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How to perform chest auscultation and interpret the findings

Authors Jaclyn Proctor is respiratory advanced nurse practitioner at Warrington and Halton NHS Foundation Trust; Emma Rickards is respiratory nurse consultant at Liverpool Heart and Chest Hospital NHS Foundation Trust and Knowsley Community Respiratory Service.

Abstract Chest auscultation is frequently used in the clinical examination of patients. This article explains the clinical procedure for chest auscultation and provides a guide to interpreting findings.

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Box 1. IPPA assessment

A commonly used acronym in clinical examination of the chest is IPPA:
Inspection
Palpation
Percussion
Auscultation
This is an example of a systemic assessment tool but other tools are available (Simpson, 2015)

Although the first stethoscope for auscultation was invented in 1816 by René-Théophile-Hyacinthe Laennec, the use of auscultation dates back to Hippocrates, who would place his ear to his patient's chest and listen for sounds.

Auscultation is an important part of an assessment of the respiratory system and is also used for cardiac and gastrointestinal examination. The procedure should always form part of an holistic assessment and must be viewed alongside the patient's clinical history (Box 1).

The Nursing and Midwifery Council (2018) has included chest auscultation and interpretation of findings in the *Standards of Proficiency for Registered Nurses*, and student nurses now learn this skill as undergraduates.

To undertake a thorough assessment of the chest, including auscultation, it is essential to understand the anatomy and physiology of the respiratory system. Fig 1 illustrates the anatomy of the lungs and Fig 2 highlights the location of the lung lobes from an anterior chest perspective. Cedar (2018) provides further information on the physiology of breathing.

What is chest auscultation?

Vesicular breath sounds occur when the vocal cords vibrate during inspiration and expiration, when the vibrations are transmitted to the trachea and bronchi. These sounds are audible when auscultation is performed using a stethoscope. Chest auscultation involves listening to these internal sounds to assess airflow through the trachea and the bronchial tree (Sarkar et al, 2015).

Familiarity with the normal vesicular breath sounds found at specific locations on the chest enables health professionals to identify abnormal sounds, which are often referred to as adventitious. It is not always possible to determine from which lobe of a lung a sound is emanating. Using the four chest X-ray zones can, therefore, be helpful:

- Apical zone: above the clavicles;
- Upper zone: below the clavicles and above the cardiac silhouette;
- Mid zone: level of the hilar structures;
- Lower zone: bases.

Equipment

The bell of the stethoscope is generally used to detect high-pitched sounds – at the apex of the lungs above the clavicle; its diaphragm is used to detect low-pitched sounds in the rest of the chest (Dougherty and Lister, 2015). Fig 3 illustrates parts of the stethoscope.

Infection prevention

The stethoscope is an important tool for clinical assessment, but can become

Fig 1. **Anatomy of the lungs**

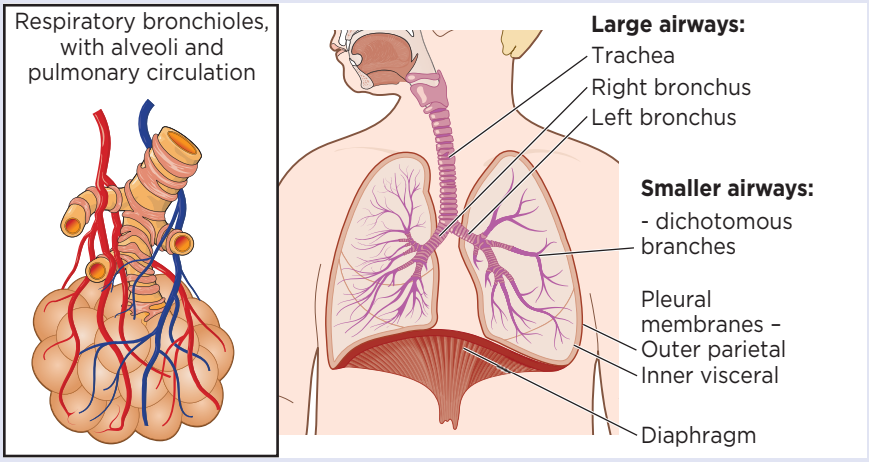

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Fig 2. **Location of the lung lobes (anterior chest)**

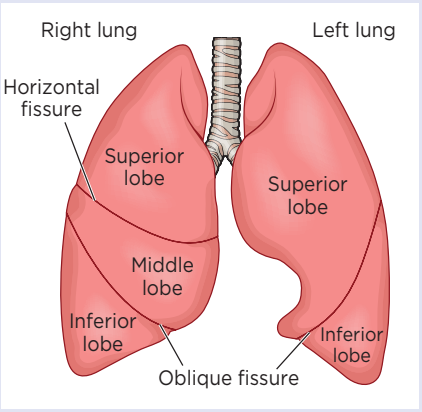


Fig 3. **Parts of the stethoscope**

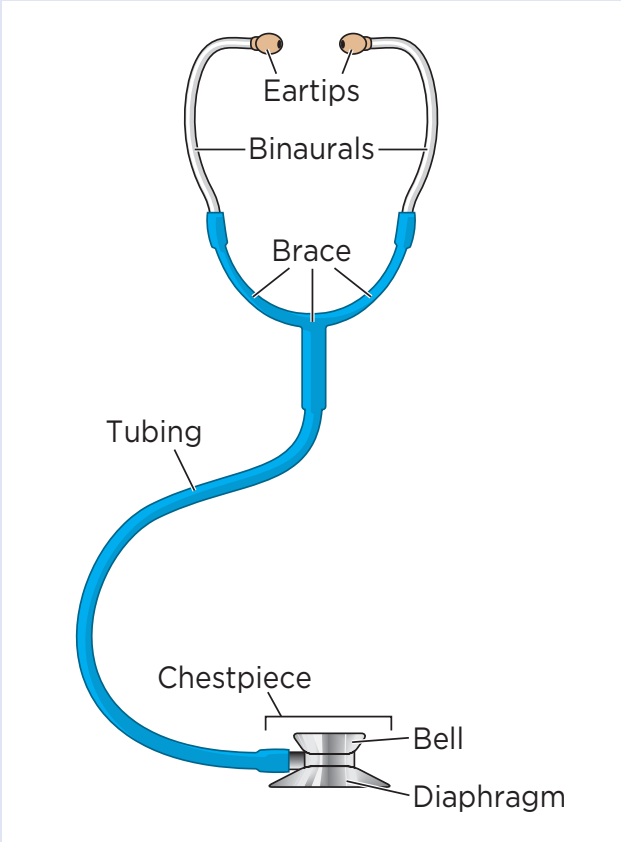
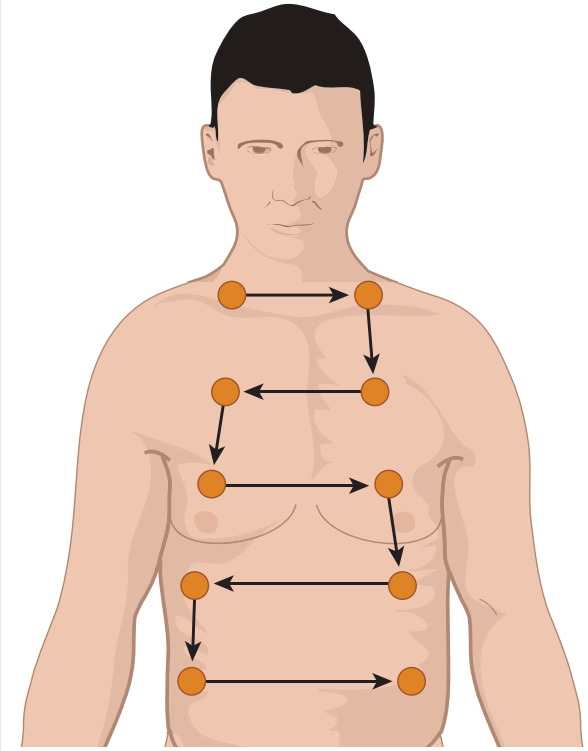


Fig 4a. **Anterior chest auscultation**



Starting at the top of the chest (first intercostal space), use a 'stepladder' approach to listen to breath sounds on the anterior chest finishing at the seventh intercostal space

contaminated by micro-organisms (Longtin et al, 2014). Adherence to local infection prevention and control policies, including the cleaning of equipment between every patient contact, is essential. Nurses are advised to have a stethoscope for their own use, as sharing equipment may increase infection risk and maintaining clean ear tips can be difficult.

Non-sterile gloves are not required routinely for this procedure. Nurses need to assess individual patients for the risk of exposure to blood and body fluids (Royal College of Nursing, 2018) and to be aware of local policies for glove use.

Preparing the environment and patient

Listening to a patient's chest to establish breath and any other sounds requires a quiet area, so that health professionals can fully appreciate what they hear and interpret their clinical relevance (Sarkar et al, 2015).

Chest auscultation requires the chest and back to be exposed, so measures should be taken to ensure the patient's privacy and dignity is maintained at all times. A chaperone should be offered for the assessment if this is considered appropriate.

Positioning the patient

The optimal position for chest auscultation is sitting in a chair, or on the side of the bed. However, the patient's clinical condition and comfort needs to be considered during the examination and some patients may only tolerate lying at a 45° angle. Both these positions will facilitate the assessment (Ferns and West, 2008). You may need help to support the patient in a comfortable position during the examination.

The procedure

1. Ensure your stethoscope has been cleaned following local infection prevention and control guidance.

2. Discuss the procedure with the patient and gain informed consent.

3. Check that the patient is kept warm and the area is free from drafts.

4. Screen the bed to maintain patient privacy and dignity.

5. Decontaminate your hands according to local policy.

6. Position the patient comfortably so you can access their chest.

7. Remove or rearrange the patient's clothing as necessary to enable you to see the chest.

8. See whether the stethoscope feels cold. Warm it between your hands if necessary before applying it to the chest to avoid discomfort for the patient.

9. Position the ear tips in your ears so they point slightly forward towards the nose; this will help to create a seal and will reduce external noise.

10. Holding it between the index and middle finger of your dominant hand, place the chest piece of the stethoscope flat on the patient's chest using gentle pressure.

11. Using a 'stepladder' approach (Fig 4a) listen to breath sounds on the anterior chest. This technique allows you to compare one side of the chest with the other in a systematic manner and detect any asymmetry. The stethoscope should be in

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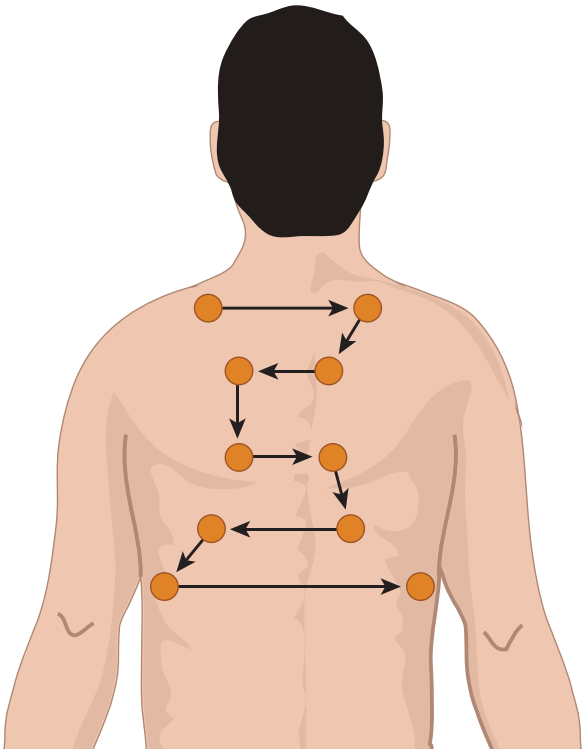
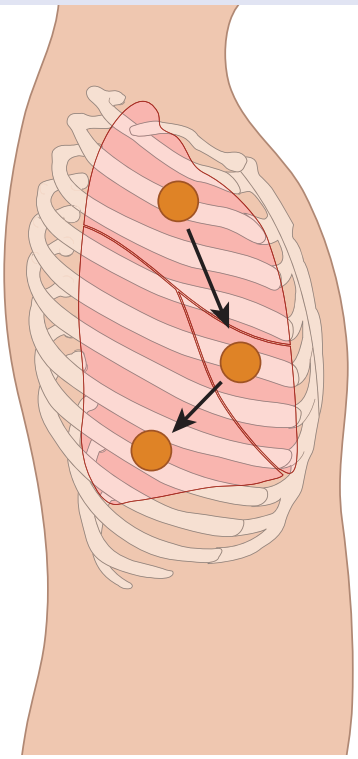
Fig 4b. **Posterior chest auscultation**



Start at the first intercostal space of the posterior chest moving downwards, avoiding the scapula, to the seventh intercostal space

Fig 4c. **Right lateral chest auscultation**



Move from the peak of the axilla to between the seventh or eight rib on the right and left.

contact with the chest for a full cycle of inspiration and expiration at each point on the stepladder (Ferns and West, 2008).

12. Use the step ladder approach for the posterior chest (Fig 4b); avoid the scapula as lung sounds cannot be heard through bone (Ferns and West, 2008).

13. Ask the patient to move their right arm to the side so the right lateral chest can be assessed (Fig 4c). Starting with the upper lobe move to the middle lobe, and finally the lower lobe at the bottom (Ferns and West, 2008).

14. Repeat on the left side where the lung is made up of an upper lobe and lower lobe.

15. Replace the patient's clothing and make them comfortable.

16. Explain your findings to the patient and check whether they have any questions.

17. Decontaminate your stethoscope.

18. Decontaminate your hands.

19. Record findings in the patient's notes (Box 2).

Interpreting findings

There are several adventitious sounds but the main ones to be aware of are crackles, wheeze and absent breath sounds.

Crackle

Crackles are generated within the small airways; they predominantly occur during the inspiratory phase but can happen on expiration. Clinical conditions where crackles maybe present include pneumonia, pulmonary fibrosis, chronic obstructive pulmonary disease (COPD), lung infection and heart failure.

Crackles can be categorised as coarse or fine; distinguishing between these can be significant – coarse crackles may indicate pneumonia, while fine crackles may suggest pulmonary oedema.

It takes practice to learn to differentiate between coarse and fine crackles and interpretation remains subjective.

Wheeze

Wheeze often occurs on expiration, but can also occur on inspiration. Wheezing is often louder than usual breath sounds and in some patients it is audible from some distance or when the patient breathes through the mouth. With a stethoscope you may also be able to hear a wheeze over the patient's trachea (Sarkar et al, 2015).

Wheeze is often referred to as a musical sound and is sometimes considered to be a precondition for conditions such as airflow obstruction (Simpson, 2015).

Clinical conditions such as asthma are associated with a high-pitched musical wheeze that may be more evident on expiration. An inspiratory wheeze (stridor) usually results from an upper airway obstruction such as laryngeal oedema or the presence of a foreign body. A wheeze on both inspiration and expiration could be due to secretions in the airways (Welch and Black, 2017) and the patient may need to be advised how to clear their chest of secretions.

Absent breath sounds

This describes a lack of audible breath sounds on auscultation. It could be caused by lung disorders that inhibit the transmission of sounds, for example, a pneumothorax, pleural effusion or areas of lung

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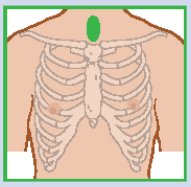
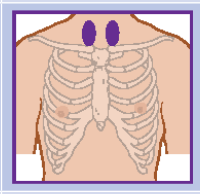
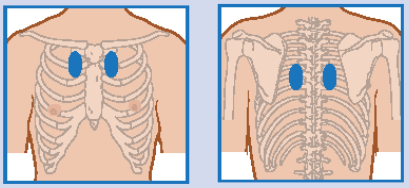
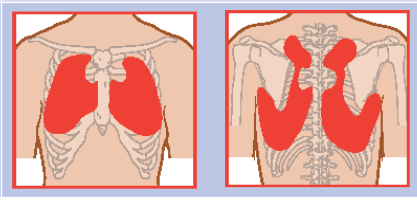
Table 1. **Quality of normal breath sounds**

Breath sound	Intensity and pitch	Inspiratory: expiratory ratio	Positions to hear sounds	
Tracheal 	Very loud, high pitch	Inspiratory and expiratory sounds equal	Over the trachea (above the subclavicular notch)	
Bronchial 	Loud, relatively high pitch	Inspiratory sound shorter than expiratory	Over the manubrium (just above the clavicles)	
Bronchovesicular 	Medium loudness, intermediate pitch	Inspiratory and expiratory sounds equal	First and second intercostal spaces next to the sternum and between the scapula	
Vesticular 	Soft, relatively low pitch	Inspiratory sound longer than expiratory	Most of the lung field	

Box 2. **Recording the findings of chest auscultation**

Accurate recording is essential to enable clinical comparison to be made when the patient is reassessed (Table 1). It is important to record:

- Location of auscultation – for example, "anterior, posterior and lateral chest assessed"
- Quality – description of quality or timbre can be used to differentiate between two sounds that have the same pitch and loudness – for example, harsh, rustling, tubular, snoring (Sarkar et al, 2015)
- Location of sounds: if there are abnormal sounds, where did you hear them?

consolidation. All these conditions prevent airflow reaching parts of the lung due to a pathological change in the function of the lung.

Case studies

Emma Green*, aged 65, attended the emergency department with history of a productive cough for five days, reduced exercise tolerance and increased breathlessness. She reported pain on right lower aspect of the posterior chest. On assessment, Ms Green reported no underlying respiratory disease. Chest auscultation identified reduced air entry on the right lower lobe and additional coarse crackles on inspiration in the right mid zone.

In this case the auscultation findings and clinical history suggest a diagnosis of pneumonia.

Raphael Garbet*, aged 45, was admitted via his GP with increased breathlessness and an audible wheeze. He had recently started treatment for asthma. His symptoms had been present for 24 hours and he had been using his salbutamol inhaler but remained symptomatic. His personalised asthma action plan suggested he should visit his GP. On assessment, Mr Garbet was using accessory muscles to breathe and was pale. He was only able to complete short sentences and was breathless at rest. Chest auscultation revealed inspiratory/expiratory wheeze in all lung fields on the left and right side.

In this case, the auscultation findings along the clinical history suggest a diagnosis of acute exacerbation of asthma.

* The patients' names have been changed

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NMC proficiency

This practical procedure will help you to meet the NMC (2018) proficiency standard (nursing procedures: 2.8) to: Use evidence-based, best practice approaches to undertake chest auscultation and interpret findings.