Diagnostic methods in pneumology

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History of disease

- Chief complaints
- Comorbidities
- Past history
- Risk factors
- Family history
- Social status
- Occupational history
Some tips for taking history of disease

- Find the border pieces and then fill in
- The negative answer is also giving important information
- Listen to the patient, the diagnosis is often in his words
- Carefully lead the conversation
Major pulmonary symptoms

- Cough
- Sputum production
- Hemoptysis
- Dyspnea
- Chest pain
- “Wheezing”
DETAILS about every symptom!!!

- Cough - time of day, productive or non productive, duration, exacerbating factors, etc.

- Sputum production: volume, smell, color, etc.

- Chest pain: sharp, gets worse when you breathe in and out, onset, etc.
Other important complaints (general, non respiratory, etc.)

- fatigue, loss of appetite, weight loss, temperature, profuse sweating

- myalgia, arthralgia, headache, sore throat, rhinitis, swelling of the ankles, etc.
Comorbidities

- Other known diseases - diabetes mellitus, heart failure, resent operation, transplantations, immunologic disorder, HIV status, neoplastic disease
- Symptoms suggesting involvement of other system
- Treatment for comorbidities
Past history

• Respiratory diseases in childhood
• Recurrent diseases
• Previous treatment - immunosuppressive drugs, radiotherapy, antibiotics, hormones, operations, etc.
Risk factors

• Smoking – pack years !!!
  • multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked. For example, 10 pack years are equal to smoking 1 pack per day for 10 years, or 2 packs per day for 5 years, or half a pack for 20 years.

• Alcoholism

• Drug abuse
Family history

• Allergy
• Contagious diseases (Tuberculosis!!!)
• Genetic diseases, etc.
Social status

- Poverty - malnutrition, living in a crowded and poorly ventilated place
- Prison
- Nursing home and other social institutions
- Military boarding house, campus, etc.
Occupational history

• Toxic gases, fumes, air pollution, etc.
• Radiation
• Infections
• Animals, birds, cattle, etc.
Physical examination

• Inspection
• Palpation
• Percussion
• Auscultation
• https://meded.ucsd.edu/clinicalmed/lung.htm

• **A Practical Guide to Clinical Medicine**

• Jan Thompson, Program Representative, UCSD School of Medicine.

• Charlie Goldberg, M.D., UCSD School of Medicine and VA Medical Center, San Diego
Inspection

- Body features and symmetry appearance
- Nutritional state or weight
- Skin color (in particular around the lips and nail beds)
- General comfort and breathing pattern of the patient, respiratory rate
- Use of accessory muscles of breathing (e.g. scalenes, sternocleidomastoids)—their use signifies some element of respiratory difficulty
Chest or spine deformities - as a result of chronic lung disease (e.g. emphysema), congenitally, or otherwise acquired (e.g. Pectus Carinatum, Pectus Excavatum, Kyphosis, Gibbus, Lordosis, Scoliosis)
Patient’s position:

Those with extreme pulmonary dysfunction will often sit up-right. In cases of real distress, they will lean forward, resting their hands on their knees - the tri-pod position.
• Breathing through pursed lips - often seen in cases of emphysema.

• Ability to speak - unable to speak in complete sentences (the fewer words per breath, the worse the problem).
• Audible noises associated with breathing, i.e. wheezing or gurgling caused by secretions in large airways, are audible to the "naked" ear
Exemples d'images de patients DPOC
a) “blue bloater” par “pink puffer”
1. Barrel chest: associated with emphysema and lung hyperinflation
2. Kyphosis
Palpation:

• Chest excursions
Tactile Fremitus ((L. fremere, to murmur) - A palpable vibration. (99, 33)

- Lung consolidation: (most commonly in the setting of pneumonia) - fremitus becomes more pronounced
- Pleural fluid or pneumothorax - diminished
diminished

more pronounced
Percussion

- striking a surface which covers an air-filled structure (e.g. normal lung) will produce a **resonant note**
- If the normal, air-filled tissue has been displaced by fluid (e.g. pleural effusion) or infiltrated with white cells and bacteria (e.g. pneumonia), percussion will generate a **dull sound**
- processes that lead to chronic (e.g. emphysema) or acute (e.g. pneumothorax) air trapping in the lung or pleural space, respectively produce **hyper-resonant** (i.e. more drum-like) notes on percussion
Fig. 4.16  Technique of percussion.
Comparative percussion of the chest
Percussion of the Chest
(Stanford Medicine 25)
Auscultation
Instruct the patient to breathe with his mouth open, a little deeper and faster. Demonstrate it to the patient yourself.
• https://www.easyauscultation.com/lung-sounds

• Diane Wrigley
• Physician Assistant and national educator for continuing education
MANEUVERS FOR AUSCULTATION OF THE CHEST

- **Forced Expiratory Time (FET).** Duration of time it takes a patient to blow out air as quickly as they are able, from a full breath (total lung capacity) until air flow stops. The prolongation of FET (LONGER THAN 4 SECONDS) correlates very well with the severity of obstruction as in chronic bronchitis or asthma.

- **Whispered Pectoriloquy** – high pitched, intensified speech heard over area of consolidation when the patient is asked to whisper low pitched words.

- **Bronchophony** – a change in the pitch of spoken word over an area of consolidation (99, 33).

- **Egophony** – The sound of a spoken “E” changes to “A” over an area of consolidation.
Physical examination of other systems

Sometimes the lung problem is a result of a primary disease in another system!

• Heart rhythm, murmurs, swellings, ascites, enlarged liver, enlarged lymph nodes (especially supraclavicular area)
• Local status - urological, gynecological, etc.
Imaging methods

X-ray imaging: TV-scopy, chest radiograph/ chest X-ray (CXR), Classic Tomography, Computed tomography (CT), etc.

Ultrasound imaging

Radioisotopes (scintigraphy)

Nuclear Magnetic Resonance Imaging (MRI)

Pozitron Emmision Tomography (PET)

Pulmonary angiography
Spirometry (measuring of breath) is the most common of the Pulmonary Function Tests (PFTs), measuring lung function, specifically the measurement of the amount (volume) and/or speed (flow) of air that can be inhaled and exhaled.

- **Forced Vital Capacity (FVC)** - the volume of air that can forcibly be blown out after full inspiration, measured in liters.

- **Forced Expiratory Volume in 1 second (FEV1)** - Average values for FEV1 in healthy people depend mainly on sex and age. Values of between 80% and 120% of the average value is considered normal.

- **FEV1/FVC ratio (FEV1%)**

- **Peak Expiratory Flow (PEF)** - the maximal flow (or speed) achieved during the maximally forced expiration initiated at full inspiration, measured in liters per minute.

- **Diffusion capacity (DLCO)**
A modern PC based spirometer printout
Spirometry measures how fast and how much air you breathe out.
Body plethysmography
Other functional tests

- Bronchodilator test - COPD, bronchial asthma
- Bronchoprovocation test (methacholine challenge test) - bronchial asthma
- Monitoring PEF - bronchial asthma
Laboratory methods

- **Clinical laboratory** - Biochemical Methods: blood tests, enzyme tests, mineral content tests, glucose, urea, etc. - in blood plasma, in pleural effusion, ESR (erythrocyte sedimentation rate), CBC (complete blood count), CRP (C-reactive protein) etc.

- **Microbiology** - Gram staining, cultures - bacteria, fungi, viruses, radiometric test - Bactec

- **Immunology** - ELISA, complement fixation test, immune status, etc.

- **Cytology** - tumor cells in sputum, pleural effusion, bronchial secretion

- **Genetics** - cystic fibrosis
Invasive methods of diagnosis

- Bronchoscopy
- Percutaneous fine-needle biopsy
- Cutting-needle biopsy
- Video-assisted thoracoscopic surgery (VATS)
- Mediastinoscopy
- Open lung biopsy
- Biopsy of other sites
Bronchoscopy

- The bronchoscope is inserted into the airways, usually through the nose or mouth, or occasionally through a tracheostomy. This allows the practitioner to examine the patient's airways for abnormalities such as foreign bodies, bleeding, tumors, or inflammation. Specimens may be taken from inside the lungs.
• **Bronchial washing:** Saline is injected through the bronchoscope and subsequently aspirated from the airways.

• **Bronchial brushing:** A brush is advanced through the bronchoscope and used to abrade suspicious lesions to obtain cells.

• **Bronchial biopsy:** A forceps is used to take some small sample from a lesion in the bronchial wall.

• **Bronchoalveolar lavage:** 50 to 200 mL of sterile saline is infused into the distal bronchoalveolar tree and subsequently suctioned out, retrieving cells, protein, and microorganisms located at the alveolar level.

• **Transbronchial biopsy:** Forceps are advanced through the bronchoscope and airway to obtain samples from one or more sites in the lung parenchyma.

• **Transbronchial needle aspiration:** A retractable needle is inserted through the bronchoscope and can be used to sample enlarged mediastinal lymph nodes or masses.
Percutaneous fine-needle biopsy
Video-assisted thoracoscopic surgery (VATS) a type of thoracic surgery performed using a small video camera that is introduced into the patient's chest via a scope.
Other methods

- Blood gas analysis - arterial blood gas (ABG), venous blood gas
- Pulse oximetry - SO$_2$
- ECG – cor pulmonale
- Echocardiography- pulmonary hypertension, cor pulmonale
- Skin tests for allergy - A small amount of a suspected allergen is placed on or below the skin to see if a reaction develops.
  - Skin prick test - placing a drop of a solution containing a possible allergen on the skin, and a series of scratches or needle pricks allows the solution to enter the skin
  - Intradermal test - a small amount of the allergen solution is injected into the skin
  - Skin patch test - the allergen solution is placed on a pad that is taped to the skin for 24 to 72 hours.