The respiratory system examination

The physical examination

- Inspection
- Palpation
- Percussion
- Auscultation

Inspection

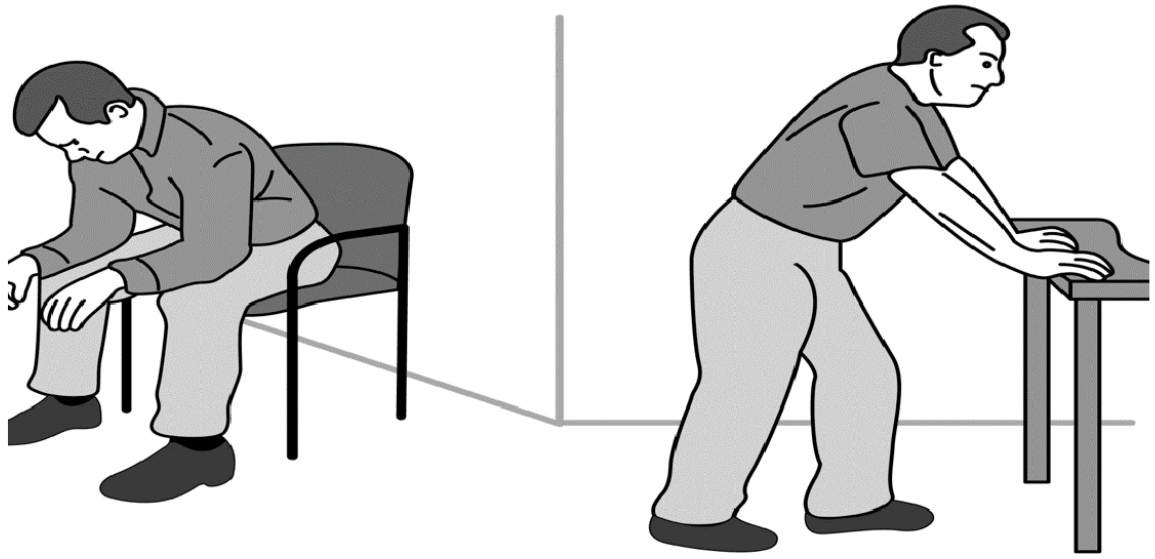
- Consciousness, alertness, orientation.
- Position of the patient (Sitting or lying flat)
- Respiratory distress and respiratory rate
- Presence on nebulizers, inhalers and oxygen therapy
- Cyanosis
- Any audible sounds (wheeze, hoarseness of voice, stridor).
- Respiratory rate

Respiratory distress

- Tachypnea
- Indrawing of the intercostal spaces
- Using accessory muscles (sternocleidomastoid, trapezius and scalenes)

Tripod position

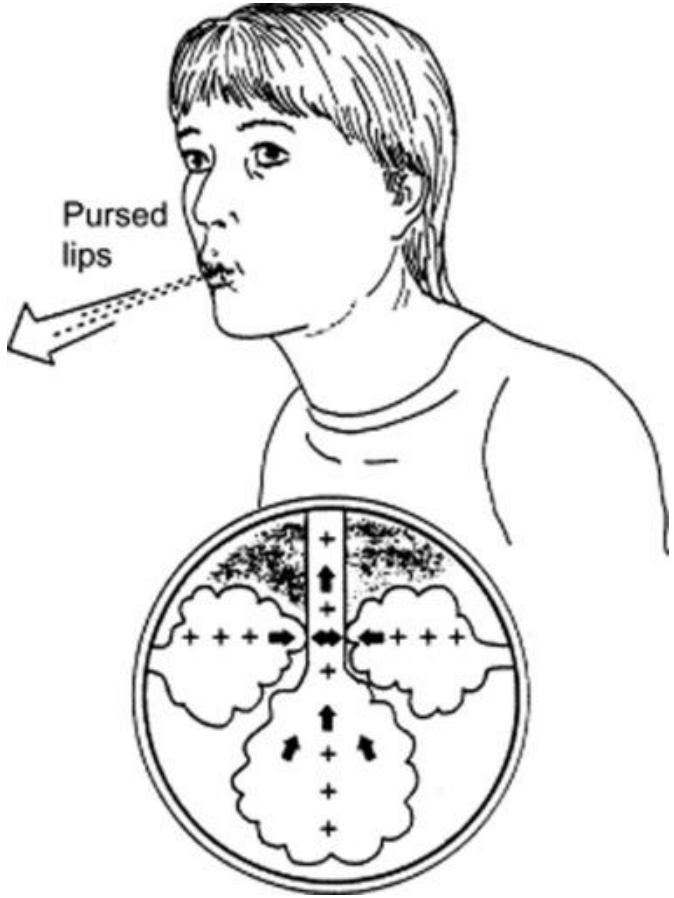
- Sitting forward and bracing arms on table, allowing them to use pectoralis major to pull the ribs outward during inspiration. Thus, increasing lung volume and acheiving negative intrathoracic pressure.



Pursed lips

- This manoeuvre increases positive end-expiratory pressure, reducing small-airway collapse and improving ventilation.

- May be seen in patients with severe COPD



Respiratory pattern

- Cheyne–Stokes respiration: is cyclical with increasing rate and depth of breathing, followed by diminishing respiratory effort and rate, ending in a period of apnoea or hypopnoea.

- This relates to altered sensitivity of the respiratory centre to CO2 and delay in circulation time between the lung and chemoreceptors.

Chest deformity

- Normally; The chest should be symmetrical. The anteroposterior diameter should be less than the lateral diameter.
- Congenital as in pectus excavatum
- Acquired as in pectus carinatum
- Asymmetry of the chest
- Kyphosis, scoliosis

Hands and arms

- Examine hands for cyanosis, tar staining and nail discoloration as yellow brown nail discoloration as in yellow nail syndrome
- Examine for small muscle wasting which may indicate T1 root damage by apical lung tumor
- Examine for finger clubbing and hypertrophic pulmonary osteoarthropathy
- Examine for fine tremor and course flapping tremor
- Check the pulse

Fig. 7.10 Asterixis. Hand and arm position for observing the 'flapping tremor' of CO_2 retention.

Hypertrophic pulmonary osteoarthropathy

- Painful tender swelling of the wrists and ankles
- Rare complication of lung cancer
- Accompanies pronounced finger clubbing
- X-ray shows subperisoteal new bone formation overlying the cortex of the long bone

Face

- Check conjunctiva for anemia
- Check tongue for central cyanosis
- Check for ptosis and pupil asymmetry

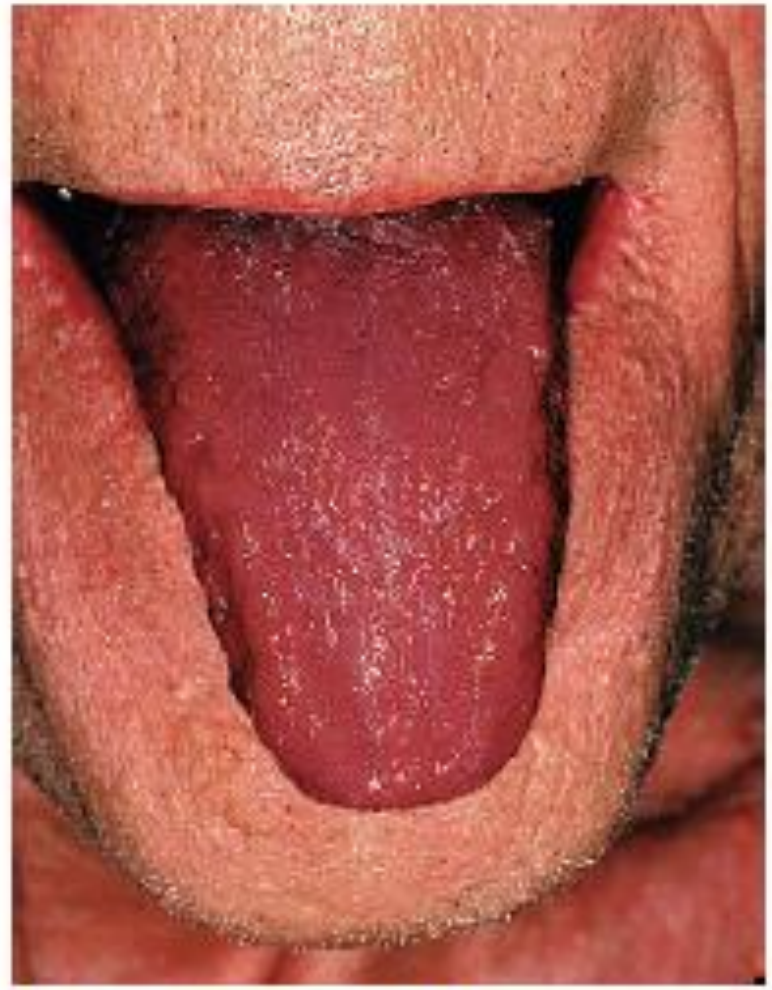


Fig. 7.5 Central cyanosis of the tongue.

Horner’s syndrome

- Tumor at the root of the neck may disrupt the sympathetic nerves to the eye
- Causes unilateral ptosis and pupillary constriction

Superior vena cava obstruction

- Usually indicates tumor invasion of the upper mediastinum.
- Causes dusky generalized swelling of the head, neck and face with subconjunctival edema.

A

B

Fig. 7.11 Superior vena caval obstruction. (A) Distended neck veins. **(B)** Dilated superficial veins over chest.

Neck

- Support the patients head with a pillow
- Examine JVP
- Check for tracheal deviation
- Check cricosternal distance
- Examine cervical LN from behind with the patient sitting forward

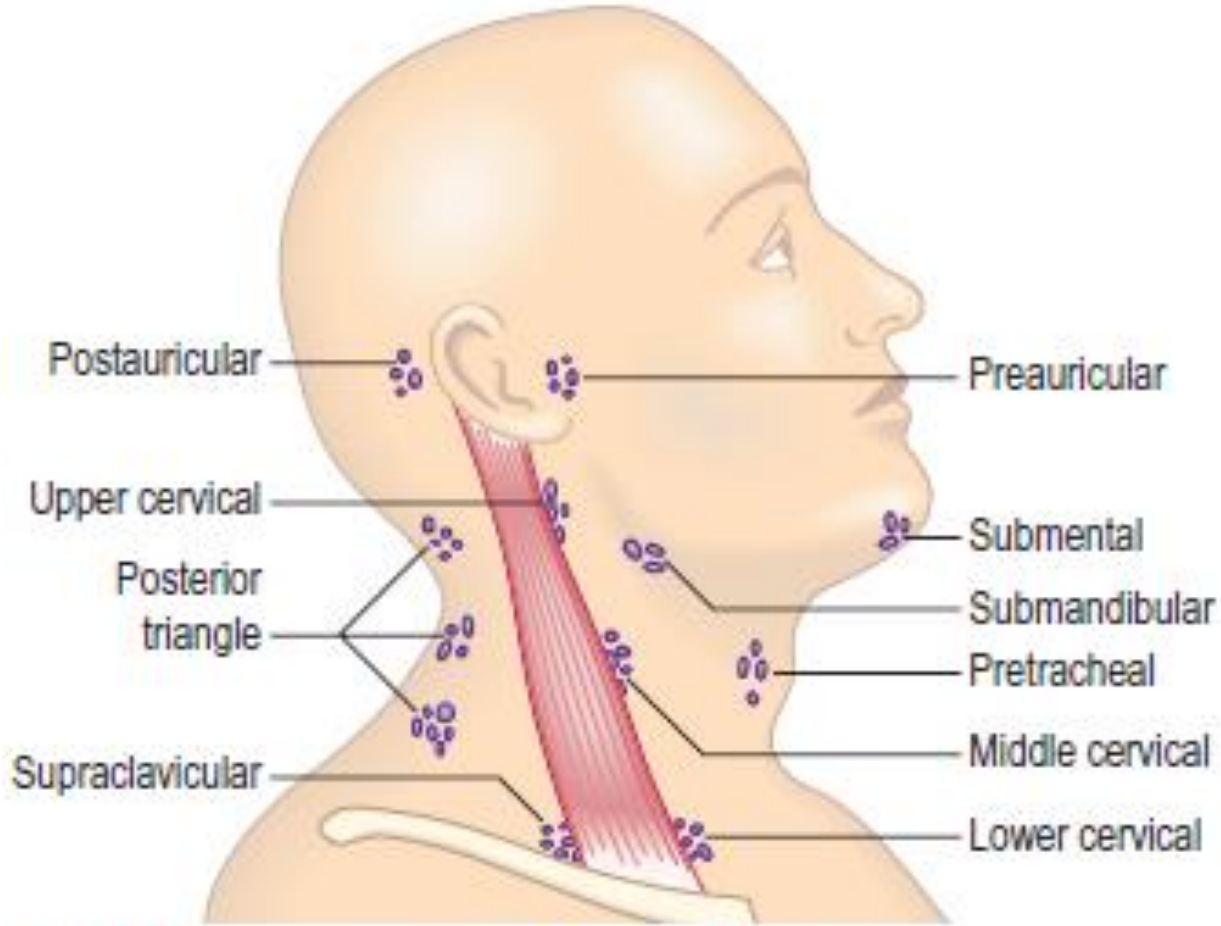
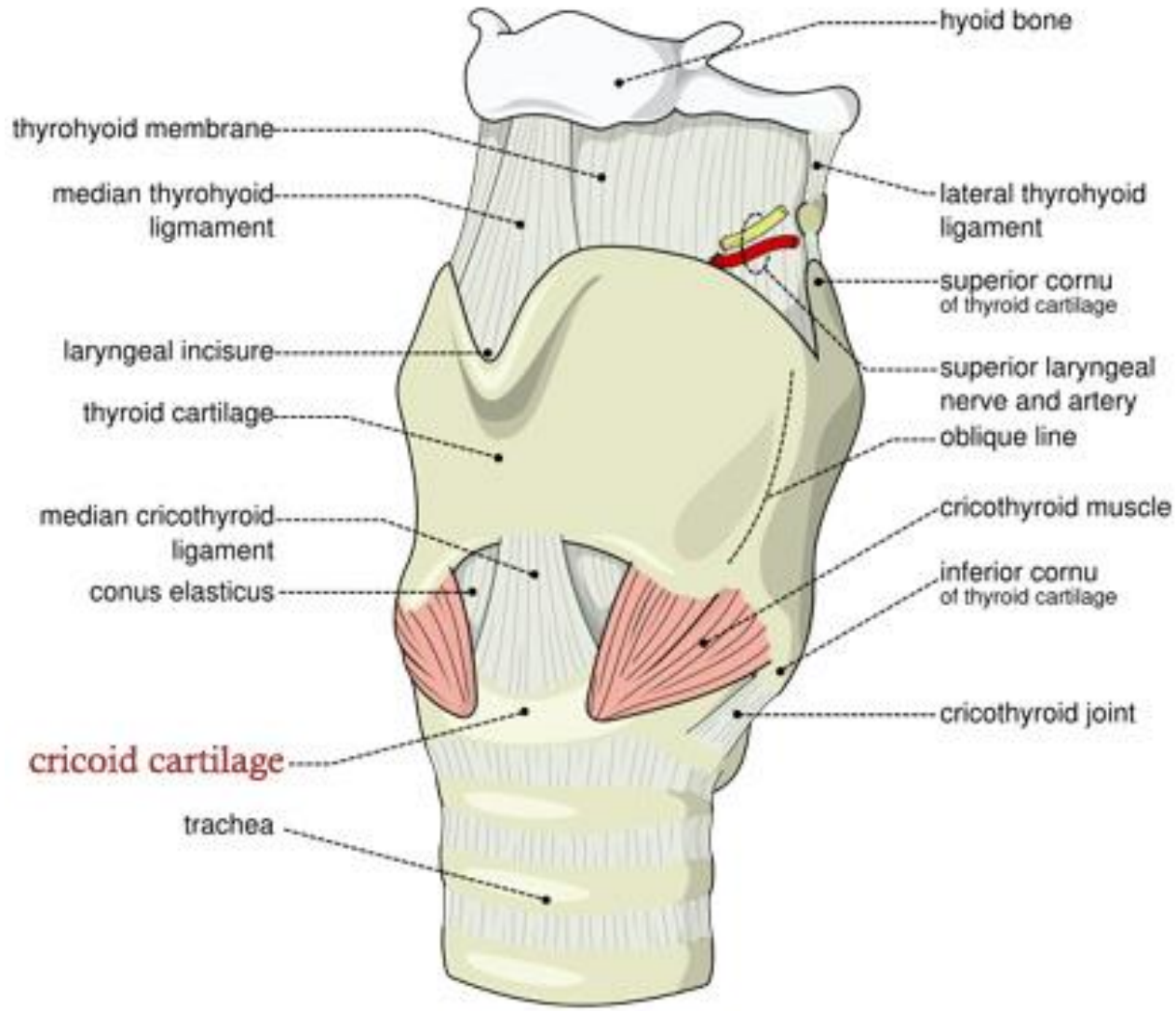
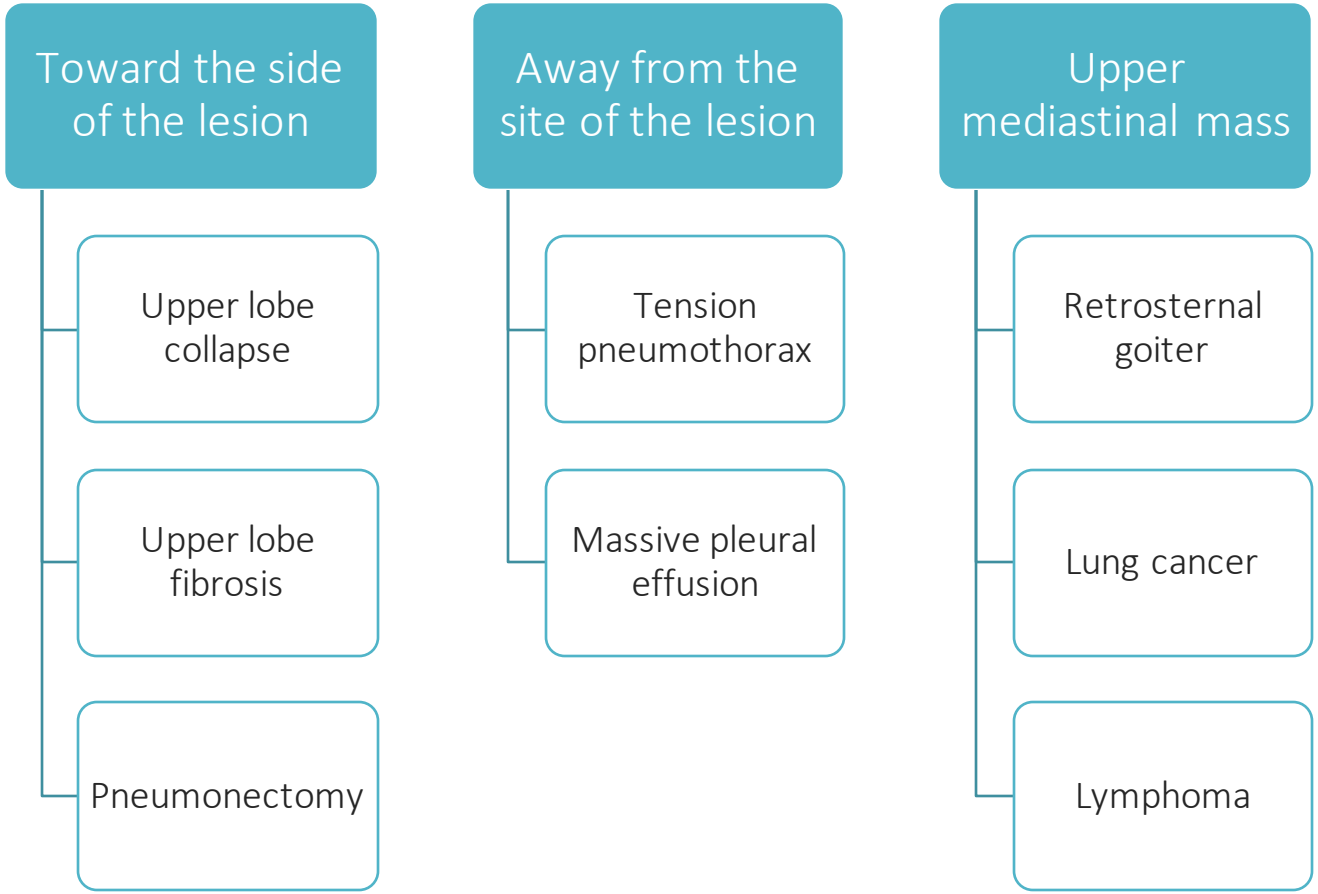


Fig. 7.12 The lymph node groupings in the neck.

Fig. 7.15 Examining for tracheal shift.


hyoid bone
thyrohyoid membrane
median thyrohyoid ligmament
lateral thyrohyoid ligament
superior cornu of thyroid cartilage
laryngeal incisure
superior laryngeal nerve and artery
thyroid cartilage
oblique line
median cricothyroid ligament
cricothyroid muscle
conus elasticus
inferior cornu of thyroid cartilage
cricothyroid joint
cricoid cartilage
trachea

Tracheal deviation



Thorax

- Inspection
- Palpation
- Percussion
- Auscultation

Inspection

•From the foot of the bed:

Shape

symmetry

pattern of breathing

chest deformities

- From the side of the patient:

Scars

Skin lesions

Swellings

Dilated veins

Axilla

Palpation

- Superficial palpation
- Apex beat
- Palpate for right ventricular heave
- Tactile vocal fremitus
- Assess thoracic expansion

❖Apex beat:

Displaced by dilatation of ventricle or displacement of lower mediastinum

Impalpable in hyperinflation in obstructive lung disease when the lingual comes between the heart and the chest wall

❖Right ventricular heave:

found in severe pulmonary hypertension, is best felt at the left sternal edge

❖Tactile vocal fremitus:

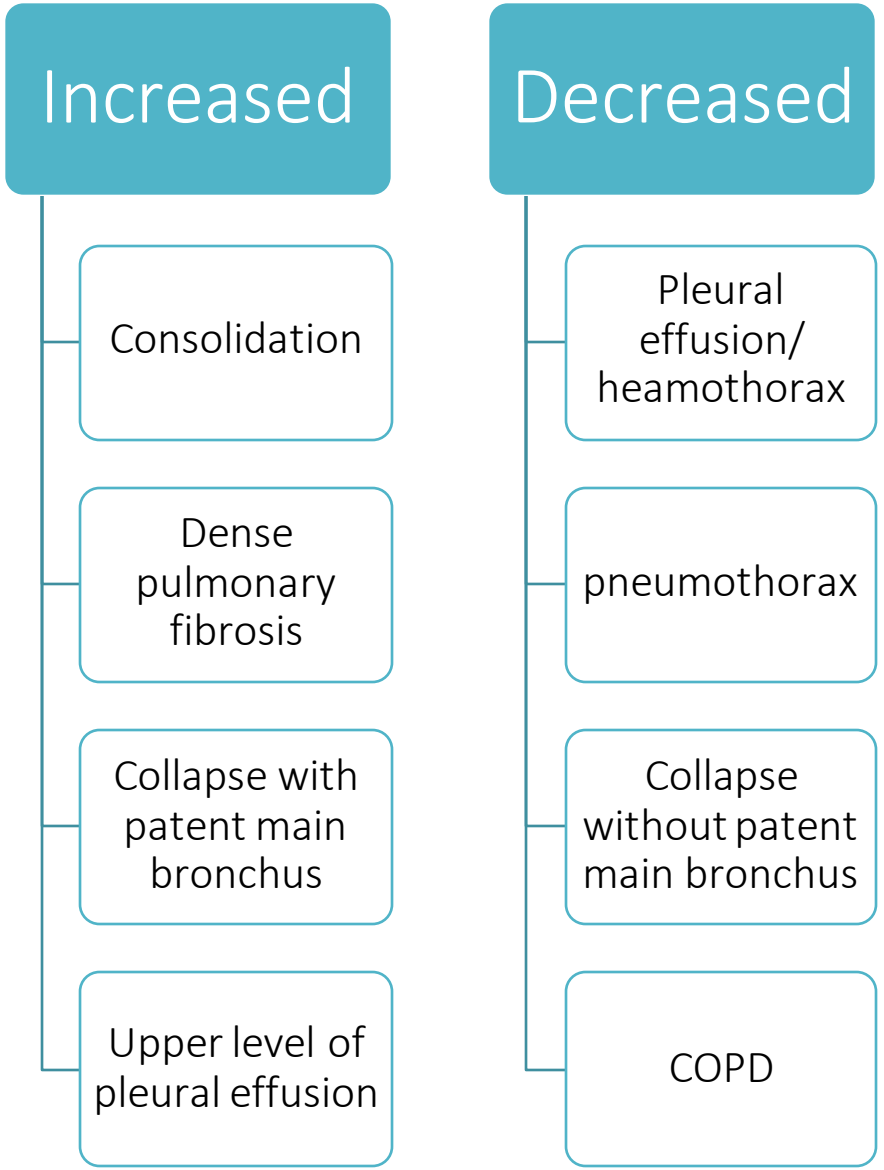
Is the palpable vibration (of non vascular origin) that reaches the body surface during low frequency vocalization and is felt by examiner's palms.

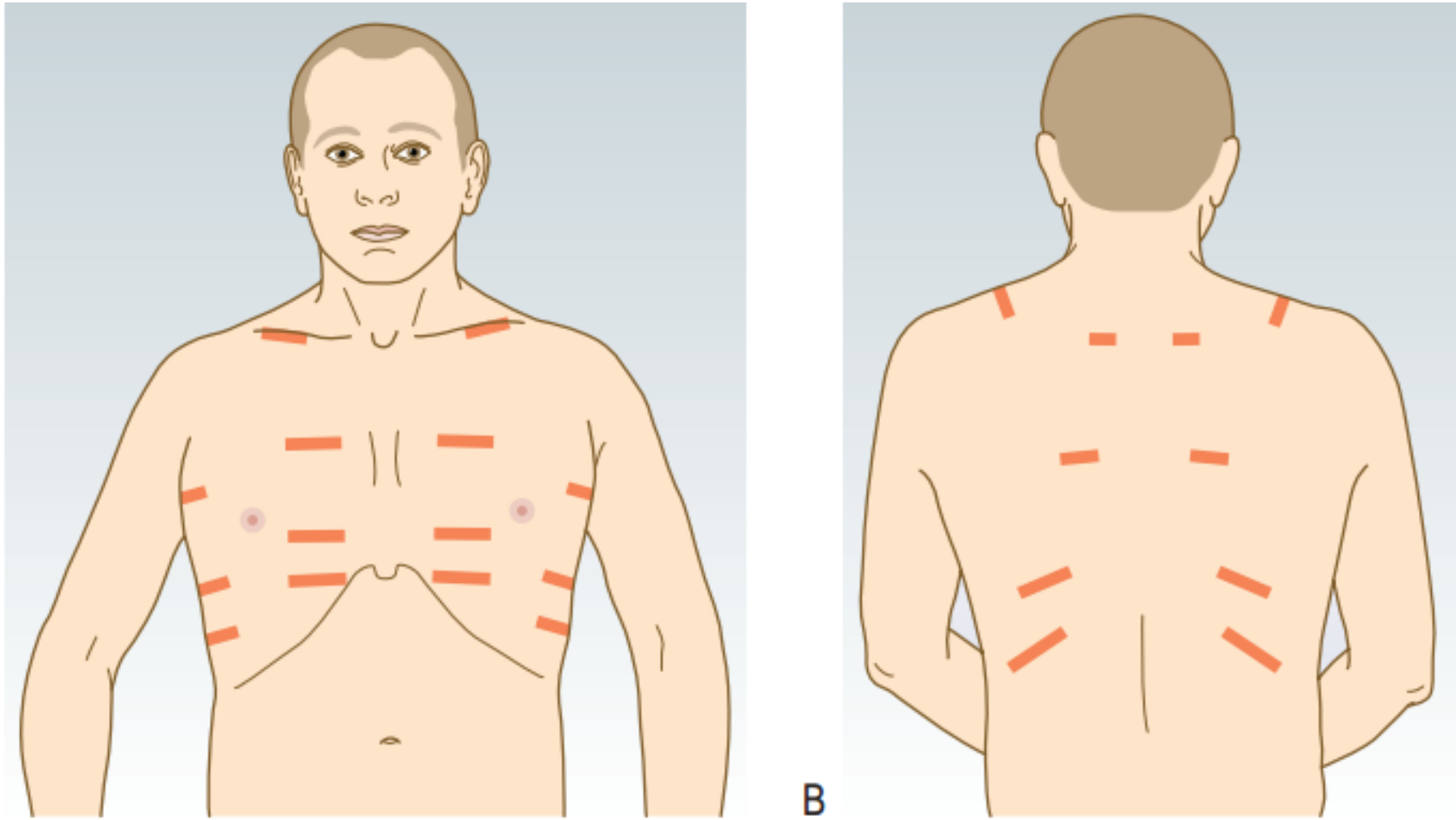
Sound waves travels faster and is conducted better in solid media rather than air/fluid

Tactile vocal fremitus

Palpate the chest wall with palm of hand while patient repeats one, one, one.

The cause of change in vocal fremitus is same as these for vocal resonance.





B

Chest expansion

- Normally; Both sides of the thorax should expand equally during normal breathing and ribs move out and up with inspiration.
- Reduced expansion on one side indicates abnormality on that side: for example, pleural effusion, lung or lobar collapse, pneumothorax and unilateral fibrosis.
- Bilateral reduction in chest wall movement is common in severe COPD and diffuse pulmonary fibrosis.
- Paradoxical inward movement may indicate diaphragmatic paralysis or, more commonly, severe COPD.

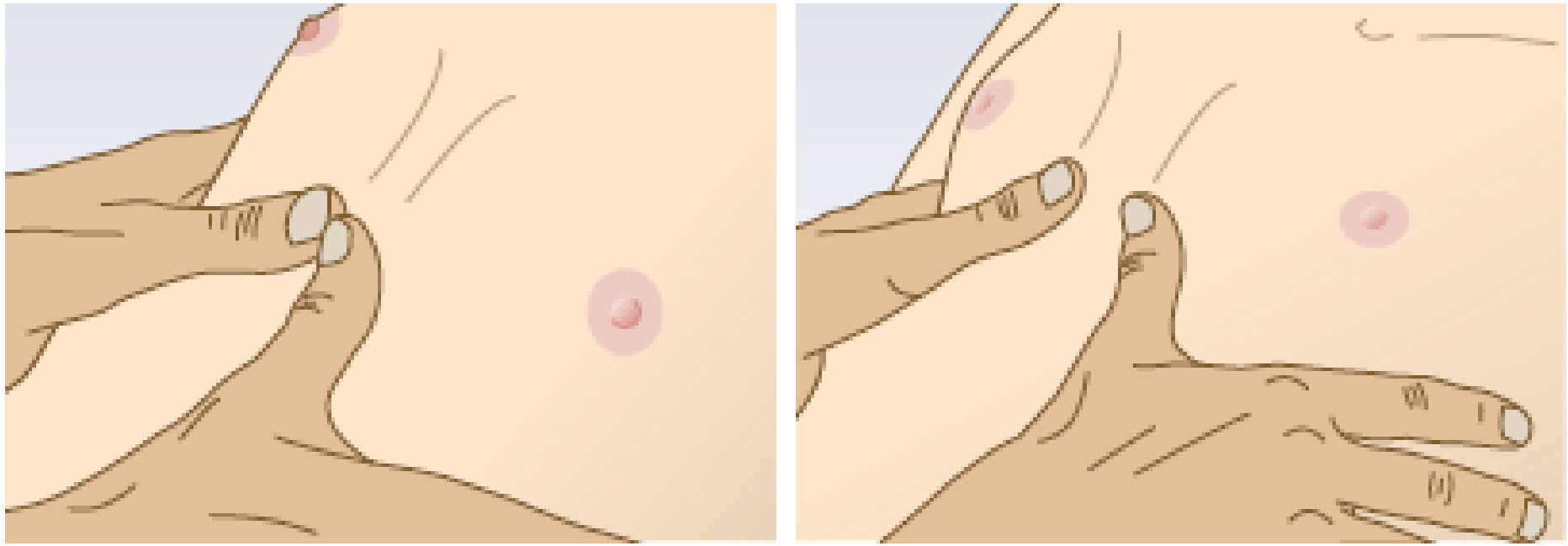


Fig. 7.16 Assessing chest expansion from the front. (A) Expiration. **(B)** Inspiration.

Percussion

- Tapping on a surface to determine the underlying structure, it allows to listen for the pitch and loudness of the percussed note.

- The palm of the left hand is placed on chest and finger separated, the middle finger of the left hand is pressed firmly aligned with the underlying ribs

- Strike the centre of the middle phalanx of the left middle finger with the tip of the right middle finger

Percussion

- Percuss in sequence, comparing areas on the right with corresponding areas on the left before moving to the next level.
- Posteriorly; the scapular and spinal muscles obstruct percussion. Don’t percuss near the midline, percuss few cm lateral to the spinal muscles.

- Direct percussion on clavicle
- Move your wrist not your elbow

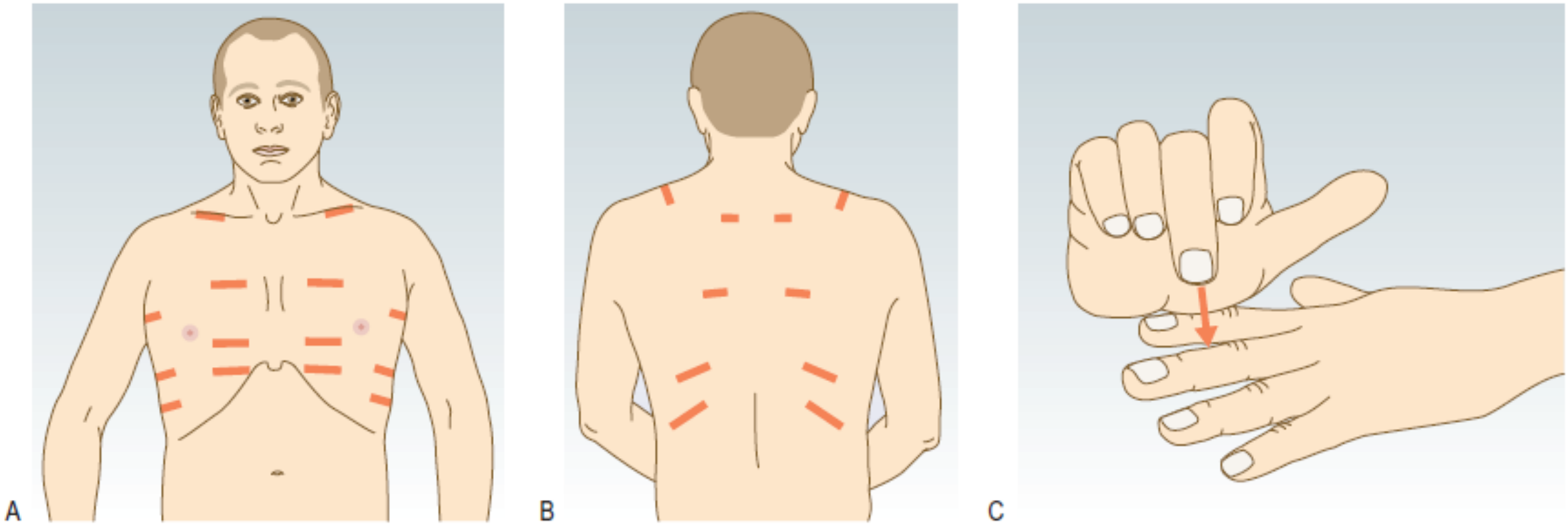


Fig. 7.18 Sites for percussion. (A) Anterior and lateral chest wall. **(B)** Posterior chest wall. **(C)** Technique of percussion.

Percussion note

Resonant	Hyperresonant	Dull	Stony dull
• Normal lung	• Pneumothorax	• Pulmonary consolidation • Pulmonary collapse • Severe pulmonary fibrosis	• Pleural effusion • Haemothorax

Diaphragmatic excursion

- Assess the movement of the thoracic diaphragm during breathing.
- It is performed by asking the patient to exhale and hold it. The provider then percusses down their back in the intercostal margins, starting below the scapula, until sounds change from resonant to dull. Then the patient takes a deep breath in and holds it as the provider percusses down again, marking the spot where the sound changes from resonant to dull again. Then the provider will measure the distance between the two spots.
- Repeat on the other side, is usually higher up on the right side.
- Normal diaphragmatic excursion should be 3–5 cm. If it is less then the patient may have pneumonia or pneumothorax.


Resonant over lungs
Dull over diaphragm

Auscultation

- Breath sounds
- Added sounds
- Vocal resonance
- Whispering pectoriloquy
- Aegophony

Auscultation

Listen with the patient relaxed and breathing deeply through his open mouth. Avoid asking him to breathe deeply for prolonged periods, as this causes giddiness and even tetany.

Auscultate each side alternately, comparing findings over a large number of equivalent positions to ensure that you do not miss localised abnormalities.

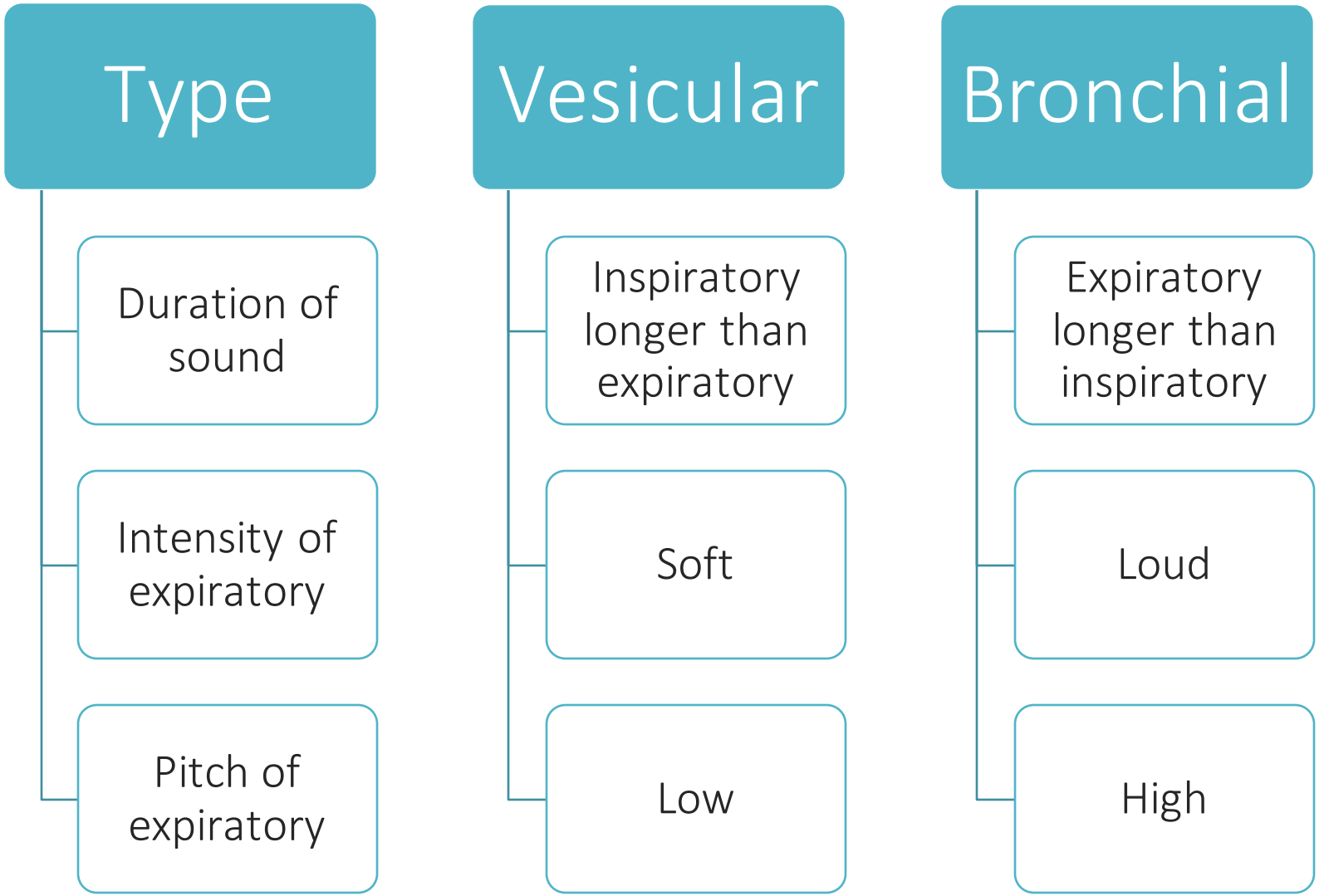
Listen:

- anteriorly from above the clavicle down to the sixth rib
- laterally from the axilla to the eighth rib
- posteriorly down to the level of the 11th rib.
- Assess the quality and amplitude of the breath sounds.

Auscultation

Identify any gap between inspiration and expiration, and listen for added sounds. Avoid auscultation within 3 cm of the midline anteriorly or posteriorly, as these areas may transmit sounds directly from the trachea or main bronchi.

Breathing sounds



Breathing sounds

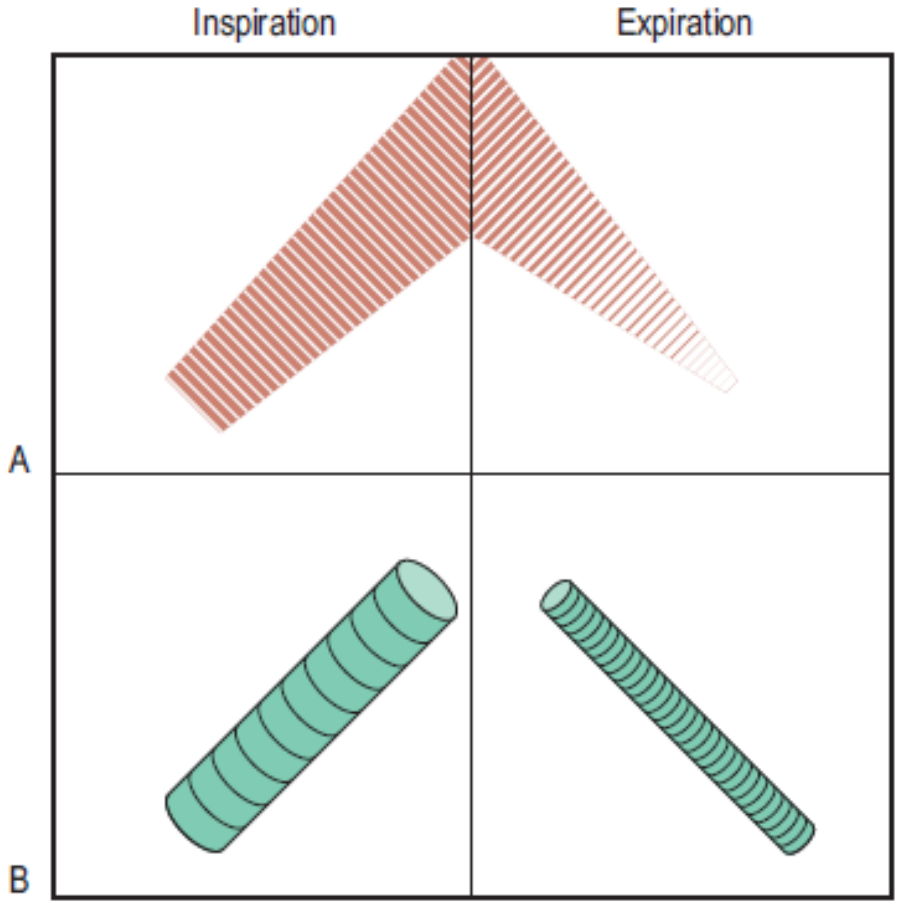
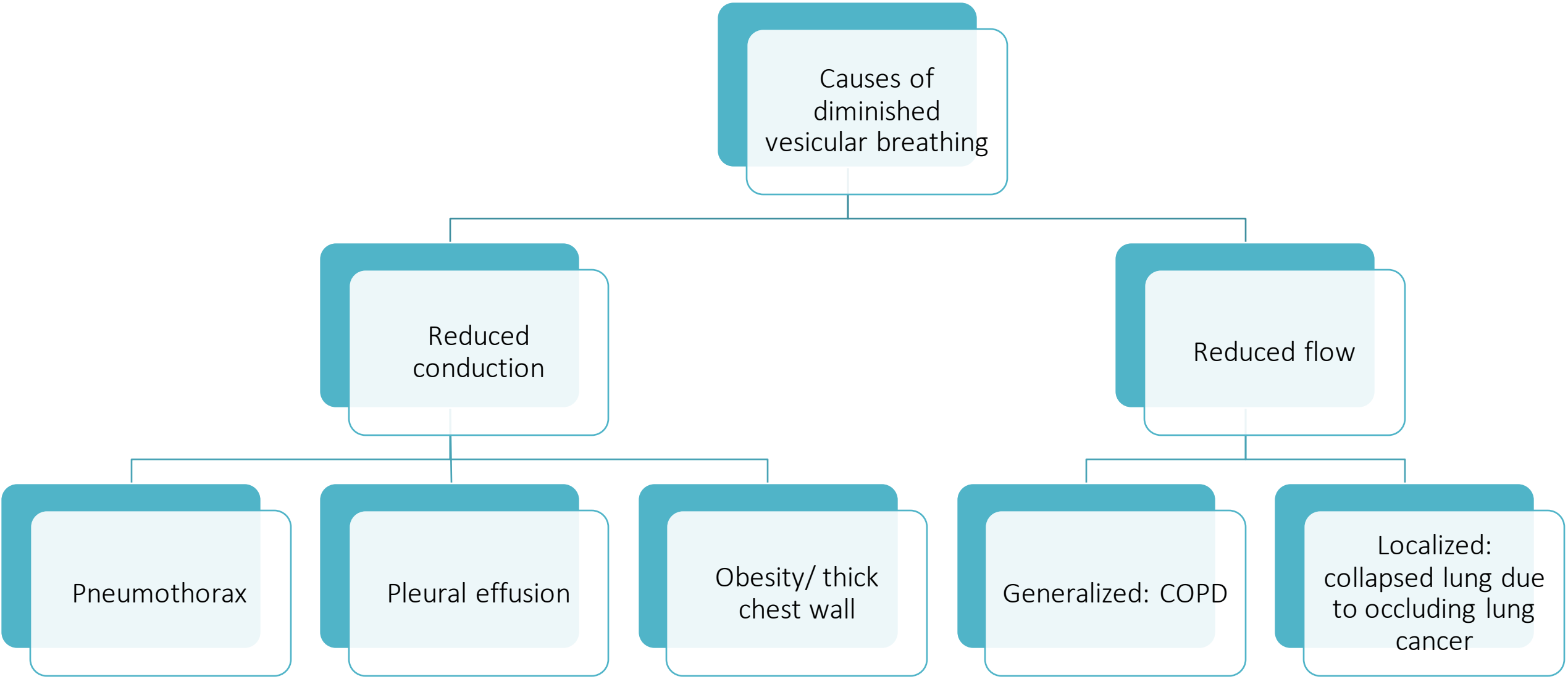
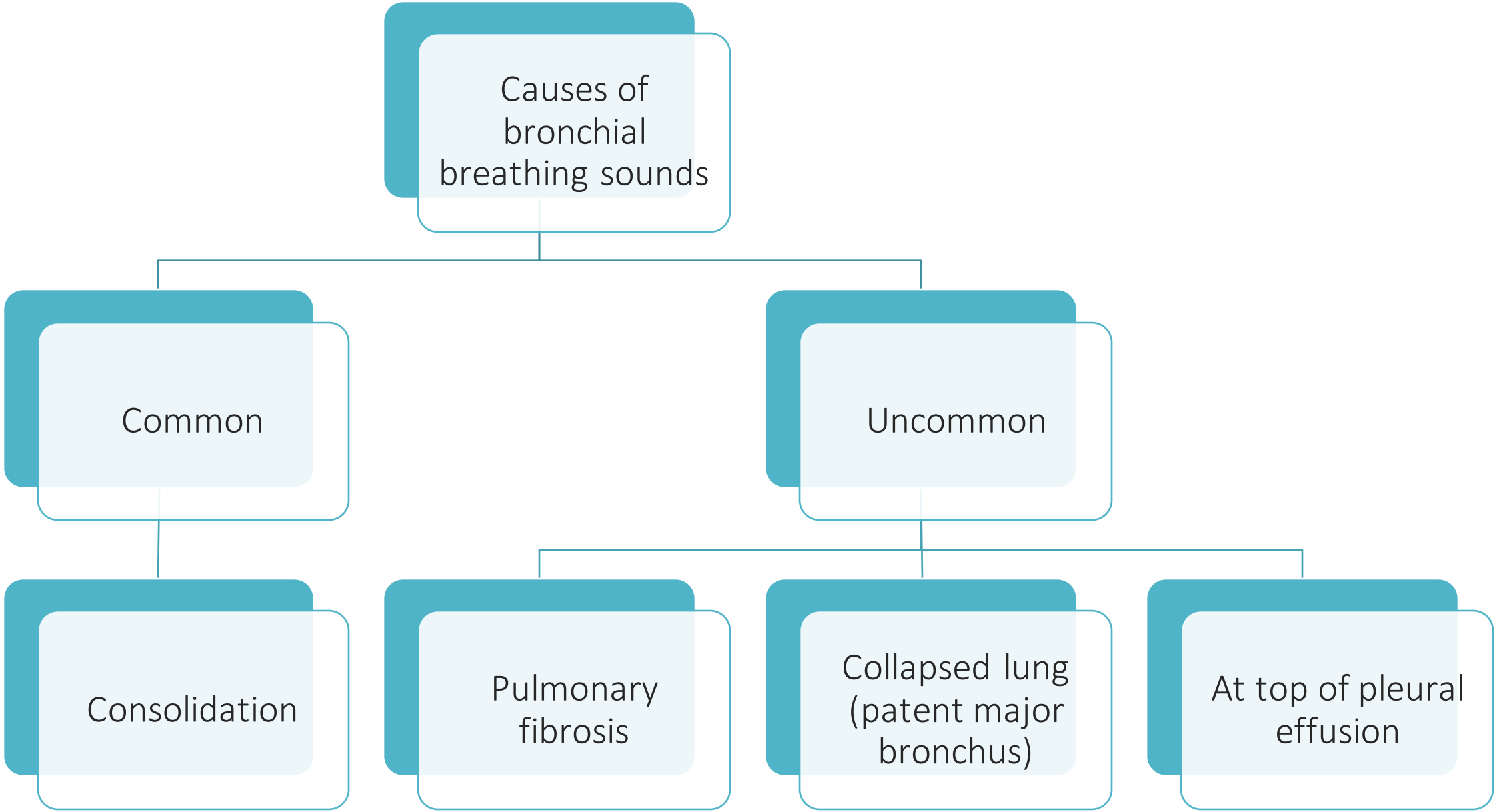


Fig. 7.19 Diagrammatic representation of breath sounds.
(A) Vesicular. **(B)** Bronchial. Note the gap between inspiration and expiration and change in pitch and the blowing, tubular quality of bronchial breath sounds.


Causes of diminished vesicular breathing
Reduced conduction
Reduced flow
Pneumothorax
Pleural effusion
Obesity/ thick chest wall
Generalized: COPD
Localized: collapsed lung due to occluding lung cancer


Causes of bronchial breathing sounds
Common
Uncommon
Consolidation
Pulmonary fibrosis
Collapsed lung (patent major bronchus)
At top of pleural effusion

Added sounds

Wheezes

Crackles

Rubs

Wheezes

- Musical whistling sound accompanying airflow and usually originates in narrowed small airways.
- Most commonly expiratory due to dynamic airway narrowing.
- Polyphonic vs. monophonic

Crackles

- Sudden opening of small airways but may indicated secretions in the airways or fibrosis

- crackles are graded into Fine (soft multiple crackles) to coarse (loud and scanty)

Phase of inspiration	Cause
Early	Small airways disease, as in bronchiolitis
Middle	Pulmonary oedema
Late	Pulmonary fibrosis (fine) Pulmonary oedema (medium) Bronchial secretions in COPD, pneumonia, lung abscess, tubercular lung cavities (coarse)
Biphasic	Bronchiectasis (coarse)

Pleural rub

- Rasping grating sound with each breath.
- Indicates pleural inflammation, usually due to infection and often accompanied by Pleuritic chest pain.

Vocal resonance, whispering pectoriloquy, Aegophony

- Ask the patient to say “one, one, one” while you auscultate to assess the quality and amplitude of vocal resonance.

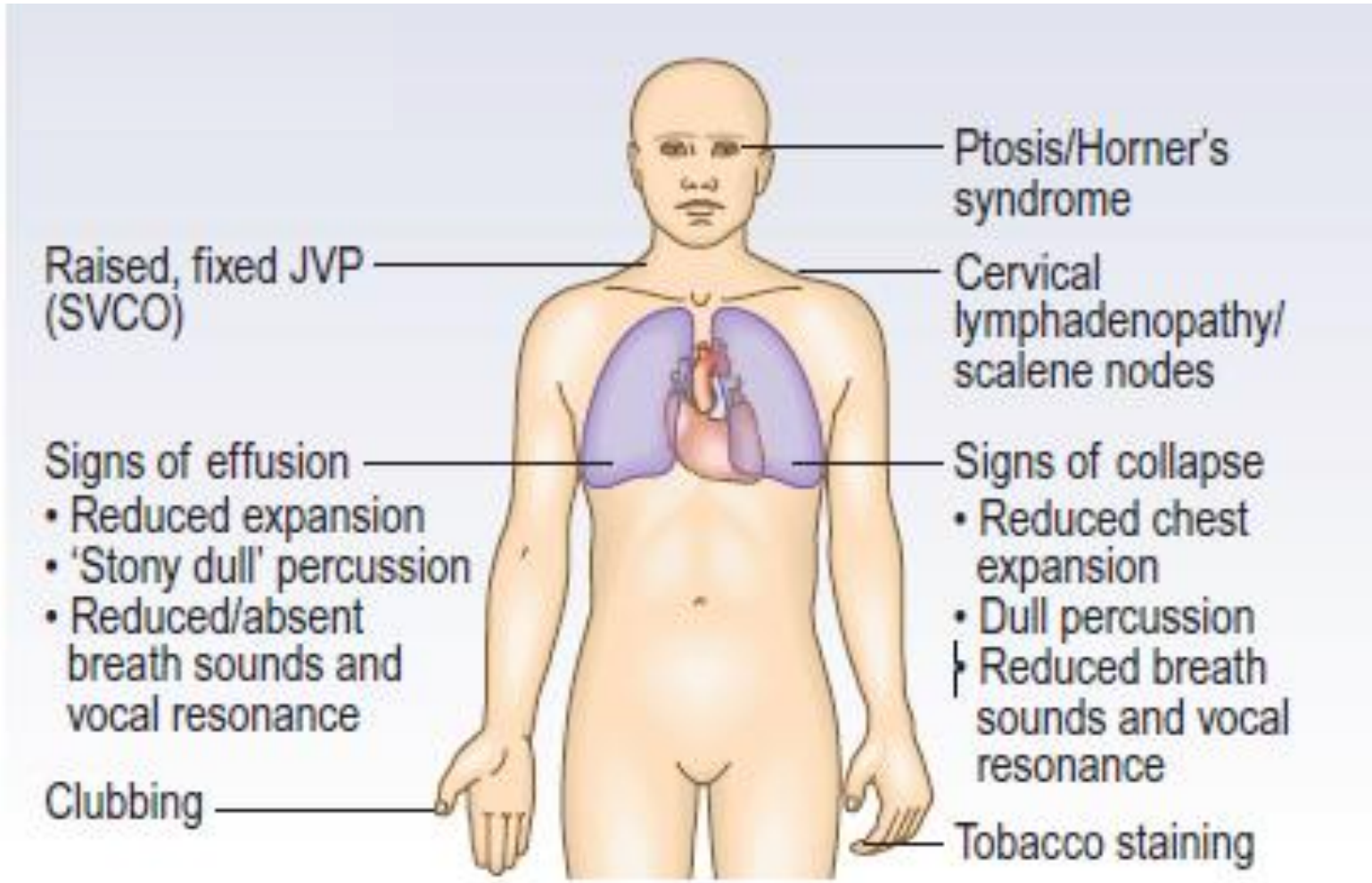
  In healthy the sound will be muffled but over consolidation or fibrosis it will be heard loudly and clearly.

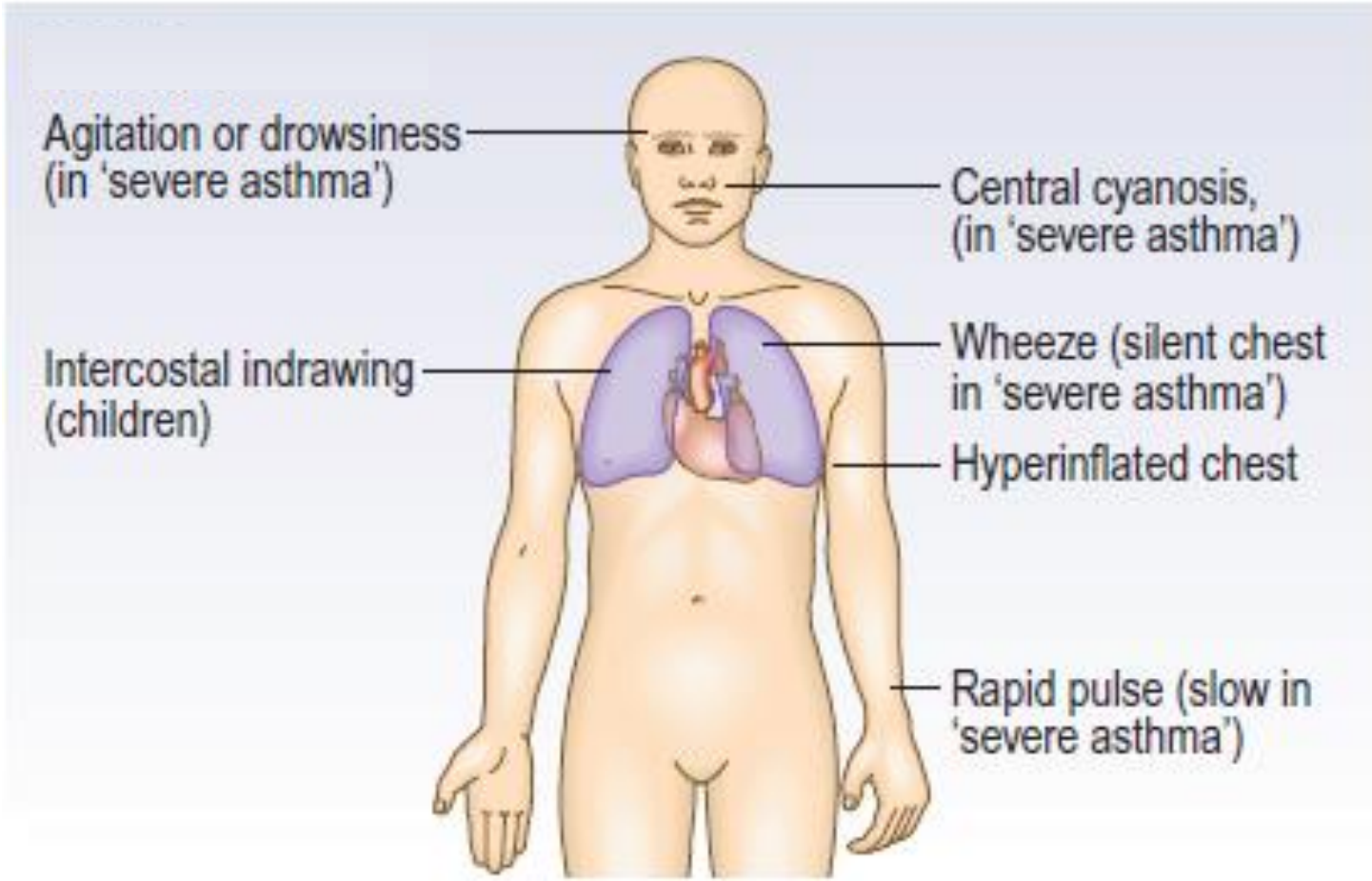
- Ask the patient to whisper “one,one,one” while you continue to listen.

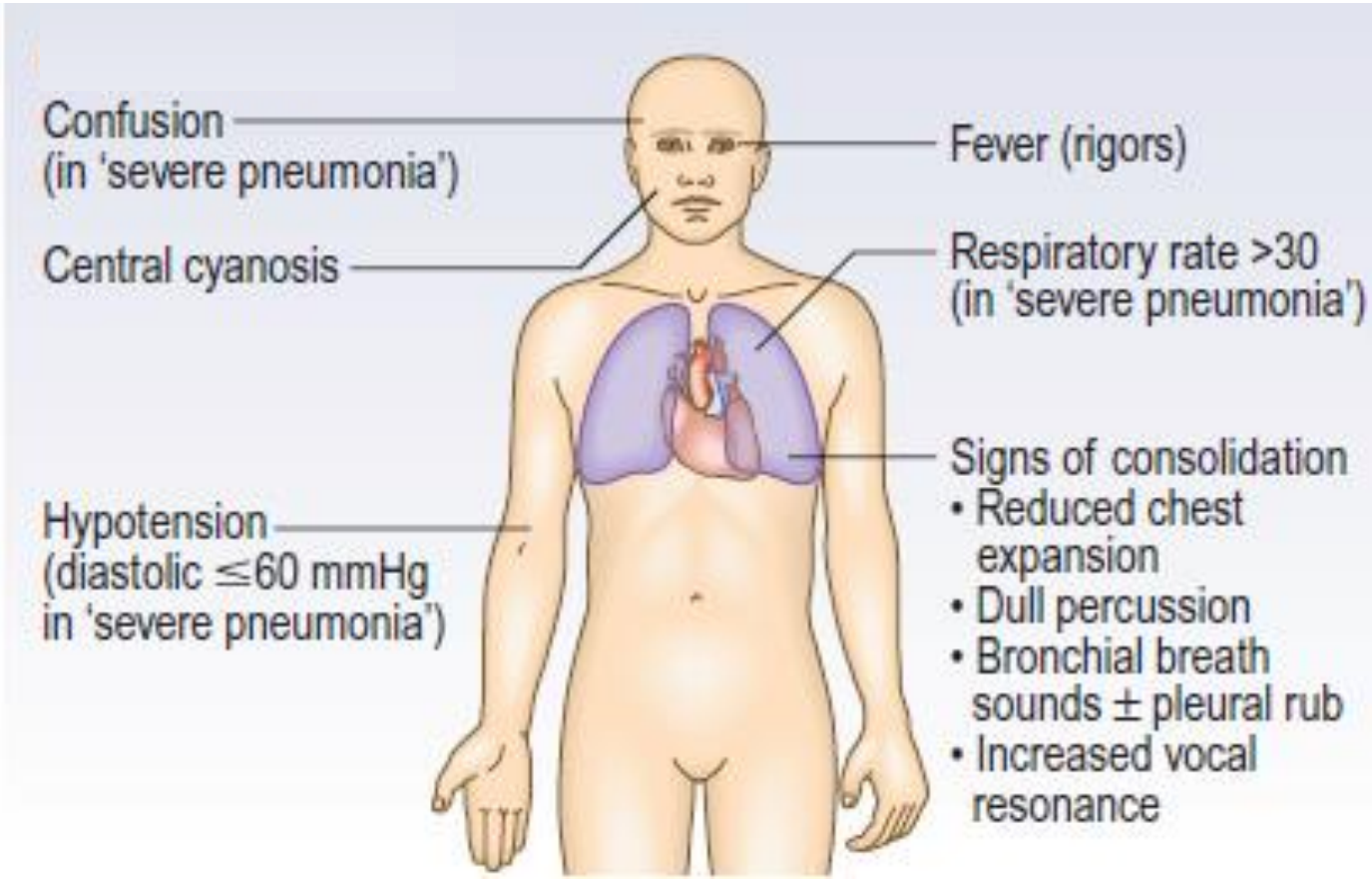
- Ask the patient to say (E) if heard as (A) then this is Aegophony which indicates consolidation.

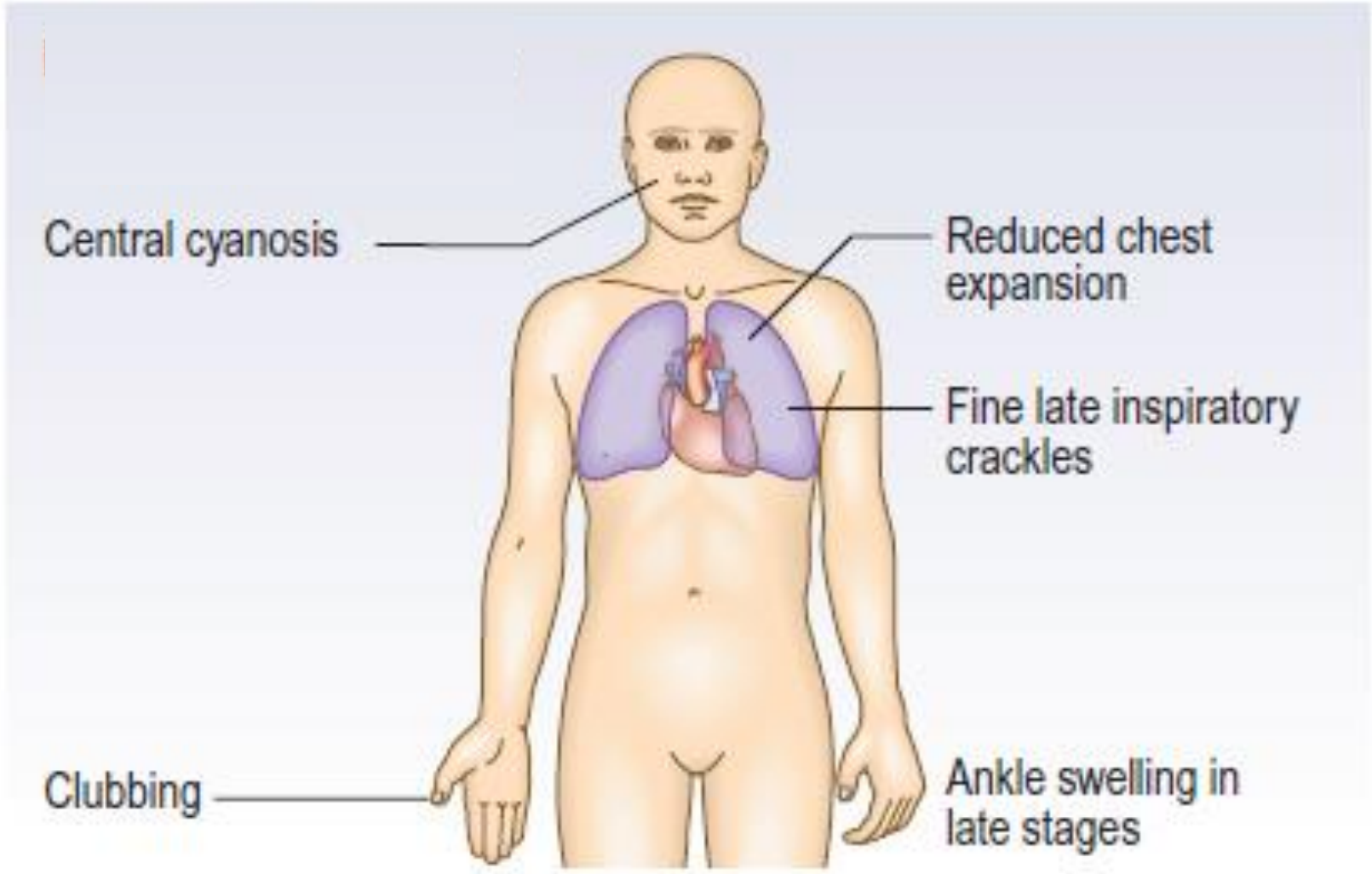
Don’t forget to examine;

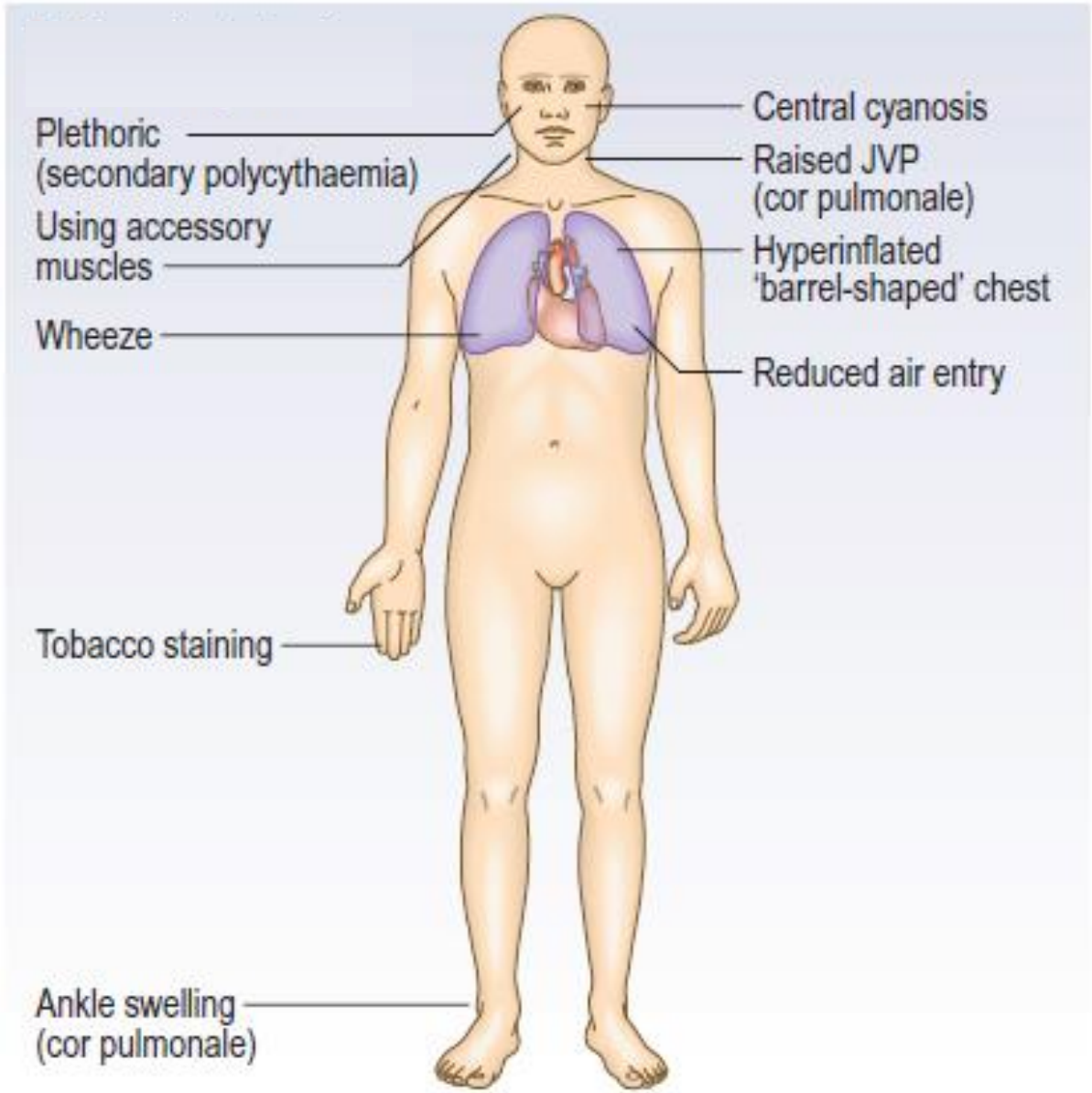
- Pitting edema over the sacrum and lumbar spine
- Lower limbs for signs of DVT and erythema nodosum

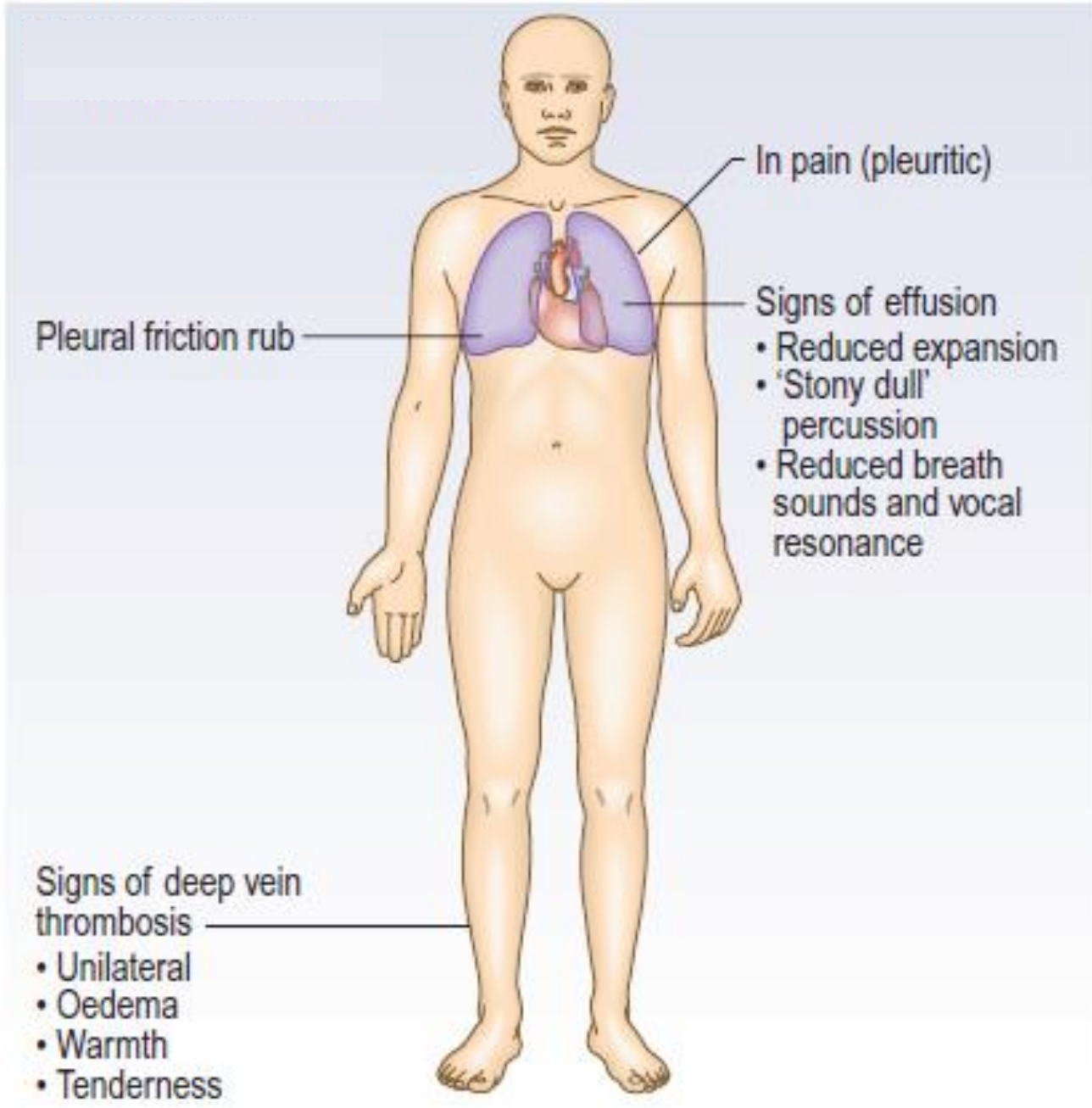

Ptosis/Horner's syndrome
Raised, fixed JVP (SVCO)
Cervical lymphadenopathy/ scalene nodes
Signs of effusion
• Reduced expansion
• 'Stony dull' percussion
• Reduced/absent breath sounds and vocal resonance
Signs of collapse
• Reduced chest expansion
• Dull percussion
• Reduced breath sounds and vocal resonance
Clubbing
Tobacco staining


Agitation or drowsiness
(in 'severe asthma')
Central cyanosis,
(in 'severe asthma')
Intercostal indrawing
(children)
Wheeze (silent chest
in 'severe asthma')
Hyperinflated chest
Rapid pulse (slow in
'severe asthma')


Confusion
(in 'severe pneumonia')
Central cyanosis
Hypotension
(diastolic ≤60 mmHg
in 'severe pneumonia')
Fever (rigors)
Respiratory rate >30
(in 'severe pneumonia')
Signs of consolidation
• Reduced chest expansion
• Dull percussion
• Bronchial breath sounds ± pleural rub
• Increased vocal resonance


Central cyanosis
Reduced chest expansion
Fine late inspiratory crackles
Clubbing
Ankle swelling in late stages


Plethoric
(secondary polycythaemia)
Using accessory
muscles
Wheeze
Tobacco staining
Ankle swelling
(cor pulmonale)
Central cyanosis
Raised JVP
(cor pulmonale)
Hyperinflated
'barrel-shaped' chest
Reduced air entry


In pain (pleuritic)
Pleural friction rub
Signs of effusion
• Reduced expansion
• 'Stony dull' percussion
• Reduced breath sounds and vocal resonance
Signs of deep vein thrombosis
• Unilateral
• Oedema
• Warmth
• Tenderness

Thank you