed?
- Is the patient thin or cachectic?
- Is the patient breathless at rest or on moving? Are they using any accessory muscles such as the sternocleidomastoid?
- Do they have a hoarse voice?

Hands and nails



Figure 1 Assessing for CO₂ retention flap



Figure 2 Finger clubbing

Look at the hands first then move up to wrist to check pulse.

- Clubbing. When associated with painful wrists and ankles, this is hypertrophic, pulmonary osteoarthropathy (HPOA) and associated with lung cancer.
- Tar staining of the fingers (smoking)
- Capillary refill time
- Peripheral cyanosis
- Palmar erythema
- Dupuytren's contracture
- **Asterixis** – CO₂ retention flap. Looking for a jerking flap of the hands involves asking the patient to stretch out their arms and hyperextend their wrists, so their hands are up in the air. You look for a coarse upward and downward bobbing motion of the hands. This is found in CO₂ retention and in liver failure.

Check respiratory rate.

Face and eyes



Figure 3 Superior vena cava obstruction (SVCO)

A dusky appearance and swelling of the face and neck can be caused by a mediastinal tumour pressing on the superior vena cava (SVC).

Eyes

- Conjunctival pallor (anaemia)?
- Drooping of the eyelid (Ptosis) or a smaller pupil on one side, indicative of Horner's syndrome (interruption of the sympathetic chain, this can occur because of a lung cancer at the lung apex).



Mouth

Central cyanosis—check under tongue. Pursed lip breathing on expiration. Look for oral candidiasis (associated with corticosteroid and antibiotic use)

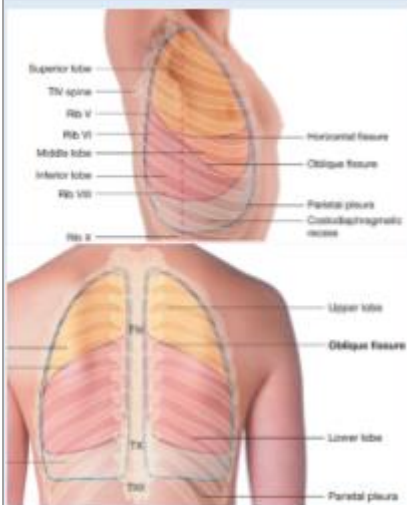
Neck

JVP can be raised in Cor Pulmonale* or SVC obstruction and acutely raised in tension pneumothorax and PE.

Examine the lymph glands by standing behind the patient

CHEST	<ul style="list-style-type: none"> Examine anterior chest then get patient to sit forwards to examine the posterior chest.
Inspection	<ul style="list-style-type: none"> Shape of chest and movements of chest wall. A barrel shaped chest indicates hyperinflation from chronic airway obstruction. You may see scars on the chest wall, or drains or pacemakers. Is there any intercostal recession indicating forced rapid inspiration seen in acute infection and asthma?
Palpation  Figure 4 Assessing for tracheal deviation  Figure 5 testing for chest expansion	<p>Tracheal deviation can be assessed by placing 3 fingers (gently and with warning) into the sternal notch – if central, the trachea should be felt under your middle finger.</p> <p>Check for expansion—cup your hands (fingers spread) around the patient's upper anterior chest pressing finger tips into the mid axillary line, pull your hands slightly together and raise your thumbs off the chest wall, as the patient breathes in you can see how much each of your thumbs move (should be about 5cm) and if there is an asymmetry.</p> <p>Repeat on the lower anterior chest wall and on the back.</p> <p>Tactile vocal fremitus (or vocal resonance, see below)*. Place the edge of your hands on the front of the patient's chest and ask them to say "99". Repeat this with the hands placed more laterally. Increased fremitus may be felt if there is underlying consolidation.</p> <p>Apex beat (lowest, most lateral position of cardiac impulse) – as should be 5th intercostal space, mid-clavicular line. Mediastinal masses may displace the apex, the apex beat may be absent in large pleural effusion or pneumothorax. Hyperinflation may make it difficult to feel (and hear). If it is difficult to feel you can ask the patient to lean to their left side.</p> <p>Feel for right ventricular heave (palm left of the sternum).</p>
Percussion	<p>Produces a hollow resonance, it produces a dull thud without resonance over fluid and consolidation. Apply middle finger of your non-dominant hand along an intercostal space and tap it with the flexed index or middle finger of your dominant hand. Percuss down the chest comparing left with right, avoid the scapula so move out as you move down. Hyperresonance can be hard to assess but accompanied by absent breath sounds indicates pneumothorax.</p>

Auscultation



Ask patient to take normal breaths in and out through their mouth (can ask patient to breathe more deeply if breath sounds are quiet).

Compare left to right starting with the bell of the stethoscope over the apex of the lung. Work your way down comparing left to right. Think about the surface anatomy of the lungs as you listen. Listen to the lateral chest in the mid axillary line.

Note if the breath sounds are

- normal (vesicular), soft and muffled, or absent
- loud and harsh (bronchial and indicates underlying consolidation).
- asymmetrical (if they are different side to side)

And if there any added sounds (inspiratory stridor, wheeze, crackles, pleural rubs). If you hear crackles, ask the patient to cough. If there are crackles decide if they are fine or coarse and if they change with the breath.

Vocal resonance (or tactile vocal fremitus)*:

Breath sounds can reveal consolidation (bronchial breath sounds), air or fluid in the pleura (absent breath sounds). This can be confirmed by asking the patient to generate laryngeal sounds on purpose (Ask the patient to say “99” and move the stethoscope in the same places you auscultate).

Posterior chest

Repeat inspection, palpation (and lymph glands if not already done), percussion and auscultation and check for sacral oedema.

Lower limb

Check for swelling indicative of DVT. Pitting oedema.

Investigations

Check Oxygen saturations and Peak expiratory flow rate if relevant. Look at Chest X-ray—if available.

Closing

Cover patient/help them dress or get off couch if required, thank patient. Explain any findings to patient. Wash hands.

* You do not need to do both vocal resonance and tactile fremitus as they work on the same principle

Differential diagnoses

Acute breathlessness

Acute dyspnoea is new onset or abruptly breathlessness over less than two weeks. It can be caused by life-threatening conditions such as a large pulmonary embolism. Clinical evaluation and monitoring should be combined with investigations such as chest x-ray, assessing acid-base status e.g. arterial blood gases and ECG.

The following suggest serious causes:

- Respiratory rate > 30 breaths per minute.
- Tachycardia > 130 beats per minute.
- Systolic BP < 90mmHg, or diastolic BP < 60mmHg (unless this is normal for them).
- Severe hypoxaemia--Oxygen saturation < 92% or central cyanosis (if no history of chronic hypoxia).
- Hypercapnia
- Altered level of consciousness (exhaustion or reduced GCS).
- High temperature (especially if more than 38.5°C).

A few causes (by no means an exhaustive list) include:

- **Upper airway obstruction** e.g. inhaled foreign body/anaphylaxis/epiglottitis
- **Infective:** Infection (especially infective exacerbations of asthma or COPD) are the commonest reason for an acute presentation of breathlessness but tend to come on over days not suddenly.
- **Cardiac:** Cardiac tamponade, arrhythmias, acute coronary syndrome. Pulmonary oedema can also occur or worsen in a short time frame.
- **Acute asthma:** acute or subacute worsening of symptoms e.g. cough, wheeze, chest tightness with decreased objective pulmonary function compared to baseline e.g. peak expiratory flow rate and FEV1
- **Pneumothorax:** Causes unilateral, sudden onset pleuritic pain and breathlessness. There may be reduced breath sounds and hyperresonance on percussion of the chest.
- **Pulmonary embolism:** Patients may present with breathlessness, tachypnoea, and pleuritic chest pain, or there may be signs of a DVT. Patients may also be tachycardiac, have haemoptysis, or hypotension/syncope.
- **Anxiety:** Triggered by worries or a stressful situation and associated with feelings of panic, sweating, dizziness and hyperventilation.

Intermittent or chronic breathlessness

Chronic dyspnoea is defined as lasting two weeks or more. It's not always straightforward to make the diagnosis as pathologies can co-exist, and early COPD and cardiac failure may initially have no clinical signs initially and normal chest x-ray.

A combination of clinical assessment (history, examination and pulse oximetry) should be combined with pulmonary function tests, blood tests (especially FBC), ECG, and chest x-ray.

A list of causes is in your textbook Macleod's clinical diagnosis available online through the library.

Chronic obstructive pulmonary disease (COPD)

Chronic obstructive pulmonary disease (COPD) is characterised by airflow obstruction, which is usually progressive, not fully reversible and does not change markedly over several months. It is now the preferred term which covers many previously used clinical labels (chronic bronchitis, emphysema, chronic obstructive airways disease, chronic airflow limitation). The most important cause is smoking.

Typical clinical features of COPD include:

- Breathlessness
- chronic cough
- regular sputum production
- frequent winter "bronchitis"
- wheeze.

On examination patients may have:

- Hyperinflated chest
- Use of accessory muscles
- Poor chest expansion
- Pursing of lips on expiration
- Cyanosis
- Hyper resonant chest with reduced cardiac dullness
- Peripheral oedema and raised JVP
- Cachexia

Spirometry is required to make the diagnosis; the presence of a post-bronchodilator $FEV_1/FVC < 0.70$ confirms the presence of persistent airflow limitation.

Classification of COPD	FEV_1/FVC	FEV_1	FEV_1 is the volume of air the patient can exhale in the first second of forced expiration FVC is the total volume of air the patient can forcibly exhale in one breath FEV_1/FVC is the ratio of FEV_1 to FVC expressed as a percentage
Mild	<0.7	$>80\%$	
Moderate	<0.7	$\geq 50-79\%$	
Severe	<0.7	$\geq 30-49\%$	
Very severe	<0.7	$<30\%$	

A chest x-ray along with blood tests e.g. FBC can exclude other diagnoses/complications of COPD.

COPD management includes **smoking cessation** to prevent worsening, treating infections promptly and symptom management, pulmonary rehabilitation to improve exercise capacity and influenza and pneumococcal vaccination.

Asthma

Asthma is a clinical diagnosis, tests increase probability, but no test is diagnostic. There is presence of more than one of the following *variable* symptoms: breathlessness, wheeze, cough, or chest tightness.

You should do a structured clinical assessment from history/examination, previous records:

- Symptoms are recurrent, episodic and commonly diurnal (worse at night or in the early morning) and can be triggered by cold, exercise, viruses, or allergens—ask about triggers.
- There is absence of symptoms that would support an alternative diagnosis.
- There may be personal/family history of atopy.
- There may be recorded episode of wheeze, or recorded variable PEF or FEV₁

Also ask about medication (NSAIDs or betablockers may trigger symptoms). Consider occupational asthma in adult-onset asthma that is worse at work.

Variable peak expiratory flow test readings can support a diagnosis of asthma.

- Guidelines recommend doing this when other tests are inconclusive, but it is easy to do and helps the patient with self-monitoring (which is then useful for patient held asthma action plans in the management of asthma).
- The patient measures their peak flow am & pm for 2-4 weeks and an average taken of the highest and lowest readings, >20% variability is a positive result (but may not pick up variability if asthma is not active).

Other tests include:

- Spirometry, with bronchodilator reversibility testing
- Fractional exhaled Nitric Oxide (FeNO) (variable availability in primary care)