Approach to the Patient with Disease of the Respiratory System

LECTURE IN INTERNAL MEDICINE PROPAEDEUTICS

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Plan of the lecture

Approach to the Patient with Disease of the Respiratory System

- Interviewing of the patient
- Physical examination of the patient
- Instrumental methods for evaluating of the patient status
- laboratory methods for evaluating of the patient status

Interviewing of the patient: the chief symptoms

- Dyspnoea: orthopnea, paroxysmal nocturnal dyspnea (PND), severity
- Cough: time of day, severity, type (dry, moist, wet, productive, hoarse, hacking, barking, whooping), onset , duration, wheezing, associated symptoms
- Sputum: quantity, color, consistency, time of day, odor, pattern of production
- Haemoptysis: source, color, quantity
- Chest pain
- Wheezing

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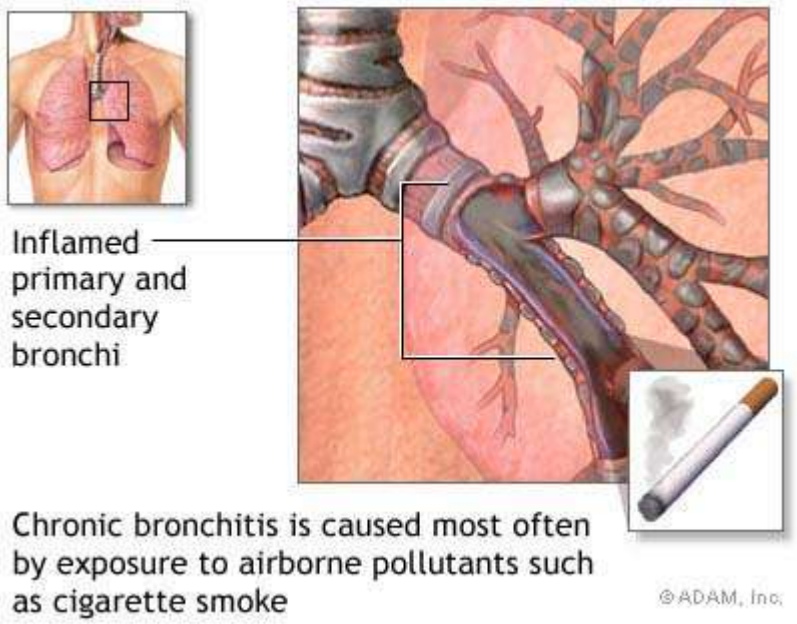
Interviewing of the patient: the general symptoms

- Fever
- Weight loss
- Oedema
- Night sweats
- Nocturia
- Daytime somnolence



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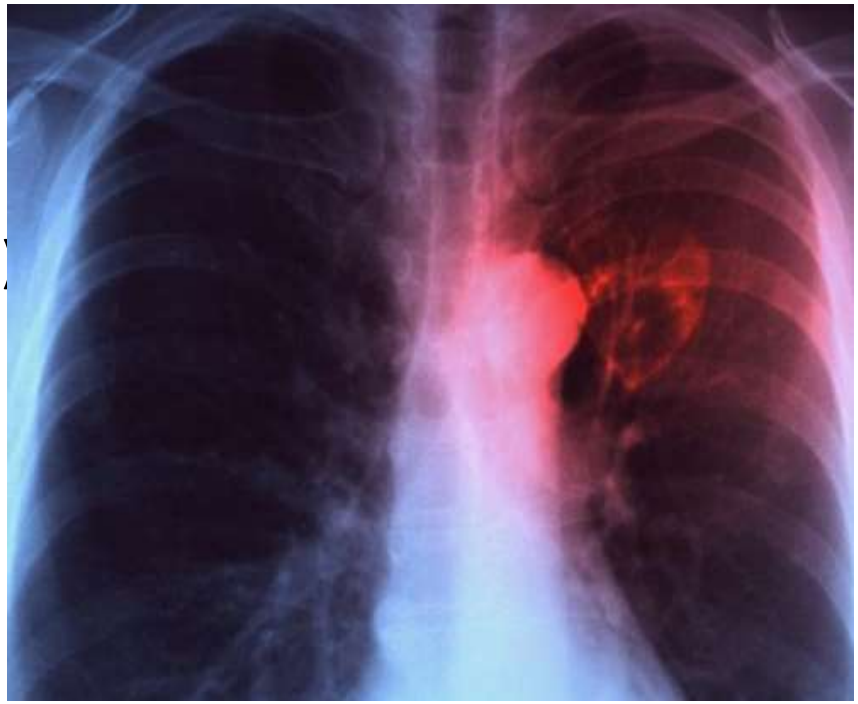
Interviewing of the patient: other systems

- Loss of appetite (a common feature whenever people are unwell)
- Significant loss of weight (serious illness, e.g. malignancy or tuberculosis)
- Upper gastrointestinal symptoms as common cause of chronic cough
- Heart disease (may cause respiratory symptoms)
- Severe anaemia (may cause breathlessness)
- Rheumatoid arthritis and other connective tissue diseases
- Neuromuscular diseases



Tuberculosis

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Interviewing of the patient: past medical history

- Use of inhalers (assess compliance and technique)
- Use of steroids (some measure of severity in asthma)
- Use of other drugs which may have relevance in respiratory disease, e.g. angiotensin-converting enzyme (ACE) inhibitors (cough)
- Childhood respiratory illnesses (e.g. asthma, pneumonia, TB)

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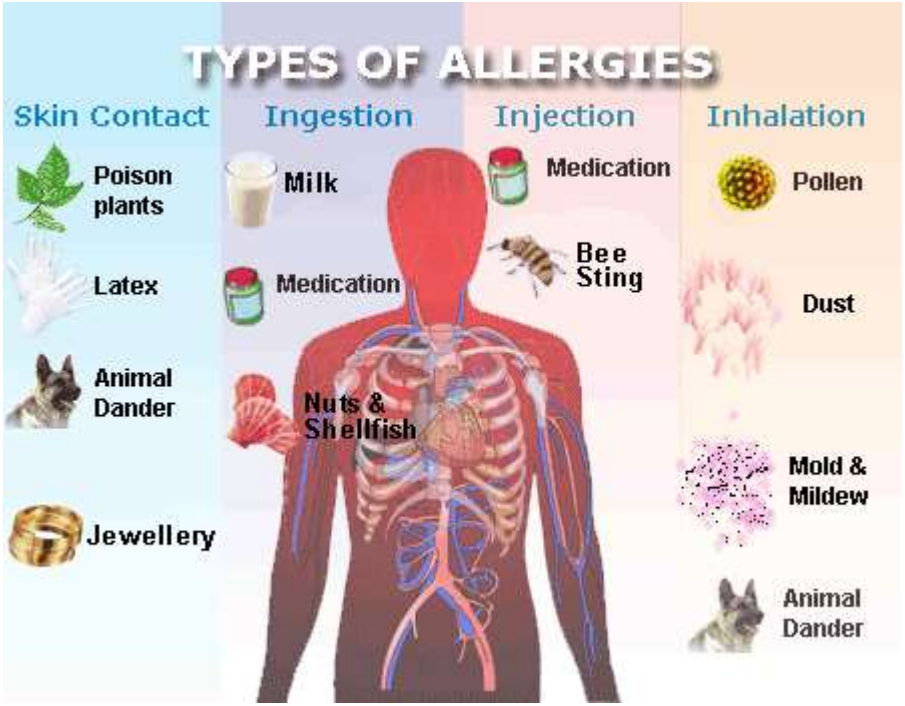
Interviewing of the patient: allergies

- Food
- Inhaled allergens
- Drugs



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Interviewing of the patient: occupational history

An occupational diseases (e.g. Occupational Asthma, Industrial Dust Diseases, Asbestos-related Diseases, Extrinsic Allergic Alveolitis, Sick Building Syndrome)

- Chronological listing of all jobs
- Precise job activities
- All materials used in job, with material safety data sheet (MSDS) if possible
- Duration and intensity of exposure
- Protective measures used, or breached
- Ventilation of workplace
- Timing relationship of symptoms with shift or vacation
- Other workers similarly affected

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Interviewing of the patient: social history

- Environmental history (home - animals, humidifiers, heating)
- Lifestyle (alcohol consumption, illicit drugs)
- Smoking history (the type and number of cigarettes smoked currently and in the past, passive smoking)
- Sexual history (risk of HIV and AIDS)
- Ask about travels

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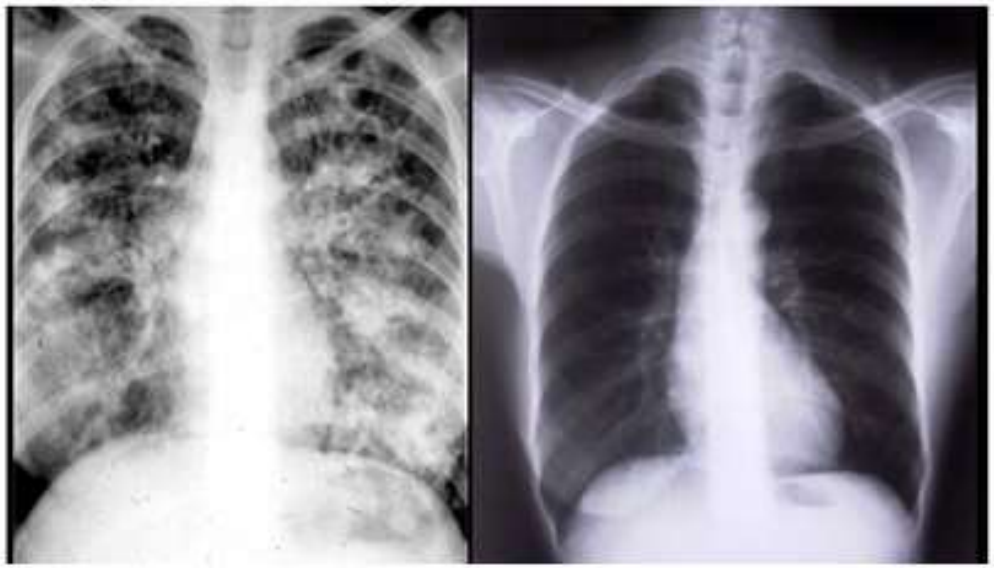
Interviewing of the patient: family history

- Respiratory diseases with a genetic component, e.g. cystic fibrosis, emphysema (alpha-1-antitrypsin deficiency)
- Infectious diseases such as tuberculosis
- Atopic diseases such as asthma (hay fever, eczema)



Cystic Fibrosis Lung Healthy Lung

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Physical examination of the patient: general inspection

- The position of the patient
- Evidence of respiratory distress at rest or when walking, e.g. obvious breathlessness, talking in short phrases rather than full sentences, use of accessory muscles, exhalation with pursed lips, diaphragmatic paradox , intercostal indrawing
- Evidence of other respiratory symptoms, e.g. cough, audible wheeze.
- Does the patient appear to be pyrexial (check his temperature).
- Any indicators of recent weight loss, e.g. sunken cheeks

The patient in case of distress leans forward, resting his hands on his knees in what is known as the tri-pod position

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Physical examination of the patient: hands inspection

- Finger clubbing
- Cyanosis
- Tobacco staining
- Pulse (tachycardia suggests significant respiratory difficulty or marked overuse of a beta agonist, lung cancer can cause atrial fibrillation, a large pneumothorax or a tension pneumothorax can cause pulsus paradoxus)
- Tremor (may indicate carbon dioxide retention)
- Oteoarthropathy

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Physical examination of the patient: face inspection

- Cushingoid (as a result of long-term use of steroids)
- Central cyanosis
- Anaemia (conjunctivae)
- Horner's syndrome (possible apical lung cancer)

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Physical examination of the patient: neck inspection

- Jugular venous pressure (e.g. cor pulmonale)
- Goitre (any possible tracheal obstruction)
- Lymphadenopathy
- Evidence of superior vena cava obstruction (may be caused by lung cancer)

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Physical examination of the patient: chest inspection

- Chest shape:
  - Overinflated (e.g. chronic obstructive pulmonary disease or severe acute asthma)
  - Asymmetry (the abnormality is on the side that moves less, e.g. pneumothorax, collapse, consolidation or effusion)
  - Deformity (pigeon chest (pectus carinatum), funnel chest (pectus excavatum), kyphosis and/or scoliosis)
- Respiratory rate for an adult:
  - normal is about 14/min
  - tachypnea > 28/min
  - bradypnea < 10/min
- Respiratory distress (difficulty in breathing)
- Pathological breathing
  - Kussmaul's (deep and labored, associated with metabolic acidosis)
  - Cheyne-Stokes (progressively deeper breathing followed by temporary apnoea, may occur with heart failure, cerebrovascular disease, head injury, carbon monoxide poisoning or brain tumors, or be a normal variant during sleep or at high altitude)
- Scars
- Paradoxical chest movement (may indicate a fractured rib)

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Physical examination of the patient: chest inspection

Pectus excavatum: congenital posterior displacement of lower aspect of sternum

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Physical examination of the patient: chest inspection

Barrel chest: associated with emphysema and lung hyperinflation

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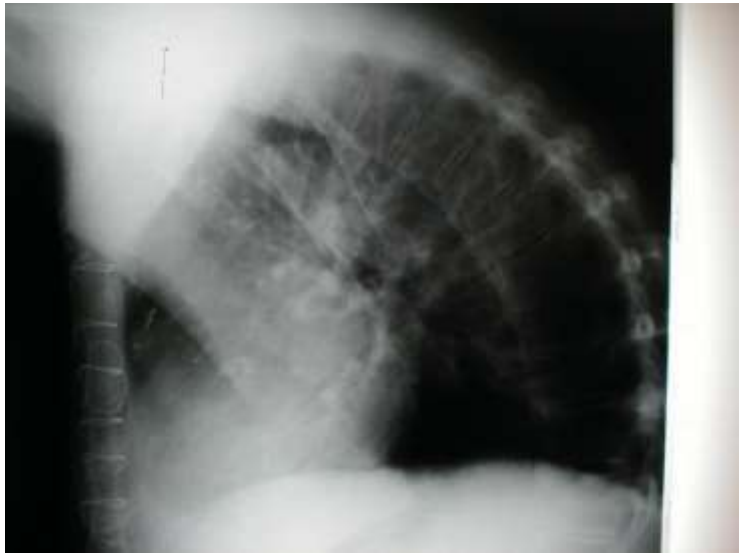
Physical examination of the patient: chest inspection



Kyphosis: causes the patient to be bent forward

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Physical examination of the patient: chest inspection

Scoliosis: condition where the spine is curved to either the left or right

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Physical examination of the patient: abdomen and lower limbs inspection

- Hepatomegaly (may indicate right heart failure)
- Ascites(may indicate end stage right heart failure)
- Swollen calf (possible deep vein thrombosis)
- Peripheral oedema (lower legs if ambulant or sacral if bed-bound)

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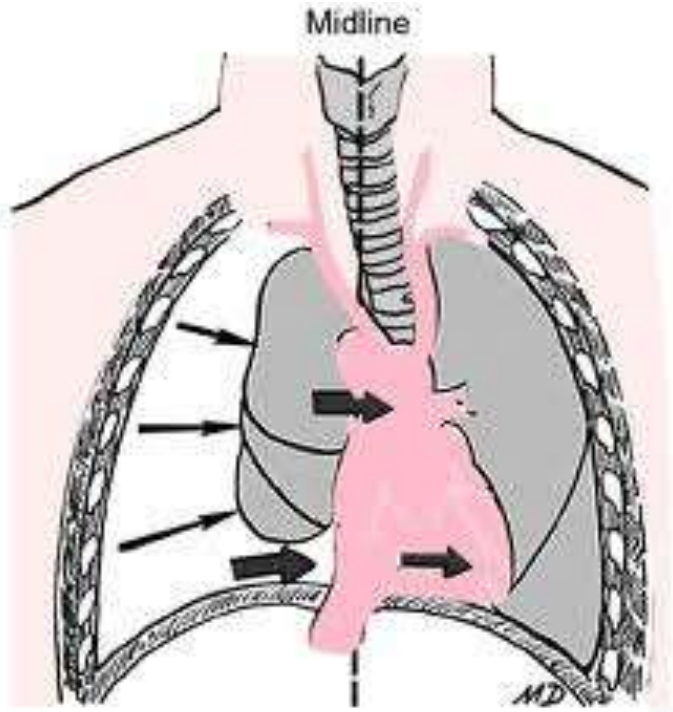
Physical examination of the patient: the trachea palpation

- Use the index finger to feel the trachea and to determine whether the trachea feels central or is deviated
- The trachea is deviated away from pneumothorax and effusion and towards collapse and consolidation
- The trachea may also be deviated by a mass, e.g. enlarged lymph nodes



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Physical examination of the patient: the trachea palpation

If it is deviated, it may suggest a tumor or pneumothorax

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Physical examination of the patient: chest palpation

- Chest expansion in an adult usual is 4-5 cm and should be symmetrical
- Symmetrical reduction of chest wall expansion in overinflated lungs (e.g. bronchial asthma, emphysema), stiff lungs (e.g. pulmonary fibrosis), ankylosing spondylitis
- Asymmetrical reduction of chest wall expansion: absent expansion (e.g. empyema and pleural effusion) or reduced expansion (e.g .pulmonary consolidation and collapse)

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Physical examination of the patient: chest palpation

Supra and infra clavicular lymph nodes

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Physical examination of the patient: chest palpation

Detecting chest excursion: place your hands on the patient's back with thumbs pointed towards the spine

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Physical examination of the patient: vocal fremitus palpation

- To assess tactile vocal fremitus, use the ulnar side of the hand, by the hypothenar eminence with the palms facing upwards Place it at various levels over the back, each time asking the patient to say "ninety-nine“
- Note how the sound is transmitted to the hand
- Tactile vocal fremitus is increased over areas of consolidation and decreased or absent over areas of effusion or collapse

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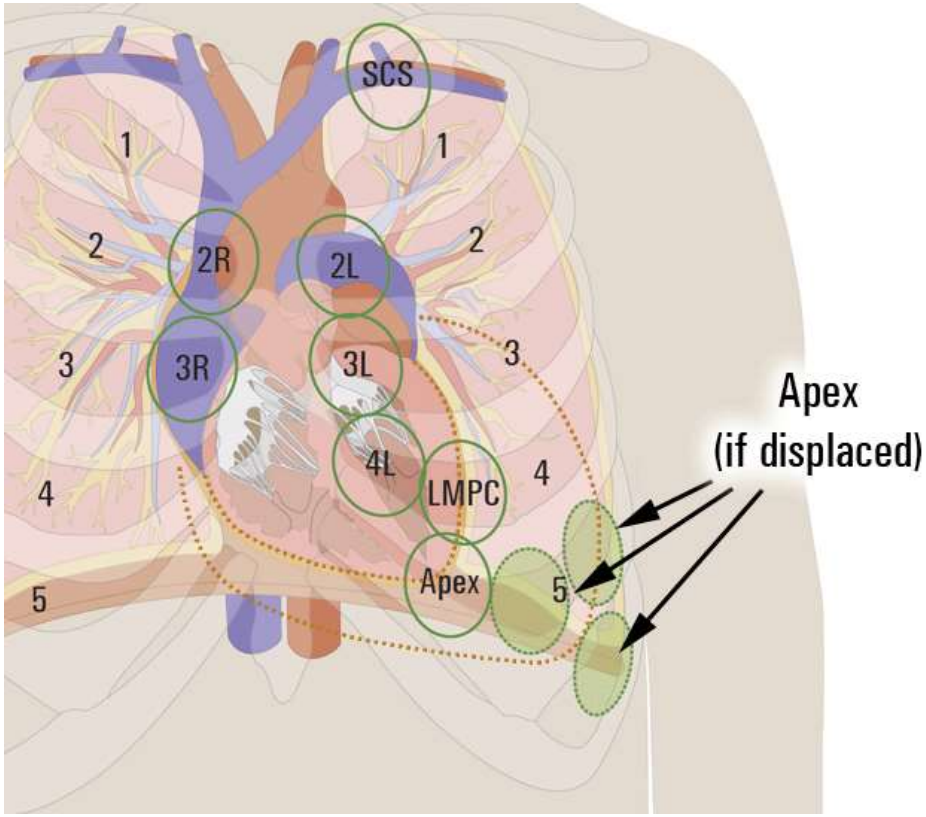
Physical examination of the patient: heart apex palpation



- Feel for the apex beat of the heart
- It will be displaced if the mediastinum is displaced or distorted

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Physical examination of the patient: the chest percussion

- For percussion it is usual to use the middle finger of the dominant hand to do this
- The clavicle is percussed directly
- The rest of the chest is percussed by placing the non-dominant hand on the chest and using the dominant middle finger to tap the other middle finger over the middle phalanx
- Percuss over all the lobes of the lung, front and back except that the middle lobe does not have surface anatomy on the back
- Percuss over the heart: in hyperinflation of the chest, there is loss of cardiac dullness.
- A hyper-resonant sound suggests hyperinflation or a pneumothorax
- A dull sound is easier to distinguish from normal: it may suggest collapse or consolidation, or a pleural effusion

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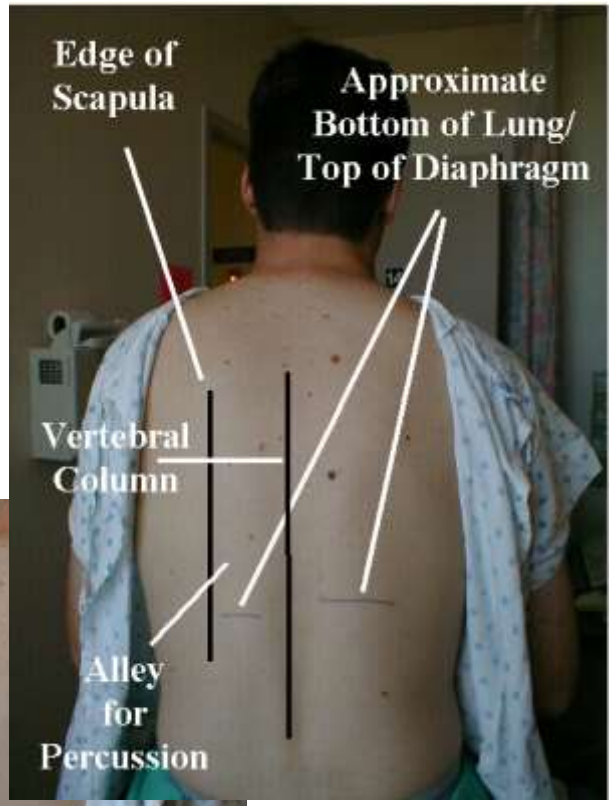
Physical examination of the patient: the chest percussion

- This technique makes use of the fact that striking a surface which covers an air-filled structure (e.g. normal lung) will produce a resonant note while repeating the same maneuver over a fluid or tissue filled cavity generates a relatively dull sound



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Physical examination of the patient: main heart and lungs sounds in auscultation

- Heart auscultation is used to detect heart abnormalities, pulmonary hypertension and a loud P2
- In lungs auscultation the stethoscope is placed over each of the 5 lobes of the organ in turn, on the front and back of the chest, ask the patient to take deep breaths in and out with their mouth open
- Normal breath sounds are called vesicular, they are described as quiet and gentle, there is usually no gap between the inspiratory and expiratory phase sounds
- Rhonchi (wheezes):
  - Musical sound heard on expiration, in severe cases they may be both inspiratory and expiratory, imply narrowing of the airways
  - The loudness of rhonchi gives no indication of the severity of the condition

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Physical examination of the patient: normal breath sounds

- **Bronchial :**Heard over the trachea and mainstem bronchi (2nd-4th intercostal spaces either side of the sternum anteriorly and 3rd-6th intercostal spaces along the vertebrae posteriorly). The sounds are described as tubular and harsh. Also known as tracheal breath sounds.
- **Bronchovesicular** :Heard over the major bronchi below the clavicles in the upper of the chest anteriorly. Bronchovesicular sounds heard over the peripheral lung denote pathology. The sounds are described as medium-pitched and continuous throughout inspiration and expiration.
- **Vesicular :**Heard over the peripheral lung. Described as soft and low- pitched. Best heard on inspiration.
- **Diminished/absent**: Heard with shallow breathing:
  - normal in obese patients with excessive adipose tissue and during pregnancy.
  - abnormal:
    - air or fluid in or around the lungs (such as pneumonia, heart failure, and pleural effusion)
    - over-inflation of a part of the lungs (emphysema can cause this)
    - reduced airflow to part of the lungs
    - obstructed airway, partial or total lung collapse, or chronic lung disease.

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Physical examination of the patient: main heart and lungs sounds in auscultation

- Prior to listening over any one area of the chest, remind yourself which lobe of the lung is heard best in that region: lower lobes occupy the bottom 3/4 of the posterior fields; right middle lobe heard in right axilla; lingula in left axilla; upper lobes in the anterior chest and at the top 1/4 of the posterior fields
- Many disease processes (e.g. pulmonary edema, bronchoconstriction) are diffuse, producing abnormal findings in multiple fields

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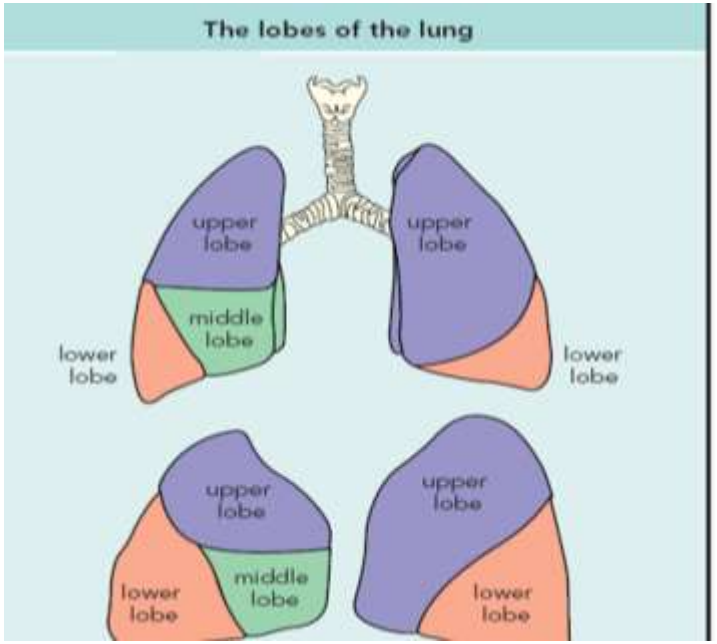
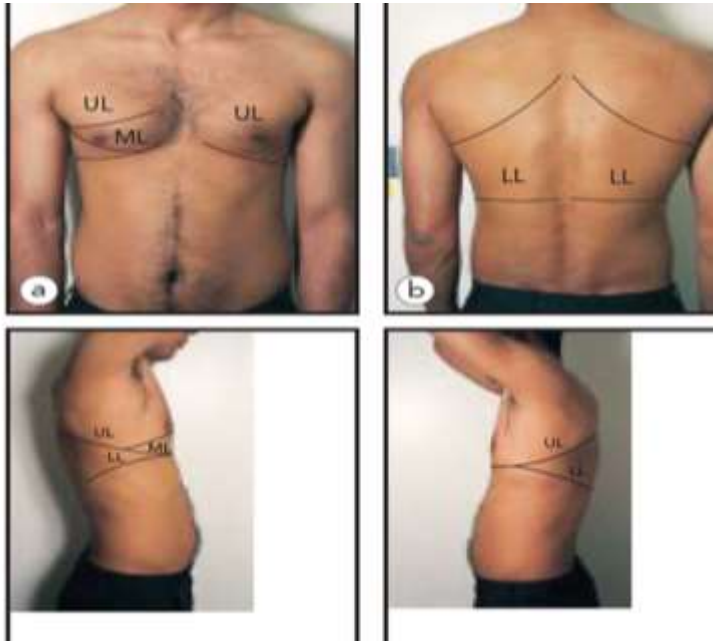
Physical examination of the patient: main heart and lungs sounds in auscultation





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Physical examination of the patient: main heart and lungs sounds in auscultation

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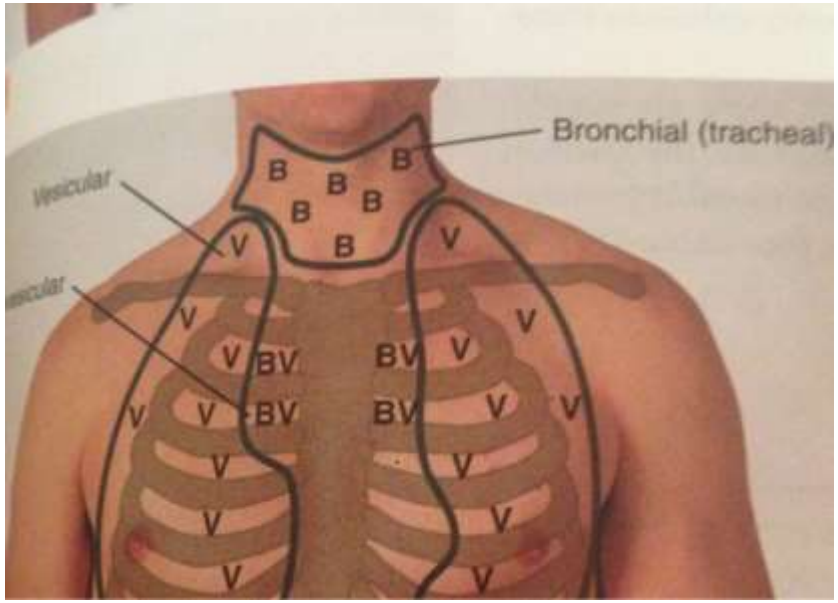
Physical examination of the patient: bronchial breathing in auscultation

- The sounds of bronchial breathing are generated by turbulent air flow in large airways (similar sounds can be heard in healthy patients by listening over the trachea
- Sounds are harsh and poor in nature, unlike normal vesicular breath sounds, there is a gap between the inspiratory and expiratory phase sounds
- bronchial breathing suggests consolidation or fibrosis, cavitation, complete alveolar atelectasis with patent airways, mass interposed between chest wall and large airways which permit the sound to be conducted more effectively to the chest wall



V- vesicular, B - bronchial

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Physical examination of the patient: adventitious breath sounds

- Adventitious breath sounds are abnormal sounds that are heard over a patient's lungs and airways
- These sounds include:
  - fine and coarse crackles (crackles are also called rales)
  - wheezes (sometimes called rhonchi)
  - pleural rubs
  - stridor

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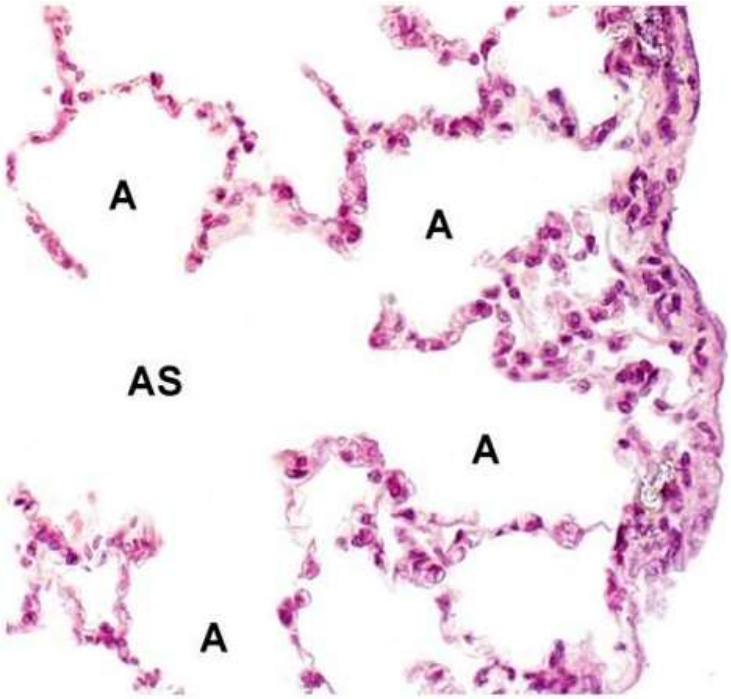
Physical examination of the patient: rales (crackles) in auscultation

Rales

- Probably represent opening of small airways and alveoli
- Are heard more commonly during inspiration than expiration
- Imply either accumulation of fluid secretions or exudate within airways or inflammation and edema in the pulmonary tissue
- May be normal at the lung bases if they clear on coughing or after taking a few deep breaths
- Basal rales are a classical feature of pulmonary congestion with left ventricular failure, they may be more diffuse in pulmonary fibrosis



Alveolar sac with alveoli

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Physical examination of the patient: wheezes (rhonchi) in auscultation

- Result as a collapsed airway lumen gradually opens during inspiration or gradually closes during expiration
- Are continuous musical tones that are most commonly heard at end inspiration or early expiration
- Imply decreased airway lumen diameter (obstruction) either due to thickening of reactive airway walls or collapse of airways due to pressure from surrounding pulmonary disease

High pitch wheezes (= wheezes = sibilant wheezes)

- shrill sounding breath sounds, often have a musical quality
- heard during exhalation, in *severe blockage also are heard during inhalation*
- are associated with partial blockage of the small airways

Low pitch wheezes (= rhonchi = sonorous wheeze)

- a snoring, gurgling quality
- associated with disease of larger airways
- heard primarily in exhalation
- *disappears with coughing*
- caused by blockages to the main airways by mucous, lesions, or foreign bodies (pneumonia, chronic bronchitis, cystic fibrosis)

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Physical examination of the patient: pleural rub in auscultation

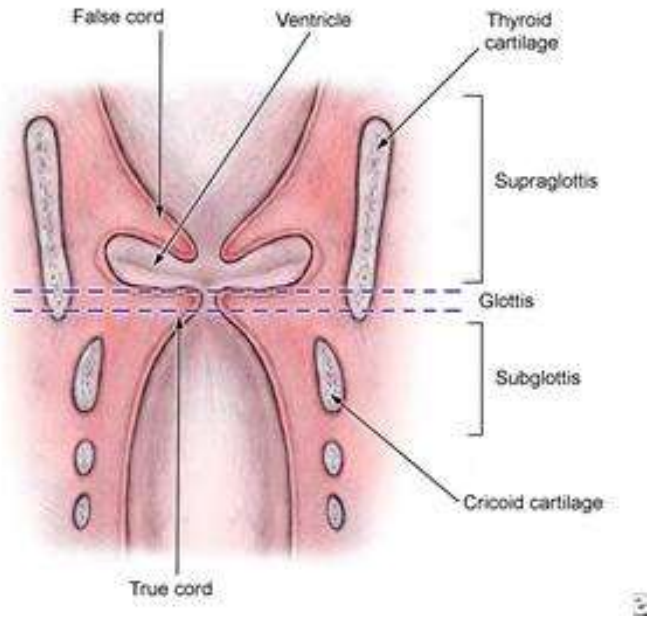
Pleural rub means a creaking sound caused by stiff pleural membranes

Here Laënnec auscultates a patient before his students (1816, Painting by Théobald Chartran*)*

http://patient.info/doctor/Respiratory-System-History-and-Exam.htm https://en.wikipedia.org/wiki/Auscultation#/media/File:Laennec_-_Th%C3%A9obald_Chartran.jpg

Physical examination of the patient: stridor in auscultation

- Stridor means harsh inspiratory sound caused by upper airway (large airway) narrowing or partial obstruction
- The common causes of stridor are pertussis, croup, epiglottis, aspirations
- Here is demonstrated congenital laryngeal stridor as the result of poor development of the child's throat cartilage



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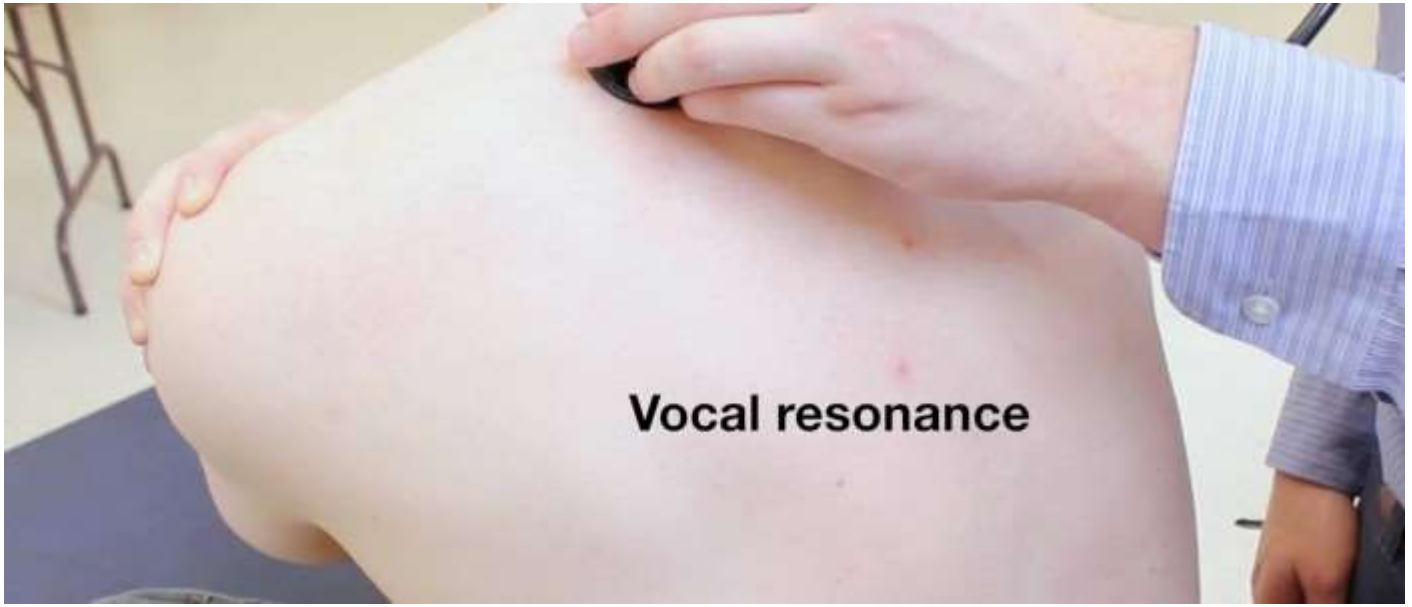
Physical examination of the patient: vocal resonance in auscultation



- Place the stethoscope at various levels over the back and ask the patient to whisper "ninety-nine" each time
- Note how well the sound is transmitted
- The sound is muffled over a normal lung, increased if there is consolidation, and decreased or absent if there is effusion or collapse

http://patient.info/doctor/Respiratory-System-History-and-Exam.htm http://geekymedics.com/wp-content/uploads/2013/04/Vocal-resonance-700x300.jpg

Physical examination of the patient: whispering pectoriloquy in auscultation

- Is elicited as for vocal fremitus but ask the patient to whisper "one, two, three"
- Whispering pectoriloquy is the increased quality and loudness of whispers that are heard with a stethoscope over an area of lung consolidation

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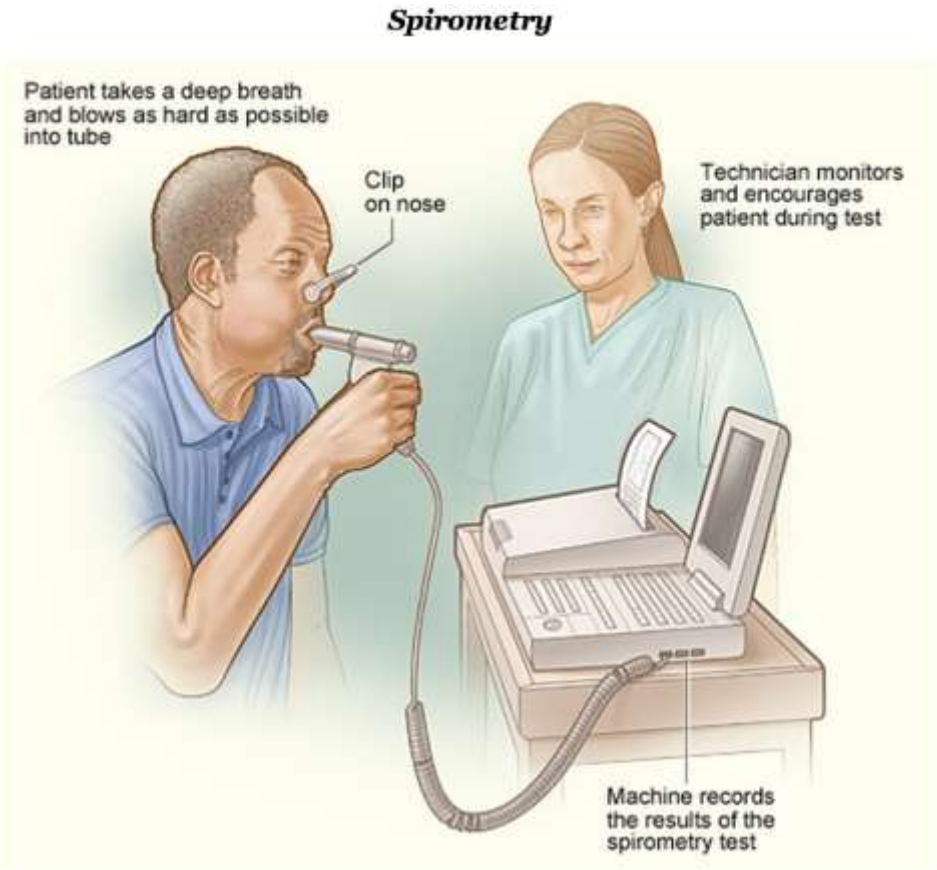
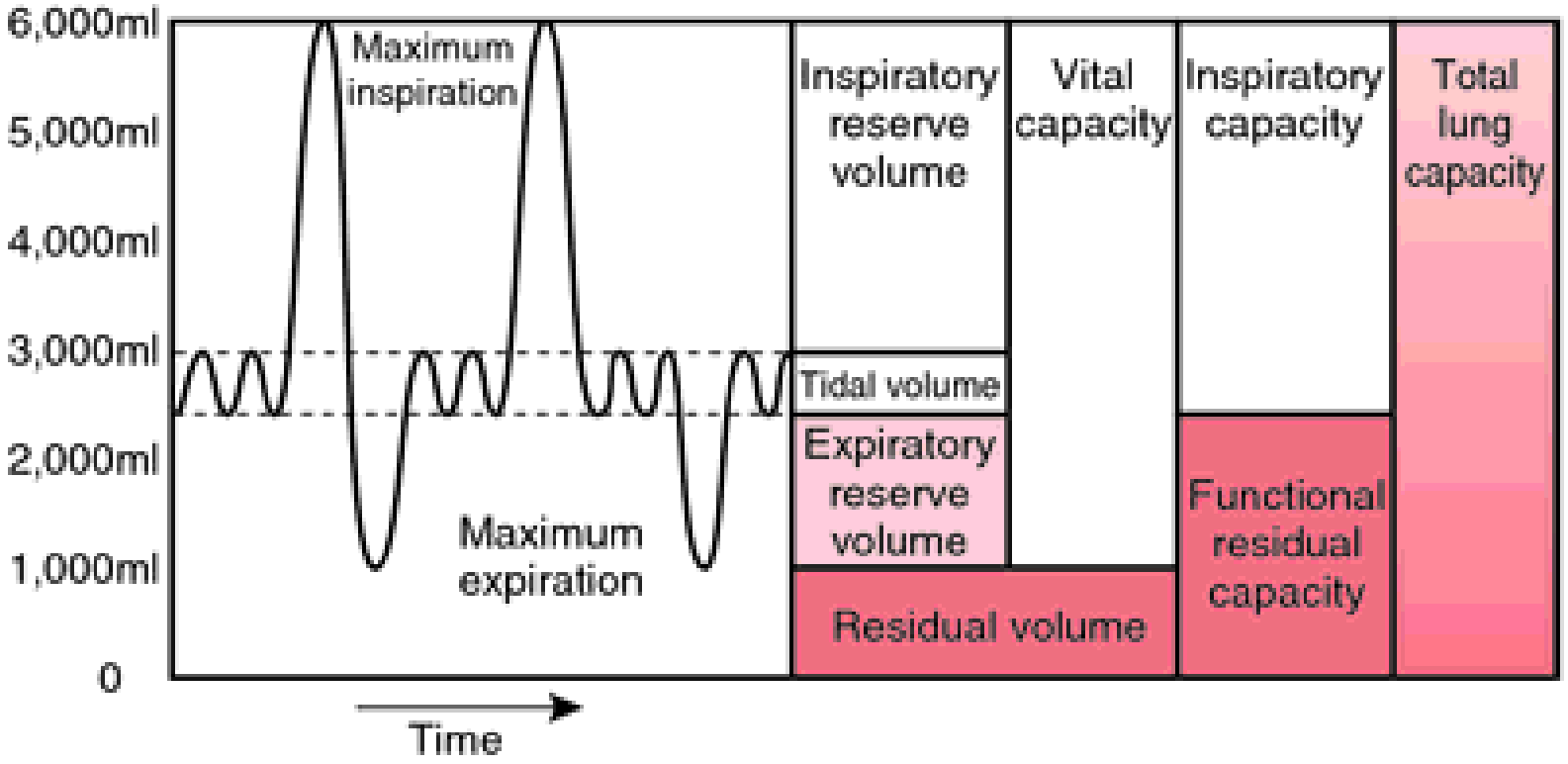
Instrumental methods for evaluating of the patient status: spirometry

- A spirometer is a device for measuring timed expired and inspired volumes and is the gold standard for the diagnosis, assessment and monitoring of chronic obstructive pulmonary disease (COPD) and asthma
- The reduced expiratory volume in one second (FEV1) is a marker of cardiovascular mortality



http://patient.info/doctor/Respiratory-System-History-and-Exam. https://www.retailinvestor360.com/images/mnkd_spirometry.png

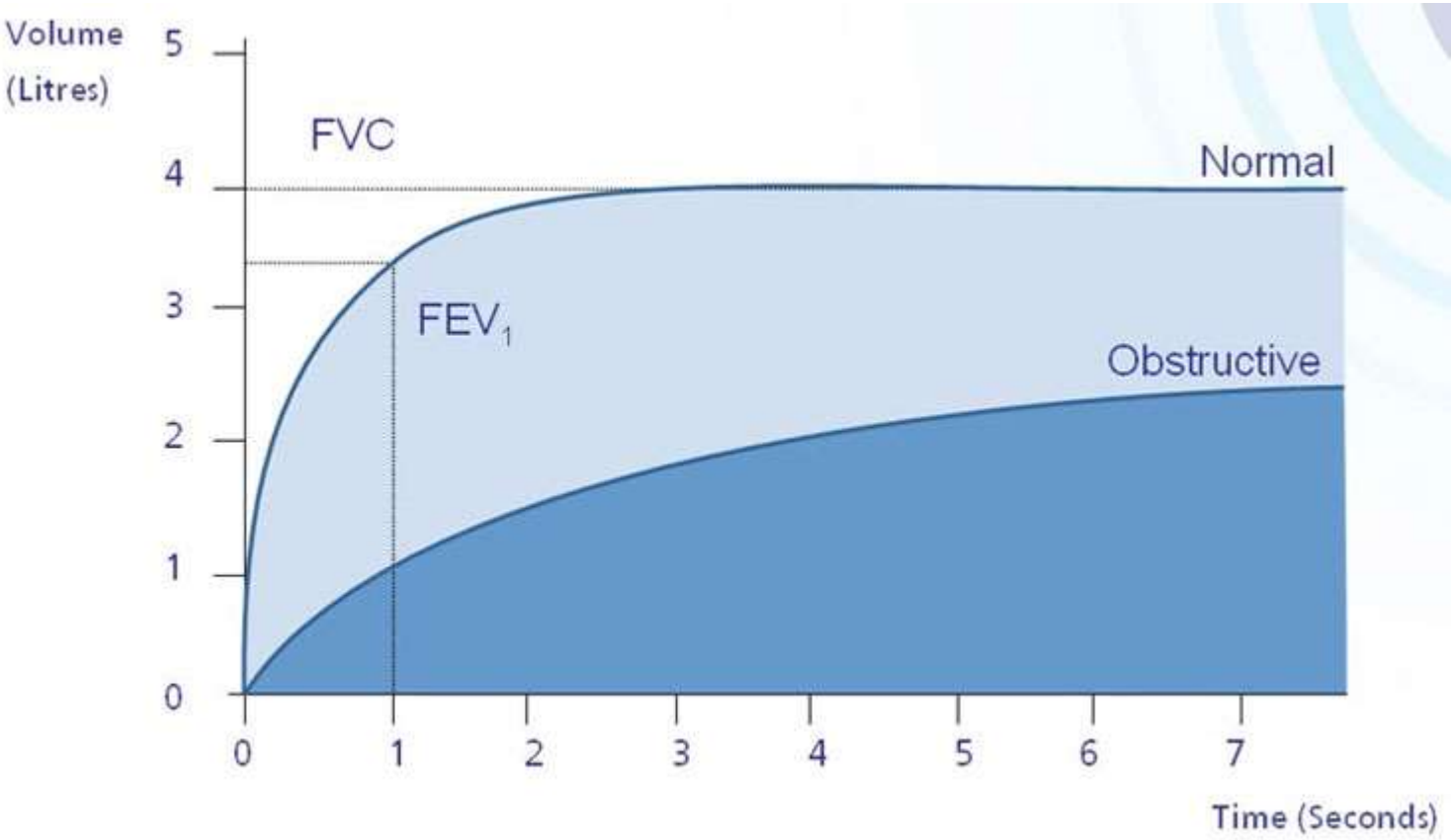
Instrumental methods for evaluating of the patient status: spirometry



Incentive spirometry

http://patient.info/doctor/Respiratory-System-History-and-Exam. https://www.retailinvestor360.com/images/mnkd_spirometry.png

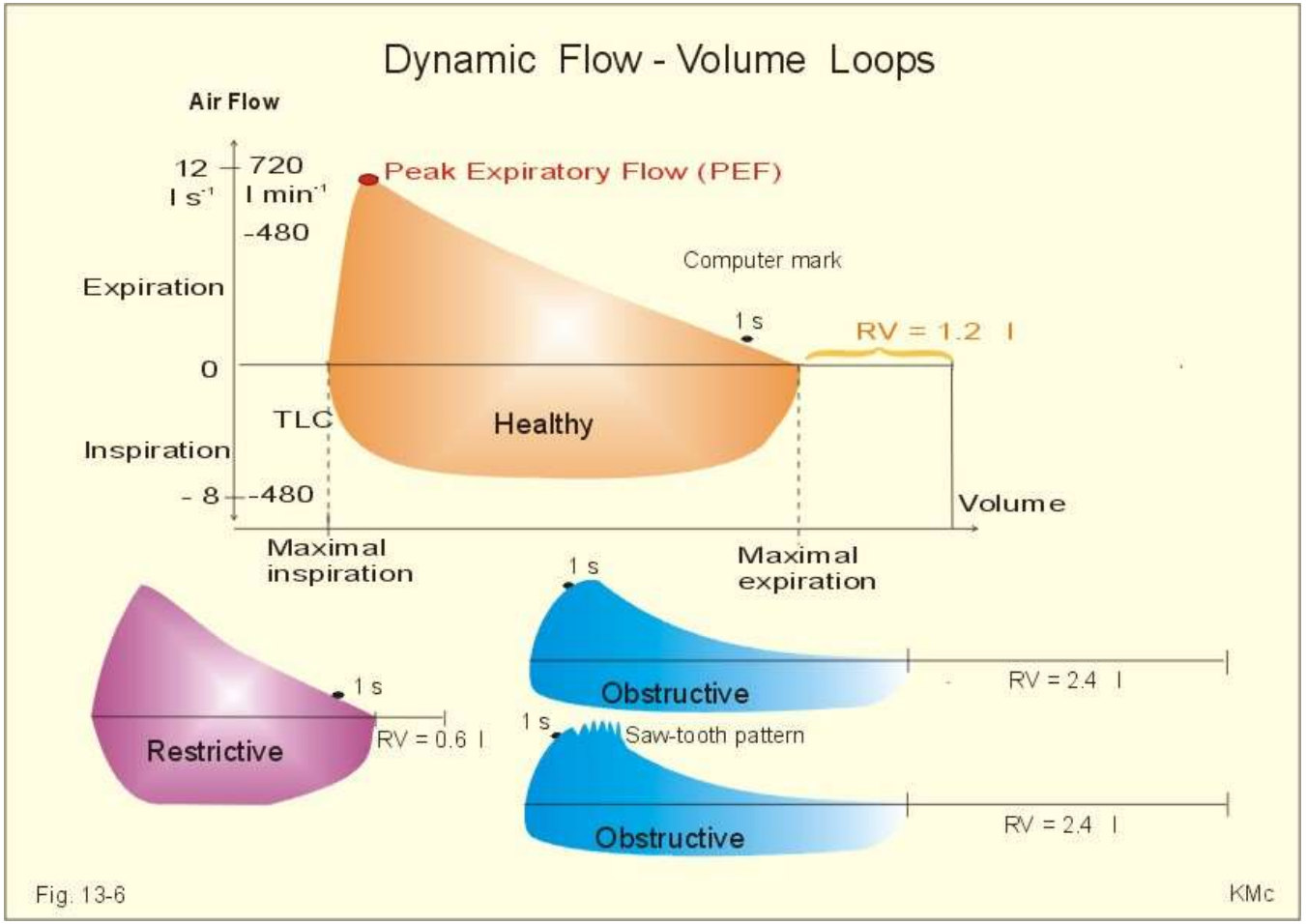
Instrumental methods for evaluating of the patient status: spirometry



The time volume curve

http://patient.info/doctor/Respiratory-System-History-and-Exam. https://www.retailinvestor360.com/images/mnkd_spirometry.png

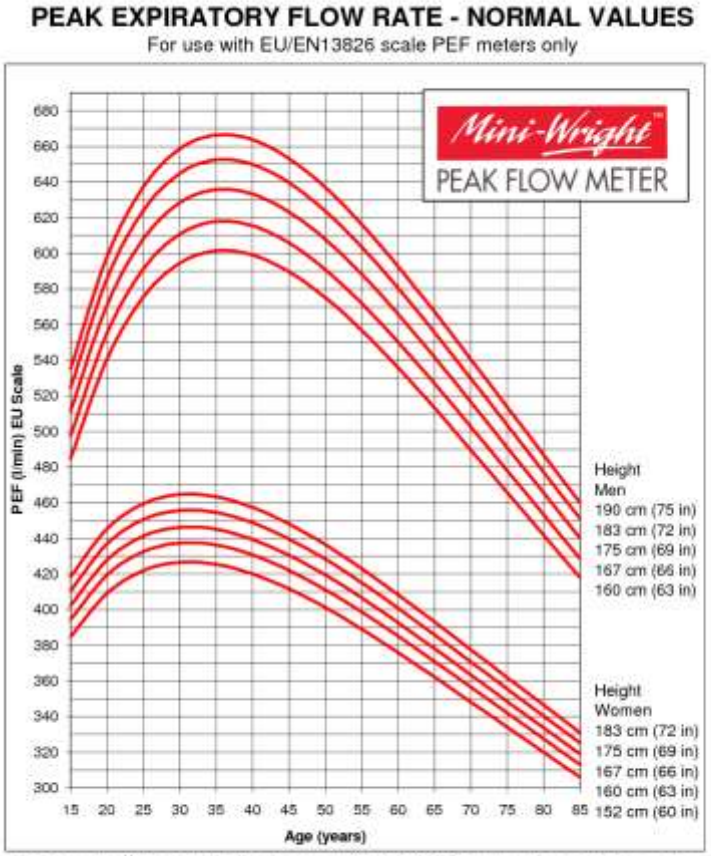
Instrumental methods for evaluating of the patient status: spirometry



Expiratory flow loop

http://patient.info/doctor/Respiratory-System-History-and-Examhttp://www.zuniv.net/physiology/book/images/13-6.jpg

Instrumental methods for evaluating of the patient status: peak expiratory flow



Adapted by Clement Clarke for use with EN13826 / EU scale peak flow meters
from Nunn AJ Gregg I, Br Med J 1989:298;1068-70

In men, readings up to 100 L/min lower than predicted are within normal limits. For women, the equivalent figure is 85 L/min. Values are derived from Caucasian populations.

Mini-Wright
(Standard Range)
EU scale
(EN 13826)

Blue text
on a yellow
background

Single Patient Use
Part Ref: 3103388

Multiple Patient Use
Part Ref: 3103387

NHS Logistics
Code : FDD 609

Mini-Wright
(Low Range)
EU scale

Blue text
on a yellow
background

Single Patient Use
Part Ref: 3104708

Multiple Patient Use
Part Ref: 3104710

Clement Clarke has developed mathematical equations that will allow conversion of P.E.F. readings from Wright-McKerrow scale to EN 13826 scale, and vice-versa. Contact us directly, or visit the website

www.peakflow.com

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Precision by Tradition

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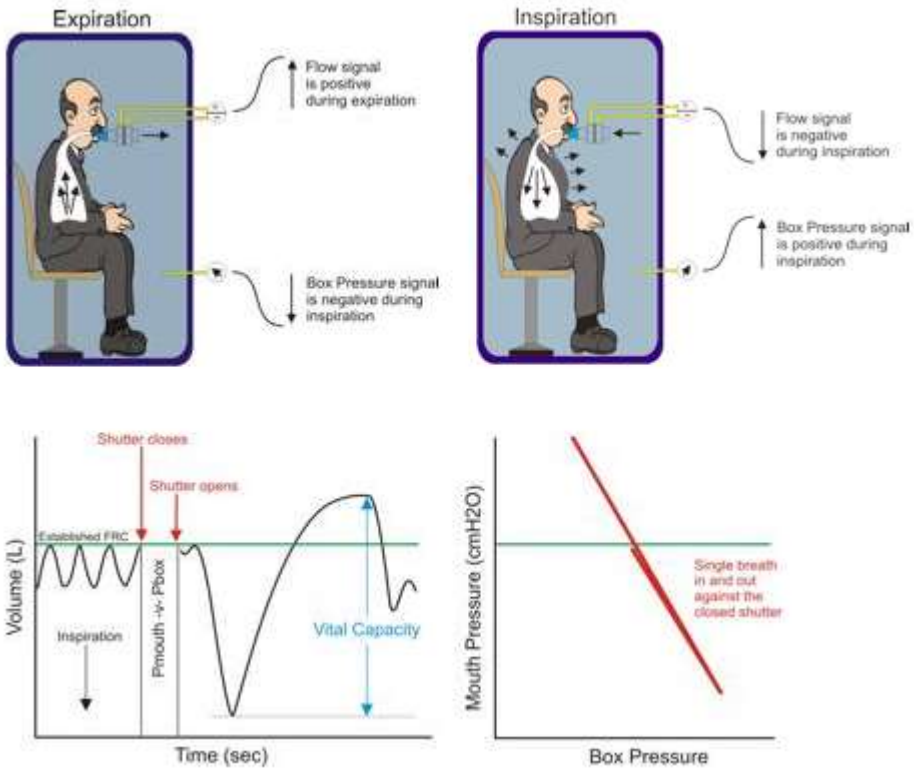
(Issue 1 Date of preparation: 23rd July 2004)

Peak flow monitoring is recommended in the diagnosis of asthma and exacerbations

http://patient.info/doctor/Respiratory-System-History-and-Exam.htm http://www.docstoc.com/docs/91602115/PEAK-EXPIRATORY-FLOW-RATE---NORMAL-VALUES

Instrumental methods for evaluating of the patient status: body plethysmography

- The ultimate way to measure lung volumes is body plethysmography
- With this instrument, the volumes of the lungs are evaluated by pressure change
- Body plethysmography is the most accurate means available at this time to assess lung volumes because it is not limited by air trapping



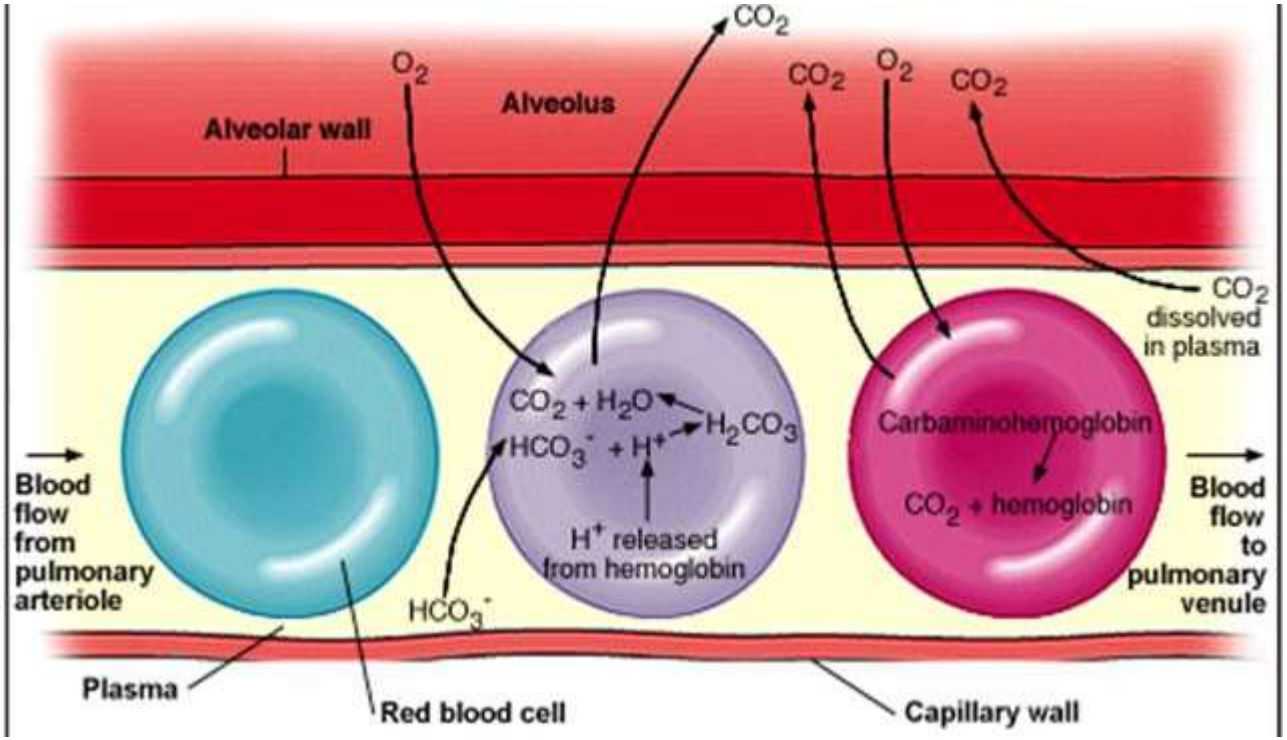
http://www.morgansci.com/pulmonary-function-solutions/what-is-a-test-pulmonary-function-test/

Instrumental methods for evaluating of the patient status: pulse oxymeter

A pulse oxymeter is a device that continuously measures heart rate and oxygen saturation as a dynamic extension of the cardiac and pulmonary examinations

http://patient.info/doctor/Respiratory-System-History-and-Exam.htm https://upload.wikimedia.org/wikipedia/commons/7/7d/Wrist-oximeter.jpg

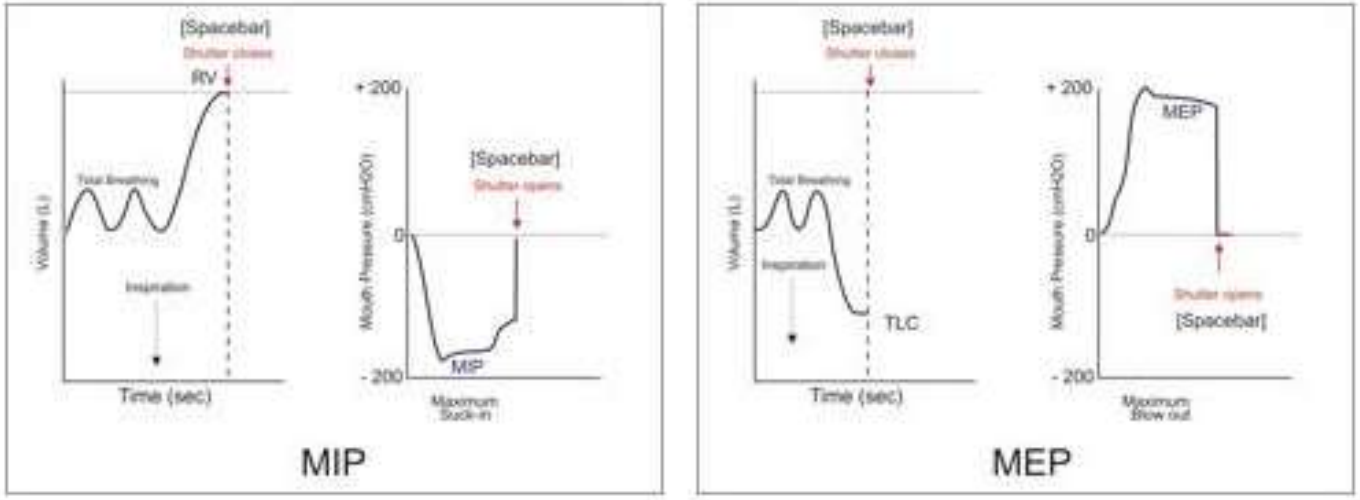
Instrumental methods for evaluating of the patient status: diffusing capacity of the lungs



- Diffusing capacity of the lungs measures the transfer of gas from air in the lungs, to the red blood cells in lung blood vessels
- It is part of a comprehensive series of tests to determine the overall ability of the lung to transport gas into and out of the blood

en.wikipedia.org/wiki/Diffusing_capacity intranet.tdmu.edu.ua/data/kafedra/internal/normal_phiz/classes_stud/en/nurse/Bacchaour%20of%20sciences%20in%20nurses/ADN/13_Ventilation_of_lungs.htm

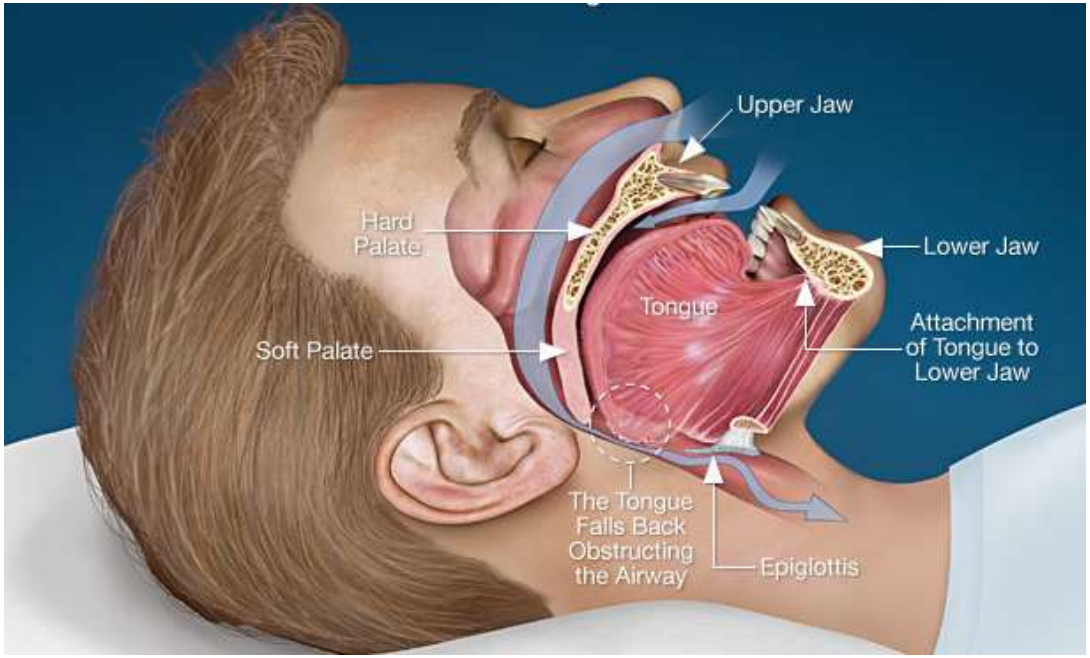
Instrumental methods for evaluating of the patient status: respiratory muscle strength



- Respiratory muscle function is commonly assessed by measuring maximal pressures generated at the mouth during maximal inspiratory and expiratory efforts against an occluded airway
- The test is often called MIP/MEP - maximum inspiratory and expiratory pressure

http://www.morgansci.com/site/assets/files/2083/mip_mep.png

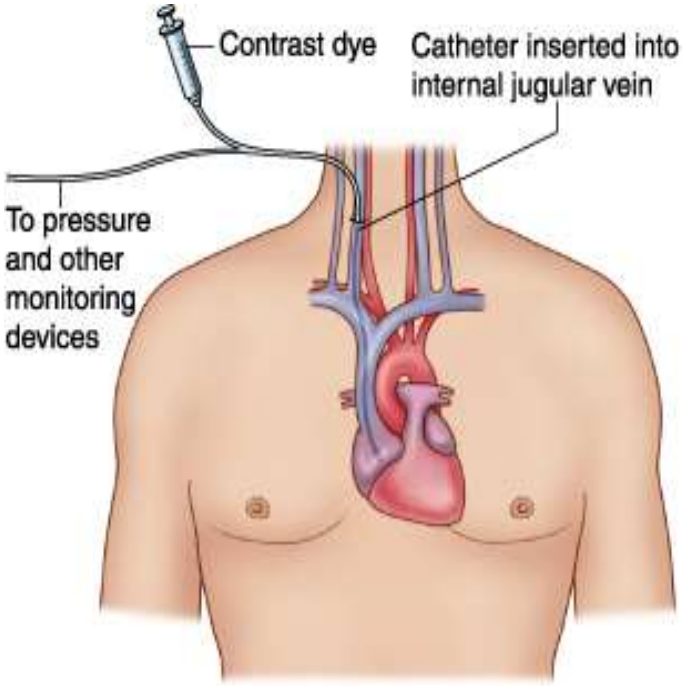
Instrumental methods for evaluating of the patient status: obstructive sleep apnea

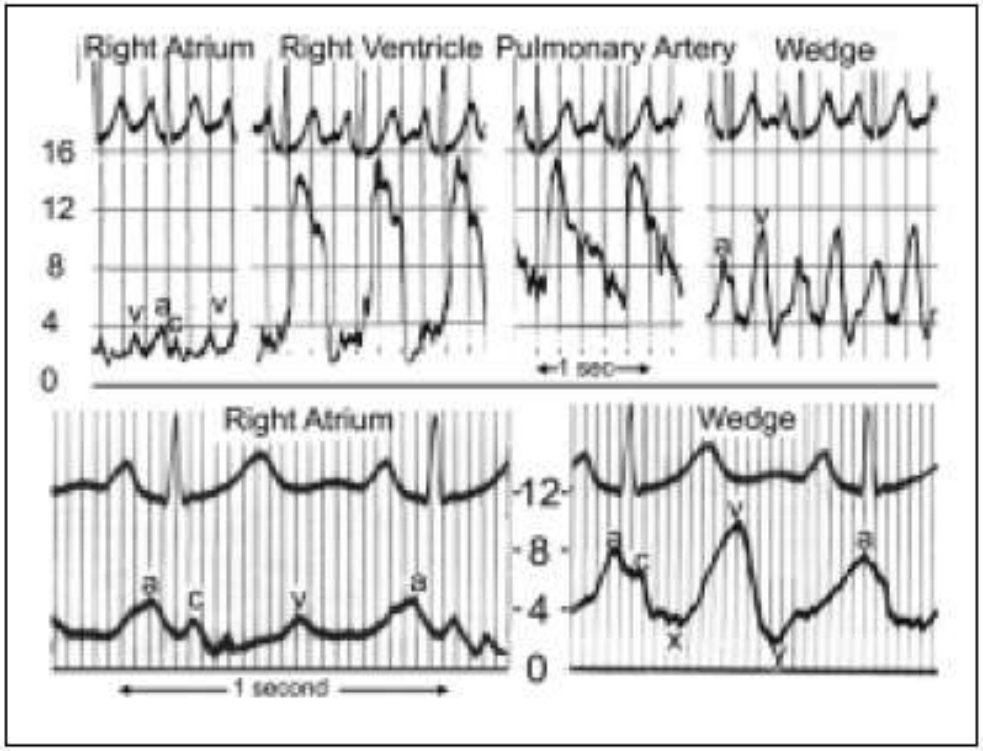


- Obstructive sleep apnea is a sleep disorder characterized by pauses in breathing or instances of shallow or infrequent breathing during sleep
- Each pause in breathing (an apnea) can last to several minutes, and may occur at least 5 times in an hour

https://en.wikipedia.org/wiki/Sleep_apnea http://www.deardoctor.com/images/ddwc/features/sleep-disorders/obstructive-sleep-apnea.jpg

Instrumental methods for evaluating of the patient status: right heart catheterisation





Right heart catheterisation is used in the differential diagnosis of pulmonary hypertension

erswhitebook.org/chapters/principles-of-respiratory-investigation/ phaonlineuniv.org/Journal/Article.cfm?ItemNumber=1736 mdguidelines.com/images/Illustrations/car_cath.jpg

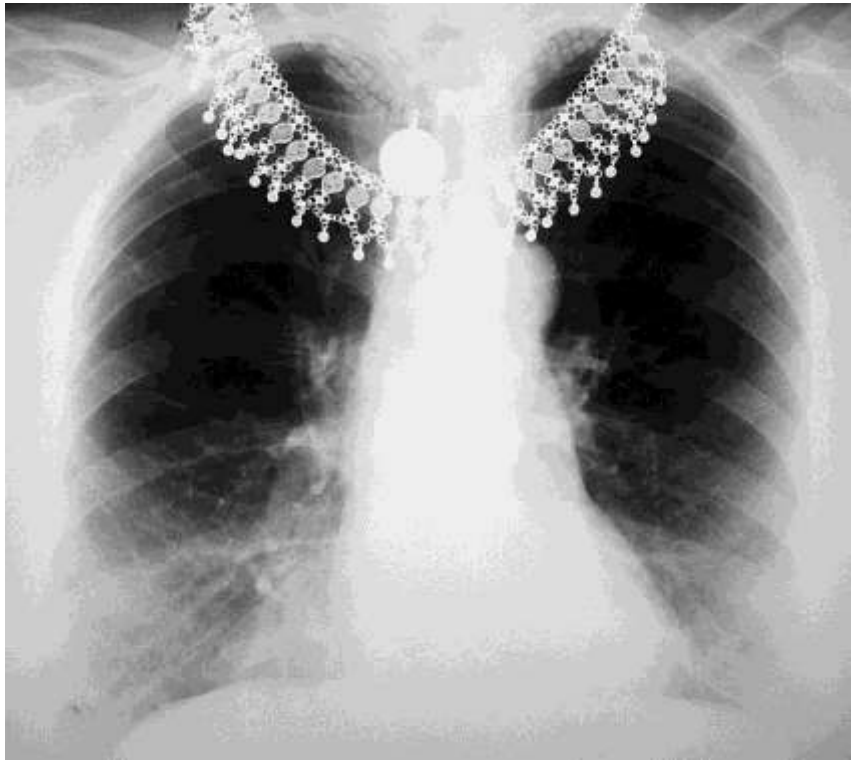
Instrumental methods for evaluating of the patient status: intensive care monitoring

The measurement of special parameters (*e.g.* tidal volume, inspiratory and expiratory pressures) in mechanically ventilated patients

erswhitebook.org/chapters/principles-of-respiratory-investigation/ https://res.cloudinary.com/healthmanagement-org/image/upload/v1429761765/cw/00101668_cw_image.png

Instrumental methods for evaluating of the patient status: chest (x-ray) radiography

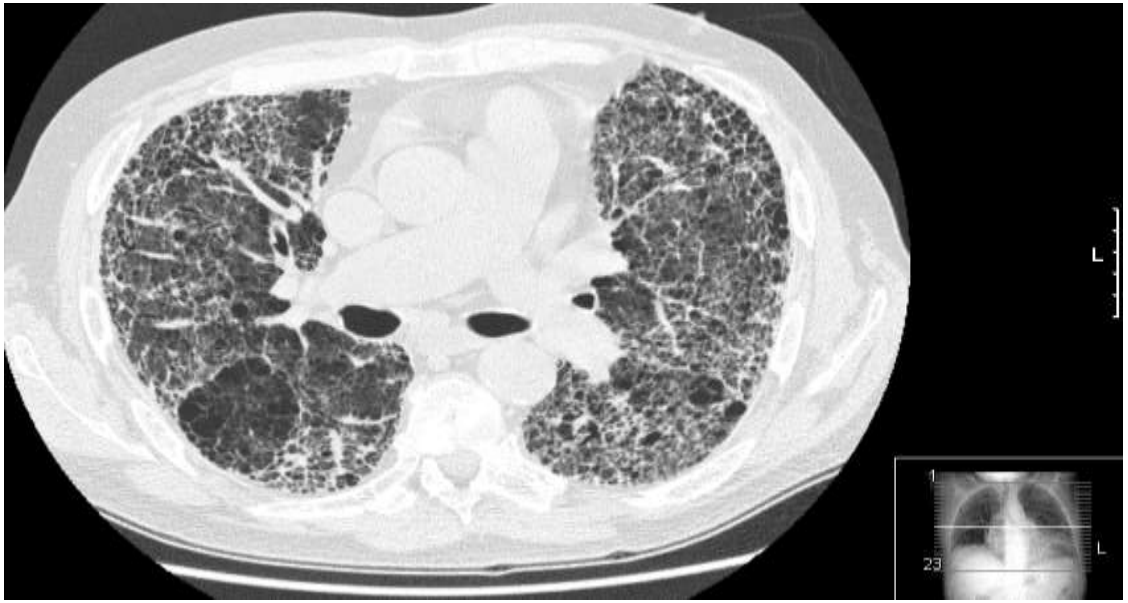
- The chest x-ray is the most commonly performed noninvasive medical test that helps physicians diagnose and treat medical condition
- A chest x-ray produces images of the heart, lungs, airways, blood vessels and the bones of the spine and chest
-



Increased opacity in R paracardiac space

http://www.radiologyinfo.org/en/info.cfm?pg=chestrad

Instrumental methods for evaluating of the patient status: chest computed tomography

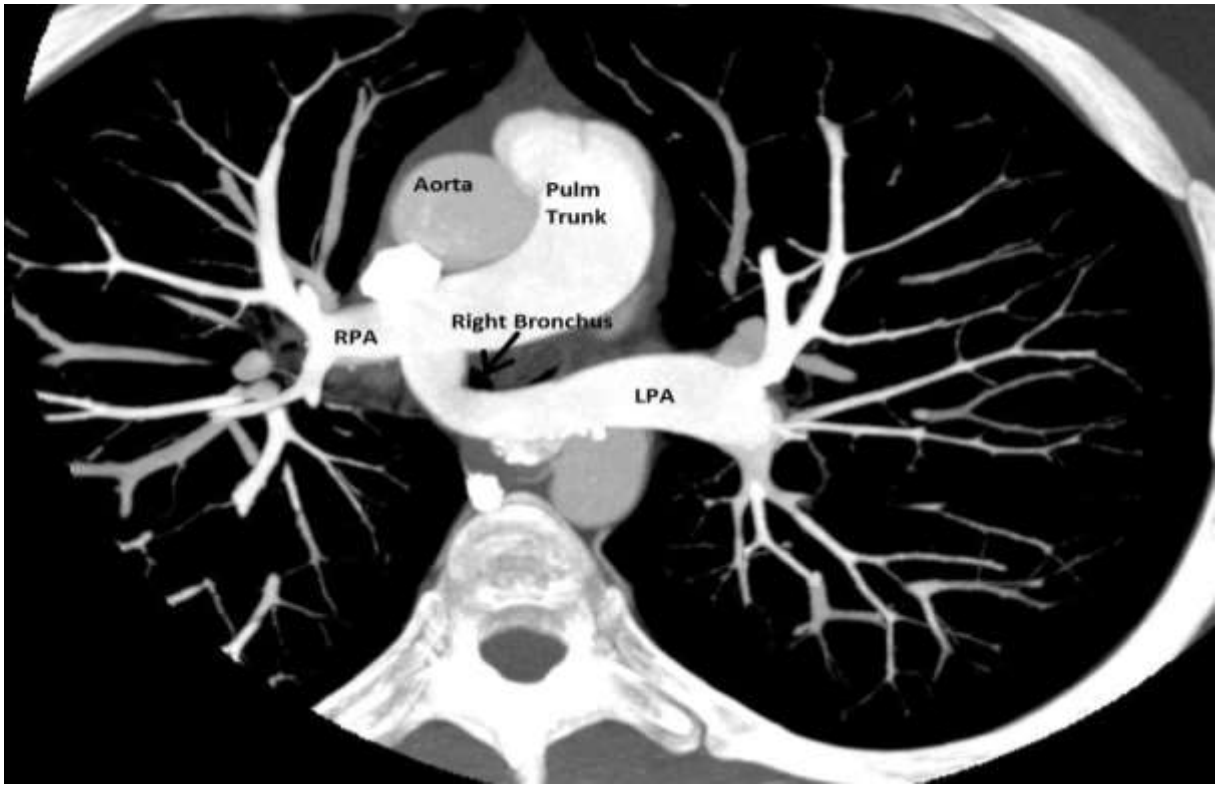


Pulmonary fibrosis

- Computed tomography (CT) of the chest is performed (in suspected pulmonary embolism cases, for example)
- CT is helpful for guiding needle aspiration of peripheral lung lesions
- High-resolution CT has improved the diagnosis of diffuse interstitial lung disease considerably

http://www.radiologyinfo.org/en/info.cfm?pg=chestrad https://upload.wikimedia.org/wikipedia/commons/8/81/Pulmon_fibrosis.PNG

Instrumental methods for evaluating of the patient status: pulmonary and bronchial angiography



Pulmonary and bronchial angiography are invasive techniques for imaging vessels and are used if less invasive techniques fail or need to be confirmed

http://www.radiologyinfo.org/en/info.cfm?pg=chestrad http://www.aocr.org/associations/12322/files/CRMaliel1.jpg

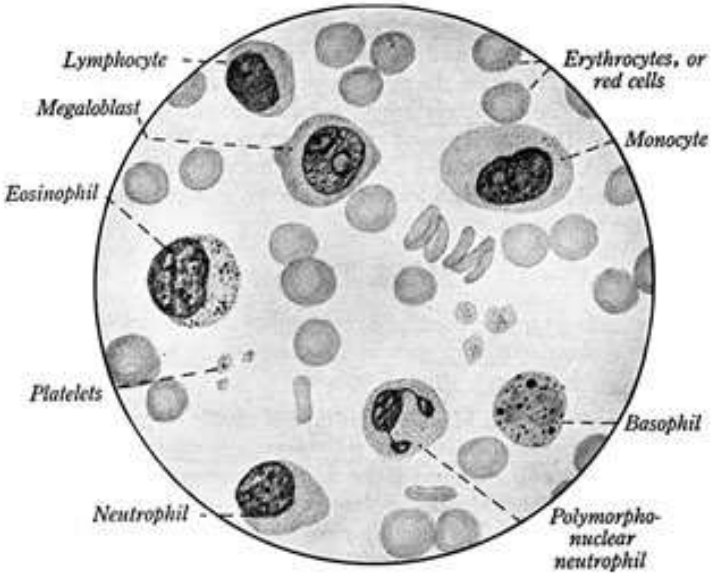
Instrumental methods for evaluating of the patient status: bronchoscopy

The procedure not only allows inspection and sampling of the airways, but also facilitates transbronchial lung biopsy

http://www.radiologyinfo.org/en/info.cfm?pg=chestrad http://http://www.mspulmonary.com/sites/247/uploaded/images/fob.jpg

laboratory methods for evaluating of the patient status: blood tests

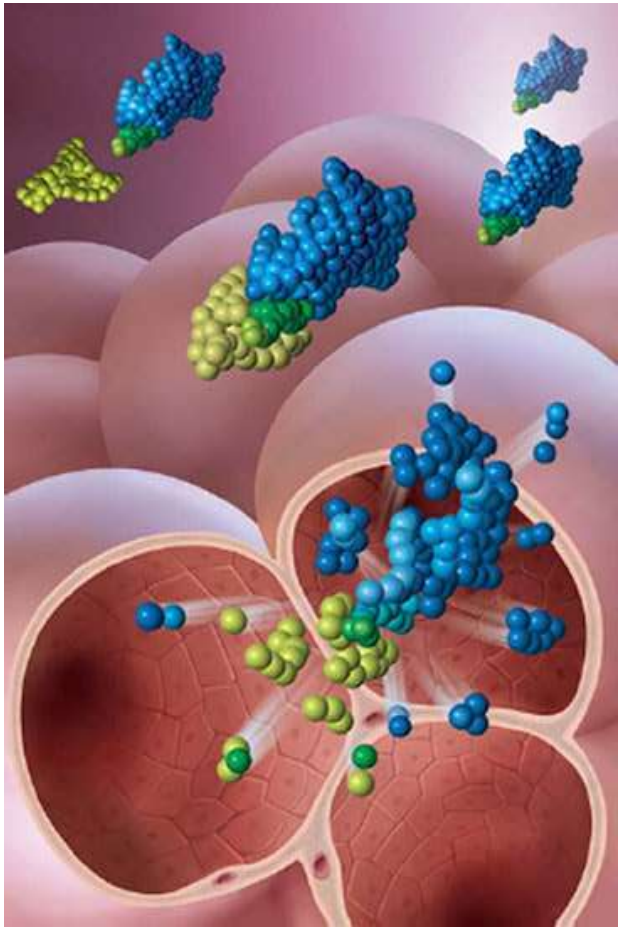
- A complete blood count
- Basic chemistry profile
- Serum electrolytes
- C-reactive protein level
- Alpha-1 antitrypsin (AAT) test



https://en.wikipedia.org/wiki/Pneumonia#Microbiology http://www.rnceus.com/cbc/images/cells.jpg

laboratory methods for evaluating of the patient status: alpha-1 antitrypsin (AAT) test

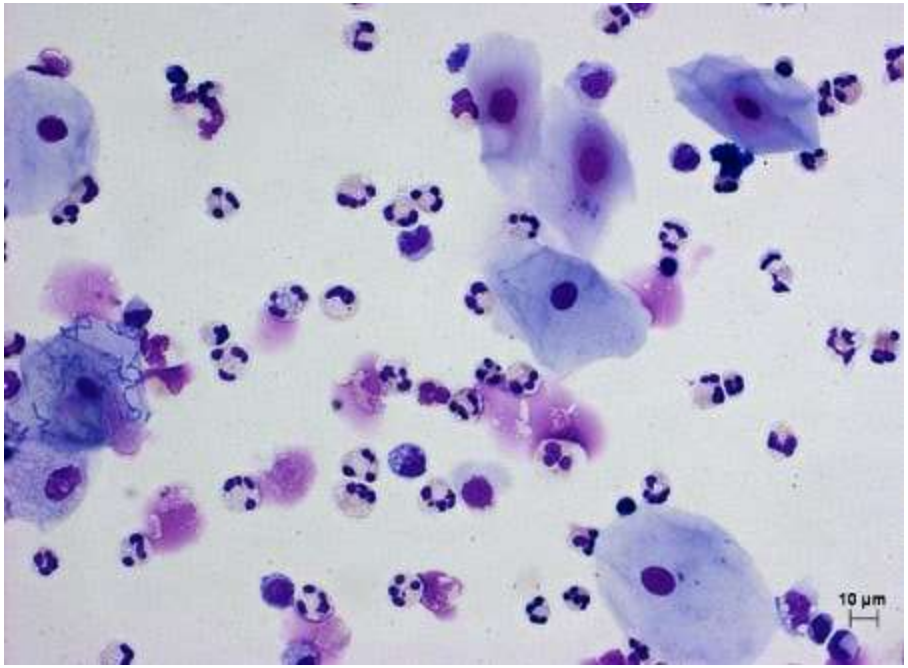
- People whose bodies do not produce enough of AAT (AAT deficiency) are more likely to develop emphysema and to do so at a younger-than-normal age (30 to 40 years old)
- AAT deficiency is a rare disorder and is the only known genetic factor that increases risk of developing COPD



http://www.prolastin.com/images/aatPromo2.jpg

laboratory methods for evaluating of the patient status: sputum analysis

- Sputum often consists of bacteria, cellular fragments, blood, and pus
- A sample of sputum can give useful information for screening or diagnosing bacterial infections, non infectious, noncancerous and cancerous conditions in the respiratory system



Cells in sputum

healthline.com/health/sputum-culture#Overview1

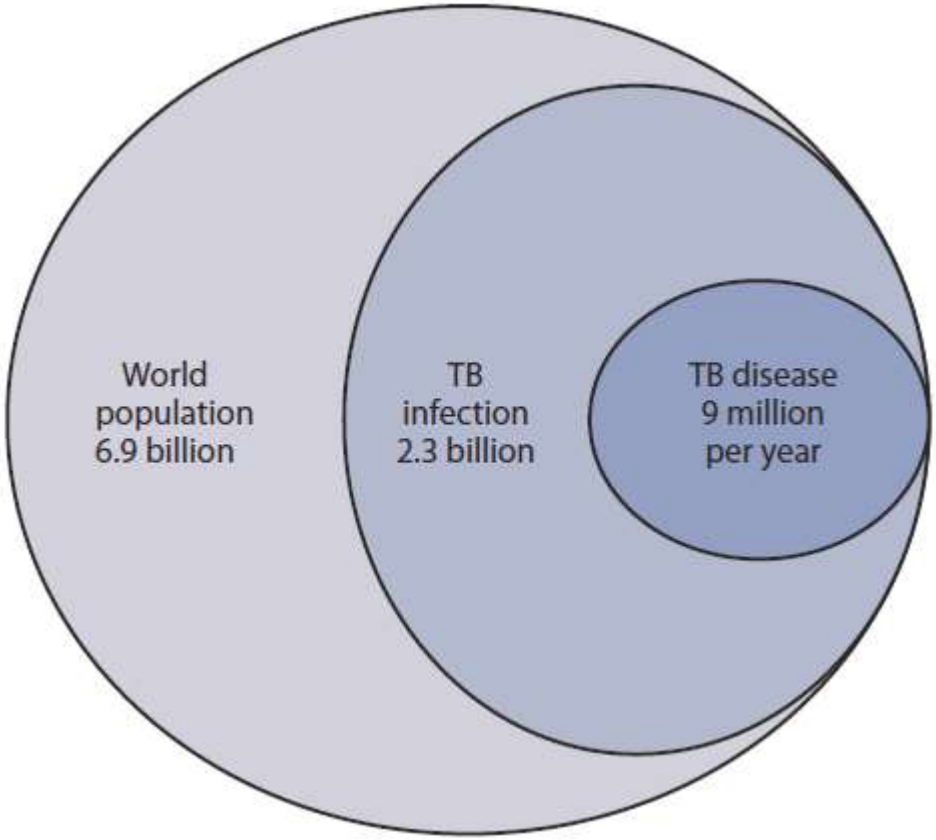
item.fraunhofer.de/content/dam/item/en/New%20images/Image_galleries/Sputummethodology/Neutrophilic%20inflammation%20in%20sputum%20after%20LPS%20challenge-L.jpg

laboratory methods for evaluating of the patient status: microbiology

- For people that do not respond to treatment, sputum culture should be considered, and culture for *Mycobacterium tuberculosis* should be carried out in persons with a chronic productive cough
- Testing for other specific organisms may be recommended during outbreaks, for public health reasons
- In those hospitalized for severe disease, both sputum and blood cultures are recommended, as well as testing the urine for antigens to *Legionella* and *Streptococcus*
- Viral infections can be confirmed via detection of either the virus or its antigens with culture or polymerase chain reaction (PCR), among other techniques
- The causative agent is determined in only 15% of cases with routine microbiological tests

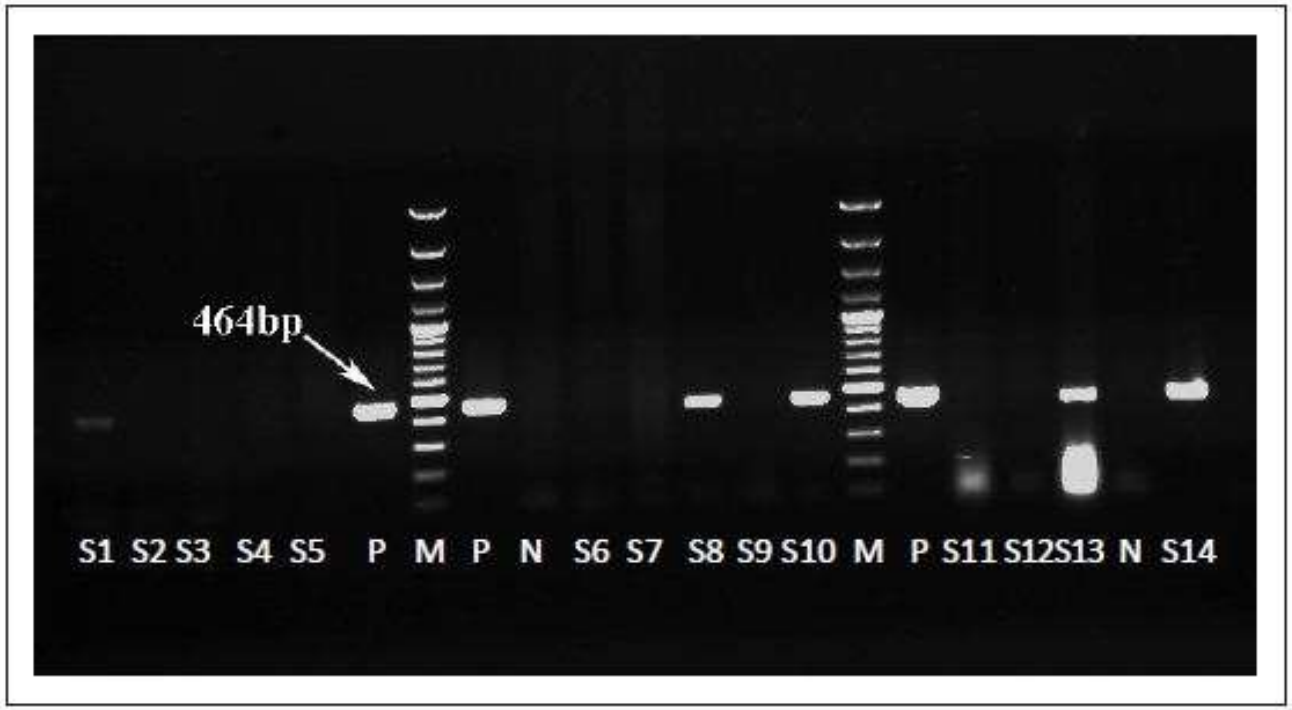
https://en.wikipedia.org/wiki/Pneumonia#Microbiology

laboratory methods for evaluating of the patient status: *Mycobacterium tuberculosis*



http://dailyprepper.com/wp-content/uploads/2015/02/mycobacterium_tuberculosis_bacteria_the_cause_of_tb.jpg http://www.cdc.gov/mmwr/preview/mmwrhtml/figures%5Cm6126a3f1.gif

laboratory methods for evaluating of the patient status: polymerase chain reaction



M, Marker 100 bp, N, Negative control, P, Positive control.
S1 and S8, trachea; S2 and S9, lungs; S3 and S10, caecal tonsils; S4 and S11, kidney; S5 and S12, spleen; S13, bursa of Fabricius; S6, thymus; S7 and S14, cloaca.

Detection of infectious bronchitis virus by Reverse transcription polymerase chain reaction in different tissue samples

en.wikipedia.org/wiki/Pneumonia#Microbiology jsava.co.za/index.php/jsava/article/viewFile/970/1184/3803

Glossary of Patients Examination with Diseases of the Respiratory System’ terms

Respiratory system terms