RESPIRTORY INFECTIONS

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Upper Respiratory Diseases

Common Cold

- A viral infection with prominent symptoms of **rhinorrhea** and **nasal obstruction**.
- Absent or mild fever, and no other systemic manifestations.
- It usually involves the sinus mucosa and termed as **rhinosinusitis**.
- Children in out-of-home day care during the first year of life have 50% more colds than children cared for at home only. This difference diminishes during subsequent years in day care.
- **Etiology:**
  - The viruses primarily associated with colds are rhinoviruses
  - Less commonly, coronaviruses.
- **Diagnosis:**
  - Laboratory studies often are not helpful.
  - A nasal smear for eosinophils may be useful in the evaluation for allergic rhinitis.
- **Treatment:**
  - There is no specific therapy for the common cold.
  - Antibacterial therapy is not beneficial.
  - Management consists of symptomatic therapies.
- **Complications and prognosis:**
  - Otitis media is the most common complication and occurs in 5% to 20% of children with common cold.
  - Bacterial sinusitis, which should be considered if **rhinorrhea** or **day time cough persists without improvement for at least 10 to 14 days** or if **severe signs of sinus involvement develop**, such as fever, facial pain, or facial swelling.
  - Colds may lead to exacerbation of asthma.
  - May result in inappropriate antibiotic treatment.

Sinusitis

- Inflammation of any sinus due to obstruction of the drainage of the sinus.
- Most common sinus: Maxillary Sinus.
- Could be Viral or bacterial.
  - M.C Viral Causes: Rhinovirus – influenza –Parainfluenza
  - M.C Bacterial Causes: S. pneumoniae - non typeable H.Inflenzae - M catarrhalis
  - Nasogastric and nasotracheal tubes predispose to nosocomial sinusitis, which may be caused by gram-negative bacteria (Klebsiella or Pseudomonas).
- **Clinical Picture:**
  - Nasal discharge and Pain
  - Headache

- Congestion

- **The common cold** is the major predisposing factor for developing sinusitis at all ages. Other risk factors include allergy, cystic fibrosis, immunodeficiency, human immunodeficiency virus (HIV) infection, etc.
- **Diagnosis:**
  - It is diagnosed clinically.
  - Sinus aspirate culture is the most accurate diagnostic method but is not practical or necessary in immunocompetent patients.
  - CT if needed.
- **Treatment:**
  - Supportively if the cause is viral
  - Amoxicillin-clavulanate for 10 to 14 days is recommended as first line therapy if the cause is bacterial.
  - More than half of children with acute bacterial sinusitis recover without any antimicrobial therapy.
  - Fever and nasal discharge should improve dramatically within 48 hours of initiating treatment.
- **Complications:**
  - Orbital cellulitis
  - Epidural or subdural empyema
  - Brain abscess
  - Dural venous sinus thrombosis
  - Osteomyelitis of the outer or inner table of the frontal sinus (Pott puffy tumor)
  - Meningitis

***These all should be managed with sinus drainage and broad-spectrum parenteral antibiotics.**

Pharyngitis & Tonsillitis

- Inflammation of the Pharynx (Pharyngitis), Tonsils (Tonsillitis) or both (Pharyngotonsillitis).
- Could be Viral or bacterial (Viral is more common).
- M.C Bacterial Causes: group A Hemolytic streptococcus (S. Pyogenes).
- Some viruses, such as **adenoviruses**, are more likely than others to cause pharyngitis as a prominent symptom.
- **Clinical picture:**
  - Cough (Only in Viral)
  - Runny nose
  - Eye discharge
  - Sore throat

- Fever
- Exudate
- Lymphadenopathy
- Stigmata of scarlet fever
- Compared with classic streptococcal pharyngitis, the onset of viral pharyngitis is typically more gradual.

- **Diagnosis:**
  - Clinically diagnosed
  - Rapid strep antigen testing
  - Throat culture, to distinguish viral from bacterial

***Throat culture is the diagnostic gold standard for establishing the presence of streptococcal pharyngitis. As many as 20% of positive cultures in children during winter months reflect streptococcal carriers and not acute pharyngitis.**

- **Treatment:**
  - If bacterial: **Cephalosporins** have superior pharyngeal bacterial eradication rates compared to penicillin.
  - If viral supportive therapy.
  - The major benefit of antimicrobial therapy is **prevention of acute rheumatic fever** (see the criteria below).
  - Antibiotic therapy should be started promptly in children with:
    i. A positive rapid test for group A streptococcus
    ii. Scarlet fever
    iii. Symptomatic pharyngitis whose sibling has documented streptococcal pharyngitis
    iv. A past history of rheumatic fever or a recent family history of rheumatic fever
    v. Symptomatic pharyngitis and living in an area experiencing an epidemic of acute rheumatic fever or poststreptococcal glomerulonephritis.
- **Complications and prognosis:**
  - Para-pharyngeal abscess
  - Infections of the deep fascial spaces of the neck
  - Acute rheumatic fever
  - Acute post infectious glomerulonephritis
  - Viral respiratory tract infections may predispose to bacterial middle ear infections
- **Indications for tonsillectomy:**
  - More than six episodes of streptococcal pharyngitis (confirmed by positive culture) in one year.
  - Five episodes of streptococcal pharyngitis in 2 consecutive years.
  - Three or more infections of the tonsils and/or adenoids per year for 3 years in a row despite adequate medical therapy.
  - Chronic or recurrent tonsillitis associated with the streptococcal.
  - Carrier state that has not responded to beta lactamase resistant antibiotics.

Jones Criteria for Rheumatic Fever

Major Criteria	Minor Criteria
Pancarditis (pericarditis, endocarditis, myocarditis)	Fever
Polyarthritis	Arthralgia

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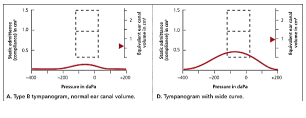
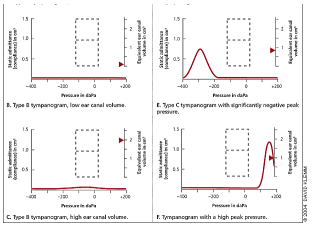
Sydenham Chorea	Prolonged PR interval
Subcutaneous Nodules	Increased ESR or CRP*
Erythema marginatum	Leukocytosis

*Erythrocyte sedimentation rate or c-reactive protein
**Two major or 1 major and 2 minor must be present to diagnose rheumatic fever

Otitis Media

- Inflammation in the middle ear.
- Could be bacterial or viral:
  - Most Common organism is: S. pneumoniae.
  - H. influenzae and Moraxella catarrhalis are common too.
  - Viruses including: rhinoviruses, influenza, and respiratory syncytial virus.
- **Recurrent OM:**
  - Is defined by the presence of **six or more acute OM episodes in the first 6 years of life.**
  - At least 12% of children in the general population have recurrent OM and would be considered otitis-prone.
  - Craniofacial anomalies and immunodeficiencies often are associated with recurrent OM.
- **Clinical Picture:**
  - In infants:
    - Poor feeding
    - Irritability
    - Fever
  - In older children:
    - Redness
    - Fever
    - Otalgia (acute ear pain)
    - Otorrhea (ear drainage) after spontaneous rupture of the tympanic membrane
    - Signs of common cold, which predisposes to acute OM, are often present
    - Bulging in the tympanic membrane, air fluid level, or visualization of purulent material by **otoscopy** are reliable signs of infection.
- **Diagnosis:**
  - **Pneumatic otoscopy** allows evaluation of ventilation of the middle ear and is a standard for clinical diagnosis.
  - **Tympanometry** provides objective acoustic measurements of the tympanic membrane-middle ear system by reflection or absorption of **sound energy** from the external ear duct as pressure in the duct is varied.
  - Measurements of the resulting **tympanogram** correlate well with the presence or absence of middle ear effusion.
  - **Tympanocentesis** and middle ear exudate culture are not always necessary, but they are required for accurate identification of bacterial patho-gens and may be useful in neonates, immunocompromised patients, and patients not responding to therapy.





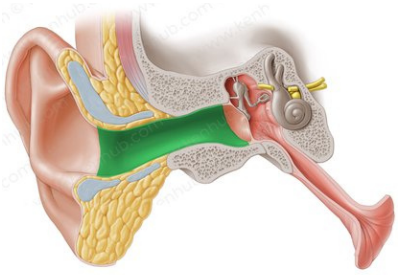
- **Complications and Prognosis:**
  - Chronic effusion
  - Hearing loss
  - Cholesteatoma (mass-like keratinized epithelial growth)
  - Petrositis
  - Intracranial extension (brain abscess, subdural empyema, or venous thrombosis)
  - Mastoiditis

***OM with effusion (chronic OM) is the most frequent sequela of acute OM and occurs most frequently in the first 2 years of life.**

- **Management:**
  - Antibiotic is not needed for all cases.
  - Use symptomatic treatment for all.
  - Antibiotic Indications:
    - Children <2 years
    - Toxic Child
    - Otalgia for more than 48 hours
    - Temperature ≥ 39˚C in the past 48 hours
    - Bilateral Otitis Media
    - Otorrhea
    - Can't be followed up
  - Antibiotic of choice: **HIGH DOSE OF AMOXICILLIN**, to overcome resistant streptococcus pneumonia.
  - High dose amoxicillin + clavulanate or third generation cephalosporins is the recommended second line therapy in case of Failure of initial therapy with amoxicillin at 3 days.
  - Acetaminophen and ibuprofen are recommended for fever.
  - Macrolides (azithromycin or erythromycin) or lincozamide (clindamycin) are used in patients with penicillin allergy.
  - In case of TM perforation, Small perforations go back to normal without any intervention, but if it is large, we can help by doing **myringoplasty (**surgical repair of a perforated ear drum with a tissue graft).

Otitis Externa

- Otitis externa, also known as swimmer's ear, is defined by inflammation and exudation in the external auditory canal, the auricle, or both, in the absence of other disorders, such as otitis media or mastoiditis.

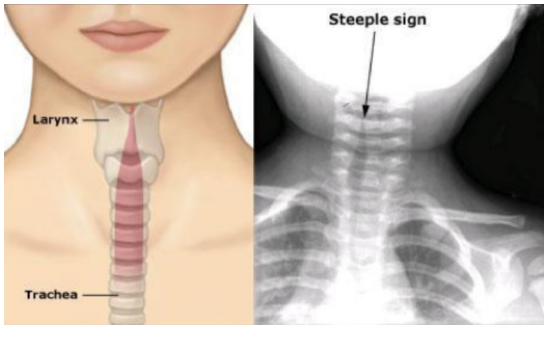


- **The most common bacterial pathogens are:**
  - Pseudomonas aeruginosa, especially in association with swimming in pools or lakes.
  - Staphylococcus aureus.
- **Malignant otitis externa** is caused by P.aeruginosa in immunocompromised patients and adults with diabetes.
- Otitis externa cases peak in summer, in contrast to otitis media.
- **Clinical presentation:**
  - **Pain, tenderness, and aural discharge** are the characteristic clinical findings of otitis externa.
  - Fever is notably absent, and hearing is not affected.
  - Inspection usually reveals that the lining of the auditory canal is inflamed with mild to severe erythema and edema.
  - Scant to copious discharge from the auditory canal may obscure the tympanic membrane.
  - The most common symptoms of **malignant otitis externa** are similar, but **facial nerve palsy** occasionally occurs.
- **Diagnosis:**
  - The diagnosis of uncomplicated otitis externa usually is established solely on the basis of the clinical symptoms and physical examination.
  - In **malignant otitis externa**, an elevated **erythrocyte sedimentation rate** is a constant finding.
  - Cultures are required to identify the etiologic agent, which is usually P. aeruginosa, and the antimicrobial susceptibility.
- **Treatment:**
  - Topical antimicrobial/corticosteroid.
  - Aminoglycosides such as neomycin should be **avoided** in cases of tympanic membrane rupture due to their ototoxicity.
  - It is important with any topical therapy to remove purulent discharge from the external auditory canal with a swab or with suction.
  - Excess water should be removed after bathing and the ear canal dried using a hair dryer.
  - The predisposing activity, such as swimming or diving, should be avoided until the inflammation has resolved.
  - In most cases of fungal otitis externa, local therapy and restoration of normal pH as recommended for bacterial otitis externa are sufficient.
  - Malignant otitis externa is treated by parenteral antimicrobials with activity against P. aeruginosa, such as an expanded-spectrum penicillin (mezlocillin, piperacillin-tazobactam) or a cephalosporin with activity against P.aeruginosa (ceftazi-dime, cefepime) plus an aminoglycoside.
- **Complications and Prognosis:**

- Acute otitis externa usually resolves promptly without complications within 1 to 2 days of initiating treatment.
- Complications of malignant otitis externa include invasion of the bones of the base of the skull, which may cause cranial nerve palsies.

Croup

- Inflammation of the larynx, Trachea and proximalbronchi (Laryngeotracheobronchitis) that leads to narrowing.
- Most common middle respiratory tract infection.
- M.C Cause: Parainfluenza and the 2nd M.C Cause is: Respiratory Syncytial Virus (RSV).
- Bacterial Croup is very rare.
- **Clinical Picture:**
  - Barking/brassy (harsh) cough
  - Hoarseness of voice
  - Inspiratory stridor
  - Low grade fever
  - Respiratory distress
- **Diagnosis:**
  - It is diagnosed clinically.
  - CXR, if needed that shows **steeple sign** which is the diagnostic subglottic narrowing of croup.

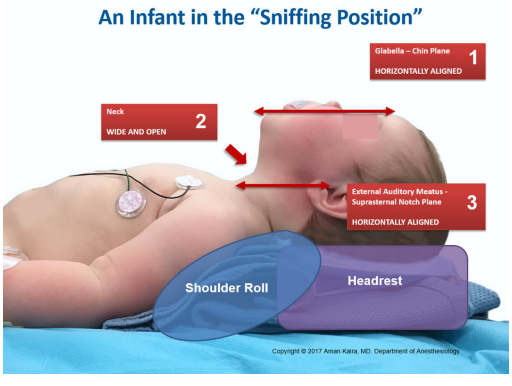


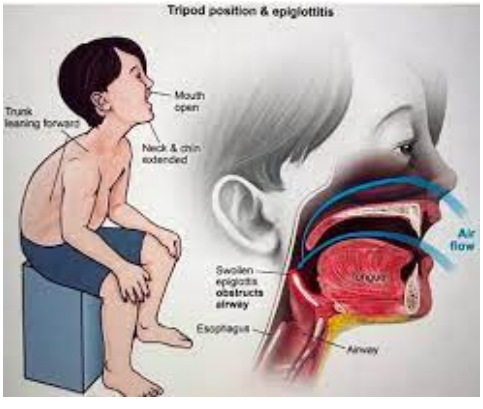
- **Treatment:**
  - Steroids oral or IM (Mild symptoms)
  - Epinephrine (Sever symptoms)
- **Complications and prognosis:**
  - The most common complication of croup is viral pneumonia, which occurs in 1% to 2% of children.
  - Parainfluenza virus pneumonia and secondary bacterial pneumonia are more in immunocompromised patients.
  - Bacterial tracheitis.

***Respiratory Distress signs: tachypnea, tachycardia, chest wall retractions, using of accessory muscles, nasal flaring, expiratory grunting and cyanosis.**

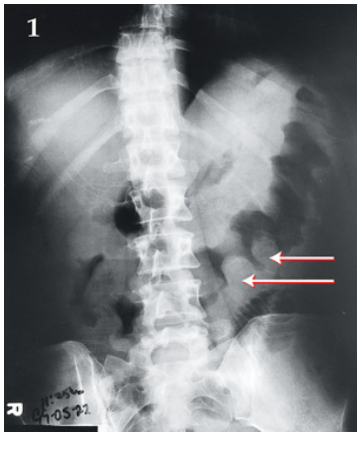
Epiglottitis

- Inflammation of the Epiglottis and it is an emergency.
- This illness is now rare and usually caused by:
  - Group A streptococcus
  - Staphylococcus aureus
  - Haemophilus influenza type b in non-immunized patients
- **Clinical Presentation:**
  - Hot potato voice
  - Fever
  - Drooling in the tripod position
  - Refusal to lie flat
  - Physical examination will reveal an extremely swollen-cherry red epiglottis





- **Diagnosis:**
  - It is diagnosed clinically.
  - CXR shows Thump print sign and swelling of the aryepiglottic folds.



- **Treatment:**
  - Intubation or tracheostomy
  - Ceftriaxone for 7 to 10 days
  - Rifampin must be given to all close contacts

- Clinical recovery is rapid, and most children can be extubated safely within 48 to 72 hours

Pertussis

- Classic pertussis (whooping cough) is caused by B. pertussis.
- B. pertussis infects only humans and is transmitted person to person by coughing, sneezing, or sharing breathing space (Highly contagious).
- Pertussis is known for **uncontrollable, violent coughing which often makes it hard to breath**. After cough fits, someone with pertussis often needs to take deep breaths, which result in a **whooping sound**.
- Pertussis can affect people of all ages, but can be very serious, even deadly, for babies less than a year old.
- Antibiotics may shorten the amount of time someone is contagious. While pertussis vaccines are the most effective tool to prevent the disease.
- **Clinical Presentation:**
  - **Stage #1 >> catarrhal stage**
    - Early symptoms can last for 1 to 2 weeks and usually include: Runny nose, low grade fever, mild occasional cough, apnea (in babies).
    - Note that in its early stages pertussis appears to be nothing more than the **common cold**!
  - **Stage #2 >> paroxysmal stage**
    - May extend up to 10 weeks.
    - After 1 to 2 weeks and as the disease progresses, **the traditional symptoms of pertussis may appear** and include: paroxysms (fits) of many, rapid coughs followed by a high-pitched "whoop" sound, vomiting during or after coughing fits, exhaustion after coughing fits.
  - **Stage #3 >> convalescent stage**
    - Last about 2 to 3 weeks; **recovery** is gradual, coughing lessens but fits of coughing may return.

***Its important to know that many babies with pertussis don't cough at all. Instead it causes them to stop breathing and turn blue.**

- **The diagnosis:**
  - Depends on isolation of B. pertussis or detection of its nucleic acids.
  - Culture on specialized media is usually accomplished during the early phases of illness on specimens from nasopharyngeal swabs or aspirates but can be difficult to accomplish given the organism's fastidious nature.

Infectious Mononucleosis (The Kissing Disease)

- EBV is the primary cause of infectious mononucleosis.
- It is a clinical syndrome characterized by fever, fatigue, malaise, cervical or generalized lymphadenopathy, tonsillitis, and pharyngitis.
- EBV, a member of the **herpesvirus family**, infects B lymphocytes and is spread by salivary secretions.

- **Diagnosis:**
  - History, physical exam and blood tests for EBV antibodies.
- **Treatment:**
  - There's no specific therapy available to treat infectious mononucleosis. Just like other viral infections treatment plan involves bed rest, good nutrition and drinking plenty of fluids.
- **Complications:**
  - Splenomegaly and rupture of spleen, hepatitis, and jaundice are among the common complications.
  - Others less common complications include: anemia, thrombocytopenia, heart problems, swollen tonsils that can block breathing, and nervous system problems.

Lower Respiratory Diseases

Bronchiolitis

- Bronchiolitis is an acute lower respiratory tract infection.
- Bronchiolitis is the commonest **serious respiratory disease of infancy**.
- Bronchiolitis occurs in children aged between 6 months – 2 years.
- M.C Cause: Respiratory Syncytial Virus (RSV) and the 2nd M.C Cause is Rhinovirus.
- Bacterial Bronchiolitis is rare.
- Risk factors:

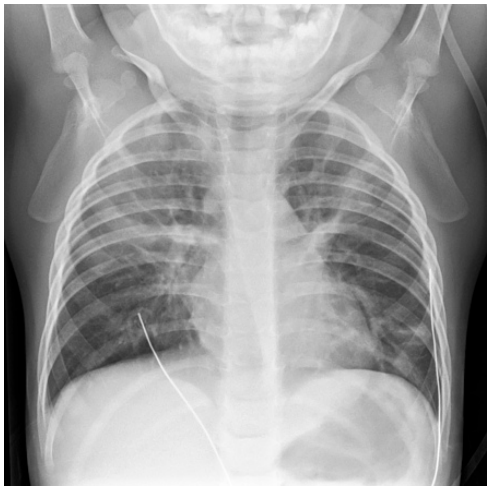
1. Prematurity
2. Age less than 2 years
3. Bottle feeding
4. Immunodeficiency
5. Underlying congenital heart disease or Bronchopulmonary dysplasia (BPD)
6. Neuromuscular weakness

- **Clinical Picture:**
  - Classically present as a progressive respiratory illness that is similar to **common cold** in its early phase with cough, coryza , and rhinorrhea
  - It progresses over 3 to 7 days to **noisy breathing and audible bilateral wheezing**.
  - There is usually low grade fever accompanied by irritability, which may reflect the increased work of breathing.
  - On examination: RDS signs, hypoxia, wheezing, crackles.
  - If more sever > grunting + cyanosis.
  - On percussion: hyper-resonance.
  - On auscultation: Bilateral diffused wheezing and crackles.

- The infection results in infiltration of the respiratory epithelium and transmission to the lower respiratory tract by cell to cell transfer, with resultant inflammation and necrosis, sloughing of the epithelium and increased mucus production causing airflow limitation in the small airways. leading to the hallmark of the disease:

- Thus the affected infant have signs of **airflow limitation including hyperinflation, atelectasis, and wheezing.**

- **Diagnosis:**
  - It is diagnosed clinically.
  - CBC: mild leukocytosis 12000-16000 cell per micro liter, but not specific.
  - Pulse oximetry.
  - **Antigen test by IF (Immunofluorescence) or ELISA of nasopharyngeal secretion** for RSV, parainfluenza, Influenza and adeno viruses. This is the most sensitive test to confirm the infection and is required for the definitive diagnosis.
  - PCR
  - Blood gas analysis: in most severe case shows lowered arterial oxygen and raised CO2 tension.
  - CXR: hyperinflation, patchy atelectasis, consolidation.



- **Treatment:**
  - Hospitalization if the patient is:
    i. Young age < 6 months old
    ii. Moderate to marked respiratory distress
    iii. Hypoxemia (Po2< 60 mm Hg), (O2 sat <92%)
    iv. Vomiting
    v. Immunodeficiency state
    vi. Apnea
    vii. Inability to tolerate oral feeding
    viii. Lack of appropriate care available at home
  - Supportive treatment (Viral)
  - Antibiotics (Bacterial 2ndry infection)
  - Inhaled steroids and Epinephrine are not routinely used in 1st episode except in sever cases.
- **Possible complication:**
  - Pneumothorax
  - Respiratory failure

Pneumonia

- Will be discussed in another part.