

PHARYNGO -TONSILLITIS

ETIOLOGY

Viral cause:

- Rhino virus(common cold)(60%)
- Enterovirus,Influenza virus,Para-influenza virus.
- Adenovirus,
- Special: HIV, Cytomegalovirus, Coxsackievirus, Herpes simplex, Ebstein-barr virus, Bird flu?).

Bacterial cause:

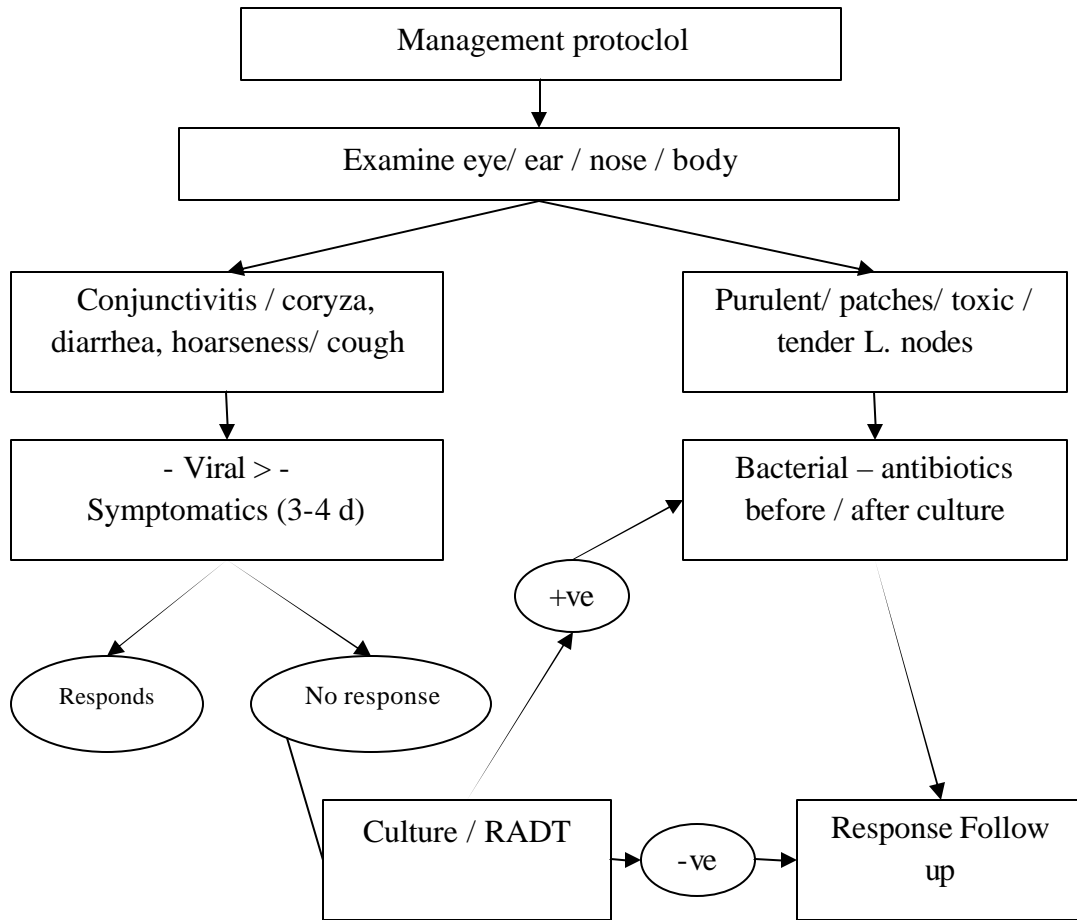
- Group A B-hemolytic streptococci (GABHS), 15-30% > 3yr
- C, diptheriae, Hemophilus influenzae, N. meningitides.
- Special; Gonococcus, A. hemolyticum, and Mycoplasma pneumoniae
- Diagnosis of viral is mainly clinical
- Blood count, ESR and CRP- low predictive value

Throat culture

- Gold standard for diagnosing streptococcal pharyngitis cannot differentiate between carriers and case
- Negative throat culture result has a very high negative predictive value for GABHS pharyngitis
- Major drawback - lag time of 18-48 hours
- Not currently practiced in most centers in India !

In children with no penicillin allergy		
Antibiotic (route) days	Children (<30 kg)	>30kg
Penicillin V (oral) (10d)	250 mg BID	500 mg TID
Amoxicillin (oral) (10d)	40mg/kg/day	250 mg TID
Benzathine penicillin G (IM) (single dose)	6 lakh units	1.2 million units

In children with penicillin allergy (non type 1)	
Antibiotic (route) (days)	Children (<27 kg)
Erythromycin ethylsuccinate (oral) (10 days)	40-50 mg/kg/day tid
Azithromycin (oral) (5days)	12 mg/kg OD
1 st generation cephalosporin (oral) (10 days)	Cephalexin /cefaclor* in usual doses
2 nd line : clindamycin (oral) (10 days)	10-20 mg/kg



SINUSITIS

- Two types of settings
 - Prolonged, upper respiratory signs/symptoms > 10-14 days.
 - Severe upper respiratory signs/symptoms(fever >102 degree F, Facial swelling and pain)

Classification of Sinusitis

- Acute infection <30 days
 - Persistent :>14/<30 days
 - Severe Temp >102degree F, purulent discharge , sick child
- Subacute : 30 -90 days
- Recurrent: < 30 days; relapse after 10 days
- Chronic: > 90 days.

Development of sinuses

	Development begins	complete development
Maxillary and ethmoid sinuses	10 th week POG	At birth
Sphenoid sinus	3Yrs	8 yrs
Frontal sinus	7- 8 yrs	Early teens

Predisposing factors

- Viral URI
- Allergic rhinitis and nasal polyps
- Nasal foreign body

- Adenoidal hypertrophy
- Nasogastric tube
- Cleft palate
- GERD
- Mucociliary disorders
 - PCD
 - CF
 - Kartageners syndrome
- Immunodeficiency status
- Dental infections

Common Pathogens

- Acute and Subacute sinusitis
 - strept. Pneumoniae
 - Non typeable H. influenzae
 - Moraxella catarrhalis
 - Strept pyogens (beta hem)
- Chronic Sinusitis
 - Bacterial pathogens not well defined
 - Polymicrobial infection common
 - Alpha hemolytic strept, staph aureus, CONS, Non typeable H influenzae, Moraxella catarrhalis & Anaerobic Bacteria
- Guidelines for Radiological Diagnosis
- X- rays therefore not needed in most.

- Clinical correlation is good.
- X- rays recommended if:
 - Recurrent
 - Complications
 - Unclear diagnosis

Management Medical

- Antibiotics Main stay :
 - Amoxicillin (40 mg/kg/day)
 - Cefuroxime
 - Co - amoxy- clavulanic acid —can be second line if initial choice was amoxicillin
 - Macrolides e.g. Azithromycin
 - Select any of these based on cost and safety
- If severe disease or failure to first line drugs
 - Parenteral ceftriaxone/ cefotaxime then may switch to oral cefpodoxime
- Treat for 10 to 14 days or 1 week beyond symptom resolution, whichever is later.
- In case of persistent non response (already used 1st and 2nd line drugs)
 - Imaging and sinus aspiration could be done.
- Adjuvant therapies :
 - limited data
 - not recommended

ACUTE OTITIS MEDIA

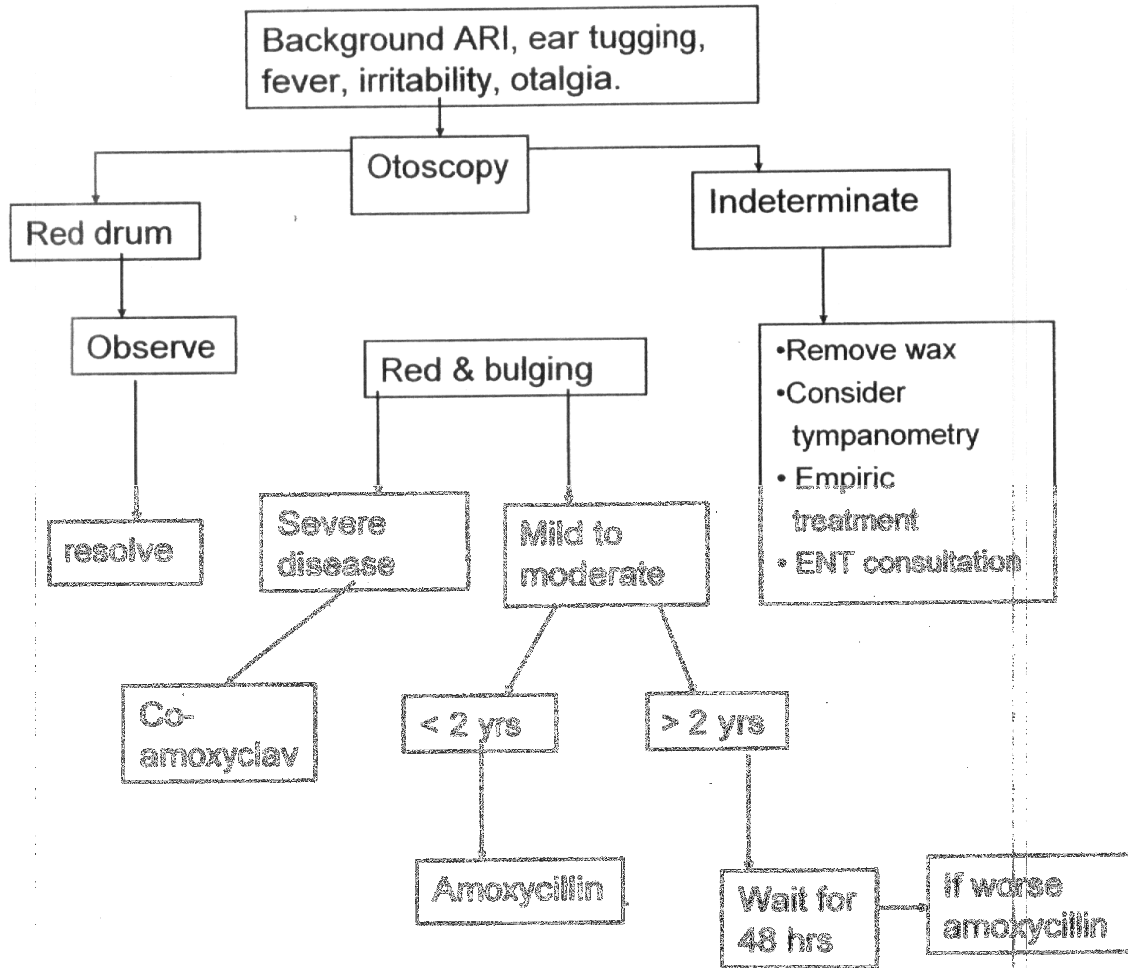
- Signs of acute otitis media
 - Erythema
 - Fluid
 - Impaired mobility
 - Acute symptoms
- Management of AOM- Under 2 yrs
 - Analgesia — paracetamol in good doses as good as ibuprofen
 - Decongestants no role
 - Antibiotics in divided doses for 10 days
 - choices, first line— Amoxicillin/ co-amoxyclav
 - second line * second generation cephalosporins e.g. cefaclor, cefuroxime
 - co-amoxyclav- if not used earlier.
- Management of AOM in > 2 yr old children
 - Analgesics --> main stay of treatment
 - Decongestants have questionable role
 - Antibiotics
 - No urgency to start antibiotics unlike a <2 yrs baby.
 - Wait and watch for 48 hrs
 - Start antibiotics only if deterioration
 - Drug of choice Amoxicillin 40 mg/kg/day in two doses for 7 days.

- Follow up:

Reviewing at 72 hrs

- If improving—continue the antibiotics for 10 days
- If patient deteriorates— consider changing the antibiotic
 - Choices are IM ceftriaxone OR Third generation oral cephalosporins e.g. cefpodoxime, cefdinir
 - NOT cefixime as it has poor action against strep, pneumoniae

Protocol for managing Ac. Otitis media



CROUP

? CHARACTERISTICS :

- Acute onset
- Fever, running nose and cough- infective etiology - likely to be upper airway
- changed cough character- likely to be involving larynx.

Hence an acute upper airway infection—laryngitis +.

GRADING SEVERITY OF CROUP

	Mild	Moderate	Severe
General appearance	Happy, feeds well, interested in surroundings	Fussy but interactive, comforted by parents	Restless, agitated, altered sensorium
Stridor	Stridor on coughing & crying, No stridor at rest	Stridor at rest, worsening with agitation	Stridor at rest, worsening with agitation
Respiratory distress	No distress	Tachypnoea, tachycardia & chest retractions	Marked tachycardia with chest retractions
Oxygenation	>92% in room air	>92% in room air	<92% in room air cyanosis

CROUP - TREATMENT

	Mild	Moderate	Severe
Steroids oral / nebulized/ IM	?	Yes	Yes
Nebulized adrenaline	No	No (may be given if deterioration noted during observation)	Reputed doses may be required
Oxygen	No	No	As required to keep SAO ₂ >92%
Antibiotics	No role	No role	No role

Management of mild croup

- Requires no treatment
- Symptomatic treatment:
 - Fever - use antipyretics to decrease oxygen requirement.
 - If bothersome coryza- 1st generation anti-histaminics may be used
 - Normal saline nasal drops - if nasal blockade.
- Grey areas :
 - Cold air inhalation / bathroom steaming may help
 - A single oral dose of prednisolone/ dexamethasone preferred by few to decrease the parental stress as well as the risk of return to the medical care.

PARENTAL ADVICE :

- Parents to be informed that croup generally gets more severe at nights.
- To look out for increasing severity manifested by
 - increasing stridor,
 - increasing breathing difficulty , and
 - child getting increasingly agitated with refusal of feeds
- To come back to medical assistance if severity increases

INVESTIGATING CROUP:

- S Croup is a clinical diagnosis. Investigations not required in a typical croup.
- In a child with airway obstruction, neck radiographs or blood tests cause anxiety which may precipitate further distress and obstruction.
- X -ray AP view of the soft tissue of neck
 - if done - reveals a tapered narrowing (steeple sign) of the subglottic trachea instead of normal shouldered appearance.
 - should be done if:
 - poor response to treatment
 - possibility of Retropharyngeal abscess
 - o toxic with high fever
 - o difficulty in swallowing, drooling of saliva
 - o malnourished child / staphylococcal skin stigmata

MODERATE CROUP

Increase in severity is not considered by mere increase in the intensity of the sound , but by increasing degree of obstruction. Croup can be called as moderate when child develops stridor at rest.

- **Management:**
 - Observation for upto 4 hours
 - steroid -> if not given before , use a dose of oral / nebulized/
IM

- Repeat dose of nebulized steroid - if previous dose > 12 hours back.
- Nebulized Adrenaline :
 - Used if symptoms are increasing . -> Repeated if clinically indicated
 - Routinely available adrenaline as effective as racemic form.
- If symptomatic at the end of 4 hrs, he can be discharged.

STEROID AND ADRENALINE DOSE

Steroids

- Repeated doses of 2 mg nebulized budesonide 12 hr X 48 hrs
- Oral and IM dexamethasone is equally efficacious
- Oral corticosteroids are preferred for their ease
- Doses—> dexamethasone 0.15- 0.30 mg/ kg, prednisolone 1 - 2 mg / kg

Adrenaline

- Adrenaline is used in severe cases and those poorly responsive to steroids
- 0.5 ml/kg of 1:1000 dilution to maximum of 5 ml.
- Need for repeated doses should alert the need for intubation/ PICU care

STEROIDS IN CROUP

- The use of steroids has been associated with,
 - Reduced average length of stay in the emergency
 - Decrease in the number of adrenaline nebulization needed.
 - Reduced need for endotracheal intubation.
 - If required, the duration of intubation is decreased.
- Current evidence more strong for its efficacy in moderate to severe croup.

MANAGEMENT OF SEVERE CROUP

- Continue oxygen as required.
- Admit.
- Continue nebulized adrenaline as frequently as needed,
 - if required > 2 hrly, consider shifting to PICU.
- Steroids to be continued.

INTUBATION

- if airway obstruction/ work of breathing is worsening, then one has to consider intubation and ventilation.
- Experienced hands only , as intubation is difficult and if fails the patient may be worse, ? Rapid sequence intubation.
- use a tube half size smaller than optimal.
- Tracheostomy is the last option

Croup - Take Home Messages

- Croup is essentially a viral illness.
- No investigations are required in a child with typical croup
- Most children with croup develop a mild illness and do not require any medical assistance.
- Steroids are extremely useful and indicated in a child with moderate and severe croup.
- Steroids can be given orally, IM or Nebulized and all routes are equipotent.
- Adrenaline nebulization is reserved for children with severe croup.

PERTUSSIS

CRITERIA TO DIAGNOSE PERTUSSIS

- Any individual (child/ adolescence) with ,
 - Prolonged (2 weeks or more) paroxysmal cough.
 - With or without whoop / post tussive vomiting
 - Irrespective of immunization.
- Respiratory illness with complications like conjunctival hemorrhages, fractures, rectal prolapse or encephalopathy.
- Paroxysmal cough - essential criteria
 - Seen even in partially immune individuals
 - Unlike whoop and post-tussive vomiting which is not.

- Typical paroxysm :
 - A series of rapid, forced expirations (usually 5-10), followed by gasping inhalation, leading to the typical whoop
 - Cyanosis, bulging eyes, protrusion of the tongue, salivation, lacrimation and distension of the neck veins occurs.
 - post-tussive vomiting is common.
 - Several times per hour- during both day and night.
 - Triggered by yawning, sneezing or physical exertion. In between the paroxysms, the patient is usually well.

DIGNOSIS CONFIRMATION

- CBC
 - Absolute lymphocyte count > 10,000/micro It
 - ALC above age specific mean has 70% sensitivity.
 - Normal count does not exclude pertussis
 - Neonates may have much higher counts
- CXR not sensitive or specific
- Role of cultures - not of practical importance
- Serology and PCR not recommended routinely
- Diagnosis usually clinical aided by CBC.

TREATMENT

- Antibiotics
 - reduce transmissibility
 - may reduce symptoms if given in 1st week.
 - limited role as usually diagnosed later.
- Avoidance of cough provoking factors.
- Humidified oxygen and assisted ventilation in seriously ill, usually infants.

	Dose and duration	Status
Erythromycin	40-59 mg/kg/day q 6 hrly x 14 days	Side effects – duration/ adherence, not > 1 month
Clarithromycin	15mg/kg/day Q 12 hrly x 7 days	Expensive. Drug interaction, not > 1 month
Azithromycin (DOC)	<6 months : 10mg/kg/day x 5 d >6 months: 10mg/kg on day 1 and 5 mg/kg day 2-5	Cheap, no drug interaction can be given >1 month
Cotrimoxazole	8 mg/kg of TMP Q 12 hrly x 14 days	Intolerant / CI of macrolides

TREATMENT- SUPPORTIVE

- One may try bronchodilators/ cough sedatives and individualise as per response
- Routinely none of the following are of any benefit
 - Antihistaminics
 - Steroids
 - Salbutamol
 - Pertussis immunoglobulin

DIPHThERIA

CRITERIA TO pfcNOSE DIPHTHERIA

- Sore throat with membrane in tonsillopharyngeal area
- Fever, hoarseness, barking cough, stridor, membrane over pharynx and larynx
- Sero- sanguinous nasal discharge, crusts and a white membrane on septum.
- Late presentations : usually no visible membrane
 - Palatal or bulbar palsy
 - myocarditis with prior sore throat
 - Acute polyneuropathy with or without prior sore throat.
- May occur even in previously immunized

CONFIRMING DIPHTHERIA

- Smear and culture of the membrane or scrapping below the membrane
- Stain with Neisser or Albert stain

MANAGEMENT OF DIPHTHERIA

- Hospitalization in infectious disease facility
- Droplet isolation till three consecutive daily cultures are negative
- Start treatment without waiting for microbiologic culture confirmation

- Components of therapy
 - Diphtheria antitoxin (DAT), most crucial
 - Antibiotics
 - Supportive care
 - Management of complications

Treatment - DAT

- Always administer test dose
- If allergic desensitize
- Full dose given IV at one time, diluted in NS (1;20), rate of ml/minute
- Limited availability at ID hospitals
- Serum sickness in 10% patients

Type	Total dose in units
Nasal	10,000 – 20,000
Laryngeal/pharyngeal	20,000 – 40,000
Tonsillar	15,000 – 25,000
Combined types / delayed diagnosis	40,000 – 60,000
Severe disease*	80,000 – 100,000
Carrier/ contact	Not required
* Extensive disease/ more than 3 days duration / neck edema/ tachycardia/ collapse / breathlessness.	

Treatment continued

- Antibiotics (penicillin G/ Procaine penicillin/ Erythromycin for 14 days)
- Strict bed rest for 2 - 3 weeks
- Adequate nutrition and hydration
- Steroids not recommended
- Carnitine 100 mg/kg/day BD for 4 doses may help preventing myocarditis.
 - # usefulness if given late in the disease???
- Airway maintenance in those having obstruction
 - # Intubation/ tracheotomy, oxygen therapy
- Complete immunization on recovery.

BRONCHIOLITIS

FEATURES:

- Young, well looking infant
- Tachypnea ++
- Tachycardia++
- Saturating well
- Bilateral scattered wheeze

GRADING BRONCHIOLITIS

	MILD	MODERATE	SEVERE
Feeding ability	Normal Ability to feed	Appear short of Breath during feeding	May be reluctant or unable to feed
Respiratory distress	Little or no resp distress	Moderate distress with some chest Wall retractions and nasal flaring.	<ul style="list-style-type: none"> • Severe distress with marked chest wall retractions, nasal flaring and grunting • Can have frequent and prolonged apneas.
Saturation	Saturation >92%	Saturation <92% correctable with oxygen	Saturation <92% , may or may not be Correctable with oxygen

BRONCHIOLITIS TREATMENT

Mild	Moderate	Severe
<ul style="list-style-type: none"> • No treatment required • Reassure mother • To bring the baby back if distress increases • Trail of adrenaline 	<ul style="list-style-type: none"> • Admit • Humidified oxygen to maintain SAO₂ > 92% • IV fluids • Observe for deterioration • If the child deteriorates treat as severe 	<ul style="list-style-type: none"> • Admit – ICU care • Oxygen to maintain SAO₂ > 92% • IV fluids • Cardiorespiratory monitoring • ABG/CXR • Assess need for ventilatory support/ICU care

DIFFERENTIAL DIAGNOSIS:

- Pneumonia
- GERD with aspiration
- Foreign body
- Congenital heart disease
- Broncho-pulmonary dysplasia
- Congenital anomalies like vascular ring

BRONCHIOLITIS

- Risk factors for increased severity and hospitalization.

- Infants in day care
- Exposure to passive smoke
- Crowding in the household
- Infants younger than 2-3 months
- Premature births < 34—37 weeks
- Congenital heart disease
- Chronic lung disease like CF, Recurrent aspiration, BPD, congenital malformations etc.
- Immunodeficiency
- Hypoxia

INDICATIONS FOR HOSPITALIZATION

- Infants younger than 3 months
- Oxygen saturation < 92%
- Resp Rate > 70/ min
- ILL appearing child
- Infants with one or more risk factors mentioned before are likely to have a severe course and merit admission.

INVESTIGATIONS :

- Bronchiolitis is a clinical diagnosis
- Investigations contribute very little
- CXR may be indicated in
 - severe respiratory distress or
 - in a case of diagnostic uncertainty
 - Atypical course
- Chest X-ray
 - often reveals bilateral hyperinflation findings like segmental atelectasis may be seen some times.
- Blood tests do not contribute

MANAGEMENT:

Non controversial	Controversial
<ul style="list-style-type: none">• Oxygen• IV fluids• Fever management	<ul style="list-style-type: none">• Adrenaline nebulization• Bronchodilators• Steroids• Antibiotics

Limited use- not being discussed

- Palavizumab and Ribavarin

FEEDING AND FLUIDS:

- Oral feeding
 - May be continued in infants with no more than moderate respiratory difficulty. (respiratory rate < 80 breaths per minute, some chest wall retraction, SpO₂ . 92% +/- oxygen)
- Nasogastric tube feeding
 - Generally reserved for the recovery phase because;
 - # NG tubes blocks one nostril- increased airway resistance, increased work of breathing.
 - # Feed in the stomach- increased the risk of reflux and aspiration as compresses the diaphragm.

INTRAVENOUS FLUIDS:

- Administered when there is moderate to severe or severe respiratory difficulty.
 - (marked chest wall retractions, nasal flaring, expiratory grunting, marked tachypnoea (.80/ min), apnoeic episodes, or visible tiring during feeding.
- Considerable variation in the intravenous hydration strategies recommended.
- Normal general maintenance IV fluids to be used.

OXYGEN:

- Common sense dictates its use to overcome hypoxemia
- In general, aim to maintain SpO₂ > 92%
- Can accept 90% to 92% SpO₂, if the child is not distressed and is feeding well

BRONCHODILATORS :

- There is no role for routine bronchodilators in bronchiolitis as they do not;
 - improve oxygen saturation.
 - affect rate or duration of hospitalization.

- A trial of nebulised bronchodilator can be given in :
 - Older infant (> 6 months) with wheeze.
 - Those with a strong history of atopy, further therapy continued if there is a objective improvement.

STERIODS:

- Multiple studies have failed to demonstrate any clear efficacy of corticosteroids in viral bronchiolitis

NEBULISED ADRENALINE

- Little support from randomized clinical trials for its use in all children with moderate/ severe disease
- Improvement in respiratory symptoms across studies— inconsistent and short lived.
- May use nebulised Adrenaline as a potential rescue medication for those who are to be admitted.
- Dose varies between 0.01 ml/kg to 0.3 ml/kg per dose of 1: 1000 solution.

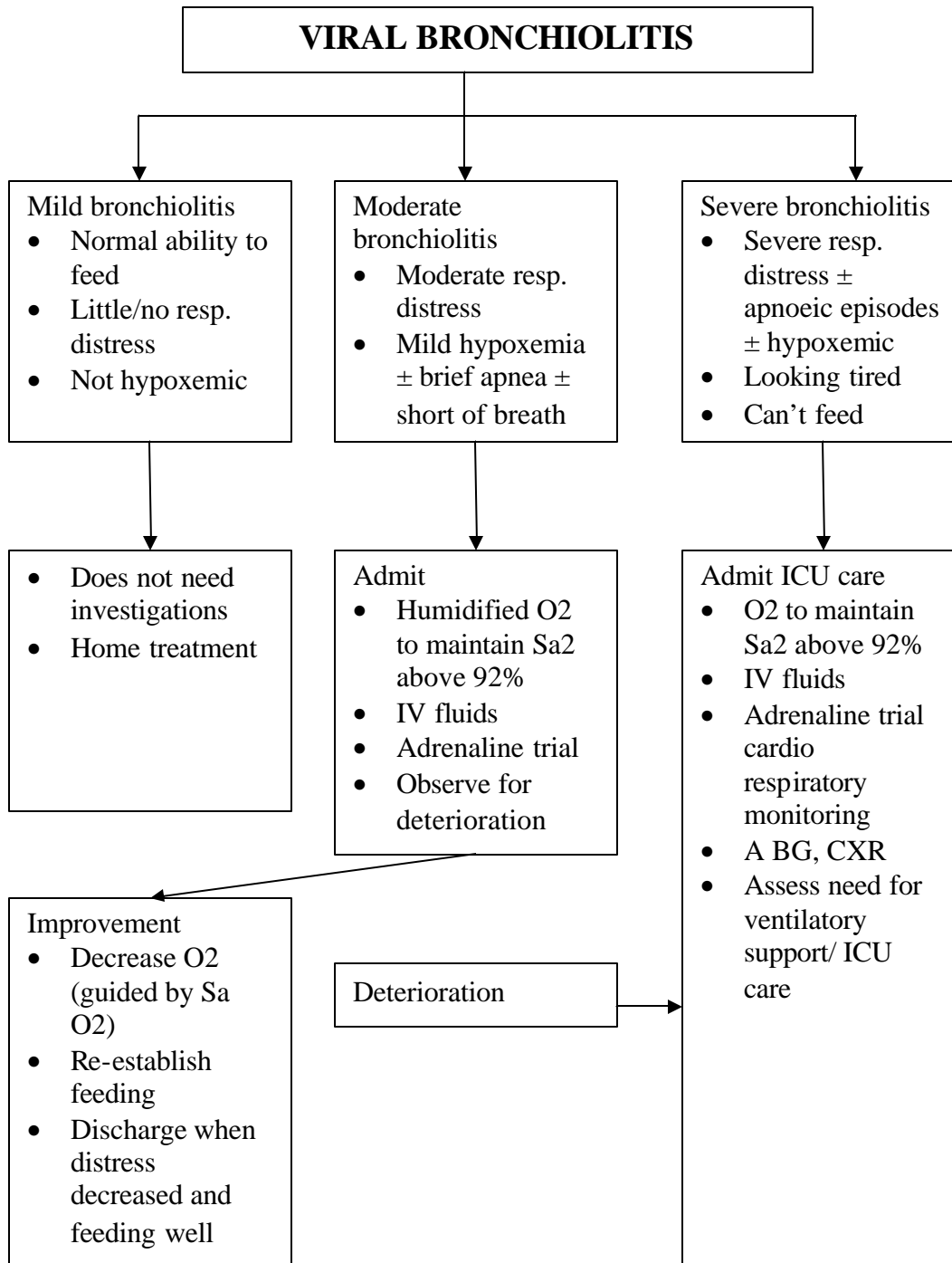
ANTIBIOTICS:

- RCTs failed to demonstrate any benefit in hospitalized infants with bronchiolitis.

- The only role of antibiotics is
 - complicated bronchiolitis where a secondary bacterial infection is suspected.
 - This is rare, but not easily excluded in a sick infant with fever, toxicity and significant opacities on the chest X-ray

SEDATION

- No safe sedation ; sedatives should be avoided
- Irritability may be a sign of Hypoxia
- Sedatives can decrease the oxygenation as well as give false sense of relief.
- Attempts to comfort the child as far as possible
 - Fever control
 - Nasal clearing
 - Feeding
 - Non threatening manner of oxygenation/ nebulisation



PNEUMONIA

TACHYPNEA

Most Consistent Clinical sign of pneumonia

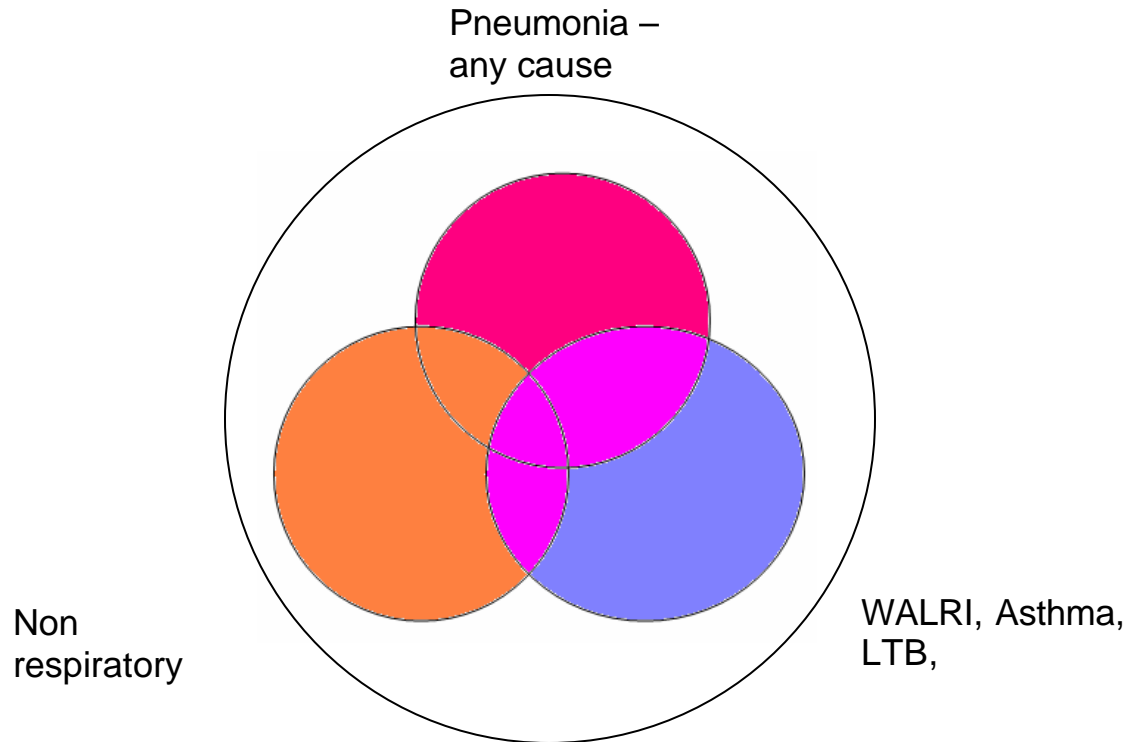
Age	Respiratory rate (breaths/min)
<2 months	60 or more
2 months upto 12 months	50 or more
12 months upto 5 years	40 or more

WHO recommends using these Respiratory rate cutoffs to diagnose pneumonia at the community level RR should be counted for full 60 sees.

Respiratory rate

Age	Respiratory rate (breaths/min)
<2 months	60 or more
2 months upto 12 months	50 or more
12 months upto 5 years	40 or more

Child with cough, rapid and difficult breathing



Tachypnoea

- A sensitive and specific tool - 66% approx.
 - as good or better than auscultation for pneumonia
- Any clinician therefore must use this merely as a beginning step (Triage sign)
- And then use all their clinical skills for the final conclusion
- Remember several other clinical situations that cause rapid breathing e.g,
- Respiratory causes: Asthma / Bronchiolites / WALRI
- Non respiratory causes: metabolic acidosis, CHF, raised ICT

Differential diagnosis

- First rule out non- respiratory causes for tachypnoea,
- Then, the No- pulmonary causes are ruled out clinically.
- In this setting of child with cough, rapid and difficult breathing, now the likelihoods are;
 - Pneumonia ± complications
 - Bronchiolitis
 - Wheeze associated with lower respiratory tract infections
 - Asthma
 - Croup

Child with Cough, Rapid, Difficult breathing

<p>Consider bronchiolitis if :</p> <ul style="list-style-type: none"> • Age 1 month – 2 years • Presence of upper respiratory catarrh • Progressive increase in resp. distress (tachpnoea, retractions) • Wheeze ± crackles • Clinical and radiological evidence of hyperinflation <p>Consider asthma if :</p> <ul style="list-style-type: none"> • Recurrent episode, 3 or more • Afebrile episodes • Wheeze • Good response to bronchodilator • Hyperinflation • Family / personal history of atopy 	<p>Consider wheeze assoc. with LRTI (WLRI) if :</p> <ul style="list-style-type: none"> • Recurrent episodes of distress under 3 years of age • Progressive increase in resp. distress (tachypnoea, retractions) • Wheeze ± crackles • Clinical and radiological evidence of hyperinflation • No family or personal history of atopy <p>Consider laryngo – tracheo-bronchiitis – Croup if :</p> <ul style="list-style-type: none"> • Hoarseness of voice and barking/brassy of cough • Stridor • Mild to marked respiratory distress • Sonorous rhonchi • Fever usually mild or spiking (tracheitis, rate)
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Can viral LRTI or bacterial pneumonia be clinically distinguished ?

- May be difficult as the investigations do not confirm etiology
- Advantage of using the suggested methodology - decreases the confounders to viral pneumonia alone rather than broad ARI.

Community acquired Pneumonia (CAP)

- CAP is an acute infection of the pulmonary parenchyma in a previously healthy child, outside of a hospital setting.
- not have been hospitalized within 14 days prior to the onset of symptoms, or
- has been hospitalized less than 4 days prior to onset of symptoms.

It excludes

- Child with immune-deficiency
- Severe Malnutrition
- Post measles state
- Ventilator assoc pneumonia / Nosocomial spread
- Recurrent pneumonias

DIAGNOSIS RADIOLOGICAL

- Do all patients require a chest radiograph?
 - NO
 - Not all CAP, particularly if on domiciliary treatment
- Few-Yes,
 - If severely ill
 - If complication suspected (for example, pleural effusion)
 - Ambiguous Clinical features.

MICROBIOLOGICAL

- Not recommended routinely
- Takes long time and hence has limited utility
- Sputum cultures / cough swabs have relatively poor reliability
- Invasive methods can not be justified for routine pneumonias.

Role of pulse oxymetry, acute phase reactants

- TLC,DLC,CRP are not diagnostic but may be useful to monitor the response to treatment.
- Pulse oxymetry is a good tool for assessing the severity and monitoring response in those with severe disease.

AGE RELATED PATHOGENS INVOLVED IN COMMUNITY

ACQUIRED PNEUMONIA

0 - 3 months	Gram negative, strepto. Pyogenes, Chlamydia, viruses
3 months - 5 years	Strept. Pneumoniae, H.influenze, stap aureus, viruses, mycoplasma pneu.
> 5 years	Mycoplasma pneumoniae, str. pneumoniae. Stap. Aureus, viruses, strp. Pyogens.

Reliability of predicting a special etiological agent based on clinical features and/or radiography

- Generally POOR.
- ONE EXCEPTION STAPH
 - More likely if
 - very rapid progression
 - skin lesions, infected scabies
 - PE/ pneumothorax / empyema
 - ? Post measles

SEVERITY OF PNEUMONIA:

- WHO classification is very simple and probably more useful from management point of view.
- Severe - tachypnoea with accessory muscles in action - lower chest indrawing
- Very severe—with additional features like
 - Altered sensorium
 - Cyanosis
 - severe grunt
 - intermittent apnea
 - difficulty in feeding

INDICATIONS FOR ADMISSION TO HOSPITAL

- SaO₂ < 92%
- Marked tachypnea, say 20+ breaths / min above the cut off for the age.
- Difficulty in breathing
- Intermittent apnea, grunting
- Not feeding/ dehydrated
- Family not able to provide appropriate observation or supervision.
- Failure of OPD treatment

TREATMENT OF C A P

Disease	Pneumonia		
Setting	Domicilliary		
Age	First line	Second line	Suspected stph. Disease
Upto 3 months	Usually severe, treated as inpatients		
3 months to 5 years	Amoxycillin	Co-amoxy clav OR Chloremphenicol	Cefuroxime OR Co-amoxy clav OR Amoxycillin + Clox
5 years plus	Amoxycillin	Macrolide OR Co-amoxy clav OR Chloremphenicol	Cefuroxime OR Co-amoxy clav OR Amoxycillin + Clox

Severe – very severe pneumonia		
Treat as in-patient		
Age	First line	Second line
0-3 months	Inj. 3 rd gen cephalosporins cefotaxime/ ceftriaxone ± Aminoglycoside (Genta/ Amikacin)	Inj co-amox clav + Aminoglycoside (Genta/Amikacin)
3 months – 5 years	Inj. Ampicillin OR Inj. Chloremphenicol OR Inj Ampicillin + Inj. Chloremphenicol (<2 years) OR Inj. Co-amox clav.	Inj. Co-amox clav OR Inj. 3 rd gen cephalosporins cefotaxime/ ceftriaxone
5 years plus	Inj. Ampicillin OR Inj co-amox calv OR Macrolides (if mycoplasma suspected)	Inj. Co-amox clav OR Inj. 3 rd gen cephalosporins cefotaxime/ ceftriaxone AND Macrolides

SEVERE - VERY SEVERE PNEUMONIA

SUSPECTED STAPHYLOCOCCAL DS

Inj 3rd Gen Cephalosporins : Cefotaxime / Cerftriaxone
+ Cloxacillin OR Inj Cfuroxime + Aminoglycoside

OR"

Inj Co-amoxylavulenic acid + Aminoglycoside
Second line: Vancomycin / Teicoplanin / Linezolid

+

Inj 3rd Gen Cephlosporins

Supportive therapy for CAP

Oxygen:

- as indicated by pulse oxymetry and / or,
- Clinical signs of hypoxia like rapid breathing as well as retractions

IV Fluids

- If dehydrated
- Tachypnoea severe enough to make the child unable to drink, or impending respiratory failure.

Fever management

- Important as fever increase oxygen requirement
- Paracetamol and sponging are useful in most situations.

Bronchodilators, where indicated

- Should be used to decrease the work of breathing.

Duration and mode of therapy

- Domiciliary 5-7 days, Oral
- If admitted:
- All antibiotics by parenteral route(i.v) to begin with
- Switch to oral after 48-72 hrs or earlier if can accept orally.
- Step-down / therapy for Inj 3rd generation Cephalosporins
- 3rd generations oral like cefpodoxime

- NOT Cefixime because it lacks action against strep. Pneumoniae
- Fluoroquinolones are not recommended
- Total 5-7 days
- If on second line, then treat for 7-10 days
- If staphylococcal disease.;
- 2 weeks if no complication:
- Else 4-6 weeks

INDICATIONS FOR TRANSFER TO PICU

- Failure to maintain SaO₂ > 92% in FiO₂ > 0.6
- Cyanosis
- Shock
- Rising respiratory and pulse rates with clinical evidence of severe respiratory distress and exhaustion with or without raised paCO₂
- recurrent apnea or slow irregular breathing.
- Excessive diaphoresis

HAP- Hospital Acquired pneumonia

- Early -onset HAP and VAP,
- occurring within the first 4 days of hospitalization,
- More likely due to antibiotic sensitive bacteria.
- Usually carry a better prognosis,

Late-onset HAP and VAP (5 days or more)

- More likely due to multidrug-resistant (MDR) pathogens,
- Associated with increased patient mortality and morbidity.

RECURRENT PNEUMONIA

- 'At least two episodes of pneumonia occurring in one year or three episodes over any period of time.'
- Recurrent pneumonia is a symptom of an underlying disease and not a diagnosis in itself.

Causes include

- Commonest — Asthma (mis- diagnosis), Aspiration syndromes
- less common — Congenital anomalies, FB, CVS shunts, TB, tumors
- Not infrequent — CF, Immunodeficiency, ciliary dyskinesia.
- Key points on history and examination
- Delayed cord fall - leuko adhesion defects
- History suggestive of aspiration (choking nasal regurgitation, recurrent seizures)
- Temporal relation of cough to feeding or posture
- Family or personal h/o atopy nocturnal cough, bronchodilator relief
- Family h/o similar disorder or consanguinity
- Multiple multifocal infections e.g. diarrhea, pyoderma, ear infections
- Malabsorptive stools
- Contact history
- Oropharyngeal examination
- Clubbing

- Other features of atopy e.g., flexural dermatitis
- Failure to thrive, BCG scar, tonsil size
- Pallor, gen adenopathy
- Perforative otitis media
- Cardiovascular system
- Respiratory system.

KEY DIFFERENTIATION :

Upper and lower respiratory symptoms	Only lower respiratory symptoms
<ul style="list-style-type: none"> • Asthma • Immunodeficiency • Ciliary dyskinesia • CF 	<ul style="list-style-type: none"> • Aspiration syndromes • Congenital anomalies • CVS shunts • FB • TB • Tumours

Same lobe	Different lobes
<ul style="list-style-type: none"> • Foreign body • Tuberculosis • Congenital anomaly 	<ul style="list-style-type: none"> • Aspiration • Asthma • CVS shunt • Mucociliary defects • Immunodeficiencies

BRONCHIECTASIS AND LUNG ABSCESS

Ask:

- Past history of pneumonia, pertussis, measles, foreign body inhalation and tuberculosis (post infectious bronchiectasis)
- Infection in other parts of body (Immune deficiencies)
- Family history of similar illness, sib death (Immune deficiencies) cystic fibrosis, primary ciliary dyskinesia)
- History of mal- absorption and failure to thrive (cystic fibrosis)
- Look for
- Respiratory difficulty: RR, chest indrawing, accessory muscles
- Clubbing and crepitations

Causes of bronchiectasis	
Congenital	Acquired
<ul style="list-style-type: none"> • Gross structural defects <ul style="list-style-type: none"> ▪ Trachomegaly ▪ Bronchomalacia ▪ Pulmonary sequestration • Ultrastructural defects <ul style="list-style-type: none"> ▪ Primary ciliary dyskinesia • Metabolic defects <ul style="list-style-type: none"> ▪ Cystic fibrosis ▪ Alfa-1 antitrypsin deficiency • Immunodeficiency <ul style="list-style-type: none"> ▪ Hypo-gammaglobulinemia 	<ul style="list-style-type: none"> • Infections <ul style="list-style-type: none"> ▪ Pneumonia ▪ Measles ▪ Tuberculosis • Obstruction <ul style="list-style-type: none"> ▪ Foreign body ▪ Enlarged node • Disorders of immunity / allergy <ul style="list-style-type: none"> ▪ Allergic broncho-pulmonary aspergillosis (ABPA) • Autoimmune disease

Investigations for the cause of bronchiectasis

- The cause remains unknown in 30-50% of patients.
- Needed investigations are:
- FO Bronchoscopy,
- HRCT or bronchography
- Serum immunoglobulin levels,
- Gastro esophageal reflux studies,
- Tests for tuberculosis and fungal infections – ABPA
- Sweet chloride, and
- Ciliary's studies

Investigations in bronchiectasis are 3 fold

A:- To ascertain and establish the diagnosis - HRCT or radiology.

B:- Pulmonary Function Tests to assess the functional capacity of the lungs.

Investigations in bronchiectasis

- **Findings on x-ray of chest are nonspecific.**
 - Ring like densities with clear centre
 - Irregular ill-defined vascular marking or
 - Unequal aeration due to atelectasis and hyperinflation
- **High resolution computerized tomographic scan (HRCT) of chest:**
 - Very sensitive and non invasive method
 - Findings include
 - Linear non tapering airway

- Distended bronchi in periphery
- Thickened bronchial walls
- **Microbiological studies**
 - Sputum culture / bronchoalveolar lavage appropriate Rx
 - Pulmonary function tests

Treating Bronchiectasis- Medical treatment

Antibiotic therapy:

- Choice of antibiotic depends on the isolates
- Most exacerbations caused by the bacteria colonizing the diseased airway

Empirical therapy:

- Co- amoxiclav / Ceftriaxone
- +/- ciprofloxacin (particularly in those with pseudomonal colonization).

Airway clearing:

- Very important tool, but hygiene
- Improve breathing efficiency
- Promote physical reconditioning

Ideally choice of antibiotics should be according to isolates and sensitivity however empirical antibiotic therapy may be justified, preferably should be

Co- Amoxyclav / ceftriaxone with or without fluroquinolones if pseudomonal colonization is suspected like in CF.

Airway cleaning, bronchial lavage and hygiene with chest physiotherapy to bring out sputum is very important and prudent should be promoted.

- Presented with fever, chest pain,
- Expectoration: 6 weeks
- Did not respond to broad spectrum antibiotics
- He had mild clubbing, bronchial breathing right infrascapular region and crepitations all over right side of chest

What are the diagnostic possibilities?

Causes of lung abscess

- Most frequently a complication of bacterial pneumonia
- Epecially those due to staphylococcus aureus,
- Klebsiella pneumonia and
- Pseudomonas
- May develop in sequestration of lung tissue or in association with foreign bodies, bronchial cysts or stenosis.
- Staphylococci lungs abscess are often multiple, while those complicating aspiration are solitary.
- May rupture into the pleural space leading to pyopnuemothrax

Lung abscesses are frequently a complication of higher bacterial pneumonia or obstruction due to retained FB or bronchial cyst, congenital anomaly like sequestration of lung tissue may also lead to lung abscess.

Take Home Messages

- Viral infections and non infectious causes of cough do not need antibiotic therapy
- Few situations for empiric use of antibiotics.
- Unwarranted use does not prevent a subsequent secondary infection in most situations.
- First line antibiotics are still effective and drugs of choice.
- Newer 3rd -4th generation antibiotics should be reserved for few non responders.
- All non responders are not due to a resistant bug. Other causes are as important.

Take home messages

- Children presenting with fever, cough with nasal / ear discharge [Includes: acute nasopharyngitis, tonsillitis, sinusitis and otitis media]
- Majority are due to viral infections
- Antibiotics do not prevent secondary bacterial infections

- Do throat swab culture / RADT in acute tonsillopharyngitis, if Exudates on tonsillar surface, cervical node enlargement, absence of conjunctival congestion or symptoms persist for > 3 days
- Consider sinusitis: if URTI persist beyond 7-10 days
- Do otoscopy in all URTIs to diagnosis otitis media
- Antibiotics in: GABHS pharyngitis, sinusitis, severe otitis media or red and bulging tympanic membrane
- Use first line antibiotics first, AMOXYCILLIN IS STILL EFFCTIVE.

Take home messages:

Children presenting with fever, cough with noisy breathing

- Common conditions: adenoidal hypertrophy, croup, pertussis, diphtheria
- Croup: commonly due to viruses, no antibiotics
- Croup: single dose of systemic steroids with epinephrine SOS
- Diphtheria: Isolate, start penicillin and ADS, give immunization on follow up.
- Pertussis: Macrolides with supportive care.

Take home:

Children presenting with breathing difficulty

[Common conditions: Bronchiolitis, pneumonia, Bronchiectasis, empyema and lung abscess]

- Bronchiolitis: viral infection,
- Oxygen inhalation, IV fluids
- Adrenaline trial

Pneumonia:

- Assess clinically, no need for C-X ray in every child.
- Amoxicillin drug of choice for ambulatory treatment
- For hospitalized children: Inj Ampicillin / Chloramphenicol or Co-Amoxyclovanic acid.
- Add macrolides if suspecting atypical organisms
- Children < 3 months: Third generation cephalosporins + Aminoglycosides

Empyema

- Cloxacillin + Ceftriaxone or Co- Amoxyclav