Respiratory Tract Infections

Muna Kilani, MD

Common Cold (Coryza)

- Nasal discharge
- Cough
- Fever
- Less than 1 week duration
- Rhinovirus, corona virus, RSV

Pharyngitis

- Sore throat, fever, cough
- Pharynx is inflamed, lymph nodes enlarged.
- Usually viral etiology, adenovirus, rhinovirus,
- In older children group A beta hemolytic streptococcus.

Tonsillitis

- A form of pharyngitis, with involvement of the tonsils.
- Common pathogens are group A hemolytic streptococcus
- Viruses like Ebstein Barr virus (infectious mononucleosis)
- If bacterial infection diagnosed treatment in penicillin or erythromycin if patient allergic
- Treatment does not prevent post streptococcal nephritis.

Streptoccocal Pharyngitis

- Streptococcal tonsillitis characterized by erythema and swelling of the tonsils, exudate, petechia on the palate, tender anterior cervical lymph nodes

- Can be associated with sandpaper rash.

- Diagnosed with Rapid Antigen Detection Test, and throat culture, sensitivity 63-96, specificity 90-100%

Strep Throat *(Streptococcal Pharyngitis)*

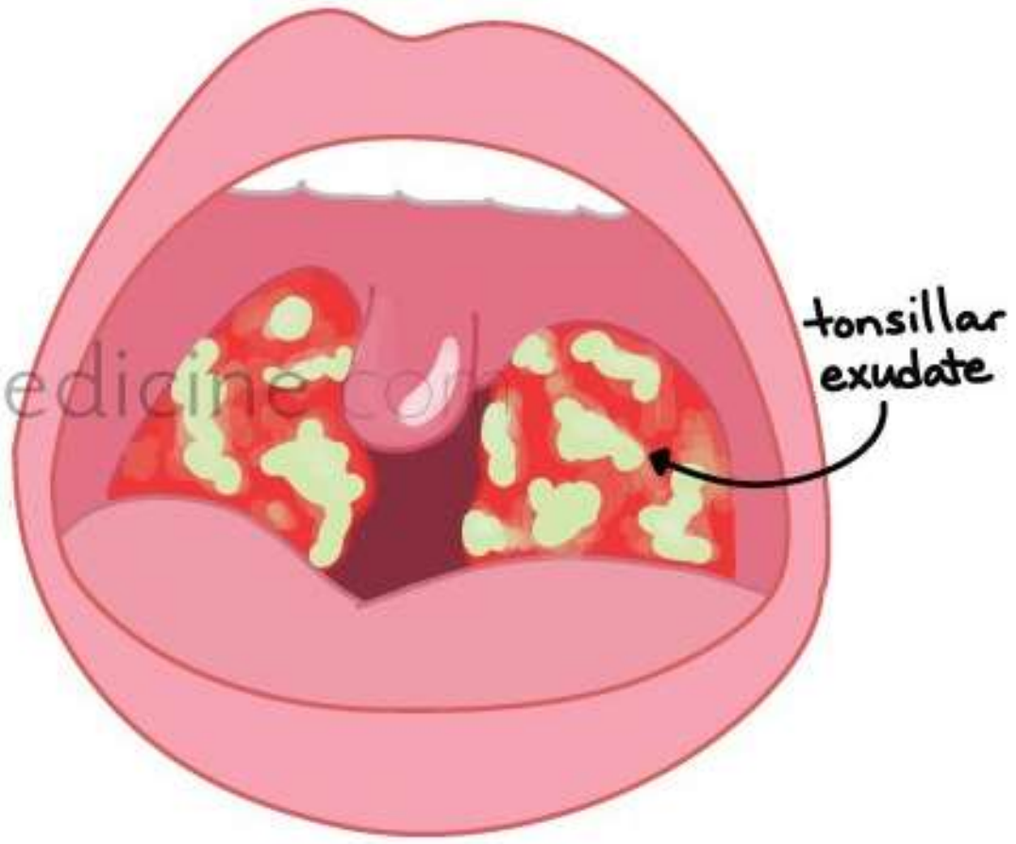
McIsaac Criteria

Centor Criteria

Add 1 point for each:

1. Fever (subjective or >38 C)
2. Ø cough
3. Tender lymphadenopathy (anterior cervical)
4. Tonsillar exudate

5. Age
   3-14 yrs: *Add 1 point*
   15-44 yrs: Ø
   45+ yrs: *Subtract 1 point*



Total score

0-1 Unlikely strep pharyngitis

2+ Throat swab & culture or rapid antigen test

4+ Lab confirmation +/- empiric antibiotics

Tonsillar exudate

Palatal petichiae

Sand paper rash

Complications

- complications of strep throat:
- rheumatic fever,
- glomerulonephritis (kidney inflammation),
- chorea,
- bacteremia (bloodstream infection) and rarely streptococcal shock syndrome
- in some severe forms of pharyngitis (e.g., severe mononucleosis-pharyngitis)
- airway obstruction may occur
- peritonsillar abscess, retropharyngeal absces

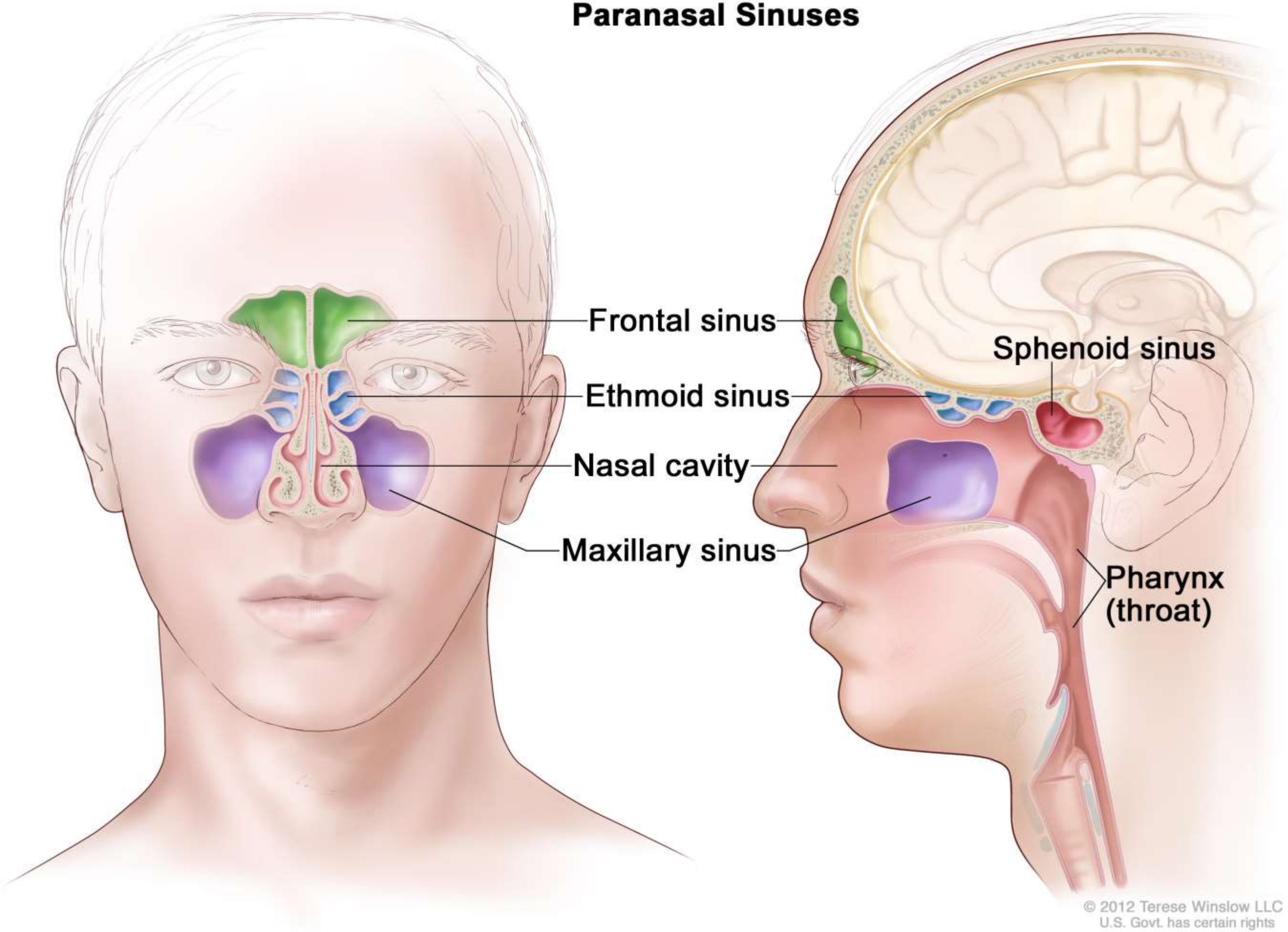
Sinusitis

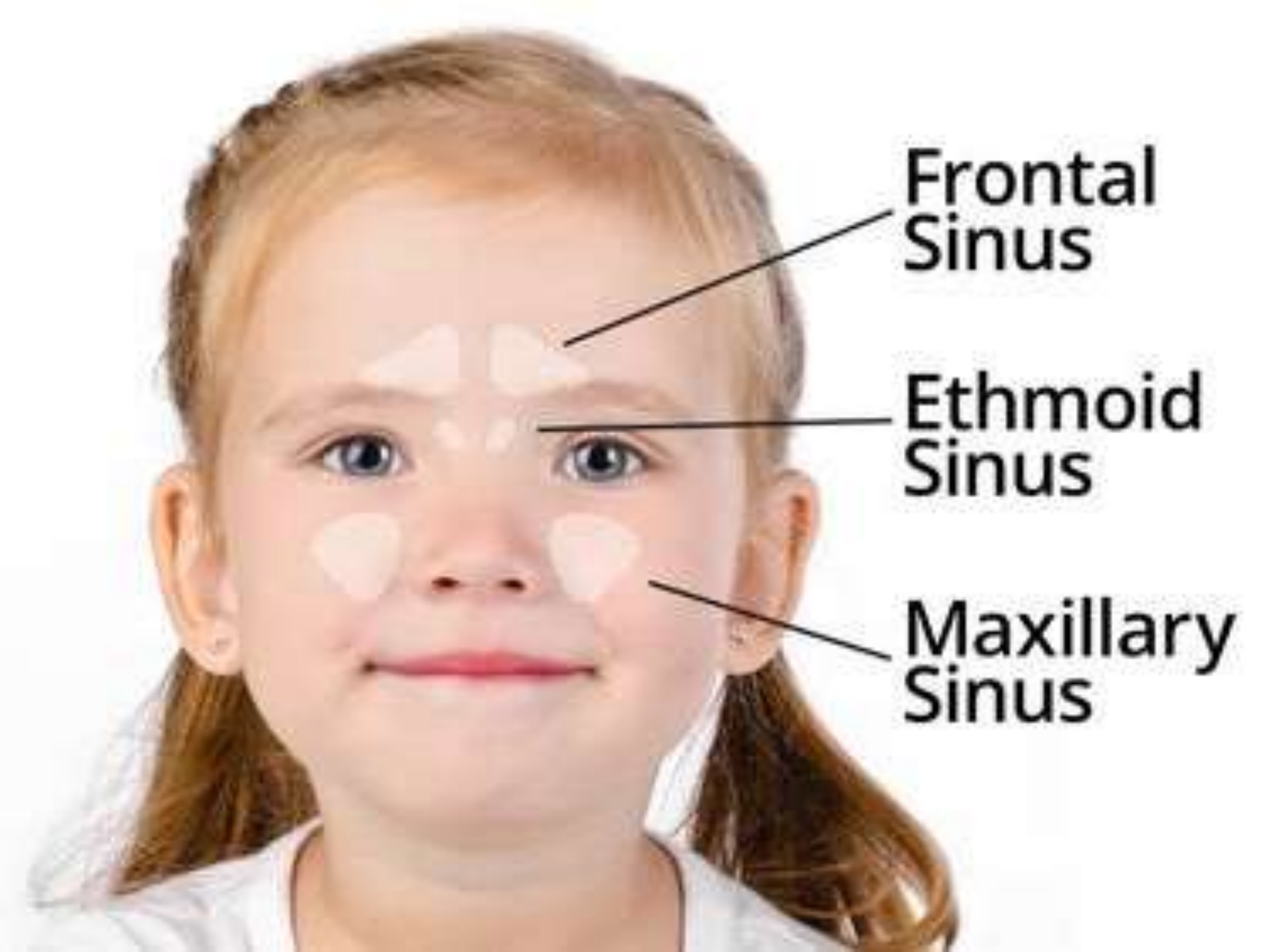
- Infection of the sinuses
- Maxillary, Ethmoidal, Spenoidal, Frontal
- Pathophysiology: Swelling --- inflammation--- infection.
- Predisposing factors: Cyctic Fibrosis, allergic rhinitis, immunodeficiencies , structural abnormalities

Sinusitis

- Headache
- Fever
- Nasal discharge
- Cough: night time and early morning cough

Paranasal Sinuses




Frontal Sinus
Ethmoid Sinus
Maxillary Sinus

Sinusitis

- Diagnostic criteria AAP guidelines 2014
- URI Symptoms of 10 days duration
- Or worsening URI symptoms after initial improvement
- Or Sever onset of purulent to discharge and high grade fever of 3 days duration
- No imaging necessary
- Organisms, streptococcus pneumonia, staph aureus, non typable Hemophilus influenza, moraxella catarralis
- Physical findings: nasal discharge, post nasal drip, facial tenderness

- The ethomoid and maxillary sinuses form in the 3rd to 4th gestational month.
- The sphenoid sinuses are pneumatized by 5 years of age
- The frontal sinuses do not appear until the 7th to 8th year of life and are not completely developed until adolescense

Croup

- Laryngotracheobronchitis
- Mostly viral
- Parainfluenza is the most common organism, but also RSV, rhinovirus, influenza
- Pathophysiology: swelling of the subglottic space secondary to the viral infection

Croup

- age 6m-3 years most common, can happen up to 6 years
- Preceded by upper respiratory tract
- Harsh barking cough, worse at night
- Stridor, non toxic looking
- Management: keep child comfortable, management according to severity

Croup

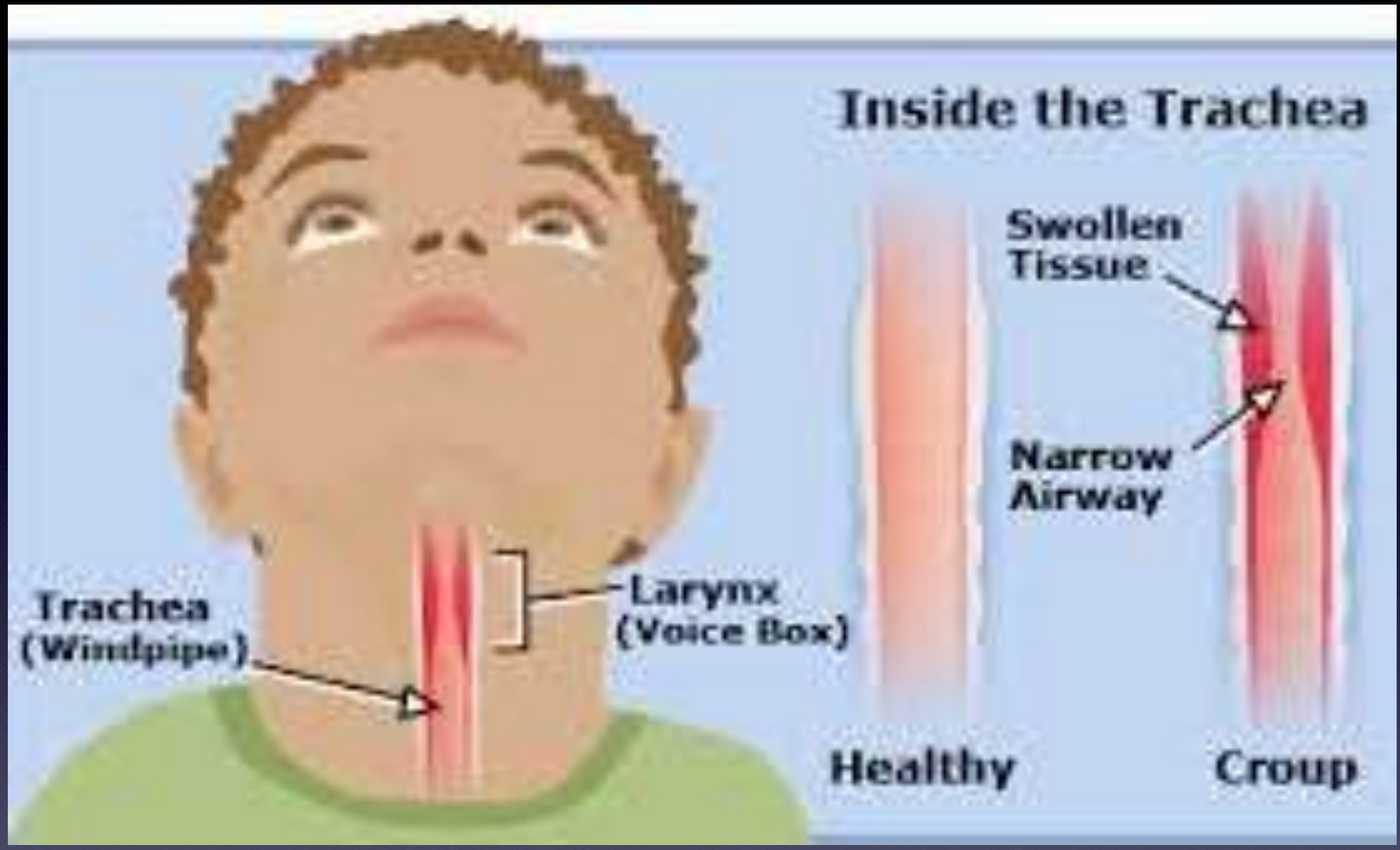
- Moderate/Severe: Stridor at rest AND
  - Moderate intercostal retractions
  - Tachypnea
  - Agitation/restlessness/tired appearing
- Mild only harsh cough

The Westley Score: Classification of croup severity

Feature	Number of points assigned for this feature					
	0	1	2	3	4	5
Chest wall retraction	None	Mild	Moderate	Severe		
Stridor	None	With agitation	At rest			
Cyanosis	None				With agitation	At rest
Level of consciousness	Normal					Disoriented
Air entry	Normal	Decreased	Markedly decreased			

Croup

- Mild------ Steroids
  - Dexamethazone 0.5mg/kg IM
- Moderate/Severe
  - Dexamethazone 0.5mg/kg IM
  - Racemic epinephrine

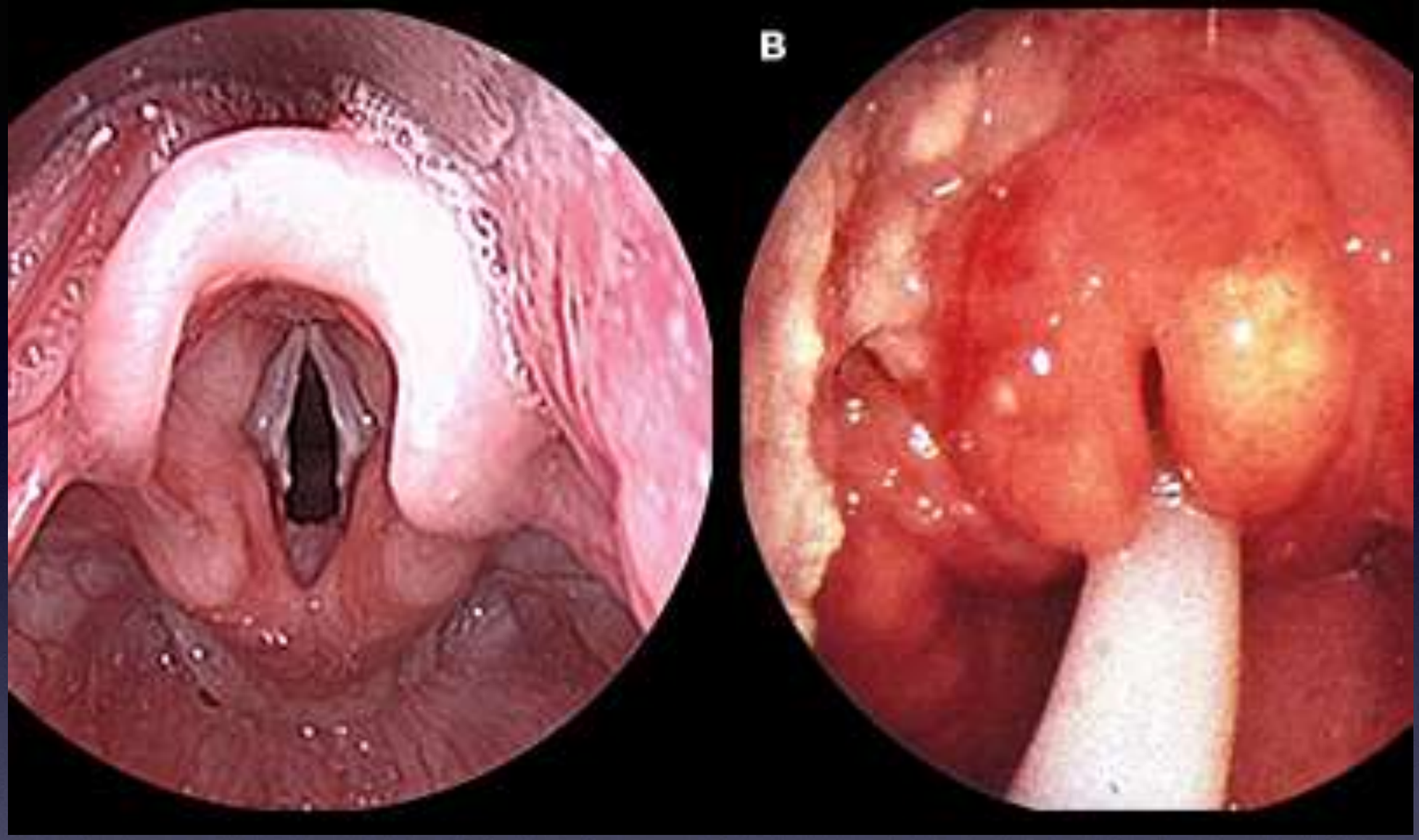

Inside the Trachea
Swollen Tissue
Narrow Airway
Larynx (Voice Box)
Trachea (Windpipe)
Healthy
Croup

Epiglottitis

- Infection of the Epiglottiis, potentially life threatening
- Most common organism is Hemophilus influenza, now streptococcus and other species.
- Most common age 2-6years
- Sudden onset of symptoms, high fever, anxious
- Patient toxic looking, drooling, tripod position, leaning forward
- Do not examine. if sever obstruction send to OR for intubation
- Incidence decreases significantly after Hib vaccination
- IV antibiotics after airway has been secured

Treatment

- Antibiotics, according to organism

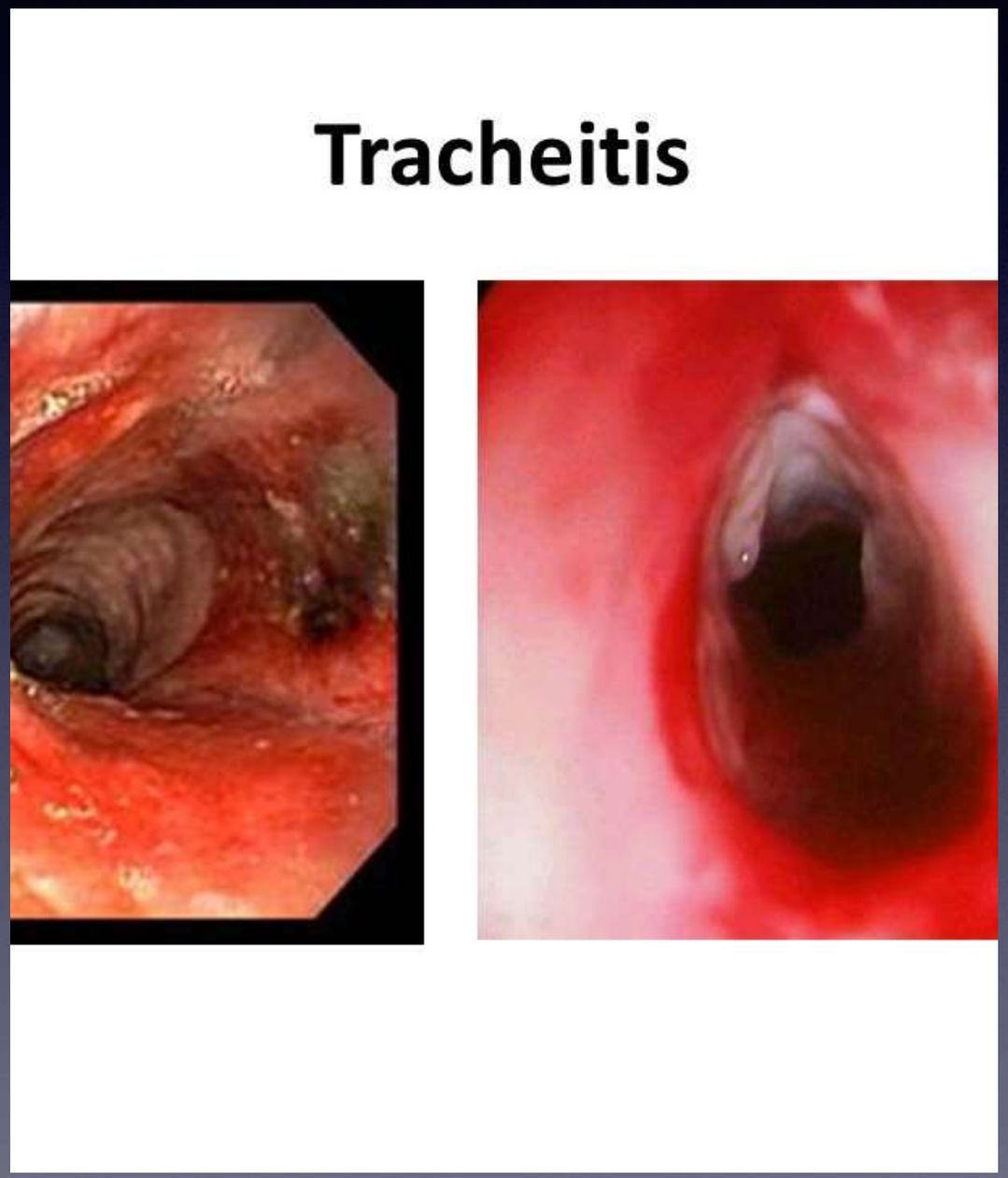

B


Normal


Epiglottitis

Tracheitis

- Most likely bacterial in origin
- Staph aureus most common organism
- Sick, toxic looking patient
- Stridor
- Treatment : Admiission, I V antibiotics.

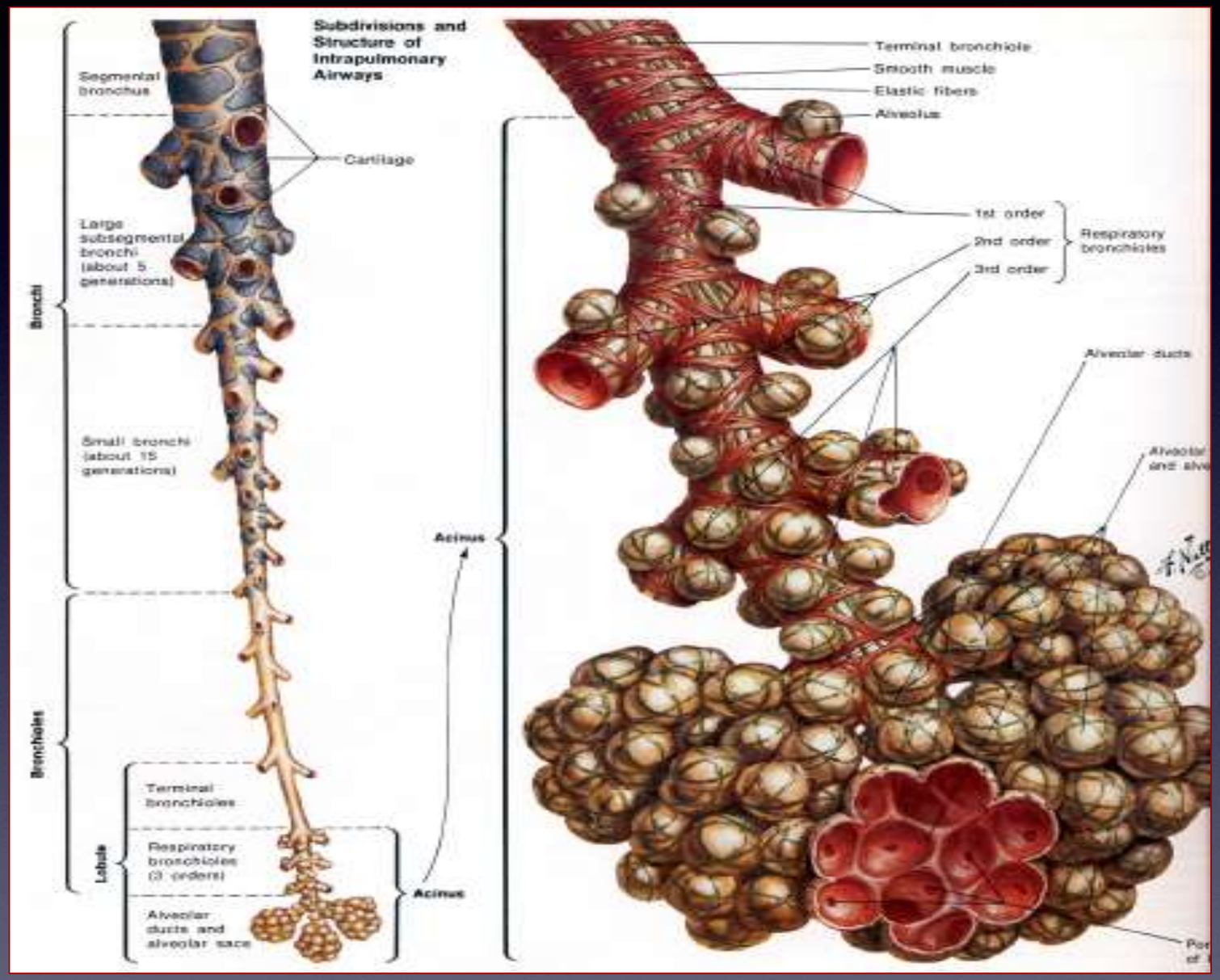


Bronchiolitis

- Very common, 3% of all US infants are hospitalized with bronchiolitis
- Respiratory syncytial virus is main pathogen, but also metapneumvirus, rhinovirus
- Up until 2-3 years of age
- Pathophysiology: viral infection of the lower respiratory tract, with inflammatiion, edema, swelling, increased mucus secretion leading to airway obstruction

Bronchiolitis

- Signs and symptoms
  - Nasal discharge, cough, fever, shortness of breath, cyanosis, apnea in infants(apnea may preceed respiratory symptoms)
  - Chest exam wheezing, crackles, retractions, cyanosis
- Infection has a seasonal pattern, depending on the patients location, in the northern US it is Nov to April


Subdivisions and Structure of Intrapulmonary Airways
Segmental bronchus
Cartilage
Large subsegmental bronchi (about 5 generations)
Small bronchi (about 15 generations)
Bronchi
Bronchioles
Terminal bronchioles
Respiratory bronchioles (3 orders)
Alveolar ducts and alveolar sacs
Lobule
Acinus
Acinus
Terminal bronchiole
Smooth muscle
Elastic fibers
Alveolus
1st order
2nd order
3rd order
Respiratory bronchioles
Alveolar ducts

Bronchiolitis

- Diagnosis
  - Viral swab: not indicated for uncomplicated cases. (rapid immunofluorescent, or PCR)
  - CBC and electrolytes normal
  - CXR : Hyperinflation, perihilar infiltrates, atelectasis.....but not always routinely indicated

Broncholitis

- Clinical course for RSV bronchilolitis is worsening first 48-72h, then a plateau for 2-3 days followed by improvement, symptoms can last 3 weeks

- High risk patients are premature babies, babies with congenital heart disease, cystic fibrosis or chronic lung disease

- About 25-50% of patients with bronchiolitis develop recurrent wheezing

Bronchiolitis

- Treatment
    - Supportive
    - Oxygen, cpap, intubation
    - IV fluid if unable to take PO or too tachypnic (respiratory rate above 60b/min)
    - Superinfection with bacteria is very rare in RSV bronchiolitis.
    - Bronchodilators albuterol and epinephrine may help, no place for scheduled treatments
    - Steroids are not recommended in previously healthy children
    - Hypertonic saline not routinely recommended

Bronchiolitis

- Prophylaxis
  - Palivisumab, monoclononal RSV antibody, has decreased admission by 50% in high risk infants, given as monthly infections

TABLE 2.

Guidelines for Administration of Palivizumab

Infants eligible for palivizumab in the 1st year of life

All infants < 29 weeks gestational age at birth

Infants < 32 weeks gestational age with chronic lung disease of prematurity, defined as > 21% oxygen for at least 28 days after birth

Infant, with hemodynamically significant cardiac disease

Infants eligible for palivizumab until 2nd year of life

Infants on supplemental oxygen for at least first 28 days of life and continuing to require medical intervention such as supplemental oxygen, steroid, and/or diuretic therapy

Infants in whom palivizumab should be considered

Infants with pulmonary abnormality

Infants with neuromuscular disability with inability to clear secretions in lower airways

Children < 2 years of age who will be severely immunocompromised during respiratory syncytial virus season

Infants not eligible for palivizumab

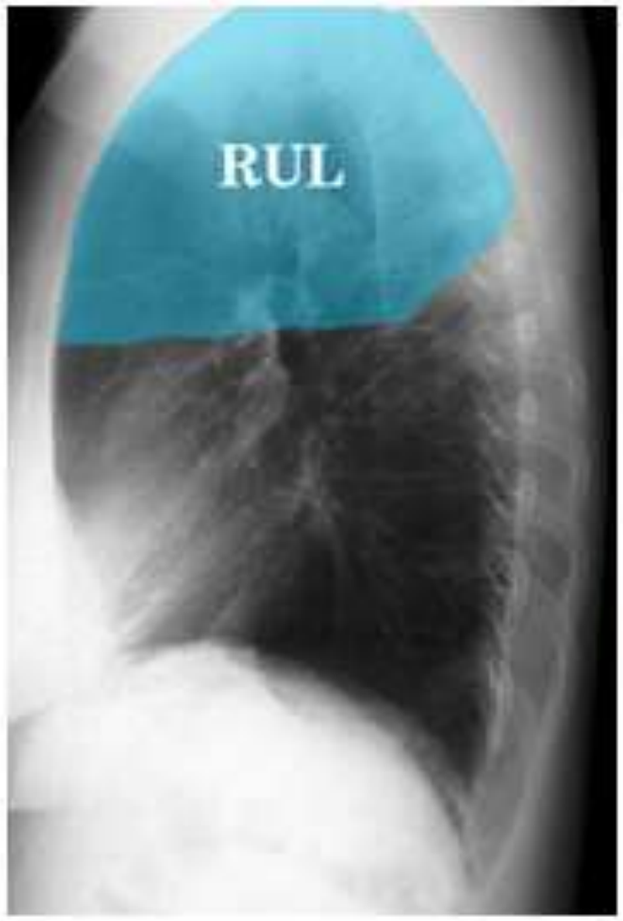
Infants ≥ 29 weeks and otherwise healthy

Any infant who experiences breakthrough respiratory syncytial virus infection despite vaccination

Adapted from Lieberthal and Meissner.[33]

Pneumonia

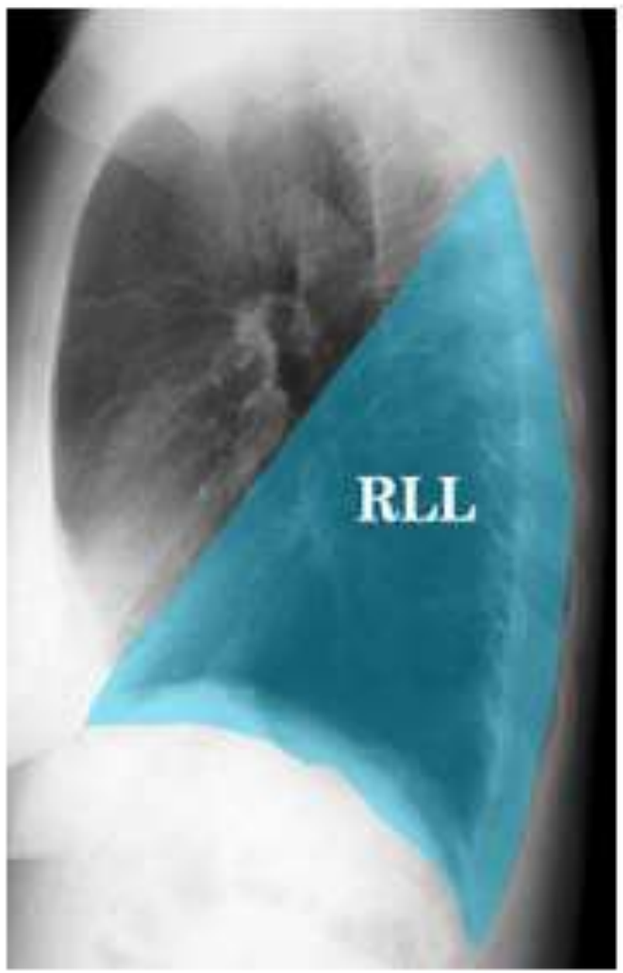

RUL

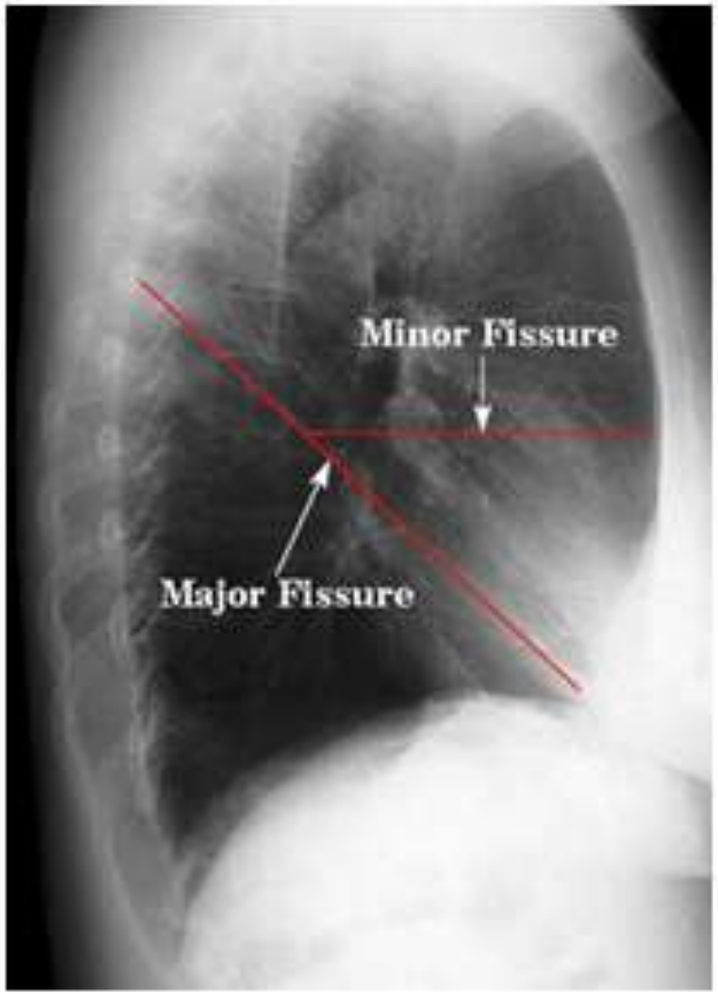

RUL

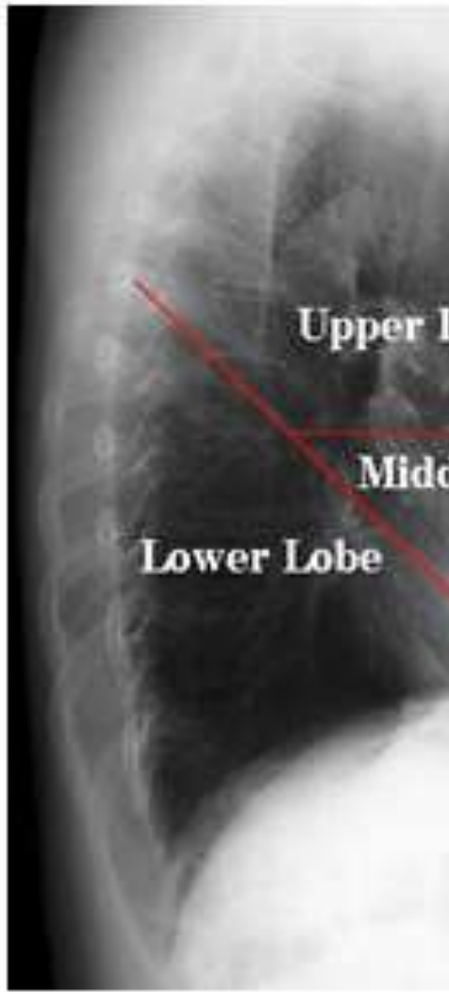

RML


RML

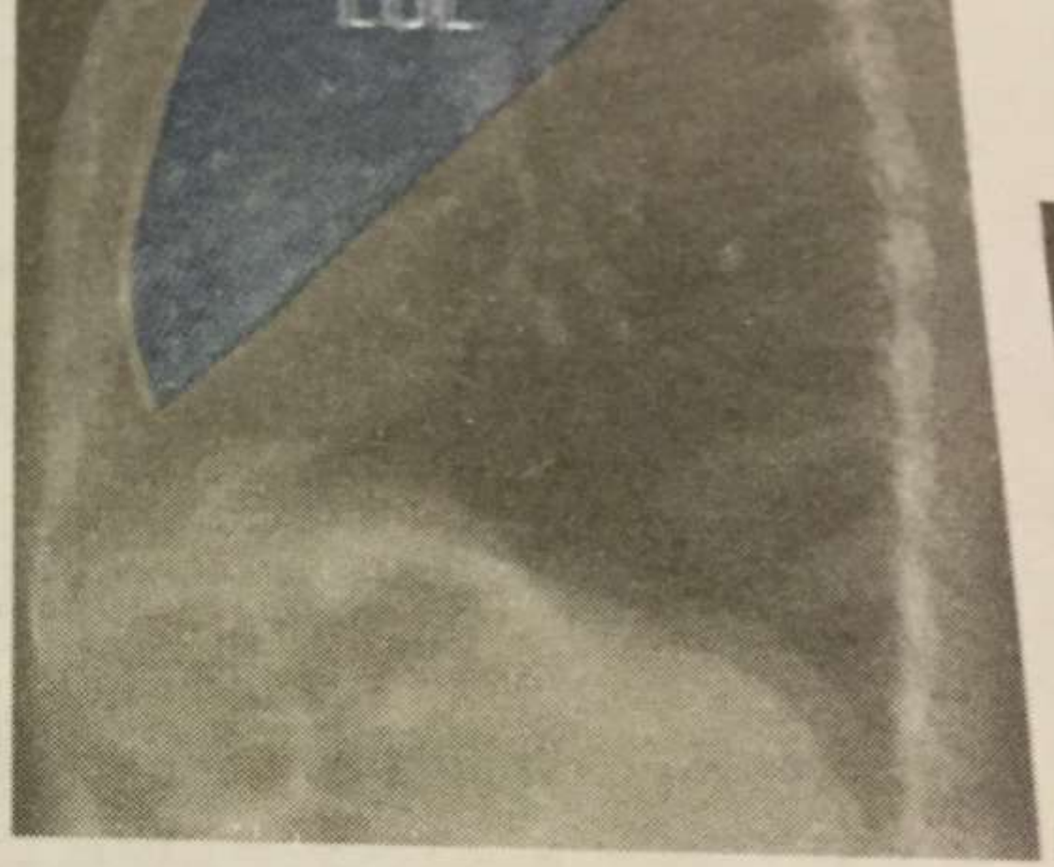

LL

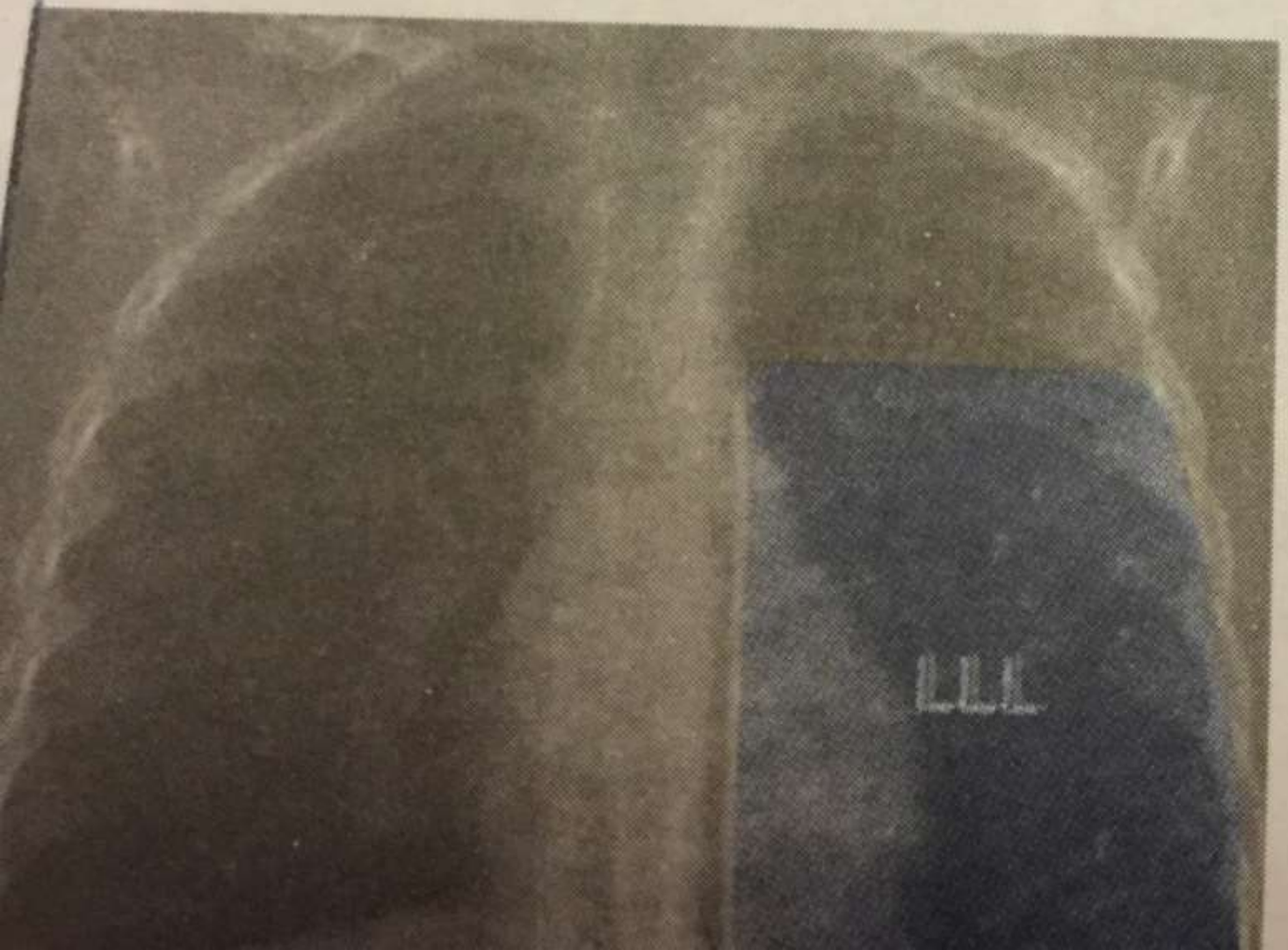

RLL


Minor Fissure
Major Fissure


Upper
Midd
Lower Lobe


LUL


LUL


LLL

LLL

Pneumonia

- Etiology varies by community, in one study 60% were bacterial, 45% viral
- Lobar pneumonia, bronchopneumonia and interstitial pneumonia

Etiology

AGE GROUP	FREQUENT PATHOGENS (IN ORDER OF FREQUENCY)
Neonates (<3 wk)	Group B streptococcus, Escherichia coli, other gram-negative bacilli, Streptococcus pneumoniae, Haemophilus influenzae (type b,* nontypable)
3 wk-3 mo	Respiratory syncytial virus, other respiratory viruses (parainfluenza viruses, influenza viruses, adenovirus), S. pneumoniae, H. influenzae (type b,* nontypable); if patient is afebrile, consider Chlamydia trachomatis
4 mo-4 yr	Respiratory syncytial virus, other respiratory viruses (parainfluenza viruses, influenza viruses, adenovirus), S. pneumoniae, H. influenzae (type b,* nontypable), Mycoplasma pneumoniae, group A streptococcus
≥5 yr	M. pneumoniae, S. pneumoniae, Chlamydophila pneumoniae, H. influenzae (type b,* nontypable), influenza viruses, adenovirus, other respiratory viruses, Legionella pneumophila

Pneumonia

- Clinical features
  - Cough, fever, shortness of breath
  - Tachypnea and retractions, grunting
  - Decreases air entry or crackles over affected lobe, or may have normal breath sounds

Pneumonia

- Diagnosis
  - Diagnosis in mainly clinical
    - CBC may show elevated WBC's, left side shift.
    - Atypical lymphocytes may be seen in viral infections
    - Blood culture only in hospitalized patients
    - CRP elevated in sever disease

Pneumonia

- CXR PA and lateral
- Lobar infiltrate more likely bacterial
- Perihilar scattered infiltrates with hyperinflation and adenopathy most likely viral

Pneumonia

- Treatment
  - Oxygen
  - IV fluids if unable to do PO feeds
  - Antibiotics vary by age, severity
  - Newborns ampicillin gentamicin or cefotaxime
  - Older children, ampicillin or ampicillin clavulanic acid, in sever cases third generation cephalosporins
  - If older than 5 and mycoplasma suspected macrolides can be used
  - Always check latest infectious disease guidelines
  - If patient is toxic looking add vancomycin

IDSA 2011

- Diagnosis and Treatment of Adults with Community-acquired Pneumonia
  An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America

- Joshua P. Metlay*, Grant W. Waterer*, Ann C. Long, Antonio Anzueto, Jan Brozek, Kristina Crothers, Laura A. Cooley, Nathan C. Dean, Michael J. Fine, Scott A. Flanders, Marie R. Griffin, Mark L. Metersky, Daniel M. Musher,
  Marcos I. Restrepo, and Cynthia G. Whitney; on behalf of the American Thoracic Society and Infectious Diseases Society of America

- THIS OFFICIAL CLINICAL PRACTICE GUIDELINE WAS APPROVED BY THE AMERICAN THORACIC SOCIETY MAY 2019 AND THE INFECTIOUS DISEASES SOCIETY OF AMERICA AUGUST 2019

Table 4. Initial Treatment Strategies for Inpatients with Community-acquired Pneumonia by Level of Severity and Risk for Drug Resistance

	Standard Regimen	Prior Respiratory Isolation of MRSA	Prior Respiratory Isolation of *Pseudomonas aeruginosa*	Recent Hospitalization and Parenteral Antibiotics and Locally Validated Risk Factors for MRSA	Recent Hospitalization and Parenteral Antibiotics and Locally Validated Risk Factors for *P. aeruginosa*
Nonsevere inpatient pneumonia*	β-Lactam + macrolide† or respiratory fluroquinolone‡	Add MRSA coverage§ and obtain cultures/nasal PCR to allow deescalation or confirmation of need for continued therapy	Add coverage for *P. aeruginosa*‖ and obtain cultures to allow deescalation or confirmation of need for continued therapy	Obtain cultures but withhold MRSA coverage unless culture results are positive. If rapid nasal PCR is available, withhold additional empiric therapy against MRSA if rapid testing is negative or add coverage if PCR is positive and obtain cultures	Obtain cultures but initiate coverage for *P. aeruginosa* only if culture results are positive

Severe inpatient pneumonia[*]	β-Lactam + macrolide[†] or β-lactam + fluroquinolone[‡]	Add MRSA coverage[§] and obtain cultures/nasal PCR to allow deescalation or confirmation of need for continued therapy	Add coverage for *P. aeruginosa*[¶] and obtain cultures to allow deescalation or confirmation of need for continued therapy	Add MRSA coverage[§] and obtain nasal PCR and cultures to allow deescalation or confirmation of need for continued therapy	Add coverage for *P. aeruginosa*[¶] and obtain cultures to allow deescalation or confirmation of need for continued therapy

Table 3. Initial Treatment Strategies for Outpatients with Community-acquired Pneumonia

	Standard Regimen
No comorbidities or risk factors for MRSA or *Pseudomonas aeruginosa*[*]	Amoxicillin or
	doxycycline or
	macrolide (if local pneumococcal resistance is <25%)[†]
With comorbidities[‡]	Combination therapy with
	amoxicillin/clavulanate or cephalosporin
	AND
	macrolide or doxycycline[§]
	OR
	monotherapy with respiratory fluoroquinolone[‖]

Pneumonia

- Influenza pneumonia
- Zanamivir (neuraminidaze inhibitors)
- Second line is oseltamivir plus rimanitidine

Pneumonia

- Complication
  - Necrosis
  - Abscess formation
    - Pneumatocele
    - Effusions parapneumonic
    - Empyema
    - Sepsis and toxic shock syndrome

Pertussis

- Bordetella pertussis or parapertussis
- Signs and symptoms
  - 3 stages
    - Catarrhal (URI like symptoms)
    - Paroxysmal (paroxysms of intense cough)
    - Convalescent (chronic cough)

- It is estimated that the incidence is 50 million cases a year
- In infants < 3 month mortality is 3%
- Maternal immunity is not transferred to infants

Pertussis

- Diagnosis
  - PCR nasophayngeal swab
  - Culture of nasophyngeal swab
  - CDC recommends both test for cough >3 weeks
  - WBC >10,000 lymphocytes
  - PCR and culture can be negative after the first few weeks of symptoms

Pertussis

- Prevention
  - DTaP at 2,4,6 and 15-18 month and at 4-6 years of age
  - Tdap recommended for children 7-10y as as single dose at 11-18 year, and for adults and pregnant women

Pertussis

Complications

- Pneumonia 13% from B pertussis or seconday infection
- Hypoxic encephalopathy 1%
- Otitis media
- Hernia
- Seizures
- Cerebral hemorrage

Pertussis

- Management
  - Antibiotics to hasten irradiation of organism and prevent spread
  - Erythromycin, clarithromycin, azithromycin