

# Examination of respiratory system in children

This article has been translated from WikiSkripta; ready for the **editor's review**.

Respiratory diseases are the most common cause of illness in children of all ages. Their clinical picture changes depending on age - the younger the child, the greater the risk of developing airway obstruction and dyspnea, and the more the overall condition alters.<sup>[1]</sup>

## Examination of the respiratory system in children:

1. anamnesis
2. physical exam
3. laboratory examination
4. imaging methods
5. functional examination of respiration

## Physical examination

### Inspection

We evaluate the respiratory pattern and its changes: dyspnoea, tachypnoea, apnea, hyperpnea, bradypnea, Cheyne-Stokes respiration, Biot respiration, Kussmal respiration, ...

#### Dyspnea (labored, difficult breathing)

- subj.: feeling of shortness of breath or lack of air
- obj.: tachypnoea, allar deflection, invasion or retraction of the jugular socket, increased effort of respiratory muscles, orthopedic position
- dyspnea in inspiration → disease upper respiratory tract
- dyspnea in expiration → disease lower respiratory tract
- dyspnea in both inspiration and expiration → disease tracheal

#### Restrictive lung disease (eg pulmonary fibrosis)

- the reduced tidal volume is compensated by the increased tidal frequency
- the expiratory / inspirational ratio is shortened

#### Obstructive lung disease (eg bronchial asthma)

- reduced respiratory rate is compensated by deepening tidal volume
- the expiration / inspiration ratio is extended

We also evaluate skin color (peripheral or central cyanosis – the level of reduced hemoglobin above 50 g/l<sup>[1]</sup>), we notice signs of long-term tissue hypoxia (clubbed fingers), chest shape (asthenic, hypersthenic or pycnic, pectus carinatum, pectus excavatum) and facial expression (facies adenoidea).

### Palpation

- assessment of chest tremor (fremitus pectoralis) and bronchophony – only in order children and adolescents
- subcutaneous cracking – in in subcutaneous emphysema (mostly on the neck)
- palpation examination of the cervical (axillary, subclavian) lymph nodes

### Percussion

- not performed on newborns and infants!!!
- over the healthy lungs the tap is *full, clear*
- percussion is *hollow* or *shortened* above the airless lungs (atelectasia, pneumonia), výpotkem a nad svaly
- percussion is *muffled* or *darkened* over the organs (heart, liver) and over fibrotic lung tissue
- *tympanic* percussion is above the intestines, stomach and pneumothorax
- *Percussive, hypersonoric* or *box* percussion is above emphysema and pneumothorax

### Auscultation

- **distance phenomena** (sounds audible even from a distance, without a stethoscope): stridor (wheezing), cough, voice assessment
- STRIDOR
  - inspiratory stridor – caused by narrowing of the upper respiratory tract (obstructive laryngitis, epiglottitis, retropharyngeal abscess)
  - expiratory stridor – caused by narrowing of the lower respiratory tract (foreign body, acute bronchitis,

- bronchial asthma)
  - inspirational-expirational stridor – tracheomalacia (oppression of the trachea by an abnormal vessel)
- cough
  - dry (bez expectorace) x wet (with expectoration)
  - permanent x seizure
- VOICE ASSESSMENT
  - hoarseness to aphonia (laryngitis)
  - veiled, glistening voice (epiglottitis)
- GRUNTING (moaning)
  - in immature neonates with respiratory distress syndrome
- **auscultation with a stethoscope**
- INHALE RATIO: EXHAUST
  - prolonged inhalation - obstruction of the upper respiratory tract
  - prolonged exhalation - obstruction of the lower respiratory tract
- RESPIRATION
  - *physiological*:
    - clean cellar - for children over 6 years<sup>[1]</sup>
    - „Puerile“ – in younger children
  - *pathological*:
    - sharpened breathing (effusion, adhesions, diffuse catarrh of the bronchi,...)
    - impaired respiration (pleural effusion, pneumothorax, atelectasis)
    - tubular breathing - exhalation noisier than inhalation (physiological above the trachea, pathological above the infiltrated lung tissue, abscesses, bronchiectasis)
  - *respiratory side effects*:
    - moist crackles - arise in the bronchi (bronchitis)
    - wheezing and crepitus - occur in the alveoli of the lungs (pneumonia)
    - wheezing and lower airway obstruction

## Laboratory examinations

- **microbiological examination** – swab from the throat, nose (not for processes in the lungs), coughed sputum (must be from DCD, small children can not cough it up), aspirated secretion from the upper respiratory tract, tracheal secretion, bronchial secretion taken during bronchoscopy, abscess puncture and pleural effusion
- **blood count, FW, CRP**
- **biochemical examination** – alpha1-antitrypsin (its deficiency leads to emphysema)
- **ABR, blood gases, transcutaneous pulse oximetry** – partial respiratory insufficiency (hypoxemia) or global (hypoxemia with hypercapnia)
- **immunological examination**
- **determination of the level of chlorides in sweat** – the concentration of chlorides in sweat above 60 mmol / l is present in cystic fibrosis
- **determination of nasal mucosal cell motility** – Kartagener's syndrome (KO: recurrent bronchitis)
- **serological examination**
- **molecular genetic examination** – cystic fibrosis (mutation F508), alpha1-antitrypsin deficiency (mutation PiZZ)
- **cytology** of bronchoalveolar lavage
- **lung tissue biopsy** – rare

## Imaging methods

- **bronchoscopy** – to determine anatomical and functional changes, to extract foreign body, often + alveolar lavage
- **X-ray, CT, NMR**
- **scintigraphy** – *inhalation* (radionuclide-labeled xenon or argon) to show ventilation and its distribution, *perfusion* (radionuclide-labeled albumin) to show lung perfusion
- **angiography - vascular anomalies**
- **24-hour esophageal pH-metry** – to evaluate gastroesophageal reflux
- **mediastinoscopy** + nodal biopsy

## Functional examination of respiration

- Standard lung function tests can be performed on cooperating children older than 6 years
- **spirometry** – to measure basic lung volumes and vital capacity, to dynamically measure expiratory rates and to describe obstructive pulmonary lesions (bronchial asthma)
- **whole-body plethysmography** – to examine ventilation mechanics, to describe lung restrictions (pulmonary fibrosis, emphysema)
- **PEF** (peak expiratory flow) – to monitor asthma

# Links

## Related articles

- **Examination of the child:** Examination of the child's cardiovascular system ■ Examination of the child's gastrointestinal system ■ Examination of the child's uropoietic system ■ Examination of the child's endocrine system ■ Examination of the child's musculoskeletal system ■ Examination of the child's skin and skin adnexa ■ Examination of the child's eyesight and hearing
- Congenital malformations of the respiratory system
- Functional examination of the cardiorespiratory system

## References

1. LEBL, Jan – PROVAZNÍK, Kamil – HEJCMANOVÁ, Ludmila, et al. *Preklinická pediatrie*. 2. edition. Praha : Galén, 2007. pp. 105-111. ISBN 978-80-7262-438-6.

## Literatura

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## Source

- ws:Vyšetření respiračního systému dítěte