

The respiratory system



Anatomy and physiology

Lungs

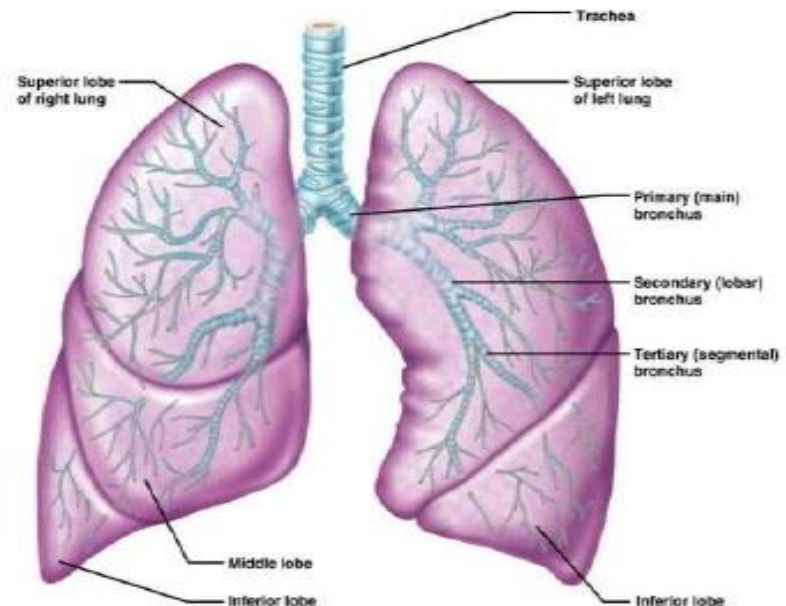
Structure

the right lung:

- It is divided into **upper, middle** and **lower lobes** by ***oblique and horizontal fissures***.

The left lung:

- It has two lobes, **upper** and **lower lobes**. They are separated by the ***oblique fissure***.



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Anatomy and physiology

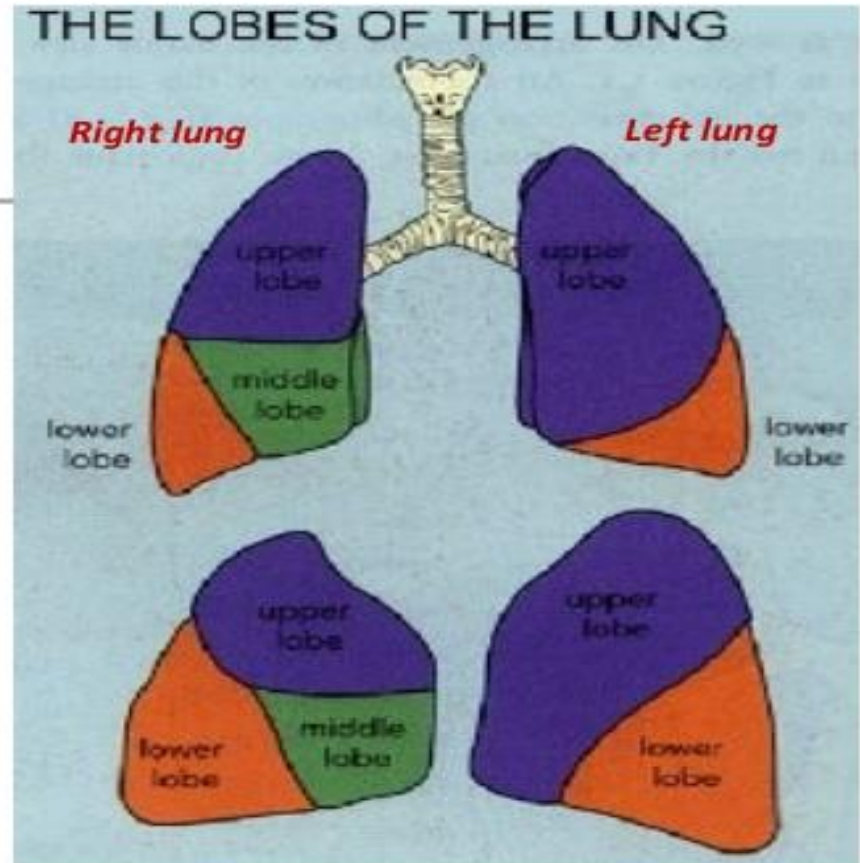


Right lung

Upper lobe
Middle lobe
Lower lobe

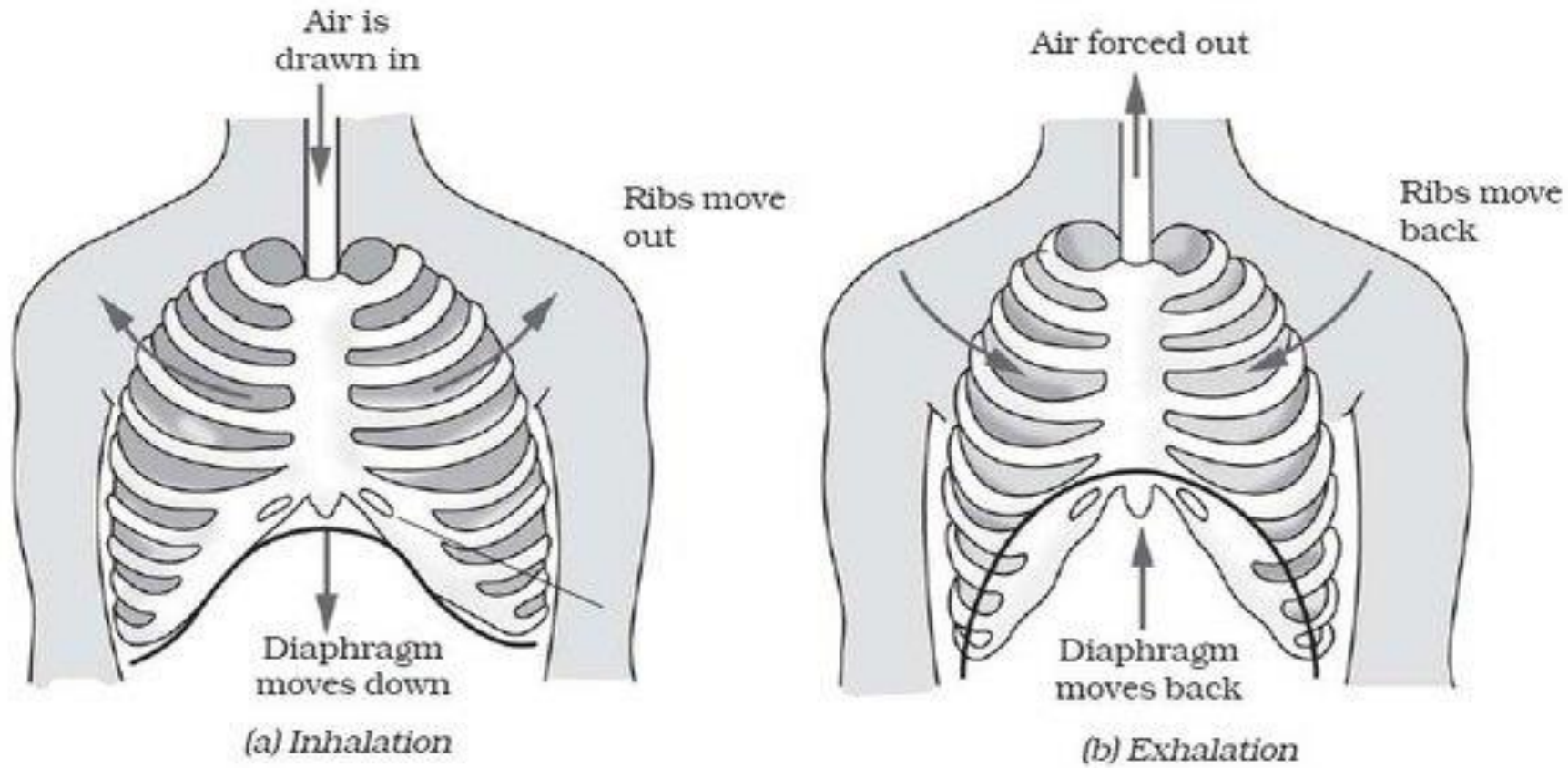
Left lung

Upper lobe
Lower lobe

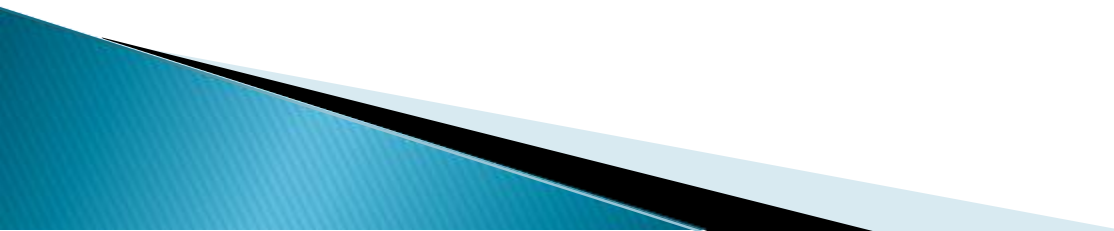


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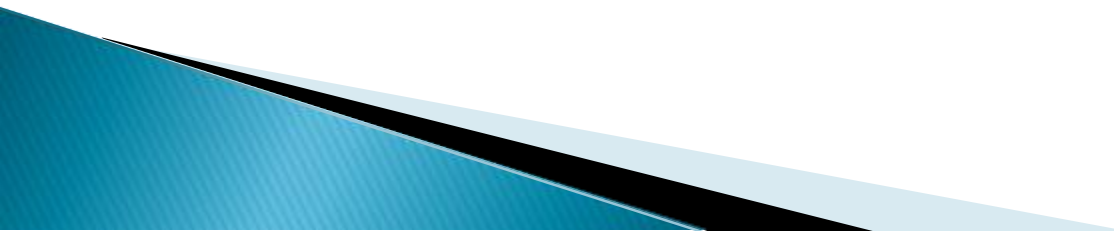
▶ Diaphragm during inhalation and exhalation



History of presenting symptoms

1. Breathlessness
 2. Cough
 3. Sputum/ hemoptysis
 4. Chest pain
 5. Wheeze
 6. stridor
 7. Fever/rigors/night sweats
 8. Weight loss
 9. sleepiness
- 

Breathlessness / definition

- ▶ The feeling of an uncomfortable need to breathe.
 - ▶ The most commonly reported respiratory symptom. Mostly subjective, and can be respiratory, cardiac, and sometimes psychiatric.
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Breathlessness/mechanisms

- ▶ Respiratory diseases can cause breathlessness by different mechanisms:
 1. Stimulation of intrapulmonary afferent nerves to induce ~, in interstitial inflammation or PE
 2. Mechanical loading of respiratory muscles due to airflow obstruction or reduced lung compliance in fibrosis
 3. Hypoxia stimulating chemoreceptors due to V/Q mismatch

Breathlessness / causes

Non-cardio respiratory

Anemia

Metabolic acidosis

Obesity

Psychogenic

Breathlessness / causes

Cardiac

Left ventricular failure

Mitral valve disease

cardiomyopathy

Constrictive pericarditis

Pericardial effusion

Breathlessness / causes

respiratory

Airways:

- Laryngeal tumor
- Foreign body
- Asthma/COPD
- Lung cancers
- Bronchiectasis

Parenchyma:

- Pulmonary fibrosis
- Pneumonia

Pulmonary circulation:

- Pulmonary thromboembolism
- pulmonary vasculitis

Pleural:

- Pneumothorax
- Effusion (may be related to resp. malignancy)

Breathlessness / causes

Respiratory

Chest wall:


- Kyphoscoliosis
- Ankylosing spondylitis

Neuromuscular :

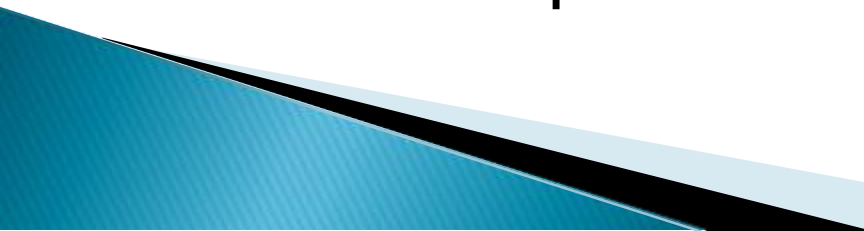
- Myasthenia gravis
- Neuropathies

Breathlessness / analysis:

SOCRATES

- ▶ Onset
 - ✓ Sudden: pneumothorax, pulmonary embolism and acute allergy.
 - ✓ Over hours : asthma, acute pulmonary edema and acute infection (pneumonia or bronchitis).
 - ✓ Insidious : pleural effusion , tuberculosis, interstitial lung diseases , tumors.
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Breathlessness / analysis

- ▶ How is your breathing at rest and overnight?
 - asthma commonly wakes patients.
 - COPD patients are comfortable at rest and asleep but struggle exertion.
 - breathlessness provoked by lying down (orthopnea) occurs frequently in patients with severe airflow obstruction or diaphragmatic weakness, because the weight of the abdominal contents compromises breathing.
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Breathlessness / analysis

- ▶ Is your breathing normal some days?
- ▶ Restrictions on normal activity or work (severity). Record the corresponding Medical Research Council breathlessness score.

Breathlessness / analysis

TABLE 2. MEDICAL RESEARCH COUNCIL DYSPNEA SCALE	
Grade	Description
1	Not troubled by breathlessness, except with strenuous exercise.
2	Troubled by shortness of breath when hurrying on the level or walking up a slight hill.
3	Walks slower than people of the same age on the level because of breathlessness or has to stop for breath when walking at own pace on the level.
4	Stops for breath after walking about 100 yards (90 m) or after a few minutes on the level.
5	Too breathless to leave the house, or breathless when dressing or undressing.

Can Respir J 2007;14(suppl B):5B-32B.

Breathlessness / analysis

- ▶ When does the breathlessness come on?
- ▶ Associated symptoms.

Breathlessness / analysis

Commonly associated symptoms

Pleuritic chest pain

- Pneumonia
- Pulmonary embolism
- Pneumothorax

Central chest pain

- Myocardial infarction
- Massive pulmonary embolism/infarction


Wheeze and cough

- Asthma
- COPD

No chest pain

- Pulmonary embolism
- Pneumothorax
- Metabolic acidosis
- Pulmonary edema

Cough

- ▶ To dislodge foreign material and secretions from the central airways.
 - ▶ an expiratory effort against a closed glottis. Then sudden opening of the glottis with rapid expiratory flow produces the characteristic sound.
 - ▶ Bovine cough is an important symptom warning of possible hilar malignancy.
Due to left recurrent laryngeal nerve invasion causing vocal cord paralysis
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Cough/analysis: SOCRATES

- ▶ Duration of cough

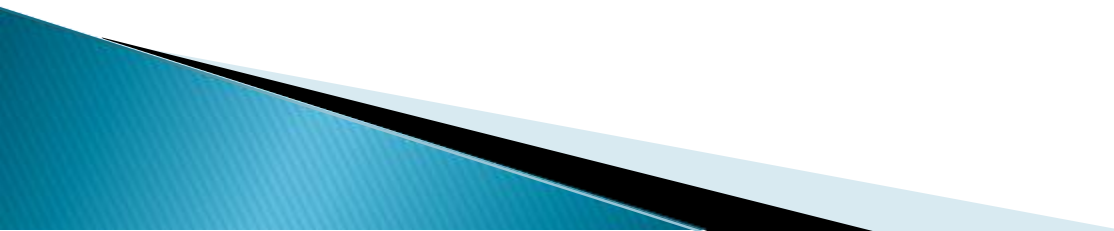
- ✓ Acute cough : less than 3 weeks.

(viral respiratory tract infection ,bacterial infection ,inhaled foreign bodies, inhalation of irritant)

- ✓ Chronic cough : more than 8 weeks.

(gastro-esophageal reflux disease ,asthma ,postviral bronchial hyperreactivity , rhinitis/sinusitis ,drugs (ACE), tumors, interstitial lung diseases ,bronchiectasis,tuberculosis)

Cough/analysis

- ▶ Whether it is present every day.
 - ▶ If it is intrusive/irresistible or whether the patient coughs to clear a perceived obstruction.
 - ▶ Whether it produces sputum.
 - ▶ Associated symptoms (wheeze, heartburn, altered voice or swallowing).
- 

Cough/analysis

- ▶ red flag associated symptoms :
 - hemoptysis
 - breathlessness
 - fever
 - chest pain
 - weight loss
- ▶ Then ask about smoking and drug history.

Sputum / analysis

▶ Color

Color of sputum	Disease
Clear (muroid)	COPD / bronchiectasis without current infection
Yellow (mucopurulent)	Acute lower respiratory tract infection / asthma
Green (purulent)	Current infection
Red / brown (rusty)	Pneumococcal pneumonia
Pink (serous/frothy)	Acute pulmonary edema


Rusty sputum



Sputum / analysis

- ▶ Volume

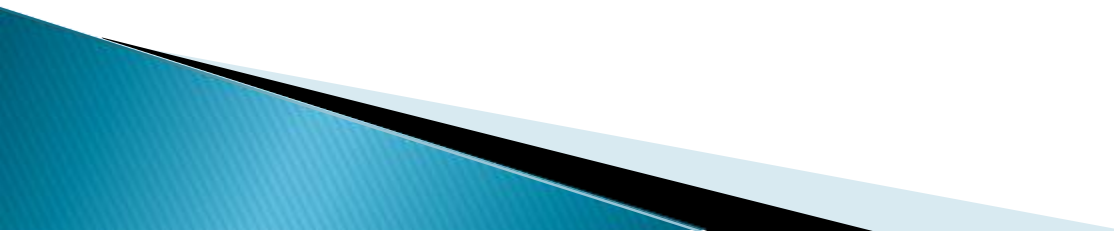
 - ▶ Consistency :
 1. increase viscosity may indicate exacerbation in bronchiectasis.
 2. Sputum plug produced by patients with asthma.

 - ▶ Any change in color or consistency or an increase in volume may indicate a new infection in chronic disease.
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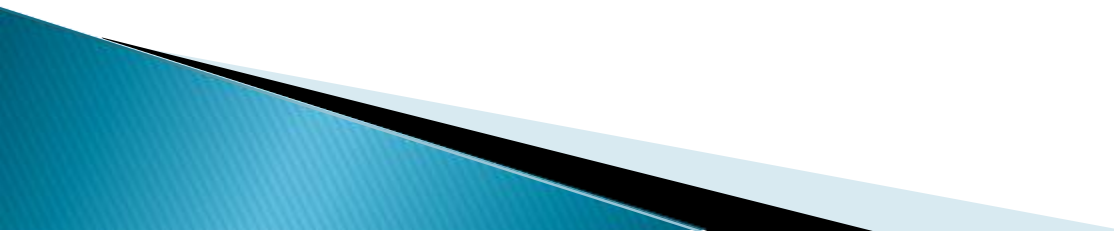
Mucus plug



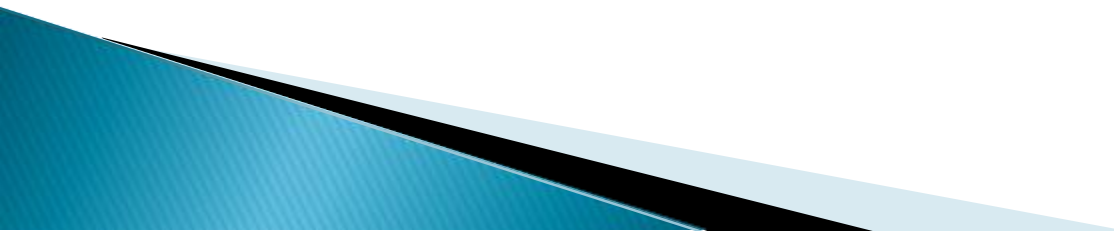
Hemoptysis / analysis

- ▶ Was the blood definitely coughed up from the chest ?
 - ▶ Onset and duration
 - ▶ Is it pure blood or mixed with sputum? if mixed , whether sputum is clear or purulent.
 - ▶ How much blood?
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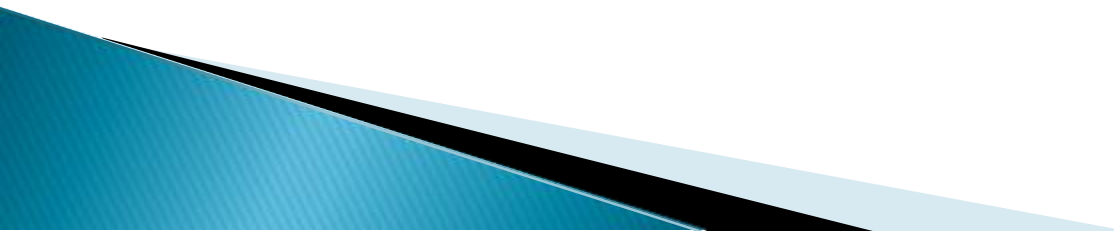
Hemoptysis / analysis

- ▶ Larger volumes of hemoptysis:
 1. Lung cancer eroding a pulmonary vessel
 2. Bronchiectasis
 3. Cavitory disease of the lungs
 4. Pulmonary vasculitis
 5. Pulmonary arteriovenous malformation
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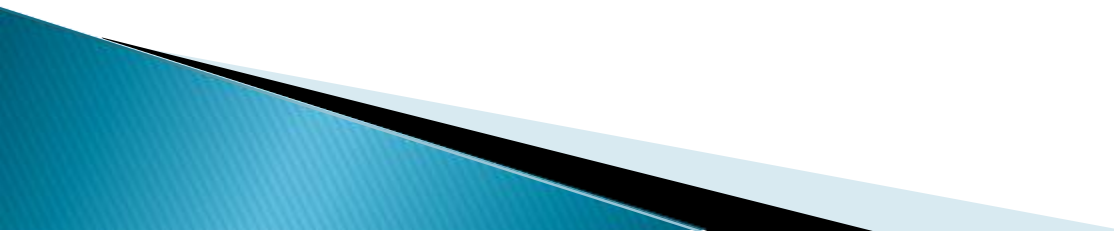
Chest pain

- ▶ Chest pain can be classified according to the site into non-central chest pain and central chest pain.
 - ▶ Non-central chest pain could originate from the pleura or the chest wall >> PE or pneumothorax
 - ▶ Central chest pain could originate from the trachea , heart , esophagus , great vessels or mediastinum.
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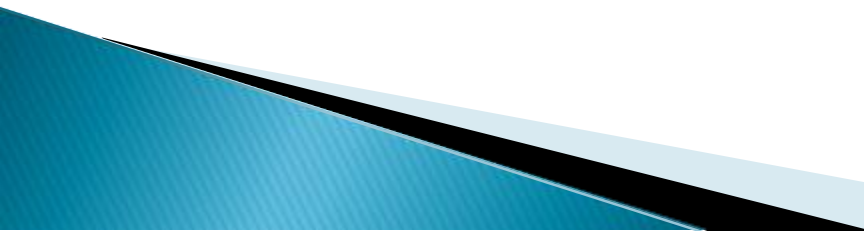
Chest pain

- ▶ Pleuritic chest pain
 - ▶ Musculoskeletal chest pain
 - ▶ Bornholm disease
 - ▶ Costochondritis
 - ❖ Do not forget SOCRATES when you analyze the chest pain.
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Wheeze

- ▶ High-pitched musical sounds produced by turbulent air flow through narrowed small airways .
 - ▶ It is most commonly heard during expiration , when airway caliber is reduced.
 - ▶ It is commonly associated with asthma and COPD but can also occur with acute respiratory tract infection or with exacerbations of bronchiectasis.
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wheeze \ specific questions

- ▶ Is the wheeze worse during or after exercise ?
COPD vs asthma
 - ▶ Do you wake with wheeze during the night?
asthma
 - ▶ Is it worse on waking in the morning and relieved by clearing sputum?
COPD
 - ▶ Are there daily volumes of yellow or green sputum, sometimes with blood?
Bronchiectasis
 - ▶ Smoking
 - ▶ History of allergies
- 


Stridor

- ▶ Harsh grating respiratory sound caused by vibration of the walls of the trachea or major bronchi when the lumen is critically narrowed.
- ▶ Timing with respiration:
 1. Inspiratory stridor
 2. Expiratory stridor
 3. Inspiratory and expiratory stridor (biphasic)

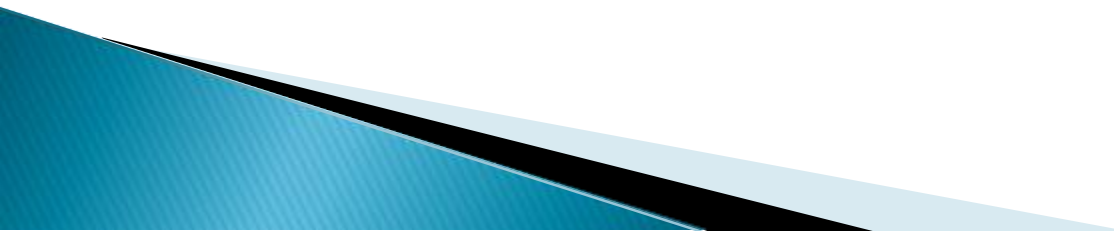
Usually requires rapid investigation and treatment.



Fevers /rigors /night sweats

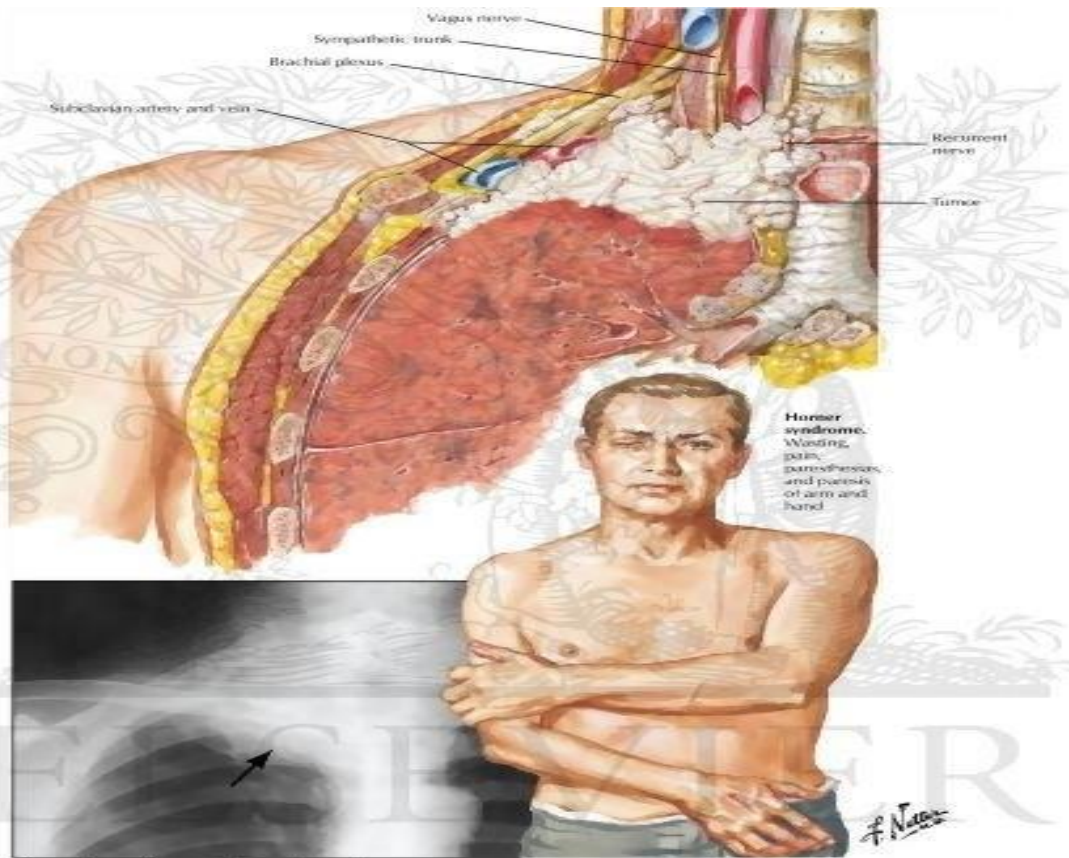
- ▶ Infection is the usual cause but other etiologies should also be considered.
 - ▶ Rigors are generalized ,uncontrollable episodes of vigorous body shaking lasting a few minutes. Bacterial sepsis, lobar pneumonia and acute pyelonephritis are the most common causes.
 - ▶ Night sweats are closely associated with chronic infection and malignancy rather than acute infection.
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Weight loss

- ▶ A common feature of several important respiratory diseases:
 1. Lung cancer
 2. Chronic infective diseases
 3. Diseases causing chronic breathlessness
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Anatomy and physiology

▶ Apical lung tumors



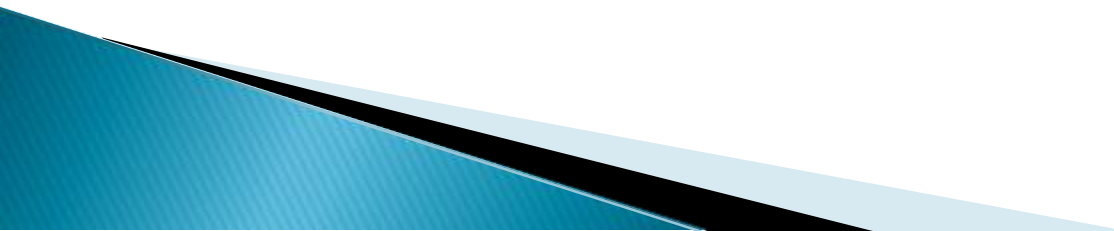
Apical lung tumors cause

-pain and numbness in inner aspect of upper arm due to T1 nerve root compression

-wasting of small hand muscles

-constricted pupil and ptosis in some cases if affecting sympathetic flow to the eye

Sleepiness / specific questions

- ▶ Normal sleeping habit
 - ▶ Shift or night work
 - ▶ Does the patient wake refreshed or exhausted
 - ▶ Have they struggled to stay awake in the day
 - ▶ Seek description of any night-time breathing disturbance from a bed partner.
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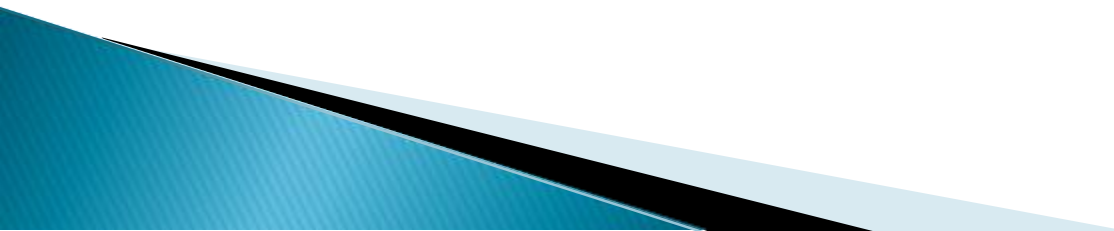
Past medical history

History	Current implications
Eczema , hay fever	allergic tendency relevant to asthma
Whooping cough ,measles, inhaled foreign body	bronchiectasis
Tuberculosis	Reactivation Mycetoma = “fungal ball”
Connective tissue disorders	Lung diseases are recognized complications
Neuromuscular disorder	Respiratory failure aspiration

Drug and allergy history

Respiratory condition	drug
Bronchoconstriction	Beta-blockers NSAIDs
Cough	ACEIs
Diffuse parenchymal lung disease	Bleomycin , methotrexate Sulfasalazine Amiodarone ,hydralazine nitrofurantoin
Pulmonary thromboembolism	estrogens
Pleural effusion	Amiodarone nitrofurantoin

Family history and social history

- ▶ Family history of respiratory disease
 - ▶ Social history
 - home circumstances /effect of and on disease
 - smoking
 - occupational history
- 

Occupational and environmental lung disease

Trade / risk	Toxic agent	Disease caused
Plumber shipbuilder	Asbestos	Pleural plaques Asbestosis lung cancer Mesothelioma
Stonemason	Silica dust	Silicosis
Coal miner	Coal dust	Coal worker pneumoconiosis “black lung disease”
Paint sprayer	Isocyanates	Asthma
Baker	Flour	Asthma
Distiller	Aspergillus in malt	Hypersensitivity pneumonitis
Pet bird owner	Antigens in dust from feathers / excreta	Hypersensitivity pneumonitis
Farm worker	Fungal spores in mouldy hay	Hypersensitivity pneumonitis

Thank you

