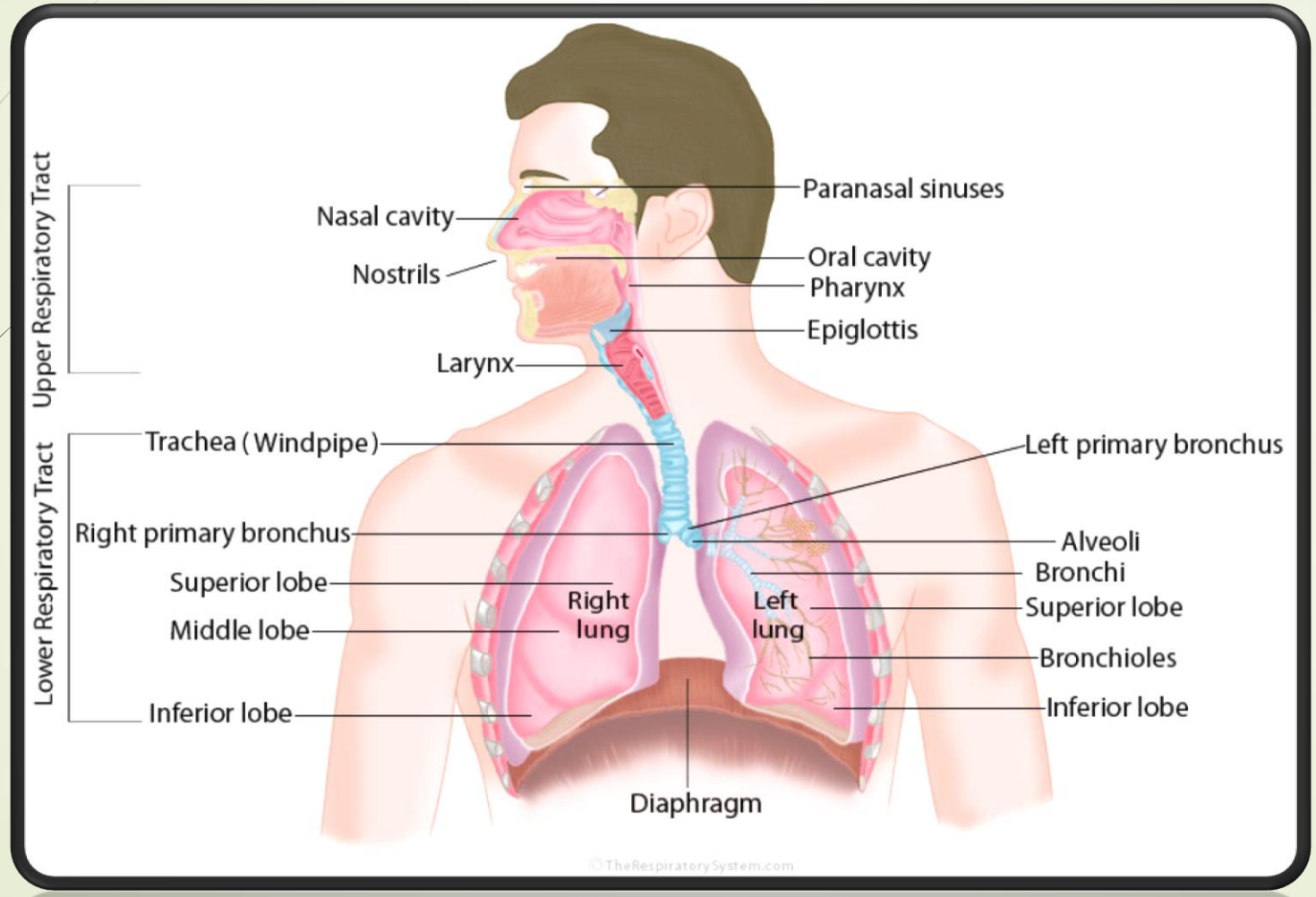
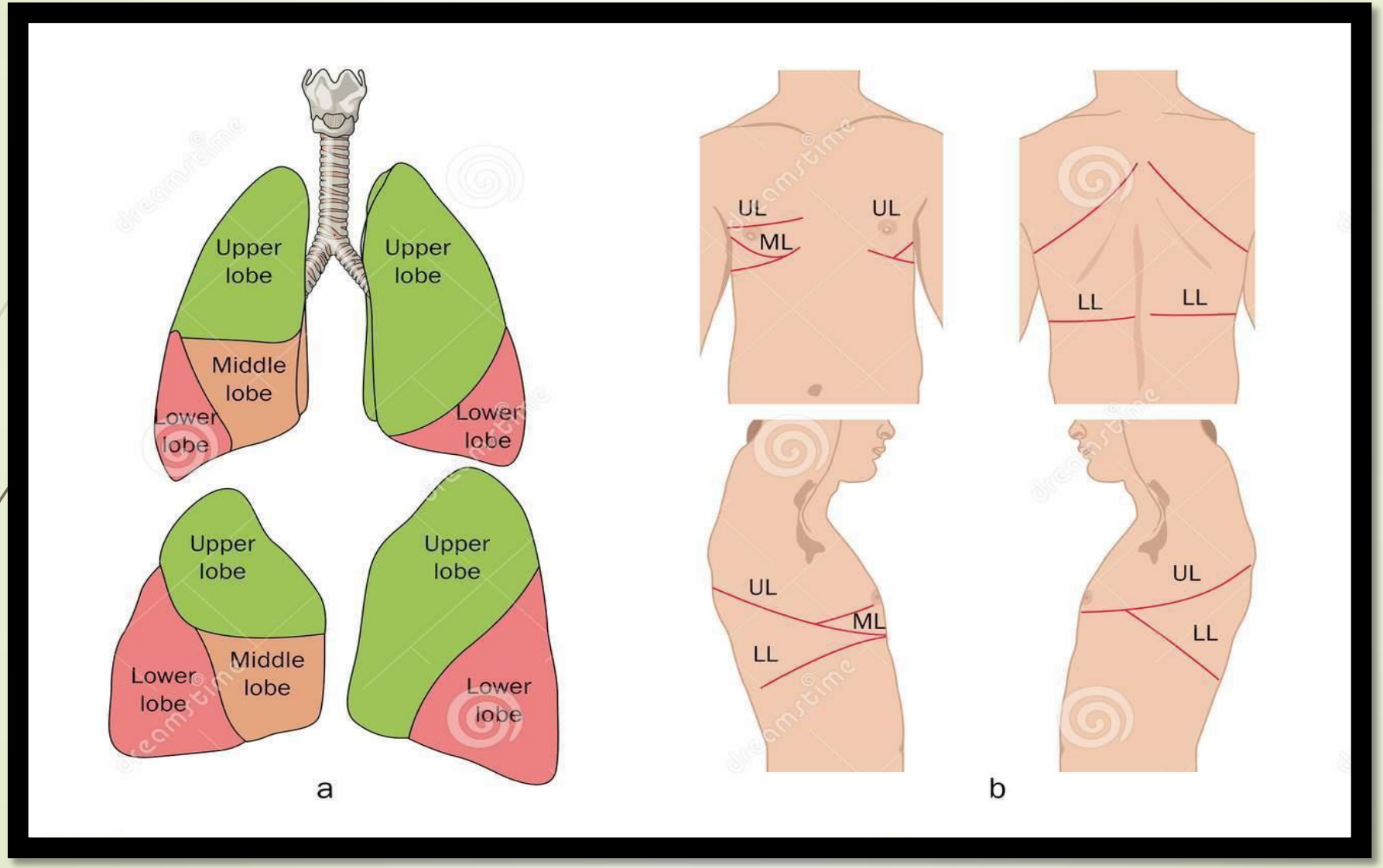
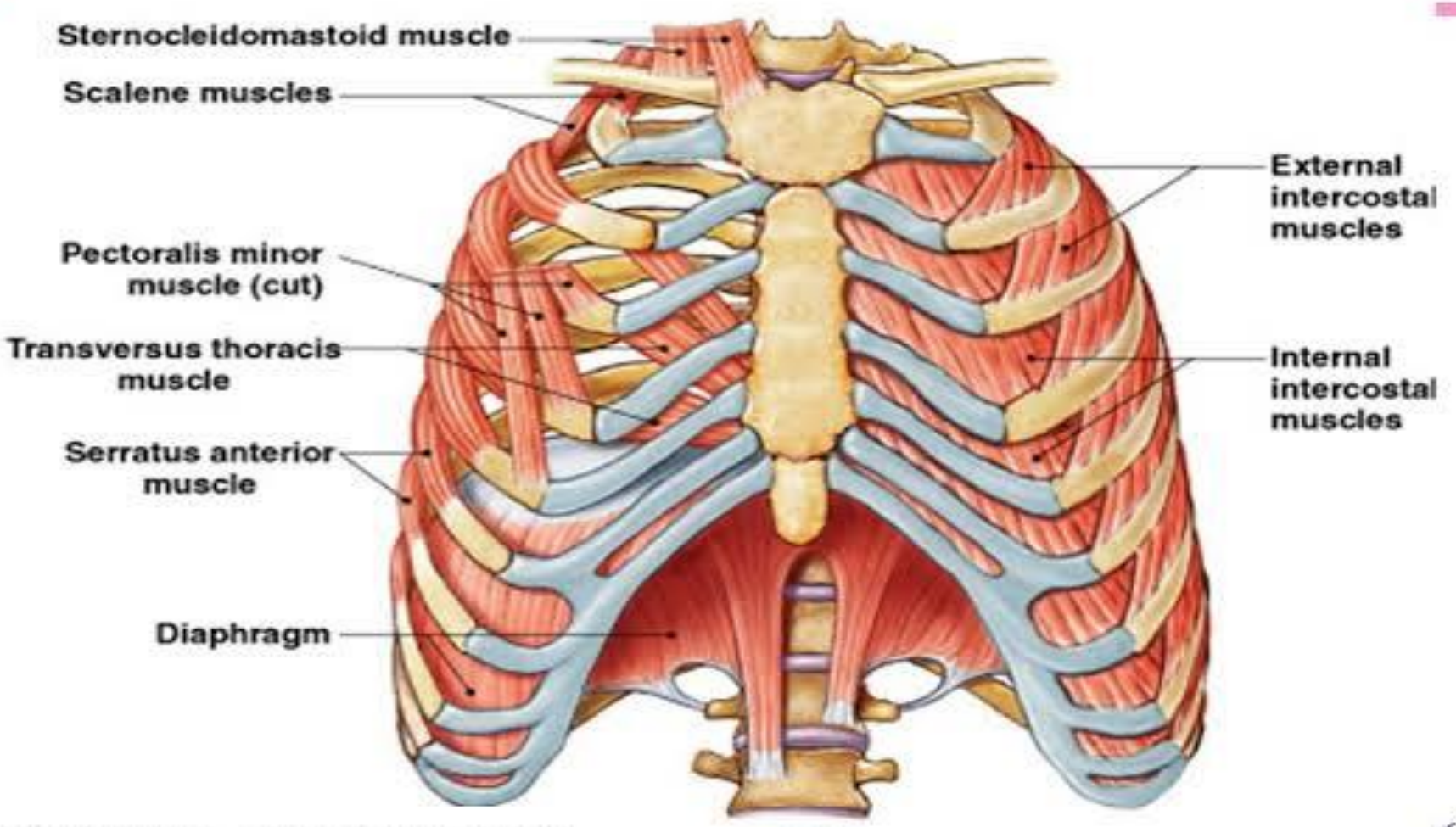
Surface anatomy of respiratory system




Upper lobe
Upper lobe
Middle lobe
Lower lobe
Lower lobe
Upper lobe
Upper lobe
Lower lobe
Middle lobe
Lower lobe
a
UL
UL
ML
LL
LL
UL
ML
LL
UL
LL
b

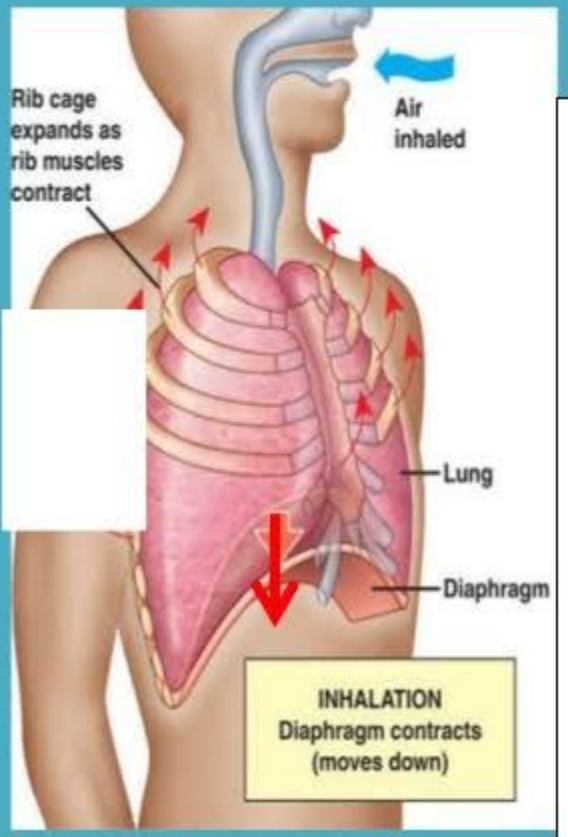
Muscles of Respiration



(b)

MECHANISM OF BREATHING

INHALATION



Internal intercostal muscle relaxed

↓

External intercostal muscle contract

↓

Rib cage moves upwards & outwards

↓

Diaphragm contracts & flattens

↓

Volume of thorax cavity increase

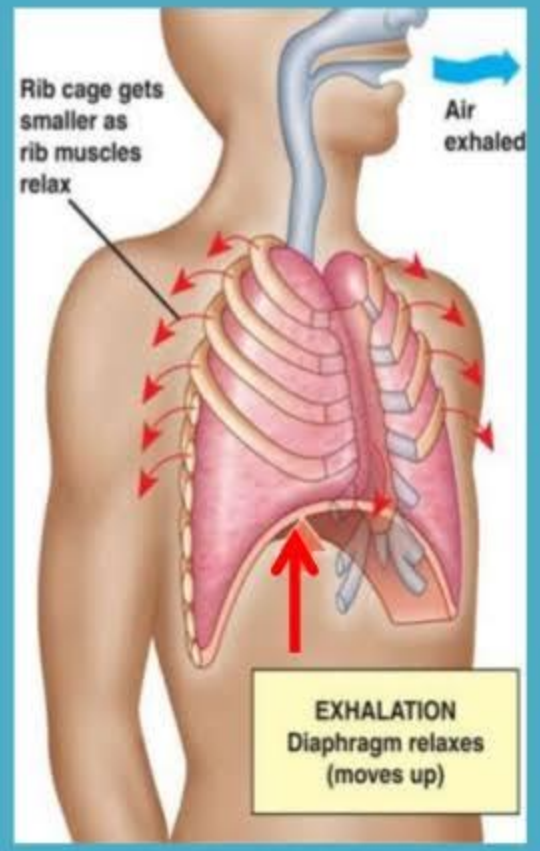
↓

Pressure in alveoli decrease

↓

Air moves in

EXHALATION



Internal intercostal muscle contract

↓

External intercostal muscle relaxed

↓

Rib cage moves downwards & inwards

↓

Diaphragm relaxes

↓

Volume of thorax cavity decrease

↓

Pressure in alveoli increase

↓

Air moves out

COMMON SIGNS AND SYMPTOMS

SYMPTOMS

- Cough(dry/productive)
- Sputum
- Hemoptysis
- Wheezing
- Chest pain
- Breathlessness

SIGNS

Physique
Pyrexia
Dyspnoea
Breathing (abdominal/thoracic)
Cyanosis
Clubbing
Tracheal position
Chest shape and movements
Breath sounds and added sounds etc

POSITIONING AND ENVIRONMENT

- Patient is asked to sit upright on examination table, with arms at the side.
- Adequate lighting is ensured.
- Asked to expose his or her chest.
- When back is examined, asked to move the arms forwards that the scapula are not in the way of examinaing the upper lung fields.

GENERAL EXAMINATION

Before doing the examination of the respiratory system, a general examination relevant to the respiratory system should be carried out.

Appearance
Pallor
Cyanosis(blue discoloration of the skin and mucous membranes)
Clubbing(excessive curvature of the nail)
Venous pulses
Lymph node enlargement

Cyanosis

1.Central –lips, tongue
usually indicate underlying cardiac or pulmonary disease

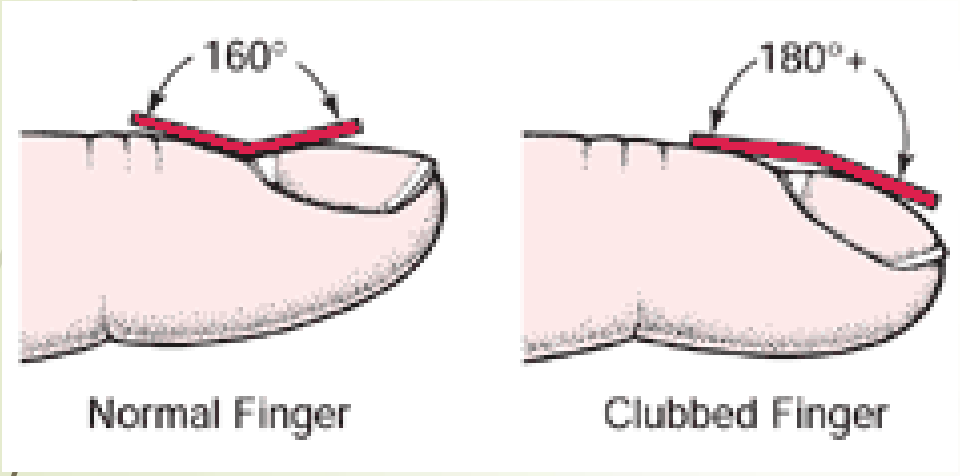
2. Peripheral- fingers ,feet, or ears.
normally +nt in cold conditions.

3. Both – seen with poor peripheral circulation due to shock, heart failure, vascular disease and venous obstruction eg. deep Vein thrombosis.

Peripheral cyanosis

Central Cyanosis in new born baby

Clubbing




Clubbed Fingers: Common Symptoms
Downward curving of nails
Bulging fingertips
Nail widening
Soft nail bed

EXAMINATION INCLUDES FOUR STEPS

- INSPECTION (Observation)
- PALPATION (Feeling)
- PERCUSSION (Tapping)
- AUSCULTATION (Listening)

INSPECTION

Upper respiratory tract

1. Oral cavity- hygiene, tonsils etc.
2. Nose- DNS, nasal polyps etc.
3. Pharynx –post nasal drip etc.

Chest examination

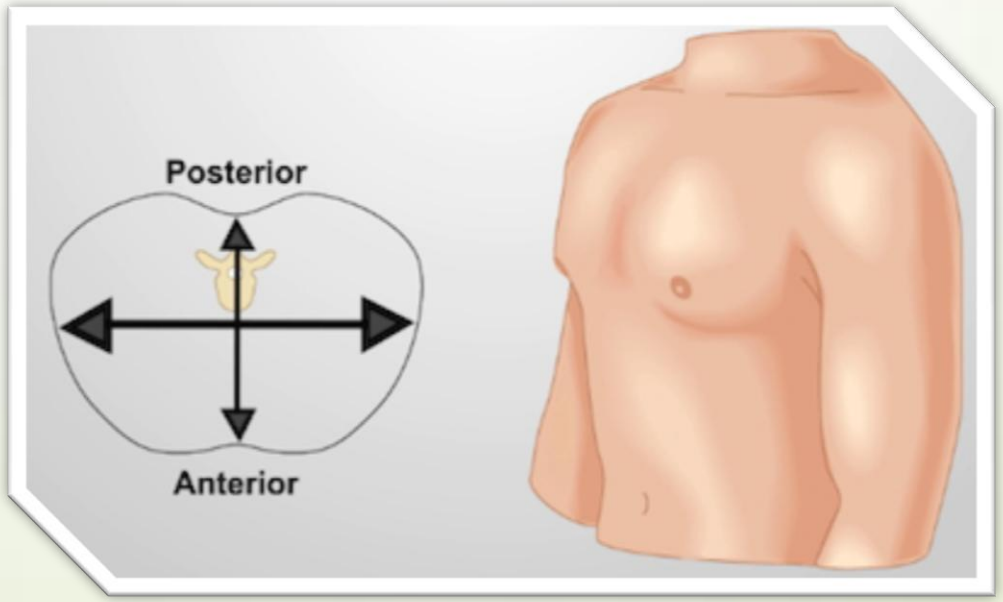
- Shape of the chest
- Symmetry
- Movement
- Breathing pattern

SHAPE AND SYMMETRY OF THE CHEST

Normally-

Bilaterally symmetrical and elliptical in cross section

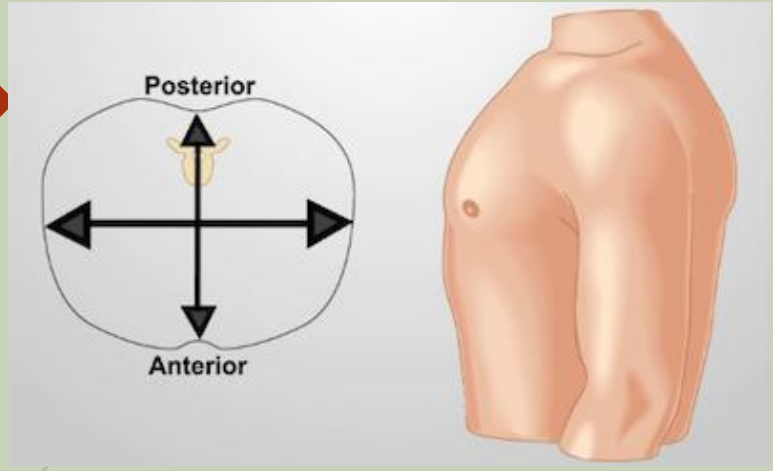
Transverse diameter> anterioposterior diameter.



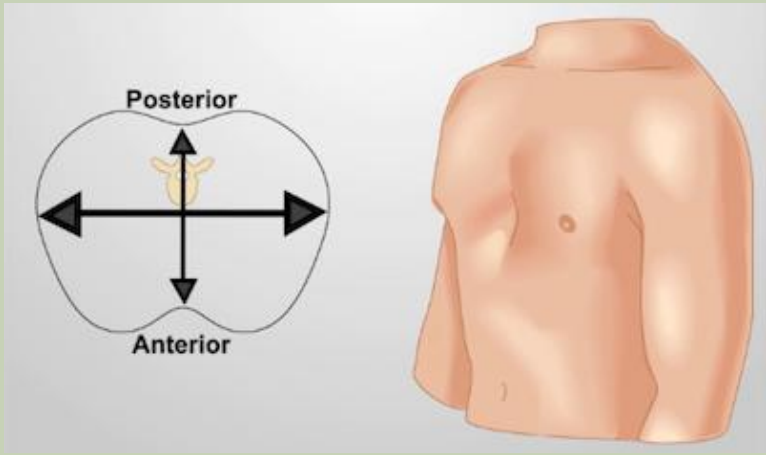
Abnormally-

Chest deformity

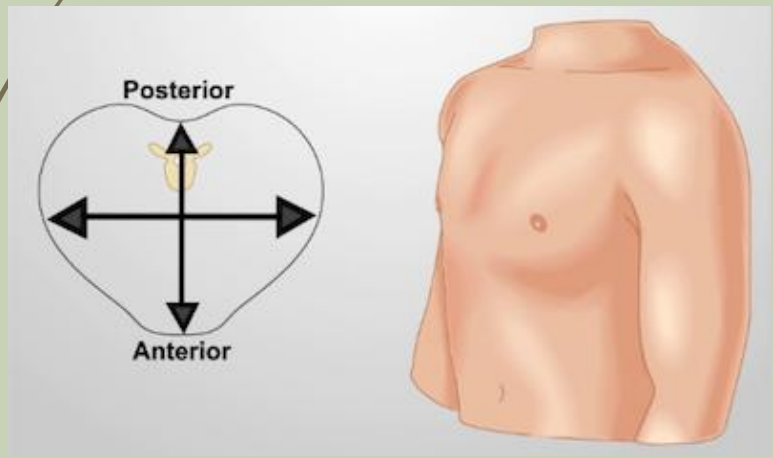
- **Flat chest-** transverse diameter and A-P diameter ratio is 1:2 pulmonary TB , fibrothorax.
- **Barrel chest** – 1:1 eg. COPD
- **Pigeon chest(pectus carinatum)** – Marfan's syndrome , asthma and rickets.
- **Funnel chest(Pectus excavatum)-** developmental defect



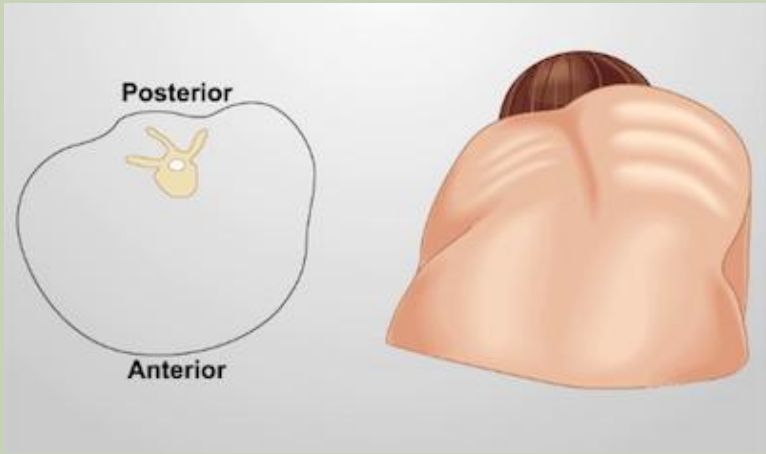
Barrel chest



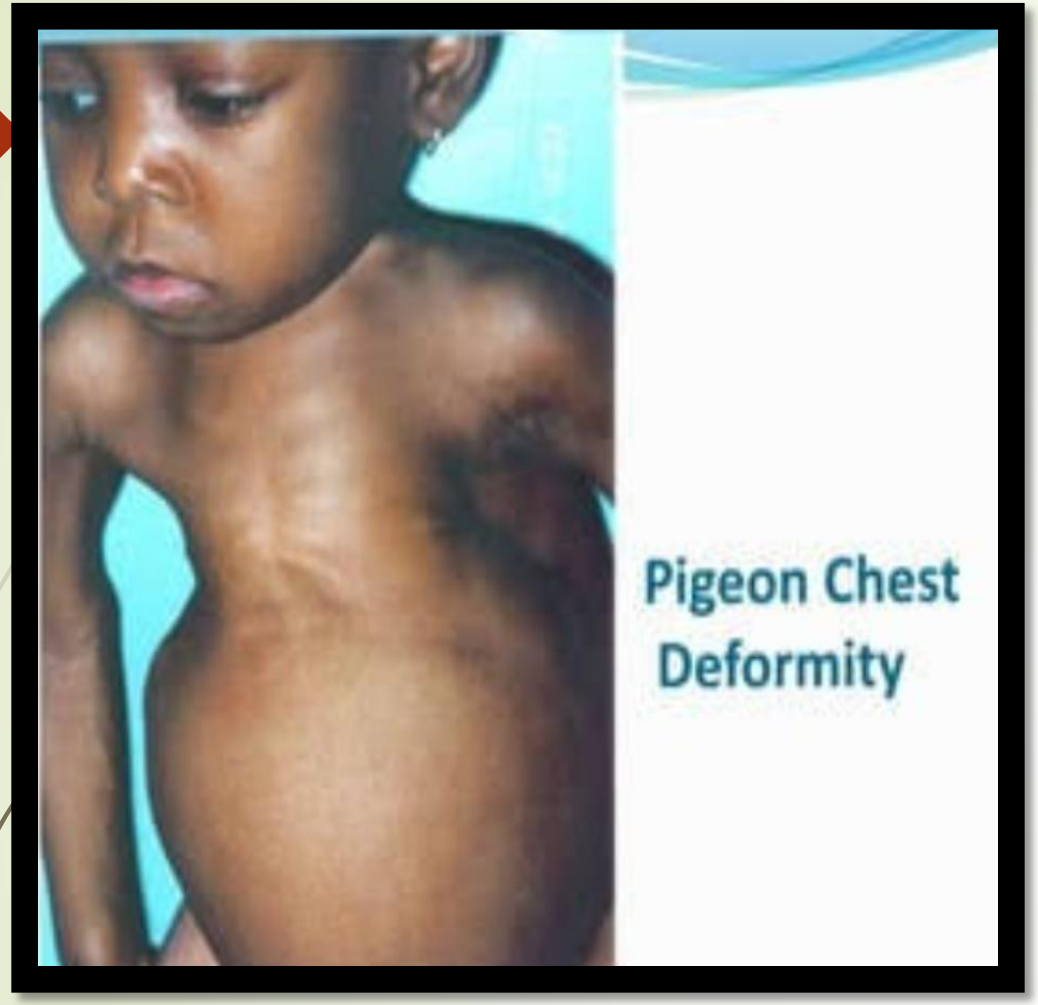
Pectus Excavatum (funnel chest).

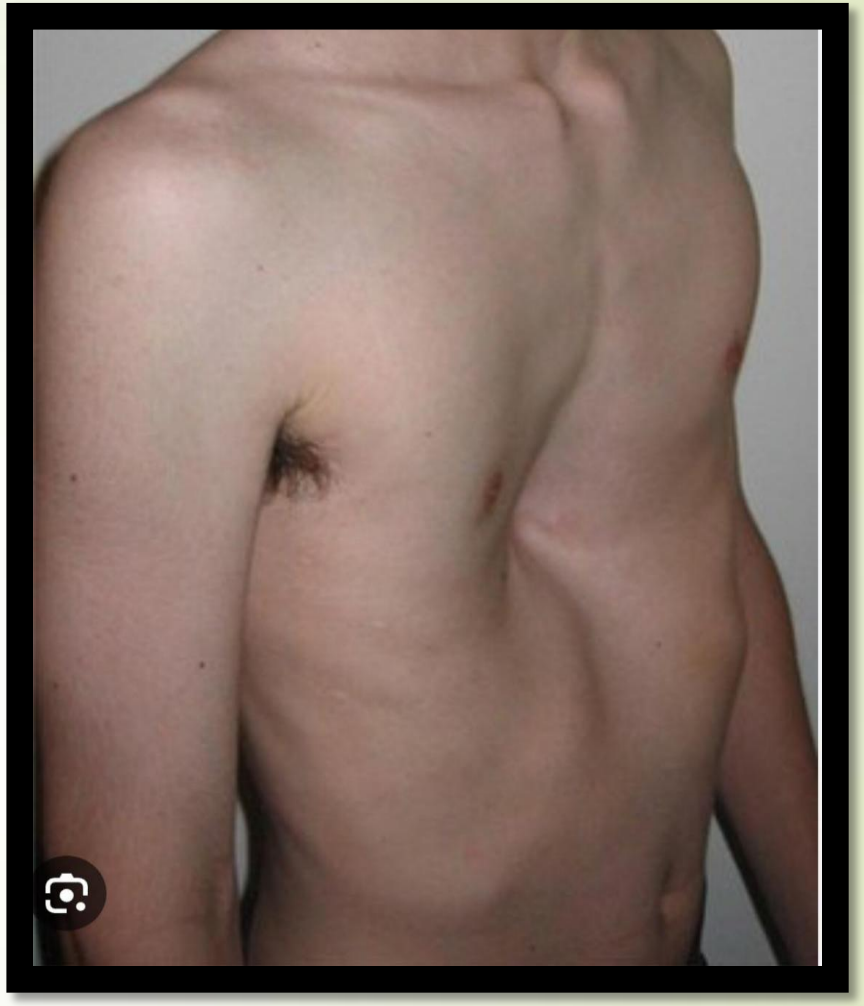


Pectus Carinatum (pigeon chest)



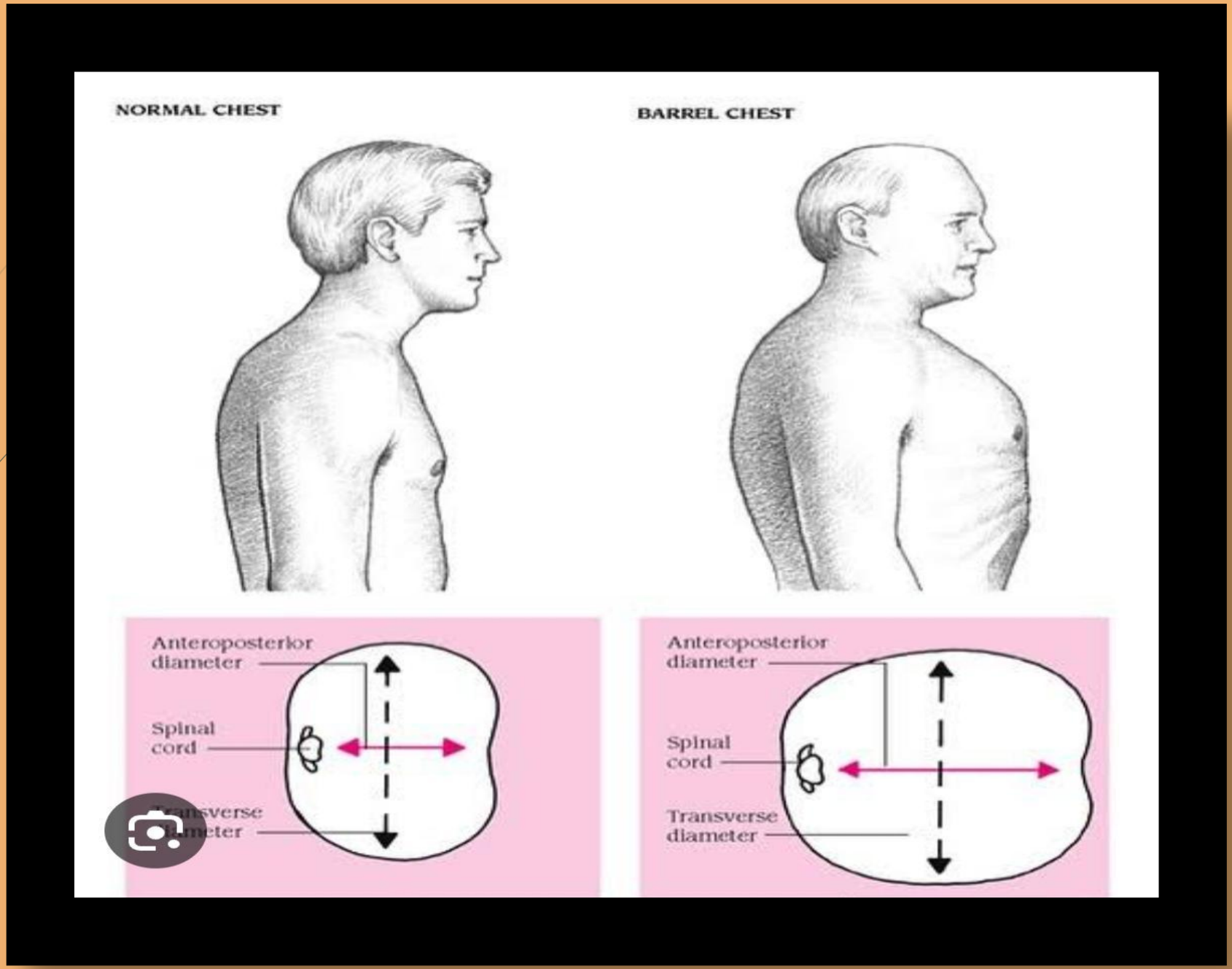
Thoracic Kyphoscoliosis





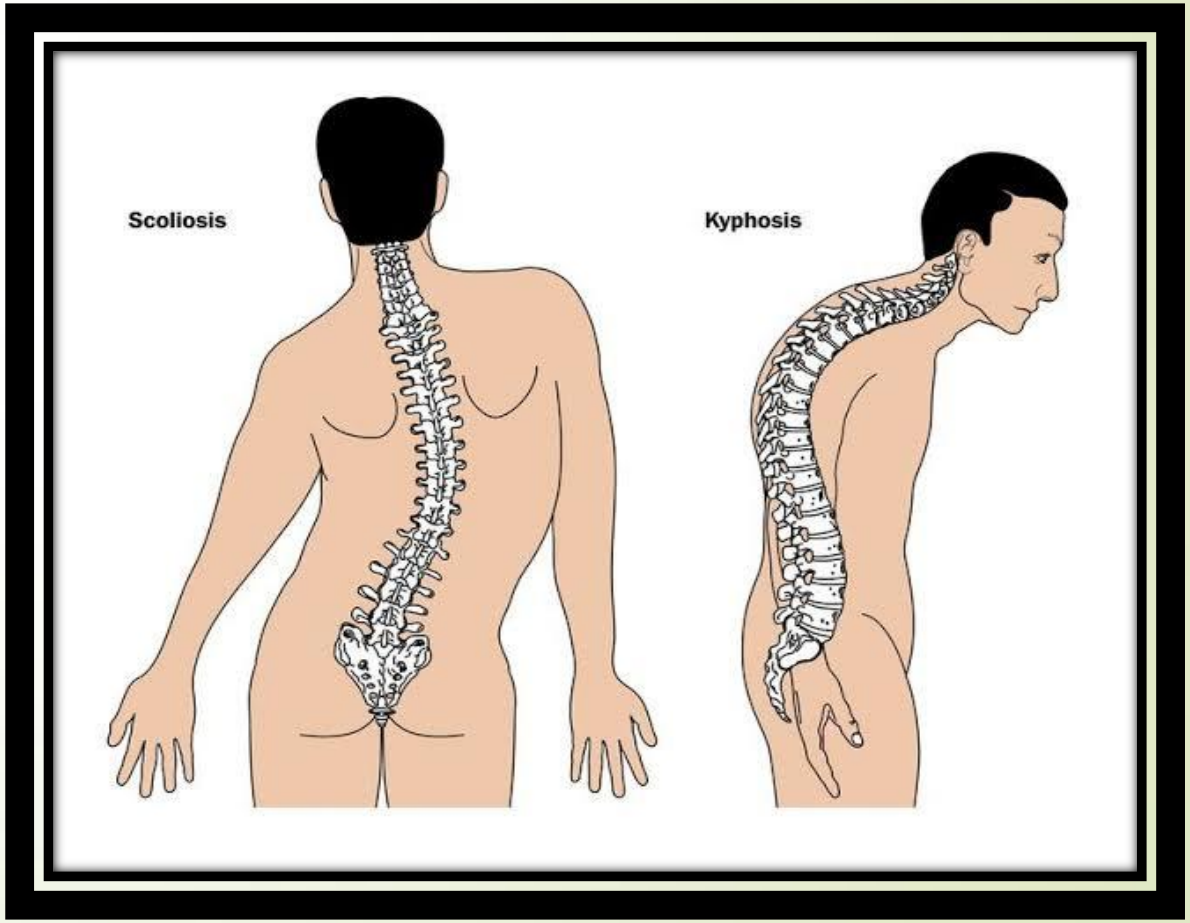
Rickets In child

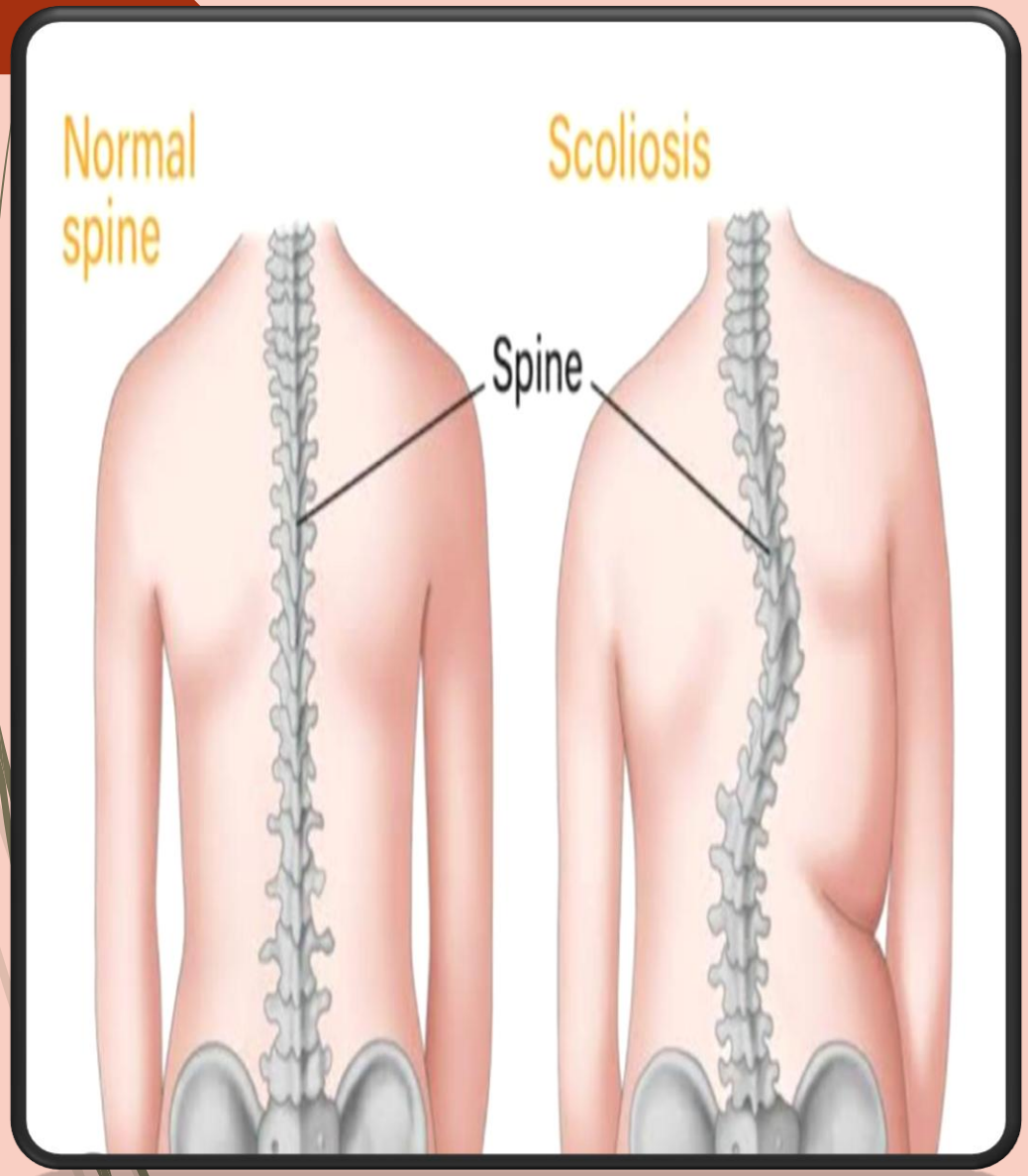
Pectus excavatum


NORMAL CHEST
BARREL CHEST
Anteroposterior diameter
Spinal cord
Transverse diameter
Anteroposterior diameter
Spinal cord
Transverse diameter

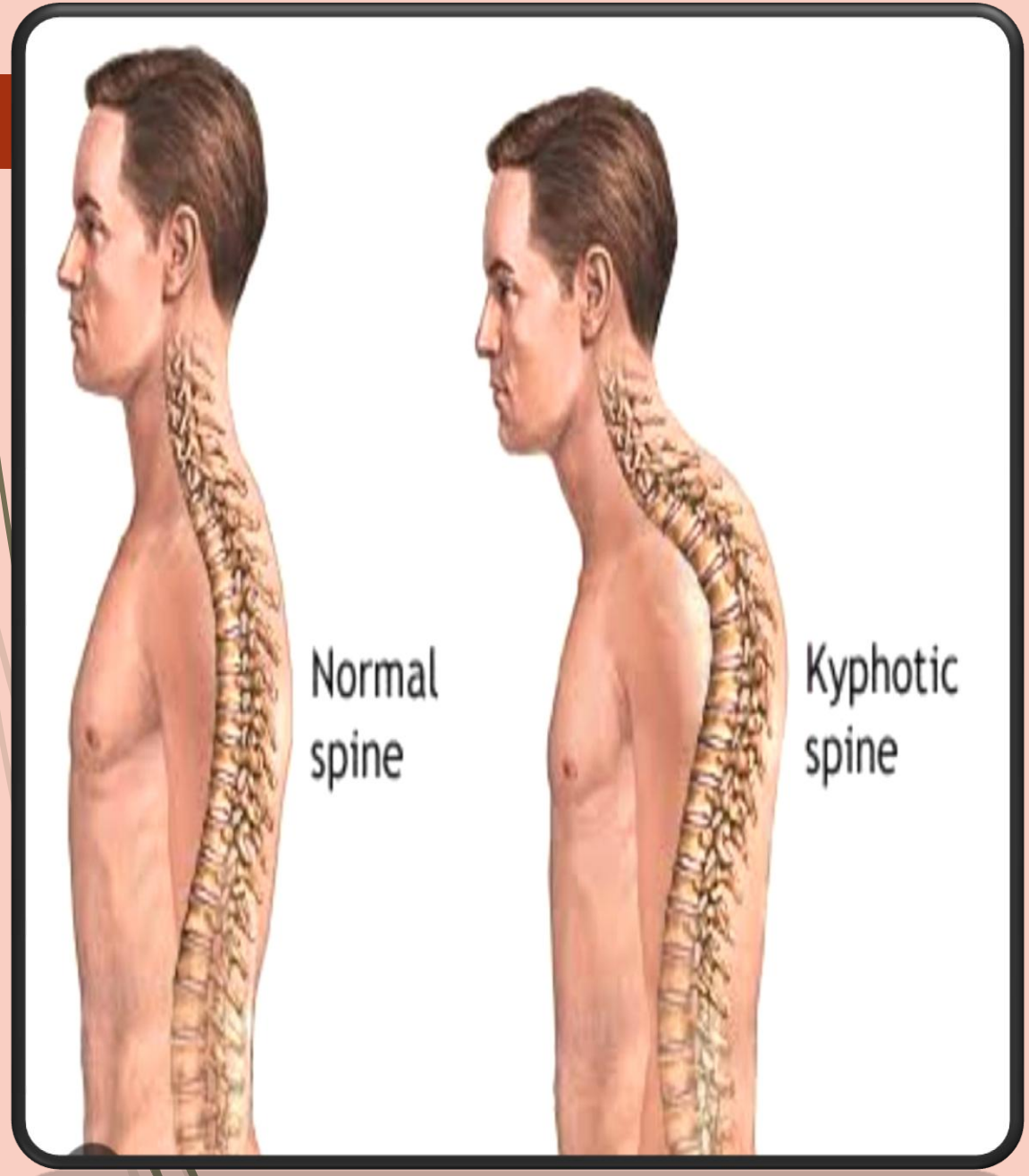
Spinal Deformity

- Kyphoscoliosis (kyphosis+ scoliosis)
- Ankylosing spondylitis

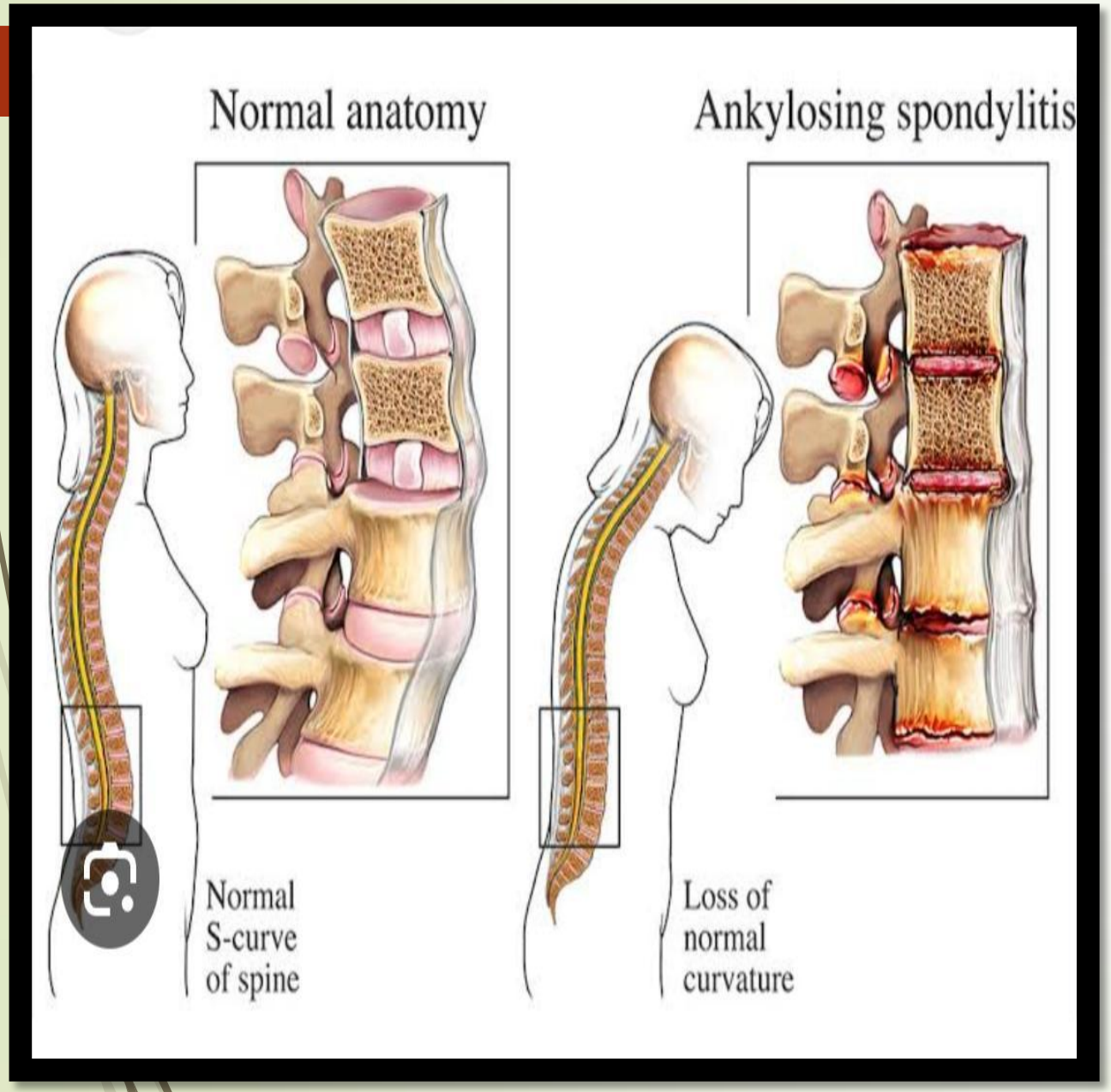




Severe scoliosis may have a significant effect on respiratory function. The effect is most often restrictive due to severe anatomical distortion of the chest, leading to reduced lung volumes, limited diaphragmatic excursion and chest wall muscle inefficiency.



Thoracic kyphosis is almost found in the elderly and reduces chest expansion which results in decreasing pulmonary function including lung function and respiratory muscle strength, then, it leads to dyspnea and exercises intolerance in the elderly.



Severe ankylosing spondylitis can also cause scarring of the lungs (pulmonary fibrosis) and an increased risk of lung infection.

MOVEMENT OF THE CHEST

Rate and Rhythm

14-18 breaths/mins

1.Tachypnoea

>20

- Nervousness
- Fever
- Hypoxia
- Respiratory conditions-

Pneumonia

Acute pulmonary odema

Metabolic acidosis etc.

2.Bradypnoea

Decrease

- Hypothyroidism
- Alkalosis
- Raised intracranial tension

etc.

Severity Scale of Dyspnoea - ATS

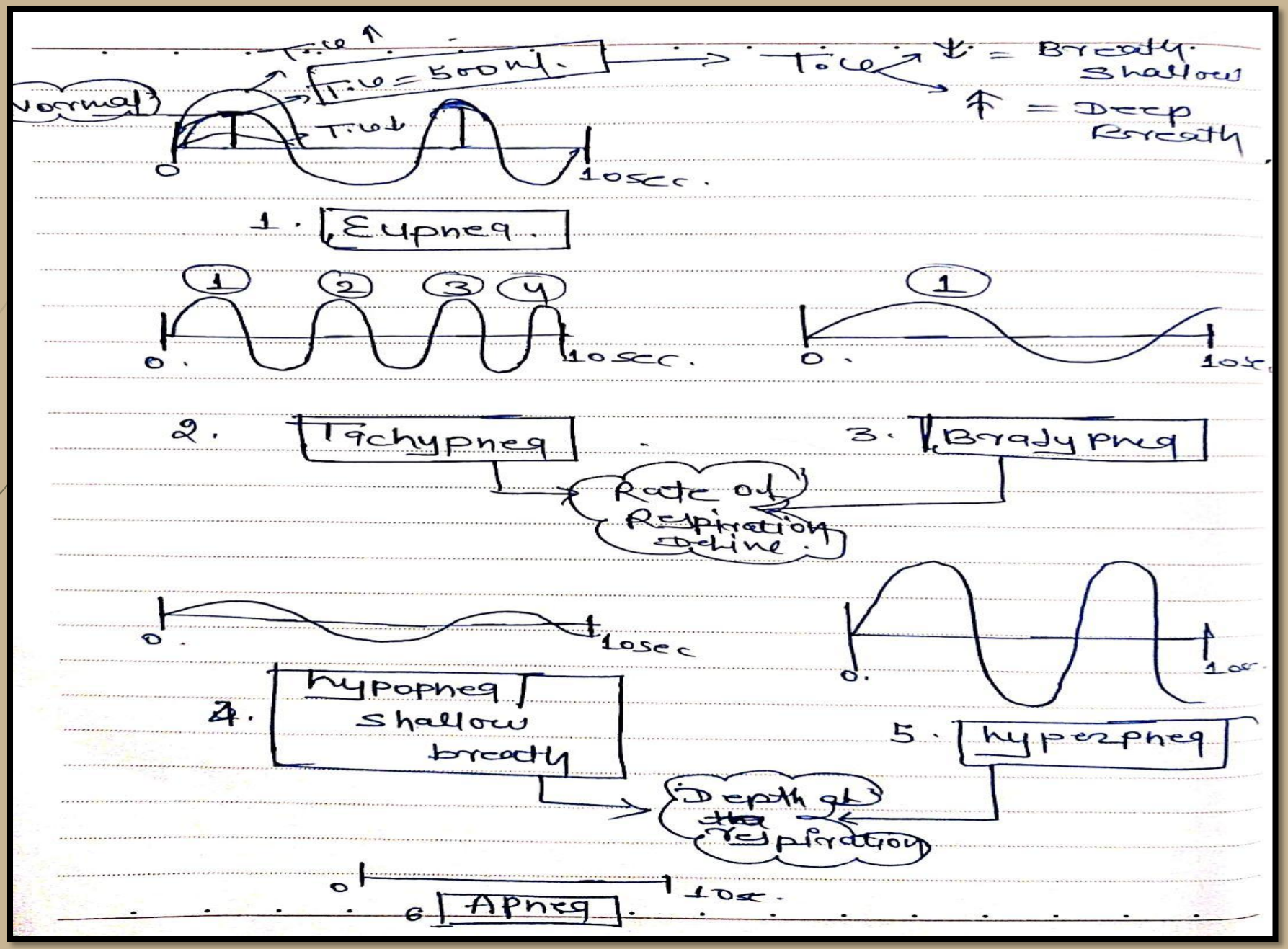
Grade	Degree	Characteristics
0	None	Only with strenuous activity
1	Slight	When hurrying on level ground or climbing a slight incline
2	Moderate	Needs to walk more slowly than others of the same age or has to stop for breath when walking at own pace on level ground
3	Severe	Stops for breath after 100 metres or after a few minutes
4	Very severe	Housebound or dyspnoea when dressing or undressing

BREATHING PATTERN

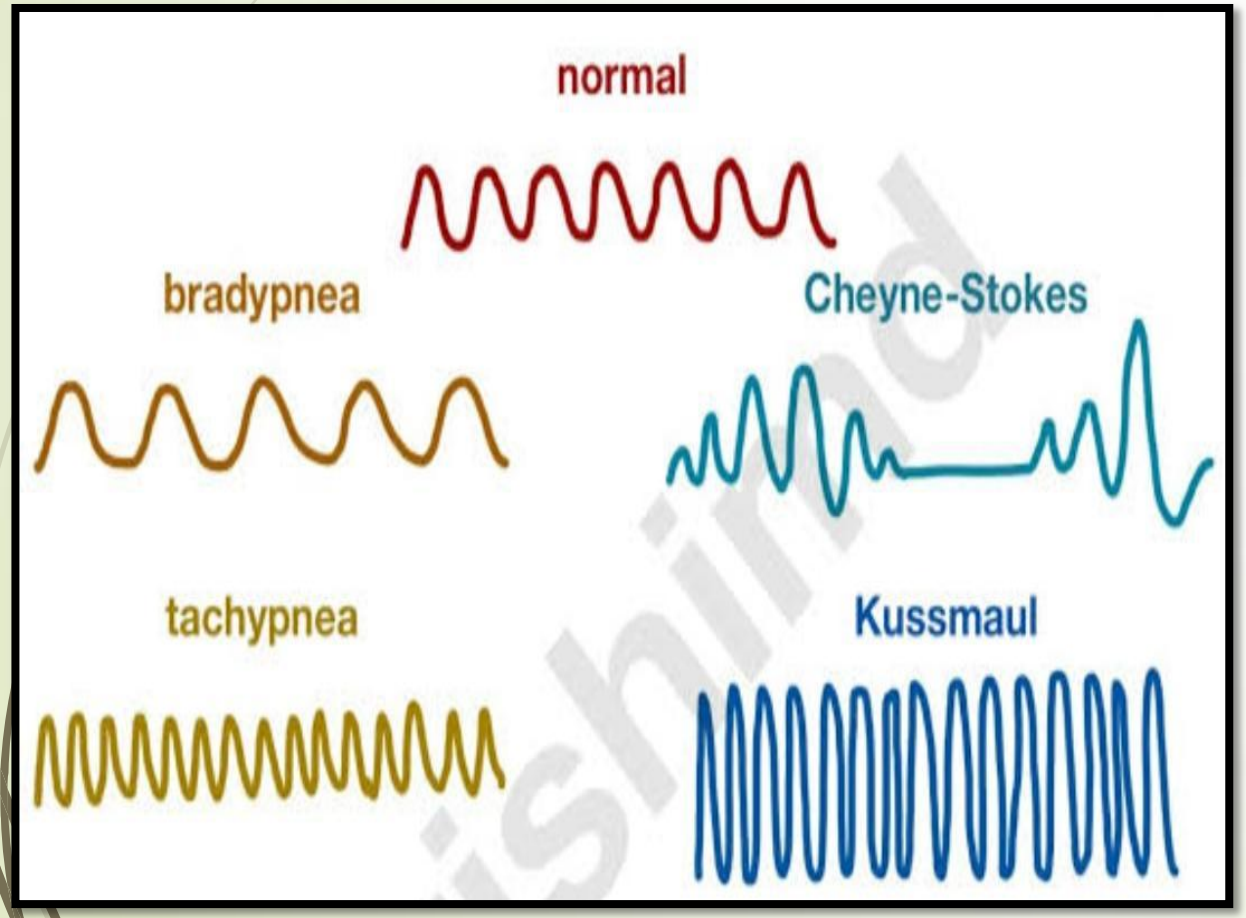
Physiologically breathing is of 2 types: Abdomino-thoracic and thoraco-abdominal.

Females have thoraco-abdominal breathing while males have abdomino-thoracic breathing.

Females have thoracicoabdominal breathing pattern… it is mainly due to the fat distribution over the abdomen n chest region… n their intercostals are stronger than their diaphragm… Females have smaller lungs in comparison to males of the similar age…


Time
Normal
T.V = 500ml.
T.V
0
10sec.
= Breathy Shallow
= Deep Breath
1. Eupnea.
1
2
3
4
0.
10sec.
1
0.
10sec
2. Tachypnea
3. Bradypnea
Rate of Respiration Decline.
0.
10sec
0.
10sec
4. Hypopnea
Shallow breathy
5. Hyperpnea
Depth of Respiration
0
10sec.
6. Apnea

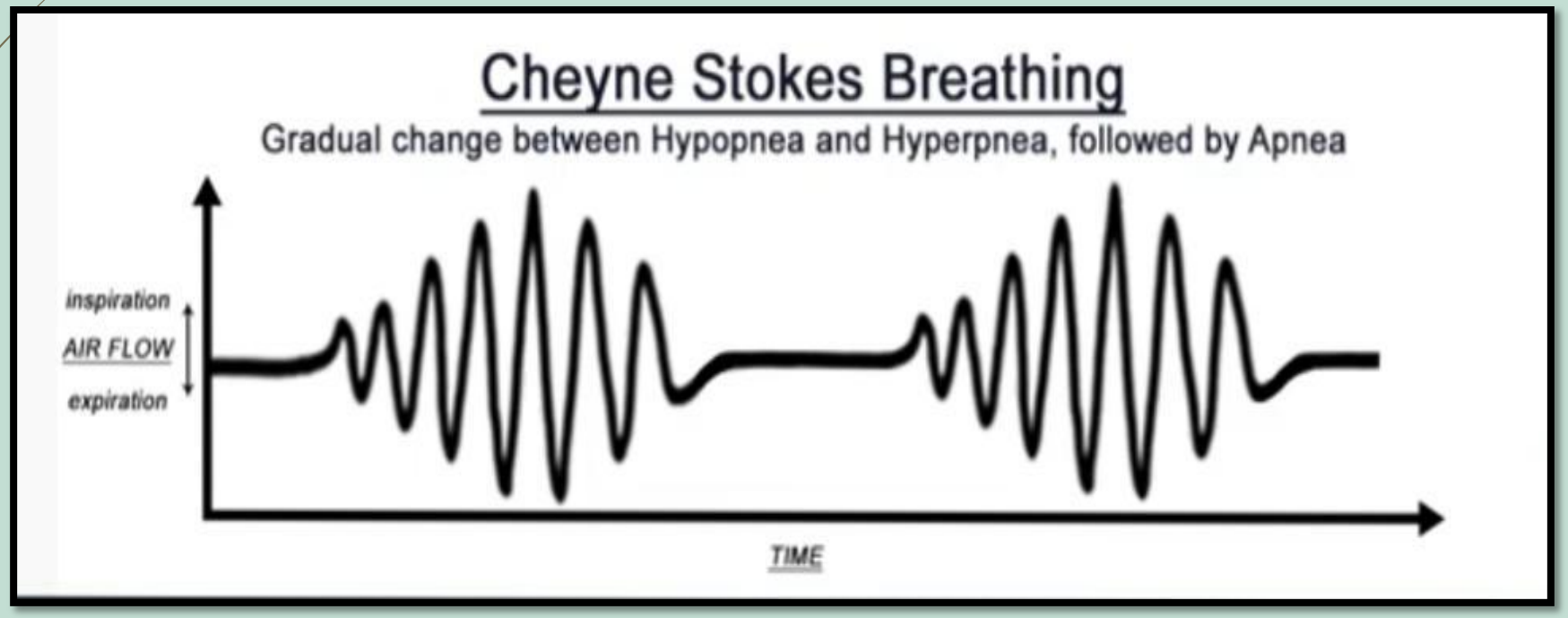
Abnormal breathing pattern (ABP)-



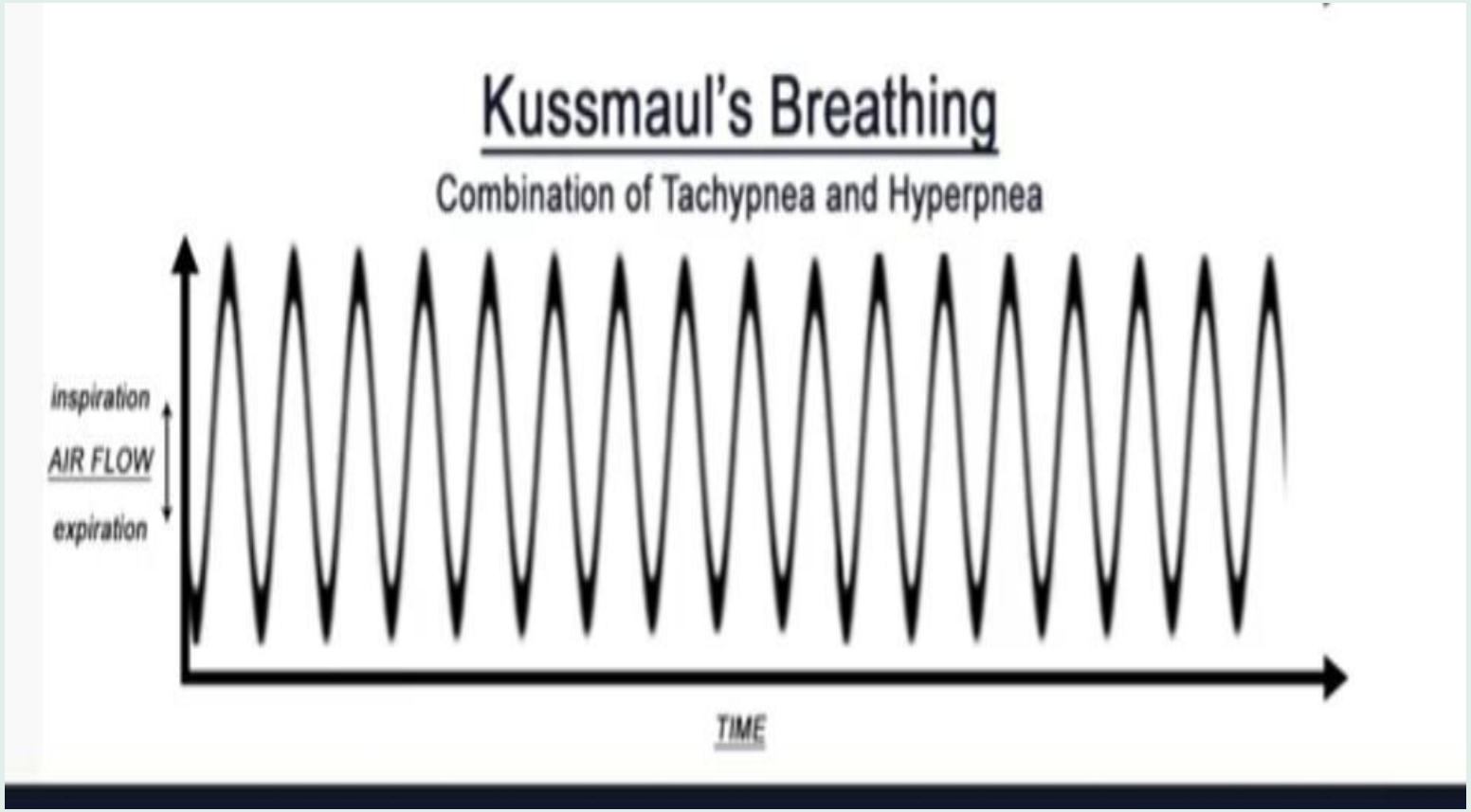
Chyne stoke breathing – seen in cardiac failure, renal failure etc.

Kussmaul breathing – seen in metabolic acidosis, diabetic ketoacidosis

Chyne stoke Respiration -irregular rate and rhythm of breathing (3-4 breath), Then apnea till 10-20 second. caused by Respiratory center damage and changes in blood PaCo2 and PaO2



Kussmaul's breathing Also called Hyper ventilation (HYPERPNEA + TACHYPNEA)

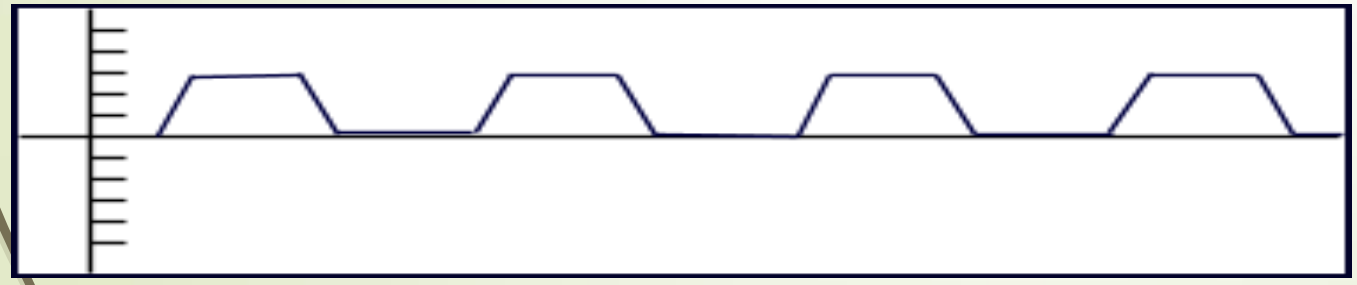


Irregular ABP-

- Biots breathing- seen in meningitis.

- Apneustic breathing- seen in pontine lesion

Biot's Respiration/cluster breathing Period of 3-4 deep breath, then apnea 20 sec. (up to 1 minute)Caused by damage to pons and use of opoids



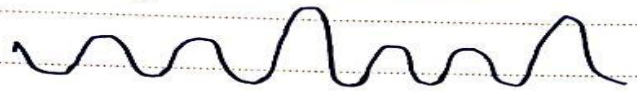
- **Pursed lip breathing-** seen in patients with COPD especially with emphysema.

- **Ataxic breathing-**

caused by damage to the medulla oblongata secondary to trauma or stroke. Seen in brainstem lesions.

Ataxia respirations

* **Sighing Respiration** ⇒ Breath 2-3 Normal Breath then Hyper

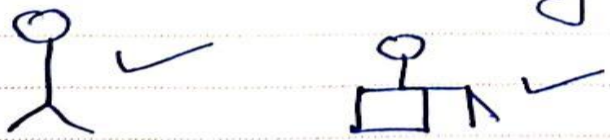


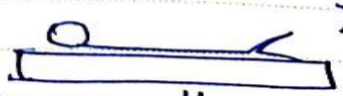
* **Periodic Breath** ⇒ Mainly in Infants

2-3 Shallow Breath

Apneq <10sec. loss of Breath.

* **Sudden dyspneq** : ⇒ pulmonary embolism**.
* **Steep Apneq** : ⇒ Due to Respiratory obstruction.
  > 10 sec.
* **Orthopneq** : ⇒ person can Breath only in upright position





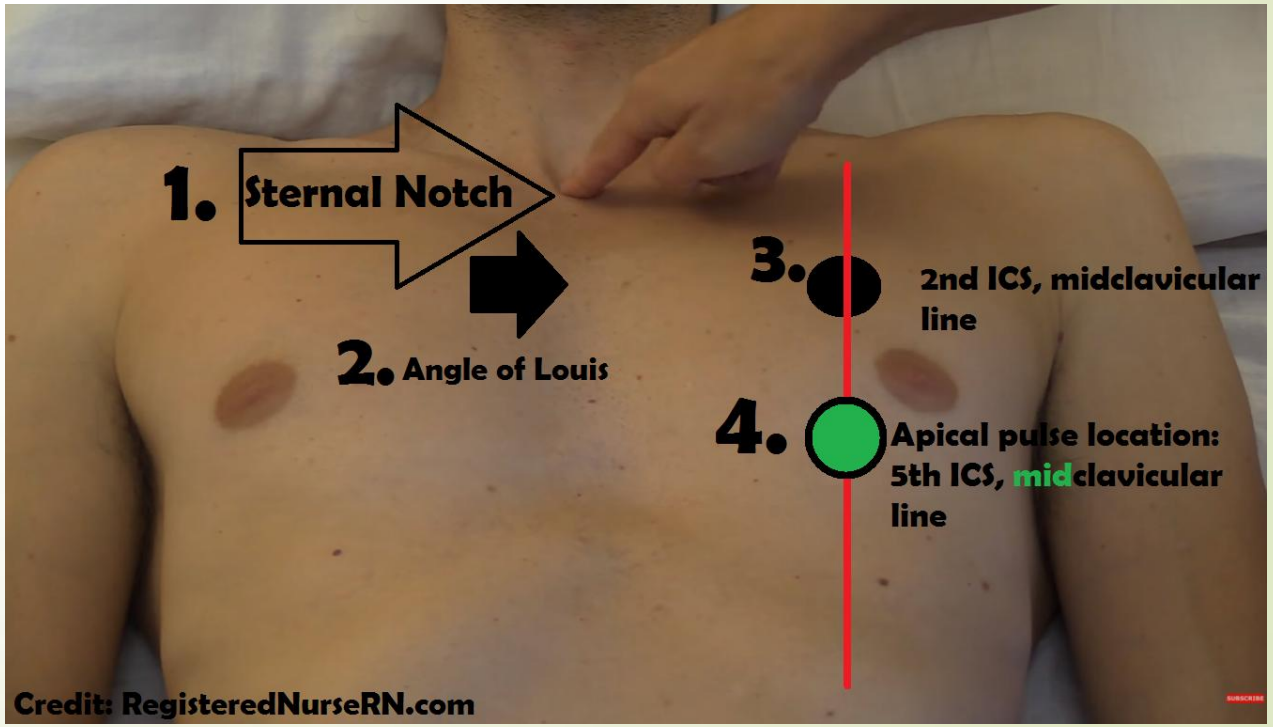
Can't Breath.

PALPATION

- Position of the apex beat and trachea
- Chest expansion
- Symmetry
- Tenderness
- Vocal fremitus

Trachea is in the midline and palpated in the suprasternal notch.

The apex beat can be usually palpated in the 5th intercoastal space within the midclavicular Line.



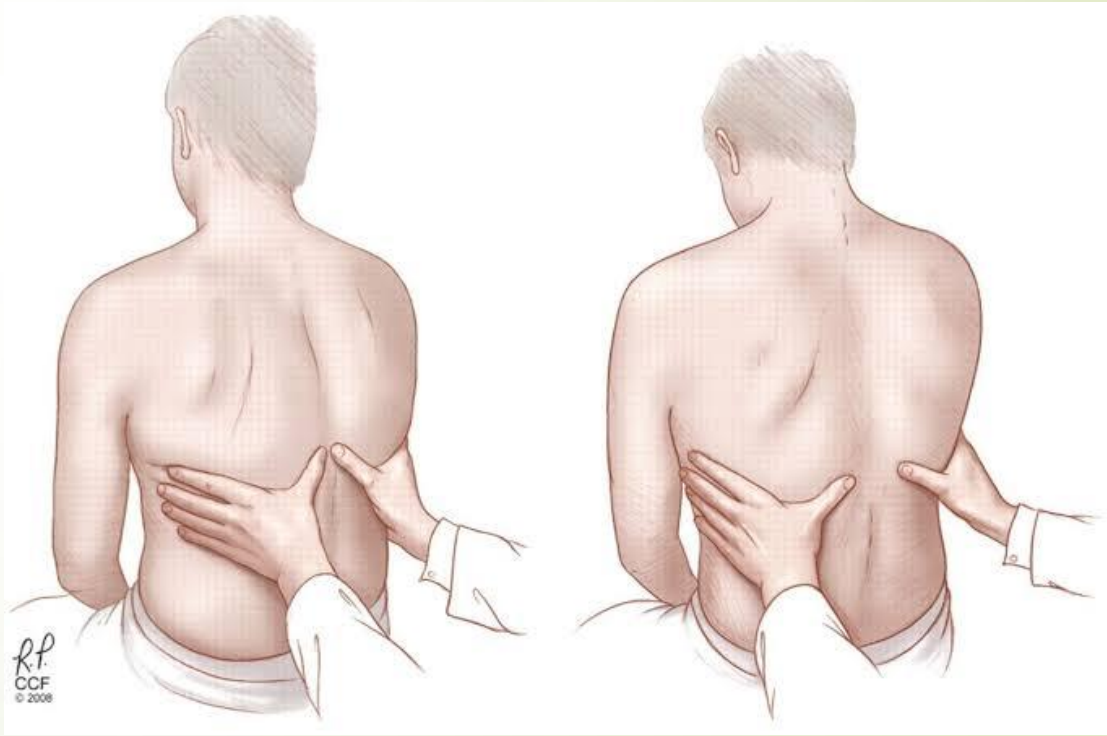
Common causes of tracheal deviation

Towards the side of the lung lesion	
• Upper lobe or lung collapse • Upper lobe fibrosis	• Pneumonectomy
Away from the side of the lung lesion	
• Tension pneumothorax	• Massive pleural effusion
Upper mediastinal mass	
• Retrosternal goitre • Lymphoma	• Lung cancer

CHEST EXPANSION $ SYMMETRY

Normally expansion is 5cm

Abnormally less than 1 in severe emphysema



General restriction of expansion	Asymmetrical expansion
• COPD • Extensive bilateral disease • Ankylosing spondylosis • Interstitial lung disease	• Pleural effusion • Pneumothorax • Extensive consolidation • Collapse • Fibrosis etc.

Tenderness may be due to –

- Empyema
- Local inflammation of parietal pleura, soft tissue
- Infiltration with tumour
- Non respiratory cause(amoebic liver abscess)

Vocal fremitus –

Vocal fremitus is the vibration detected by palpation with the palm of the Hand on the chest, when the patient is asked to repeat 99 or one-one-one.

Increased in consolidation.
Decreased in pleural effusion.

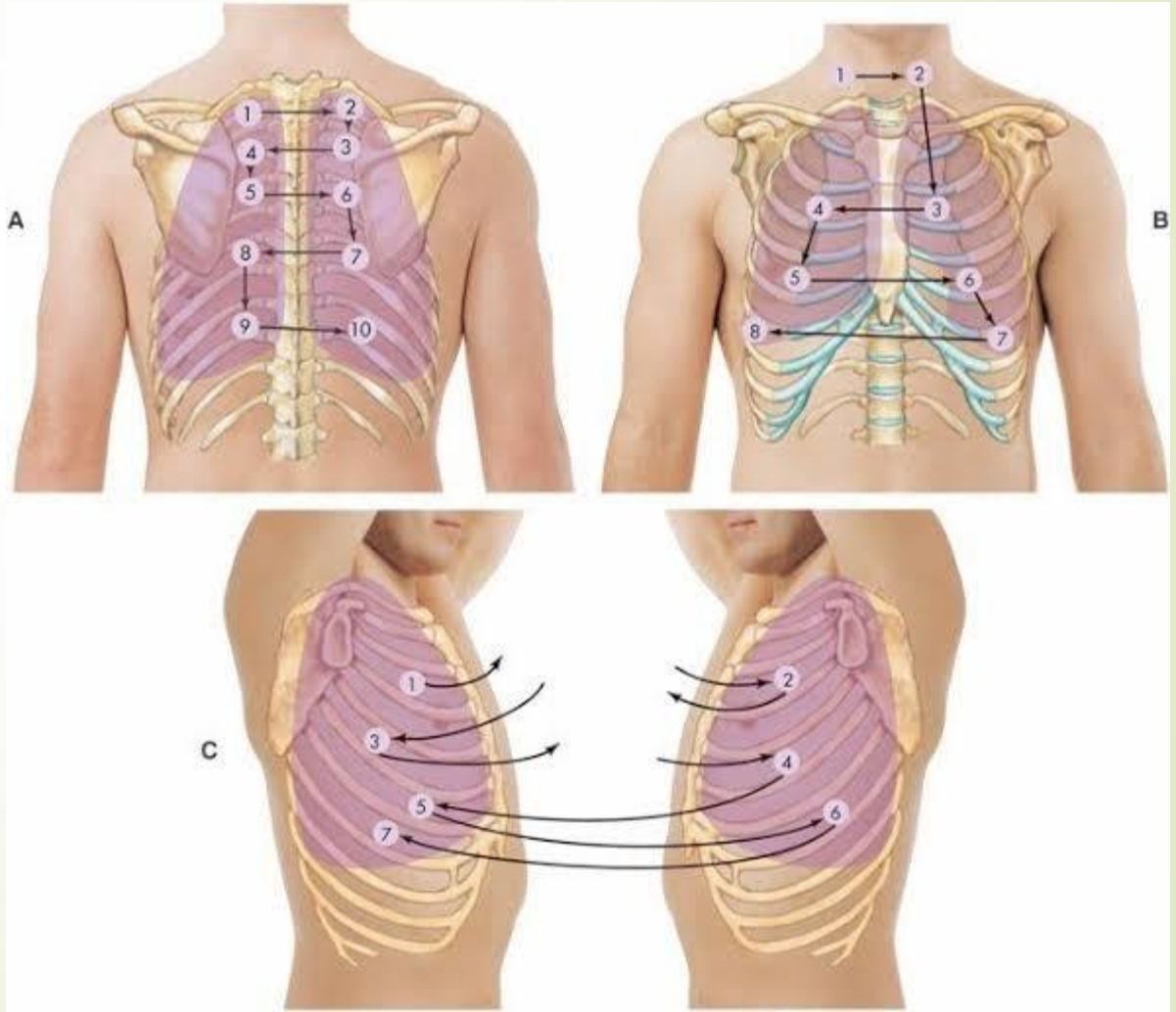
PERCUSSION

It is a method of tapping on a surface to determine the underlying structure.

Position of patient –sitting posture(best)

supine position is not desirable becoz of the alteration by underlying structure.

Areas of chest percussion are



Percussion note

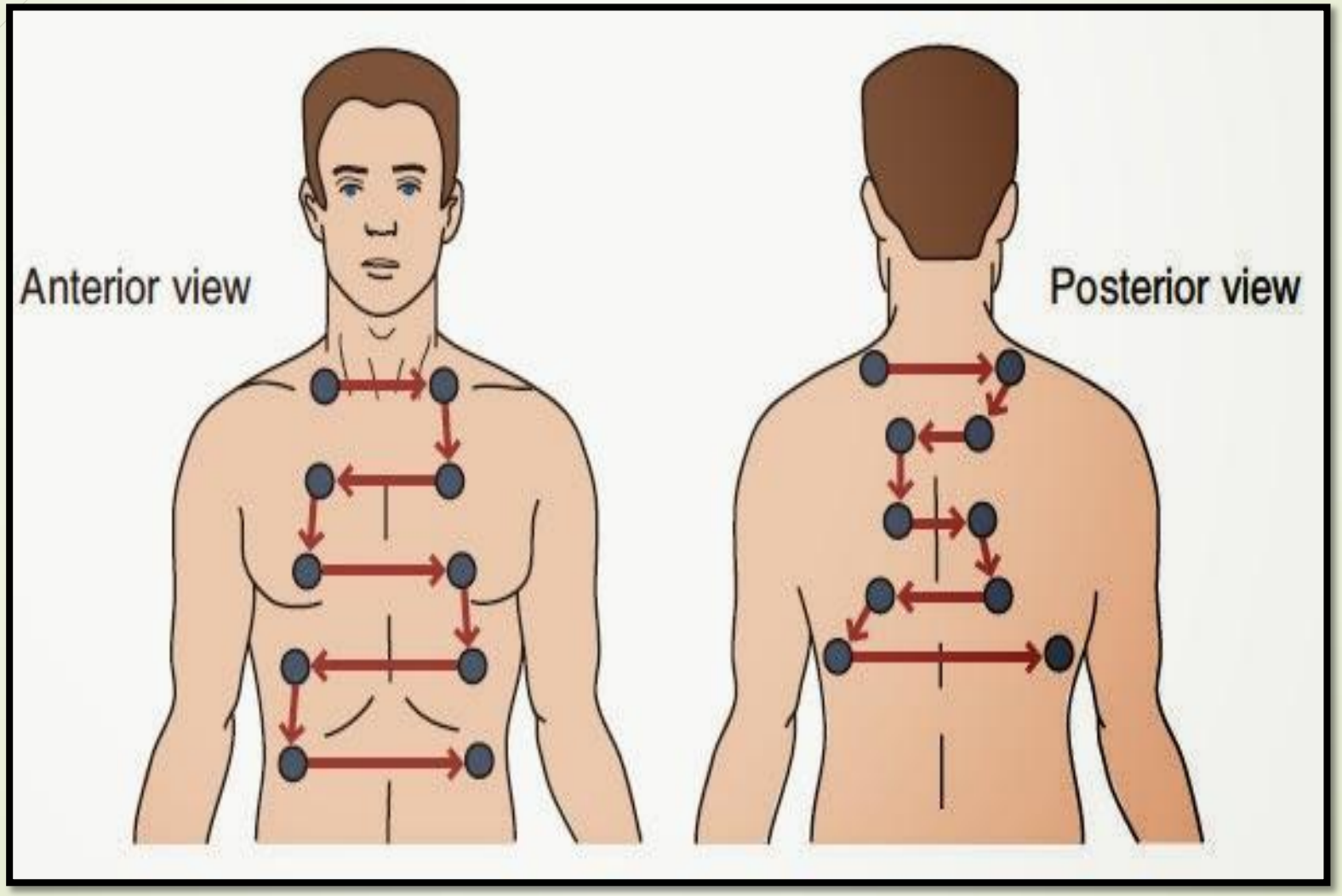
Resonant	Healthy lung tissue
Hyperresonant	Too much air present Emphysema or pneumothorax
Dull	Abnormal lung density Pneumonia, pleural effusion, atelectasis or tumour
Stoney dull	Pleural effusion or haemothorax

AUSCULTATION

As you are auscultating your patient , plz keep in mind these 2 things-

1. Are the breath sound increased, normal, or decreased?
2. Are there any abnormal or adventitious breath sounds?

Areas of auscultation -



- 1. Type of breath sounds
- 2. Adventitious sounds
- 3. Vocal resonance
- 4. Miscelleaneous sounds

NORMAL CHEST SOUND

- Bronchial :

The **bronchial** breath **sounds** over the trachea has a higher pitch, louder, inspiration and expiration are equal and there is a pause between inspiration and expiration

➢Vesicular sound:

The vesicular breathing is heard over the thorax, lower pitched and softer than **bronchial** breathing.

Qualities of normal breath sounds

Breath sound	Quality	I:E ratio	Location
Tracheal 	Harsh, high-pitched	I = E	Above supraclavicular notch, over the trachea 
Bronchial 	Loud, high-pitched	I < E	Just above clavicles on each side of the sternum, over the manubrium 
Bronchovesicular 	Medium in loudness and pitch	I = E	Next to the sternum, between scapulae 
Vesicular 	Soft, low-pitched	I > E	Remainder of lungs 

ADVENTITIOUS SOUNDS

- Wheezes, describing a continuous musical sound on expiration or inspiration. A wheeze is the result of narrowed airways. Common causes include asthma and emphysema.

Rhonchi (an increasingly obsolete term) characterised by low pitched, musical bubbly sounds heard on inspiration and expiration. Rhonchi are the result of viscous fluid in the airways

- Crackles or rales. Intermittent, non-musical and brief sounds heard during inspiration only. They may be described as *fine* (soft, high-pitched) or *coarse* (louder, low-pitched). These are the result of alveoli opening due to increased air pressure during inspiration. Common causes include congestive heart failure.

Stridor a high-pitched musical breath sound resulting from turbulent air flow in the larynx or lower in the bronchial tree. It is not to be confused with stertor. Causes are typically obstructive, including foreign bodies, croup, epiglottitis, tumours, infection and anaphylaxis

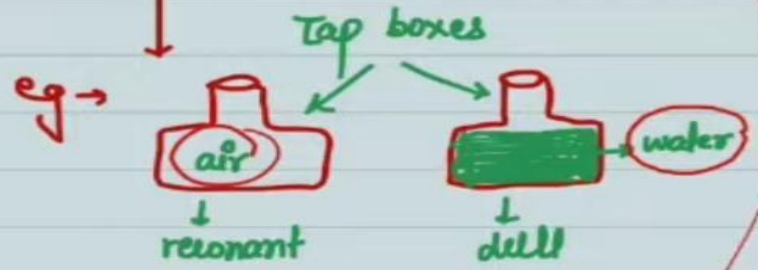
CONCEPT OF VOCAL RESONANCE / VOCAL FREMITUS & CHEST PERCUSSION

Simple PHYSICS CONCEPT

VIBRATION waves

- TRAVEL BETTER IN (1) AIR > FLUID > SOLID

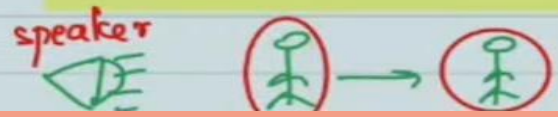
eg →



Sound waves

(1) TRAVEL BETTER IN SOLID > LIQUID > AIR

(2) IF SOURCE OF SOUND TAKEN AWAY FROM HEARER, INTENSITY ↓ses.



TAP on chest

↓

Percussion

Ask pt. to speak

C Ram/Ram, 99,99

Palpate the sound waves over ch -

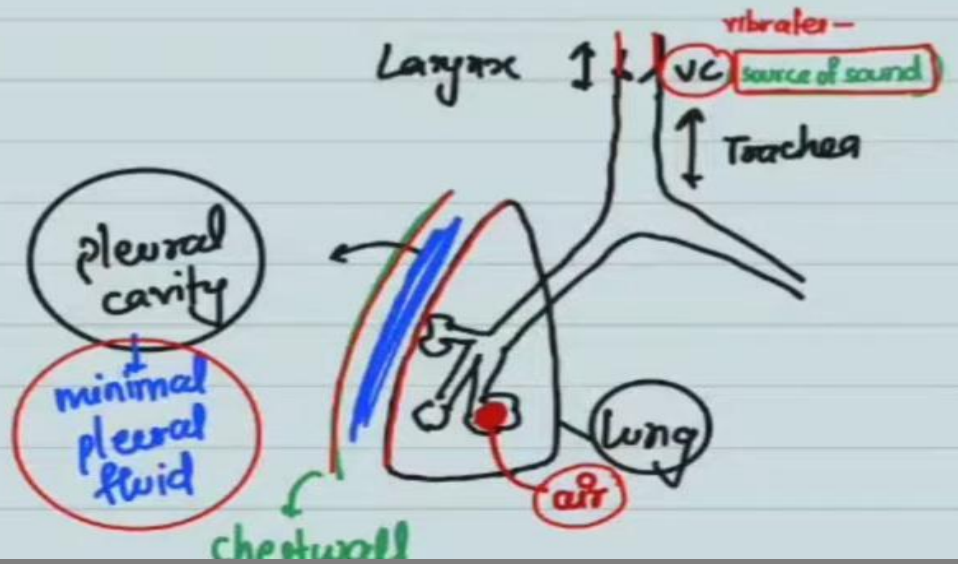
↓

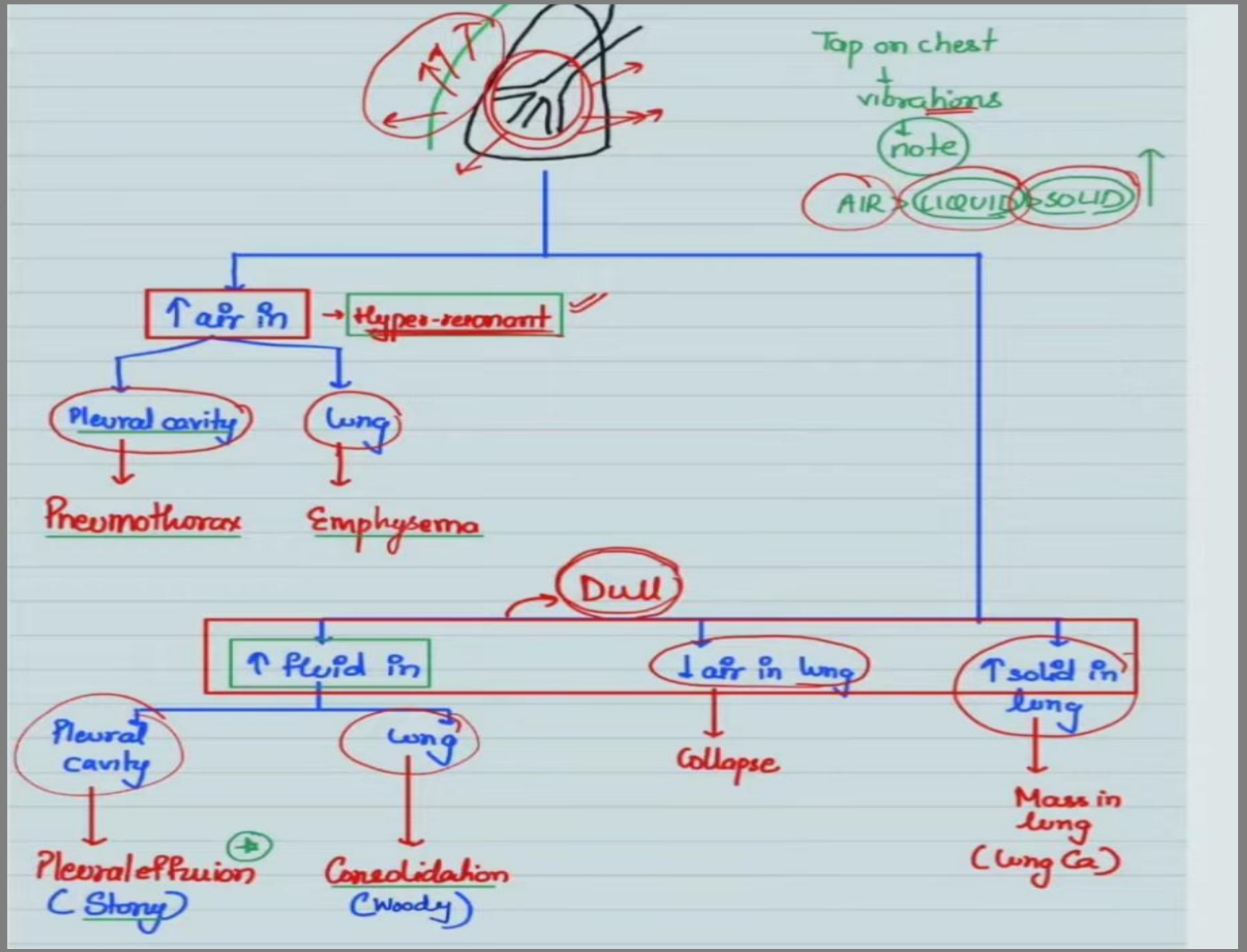
vocal fremitus

Auscultate sound waves over chest

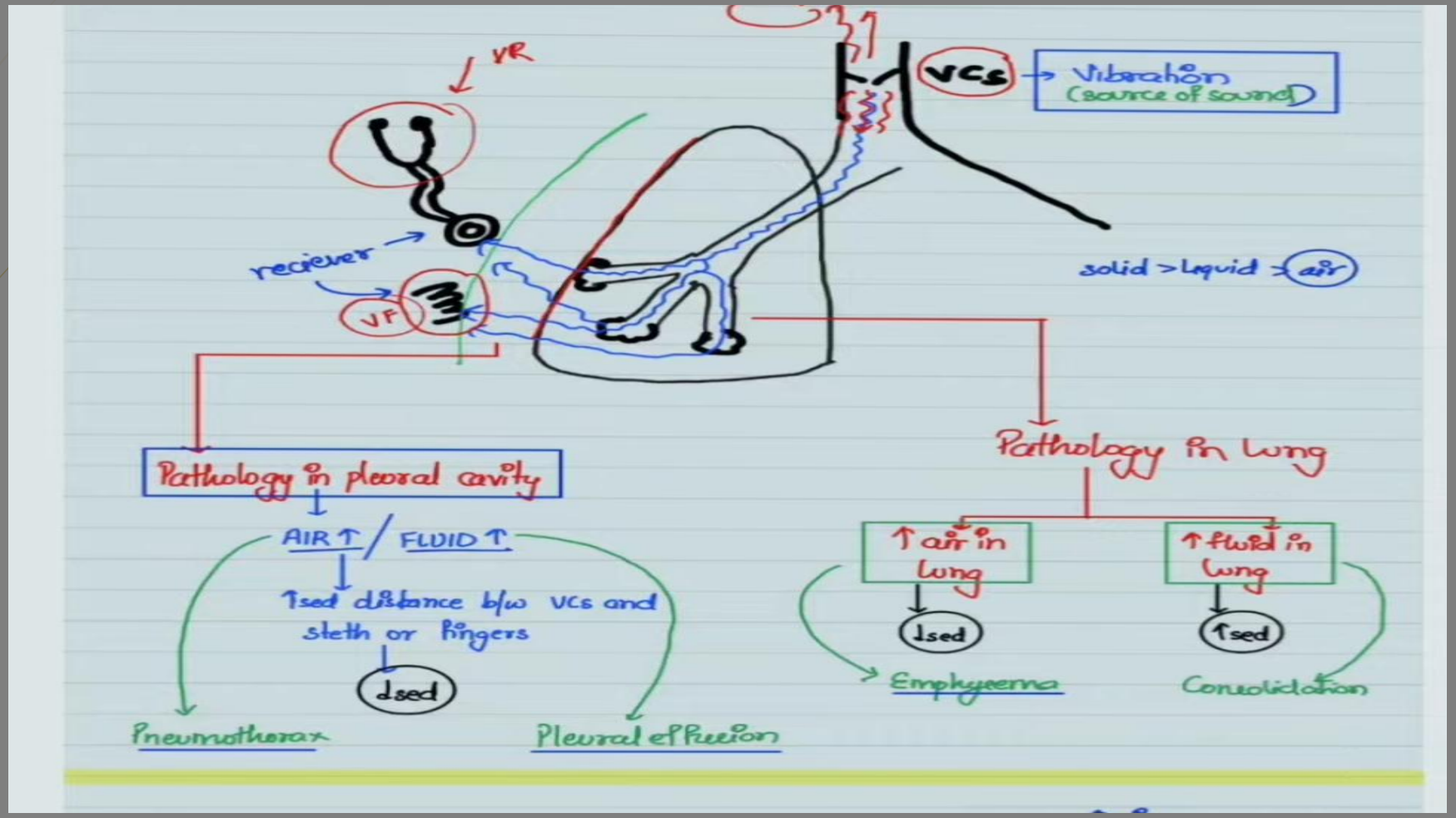
↓

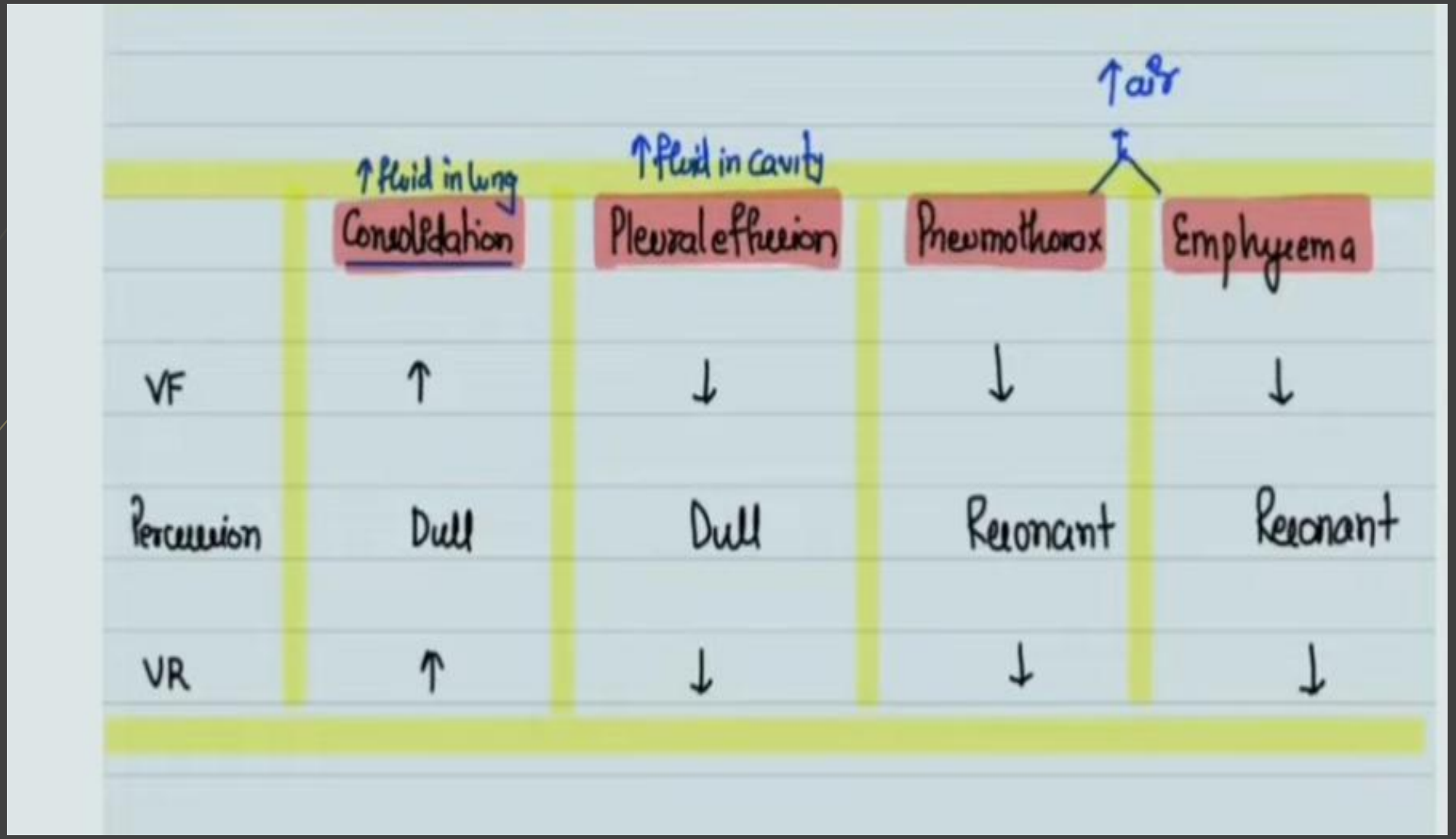
vocal resonance




Tap on chest
vibrations
note
AIR > LIQUID > SOLID
↑ air in
Hyper-resonant
Pleural cavity
Lung
Pneumothorax
Emphysema
Dull
↑ fluid in
↓ air in lung
↑ solid in lung
Pleural cavity
Lung
Collapse
Mass in lung
(Lung Ca)
Pleural effusion
(Stony)
Consolidation
(Woody)

Vocal Resonance & Vocal Fremitus




↑air
↑Fluid in lung
↑Fluid in cavity
Consolidation
Pleural effusion
Pneumothorax
Emphysema
VF
↑
↓
↓
↓
Percussion
Dull
Dull
Resonant
Resonant
VR
↑
↓
↓
↓

THANK YOU.....