THE RESPIRATORY SYSTEM: EXAMINATION

The setting of the physical examination

- Privacy is essential.
- Talk quietly, with good communication.
- The room should be warm and well lit.
- Wash your hands.
- Introduce your self.
- Seek permission .
- Equipment.

General Examination

Vital signs

Hands Examination

Face Exam

Respiratory examination

General Examination

General examination

- Consciousness, alertness, orientation.
- Sitting or lying flat.
- ? in pain or comfortable.
- ? respiratory distress .
- Cyanosed ? .
- Any audible sounds (wheeze,hoarseness of voice,stridor).

Respiratory distress

Respiratory distress is tachypnoea ,intercostal and subcostal indrawing, sternal recession, nasal flaring(in children) and the use of accessory muscles, and may be cyanosis.

Using the accessory muscles

- The sternocleidomastoid, platysma and trapezius, scalenus muscles are accessory muscles of respiration and their use is an early sign of airways obstruction.
- "Accessory muscles" refers to muscles that assist, but do not play a primary role, in breathing.





'pursed lips'

- This manoeuvre increases positive end-expiratory pressure, reducing small-airway collapse and improving ventilation.
- May be seen in patients with severe COPD



Tripod position

 patient sits forward with the hands/arms on the thighs or knees to 'fix' the shoulder girdle, he raises the clavicles and upper chest, increasing lung volume and negative intrathoracic pressure.



Cyanosis

- O2 sat <90 pao2 < 60
- Deoxyhb > 5 gm/dl

General examination

- Consciousness, alert, orientation.
- Sitting or lying flat.
- If the patient looks in pain or comfortable.
- If patient is in respiratory distress and using accessory muscles.
- Cyanosis.
- Any audible sounds (wheeze,hoarseness of voice,stridor).

wheezes

- breath with a whistling sound in the chest, as a result of airway narrowing : asthma / copd/ bronchitis
- Airway secrettion
- Can be subjective or objective.
- Mostly expiratory / but can also occur on inspiration
- Single wheeze

General examination

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- Sitting or lying flat.
- If the patient looks in pain or comfortable.
- If patient is in respiratory distress and using accessory muscles.
- Cyanosis.
- Any audible sounds (wheeze,hoarseness of voice,stridor).

Stridor

high-pitched breath sound resulting from turbulent air flow in the larynx or lower in the bronchial tree.

Examination sequence:

Ask the patient to cough and then breath deeply in and out with the mouth wide open. Listen closely to the patient's mouth, for stridor.



Vital signs

Vital signs:

- Blood pressure
- Respiratory rate
- Pulse rate
- Tempreture
- BMI

Vital signs:

- Blood pressure
- Respiratory rate
- Pulse rate
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- BMI

Blood pressure:

- pneumonia
- Tension pneumothorax
- Pulmonary embolism
- Fatal / life threatening asthma

CURB-65 : Mortality predictor in community-acquired pneumonia

Characteristic	Positive variable	Points
Confusion	Disoriented to person, place or time	1
Uremia	BUN > 20 mg / dL	1
Respiratory rate	> 30 breaths / min	1
Blood pressure	Systolic < 90 mm Hg or Diastolic < 60 mm Hg	1
Age	> 65 years	1

Blood pressure:

Pulsus paradoxus

MECHANISM OF PULSUS PARADOXUS



Causes

- Cardiac : tamponade / constrictive pericarditis
- Non cardiac /; severe COPD and severe asthma

Vital signs:

- Blood pressure
- Respiratory rate
- Pulse rate
- Tempreture
- BMI

Respiratory rate

Assess pattern of breathing from the foot of bed (thoracic vs abdominal)

Normal 12-20 breath per minute

At rest count the respiratory rate (breaths/min) for 30–60 seconds while you may feel the pulse and assess chest movements.

Tachypnoea(>20):

Increased ventilatory drive, as:

- Anxiety
- Pain

Reduced ventilatory capacity, as:

- Pneumonia
- Pulmonary embolus
- interstitial lung disease

Metabolic acidosis

Bradypnoea(<12):

- Opioids
- Central neurological causes (stroke, head injury)

Hands Examination

- If warm, cold or sweaty.
- Peripheral cyanosis.
- Tar stain.
- tremor, flapping tremors .
- Clubbing.
- Hypertrophic pulmonary osteoarthropathy

- If warm, cold or sweaty.
- Perepheral cyanosis.
- Tar stain.
- Hands tremor, flapping tremors.
- Clubbing.
- Hypertrophic pulmonary osteoarthropathy tenderness.

- In COPD ,the hands <u>may be</u> cyanosed due to reduced arterial oxygen saturation but warm due to vasodilatation from elevated arterial carbon dioxide levels.
- In *heart failure* the hands are often cold and cyanosed because of vasoconstriction in response to a low cardiac output.
- NB:If they are warm, heart failure may be due to a highoutput state, such as hyperthyroidism.

- If warm, cold or sweaty.
- Perepheral cyanosis.
- Tar stain.
- Hands tremor, flapping tremors.
- Clubbing.
- Hypertrophic pulmonary osteoarthropathy tenderness.

• *Tar stain*: A brownish stain on the fingers and nails in cigarette smokers is caused by tar, not nicotine.

Tar stain



Yellow nail syndrome

- The rare 'yellow nail syndrome' is associated with lymphoedema and an exudative pleural effusion
- The condition is thought to be rare, with approximately 150 cases described in the medical literature


Hands:

- If warm, cold or sweaty.
- Perepheral cyanosis.
- Tar stain.
- Hands tremor.
- Clubbing.
- Hypertrophic pulmonary osteoarthropathy tenderness.

Hands tremor

 A *fine tremor* is often caused by excessive use of β-agonist or theophylline bronchodilator drugs.





 A coarse flapping tremor (asterixis) is seen with severe ventilatory failure and <u>carbon dioxide</u> <u>retention</u>. This is the result of intermittent failure of parietal mechanisms required to maintain posture.

coarse flapping tremor (asterixis)



Hands:

- If warm, cold or sweaty.
- Perepheral cyanosis.
- Tar stain.
- Hands tremor.
- Clubbing.
- Hypertrophic pulmonary osteoarthropathy tenderness.

Clubbing

 Clubbing is painless softtissue swelling of the terminal phalanges. The enlargement increases convexity of the nail.



Clubbing

 Clubbing usually affects the fingers symmetrically, but may involve the toes.



Causes of clubbing

<u>Congenital or familial (5–</u> <u>10%)</u>

Thoracic (~70%) Lung cancer Chronic suppurative conditions Bronchiectasis Lung abscess Empyema Cystic fbrosis Mesothelioma Fibroma Pulmonary fbrosis Cardiovascular Cyanotic congenital heart disease Infective endocarditis Arteriovenous shunts and aneurysms

<u>Gastrointestinal</u> Cirrhosis Inflammatory bowel disease Coeliac disease

<u>Others</u> Thyrotoxicosis (thyroid acropatchy)

Examination sequence of clubbing

Look across the nail bed from the side of each fnger. Observe the distal phalanges, nail and nail bed.

Measure the anteroposterior distance at the level of the interphalangeal joint. Repeat at the level of the nail bed

Measure the nail bed angle.

Place the nails of corresponding fngers back to back and look for a visible gap between the nail beds – Schamroth's window sign .

Place your thumbs under the pulp of the distal phalanx and use your index fngers alternately to see if you can feel movement of the nail on the nail bed. This is fluctuation.







Testing for nail bed fluctuation



Hands:

- If warm, cold or sweaty.
- Perepheral cyanosis.
- Tar stain.
- Hands tremor.
- Clubbing.
- Hypertrophic pulmonary osteoarthropathy .

Hypertrophic pulmonary osteoarthropathy

-It is an X ray finding that can be detected in physical examination as wrist or ankle tenderness and swelling with associated pronounced clubbing

 \rightarrow Sub periosteal new bone formation

- is rare and almost always
associated with lung cancer
, usually squamous cancer



Fig. 7.7 X-ray of the lower legs in hypertrophic pulmonary osteoarthropathy. Arrows show periosteal reaction.

General Examination

Vital signs

Hands Examination

Head and neck Exam

Chest examination

Head and neck

- Central cyanosis.
- Ptosis and pupil asymmetry .
- Lymph nodes examination.
- JVP.
- Examine for SVC obstruction

Horner syndrome

Neck

Jugular venous pressure (JVP)

JVP is raised in

- Right side heart failure
- Tension pneumothorax
- Severe acute asthma

SUPERIOR VENA CAVA OBSTRUCTION

JVP is raised, non pulsatile, and abdominojugular reflex is absent

SVC obstruction

neck



Fig. 7.12 The lymph node groupings in the neck.

1/Look for enlargement of the cervical, supraclavicular and scalene lymph nodes.

2/ Palpate the neck. Note the size and consistency of any palpable node and whether it is fixed to surrounding structures

General Examination

Vital signs

Hands Examination

Head and neck Exam

Chest examination

Chest examination:

- Inspection.
- Palpation.
- Percussion.
- Auscultation.

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Normal fndings

-The chest should be symmetrical and elliptical in cross section.

-The **anteroposterior** diameter should be less than the **lateral** diameter.



Barrel-shaped chest

-Anteroposterior diameter is greater than the lateral diameter -Indicates hyperinflation.

Sternum and shoulder girdle Raised also



-Kyphosis is an exaggerated anterior curvature of the spine

- -scoliosis is lateral curvature.
- -Kyphoscoliosis, involving both deformities.



Kyphoscoliosis

Pectus carinatum (pigeon chest)

is a localised prominence of the sternum and adjacent costal cartilages.

-It is most often caused by severe and poorly controlled childhood asthma but can occur in osteomalacia and rickets.

Pectus carinatum (pigeon chest) / harrison sulcus



Pectus excavatum (funnel chest)

is a developmental deformity with a localised depression of the lower end of the sternum.


Breathing Patterns Normal 12 - 20 respirations in 1 minute 7 respirations in 30 seconds

Breathing Patterns

Cheyne–Stokes respiration: (apnea leading to increased CO2 which causes excessive compensatory hyperventilation, in turn causing decreased CO2 which causes apnea, restarting the cycle.)

Alternating periods of deep and shallow breathing

- ? Feedback from carotid chemoreceptors to resp center abn
- Left ventricular failure
- Central neurological causes (stroke, head injury)
- Overdose (barbiturates, γ-hydroxybutyrate, opioids)

Cheyne-Stokes Breathing Rapid breathing followed by apnea

Irregular respirations

Breathing Patterns

Kussmaul breathing is a deep and labored breathing pattern often associated with severe metabolic acidosis



Kussmaul Breathing Pattern 10 Year Old Male, Diabetic Ketoacidosis

VIENOIS

From the foot of the bed:
-shape
-symmetry
-pattern of breathing
-chest deformities

From right side of the patient:

- Scars
- Skin lesions
- Swellings.
- Dilated veins
- Axilla

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Chest Wall Scar Locations

- 1. Left thoracotomy
 - Coarctation repair
 - MVR,Mitral valvotomy.
- 2. Right thoracotomy
 - Mitral valve repair
 - Some ASD repairs
- 3. Left upper chest
 - Pacemaker/ICD
- 4. Median sternotomy
 - Most other cardiac surgeries
 - aortic valve replacement

 chest tube scars inspect axilla bilaterally.

CABG

From right side of the patient:

- Scars
- Skin lesions
- Swellings.
- Dilated veins
- Axilla

Chest examination:

- Inspection.
- Palpation.
- Percussion.
- Auscultation.

Palpation

General rules:

-Maintain eye contact with the patient.

- -Warm your hands
- -Avoid areas of pain

Sequence:

Superficial palpation Postion of the mediastinum Tactile vocal fremitus Chest expansion.

palpation

Sequence:

Superficial palpation Position of the mediastinum Tactile vocal fremitus Chest expansion.

Superficial palpation

-Move your hand continuously without gaps Look for: Tenderness Subcutaneous emphysema/ surgical

Subcutaneous masses

palpation

Sequence: Superficial palpation **Postion of the mediastinum** Tactile vocal fremitus Chest expansion.

Position of the Mediastinum

Upper Mediastinum1)Tracheal poistion2)Tracheal Tug3)Cricosternal Distance

Lower Mediastinum:

Position of the Mediastinum

Upper Mediastinum 1)Tracheal position:Normally in the midline,may be slightly deviated to the right 2)Tracheal Tug: Indicates hyperinflation. 3)Cricosternal Distance: Distance between cricoid crtilage and sternum Normally (3-4fingers=5cm) If less=Hyperinflation

Lower Mediastinum:

Cardiac apex beat: Normally at Lt 5th intercoastal space @ MCL.

Palpate for rt ventricular heave





Causes of tracheal deviation

Causes of tracheal deviation

- Lung lesion
- Towards : upper lobe fibrosis / collapse / pneumonectomy
- Away: tension pneumothorax / massive effusion

Upper mediastinal mass Lymphoma / retrosternal goiter / lung ca

Cardiac apex beat

Displaced in

- Left ventricular enlargement
- Scoliosis
- Kyphoscoliosis
- Severe pectus excavatum Difficult to detect
 - Obesity
 - Pericardial effusion
 - Poor LV function
 - Lung hyperinflation

palpation

Sequence: Superficial palpation Position of the mediastinum Tactile vocal fremitus Chest expansion.

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





В

Tactile Vocal Fremitus

Increased

Consolidation Dense pulmonary fibrosis

Collapse with a patent main bronchus

Upper level of pleural effusion

Decreased

Pleural Effusion/ thickning Hemothorax Pneumothorax

Collapse without a patent main bronchus Atelectasis

Generalized (COPD)

palpation

General rules:

-Maintain eye contact with the patient.

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<u>Sequence:</u>

Superficial palpation Postion of the mediastinum Tactile vocal fremitus Chest expansion.

Chest Expansion



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-Reduced expansion on *one side* indicates abnormality on that side: for example,

- •pleural effusion,
- pneumothorax
- •lung or lobar collapse,
- •unilateral fbrosis.

Bilateral reduction in chest wall movement is common in severe
COPD (hoover sign ; paradoxical rib cage movement)
diffuse pulmonary fbrosis.

Chest examination:

- Inspection.
- Palpation.
- Percussion.
- Auscultation.

Percussion

Is 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

-General Rules: DO NOT PERCUSS NEAR MIDLINE MOVE YOUR WRIST NOT YOUR ELBOW.

-Sequence:

Start percussing lung apices.

Direct percussion on clavicle

Percuss the following areas comparing percussion note on both sides of the chest:





DON'T FORGET:

Anteriorly:Liver edge Rt 5th intercoastal space. Posteriorly:Diaphragmatic excursion (normally 5-8 cm)(if less=diaphragmatic paralysis)

Resonant	Normal
Hyperresonant	Pneumothorax
Dull	Pulmonary consolidation Pulmonary collapse Severe pulmonary fibrosis
Stony dull	Pleural effusion Hemothorax

Chest examination:

- Inspection.
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Auscultation

Listen with the patient relaxed and breathing deeply through an open mouth. Avoid deep breathing for long periods

Ascultate both sides alternately, over equivalent positions.

Anteriorly from above clavicle down to 6th rib

Laterally from the axilla to 8th rib

Posteriorly down to 11th rib

Avoid auscultation within 3 cm of the midline.

Auscultation

Comment on :

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

Auscultation

Comment on :

Breath sounds

- Added sounds
- Vocal resonance
- Whispering pectoriloquyAegophony
Characteristics of Breath Sounds

	Duration of Sounds	Intensity of Expiratory Sound	Pitch of Expirato Sound	ry causes
Vesicular <u>*</u>	Inspiratory sounds last longer than expiratory sounds.	Soft	Relatively low	normal
vesicular with prolonged expiration	Inspiratory and expiratory sounds are about equal.	Intermediate	Intermediate	hyperinflation
Bronchial	Expiratory sounds last longer than inspiratory ones.	Loud	Relatively high	Consolidation Cavitation Collapse with a patent main bronchus Upper level of pleural effusion

Auscultation

Comment on :

Breath sounds

- Added sounds
- Vocal resonance
- Whispering pectoriloquyAegophony

Added sounds

Sound	Characteristics	Cause	Clinical Condition
Crackles or rales	Short, popping sounds. Pitch and intensity vary. Can be heard during inspiration, expiration, or both	Created when air is forced through bronchial passageways narrowed by fluid, mucus, or pus, or by the popping open of previously deflated alveoli	Can be a sign of infection, inflammation, or CHF
Wheezes	High-pitched, musical sounds that can be heard during inspiration or expiration	Airway narrowing	Usually a sign of asthma but can also occur with other causes of airway narrowing, such as COPD and bronchitis
Friction rub	A deep, harsh, grating or creaking sound that is usually heard more often during inspiration than expiration	Occurs when inflamed pleural surfaces lose their normal lubricating fluid and rub together during respiration	Can be associated with any condition that causes pleural irritation, such as pleuritis or pneumonia

CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

Auscultation

Comment on :

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

Timing of crackles

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)

Vocal Resonance, whispering pectoriloquy and aegophony:

Ask the patient to say '44' in arabic while you auscultate to Assess the quality and amplitude of vocal resonance.
Ask the patient to whisper '44' while you continue to listen.
Ask the patient to say (E) if heared as (A) then this is Aegophony which indicates consolidation.

whispering pectoriloquy indicate consolidation

And finally comment on

hepatomegaly
ascites
1.1 edema bilateralor unilateral /
erythema nodosum/ clubbing

Thank you ③