PNEUMOLOGY for Dentistry

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INFANTS
- Metabolism↑
- Higher risk of apnoe
- Resistance of upper respiratory tract ↑

- Resistance of lower airways ↑

- Lung volume↓
- Efficacy of respiratory muscles ↓

- Respiratory muscle endurance ↓

REASONS
- Oxygen consumption↑
- Immaturity of the Respiratory Centre
- Nasal breathing
- Size of tongue
- Diameter of airways↓
- Colapsibility of airways↑
- Diameter of airways↓
- Compliance of airways ↑
- Lower lung elasticityc↓
- Number of alveols ↓
- Efficacy of diaphragm ↓ – horizontal insertion
- Compliance of ribcage ↑
- Horizontal position of the ribs
- Respiratory rate ↑
- Number of fatigue resistance muscle fibers↓
COUGH

- Symptom = not disease
- Reflex – irritation of tusigenic zones (airways, external ear, esophagus, pericardium)
- DRY (unproductive) x WET (productive)
- ACUTE x CHRONIC < 4 weeks
- CHRONIC COUGH in children
  1. Asthma bronchiale
  2. Gastroesophageal reflux – disease – GERD
  3. Postnasal drip syndrome
CYANOSIS

- = reduced hemoglobin above 50 g/l

- Central x peripheral

- Depends on concentration of hemoglobin:
  - Anemia = ↓ incidence of cyanosis
  - Polycythemia = ↑ incidence of cyanosis
CONGENITAL DISORDERS OF THE NOSE

- Nasal hypoplasia
- Arhinia
- Supernumerary teeth
- Congenital nasolacrimal duct obstruction
- Choanal atresia
- Congenital defects of the nasal septum
- Pyriform aperture stenosis
- Congenital midline nasal masses – dermoids, gliomas, encephaloceles
CHOANAL ATRESIA

- 1:7000
- Unilateral x bilateral
- Bony 90 % x membranous
- 50-70% association with other anomalies
- 10-20% → the CHARGE syndrome
  Coloboma Heart disease Atresia choanae Retarded growth Genital anomalies Ear anomalies
- Clin. manif. – variable, cyanosis relieved by crying pláčem x during sucking
- Dg – catheter, fiberoptic rhinoscopy, HRCT
- Therapy – intubation, oral airway
Congenital facial anomalies

- Mandibular hypoplasia (Pierre-Robin syndrome)
  - CAVE! inspiratory airway obstruction
    - Micrognatia, retrognatia
    - High arched or cleft palate
    - Glossoptosis – with foreshortened floor of the mouth

- Cleft lip and palate

- High arched palate – common association with limited nasal breathing
CLEFT LIP and PALATE

- Typical – cleft lip, palate or cleft lip and palate
- Atypical – facial – oblique, medial, lateral
  - Incidence - 1:750 – 2500, boys > girls
  - Sporadically > possible association with 1 of 400 syndrome
- Cleft unilateral x bilateral
- Manifestation variable from small notch in the uvula to complete separation
Congenital anomalies of the Larynx

- Pharyngeal x Laryngeal obstruction
  obstruction worse during sleep worse with activity

- Manifestation – *inspiratory stridor*:
  1. **Laryngomalacia** – inspiratory stridor worse during crying or activity (feeding)
     usually appear within first 2 weeks
     15-60 % synchronous airways anomalies – complete bronchscopy in case of moderate to severe obstruction
     common gradual improvement
  2. **Congenital subglottic stenosis**
     – recurrent or persistent croup
     - usually cartilaginous
**Congenital anomalies of the Larynx**

**Vocal Cord Paralysis**
- Unilateral – aspiration, coughing and choking, wek and breathy crying
- Bilateral – airway obstruction - stridor

**Congenital laryngeal web** – glottic with subglottic extension = subglottic stenosis

**Congenital subglottic hemangioma** – hoarseness, stridor, barking cough

**Posterior laryngeal cleft** – symptoms of aspiration
- laryngotracheoesophageal cleft
Congenital tracheal and bronchial anomalies

- Vascular and cardiac anomalies:
  - *Vascular ring or sling* = coughing, *stridor*, dyspnoea
- Tracheal stenoses, webs and atresia
- Tracheomalacia
1:3500, common assoc. with esophageal atresia
84 % trachea connected with distal esophagus
50% syndromic, other anomalies (Charge sy...)

**Distal fistula**
- early after birth - frothing
- cough, cyanosis,
- stomach distension
- aspirations

**H- type fistula 4 %**
- later onset
- chronic respiratory problems (bronchospasms, pneumonias)
- respiratory symptoms during feeding
- recurrent pneumonia
Congenital disorders of the lung

- Pulmonary agenesis \( \times \) pulmonary aplasia
- Unilateral \( \times \) left \( \times \) right
- Pulmonary hypoplasia – limited space in thorax – limited breathing movements and/or \( \downarrow \) pressure of amniotic fluid
  - Cystic adenomatoid malformation
  - Diaphragmatic hernia
  - Oligohydramnion – maternal disease, congenital renal anomaly
  - Congenital neuromuscular disease
  - Lower number of alveoli and airway generations
- Pulmonary sequestration – extrapulmonary or intrapulmonary
  - Lung tissue without connection with bronchus, arterial supply from the systemic arteries
  - Repeated infections, expansion
Congential disease of the lungs

- Congenital lobar emphysema – neonatal period – respiratory distress, congenital overdistension of affected lobe – shift of mediastinus, atelectasis of normal lung tissue
  - Immediative surgery x conservative treatment
- Cystic adenomatoid malformation – cystic dysplastic lung tissue of one lobe – different types with variable prognosis
  - Respiratory distress in early infancy
  - Recurrent pneumonia, pneumothorax
  - Surgery for symptomatic patients
CONGENITAL DIAPHRAGMATIC HERNIA

- 1:2000-1:5000
- Pulmonary hypoplasia, pulmonary hypertension
- Prenatal diagnosis
- Early respiratory distress of neonates
- Manifestation – weak breathing sounds, niveau of abdominal wall bellow – scaphoid abdomen, shift of heart sounds (mediastinum) bowel sounds in the chest

X-RAY
- transport in utero – specialized centrum
- Orotracheal intubation + ventilatory support
  - avoid resuscitation with ambuvac with mask
- Nasogastric tube - stomach air bubble
• **Dyspnea** = *shortness of breath* or air hunger, subjective symptom of *breathlessness*
  - small children – according to objective symptoms and clinical signs

• **Division:** acute $\times$ chronic $>$ 3 weeks
  - obstructive $\times$ non-obstructive
  - inspiratory $\times$ expiratory $\times$ mixed
DYSPNEA – clinical manifestation

- Alar flaring of the nose, retractions of jugulum, supraclavicular and intercostal retractions, grunting
- Gasping
- Orthopnea – vertical position, often with upper arms fixation
- Different respiratory rate and breath volume: tachypnea, hyperpnea (low airways obstruction), rapid and deep breathing pattern – extrapulmonary – Kussmaul’s during diabetic ketoacidosis or renal tubular acidosis or stimulation of respiratory centrum (encefalitis, psychostimulancia)
- Apnea – arrest > 20s, bradypnea- intoxication with sedatives
- Different ration inspiration/exspiration
- Inspiratory stridor – airwax obstruction above middle trachea x lower part of trachea nad distal airways – expiratory breathing sounds (wheezing, rackles)
- Cyanosis – concentration of reduced hemoglobin >50 g/liter, CAVE – depends on global hemoglobin – anemia or polyglobulia
- Chronic hypoxia – digital clubbing
- Irritability or apathy, hypercapnia a imminent respiratory failure
DYSPNEA IN INFANCY

- Infants – inability increase tidal volume
  - Horizontal position of diaphragma and ribs, lower efficacy of respiratory muscles

- Tachypnea

- Retraction of low ribs (Hoover’s sign) = intensive contraction of horizontal diaphragma during inspiration

- Parents usually recognize difficult feeding (intemitten sucking) or tireness, intolerance prone position
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Respiratory rate per minute</th>
<th>Heart rate (beats/min)</th>
<th>Minimal systolic blood pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immature neonates</td>
<td>60-100</td>
<td>100-180</td>
<td>*</td>
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<tr>
<td>Mature neonates</td>
<td>40-60</td>
<td>100-160</td>
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<tr>
<td>1 year</td>
<td>30-60</td>
<td>100-160</td>
<td>&gt;60</td>
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<tr>
<td>Toddler</td>
<td>24-40</td>
<td>90-150</td>
<td>&gt;70</td>
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<tr>
<td>Preschool age</td>
<td>22-34</td>
<td>80-140</td>
<td>&gt;75</td>
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<tr>
<td>School age</td>
<td>18-30</td>
<td>70-120</td>
<td>&gt;80</td>
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<tr>
<td>Adolescent</td>
<td>12-20</td>
<td>60-100</td>
<td>&gt;90</td>
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<tr>
<td>Lung and airways</td>
<td>Etiology – differential diagnosis</td>
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<tr>
<td>Infection</td>
<td>Laryngitis</td>
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<td></td>
<td>Laryngotracheobronchitis (croup)</td>
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<td></td>
<td>Epiglottitis</td>
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<td></td>
<td>Abscess - retropharyngeal, retrotonsilar etc., tonsilitis acuta</td>
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<tr>
<td></td>
<td>Bronchitis obstructiva</td>
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<tr>
<td></td>
<td>Bronchiolitis</td>
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<tr>
<td></td>
<td>Pneumonia</td>
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<tr>
<td>Central airways obstruction</td>
<td>Choanal atresia, bronchomalacia, tracheomalacia, vocal cord paralysis, mediastinal tumour, vascular ring etc.</td>
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<tr>
<td>Periferal airways obstruction</td>
<td>Asthma bronchiale, cystic fibrosis, α1 antitrypsin deficit</td>
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<tr>
<td>Alveoli – lung intersticum damage</td>
<td>ARDS, pulmonar hemoragia</td>
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<tr>
<td>Thorax</td>
<td>Kyphoscoliosis, diaphragmatic hernia or eventration etc.</td>
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<tr>
<td>Decreased lung mechanics</td>
<td>Pneumothorax</td>
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<tr>
<td><strong>Extrapulmonar</strong></td>
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<tr>
<td>Cardiovascular</td>
<td>Left right shunt, insufficiency, pulmonary veins stenosis</td>
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<tr>
<td>Central</td>
<td>Encephalitis, trauma, intracranial hypertension, drugs</td>
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<tr>
<td>Metabolic</td>
<td>Ketoacidosis, renal tubular acidosis, hereditary metabolic disorder</td>
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<tr>
<td>Shock</td>
<td>Sepsis, anafylaxis, hypotension</td>
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<tr>
<td>Neuromuscular</td>
<td>Myopathy, Guillain-Barré syndrome, poliomyelitis, …</td>
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</tbody>
</table>
UPPER AIRWAYS OBSTRUCTION

- Inspiratory stridor, severe obstruction or in case of narrowing of middle trachea - mixed stridor
- Prolonged inspirium, activity of accessory muscles – retractions, orthopnoic position

1. Acute laryngitis
2. Acute epiglottitis
3. Foreign body aspiration
4. Foreign body in Killian´s space in esophagus
5. **Allergic swelling** — anaphylaxis – laryngeal edema, tongue and throat swelling, afebrile without signs of infection, dysphagia

6. **Peritonsillar abscess** - fever, odynophagia, dysphagia, trismus, asymmetric tonsillar bulge with shifted uvula

6. **Retropharyngeal abscess** — commonly <3-4 y (boys, fever, dysphagia, drooling, decreased oral intake, muffled voice, stridor, torticollis or neck stiffness, bulging of posterior pharyngeal wall, dg. CT

7. **Bacterial laryngotraceoobronchitis** – mixed dyspnea, signs of bacterial infection
Lower airways obstruction

- Expiratory dyspnea - prolonged forced active expiration with activity of accessory muscle, expiratory noises (wheezing, rhonchi) and ev. inspiratory position of thorax (hyperinflation)
- CAVE – silent thorax – weak lung sounds
- Infants and toddlers - obstructive bronchitis (virus induced wheezing), bronchiolitis and acute exacerbation of asthma - dif dg in children > 5 y difficult
- Foreign body aspiration – distal position
NON-OBSTRUCTIVE DYSPNEA

- Infants and toddlers – pneumonia or sepsis, premature infants with RDS or bronchopulmonary dysplasia (chronic lung disease=CLD)
- Congenital anomalies of respiratory system
- Extrapulmonar etiology – congenital heart disease or diaphragmatic hernia
- **Cardiac etiology** – cyanosis without effect of oxygenotherapy, fatigue, tachycardia or specific findings (heart murmurs, arrythmia, weakened pulsation etc.).
- **Sepsis in neonates** - tachypnea or apneic pauses, fever or hypothermia, worsened perfussion, tachycardia, bradycardia or organ dysfunction
- **Pneumonia** – signs of infection, fever, cough, chest pain, typical auscultation (diminished lung sounds, bronchial breathing, asymmetric auscultation, rarely fine crackles), atypical pneumonia (radiology>clinical manifestation)
- **Pneumothorax** – dry cough, diffuse chest pain or sharp lokalised pleural pain, limited thoracical movements, tachypnea, ev. cyanosis, diminished lung sounds and hypersonoric percussion, mediastinal shift, rarely subcutaneous emphysema palpable or abdominal distension with pneumoperitoneum
DYSPNEA - Therapy

- **Generally**
- Immediately assess vital function, airways patency and ev. initiation of cardiopulmonary resuscitation according to current guidelines
- Symptoms of severe respiratory insufficiency (cyanosis, „silent thorax“, severe tachycardia with tachypnea, ev. bradycardia, hypotension etc) - urgent transport by emergency, vital function monitoring, moistened warm oxygen by nostrils or mask
UPPER AIRWAYS OBSTRUCTION

- Nasopharyngitis acuta
- Tonsilitis acuta
- Sinusitis acuta
- Epiglottitis acuta
- Laryngitis acuta
- Tracheitis acuta
- Bronchitis acuta
- Bronchiolitis acuta
- Bronchopneumonia
PHARYNGITIS, TONSILLITIS ACUTE

- Viral x bacterial x mycotic
- Streptococ. pyog. - risk of poststreptococcal complications – antibiotics apply till 9 days from first symptoms
- clinical uncertainty – CULTIVATION
- Exudative tonsillitis – viral – EBV, CMV, adenovirus – mycotic

Complications:
- early – peritonsilar abscess
- late – poststreptococ. glomerulonephritis, rheumatic fever
TONSILLITIS acuta

- Therapy: 1. Penicillin 50,000-100,000 IU/kg/day every 6 to 8 hours for 10-14 days
  phenoxyethylpenicillin
  2. ev. macrolides as alternative for allergy
SINUSITIS ac.

- Sinuses - development:
  - neonates – ethmoid
  - Maxillar from 2 years
  - Frontal after 6th year
  - Sphenoid sinus about 10 years
- Limited form during any acute rhinitis
- Commonly follows upper respiratory infection
  - up to 13 % odontogenic origin
Sinusitis acuta

- Bacterial sinusitis:
  1. biphasic course of respiratory infection
  2. Acute respiratory infection > 10 days, progressive worsening
- Fever, purulent nasal secretion, frontal headache, toothache, muffled voice, dysosmia, anosmia, malaise
- COUGH = sinobronchial syndrome – typically nocturnal
- Complications – neuroinfections, orbitocellulitis
Therapy:
- Antibiotics
- Mucolytics
- Nasoconstrictive nasal drops
- Ev. intranasal cortico steroids (allergy)

Punction, surgery
<table>
<thead>
<tr>
<th>LARYNGITIS ac.</th>
<th>EPIGLOTTITIS ac.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ACUTE onset</td>
<td>• Progressive deterioration</td>
</tr>
<tr>
<td>• Subfebrilia</td>
<td>• Febrilia</td>
</tr>
<tr>
<td>• Viral (rhinitis, cough)</td>
<td>• Bact. – Haemophilus infl</td>
</tr>
<tr>
<td>• Barking (rough) cough</td>
<td>• Careful cough</td>
</tr>
<tr>
<td>• Swallowing OK</td>
<td>• Drooling, odynophagia</td>
</tr>
<tr>
<td>• Dysphonia</td>
<td>• Silent speech or refuse</td>
</tr>
<tr>
<td>• Tolerance of horizontal</td>
<td>• Refuse horizontal</td>
</tr>
<tr>
<td>position, usually restlessness</td>
<td>position, markedly calm</td>
</tr>
</tbody>
</table>
INSPIRATORY DYSPNEA- therapy

<table>
<thead>
<tr>
<th>EpiGlottitis ac.</th>
<th>Laryngitis acuta</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk of suffocation!!!!</td>
<td>Downes score therapy amb x admission (&gt; 2) x ICU (&gt; 7 – intubation)</td>
</tr>
<tr>
<td>Emergency – transport to ICU with doctor, no laboratory examination, calm</td>
<td>Calm moistened neulisation</td>
</tr>
<tr>
<td>Acute suffocation – open airways (intubation, mask with lateral position, coniopunction)</td>
<td>Nebulized adrenalin</td>
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<tr>
<td></td>
<td>Corticosteroids</td>
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<table>
<thead>
<tr>
<th>Auscultation</th>
<th>1</th>
<th>2 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheezing, rhonchi</td>
<td>Weak sound</td>
<td></td>
</tr>
<tr>
<td>Inspir.</td>
<td>Insp-exsp</td>
<td></td>
</tr>
<tr>
<td>Rough</td>
<td>Barking</td>
<td></td>
</tr>
<tr>
<td>Jug+ Supraclav.</td>
<td>+subcostal +intercostal</td>
<td></td>
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<tr>
<td>FiO2 0.21</td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>

Antibiotics
Endotracheal intubation, ev. tracheostomy
INFECTION OF LOWER AIRWAYS

- Bronchitis acuta
- Bronchitis obstructiva – therapy similat to asthma bronchiale
- Bronchiolitis acuta
- Repeated infections:
  - Cystic fibrosis
  - Primary ciliary dyskinesia (ev Kartagener syndrome)
  - Immunodeficiency
BRONCHIOLITIS ACUTA

- Age < 2 y, mainly < 6 mo
- RSV, ADV, influenza, parainfluenza, HMPV, B. pertussi, parapertussis, H. influenzae, Mycoplazma etc.

- Obstruction of bronchiols: **atelectasis + hyperinflation**

- Clinical manifestation:
  1. Mixed dyspnea with insufficient effect of bronchodilators
  2. Tachypnea, grunting, alar flaring, retraction
  3. Hyposaturation, low PaO2
  4. Increased respiratory effort
  5. Hypoventilation, cyanosis
  6. Respiratory insufficiency
BRONCHIOLITIS ACUTA

- **X RAY** – microatelectasis, emphysematic loci, peribronchial infiltration
- **Monitoration**: sat O₂, RR, HR, repeated Astrup
- **THERAPY**:
  - Oxygenotherapy – warm moistened oxygen
  - Bronchodilatation – possible effect
  - Severe dyspnea – nasogastric tube or parenteral nutrition
  - Corticosteroids in high risk patients, with ventilatory support
    .......
  - Early tracheal intubation
  - Mechanical ventilation – high risk of barotrauma - high resistance
  - Suction of secretions
BRONCHIOLITIS ACUTA

- **RISK FACTORS:**
  - Age below 6 weeks
  - Immaturity <35.gt
  - Bronchopulmonary dysplasia
  - Cystic fibrosis
  - Immune deficiency
  - Congenital heart disease

- **PREVENTION:** vaccination – PALIVIZUMAB – monoclon. antibody against RSV
  - High risk neonates < 35.week, age < 6 mo in autumn
  - BPD - age<2 y
CYSTIC FIBROSIS

- AR, 1: 2700-4000, neonatal. screening (till r. 2009)

- Multiorgan disease:
  - Chronic progres. damage of airways and lungs
  - Pancreatic insufficiency – failure to thrive
  - High concentration of chlorides in sweat
  - Reproduction
  - Hepatic disfucntion, diabetes, osteoporosis etc

- Mutation gene CFTR – chlorine cannal apical membrane – worsened mucocil. clearance, chron. bact. infection
CF - NEONATES

NEONATES:
• meconium ileus
• protracted icterus
• failure to thrive (till 1 month child below birth weight)
• hypoproteinemia with edema
• metabolic failure with hypoelectrolytemia and metabolic alkalosis

INFANTS:
• Failure to thrive with good appetite
• steatorhea – fatty stools X diarrhea (milk allergy, celiac disease)
• rectal prolapse
CF – OLDER CHILDREN

- Growth retardation, weight/height ratio < 3rd perc.
- Repeated sinusitis, nasal polyps, chronic cough, recid. bronchitis
- Digital clubbing

ADULTS:
- Obstructive azoospermia as simple symptom or associated with chronic sinusitis or mild respiratory symptoms in mild forms
Respiratory complications CF

- recid. sinusitis
- Nasal poylpes
- Alerg. bronchopulm. aspergiliosis
- pneumothorax
- Hemoptysis
- Resp. insuficiency parc. – cor pulmonale
- Resp. insuficiency global – during exacerbations
Cystic Fibrosis

- INHALATION of MUCOLYTICS
- RESPIRATORY PHYSIOTHERAPY – daily
- Prevention of infection – vaccination, antibiotics administration – inhalations, preventive application, longterm
PNEUMONIA

- CAP = community acquired x nosocomial

RISK FACTORS:

1. Immunodeficiency
2. Chronic lung disease (asthma, cystic fibrosis, anomalies, bronchopulmonary dysplasia, alfa1-antitrypsine deficiency)
3. Immaturity
4. Severe course of pneumonia – hyposaturation, extrapulmonary symptoms – meningitis, arthritis..., severe X RAY- pleural effusion, infiltrates bilateral
5. Renal failure
6. Severe leucocytosis, leukopenia
7. Non – compliance of family
ASPIRATION OF FOREIGN BODY

- Subject?
- Size?
- Amount?
- Age
RECURRENT PNEUMONIA

• Same localizations:
  1. Congenital anomaly of airways
  2. External or internal obstruction of airways
  3. Intralobar pulmonary sequestration

• Different localizations:
  1. Immunodeficiency
  2. Microaspirations, aspirations, GERD
  3. Primary ciliary dyskinezia
Hlášená onemocnění TBC na 100 tis. obyvatel, Evropa, 2010
Hlášené případy TBC mezi cizinci, Evropa, 2010
ASTHMA BRONCHIALE

- Obstruction of lower airways – mucus, spasm, swelling of lining

- SYMPTOMS:
  - COUGH
  - WHEEZING
  - TIGHT CHEST
  - DYSPNOEA, breathing troubles during expiration
ASTHMA BRONCHIALE

- **AIM of therapy:**
  - Allow sufficient longterm physical activity = necessary for appropriate development of child
  - To fully control the disease

- **Modern drugs:**
  - Treatment should be titrated to minimal drug dose/combination = allow children sufficient physical activity with asthma below full control
ASTHMA BRONCHIALE

**TREATMENT:**

1. Bronchodilatators = quick-relief medicines (“relievers”) – effect within 10-15 minutes, puffs by inhalation, preferably with aerochamber, everyone with asthma

2. Preventive medicines (“controllers”) – daily, not all asthmatic people, lower risk of asthma exacerbation
BRONCHITIS OBSTRUCTIVA

- Expiratory obstruction during URI
- Similar symptoms as asthma – wheezing, cough, dyspnea
- Infants, toddler, preschool children
- Difficult to distinguish persistent wheezer (asthma) from transient wheezer
- Same management of acute dyspnea