Thorax and Lungs Exam

Dr. Gary Mumaugh – Western Physical Assessment

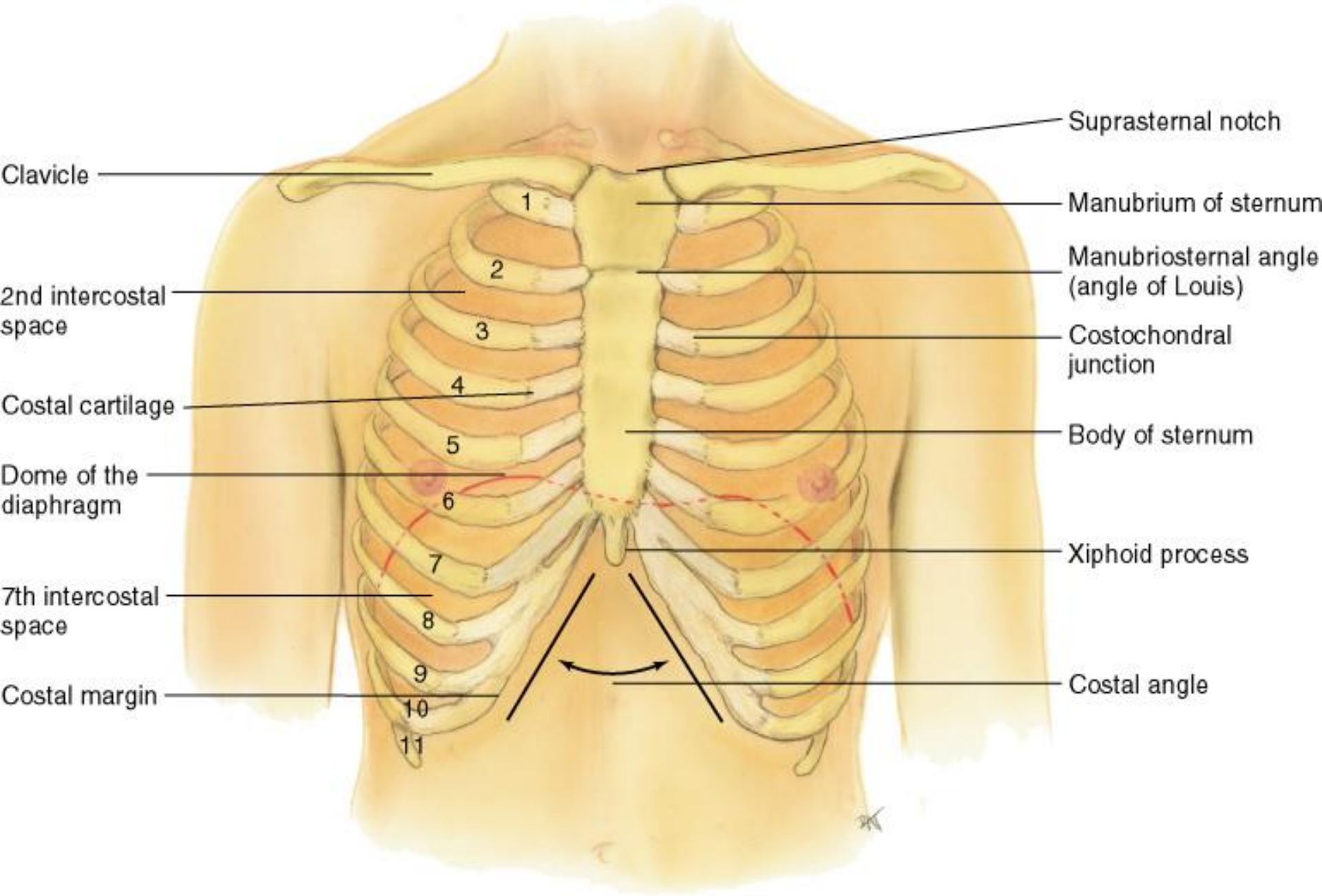
Thoracic Cage /Cavity

Shape- bony, conical shape, narrower at top borders – it is defined by:

- Sternum – 3 parts: manubrium, body, xiphoid process
- Ribs – 12 pairs, 1st seven attach to the sternum (costal cartilages) Ribs 8,9,&10 attach to the costal cartilage above, Ribs 11 & 12 are floating ribs
- 12 Thoracic vertebrae
- Diaphragm – the floor, separates the thoracic cavity from the abdomen

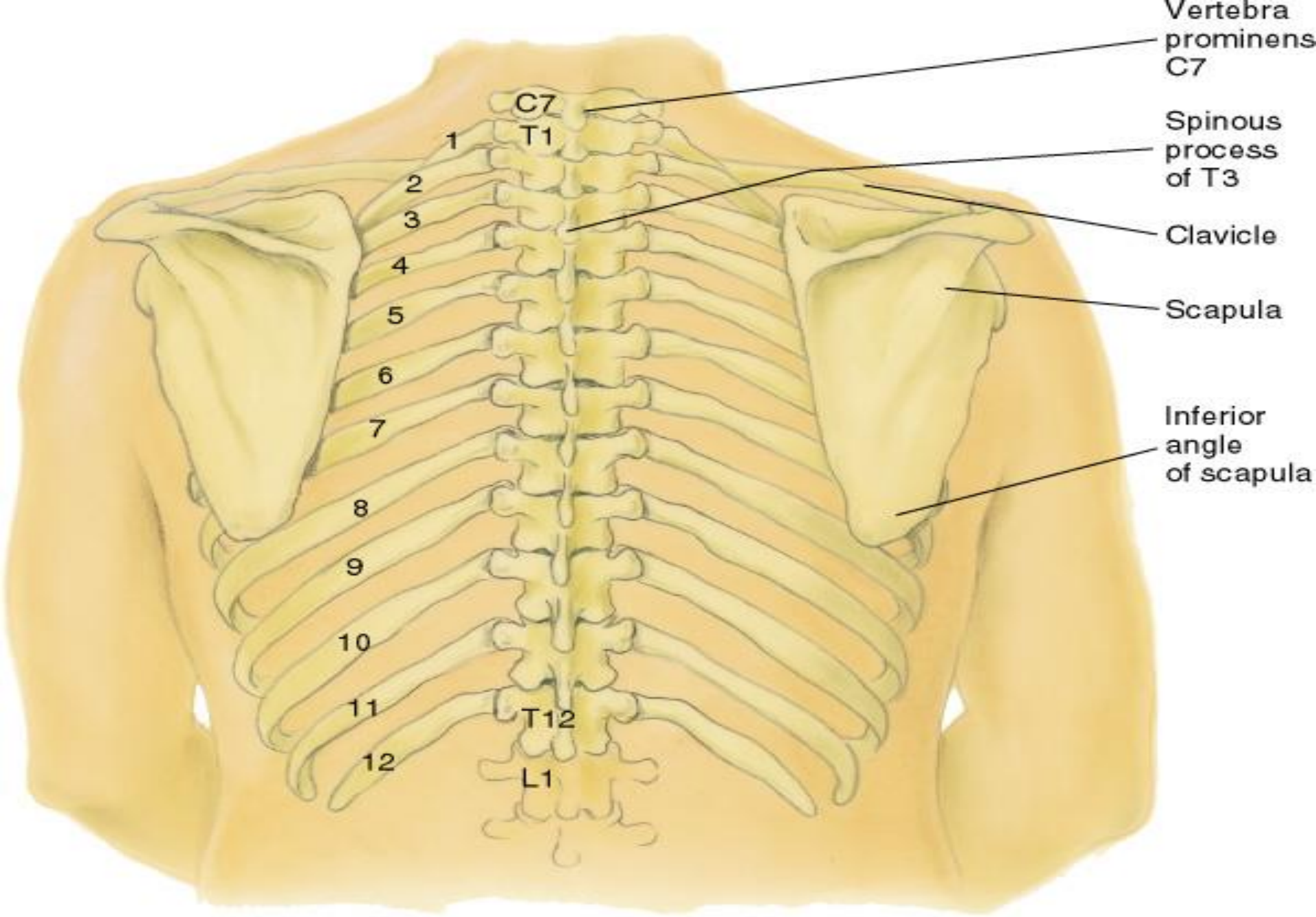
Anterior Thoracic Landmarks

- Suprasternal Notch – U shaped depression
- Sternum – “breastbone” = 3 parts
  1. Manubrium
  2. Body
  3. Xiphoid process
  - Angle of Louis – manubriosternal angle continuous with the 2^{nd} Rib
  - Costal angle- usually 90^0 or <


Clavicle
2nd intercostal space
Costal cartilage
Dome of the diaphragm
7th intercostal space
Costal margin
1
2
3
4
5
6
7
8
9
10
11
Suprasternal notch
Manubrium of sternum
Manubriosternal angle (angle of Louis)
Costochondral junction
Body of sternum
Xiphoid process
Costal angle

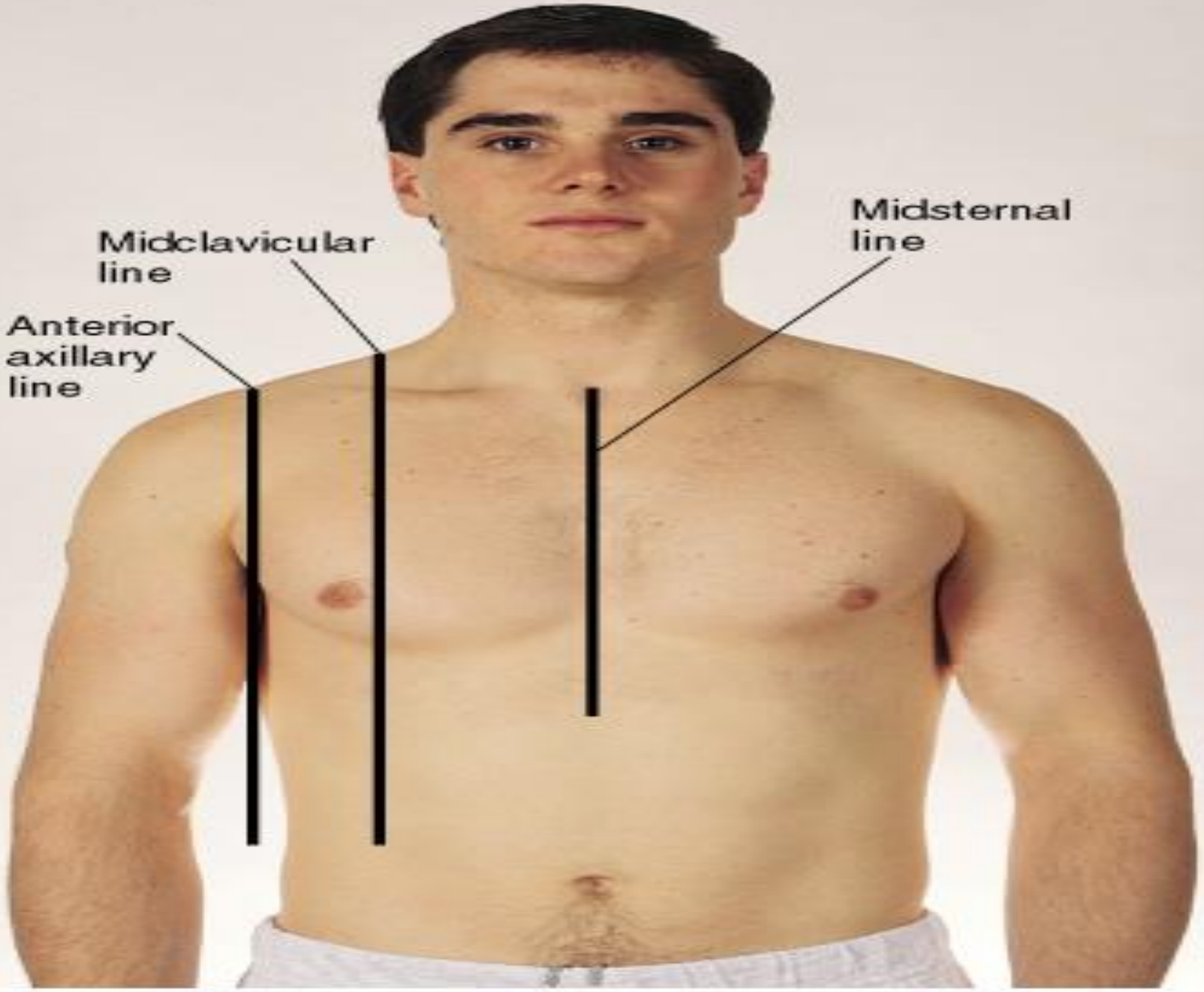
Posterior Thoracic Landmarks

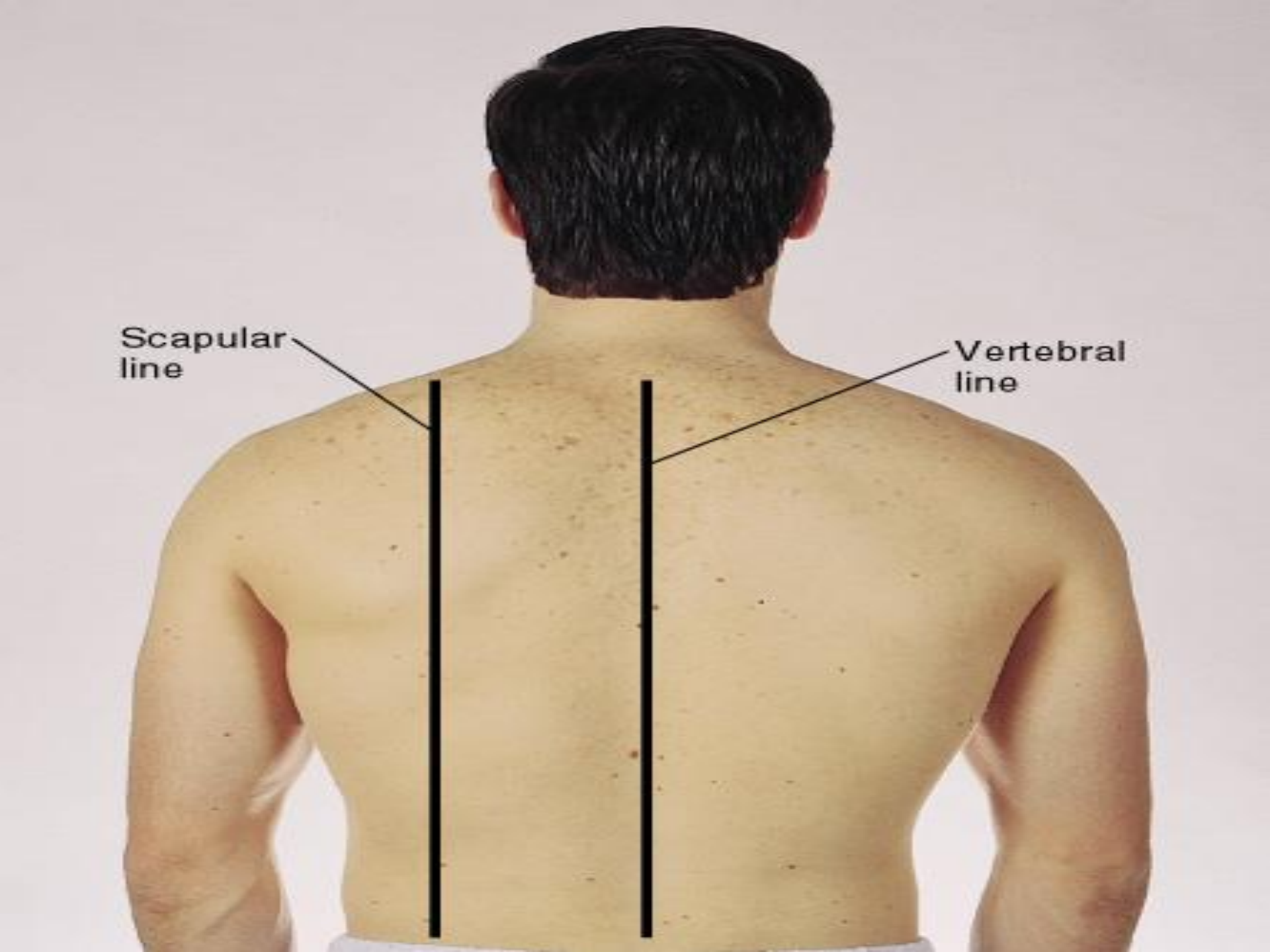
- Vertebra Prominens – Flex head, feel most prominent bony projection at base of neck = C7 next lower one is T1
- Spinous Processes – spinal column-
- Scapula – symmetrical , lower tip at the 7 -8th rib
- 12th Rib = midway b/t spine & side

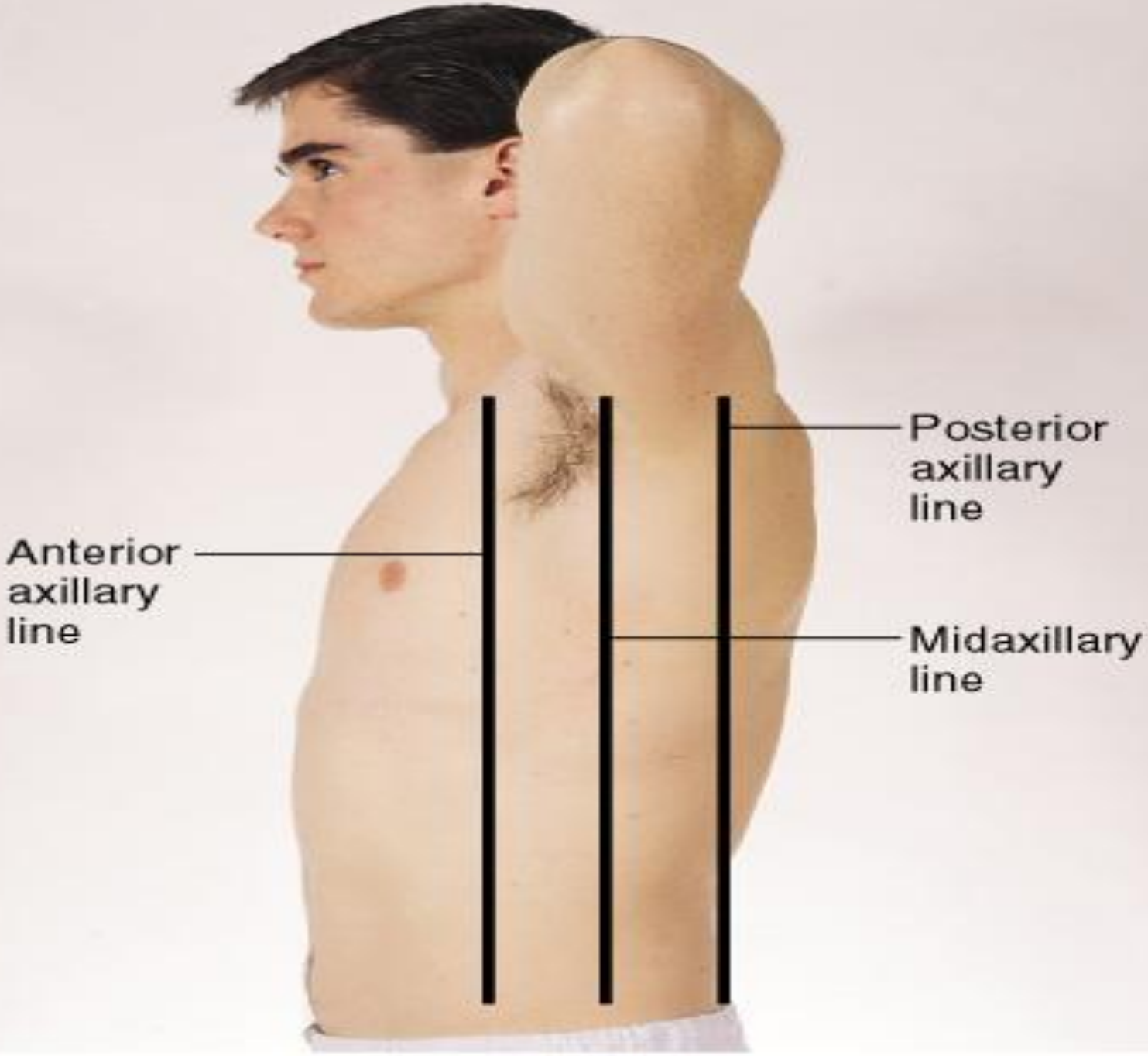

Vertebra prominens C7
Spinous process of T3
Clavicle
Scapula
Inferior angle of scapula
C7
T1
1
2
3
4
5
6
7
8
9
10
11
12
T12
L1

Reference Lines

- Anterior Chest
  - Midsternal line
  - Midclavicular line
- Posterior Chest
  - Vertebral line – midspinal
  - Scapular line
- Lateral Chest
  - Anterior Axillary line
  - Posterior Axillary line
  - Mid–axillary line


Midclavicular line
Midsternal line
Anterior axillary line


Scapular line
Vertebral line


Posterior
axillary
line
Anterior
axillary
line
Midaxillary
line

The Thoracic Cavity

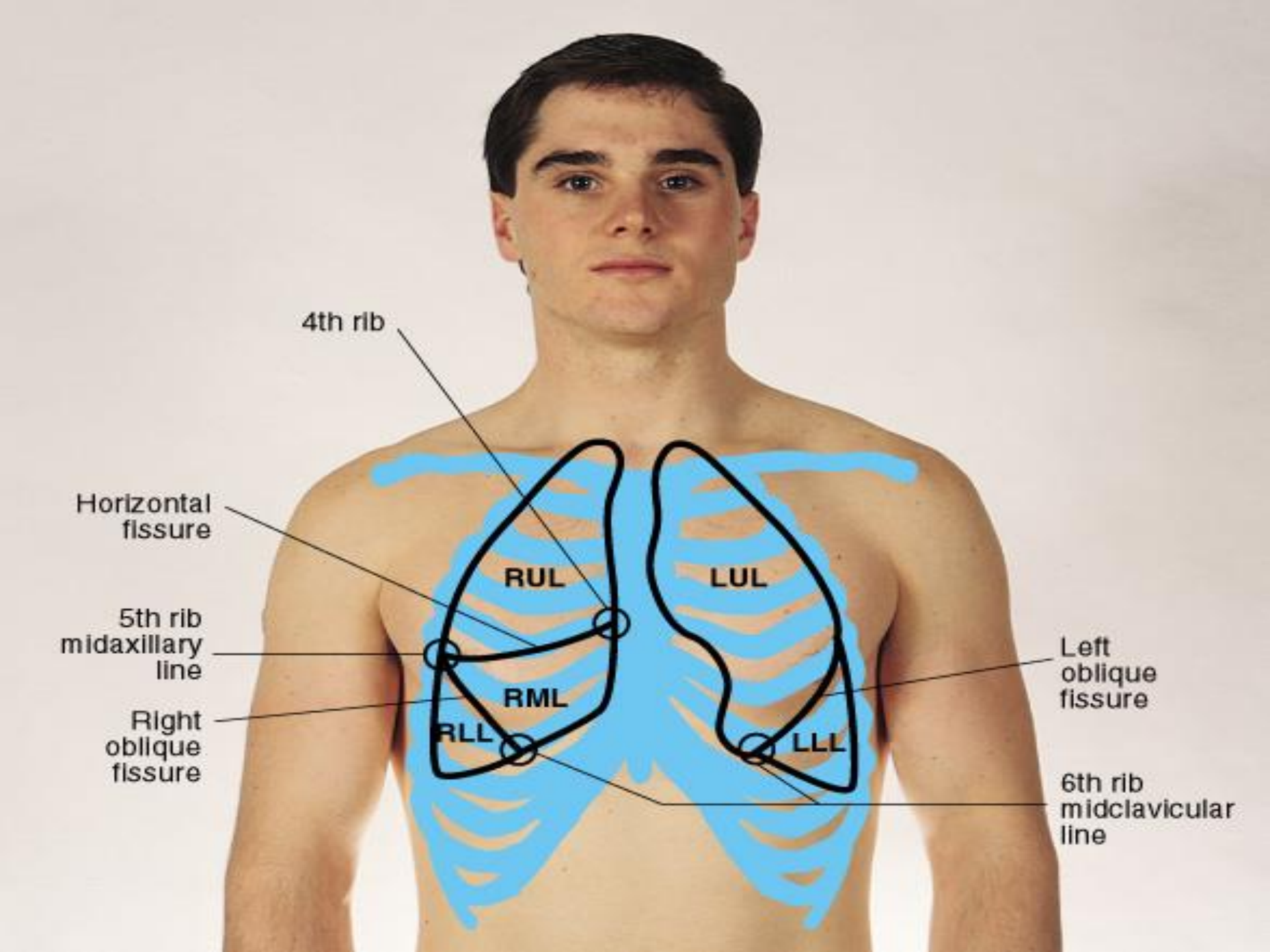
- Mediastinum middle of the thoracic cavity & contains;
  - Esophagus
  - Trachea
  - Heart
  - Great Vessels
- Pleural Cavities on either side of the mediastinum contain the lungs

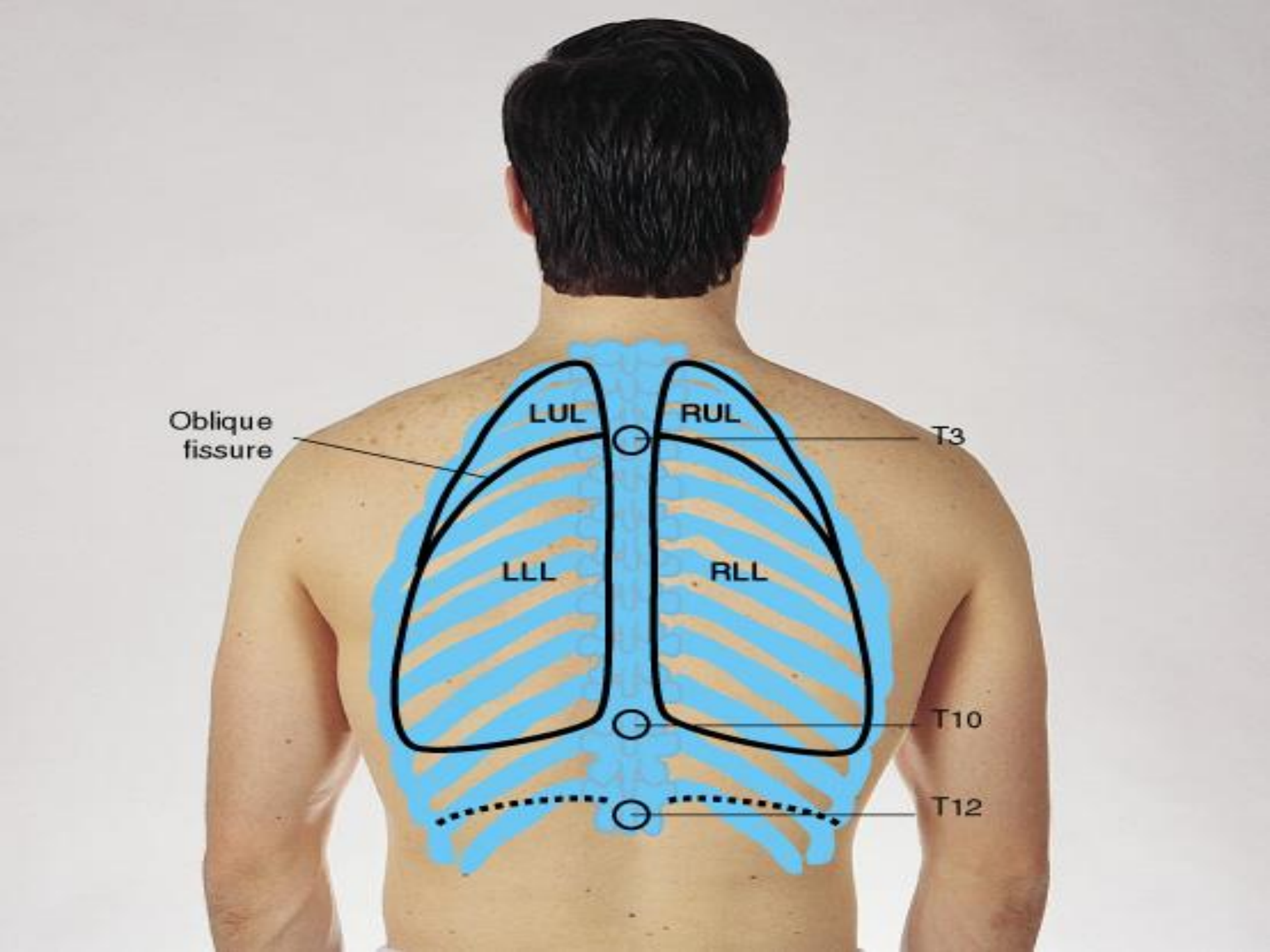
Lung Borders

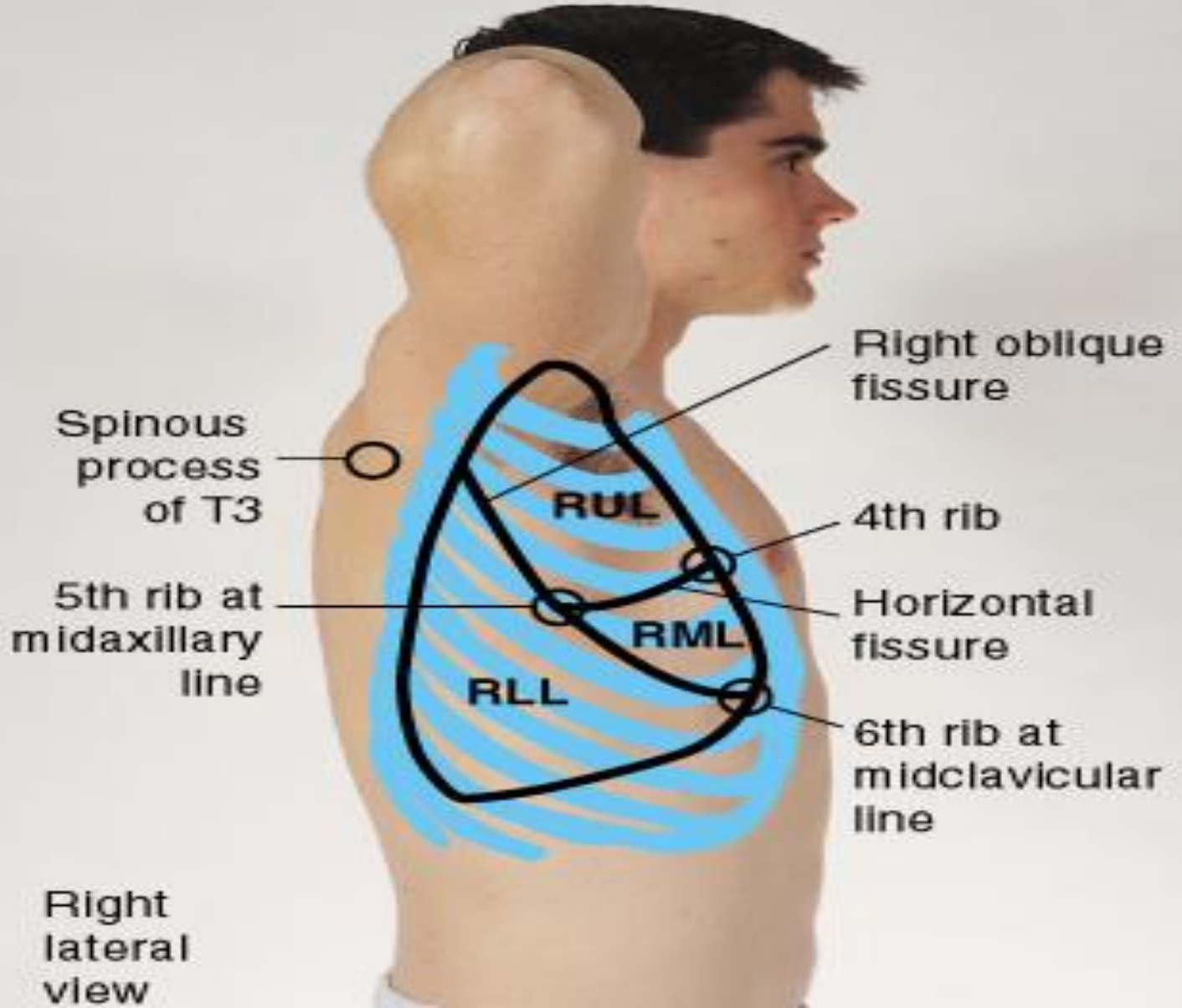
- Anterior Chest
  - Apex 3 -4 cm. ↑ inner 1/3 of the clavicles
  - Base – rests on the diaphragm, 6th rib, MCL
- Lateral Chest
  - Extends from Axilla apex to 7th –8th rib
- Posteriorly
  - Apex of lung is at C7 – Base T10 (on deep inspiration to T12)

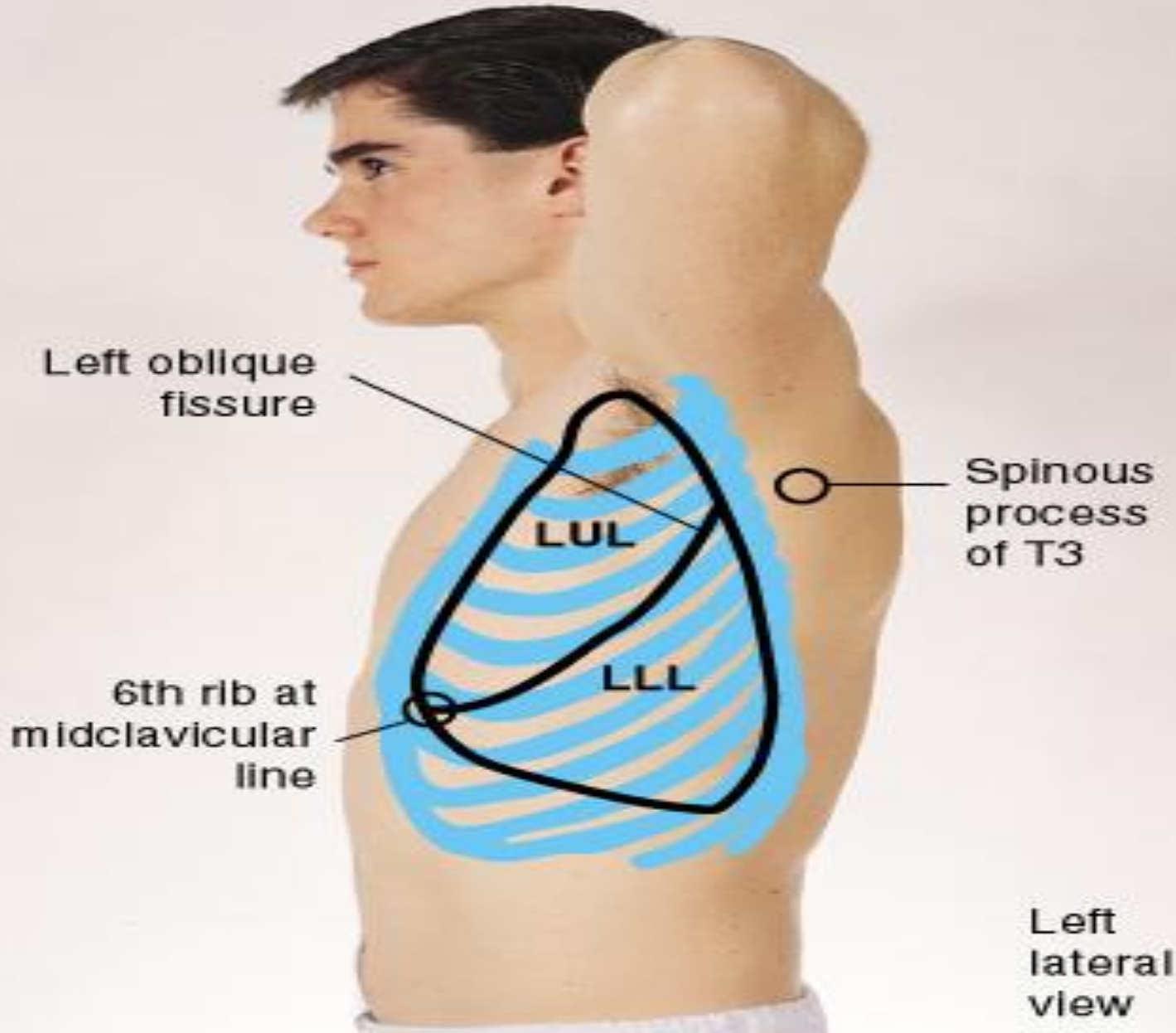
Lobes of Lung

- Right Lung
  - 3 lobes, upper, middle , lower
  - Shorter due to liver
- Left Lung
  - LUL = Left Upper and Lower (2 lobes)
  - Narrower due to heart


4th rib
Horizontal fissure
5th rib midaxillary line
Right oblique fissure
RUL
LUL
RML
RLL
LLL
Left oblique fissure
6th rib midclavicular line


Oblique fissure
LUL
RUL
T3
LLL
RLL
T10
T12


Right oblique fissure
Spinous process of T3
RUL
4th rib
5th rib at midaxillary line
Horizontal fissure
RML
RLL
6th rib at midclavicular line
Right lateral view


Left oblique fissure
LUL
LLL
Spinous process of T3
6th rib at midclavicular line
Left lateral view

3 Important Points

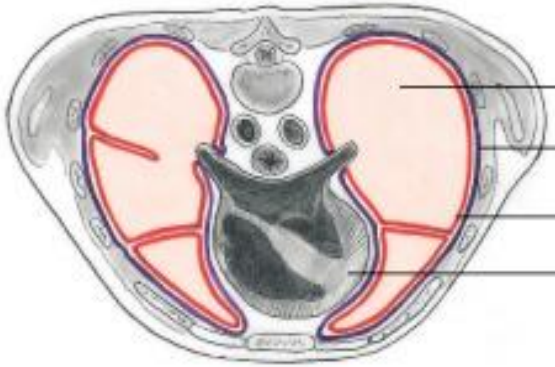
1. Left Lung – no middle lobe

2. Anterior chest contains upper & middle lobes with very little lower lobe

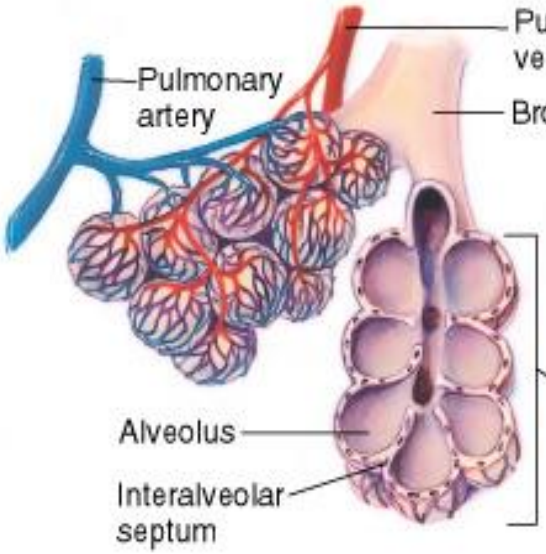
3. Posterior chest has almost all lower lobe. Right middle lobe does not project into the posterior chest

Pleurae

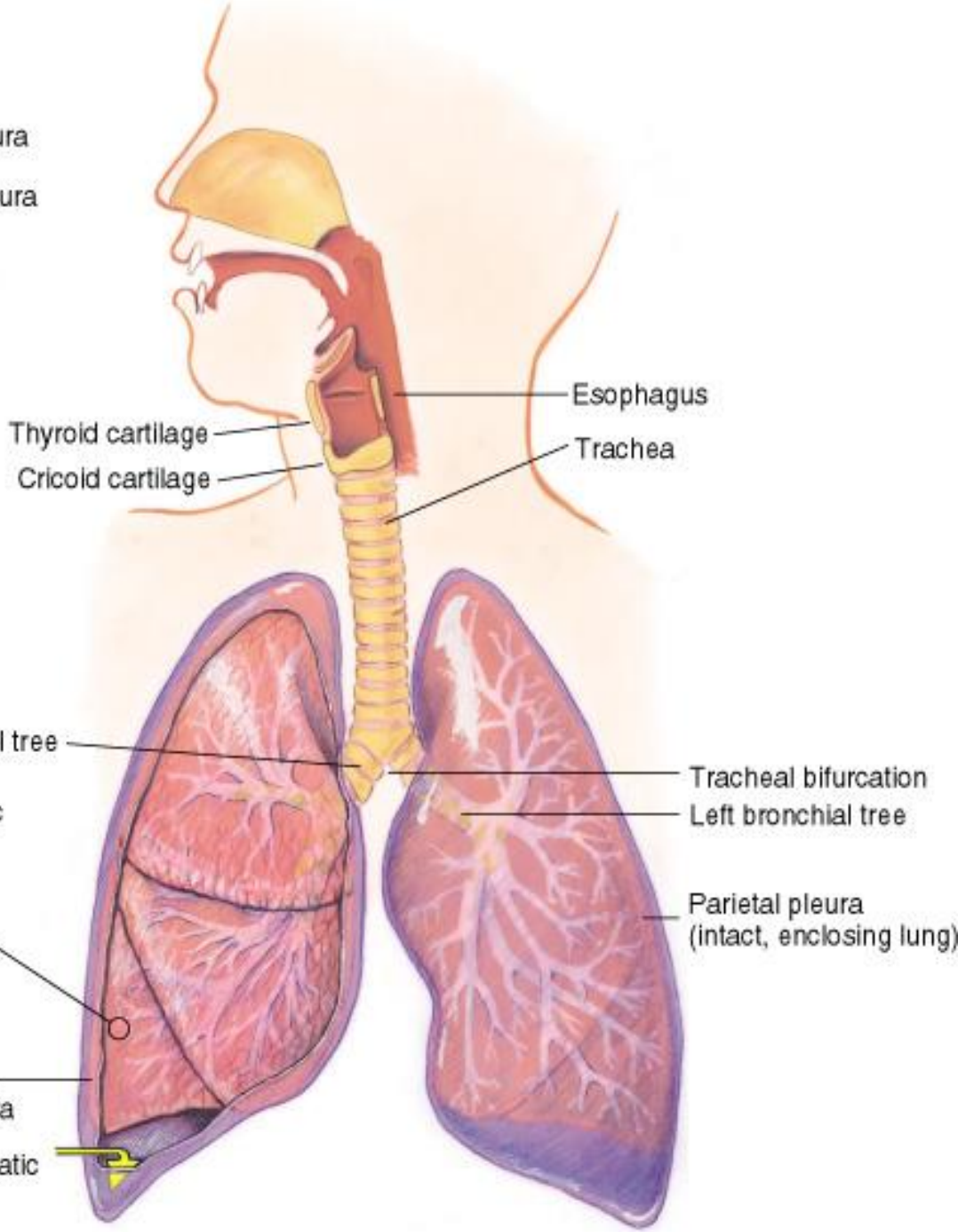
- The Pleurae form an envelope b/t the lungs & chest wall
- Visceral pleura – lines outside of lungs
- Parietal pleura – lines inside of chest wall & diaphragm
- Pleural Cavity – the inside of the envelope-space b/t visceral & parietal pleura, lubrication. Normally has a vacuum or neg. pressure



CROSS SECTION
OF THORAX



ACINUS



Tracheal & Bronchial Tree

- Trachea – anterior to esophagus-
  - 10-11 cm.long, begins at cricoid cartilage
  - Bifurcates just below the sternal angle

  (AKA angle of Louis, manubriosternal angle) into the
    - Right Main Stem Bronchus – shorter, wider, more vertical
    - Left Main Stem Bronchus

Tracheal & Bronchial Tree

- **Bronchi**
  - Secrete mucus – captures particles
  - Cilia – moves the trapped particles up to be expelled or swallowed
- **Acinus**
  - Functional respiratory unit consisting of,
    - Bronchioles, alveolar ducts, alveolar sacs, & alveoli
  - Gaseous exchange in alveolar duct & alveoli

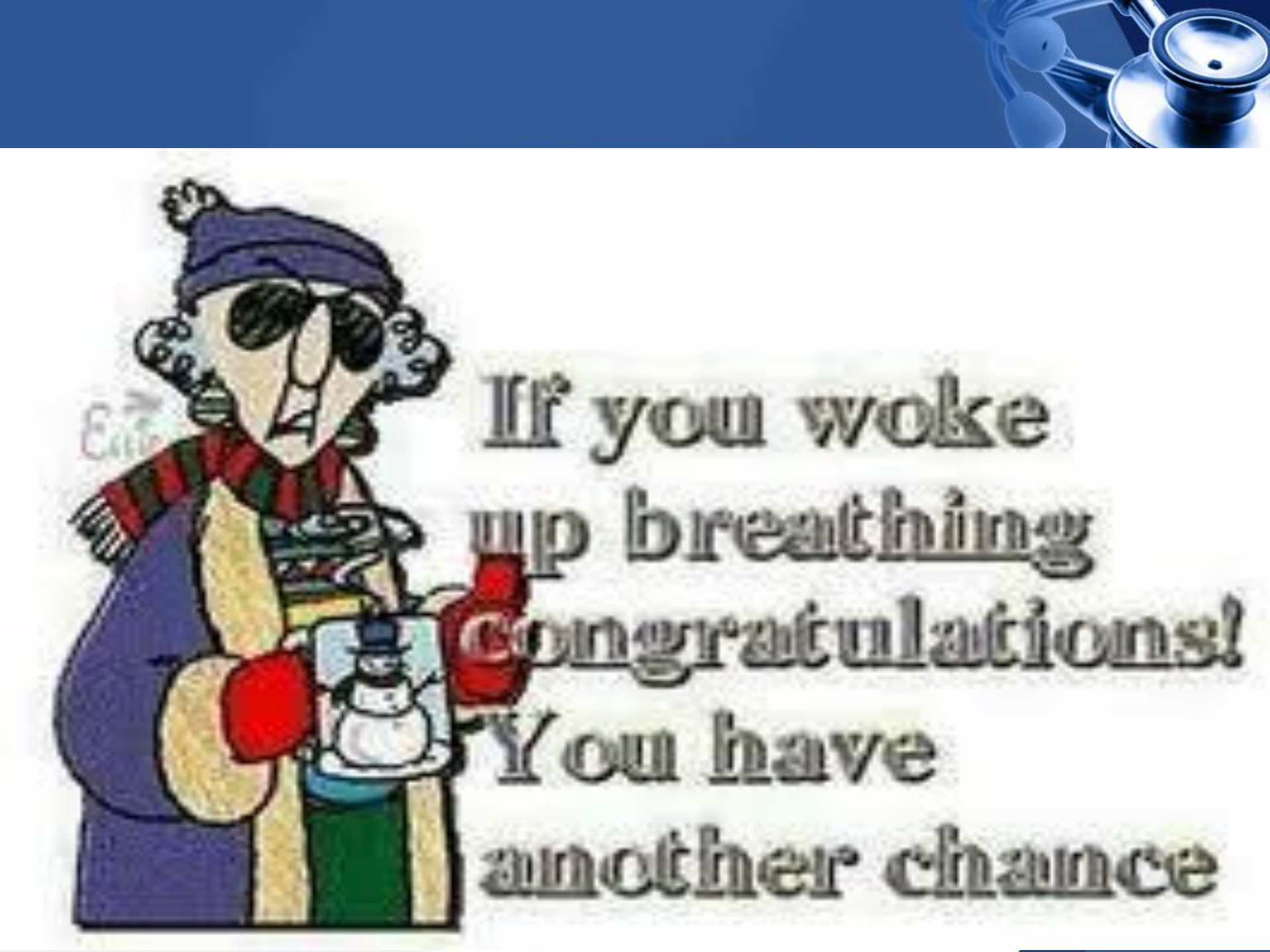
Mechanics of Respiration

4 Major Functions of the Respiratory System

1. Supply O^2 for energy production
2. Remove CO^2 , waste product of energy reactions
3. Homeostasis, acid-base balance of arterial blood
4. Heat exchange

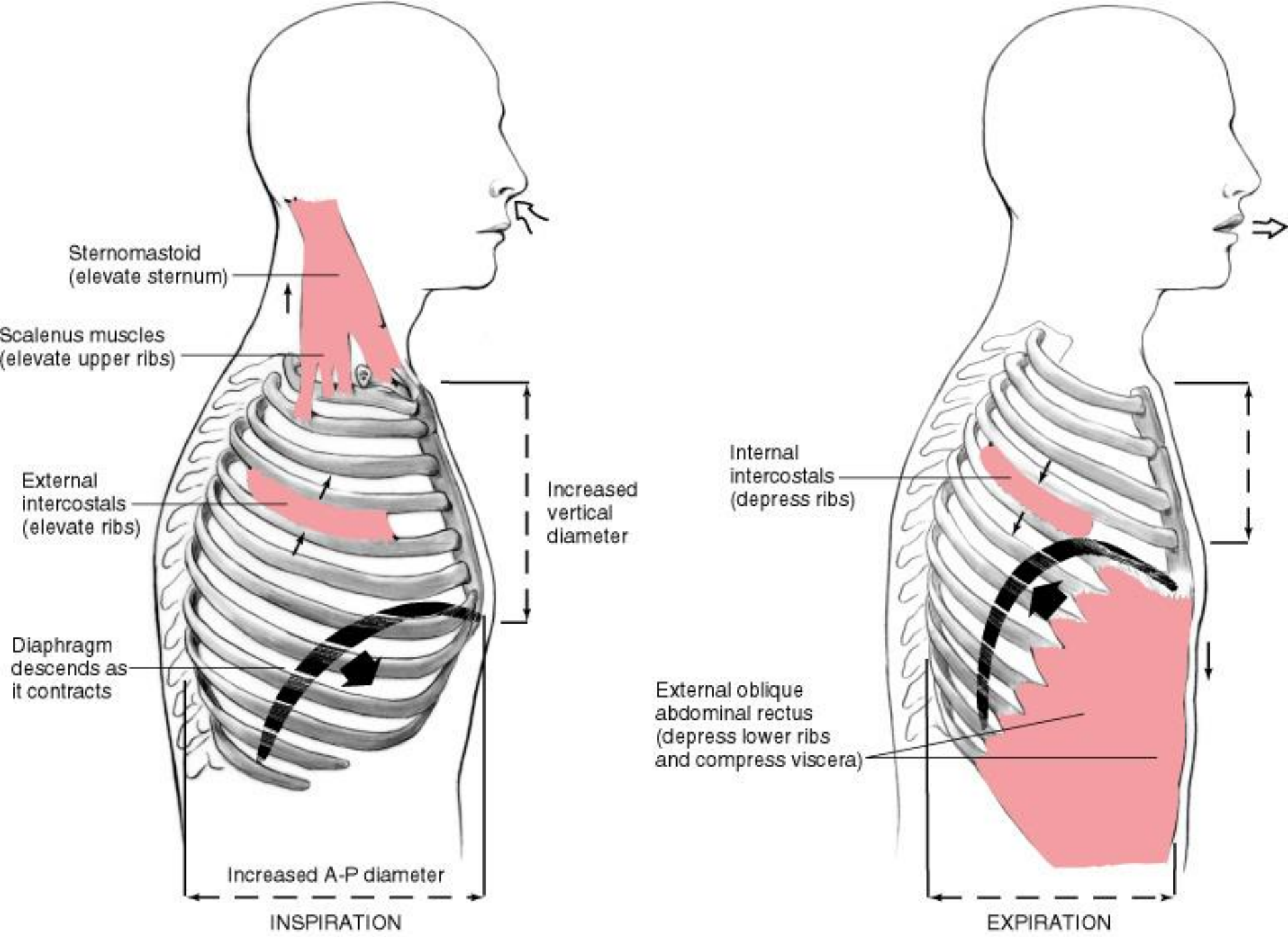
- Respiration maintains pH (acid- base balance) of the blood by supplying O_2 & eliminating CO_2
- Normal Range Values of Arterial Blood Gases
  - pH= 7.35- 7.45
  - $PaCO_2$ = 35-45mmHg (arterial carbon dioxide)
  - PaO_2 = 80-100mmHg (arterial oxygen)
  - SaO_2 = 94-98% (oxygen saturation)

- Lungs help to maintain the pH balance by adjusting the amount of CO_2 through:
  - Hypoventilation
  - Hyperventilation


If you woke
up breathing
congratulations!
You have
another chance

Respiration = Breathing

- Inspiration
- Expiration
- Control of Respiration
  - Involuntary control by respiratory center in the brain stem consisting of the pons & medulla
  - Hypercapnia is an ↑ in CO_2 in the Bld. And provides the normal stimulus to breath
  - Hypoxemia


Sternomastoid
(elevate sternum)
Scalenus muscles
(elevate upper ribs)
External
intercostals
(elevate ribs)
Diaphragm
descends as
it contracts
Increased
vertical
diameter
Increased A-P diameter
INSPIRATION
Internal
intercostals
(depress ribs)
External oblique
abdominal rectus
(depress lower ribs
and compress viscera)
EXPIRATION

Health History

- Chest pain
  - The first question should be as broad as. “Do you have any discomfort or unpleasant feelings in your chest?”
  - Ask patient to point to location of pain
  - Attempt to elicit all attributes of the patient’s symptom
  - DD – lungs, cardiac, vascular, GI, orthopedic, skin, anxiety

- Lung tissue has no pain fibers
- Pain is usually from the pleura
- Other surrounding structures may irritate the parietal pleura, causing pain

Health History

- Shortness of breath – Dyspnea
  - Dyspnea is a non painful but uncomfortable awareness of breathing that is inappropriate to the level of exertion
  - Begin assessment with a broad question such as “Have you had any difficulty breathing?”
- Wheezing
  - Wheezes are musical respiratory sounds that may be audible to the patient and others

Health History

- Cough
  - Cough is typically a reflex response to a stimuli that irritate receptors in the larynx, trachea, or large bronchi
  - It could be cardiovascular in origin
  - Ask if the cough is dry or produces sputum or phlegm
  - Ask the patient to describe the volume of any sputum and it's color, odor and consistency

Health History

- Hemoptysis
  - Coughing up blood from the lungs
  - It may vary from blood-streaked phlegm to frank blood
  - Ask the patient to describe the volume of blood produced as well as other sputum attributes
  - Try to confirm the source of the bleeding by history and examination before using the term “hemoptysis”
  - Blood may also be from the mouth, pharynx of GI tract

Health Promotion & Counseling Tobacco Cessation

- Smoking is the leading cause of preventable death in the United States
- Remember the 5 “A”s
  - **A**sk about smoking at each visit
  - **A**dvise patients regularly to stop smoking using a clear personalized message
  - **A**ssess patient readiness to quit
  - **A**ssist patients to set up dates and provide educational materials for self help
  - **A**rrange for follow-up visits to monitor and support patient progress

Subjective Data

- Cough
- SOB
- Chest Pain
- Respiratory Infections
- Smoking
- Environmental Exposure
- Self-care behaviors

Objective Data

- ***Inspect***
- ***Palpate***
- ***Percuss***
- ***Auscultate***
  - ***After <u>Posterior</u> Thyroid Exam***
  - ***Posterior chest, Lateral chest, then Anterior chest***

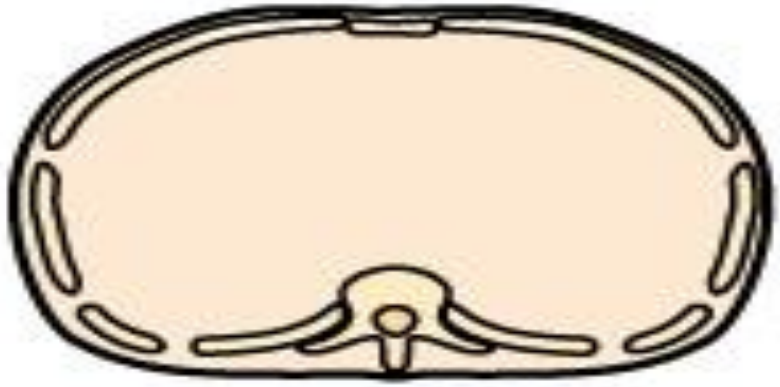
- ***Remember to clean stethoscope end piece and warm prior to use on client.***
- ***Quiet environment conducive to hearing lung sounds***

Equipment for Exam

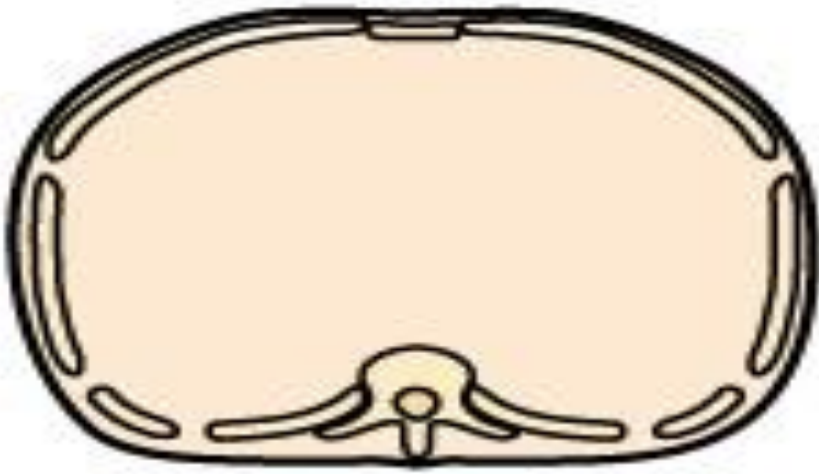
- Stethoscope
- Ruler
- Tape measure
- Washable marker
- Alcohol swabs

Posterior Chest

- ***Inspect Thoracic Cage***
  - Shape and configuration
  - Anteroposterior Diameter should be < Transverse Diameter
  - Note Position of Person to breathe
    - ? orthopnea
  - Skin Color & Condition, nail color



Barrel Chest

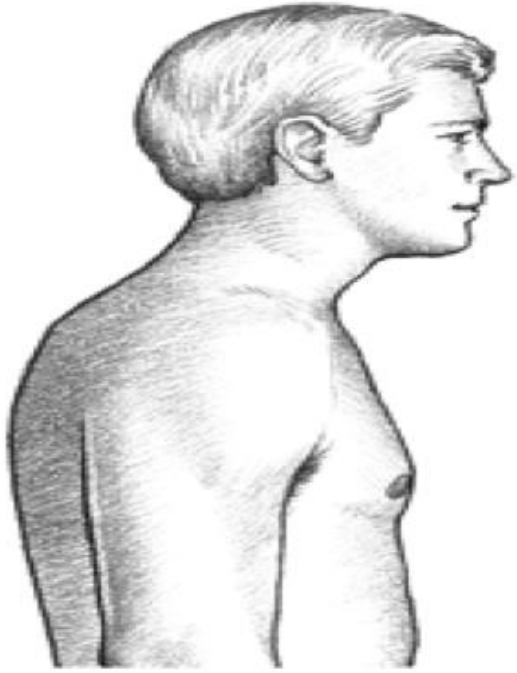


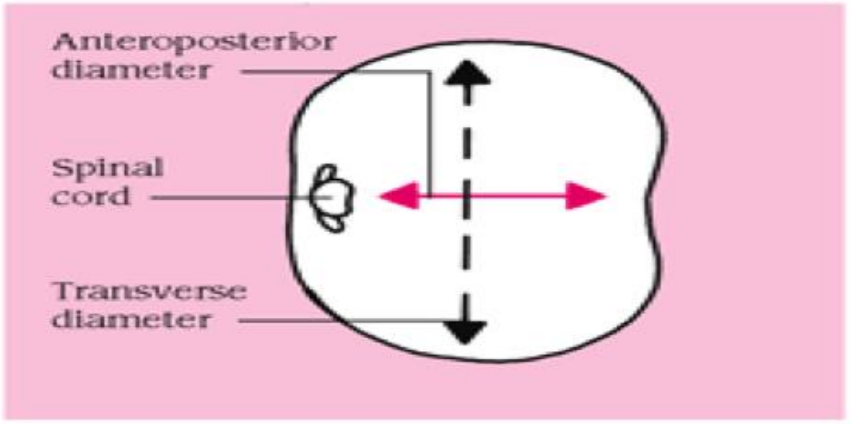
Seen in OA and COPD

Recognizing barrel chest

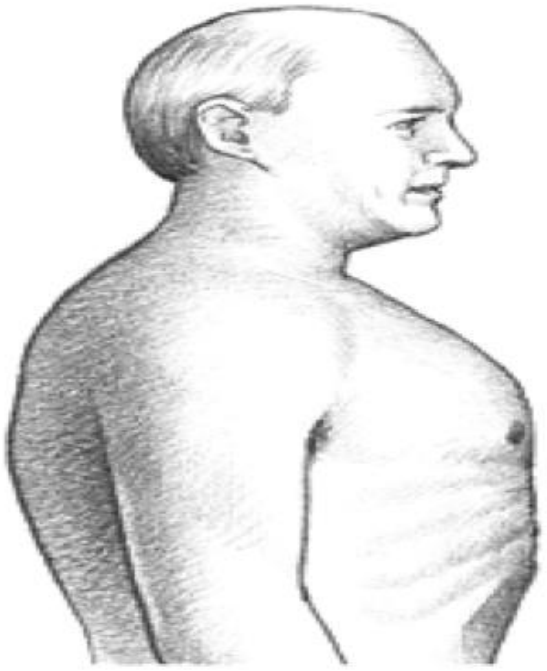
In a normal adult chest, the ratio of anteroposterior to transverse (or lateral) diameter is 1:2. In patients with barrel chest, this ratio approaches 1:1 as the anteroposterior diameter enlarges.

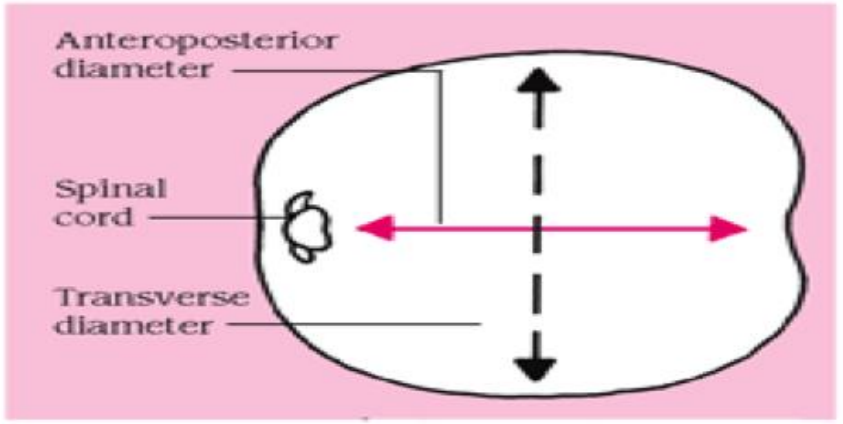
NORMAL CHEST



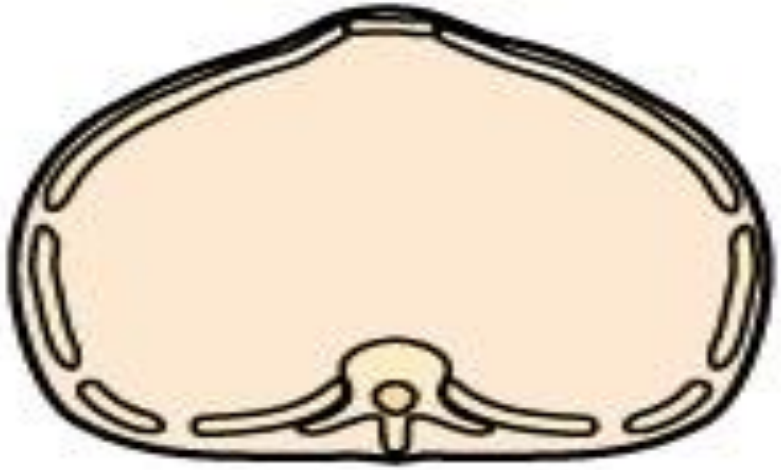


BARREL CHEST

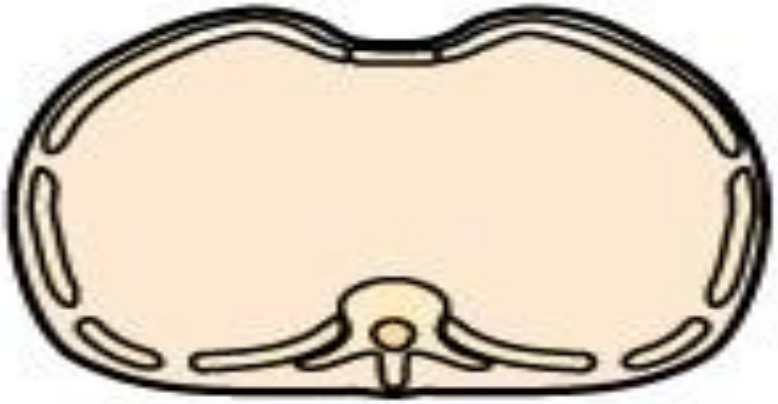


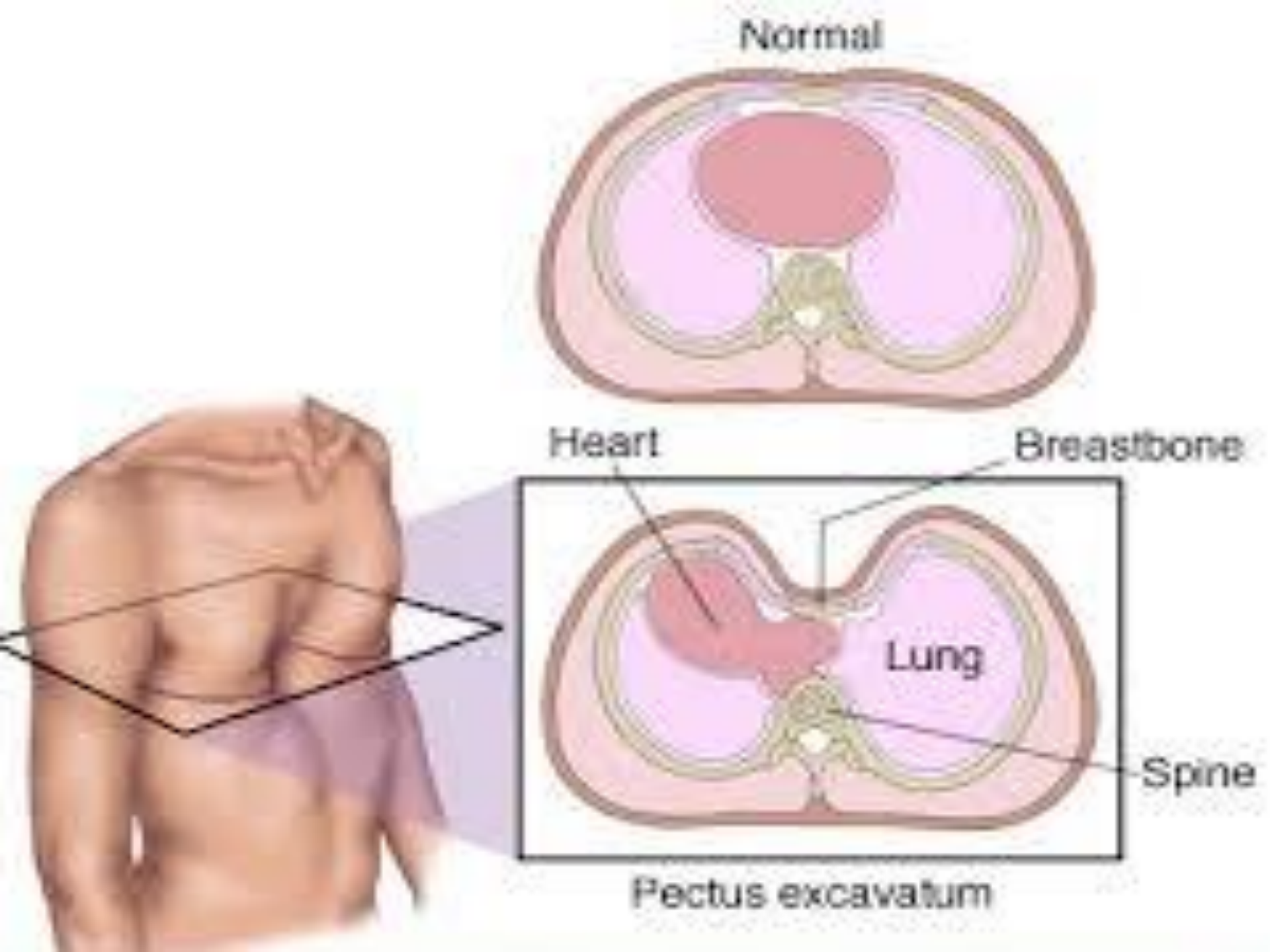


Pectus Carinatum (Pigeon)



Pectus Excavatum (Funnel)




Normal
Heart
Breastbone
Lung
Spine
Pectus excavatum

Posterior Chest

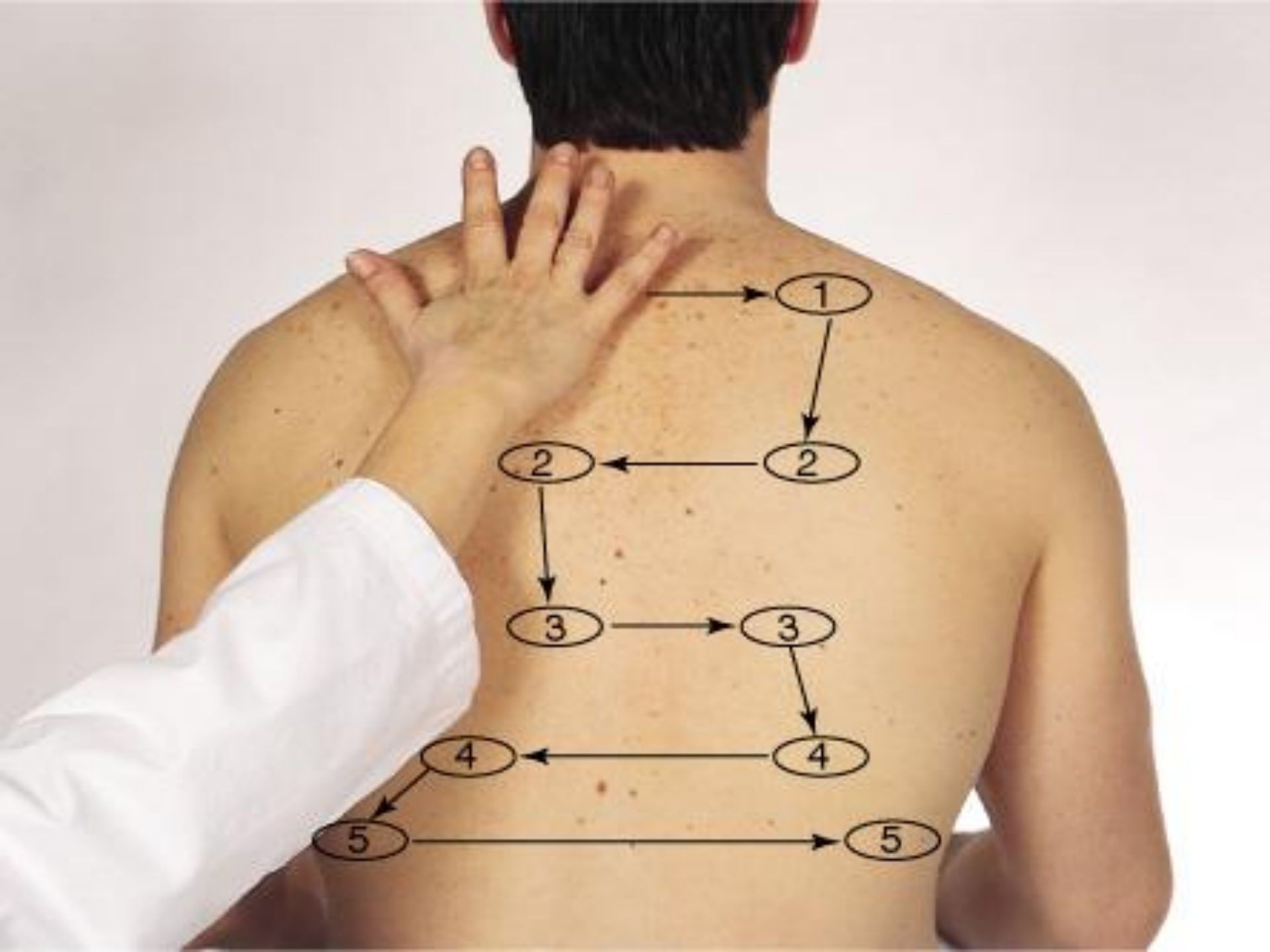
- ***Palpate***
  - Symmetric Expansion- warmed hands – thumbs @ T9-T10- pinch sm. Fold of skin

- The Lung and Thorax Exam
  - Jessica Nishikawa demonstrates some of the techniques of the Lung and Thorax assessment

Posterior chest

- Tactile Fremitus – palpable vibration of sound from the larynx- use palmer base of fingers- “99” or Blue Moon
- Symmetry important – vibration should feel the same bilaterally.
- Avoid palpating over scapulae because bone dampens out sound

- ↓ fremitus = obstructed bronchi, pleural effusion, pneumothorax or emphysema
- ↑ fremitus occurs only with gross changes (Lobar pneumonia)

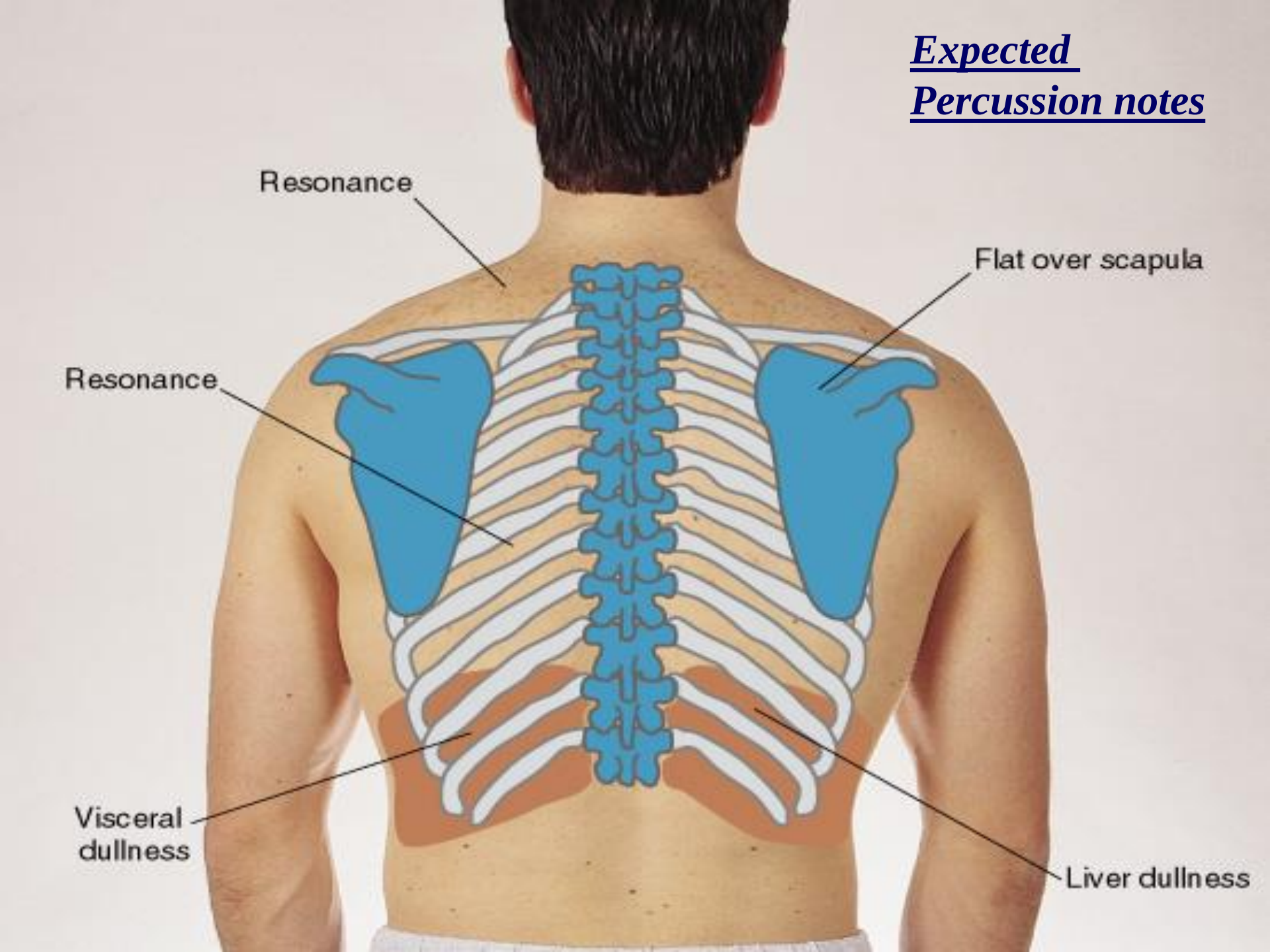

1
2
2
3
3
4
4
5
5

- Entire Chest wall – gently palpate
  - Note tenderness, skin temp., moisture, lumps, lesions
- Crepitus = coarse crackling sensation palpable over skin surface. (Subcutaneous emphysema when air escapes from lung into S/C tissue)

Posterior Chest

- ***Percuss start at the apices, across shoulders, then interspaces side to side (5cm. Intervals) Avoid scapulae & ribs***
  - Resonance predominates in healthy lung
  - Hyperresonance – too much air, emphysema, pneumothorax
  - Dull = abnormal density, pneumonia, tumor, atelectasis

Expected Percussion notes



Diaphragmatic Expansion

- Lower lung borders in expiration & inspiration
- 1st Exhale & hold- percuss down the scapulae line until sound changes from resonant to dull. Mark with marker
- Estimates the level of the diaphragm separating the abdominal cavity
- May be higher on right due to liver

Diaphragmatic Expansion

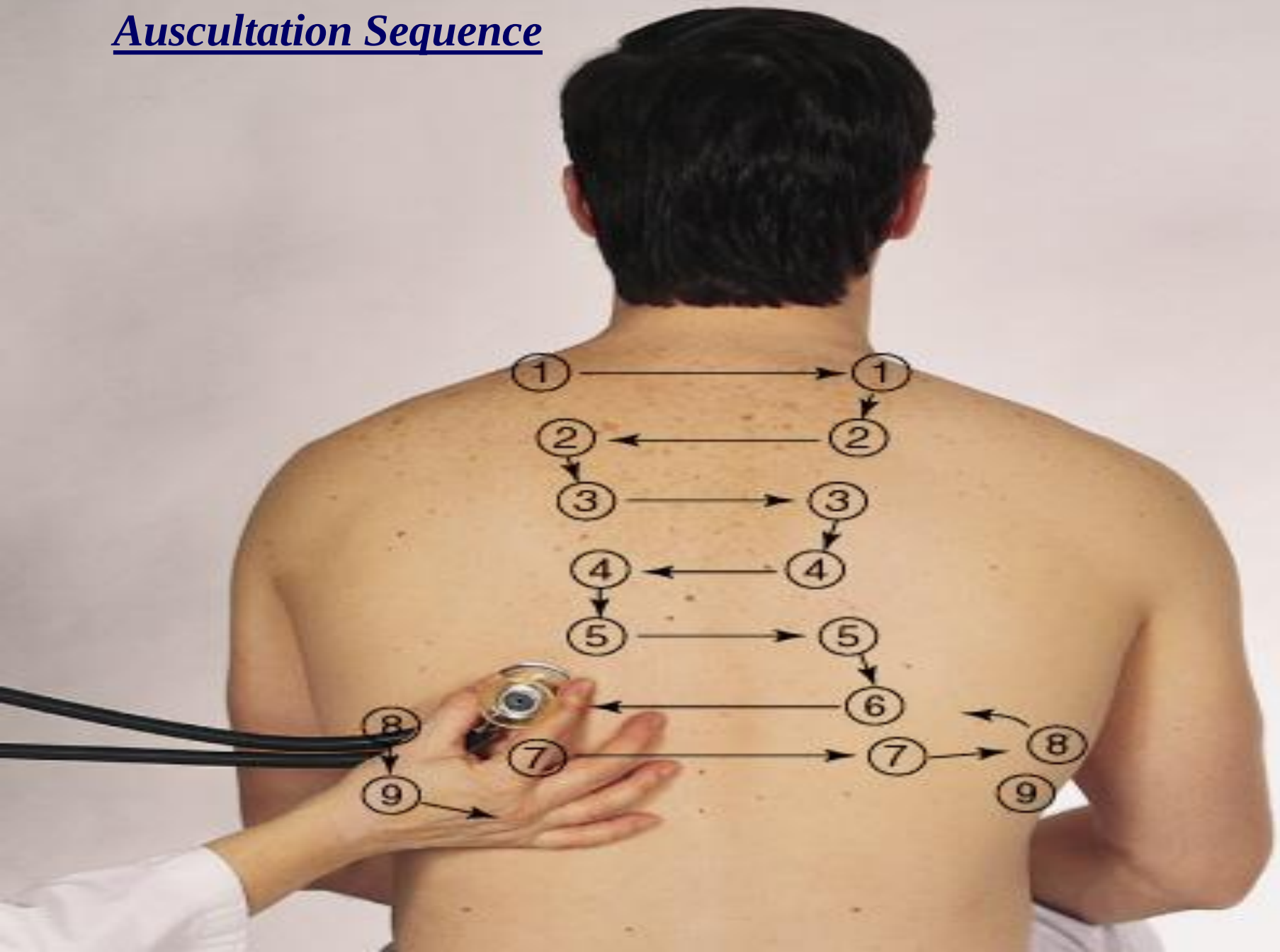
- Now take deep breath & hold
- Percuss from mark to dull sound and mark
- Measure the difference. Should be + bilaterally 3-5cm in adult may be 7-8 cm in well conditioned person
- Note hold your own breath when conducting this test!!!!!!!!!


A
Exhale
Inhale
B
Resonant
Dull

Posterior Chest

- ***Auscultate***
  - Position client
  - Instruct to breath through mouth, little deeper than usual
  - Tell you if becomes light headed
  - Use flat diaphragm & hold firmly on chest
  - Must listen to at least 1 full respiration before moving stethoscope side to side
  - Compare both sides (lung fields)

Auscultation Sequence



Normal Breath Sounds

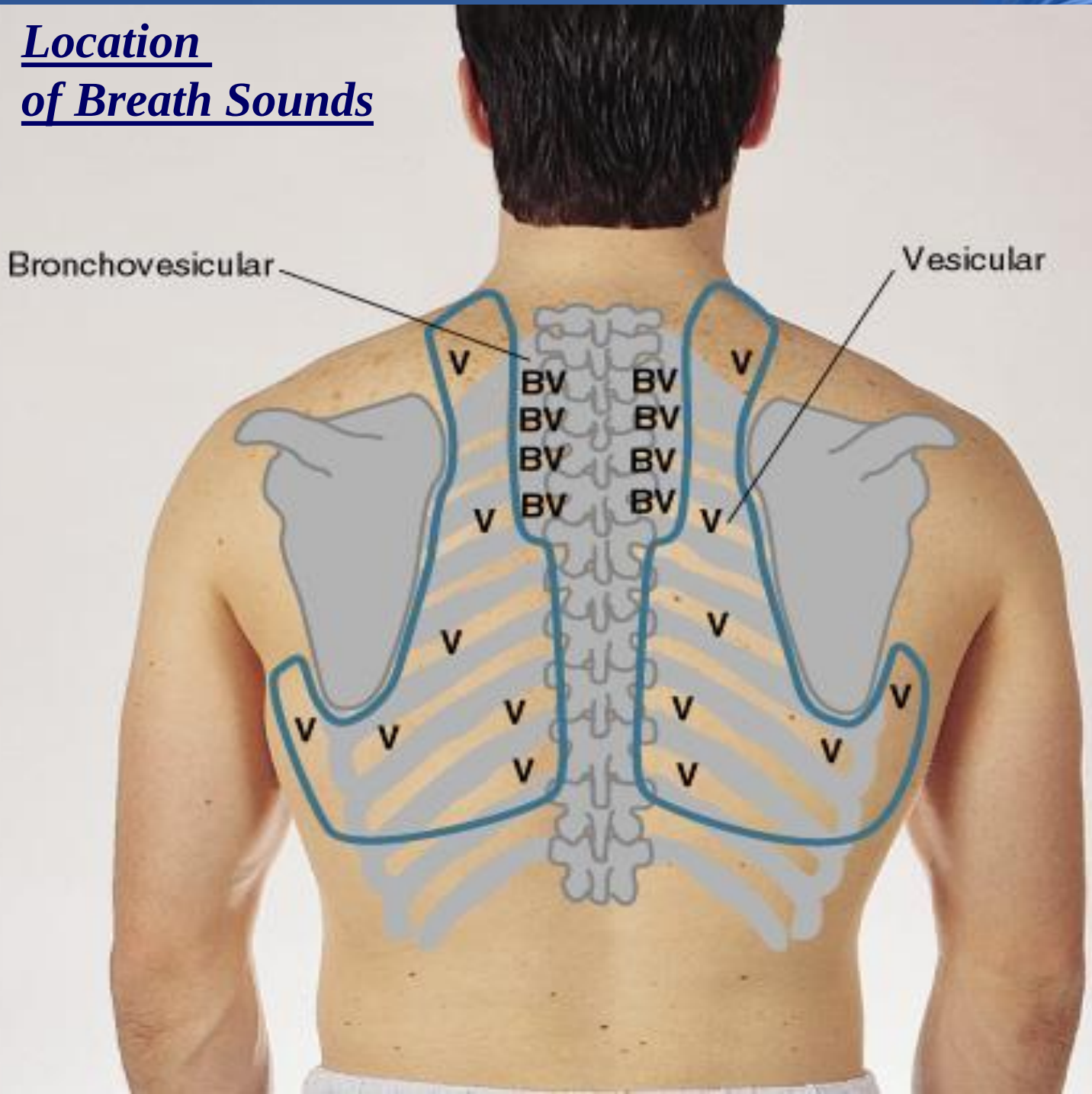
- Bronchial – Anterior Chest only = over trachea & larynx
  - Quality = harsh, hollow, tubular
  - Inspiration < Expiration
  - Amplitude = Loud

Breath Sounds

- Bronchovesicular both anterior & posterior
  - Over major bronchi, posterior b/t scapulae, anterior upper sternum, 1st & 2nd ICS
  - Pitch = high
  - Inspiration = Expiration
  - Moderate amplitude

- Vesicular – Anterior & posterior
  - Quality = rustling, wind in trees
  - Inspiration > Expiration
  - Soft amplitude

Location of Breath Sounds



- Decreased or Absent Breath Sounds
  - Causes =
  - obstruction of the bronchial tree by secretions, mucous plug, F.B
  - ↓ lung elasticity, emphysema = lungs hyperinflated
  - Pleurisy, pleural thickening, pneumothorax (air), pleural effusion (fld.) in the pleural space

- Increased Breath Sounds = dense lung tissue enhances sound transmission as in consolidation ie. pneumonia

- Silent chest = ominous

- Physiological & Pathological Breath Sounds
  - A collection of some physiological and pathological breath sounds that may be heard by auscultation

Adventitious Sounds

Not normally heard in the lungs. Caused by moving air colliding with secretions or by popping open of previously deflated airways

- ***Crackles (Rales)***
  - Fine – high pitched popping- not cleared by coughing. Simulate sound by rolling strand of hair b/t fingers near ear or moisten thumb& index finger & separate them near your ear
  - Course crackles- (opening a velcro fastener)
- ***Pleural Friction Rub – coarse & low pitched, 2 pieces of leather rubbed together close to ear***

Adventitious Sounds

- Wheeze (Rhonchi)
  - High pitched, musical squeaking = air squeezes - asthma
  - Low pitched musical snoring, moaning, =obstruction
- Stridor – high pitched, inspiratory, crowing, louder in neck = croup, acute epiglottitis

- Voice Sounds normal voice transmission is soft, muffled & indistinct. Pathology that ↑ lung density makes words clearer
  - Bronchophony – “99”
  - Egophony- ee-ee-ee if disease sounds like aa-aa-aa Record as “E → A changes”
  - Whisper pectoriloquy 1-2-3
  - These tests are only done if lung pathology is suspected

Anterior Chest

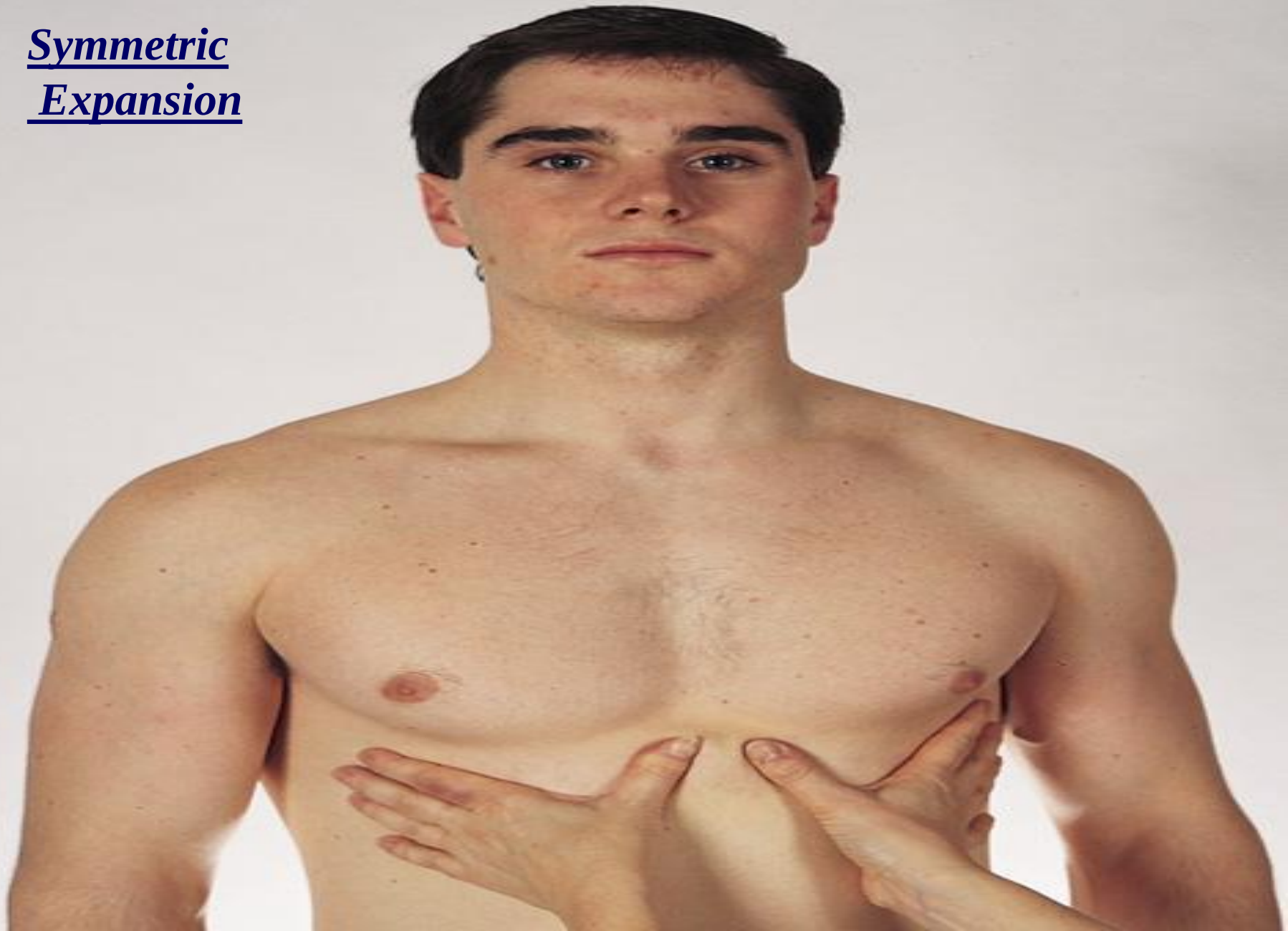
- ***Inspect***
  - Shape & Configuration
  - Expression- relaxed
  - LOC – alert & cooperative
  - Skin color & condition
  - Quality of Respirations – reg. & even, no retraction or use of accessory muscles

Anterior Chest

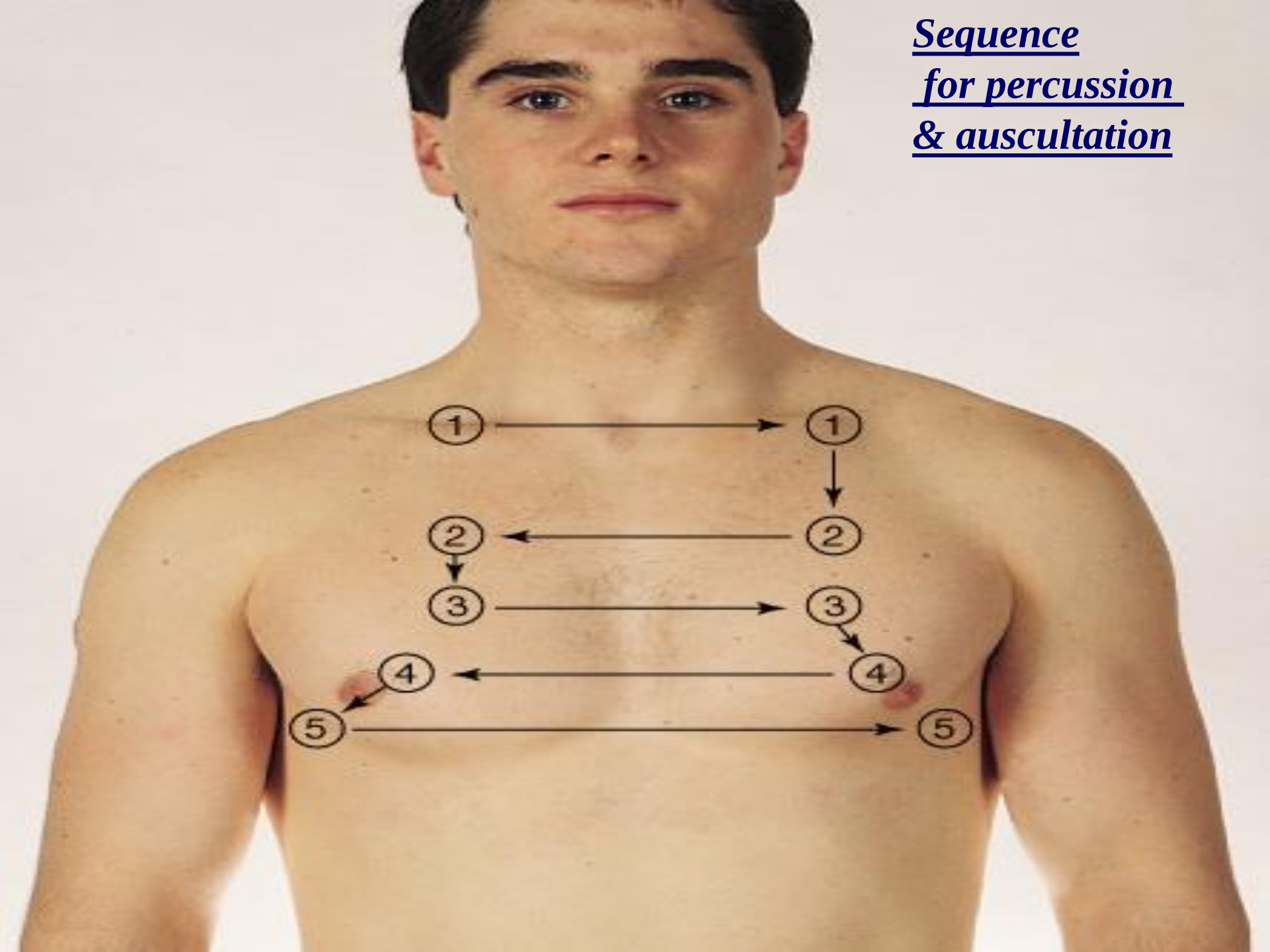
- ***Palpate***
  - Symmetric Chest Expansion
  - Tenderness, turgor, temp., moisture

- Tactile Fremitus
  - Compare both sides

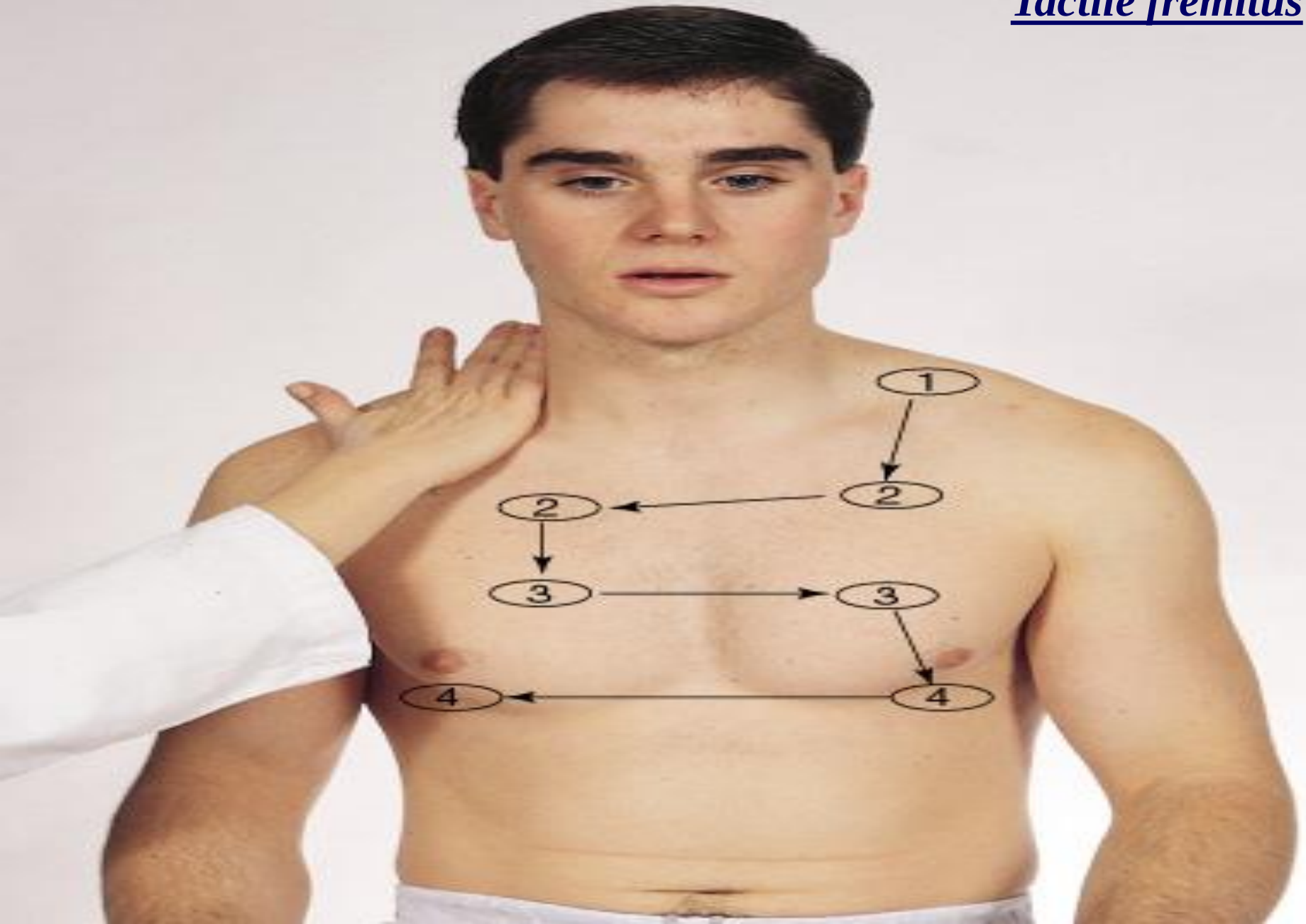
Symmetric Expansion



Sequence for percussion & auscultation



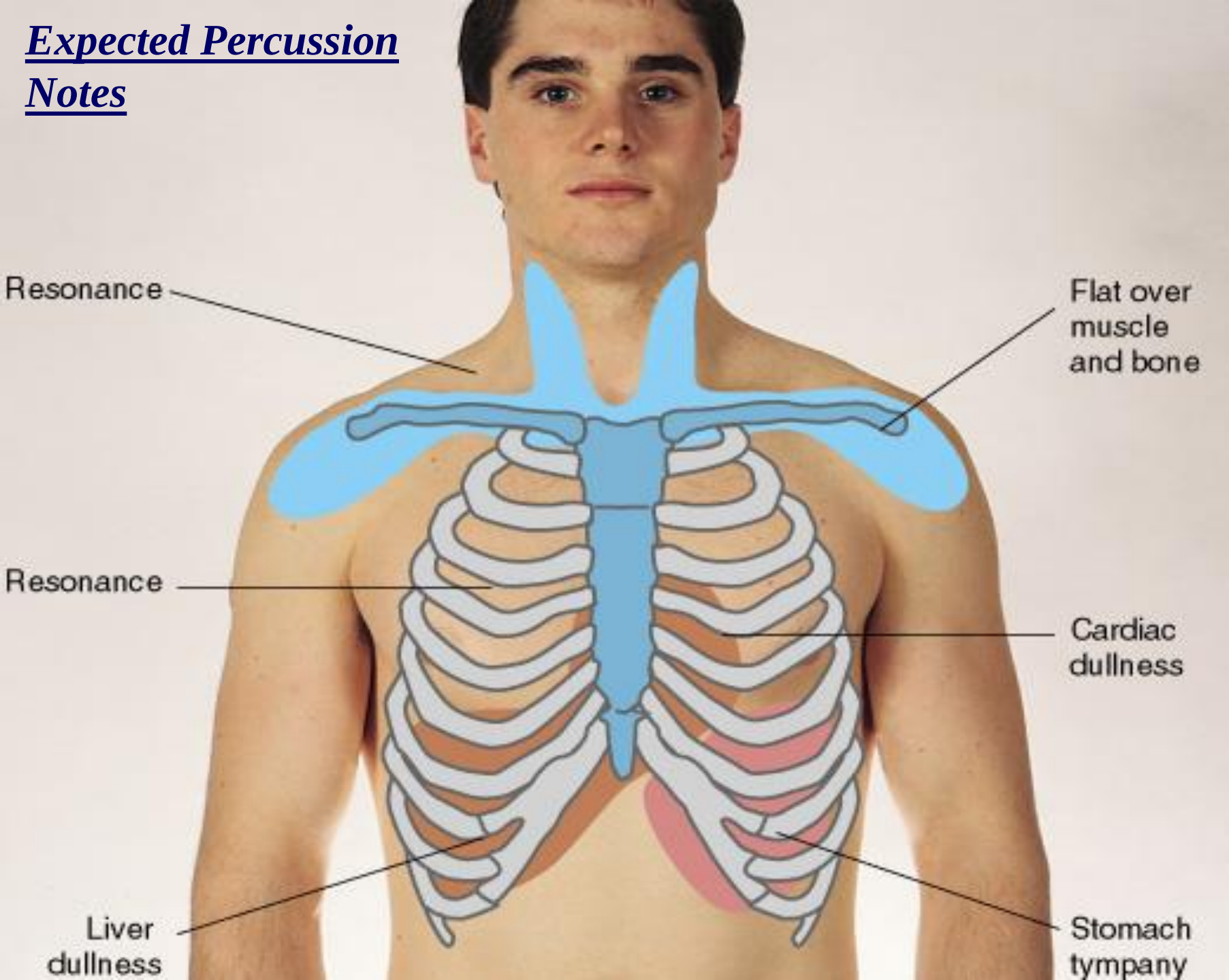
Tactile fremitus



Percussion

- Apices in Supraclavicular Areas
- Interspaces = Resonance
  - Dullness
    - Female breast tissue
    - Liver – Rt. 5th intercostal space midclavicular
    - Heart – Lt. 3rd intercostal space midclavicular
  - Flat = muscle & bone
  - Tympany = stomach (Lt. Side)

Expected Percussion Notes



- Which of the following statements about percussion is true?
  a) Use the lightest percussion that produces a clear note
  b) Percussion should be done up and down each side of the chest rather than side to side
  c) Strike using the pad of your tapping finger
  d) The heart normally produces an area of tympany to the left of the sternum

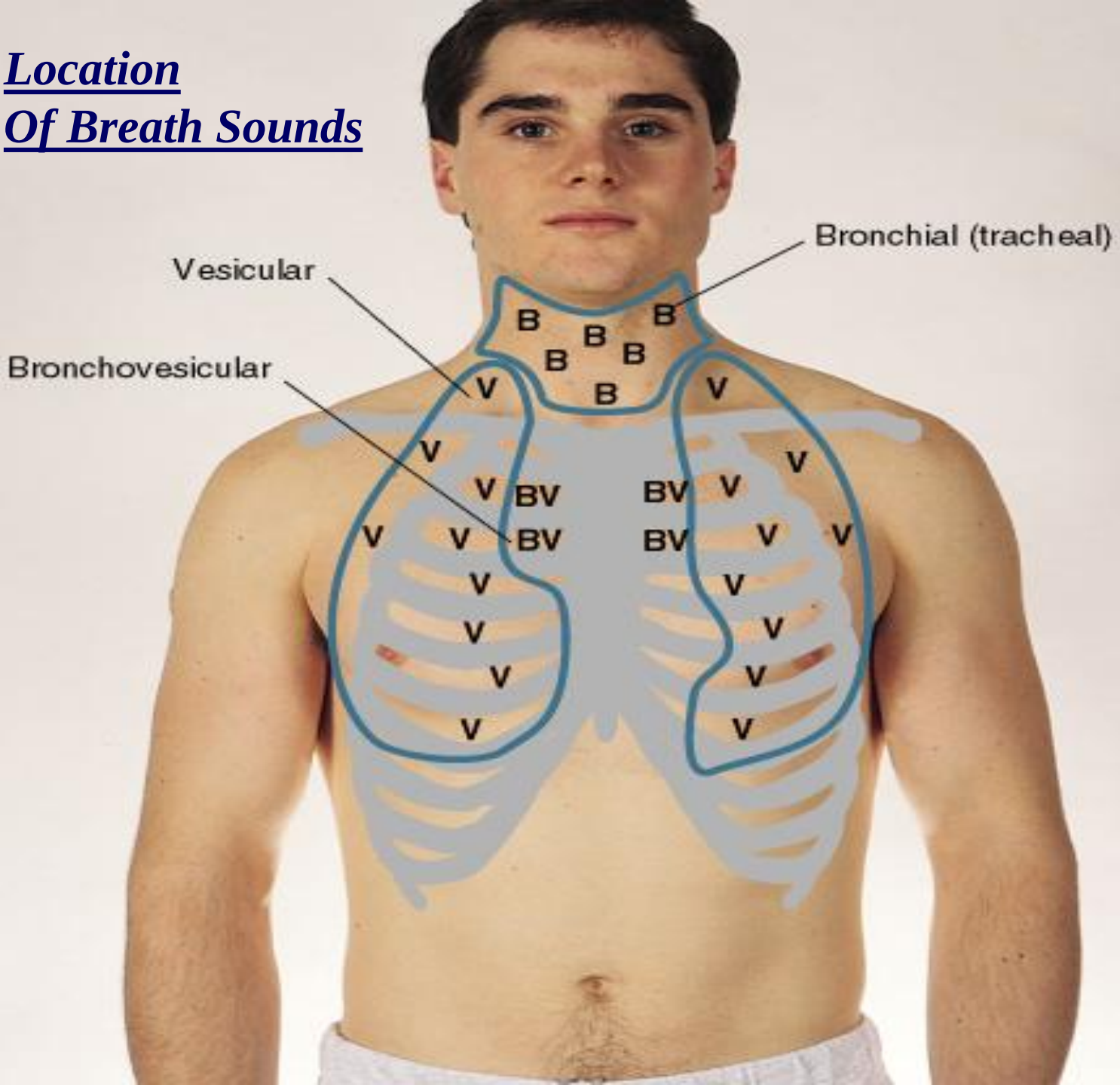
- Use the lightest percussion that produces a clear note

- Other clarifications
  - Percussion should be done side to side for comparison, not up and down
  - Strike using the tip of tapping finger
  - The heart normally produces an area of dullness to the left of the sternum

Auscultate

- Apices (supraclavicular) to 6th rib
- Bilateral moving down
- One full respiration
- Directly over chest wall – displace female breast tissue

Location Of Breath Sounds



- Which of the following breath sounds are most often auscultated the majority of both lungs?
  a) Vesicular
  b) Bronchial
  c) Bronchovesicular
  d) None of the above

- Vescicular

- Other clarifications
  - Bronchial is usually heard over the manubrium
  - Bronchovesicular is usually heard over the 1st and 2nd interspaces

Terms for Documentation

- ***Rate***
  - Eupnea 12 – 20 bpm normal
  - Tachypnea > 24, rapid, shallow
  - Bradypnea < 10
  - Apnea = No respirations for 10 sec. or more

- Pattern = breathing rhythm. Normal respirations are regular and even.
  - Cheyne – stokes = resp wax & wane in reg pattern with periods of apnea(20sec)
  - Biot's or ataxisic Sim. To cheyne –stokes but pattern irreg.

- Depth – on inspiration the normal depth is nonexaggerated and effortless.
  - Shallow
  - Sighing – purposeful to expand the alveoli

- Symmetry – bilateral rise and fall of the chest with respiration

- Audibility – normally be heard by the unaided ear several centimeters from the patient's nose/mouth

- Patient position – healthy person breathes comfortably in supine, prone or upright position
  - Orthopnea
- Mode of Breathing – normally inhale/exhale through nose

- Sputum
  - Sample
  - Color
    - Mucoid, yellow/green, rust/blood tinged, black, pink
  - Odor
  - Amount
  - Consistency

No Breathing In Class !!!!