MEDICAL UNIVERSITY - PLEVEN
FACULTY OF MEDICINE

Department of pediatrics

Lecture № 11

Upper respiratory tract infections. Bronchiolitis

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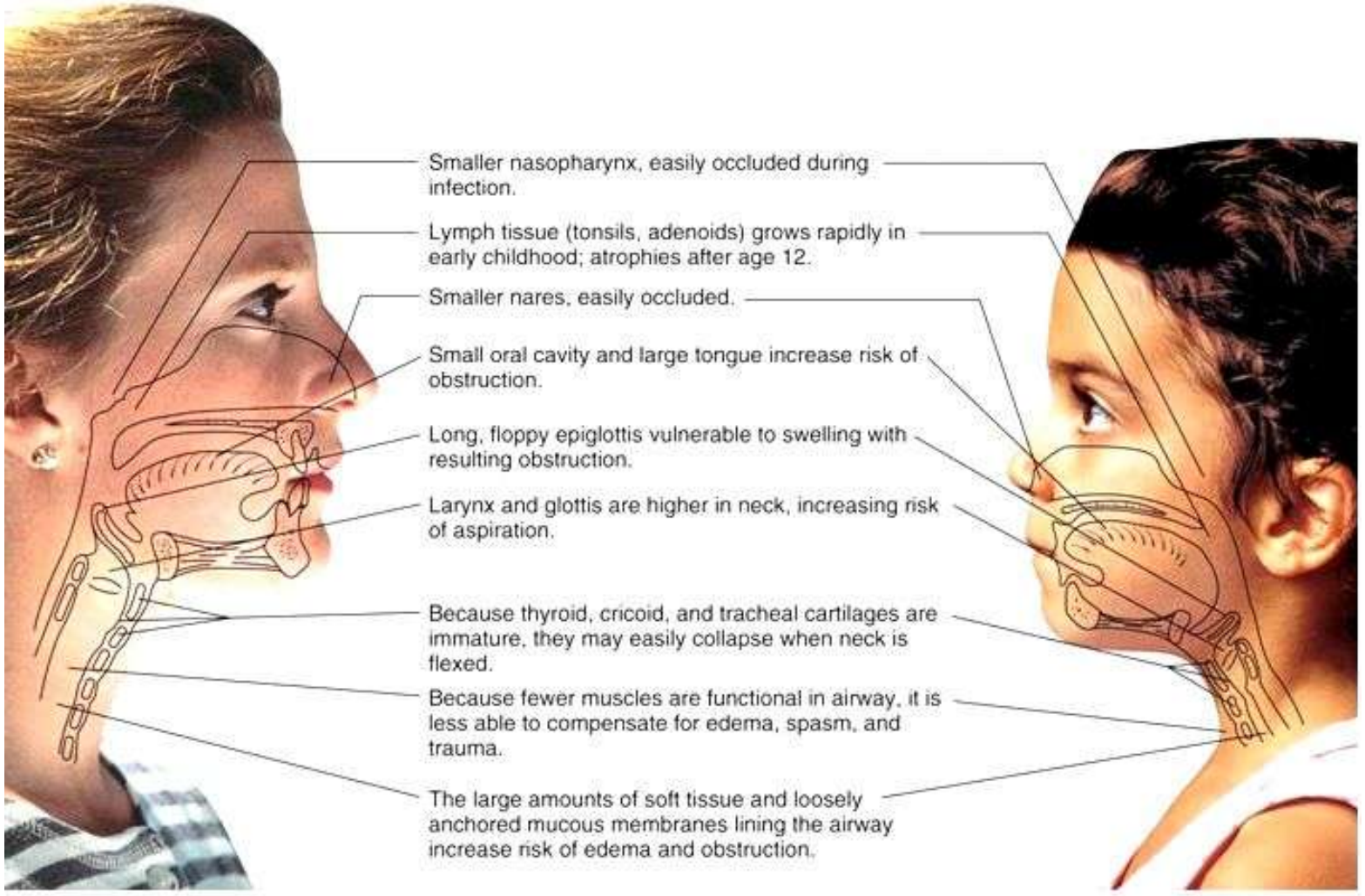
Upper respiratory tract infections

Definition

The upper respiratory tract (URT):

- Nose, sinuses and the lacrimal sac
- Nasopharynx
- Mouth
- Oropharynx (in continuity with the middle ear via the Eustachian tube)
- Larynx and laryngopharynx.

Features of the paediatric URT



Epidemiology

- In the UK, about one quarter of the population visit their doctor every year due to respiratory infections.
- URTIs make up 95% of these infections.
- Preschool children have six to eight URTIs per year.

Etiology

- Rhinovirus
- Respiratory syncytial virus (RSV)
- Influenza virus A and B
- Metapneumovirus
- Parainfluenza virus
- Adenovirus
- Coronavirus

Common cold

- Common colds are self-limiting viral

illnesses involving the nasal mucosa, and are experienced annually by the majority of

Individuals.

Common cold

- Clinical features Inflammation of the nasal epithelium (rhinitis) leads to a mucous or muco-purulent discharge (coryza).
  - Sneezing
  - Cough
  - Fever

Common cold

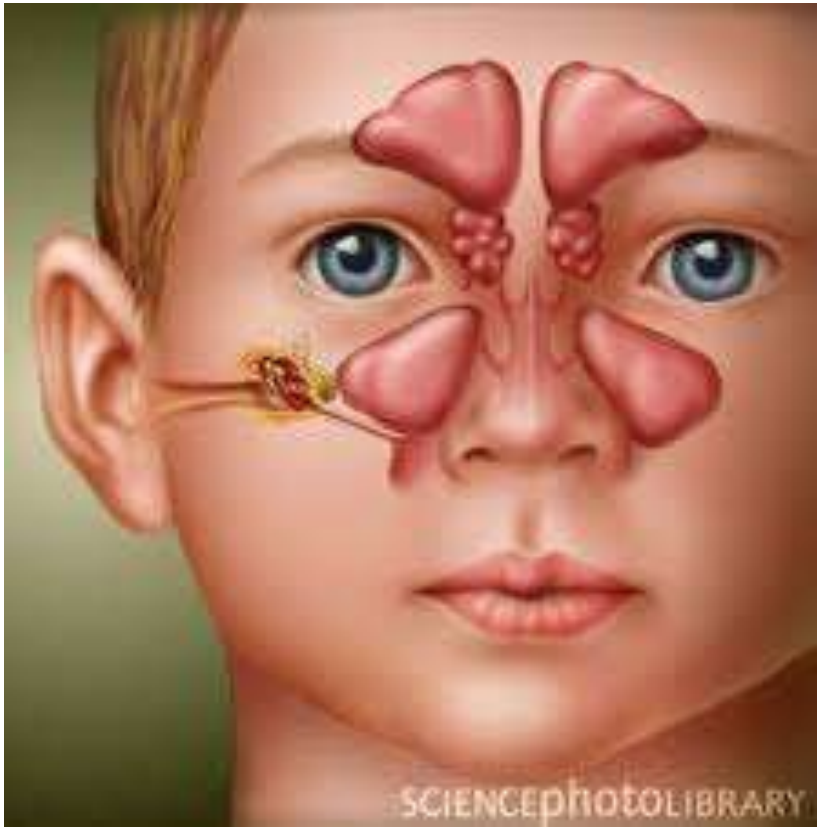
Common cold

- Treatment is supportive
  - Antipyretics
  - Decongestants
  - Saline irrigation
- Analysis of the use of antibiotics for the treatment of common colds shows no benefit in comparison with placebo and an increase in adverse events when antibiotics were prescribed in children and (Arroll et al.,2005).

Rhinosinusitis

- ‘‘Rhinosinusitis’’: infection and inflammation of the sinuses.
- One in every 10 colds in children will go on to cause sinus inflammation.
- The infections are initially viral in aetiology, but the anatomy of the drainage means that bacteria may cause secondary infections in the sinuses.
- Acute rhinosinusitis should be considered when URTI symptoms have exceeded 7–10 days

Rhinosinusitis



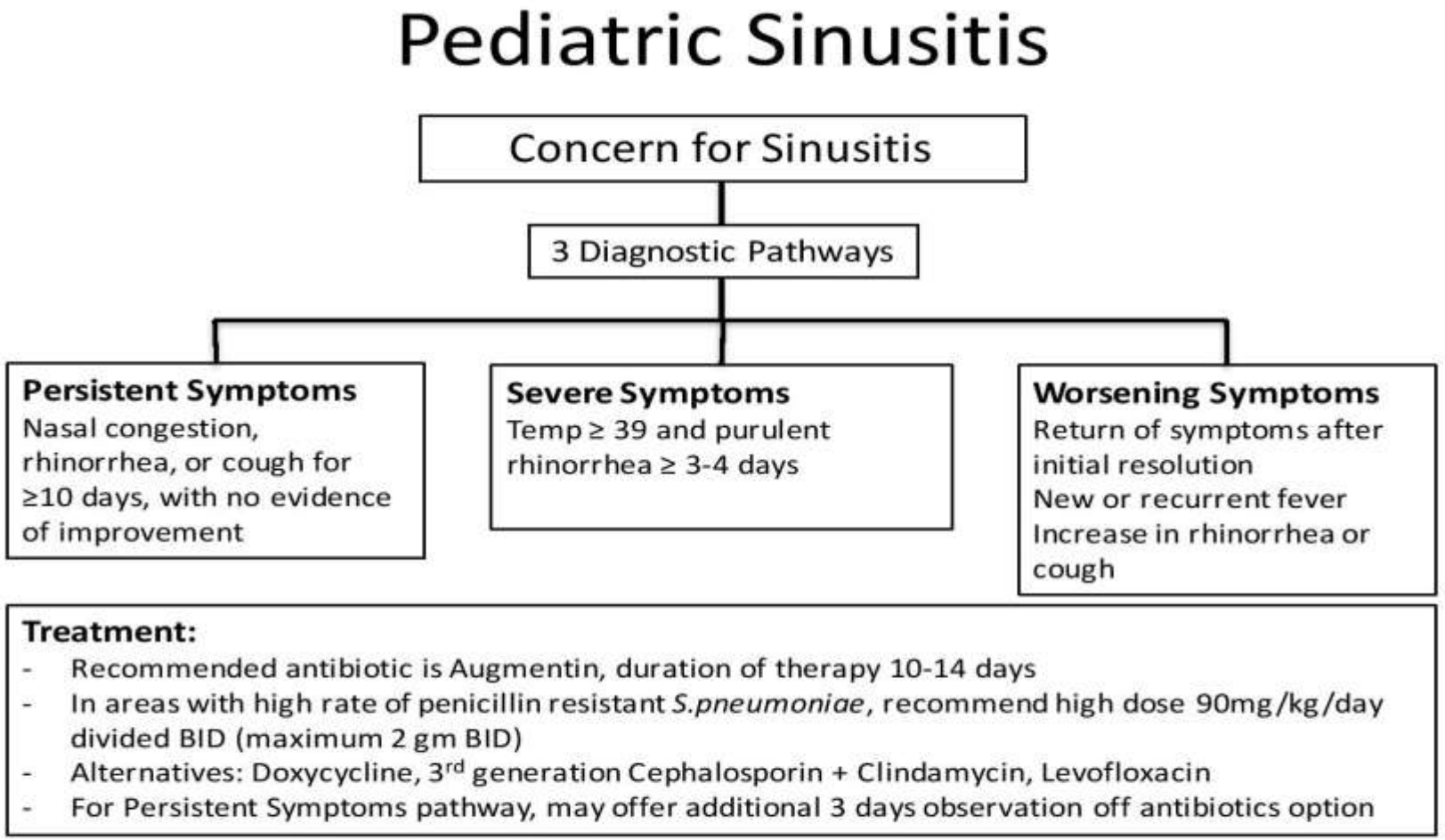
Rhinosinusitis

- Clinical features
  - Similar to the common cold (coryza, cough and fever)
- Older children and young adults may experience facial ‘‘congestion’’ or ‘‘heaviness’’ alongside focal pains.
- The sinuses may be tender if gently percussed.

Rhinosinusitis

- Management
  - Acute rhinosinusitis : nasal decongestants, saline irrigation, antibiotics
  - Chronic rhinosinusitis is less common in children and there may be an indication for adenoidectomy

Rhinosinusitis



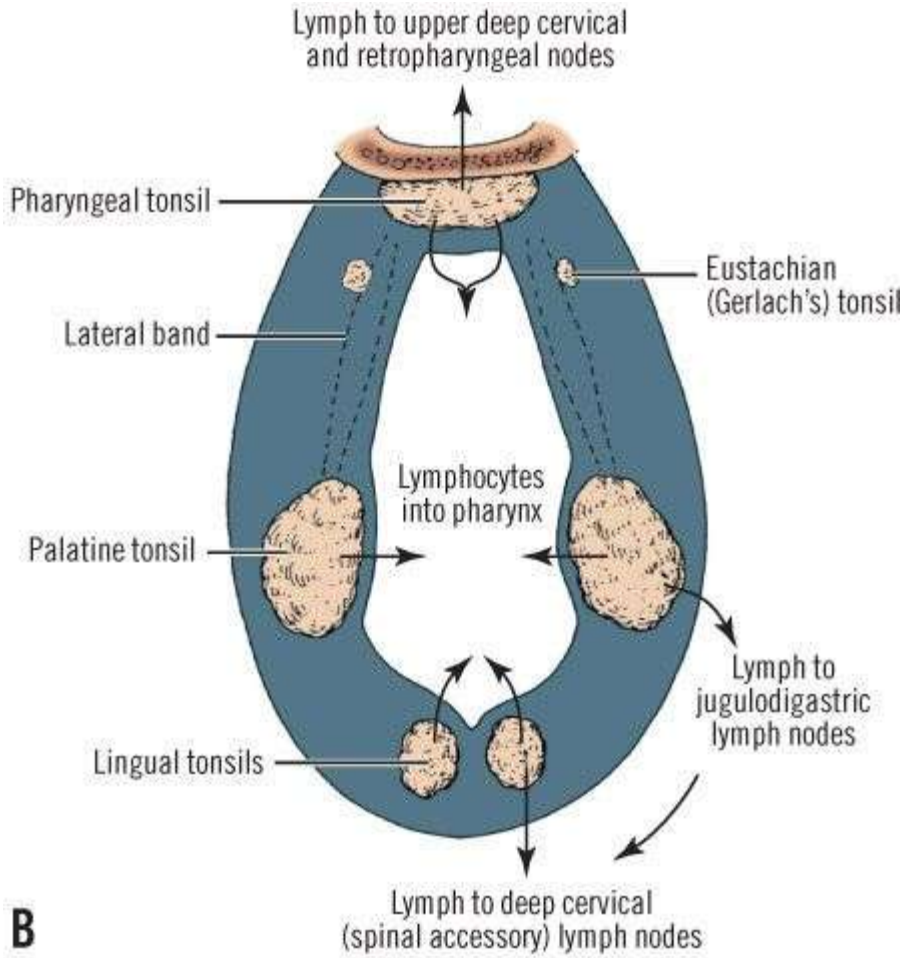
DeMuri GP, Wald ER. Clinical Practice. Acute bacterial sinusitis in children. NEJM. 2012; 367(12): 1128-1134.
Chow AW, Benninger MS, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Disease 2012; 54(8):e72-e112.

Pharyngitis

- Inflammation of the pharynx is predominantly viral in aetiology and may coexist as a common pathology in many URTIs (such as a cold and a sore throat).
- Posterior pharyngeal wall inflammation is observed on depression of the tongue.
- Treatment is supportive with analgesia (oral syrups and topical local anaesthetic sprays) and antipyretics.

Acute tonsillitis

- Waldeyer's ring of lymphoid tissue includes the tonsils, adenoids and lymphoid aggregates in the pharynx, at the base of the tongue and in the pharyngeal walls.



Acute tonsillitis

- Tonsillitis is inflammation of the palatine tonsils, and is most common in children between the ages of 3 to 9 years, after which age tonsillar regression occurs.
- Tonsillitis may occur secondary to both viral and bacterial infections.
- The common bacterial pathogens include group A Streptococcus, Staphylococcus aureus and Streptococcus pneumoniae.

Acute tonsillitis

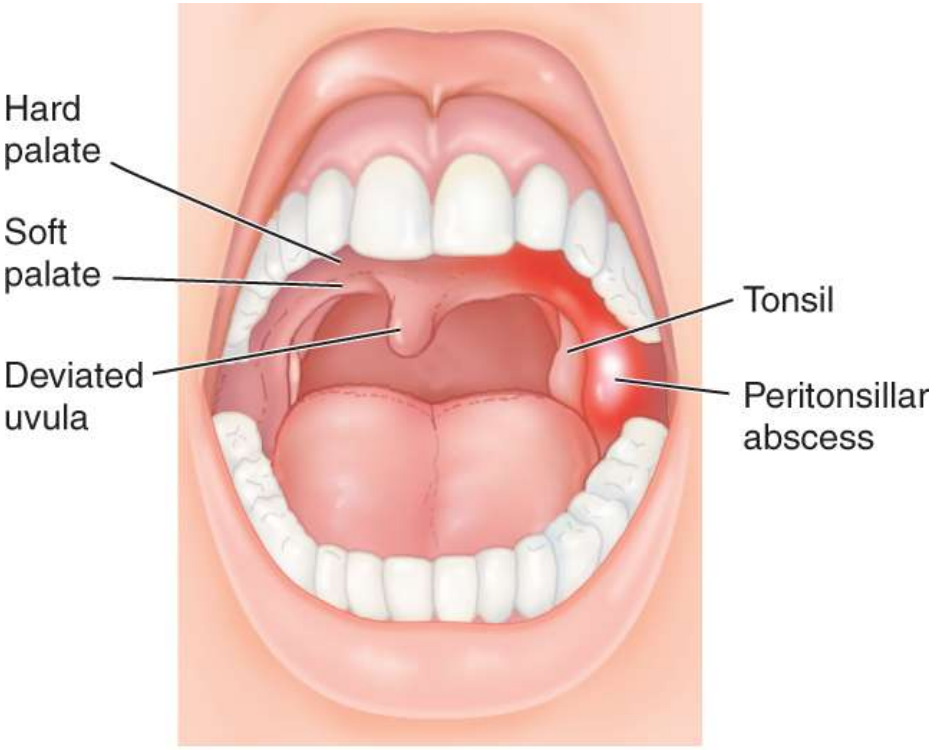
- Clinical presentation
  - Younger children: nonspecific features of fever, poor feeding, coryza, irritability, vomiting and diarrhoea.
  - Older children and young adults: similar symptoms plus localising throat pain, especially on eating or drinking. Local lymph nodes may be enlarged.

Acute tonsillitis

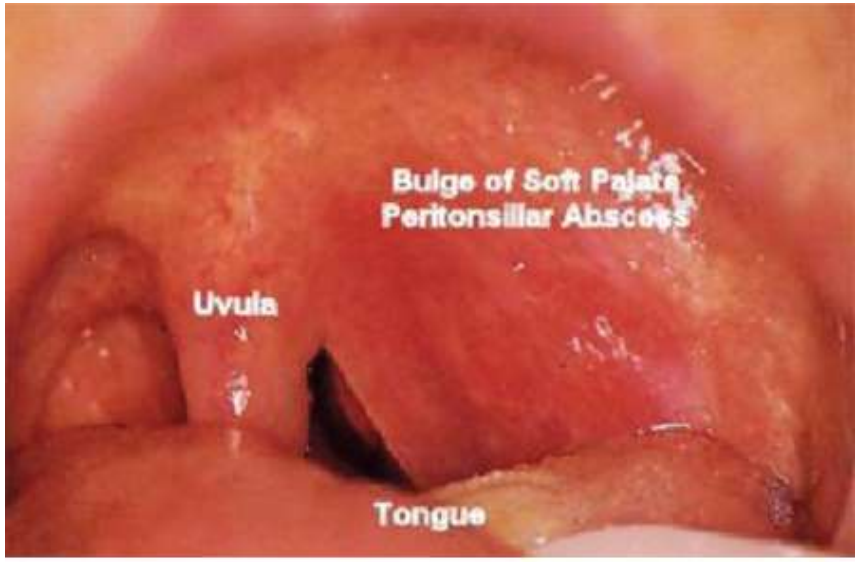
Acute tonsillitis

- Complications:
  - Peritonsillar abscess: a unilateral purulent collection in the peritonsillar fossa. Presents with pyrexia, ipsilateral otalgia (ear pain), odynophagia (pain on swallowing) and often trismus (pain on opening the jaw). Examination shows a deviated uvula and swelling of the soft palate.
  - Retropharyngeal abscess: fever, stiff neck, dysphagia and other symptoms related to inflammation or obstruction of the upper aerodigestive tract.
  - Rheumatic fever and glomerulonephritis

Acute tonsillitis

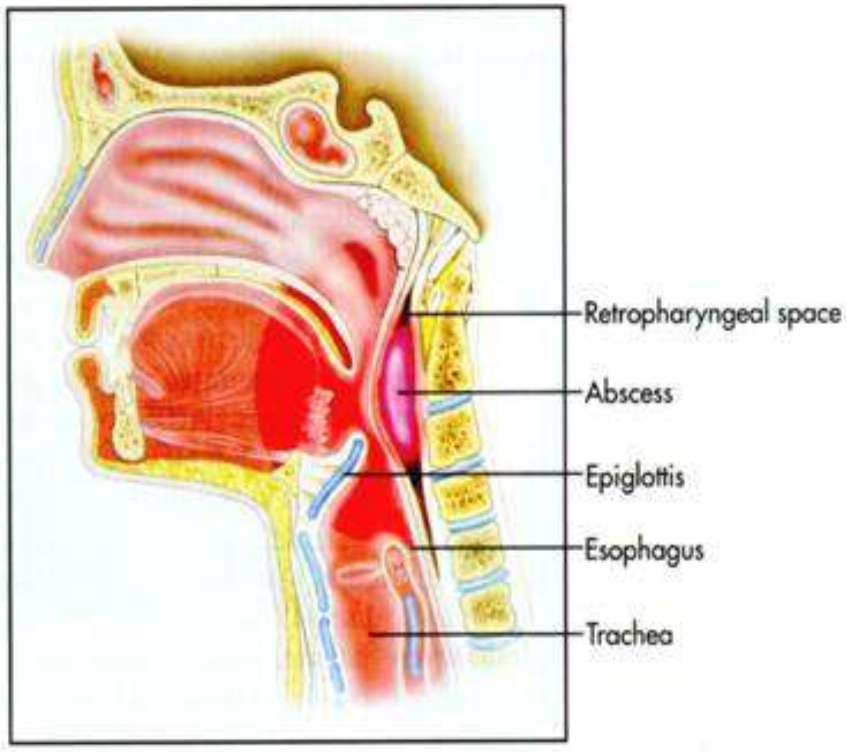


Source: Reichman EF: *Emergency Medicine Procedures, Second Edition:* www.accessemergencymedicine.com



Source: Samir S. Shah, Alex R. Kemper, Adam J. Ratner: Pediatric Infectious Diseases: Essentials for Practice, Second Edition

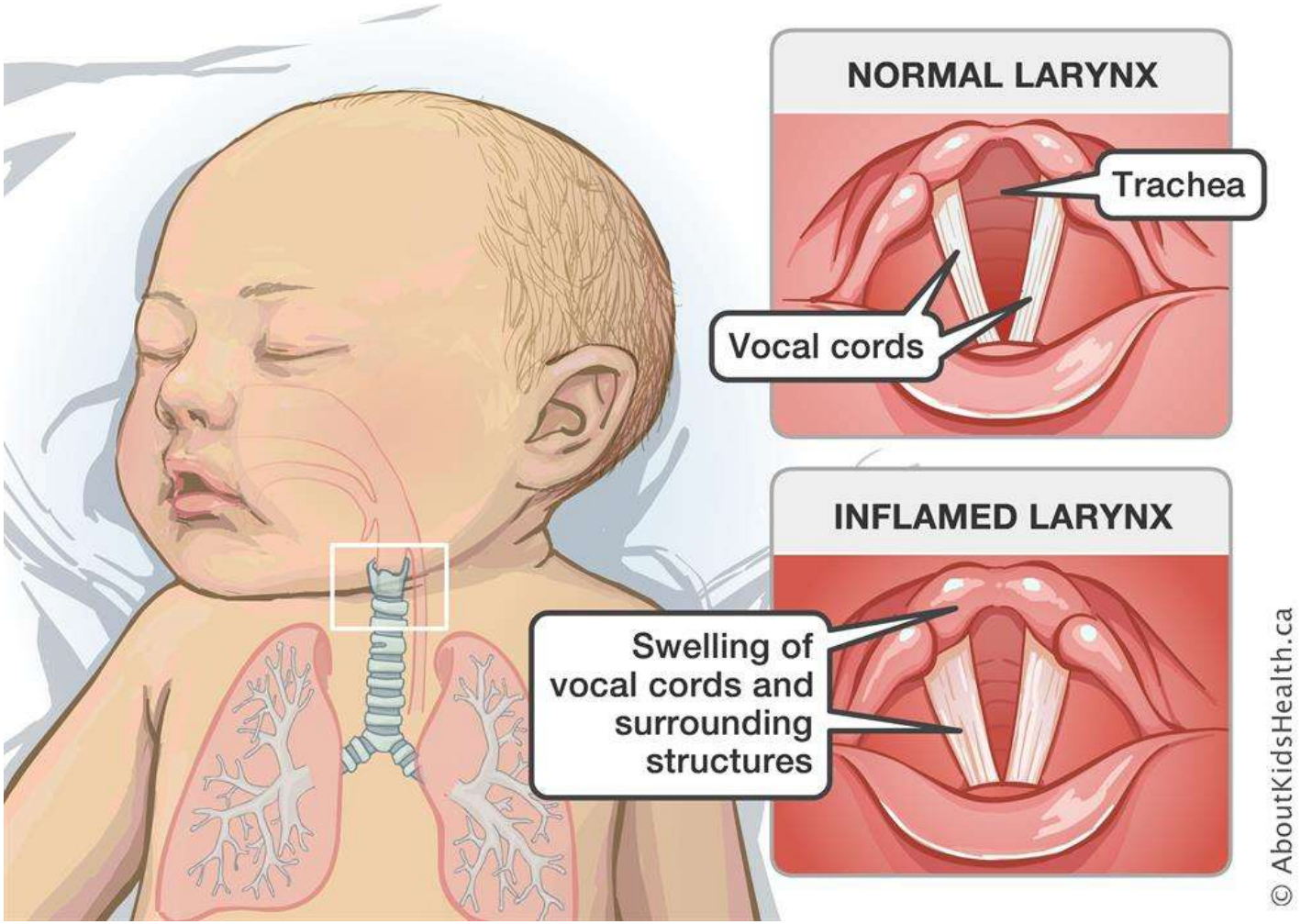
Acute tonsillitis



Croup (laryngotracheobronchitis)

- Viral infection of the larynx and adjacent structures
- The common causative organisms are rhinovirus, respiratory syncytial virus (RSV) and parainfluenza 1 and 2.

Croup (laryngotracheobronchitis)



Croup (laryngotracheobronchitis)

- Clinical features:
  - Rhinitis as the upper airway is infected first
  - Barking cough
  - Inspiratory stridor usually occurs over 6–12 hours.
- Sudden onset of stridor should prompt consideration of an inhaled foreign body or anaphylaxis.

Croup (laryngotracheobronchitis)

Croup (laryngotracheobronchitis)

- Treatment:
  - Keep the child as relaxed as possible as anxiety (e.g. from unwelcome or unwarranted interventions) may worsen airflow.
  - Steroids reduce vocal cord oedema, facilitating respiration. They can be nebulised or delivered orally.
  - More severely affected children may gain temporary benefit from nebulised epinephrine, with doses repeated as necessary due to the short half-life.

Whooping cough (pertussis)

- Etiology: Bordetella pertussis
- Clinical features:
  - Starts with fever and nasal discharge
  - At this stage the infant is highly infectious to non Immune close contacts
  - Classic, paroxysmal cough that lasts for weeks or months: ‘‘the hundred-day cough’’(China)
  - There may also be episodes of cyanosis, apnoea or bradycardia in infants.
  - The cough may occasionally result in petechiae, subconjunctival haemorrhages, and even pneumothoraces.

Whooping cough (pertussis)

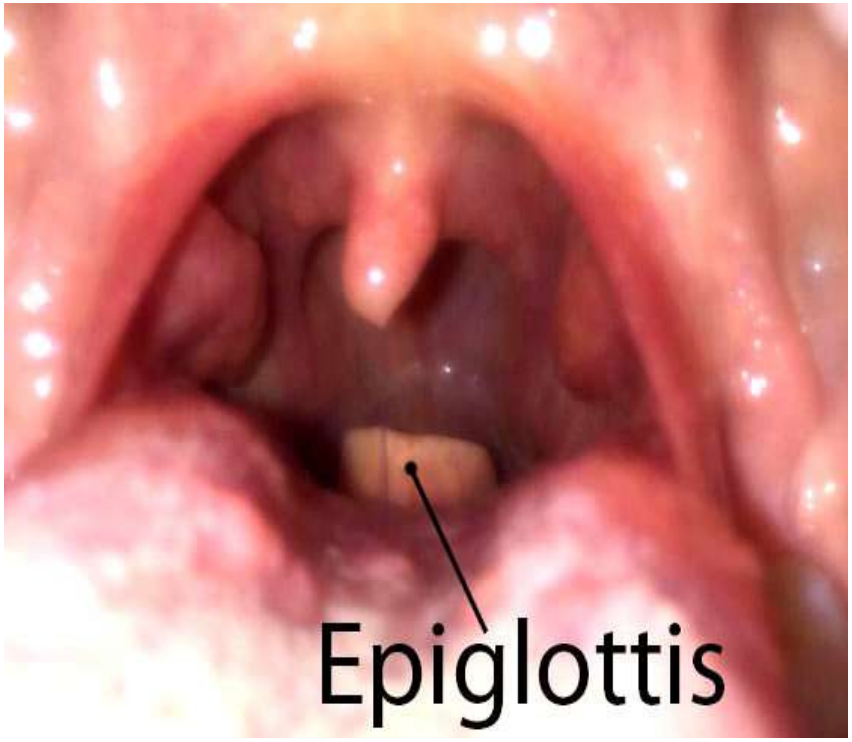
Whooping cough (pertussis)

- Diagnosis
  - Clinical presentation
  - Pernasal swab or PCR of nasopharyngeal aspirate
- Treatment
  - Macrolide antibiotic
  - Supportive treatment

Epiglottitis

- Severe swelling of the epiglottis that leads to airway obstruction
- Etiology: Haemophilus influenzae type b (Hib)
- Since the introduction of the conjugate Hib vaccine, the incidence of epiglottitis has fallen considerably.

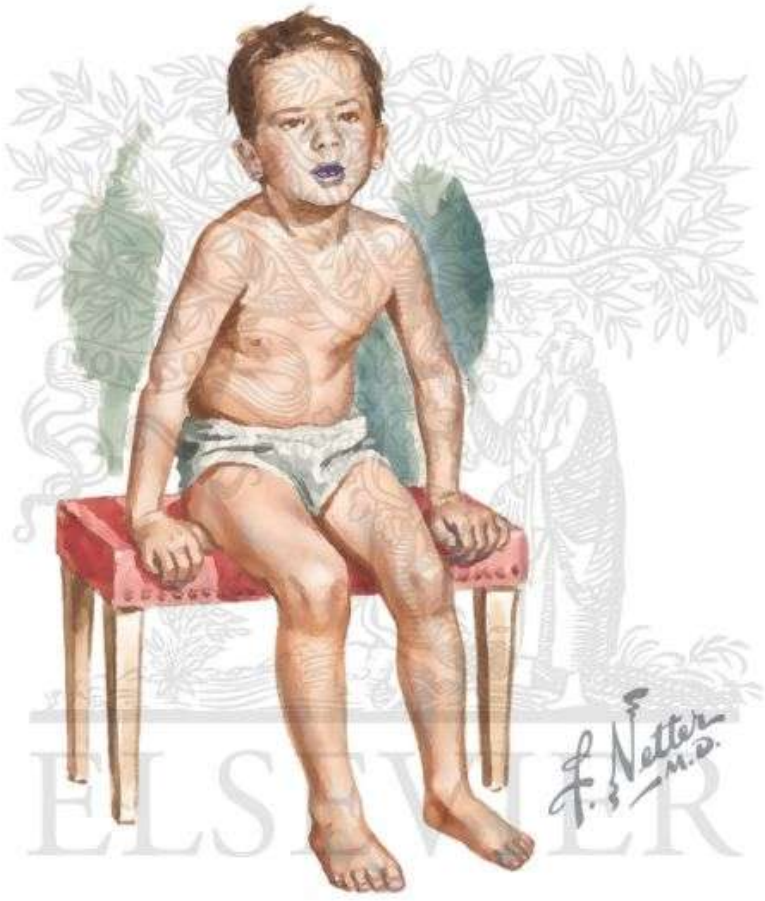
Epiglottitis



Epiglottitis

- Clinical features
  - Severe airway obstruction (fever, cough, stridor and recessions)
  - Rapid onset - over hours
  - Toxic-appearing child, without a clear viral prodrome.
  - The child sits upright with the head held forwards to extend the neck and hold the larynx open.
  - As airflow obstruction progresses, breathing becomes quieter and the child may become cyanosed with decreasing consciousness.
  - The epiglottis typically appears swollen and ‘‘cherry-red’’ in appearance.

Epiglottitis



Epiglottitis

- Treatment
  - Suspected epiglottitis is an airway emergency and children should be managed in co-operation with anaesthetic and otolaryngology teams.
  - Examination of the throat may precipitate acute obstruction (via distress causing laryngospasm) and should be avoided.
  - Fluid resuscitation
  - Antibiotics: third or fourth generation cephalosporin.
  - Intravenous access should only be obtained once the airway is secure.

Epiglottitis

EPIGLOTTITIS

A • Airway Inflammation → Obstruction
I • Increased Pulse
R • Restlessness

R • Retractions
A • Anxiety Increased
I • Inspiratory Stridor
D • Drooling

TREATMENT:

- ↓ Anxiety
- Don't Examine Throat ~~Tongue Blade~~
- Position For Comfort
- Trach Tray or Endotracheal Tube Available
- Cool Mist Humidification
- Oxygen
- No Oral Fluids
- IV Fluids

Bacterial tracheitis

- The most common, although still rare, URTI cause of respiratory failure in children (Hopkins et al., 2006).
- Etiology: S. aureus, S. pneumoniae and Streptococcus pyogenes
- Pathogenesis: oedema and purulent exudates in the trachea. There may be pseudomembrane formation.

Bacterial tracheitis

- Clinical features
  - Fever, cough, hoarseness, stridor and recessions.
- Diagnosis is usually made at bronchoscopy
- Treatment
  - Admission to intensive care
  - Intubation
  - Antibiotic therapy
  - Aspiration of exudates and breakdown of membranes may be performed at bronchoscopy.

Bacterial tracheitis

Epiglottitis vs. Croup vs. Bacterial tracheitis

	Epiglottitis	Croup	Bacterial Tracheitis
Anatomy	Supraglottic	Subglottic	Tracheal lumen
Etiology	Bacterial	Viral	Bacterial
Age Range	3-7 years, adults	6months-3 years	3weeks-16 yrs
Onset	6-24 hours	2-3 days	1-3 days
Toxicity	Marked	Mild to moderate	Mild- marked
Drooling	Frequent	Absent	Absent
Cough	Unusual	Frequent	Frequent
Hoarseness	Unusual	Frequent	Frequent
WBC	Leukocytosis	Normal	Leukocytosis

Bronchiolitis in children

Definition

- Lower respiratory tract infection that affects mainly the smallest airways – bronchioles.
- Infants between 2 to 6 months

Etiology

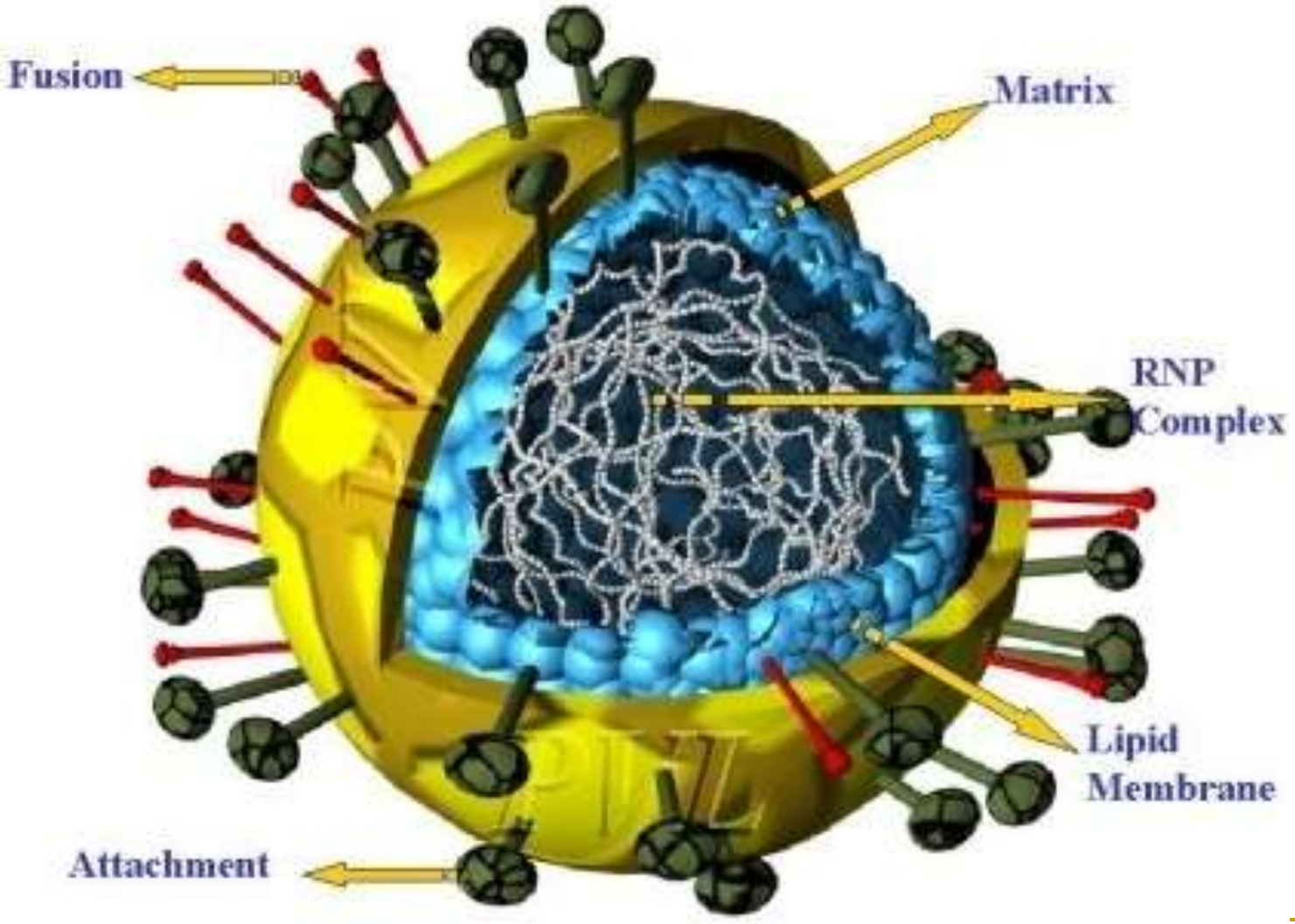
- Respiratory syncytial virus (RSV):

  50–90 %
- Human metapneumovirus (hMPV) - the second most common cause
- Adenovirus
- Parainfluenza virus

Etiology

- Other less common causes include:
  - *Mycoplasma pneumoniae*
  - Enterovirus
  - Influenza virus
  - Rhinovirus
  - *Chlamydophila pneumoniae*

Etiology



Epidemiology

- Peak incidence of RSV infections is in the winter months (November to March).
- Prevalence may be higher in urban areas.
- By their first birthday over 60% of children have been infected and, by 2 years of age, over 80%.
- The antibodies that develop following early childhood infection do not prevent further RSV infections throughout life.

Risk factors

- Environmental and social risk factors:
  - Older siblings
  - Nursery attendance
  - Passive smoke, particularly maternal
  - Overcrowding

Risk factors

- Risk factors for severe disease and/or complications:
  - Prematurity (<37 weeks)
  - Low birth weight
  - Age less than 12 weeks
  - Chronic lung disease (eg, cystic fibrosis, bronchopulmonary dysplasia)
  - Congenital heart disease

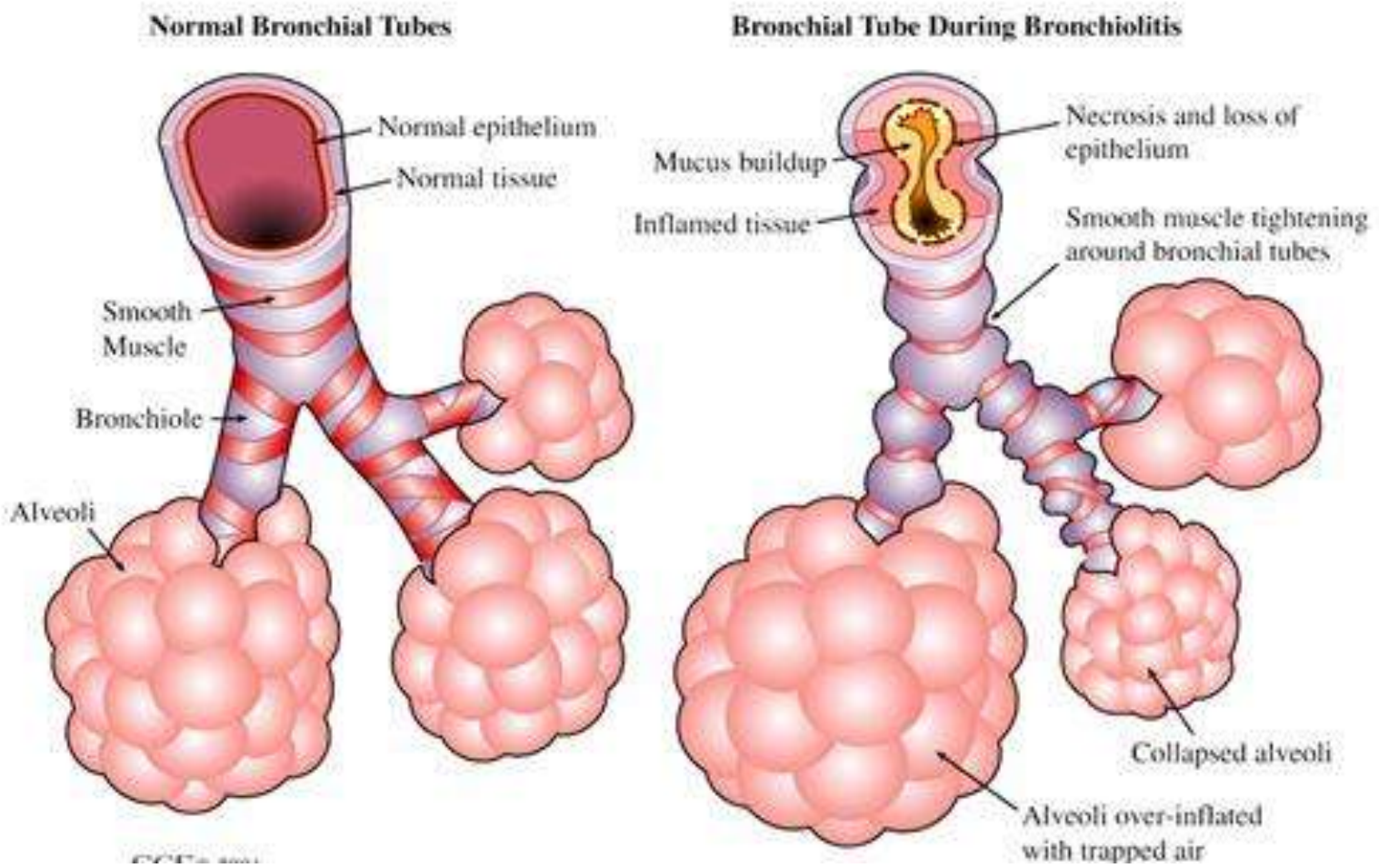
Risk factors for severe disease :

- Neurological disease with hypotonia and pharyngeal dis-co-ordination
- Epilepsy
- Insulin-dependent diabetes
- Immunocompromise
- Congenital defects of the airways
- Down's syndrome

Pathophisiology

- Bronchioles are small airways (< 2 mm in diameter) and lack cartilage and submucosal glands.
- The effects of bronchiolar injury include the following:
  - Increased mucus secretion
  - Bronchial obstruction and constriction
  - Alveolar cell death, mucus debris
  - Air trapping
  - Atelectasis
  - Reduced ventilation that leads to ventilation-perfusion mismatch
  - Labored breathing

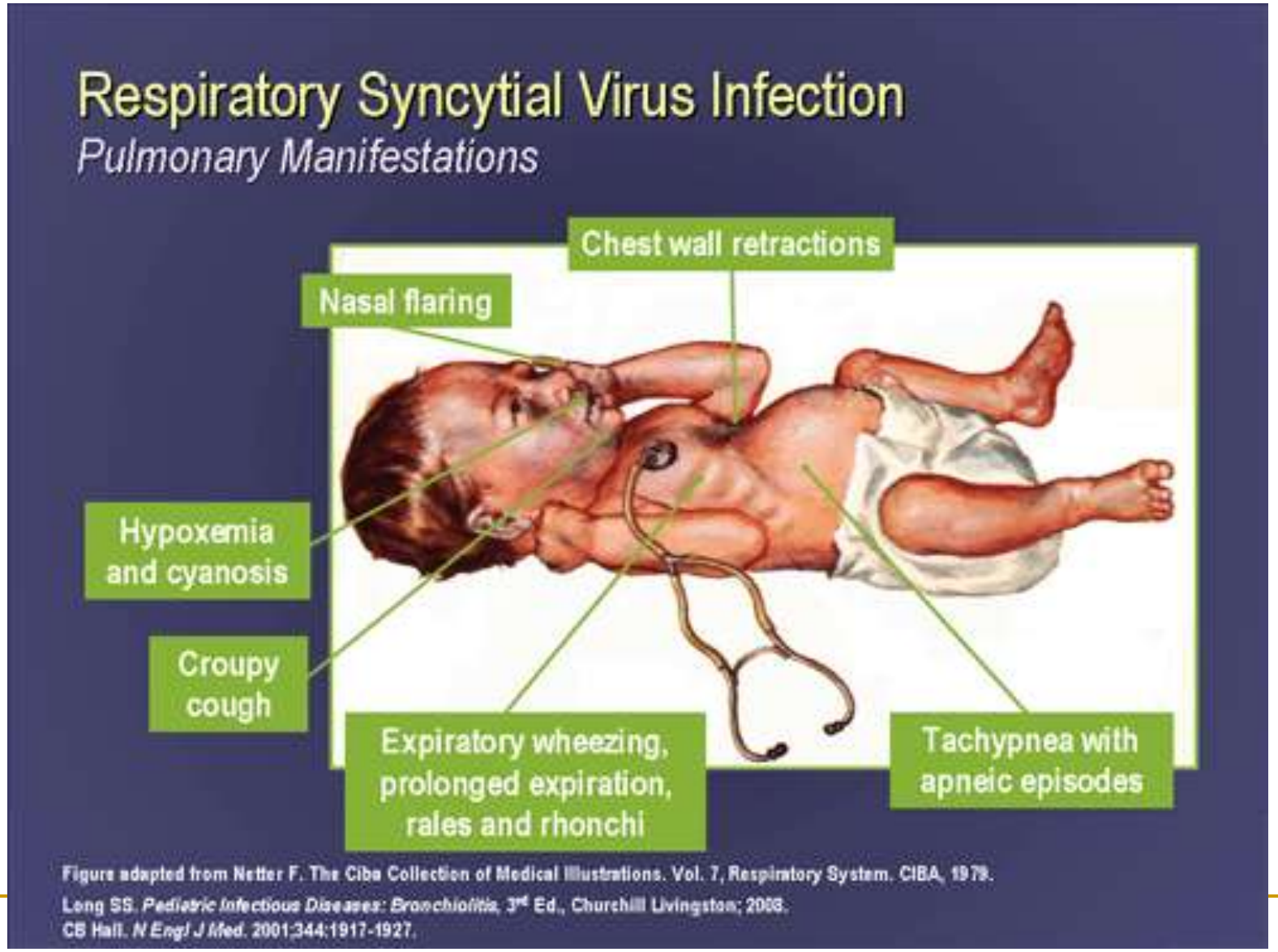
Pathophisiology



Presentation

- Tachypnea
- Tachycardia
- Fever
- Cyanosis
- Signs of dehydration
- Dyspnea
- Apnea
- Crackles
- Wheezing
- Hyperinflation of the lungs.

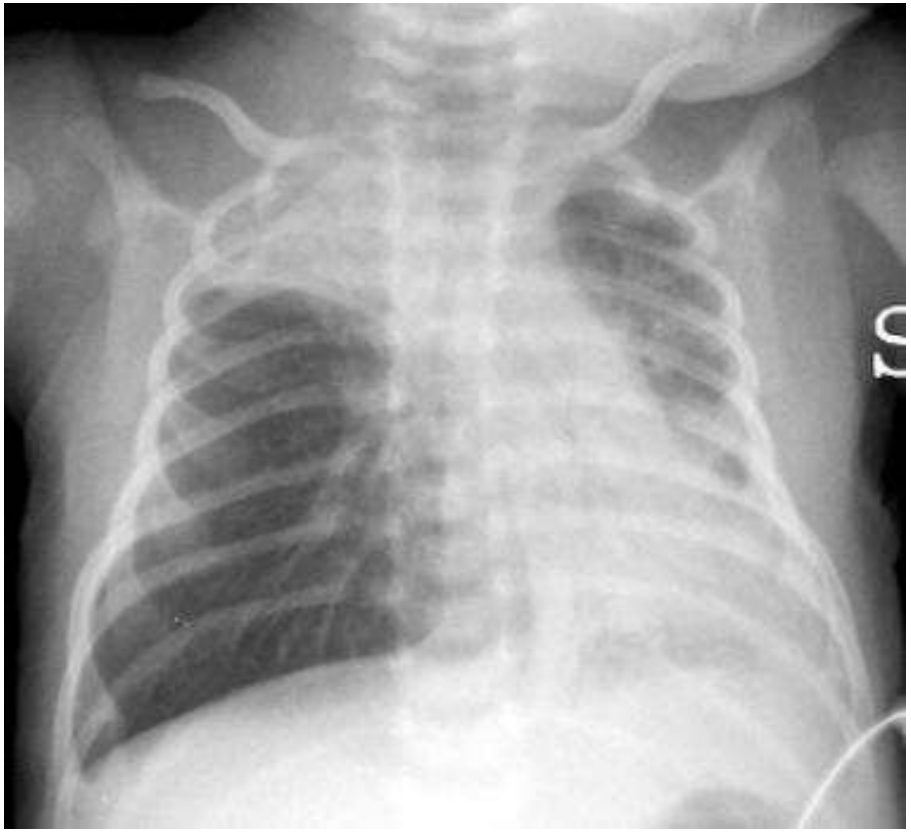
Presentation



Diagnosis

- Clinical presentation
- CX –ray
  - Nonspecific hyperinflation and patchy infiltrates
  - Focal atelectasis
  - Air trapping
  - Flattened diaphragm
  - Increased anteroposterior diameter

Diagnosis



https://www.studyblue.com/notes/note/n/microbioid-part-2/deck/1562247

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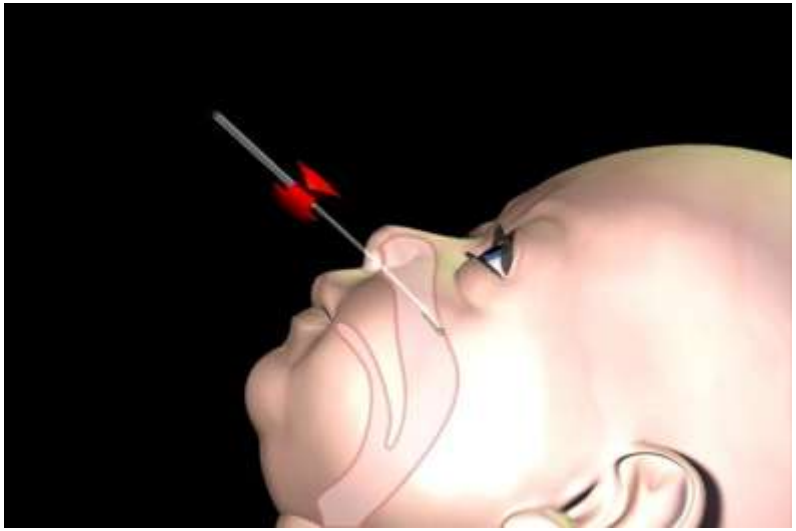
Diagnosis

- Nasopharyngeal aspirate:
  - RSV rapid testing
  - Viral cultures for RSV, influenza A and B, parainfluenza and adenovirus



Differential diagnosis

- Asthma
- Bronchitis
- Pulmonary edema
- Foreign body aspiration
- Pneumonia
- Gastro - esophageal reflux
- Aspiration
- Cystic fibrosis
- Kartagener's syndrome (PCD)
- Tracheomalacia/ bronchomalacia
- Pneumothorax

Treatment

- **Primary care**
  - Most infants with acute bronchiolitis will have mild, self-limiting illness and can be managed at home.
  - Supportive measures: fluid input, nutrition and temperature control.
  - For the majority, bronchiolitis lasts 7-10 days, with 50% asymptomatic by two weeks and only a small subgroup still symptomatic at four weeks.

Treatment

- Hospital referral is suggested where there is:
  - Poor feeding (<50% usual intake over the previous 24 hours) which is inadequate to maintain hydration
  - Lethargy
  - History of apnea
  - Respiratory rate >70 breaths/minute
  - Nasal flaring or grunting
  - Severe chest wall recession
  - Cyanosis
  - Saturations ≤ 94%
  - Uncertainty regarding diagnosis
  - Where home care or rapid review cannot be assured
  - The threshold for admission should be lower in those with significant comorbidities, premature infants and those under 3 months old.

Treatment

Treatment

- Supportive: oxygen and nasogastric feeding where necessary.
- Bronchodilators: modest short-term improvement
- Corticosteroids
- Antibiotics: if there is evidence for bacterial infection
- Ribavirin

Treatment

Prognosis

- Most children with bronchiolitis make a full recovery.
- Most deaths occur in infants younger than 6 months or in those with underlying cardiac or pulmonary disease.
- There is an association between bronchiolitis and subsequent reactive airways disease - approximately 34-50% wheeze following bronchiolitis.
- The underlying mechanism by which RSV or other agents, such as rhinovirus, cause reactive airways disease is unknown.

Prevention

- **Immunoprophylaxis**
  - RSV immunoglobulin (RSV-Ig) palivizumab, a monoclonal antibody.
  - It has been shown to reduce RSV-related hospitalisation and intensive care admissions significantly.

Prevention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Prevention

- It should be used by those at high risk of severe RSV disease:
  - Children aged under 2 years with chronic lung disease, who have required at least 28 days of supplemental oxygen from birth.
  - Infants less than 6 months old with a left-to-right shunt, hemodynamically significant congenital heart disease or pulmonary hypertension.
  - Children aged under 2 years with severe congenital immunodeficiency.