RESPIRATORY TRACT INFECTIOUS DISEASES

Department of Pediatric Pulmonology and Allergology
Medical University of Warsaw

Learning objectives

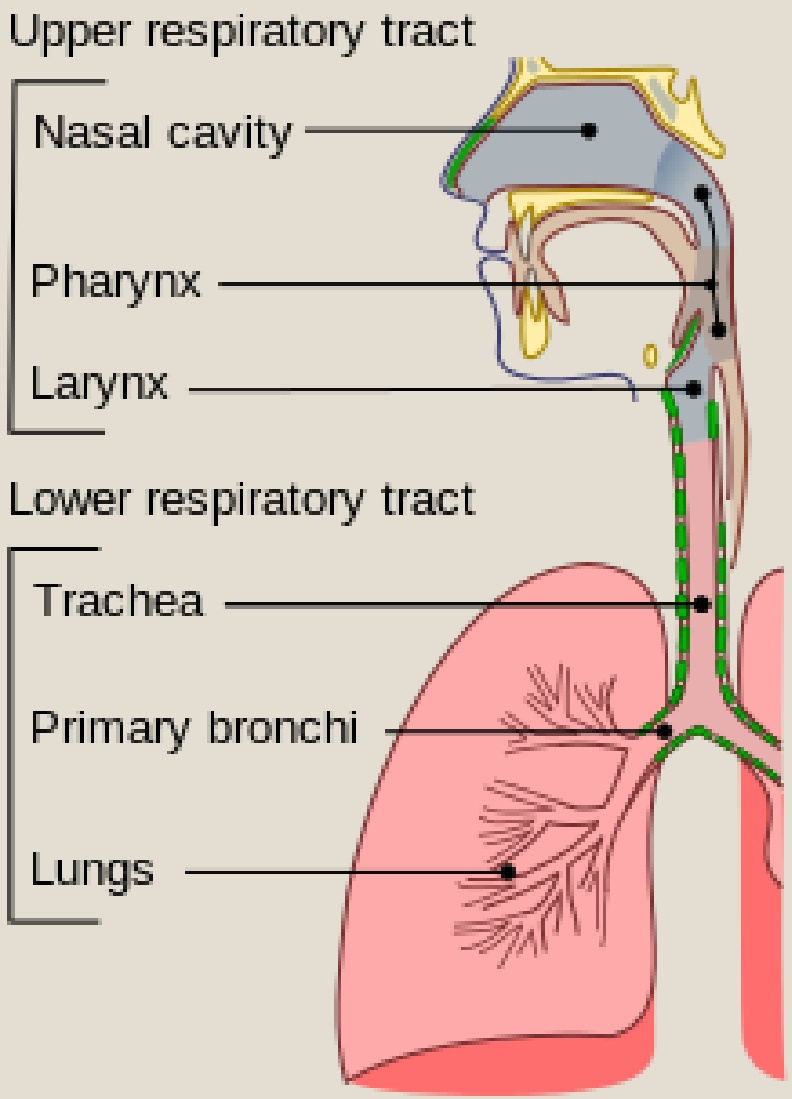
- Differentiate between viral and bacterial respiratory infections
- Become familiar with typical etiology
- Elaborate differential diagnosis for “cough” illnesses
- Understand appropriate uses of antibiotics for upper and lower respiratory tract infections
- Learn about suitable workup and testing
- Become familiar with usual clinical symptoms of rhinosinusitis, otitis media, pharyngitis, epiglottitis, croup, bronchitis and bronchiolitis

Why this seminar is important to you? ☺

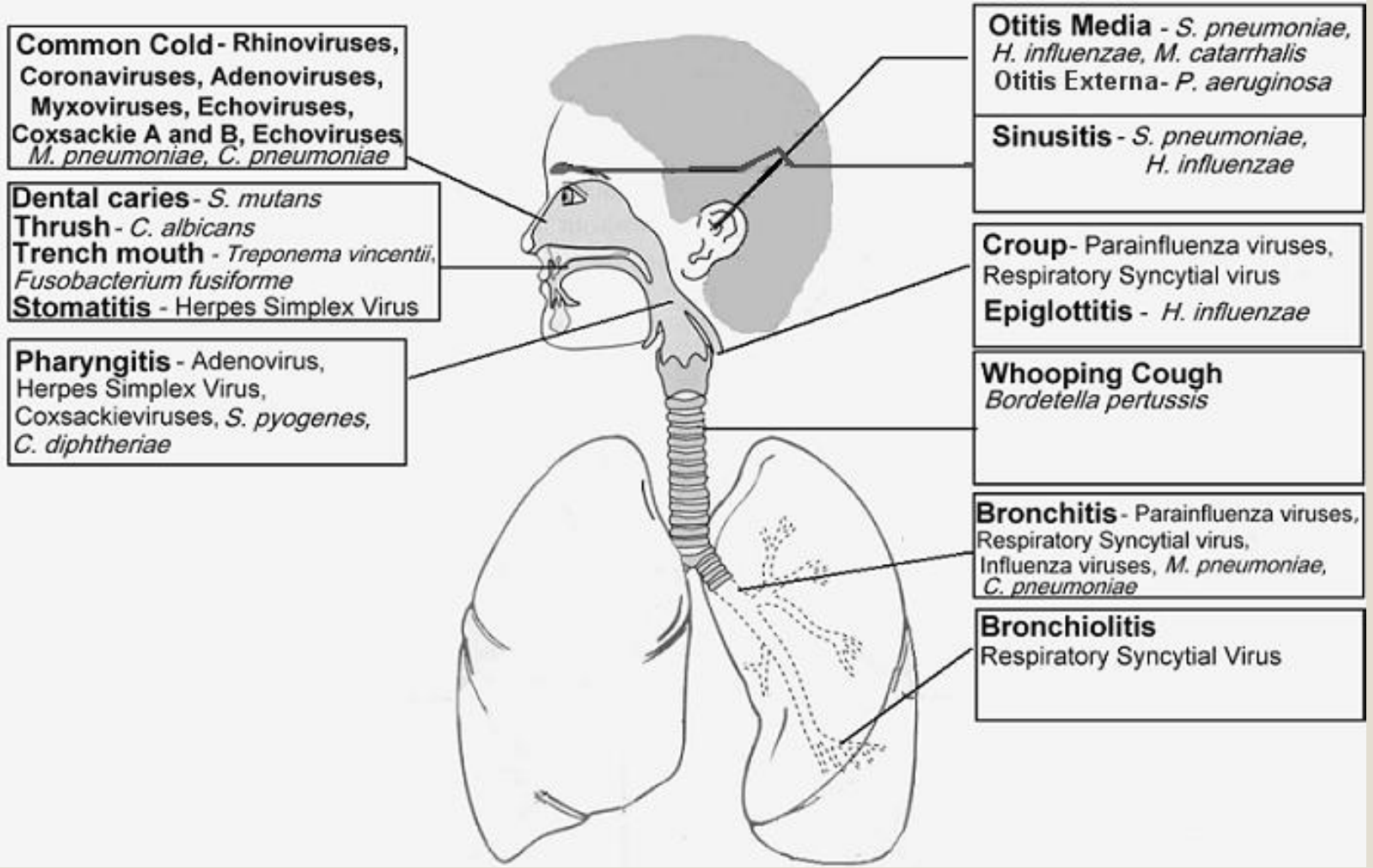
- Respiratory infections (RIs) are the most common infections in childhood (6-8x a year)
- RIs account for 50% of consultations with GP for acute illness in young children
- Most of you will have children:

  they will likely get RI at some point in life

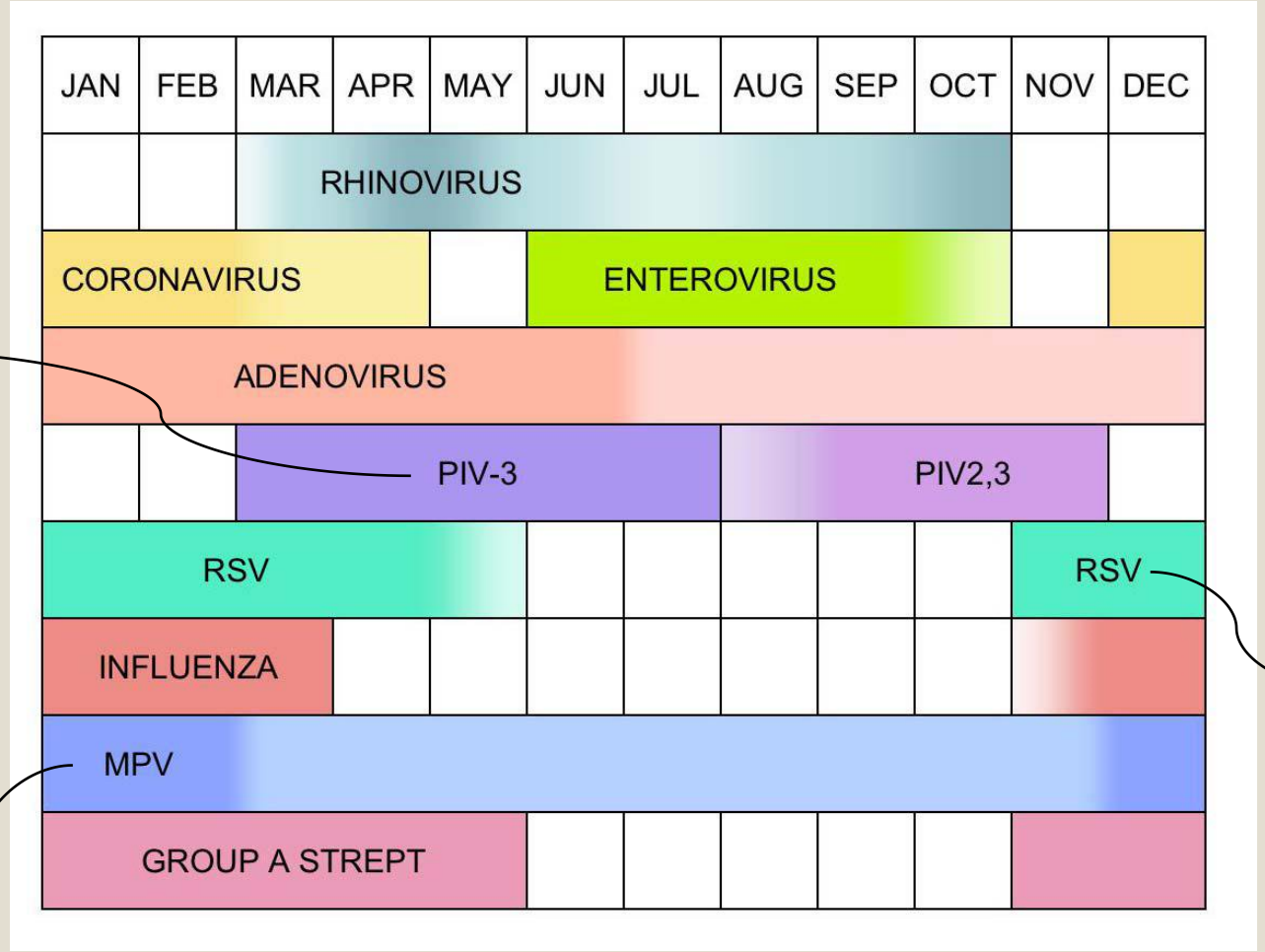
The respiratory tract



Etiology of respiratory track infections



Seasonal variation of selected pathogens



parainfluenza virus

respiratory syncytial virus

metapneumovirus

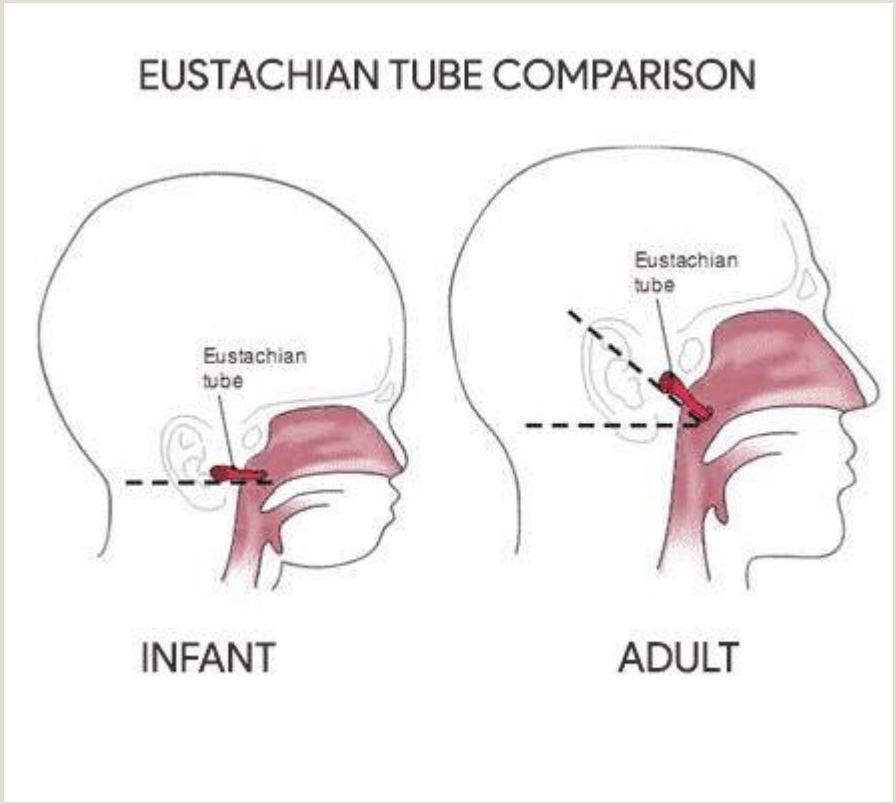
Clinical case

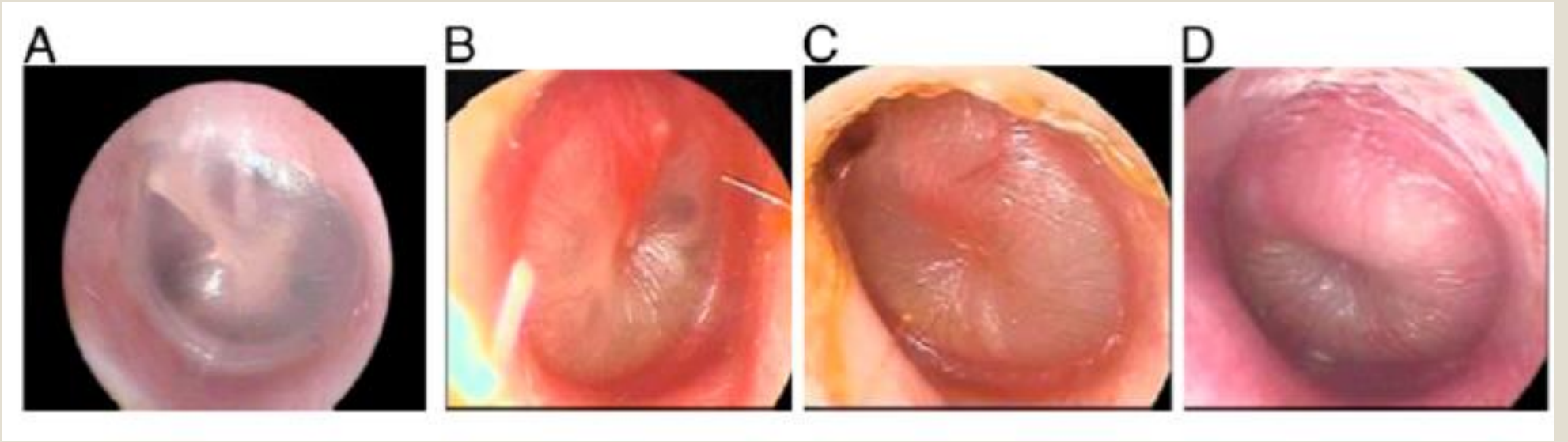
A 4-year-old boy is brought for a visit because of fever. The mother states that, for the past 4 days, the patient has been eating less, he has been more irritable, and he has been tugging his left ear. On the day of the medical appointment, the patient had a low-grade fever (38 °C) that was resolved with acetaminophen. The patient has not recently been on antibiotics, and has no allergies.

1. What do you suspect?
2. Which clinical test should you perform?
3. Which one is the correct treatment?

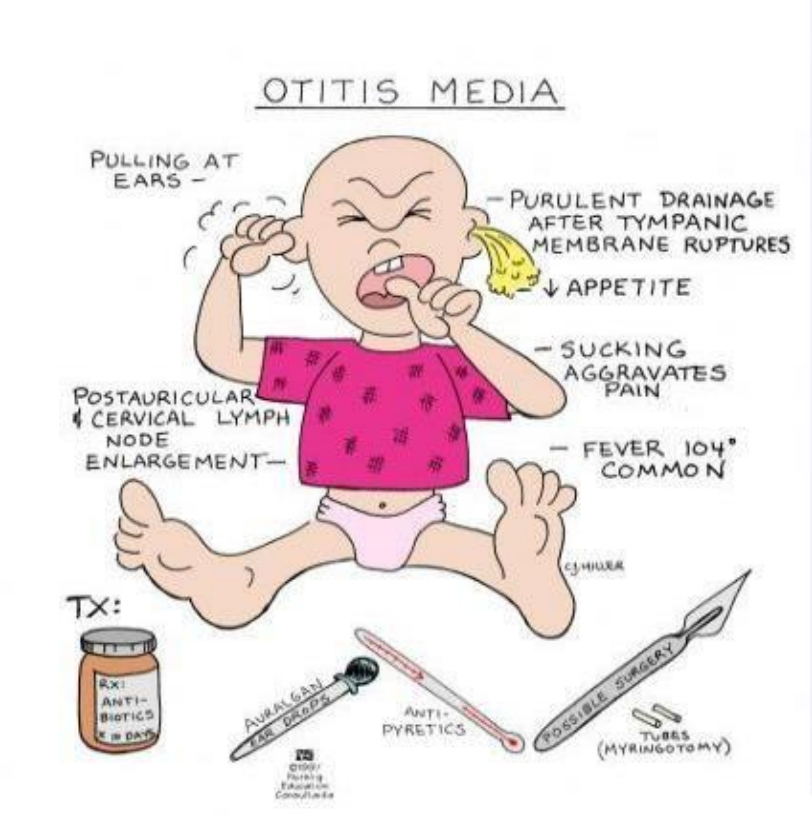
Otitis Media

- Common in small children: developmental alterations of the ET, an immature immune system, and frequent infections of the upper respiratory mucosa
- Etiology: viruses, Streptococcus pneumoniae, Haemophilus influenzae and Moraxella catarrhalis - 95% of all AOM cases with a bacterial etiology
- Symptoms:
  - Unusual irritability
  - Difficulty sleeping or staying asleep
  - Tugging or pulling one or both ears
  - Ear pain
  - Fever
  - Fluid draining from the ear
  - Loss of balance
  - Hearing difficulties
  - Belly pain, diarrhea, vomiting
- Subtypes of OM:
  - Acute OM
    - Catarrhal
    - Bacterial
  - Chronic suppurative OM




A
B
C
D

Otitis Media: Treatment



Source:Memory Notebook of Nursing, 4th edition, R.N. Zerwekh JoAnn, Jo Carol, R. N. Claborn, C. J. R. N. Miller

*American Academy of Pediatrics

- **Pain assessment**; analgesics, particularly ibuprofen or acetaminophen, should be used to treat the pain, regardless of the antibiotic therapy
- **Watchful waiting:** observing children with uncomplicated AOM for 48 to 72 hours to allow for spontaneous recovery without antibiotics
- Recommendations* for prescribing antibiotics:
- Without "watchful waiting" period:
  - Babies <6 month
  - bilateral or unilateral AOM in children aged >6 months with severe signs or symptoms (moderate or severe otalgia, otalgia for 48 hours or longer, or temperature >39°C)
  - Nonsevere, bilateral AOM in children aged 6 - 23 months
  - Presence of perforation
- On the basis of a joint decision with the parents, unilateral, nonsevere AOM in children aged 6-23 months or nonsevere AOM in older children may be managed either with antibiotics or with close follow-up and withholding antibiotics, unless the child worsens/does not improve within 48-72 hours since the onset of symptoms
- **Amoxicillin** is the antibiotic of choice unless the child has received it in the last 30 days, or if he has concurrent purulent conjunctivitis, or if he is allergic to penicillin. In these cases, clinicians should prescribe an antibiotic with additional beta-lactamase coverage

DOSAGE FOR:

- IBUPROFEN?
- ACETOAMINOPHEN?

Dosage

- Ibuprofen – 10mg/kg/dose
  max. every 6h (max 30mg/kg per day)

- Acetoaminophen – 15mg/kg/dose
  max. every 4h (max 90mg/kg per day)

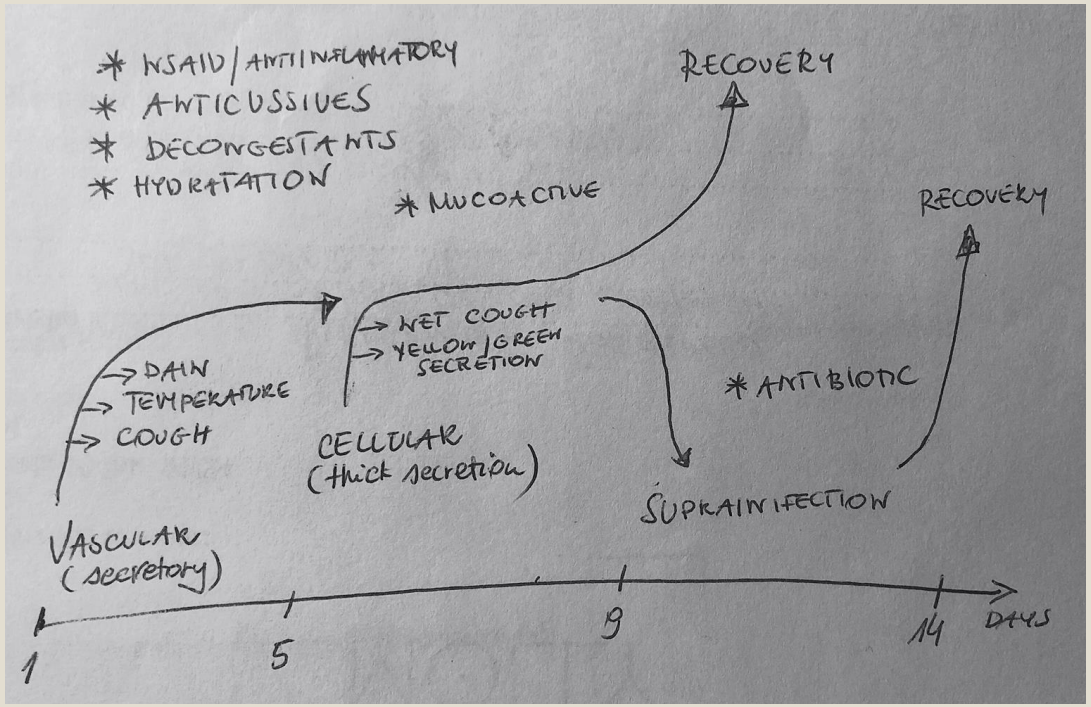
Acute rhinosinusitis (ARS)/common cold

- Etiology
  - Patients with the acute rhinosinusitis/common cold may have a paucity of clinical findings despite notable subjective discomfort
- Symptoms
  - Cough
  - Nasal mucosal erythema and edema, nasal discharge: profuse discharge is more characteristic of viral infections than bacterial infections. Initially, clear secretions typically become cloudy white, yellow, or green over several days, even in viral infections
  - Foul breath
  - Fever
  - A common cold may last up to 14 days, with symptoms averaging 7-11 days in duration. Fever, sneezing, and sore throat typically resolve early, whereas cough and nasal discharge typically last longer

- Acute viral rhinosinusitis: Treatment
  - Nasal decongestants, mucolytic, nasal irrigation, ibuprofen/acetoaminophen
- Proper hydration, rest

- Acute bacterial sinusitis
  - Defined as a URI with any of the following:
    - Persistent nasal discharge (any type) or cough lasting 10 days or more without improvement
    - Worsening course (new or worse nasal discharge, cough, fever) after initial improvement
    - Severe onset (fever of 39° or greater with nasal discharge) for at least 3 consecutive days
  - Etiology (ABS often secondary to other UTI infections): Streptococcus pneumonia, Haemophilus influenzae, Moraxella catarrhalis
  - First line treatment: **Amoxicillin**

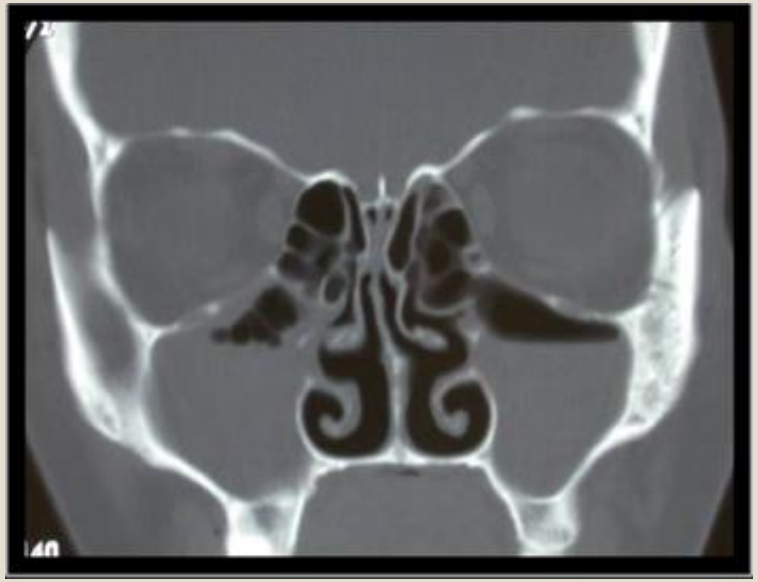
- Complications of sinusitis include the following:
  - Orbital cellulitis
  - Subperiosteal abscess
  - Orbital abscess
  - Mastoiditis
  - Frontal or maxillary osteomyelitis
  - Subdural abscess
  - Cavernous sinus thrombosis
  - Brain abscess



AT WHAT AGE DO CHILDREN DEVELOP SINUSES?

At what age do children develop sinuses?

The paranasal sinuses develop and enlarge after birth; ethmoid and sphenoid sinuses may not be of significant size until age 3-7 years. The frontal sinuses are the last to develop and may not be of significant size until adolescence.



CT scan of the sinuses demonstrates maxillary sinusitis. The left maxillary sinus is completely opacified (asterisk), and the right has mucosal thickening (arrow).

When is CT scanning indicated for rhinosinusitis?

If rhinosinusitis symptoms persist despite therapy or if complications (e.g., extension of disease into surrounding tissue) are suspected, sinus imaging may be appropriate to evaluate the anatomy. Signs or symptoms consistent with intracranial extension of infection warrant CT scanning to evaluate the possibility of an intracranial abscess or other suppurative complication.

Such symptoms may include the following:

- Proptosis
- Impaired intraocular movements
- Decreased vision
- Papilledema
- Changes in mental status
- Other neurologic findings

Acute pharyngitis

- Viral
  - typical un winter and spring;
  - more gradual with typical URI symptoms; erythematous pharynx, no pus
    - Pharyngoconjunctival fever (adenovirus)
    - Coxsackie:
      - Herpangina—small 1–2 mm vesicles and ulcers on posterior pharynx
      - Hand-foot-mouth disease—inflamed oropharynx with scattered vesicles on tongue, buccal mucosa, gingiva, lips, and posterior pharynx → ulcerate; also on hands and feet and buttocks; tend to be painful
  - Treatment: symptomatic, hydratation

- Strep pharyngitis
  - uncommon <2–3 years of age; increased incidence in childhood, then decreases in adolescence; all year long (but most in cold months)
  - rapid onset
  - Signs and symptoms: severe sore throat and fever, headache and gastrointestinal symptoms, red pharynx, tonsillar enlargement with yellow, blood-tinged exudate, petechiae on palate and posterior pharynx, strawberry tongue, red swollen uvula, increased and tender anterior cervical nodes
- Scarlet fever—from GABHS that produce one of 3 streptococcal pyogenic exotoxins (SPE A, B, C)
  - Signs and symptoms: findings of pharyngitis plus circumoral pallor, rasberry tounge, red, finely papular erythematous rash diffusely that feels like sandpaper, pastia's lines in intertriginous areas
- Group A streptococcal pharyngitis – complications:
  - retropharyngeal and lateral pharyngeal abscess
  - streptococcal toxic shock syndrome,
  - acute rheumatic fever (ARF),
  - acute glomerulonephritis,
  - scarlet fever.

Acute pharyngitis: Treatment

- Early treatment only hastens recovery by 12–24 hours but prevents acute rheumatic fever if treated within 9 days of illness – **Penicillin**
- The level of streptococcal antibodies (antistreptolysin O) does not peak until 4-5 weeks after the onset of pharyngitis. Therefore, testing for these antibodies has no role in the diagnosis of acute pharyngitis.

McIsaac Criteria

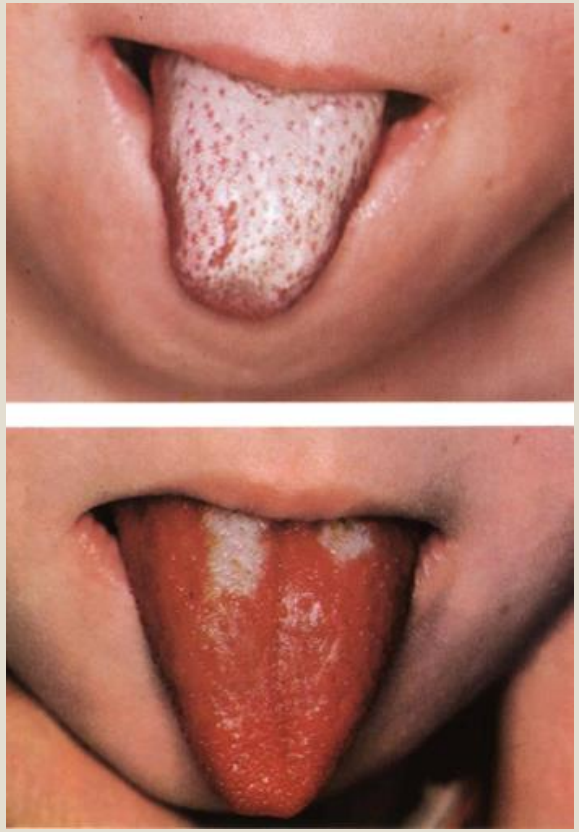
Centor Criteria

Add 1 point for each:

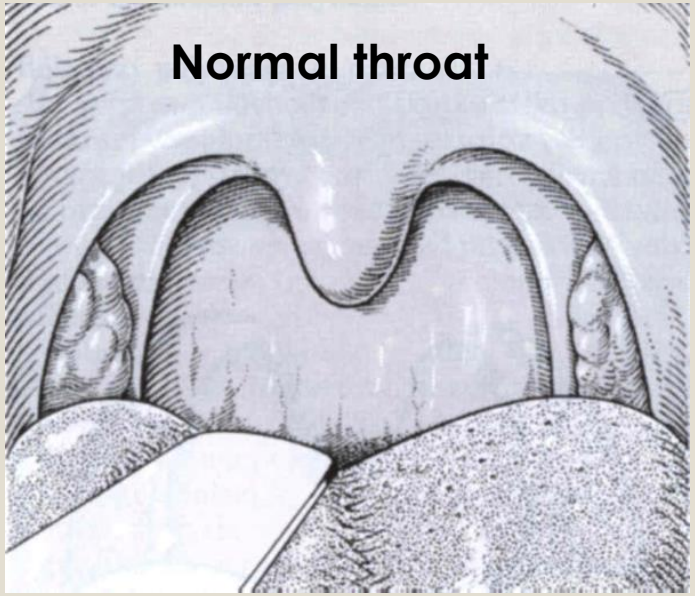
1. Fever >38C
2. no cough
3. Tender limphadenopathy (anterior cervical)
4. Tonsillar exudate

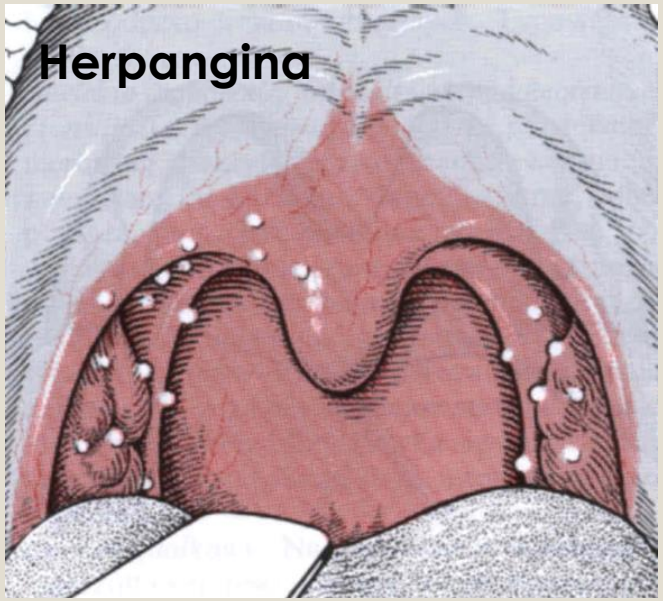
5. Age:
   - 3-14yrs +1point
   - 14-44yrs 0 point
   - >45yrs -1 point

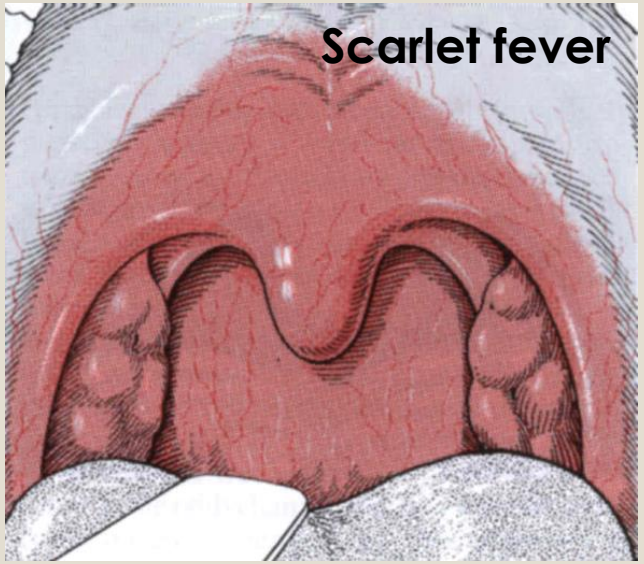
Total score
- 1-2 – unlikely strep pharyngitis
- 2+ strep test for diagnosis
- 4+ antibiotics

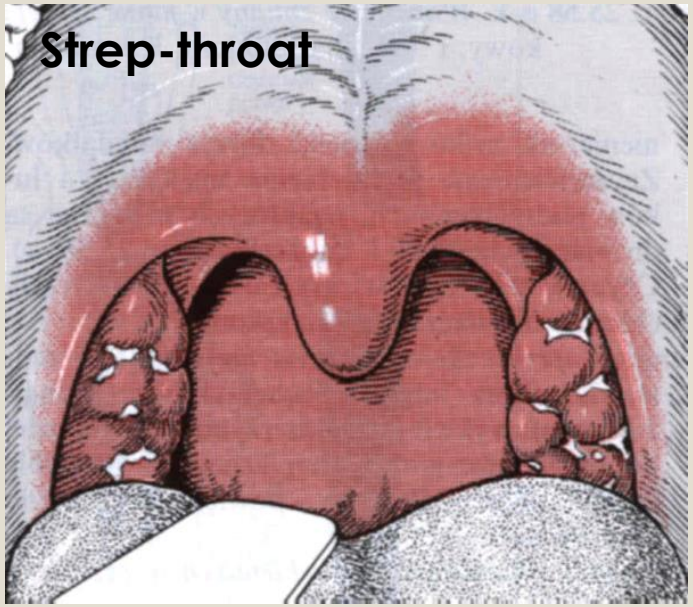


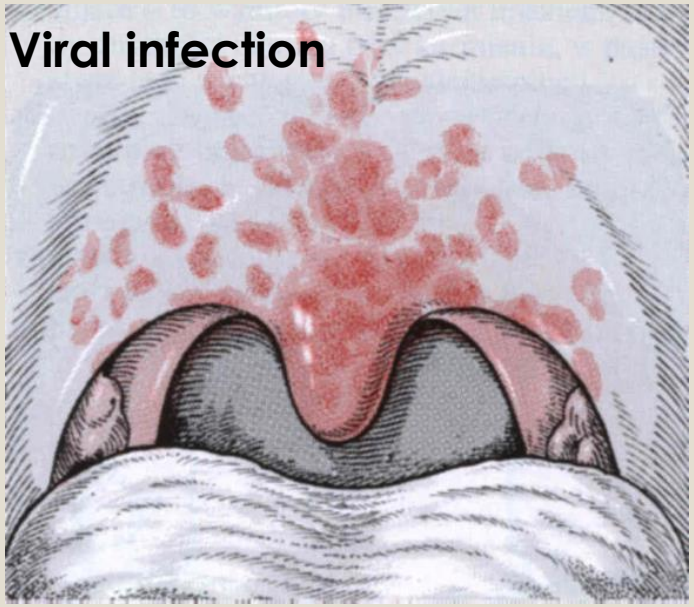
Raspberry tongue

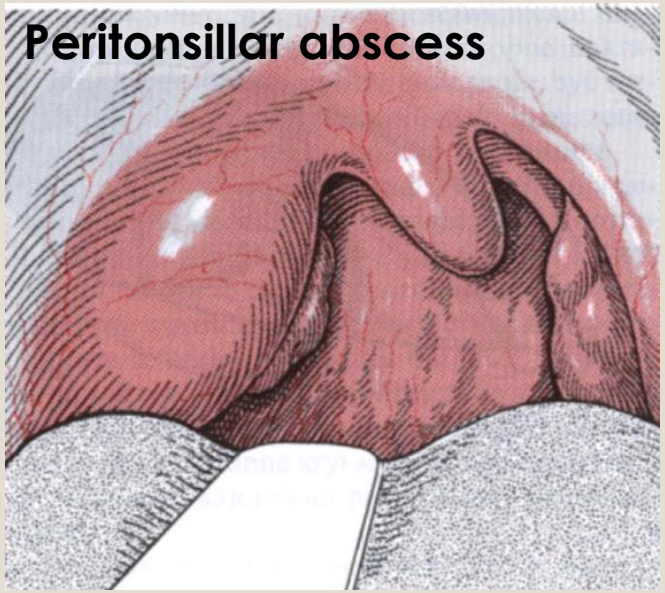

Normal throat


Herpangina


Scarlet fever


Strep-throat


Viral infection


Peritonsillar abscess

Acute Inflammatory Upper Airway Obstruction

- Symptoms:
  - Stridor
  - Wheezing
  - Hoarseness (vocal cords)
  - Barking cough
  - Dyspnea
  - Suprasternal, sternal, intercostal and subcostal retraction
  - Increasing respiratory rate, heart rate, agitation, drowsiness, changes in consciousness or central cyanosis —> SEVERE OBSTRUCTION

Causes of acute upper airways obstruction

- CROUP - viral subglotis
- Epiglottitis
- Bacterial tracheitis
- Anaphylaxys
- Foreign body
- Chemical burns
- Inhalation of smoke, hot air
- Retropharyngeal abscess
- Tracheomalacia

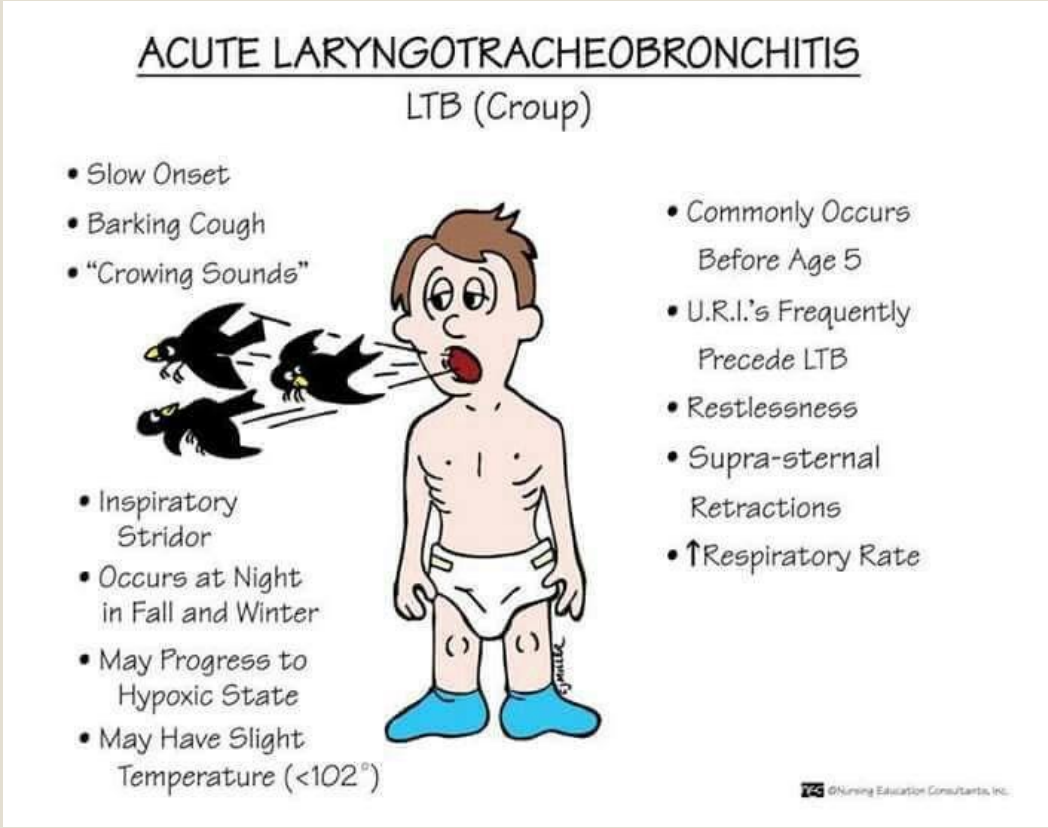
Clinical case

A 10-month-old child is brought to your office because of a barky cough. The mother states that over the past 2 days the child has developed a runny nose, mild fever, and cough. The symptoms are getting worse, and now the child seems to have difficulty breathing.

1. What do you suspect?
2. Which clinical test should you perform?
3. Which one is the correct treatment?

Croup

- Inflammation of subglottis/laryngotracheobronchitis
- ~95% Viral infections (Parainfluenza - most common, Human metapneumovirus, RSV, Influenza)
- Occurs: 6 months - 6 years of age; peak in 2nd year of life
- Most common in the autumn
- Symptoms: upper respiratory infection 1–3 days, then barking cough (like a sea lion), hoarseness, inspiratory stridor, dyspnea; worse at night, gradual resolution over 1 week
- Complications are rare: hypoxia only when obstruction is complete, fewer than 5% of children who present with croup require hospitalization, fewer than 2% of those who are hospitalized are intubated, death occurs in approximately 0.5% of intubated patients
- Diagnosis: clinical, x-ray not needed (steeple sign - typical subglottic narrowing, if an x-ray is performed)
- Treatment - supportive, but for more severe cases:
  - Cold humidified oxygen,
  - Budesonide nebulization 2g at once or 1g 2x (in mild cases)
  - Oral Dexamethasone or Predniozon 1.0 mg/kg p.o. (in mild cases)
  - Dexamethasone 0.15 - 0.6 mg/kg im (in moderate and severe cases),
  - Adrenaline 0.5 ml/kg (max. 5 ml) 1:1000 (5 mg) solution as nebulization (in severe cases),



Source:Memory Notebook of Nursing, 4th edition, R.N. Zerwekh JoAnn, Jo Carol, R. N. Claborn, C. J. R. N. Miller

Clinical case

A 2-year-old girl is brought to the emergency center by her parents because of high fever and difficulty swallowing. According to her mum, she had been in her usual state of health but woke up with fever of 40 °C, a hoarse voice, and difficulty swallowing. On physical examination, the patient is sitting in a tripod position. She is drooling, has inspiratory stridor, nasal flaring, and retractions of the suprasternal notch and supraclavicular and intercostal spaces.

1. What do you suspect?
2. Which clinical test should you perform?
3. Which one is the correct treatment?

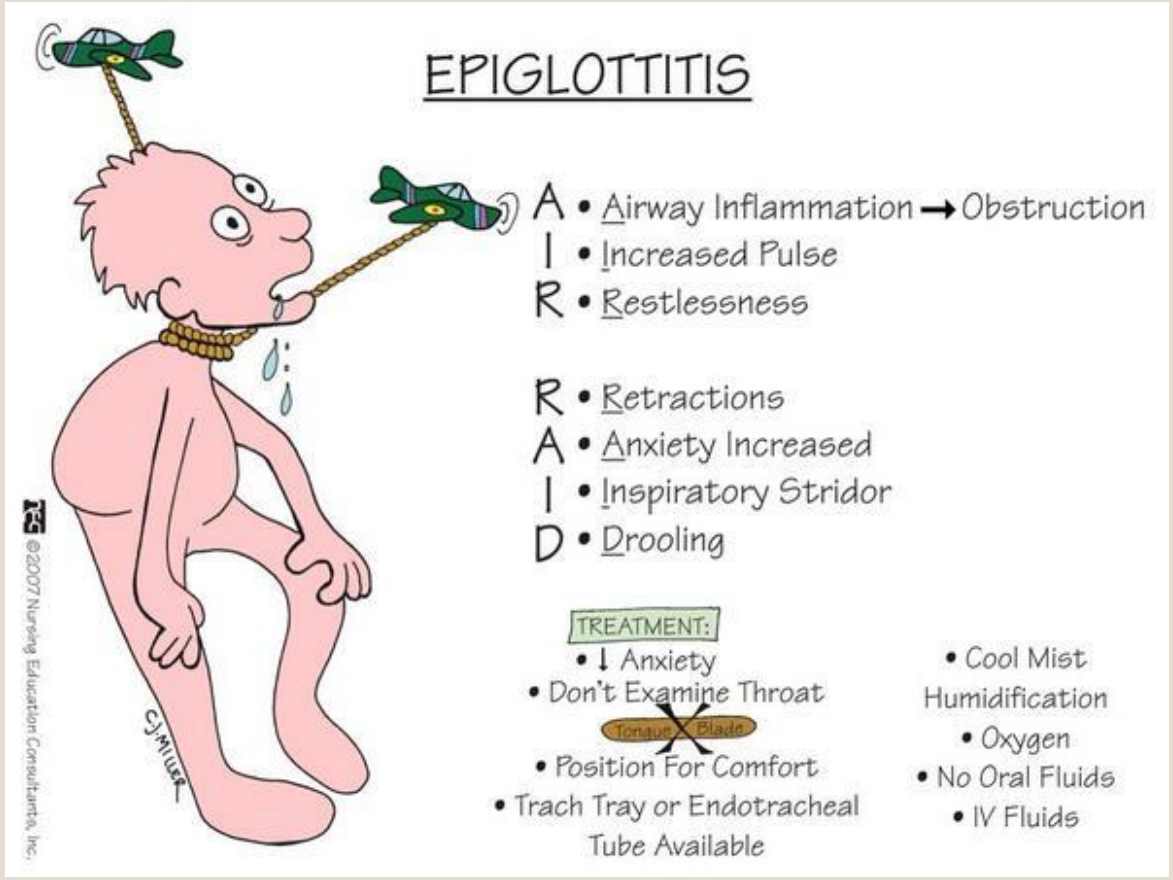
Epiglottitis (supraglottitis)

Life-threatening emergency !!!

- Intense swelling of the epiglottis and surrounding tissues
- Etiology: Haemophilus influenzae type B (HiB) no longer number one (vaccine success), now combination of Streptococcus pyogenes, Streptococcus pneumoniae, Staphylococcus aureus, Mycoplasma
- Occurs: All group of age, mostly 1-6 years old
- Signs and symptoms/examination—dramatic acute onset
  - High fever - the first symptom, sore throat, dyspnea, and rapidly progressing obstruction
  - Toxic-appearing, difficulty swallowing, drooling, sniffing-position
  - Stridor is a late finding (near-complete obstruction)
- Complications - complete airway obstruction and death,; penetration of mucosa -> invasion into bloodstream -> bacteremia, infection of meningitis, lungs, ears and joints
- Do not:
  - **Examine the throat with a spatula!!!**
  - **Take a lateral neck X-ray!!!**
  - **Lay the child down!!!**

Epiglottitis: Management

- Team: anesthesiologist, pediatric surgeon (tracheostomy), pediatric otolaryngologist
- Oxygen
- Transfer to the Intensive Care Unit
- Secure the airway
- Intubation under control —> if impossible an urgent tracheostomy is life-saving
- Next: blood culture, intravenous antibiotics (f.ex. third-generation Cephalosporin)
- Recovery within 2-3 days
- Prophylaxys with Rifampicin for close household contacts



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Bronchitis

- Etiology:
  - Viruses: RSV, influenza, adenovirus, parainfluenza, metapneumovirus, rhinovirus
  - Atypical bacteria (<1%): Chlamydophila pneumoniae, Mycoplasma pneumoniae
  - Bordetella pertussis (cough >3 weeks)
  - Other: dust, allergens, tobacco smoke, chemical agent
- Management:
  - Chest X-ray - differential diagnosis
  - Arterial blood gas - capillary sample
  - Pulse oximetry - measure arterial oxygen saturation
  - Sputum and nasal discharge culture
- Treatment:
  - No evidence that antibiotics, cough suppressants or expectorants speed recovery
  - Macrolids - cough > 2 weeks, after microbiological test for pertussis
  - Analgesics
  - Increased fluid intake
  - Cool mist humidifier

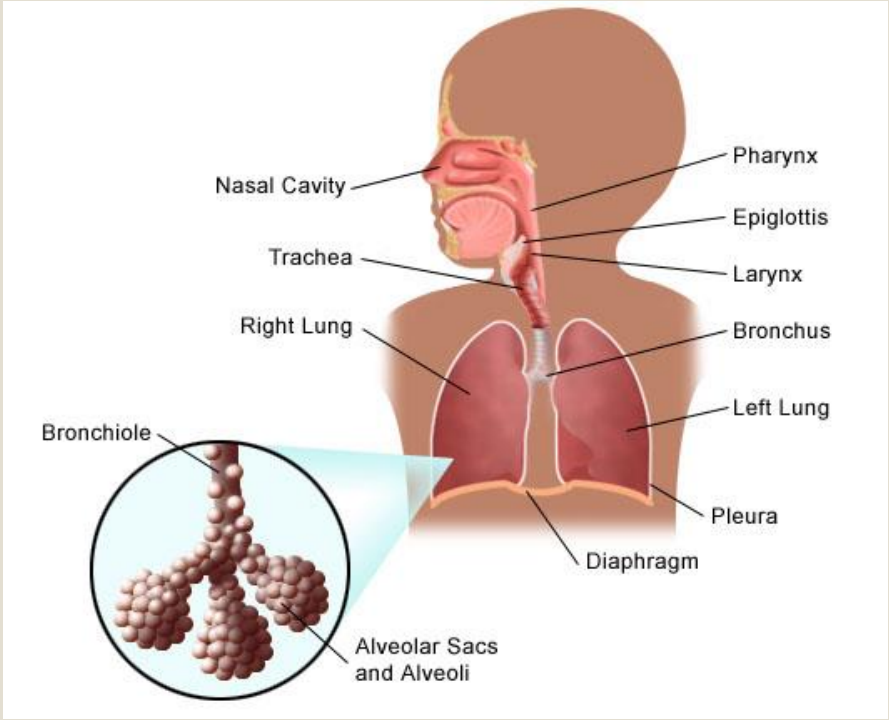
Clinical case

A 6-month-old infant goes to the physician with a 3-day history of upper respiratory tract infection, wheezy cough, and dyspnea. On physical examination, the patient has a temperature of 39 °C, respirations of 72 breaths/min, nasal flaring, and accessory muscle usage. The patient appears to be air hungry, and the oxygen saturation is 91%.

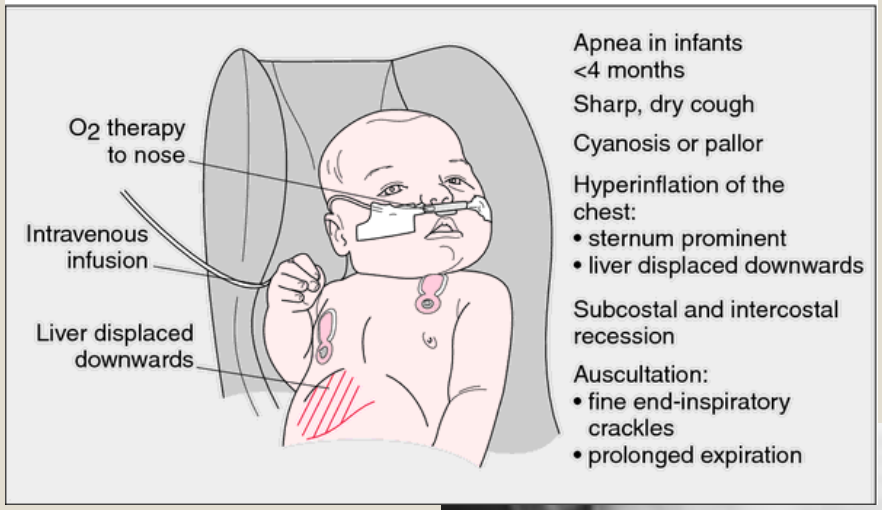
1. What do you suspect?
2. Which clinical test should you perform?
3. Which one is the correct treatment?

Bronchiolitis

- Most common serious respiratory infection in infancy
- Inflammation of the small airways (inflammatory obstruction: edema, mucus, and cellular debris) → (bilateral) obstruction → air-trapping and overinflation
- Etiology: viral infection (**RSV – respiratory syncytial virus** - most common >80% of cases, Human metapneumovirus, Parainfluenza Virus, Rhinovirus, Adenovirus Influenza), rarely bacterial infection - Mycoplasma pneumoniae
- Typical age: almost all children infected at <2 years, most severe at age 1–2 months in winter months
- Most common in the winter and early spring
- Risk factors:
  - Social factors (e.g., exposure to smoke, older child at home, day care attendance, not breastfed infant)
  - Prematurity, low birth weight
  - Age < 3 months
  - Immunodeficiency
  - Neuromuscular disorders
  - Chronic pulmonary disease
  - Hemodynamically significant heart disease



- Clinical presentation
  - Signs and symptoms:
    - Mild URI (often from household contact), decreased appetite and fever, irritability, paroxysmal wheezy cough, dyspnea and tachypnea
    - Apnea may be more prominent early in young infants.
  - Examination:
    - High pitched wheezes and/or fine end-expiratory crackles, increased work of breathing, prolonged expiratory phase
    - Lasts average of 12 days (worse in first 2–3 days)
- Complications—bacterial superinfection, respiratory insufficiency and failure (worse in infants with small airways and decreased lung function)
- Diagnosis
  - Clinical
  - RSV - Immunofluorescence of nasopharyngeal swab (not routine); PCR
  - Chest X-ray —> hyperinflation of the lungs, air trapping, focal atelectasis, flattening of the diaphragm, horizontal ribs
  - Pulse oximetry
  - Blood gas analysis (capillary sample)



Bronchiolitis: Treament

- Oxygen supplementation if oxygen saturation is persistently less than 92%
- Upper airway suctioning if apnoea, respiratory distress or feeding difficulty because of upper airway secretions
- Fluids by nasogastric tube or intravenous (who do not tolerate nasogastric or orogastric fluids, have impending respiratory failure)
- Chest physiotherapy assessment if additional difficulty clearing secretions (tracheomalacia, neuromuscular disorders - f.ex. SMA spinal muscular atrophy)

- Prevention - monoclonal antibody to RSV F protein (palivizumab) in high-risk patients only - premature or with chronic lung disease during RSV season

Indications for admission to the hospital

- Apnoea
- Oxygen saturation <92% when breathing air
- Inadequate oral fluid intake
- Persisting severe respiratory distress (grunting, chest recession, tachypnoea > 70/min)
- Social circumstances

WHAT ARE THE INCUBATION PERIODS FOR UPPER RESPIRATORY TRACT INFECTIONS (URIS)?

What are the incubation periods for upper respiratory tract infections (URIs)?

- Incubation times before the appearance of symptoms vary among pathogens:
  - Rhinoviruses and group A streptococci may incubate for 1-5 days,
  - influenza and parainfluenza may incubate for 1-4 days,
  - respiratory syncytial virus (RSV) may incubate for a week.
  - Pertussis typically incubates for 7-10 days, or even as long as 21 days, before causing symptoms.
  - Diphtheria incubates for 1-10 days,
  - yhe incubation period of Epstein-Barr virus (EBV) is 4-6 weeks.