MED439
KING SAUD UNIVERSITY

pediatric
439 Teamwork

Revised by The Academic Leader
Homoud Algadheb

Respiratory Infections

objectives:

- To know how common this problem in pediatric medicine.
- How to differentiate between upper and lower respiratory tract infection.
- To know epiglottitis in details (history, physical examination, etiology, differential diagnosis, management).
- To know croup in details (history, physical examination, etiology, differential diagnosis, management).
- To know pneumonia (bacterial versus viral).
- Management of Community Acquired Pneumonia (CAP) in Children.
- Clinical features (How do children with CAP present?).
- Etiology – Causes of CAP (virus, bacteria, atypical organism) does the etiology alter by age.
- Investigations of CAP.
- Severity assessment.
- Management of CAP.
- Complications of CAP pneumonia (pneumatocele necrotizing pneumonia).
- Pulmonary tuberculosis (TB).
- Local epidemiology versus international epidemiology of TB.
- Presentations of pulmonary tuberculosis (TB) in children.
- Diagnosis, investigations, and managements of TB.
- How to approach children with positive purified protein derivative [(PPD) in child and family].

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Special thanks to team 437 & Faisal alsaif

Notes

Important

Book

Overview

Introduction

- Children have about 6 respiratory infection per year (normal) [1]
- They are the the greatest of all causes of medical morbidity in pediatrics.
- Majority of acute respiratory infections are URTI, but infection of lower respiratory tract are sufficiently frequent to pose almost daily problems for clinician caring for children
- Large number of different microorganisms are capable of infecting the lower respiratory tract and produces several respiratory syndromes and illnesses.

Etiology of URTIs

- **Viral**: Influenza, Parainfluenza, RSV, Rhinovirus[2], Entero, Corona, Measles, Varicella, Adeno[2], EBV,CMV, herpes.
- **Mycoplasma**: M. pneumoniae School age kids[3]
- **Rickettsia**: Coxiella burnetii (Q fever)
- **Chlamydia**
- **Bacterial**: staph aureus devastating with a lot of pus, H. flu, Pneumococcus
- **Fungi**: Candida, Histoplasma, Aspergillus
- **Parasites**: Pneumocystis carinii, Toxoplasmosis

- Staph. A is Very bad in children less than a year, it destroys all the lung
- H. Flu not seen a lot after vaccines (atypical infection) Type B
- Pneumococcus is the most common cause of pneumonia in all age groups
- Fungi & parasites are common in immunocompromised children

The doctor went through them

TABLE 13.2. Common causes of upper airway obstruction in children.

Anatomic	You won't face it as a medical student
Altered level of consciousness (airway muscle laxity)	Secondary to anesthesia and ICU & post-op (tube causes edema)
Postextubation airway obstruction	
Tonsillar hypertrophy	
Subglottic stenosis (acquired or congenital)	esp if the baby was ventilated
Macroglossia	Hypothyroidism & mucopolysaccharides
Vocal cord paralysis	Any lesions on the vocal cords & post aggressive intubation
External or internal compression	
Tumor	
Hemangioma	
Hematoma	
Cyst	
Papilloma	
Vascular rings and slings	
Infectious	
Laryngotracheobronchitis (croup)	
Peritonsillar abscess	
Retropharyngeal abscess	
Bacterial tracheitis	
Supraglottitis (epiglottitis)	
Infectious mononucleosis	
Miscellaneous	
Postextubation airway obstruction	
Angioedema	
Foreign body aspiration	
Airway trauma	

1. >6 infections is abnormal (needs investigation).. take into consideration the sitter of the baby; are they in daycare? Is the mother a healthcare worker?
2. Rhinovirus: can be a precursor to asthma "viral wheezy bronchitis" esp type c and its difficult to treat because it can prevent the bronchodilator from working. **adeno**: can cause bronchiolitis obliterans & the child will need a transplant esp type 1,3,7,21
3. 6 years & above → different antibiotic choice for a school-age child than for a 3 year old child because possibility of mycoplasma

Upper airway obstruction illness

Causes

Non-infectious

- Foreign body
- Trauma
- Angioneurotic edema
- Hypocalcemic tetany
- Caustic burns

infectious

- Epiglottis
- Laryngotracheobronchitis (Croup)
- Bacterial tracheitis
- Diphtheria
- Retropharyngeal abscess
- Peritonsillar abscess

Acute Epiglottitis

- Life- threatening condition characterized by upper airway inflammation and obstruction.
- Infection of epiglottis and supraglottic structures
- High risk of death (7%)
- Most common in male (ration of 2.5 to 1).
- may occur at any age.
- Age incidence 2-7 Y
- Vulnerable population include lower immunity
  - infants less than 12 months
  - elderly more than 85 years old
- Caused by almost always H.Influenzae type B (HIB) 90%[1]
- No seasonal predilection in incidence of epiglottitis (Croup: more in fall and winter)
- Risk factors:
  - Absence of immunization against HIB
  - Immunocompromised state
  - Smoking in the family
- You can see it now a days in pt who didn't take vaccine

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1. We do see non-typable — esp the H influenza that causes conjunctivitis as well; esp in the presence of risk factors or incomplete vaccination

Acute Epiglottitis

Pathology

Direct invasion by HIB

↓

Cellulitis with marked edema of the epiglottis, aryepiglottic folds, ventricular band and arytenoid.

↓

Edema increase the epiglottis curls posteriorly and inferiorly

↓

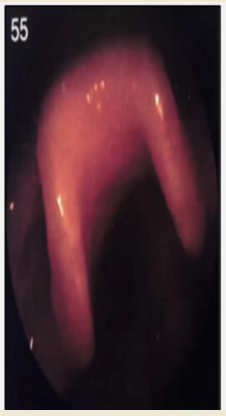
Airway obstruction

(Inspiration tend to draw the inflamed supraglottic ring into the laryngeal inlet)

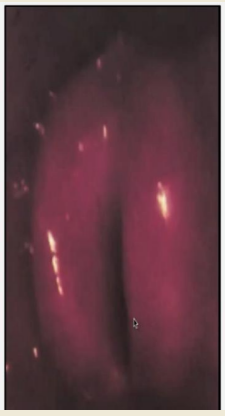
Clinical features

- Sore throat, followed by Odynophagia accompanied by drooling, retching and difficulty breathing (intensely painful throat that prevents speaking/swallowing)
- Voice is not hoarse but speech is muffled
- Cough is not croupy & it is minimal/absent
- Stridor
- Marked Fever (38.8-40C) in a toxic looking pt
- Child assuming posture that maximize the increase in diameter of the obstructed airway/ Sitting & leaning forward with hyperextension of the neck and protrusion of the chin)
- Lateral Neck x-ray: Thumb sign (in OSCE) this is atypical, the x-ray should not be done

If you see a child like this in the ER it is Epiglottis until proven otherwise



Normal



Inflamed epiglottis, inlet is almost obstructed
Sometimes they require a cricothyroidotomy

- Thumb sign imp swelling of the epiglottis
- X-ray is not done routinely, only when the case is atypical
- green arrow: air is not going down

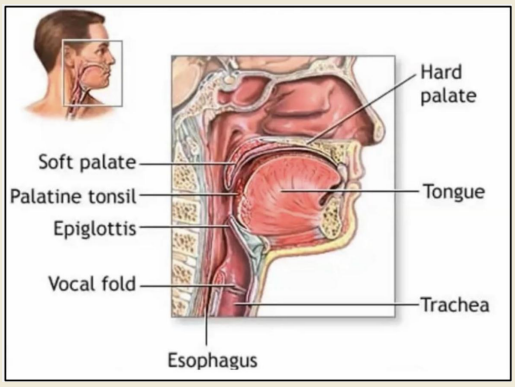
Acute Epiglottitis

management:

- Avoid stimulation of the child. This includes radiographs, drawing bloods, starting IV until secure airway established don't do x-ray Don't attempt to lie the child down and examine the throat with a spatula

Stabilization first then intubation

- Emergency Intubation: Elective nasopharyngeal intubation[1] (ETT 0.5mm smaller[2] than that required is recommended). If you can't intubate: tracheostomy
- Draw blood for culture and start I.V Cefuroxime or cefotaxime for 7 days Second or third generation cephalosporins
- Household contact prophylaxis with RIF
- NO steroid
- Criteria for extubation:
  - Afebrile
  - Swallowing comfortable



CROUP

- Age: 6 months - 3 years (6 years)
- More in fall winter and spring
- URI (Rhinorrhea, Mild to moderate fever) Max 37
- Progress to inspiratory stridor, hoarseness and croupy cough "barky" -- due to tracheal edema
- Rib cage and abdominal asynchrony occurs as the condition deteriorates RED FLAG, this is a sign that he will have respiratory failure soon. send to Icu
- Respiration is thoracoabdominal
- Most children have mild disease
- Last 7-14 days
- Among children admitted with croup less than 1% require intubation
- AP neck X-ray: Narrowing of subglottic area OSCE

Steeple or Rat tail sign, X-ray is not usually done it's a clinical diagnosis but know it for the exam
Q: 6 months old child come with respiratory stridor and low grade fever. this is his x-ray

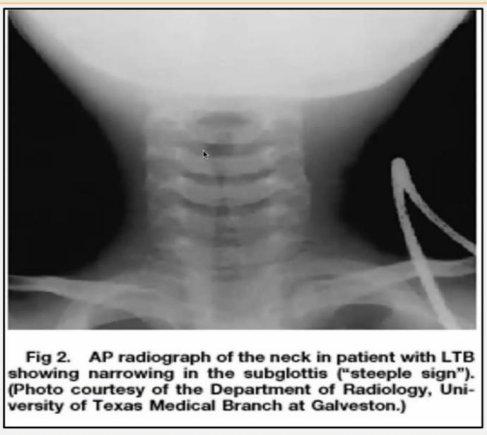


Fig 2. AP radiograph of the neck in patient with LTB showing narrowing in the subglottis ("steeple sign"). (Photo courtesy of the Department of Radiology, University of Texas Medical Branch at Galveston.)

1- why elective? because the emergent way will crush the odontoid fold. Not oropharyngeal B.C its uncuffed so the child will remove it
2- because of the edema — you want to avoid subsequent subglottic stenosis so we use smaller one.

CROUP

Etiology

- Parainfluenza most common
  - Parainfluenza 1 (most common)
  - Parainfluenza 2 (less frequent)
  - Parainfluenza 3 (less common)
- Influenza
- RSV
- Adeno, rhino, entero,herpes
- M Pneumoniae if other family member have it

	Croup	Epiglottitis
Onset	Over days	Over hours
Preceding coryza	Yes	No
Cough	Severe, barking	Absent or slight
Able to drink	Yes	No
Drooling saliva	No	Yes
Appearance	Unwell	Toxic, very ill
Fever	<38.5°C	>38.5°C
Stridor	Harsh, rasping	Soft, whispering
Voice, cry	Hoarse	Muffled, reluctant to speak

Treatment

- Moist air helps to relieve symptoms.. if you're in a very cold area, take the child for a walk outside
- Oxygen
- IV fluid if vomiting
- Steroid therapy: IM,PO, Inhalation (suppression of the local inflammatory reaction, shrinking of lymphoid swelling and reduction in capillary permeability) Mainstay of treatment IM: in the thigh
  - 0.6mg/kg IM Type of steroid? Mostly dexa
  - Half life of steroids is 6 hours — so you have to tell the parents it won't work immediately
- Aerosols: Racemic epi: increase the airway diameter within 30 mints, however the effect is short lived lasting for 2 hours Beware or rebound phenomenon (in two hours) observe for 2 hrs before discharge
  - <12 months old have a narrow airway, so have a low threshold for admission

Imp. For MCQs and OSCE

Know how to differentiate between them

Already took them in ENT, you're expected to know them

Table 13.3. Infectious causes of upper airway obstruction.

	Croup	Epiglottitis	Bacterial tracheitis	Retropharyngeal abscess
Onset	Gradual Viral prodrome 1–7 days	Rapid onset 6–12 hr	Viral prodrome followed by rapid deterioration	Viral prodrome followed by rapid deterioration
Typical age at onset	6 months to 4 years	2–8 years	6 months to 8 years	<5 years
Seasonal occurrence	Late fall to winter	Throughout the year	Fall to winter	Throughout the year
Causative agents	Parainfluenza, respiratory syncytial virus, influenza A	*Haemophilus influenzae* type b (classically), *Streptococcus pneumoniae*, GABHS	*Staphylococcus aureus* (classically), GABHS, *Streptococcus pneumoniae*	Anaerobic bacteria, GABHS, *Staphylococcus aureus*
Pathology	Subglottic edema	Inflammatory edema of supraglottis	Thick, mucopurulent, membranou stracheal secretions	Abscess formation in the deep cervical fascia
Fever	Low-grade	High fever	High fever	High fever
Cough	"Barking" or "seal-like"	None	Usually absent	Usually absent
Sore throat	None	Severe	None	Severe
Drooling	None	Frequent	None	Frequent
Posture	Any position	Sitting forward,mouth open, neck extended ("tripod position")	Any position	Sitting forward, mouth open, neck extended ("tripod position")
Voice	Normal or hoarse	Muffled	Normal or hoarse	Muffled
Appearance	Nontoxic	Toxic	Toxic	Toxic

Note: GABHS, group A β-hemolytic *Streptococcus*.

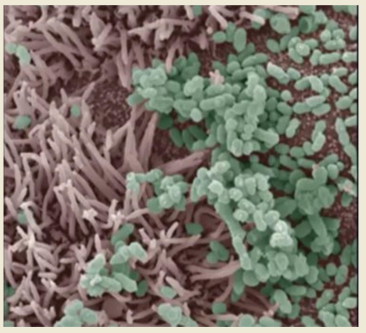
Signs and Symptoms of MERS skipped

- Fever > 38C (100.4F)
- Cough
- Shortness of breath
- Malaise
- Vomiting
- Diarrhea
- Pneumonia
- Incubation period about 5.2 days but can range up to 14 days
- Symptoms range from mild - severe
- Mean age: 56

Pneumonia

- Factor relating to the etiology:
  - Host normal or compromised
  - Age preterm babies or young babies (less than 6 months didn't finish their vaccines)
  - Season viral in the winter, bacterial in the summer
  - Environment: animate (human and animals) and inanimate

- Innate immunity in the lung is truly amazing. The lung has ~100 square meters of surface area (roughly the size of a tennis court) and is directly exposed to the outside environment with every breath we take. Despite this, the lower airway is normally sterile. There are many levels of innate immunity that keep the lung free of pathogens, including
  - filtering in the upper airways
  - mucociliary clearance Causes primary ciliary dyskinesia causing repeated respiratory infections (ex: admitted 5 times for pneumonia, repeated OM)
  - antimicrobial factors Ex: IgA deficiency



Etiology

- **Bacterial** : S. pneumonia, H flu, Staph, GAS, TB
- **Viral**: RSV, parainfl (1,2,3), Inf, adeno, rhino especially type C, entero
- **Immunocompromised**: Broader spectrum of etiological agents: fungi, gram negative bacilli, pneumocystis carinii. anaerobes, CMV Very strange organisms

Pneumonia

Etiology

Most Common Causes of Pneumonia in Immunocompetent and Immunocompromised Children over 1 month of Age

	Immunocompetent	Immunocompromised
Bacterial	• Streptococcus pneumonia • Haemophilus influenzae • Staphylococcus aureus • Group A Streprococci • Bordetella pertussis • Moraxella catarrhalis • Yersinia pestis • Pasteurella multocida • Brucella spp. • Francisella tularensis • Neisseria meningitidis • Salmonella spp.	• Pseudomonas spp. • Enterobacteriaceae • Legionella pneumophilia • Nocardia spp. • Rhodococcus equi • Actinomyces spp. • Anaerobic bacteria • Enterococcus spp.
Bacteria- like agents	• Mycoplasma pneumonia • Chlamydia pneumonia • Chlamydia trachomatis • Chlamydia psittaci • Coxiella burnetii	-

Bronchiolitis

Viral pneumonia Viral pneumonia = Bronchiolitis

- ❖ Most common cause of LRTI
- ❖ RSV, parainfl (1,2,3), influenza, adeno, rhino, entero. causes upper airway infection then goes down. Know RSV Bronchiolitis from A-Z it's very important

Treatment:

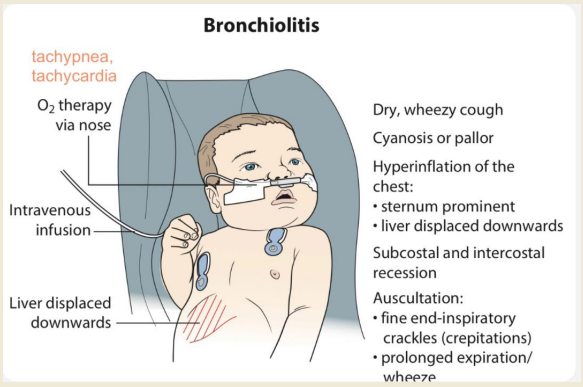
- Difficult to distinguish from bacterial pneumonia.
- Oxygenation and ventilator assistance in severe cases.
- IV Abx

- ❖ At what time of day will you get infection of the lower airway? During sleep; because of saliva aspiration during sleep

Clinical case

-January... ahmed 1 months...
- An older brother with an upper respiratory tract infection
- 3 days of rhinorrhoea and cough accompanied by low grade fever.
- Admitted to the Emergency Department for an episode of apnea with mild respiratory distress with retractions and reduced oral intake of fluid (<50%) need an admission in the last 12 hrs.

Classical case of bronchiolitis



Bronchiolitis

Clinical definition

- The diagnosis of bronchiolitis is a clinical one based on typical history and findings on physical examination.
- Clinicians in different countries use different criteria to diagnose acute bronchiolitis.

The definition: What's the difference between bronchiolitis & asthma?

- A Consensus guidelines panel reported a 90% consensus on the definition of bronchiolitis as a seasonal viral illness characterized by **fever**, **nasal discharge** and **dry, wheezy cough.**
- On examination there are fine respiratory crackles and / on high pitched expiratory wheeze.

Bronchiolitis definition

we use this, but u should know both

American:

1. Age <24 months
2. Signs of viral infection + wheeze

European:

1. Age <12 months
2. Signs of viral infection + widespread crackles +/- wheeze

Overview

- Lower respiratory tract infection in children <24 months of age.
- It involves large and small airways
  - tracheobronchitis, bronchiolitis and alveolar and interstitial lung involvement (pneumonia). It has extrapulmonary manifestations: carditis, GBS, encephalitis, seizures
- Etiology:
  - Viral: RSV Respiratory syncytial virus, the most common cause ; adenovirus (3,7,21) if these strains infect the child (or adult) they will destroy the lung (bronchiolitis obliterans) and he will need a transplant influenza, parainfluenza (3); rhinovirus; mumps. We don't do lung transplant here for children because the failure rate is high.
  - Others: Mycoplasma pneumoniae
- RSV season? winter
  - Ubiquitous throughout the world
  - Seasonal outbreaks
    - Temperate Northern hemisphere السعودية: November to April, peak January or February
    - Temperate Southern hemisphere استراليا : May to September, peak May, June or July
    - Tropical Climates: rainy season
    - In Saudi Arabia RSV appears in November and the seasonal peak occurs during Jan. & Feb.

C/P

-usually in mid winter
-fever, rhinitis, followed by dry cough, dyspraxia, poor feeding and vomiting.

P/E

-Tachypnea, chest retractions and wheezing
-Mild conj. and otitis media.

CXR

-Non-specific, air trapping, atelectasis, and consolidation.

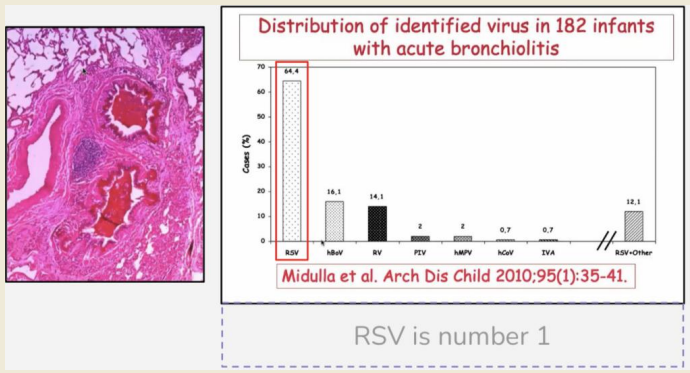
Bronchiolitis

Clinical manifestations

- Exposure to children or adults with a respiratory viral infection.
- The initial symptoms are rhinorrhoea, cough and sometimes low grade fever. In 18% of cases the first clinical symptom could be episodes of apnoea one of indication of ICU admission.
  Why apnea? Because the muscles of the child are weak. They get fatigued with increased work of breathing. If apnea happens, they child need CPAP/BIPAP or mechanical ventilation
- With the relief of fever the child manifests tachypnoea, retractions, nasal flaring, rales and hypoxemia
- Dehydration and metabolic acidosis.
- Syndrome of inappropriate secretion of antidiuretic hormone is common with severe respiratory distress that's why we use 2⁄3 of maintenance.
- It is a dynamic disease and its clinical characteristics can quickly change from morning, afternoon, night

Pathophysiology

- Upper -> lower airways
- Peribronchiolar mononuclear infiltration
- Epithelial necrosis
- Airway plugging
- Hyperinflation, atelectasis, V/Q mismatching
- Hypoxemia, work of breathing



RSV is number 1

Pathology:

Inflammation of small bronchi and bronchioles, sloughing of resp. ciliated epi.

↓

The bronchioles are plugged with fibrin and mucus

↓

bronchial obstruction

↓

increase work of breathing + V/Q mismatching

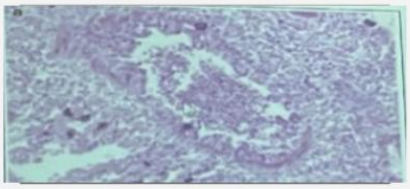
↓

hypoxemia

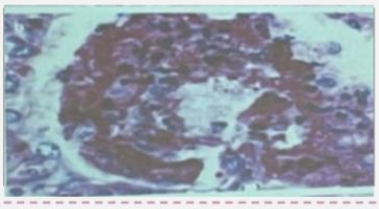
Pathogenesis ★

- Mechanical occlusion of terminal and respiratory bronchiole with mucus, fibrin, epithelial cells and inflammatory cells.
- Effects of the immunological reaction and of inflammatory mediators.
  - It's an RNA virus & there's no vaccine for it. It always changes, & therefore you cannot be immune to it.However, you might get a mild disease if you've been exposed before
  - Lumen full of inflammation ⟶ V/Q mismatch ⟶ difficulty breathing

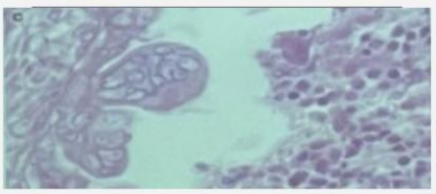
Bronchiolitis



Medium-size airway intraluminal cell fragments composed of dead epithelium, inflammatory cells and amorphous debris

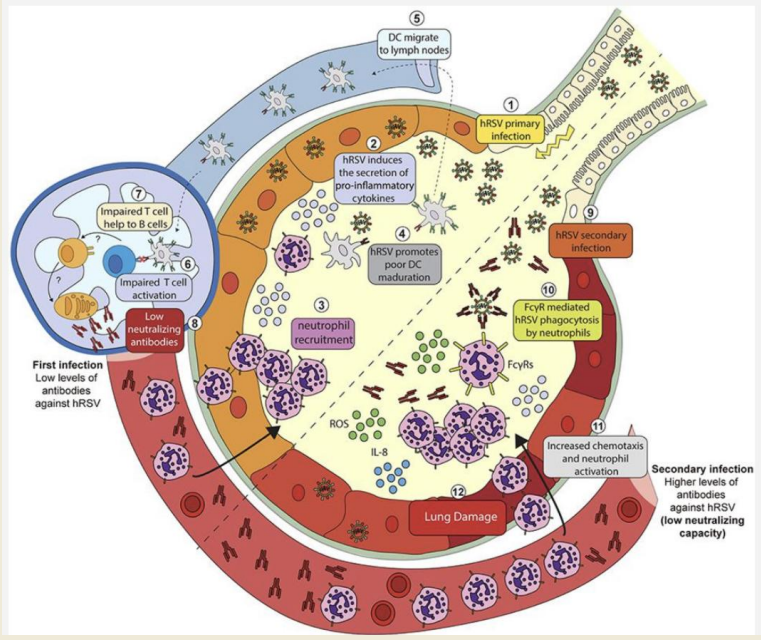


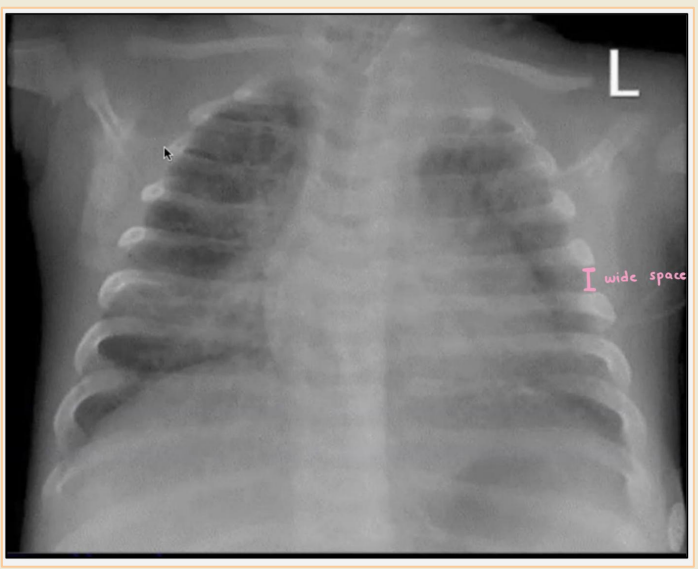
Intraluminal debris includes mucus, fibrin, epithelial cells and inflammatory cells.



Intrabronchiolar syncytia adjacent to intraluminal cellular debris

- Exposure to RSV first to an innate immunoregulatory cascade beginning with airway responses from cells constitutively present in airways. (Innate immune response)
- These cells release a variety of mediators, which recruit circulating monocytes, N cells and granulocytes that participate in the inflammatory response. (Adaptive immune response)





- Consolidation + atelectasis + hyperinflated lung (wide space between the ribs)
- Air bronchogram
- you can see this picture in any child with viral pneumonia
- RSV bronchitis

Bronchiolitis

Complications

- Atelectasis because of mucus
- Apnea and respiratory failure because they get tired, they have small muscles
- Bronch obliterans (esp. with adeno 1, 3, 7, 21)
- Myocarditis can cause pericardial effusion that restricts the heart movement

Majority: Mild to moderate disease lasting 3-10 days, 2% require hospitalization; of those 3-7% develop respiratory failure and 1% die.
High risk: Children with Cardiopulmonary disease (e.g. bronchopulmonary dysplasia, CF, VSD), immune deficiency and neonates.

Risk factors for severity

- Prematurity
- Low birth weight
- Age less than 6-12 weeks
- Chronic pulmonary disease
- Hemodynamically significant cardiac disease CHF
- Immunodeficiency
- Neurologic disease
- Anatomical defects of the airways Laryngotracheomalacia, tracheoesophageal fistula

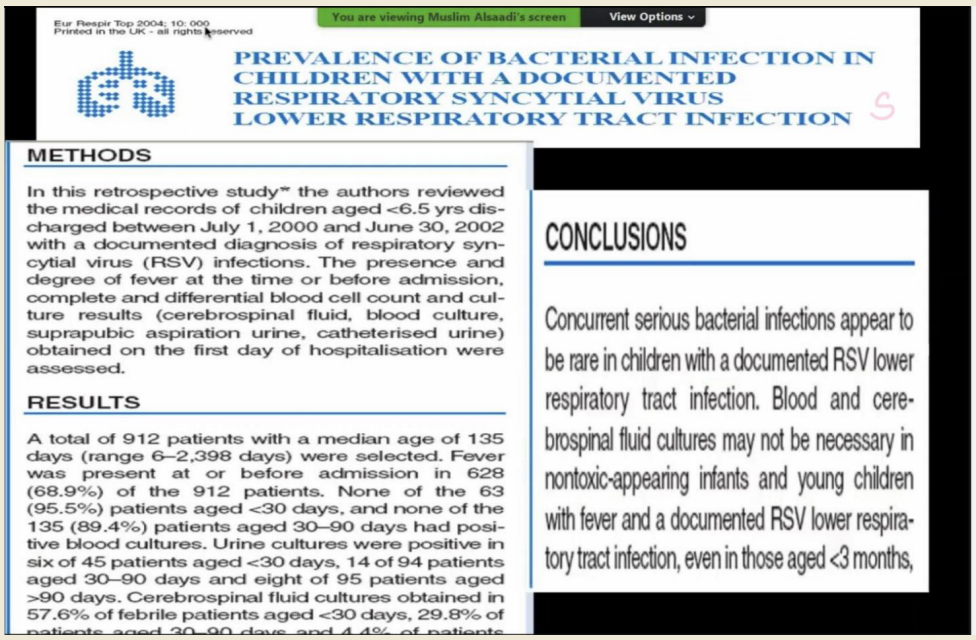
Environmental risk factors

- Older siblings primary infection to baby
- Concurrent birth siblings
- Native American heritage
- Passive smoke exposure
- Household crowding
- Child care attendance
- High altitude.

Indications for hospitalization

- Prematurity
- Age <3 months
- Apnoea
- Severe underlying conditions
- Poor feeding (less than 50% of usual) Not feeding because of respiratory distress
- Respiratory distress (RR > 60/min, nasal flaring, retractions) and cyanosis
- Oxygen saturation <92% SpO2 when breathing air < 90%

Phase of illness should be considered in the decision for timing of review or admission to hospital

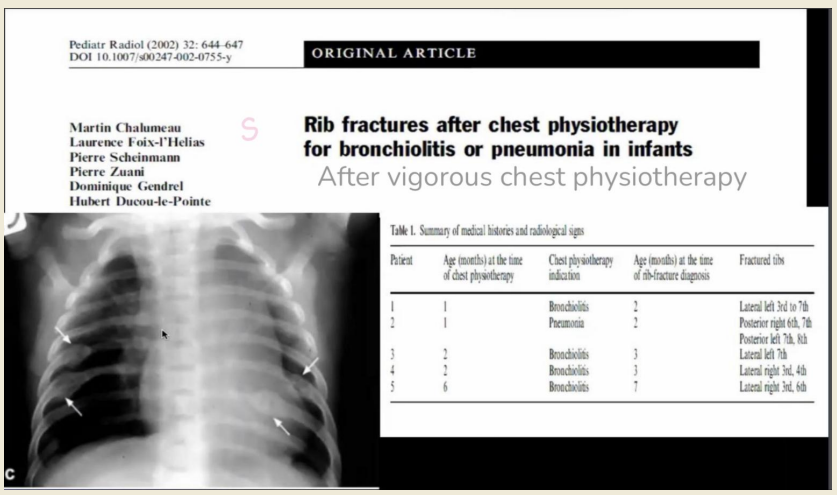


Bronchiolitis

Treatment

- Admit: if significant respiratory distress, dehydration, underlying disease.
- 02 sat, CXR, NP aspirate. Oxygen, IPPV Monitor for (apnea, fatigue), IV fluid
- BD: 30% respond to salbutamol. Of those 30% - they have a family background of agony (asthma, allergic rhinitis...)
- Steroids: not recommended.
- Ribavirin The only antiviral for RSV. given as nebulization 12-18 hr/day for 3-7 days rarely used because its difficult to administer and It's also teratogenic to the drs
- Racemic epi: Not used anymore
- CXR & ABG: if respiratory failure is suspected
- X-ray (if needed): Look for atelectasis or secondary infection
- Aspirate: to know if they have additional organisms (other than RSV)

Case report



Pediatr Radiol (2002) 32: 644–647
DOI 10.1007/s00247-002-0755-y

ORIGINAL ARTICLE

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Rib fractures after chest physiotherapy for bronchiolitis or pneumonia in infants

After vigorous chest physiotherapy

Table 1. Summary of medical histories and radiological signs

Patient	Age (months) at the time of chest physiotherapy	Chest physiotherapy indication	Age (months) at the time of rib-fracture diagnosis	Fractured ribs
1	1	Bronchiolitis	2	Lateral left 3rd to 7th
2	1	Pneumonia	2	Posterior right 6th, 7th Posterior left 7th, 8th
3	2	Bronchiolitis	3	Lateral left 7th
4	2	Bronchiolitis	3	Lateral right 3rd, 4th
5	6	Bronchiolitis	7	Lateral right 3rd, 6th

Prophylaxis for high risk patients, (CHF, CF, Immunodeficiency, preterm babies)

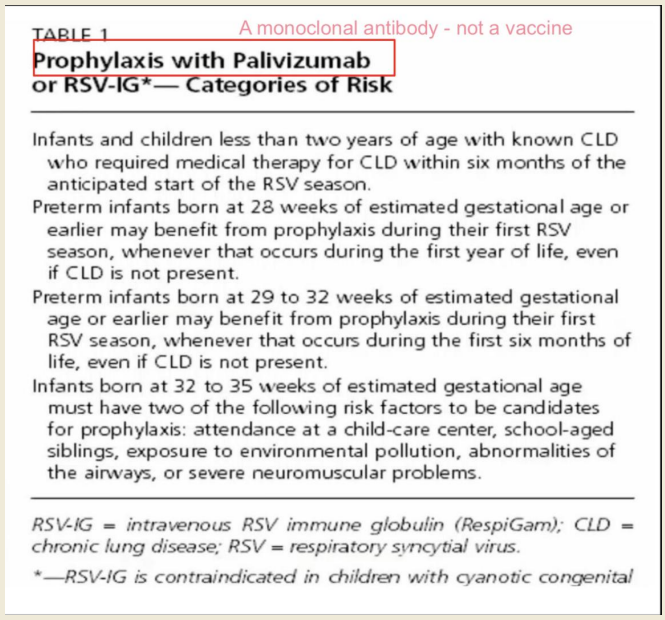


TABLE 1

A monoclonal antibody - not a vaccine

Prophylaxis with Palivizumab or RSV-IG*— Categories of Risk

Infants and children less than two years of age with known CLD who required medical therapy for CLD within six months of the anticipated start of the RSV season.

Preterm infants born at 28 weeks of estimated gestational age or earlier may benefit from prophylaxis during their first RSV season, whenever that occurs during the first year of life, even if CLD is not present.

Preterm infants born at 29 to 32 weeks of estimated gestational age or earlier may benefit from prophylaxis during their first RSV season, whenever that occurs during the first six months of life, even if CLD is not present.

Infants born at 32 to 35 weeks of estimated gestational age must have two of the following risk factors to be candidates for prophylaxis: attendance at a child-care center, school-aged siblings, exposure to environmental pollution, abnormalities of the airways, or severe neuromuscular problems.

RSV-IG = intravenous RSV immune globulin (RespiGam); CLD = chronic lung disease; RSV = respiratory syncytial virus.

**—RSV-IG is contraindicated in children with cyanotic congenital*

Discharge criteria

- Oxygen saturation stably remains 90-94%
- Absence of respiratory distress
- Adequately oral intake to prevent (>75% of usual intake) to prevent dehydration
- Adequate parental care and family education very imp

Prevention of spread

- In hospital :
  - Meticulous infection control. Isaacs D. Arch Dis Child 66,p226;1991
- At home:
  - Immunization? No vaccines available Only monoclonal antibodies
    - Formalin inactivated-> worse disease
    - Heat inactivated?
  - Passive immunity?
    - RSV-IG
    - Palivizumab For high risk, before winter, expensive (each dose 3000 SR) it will lower the risk of severe disease

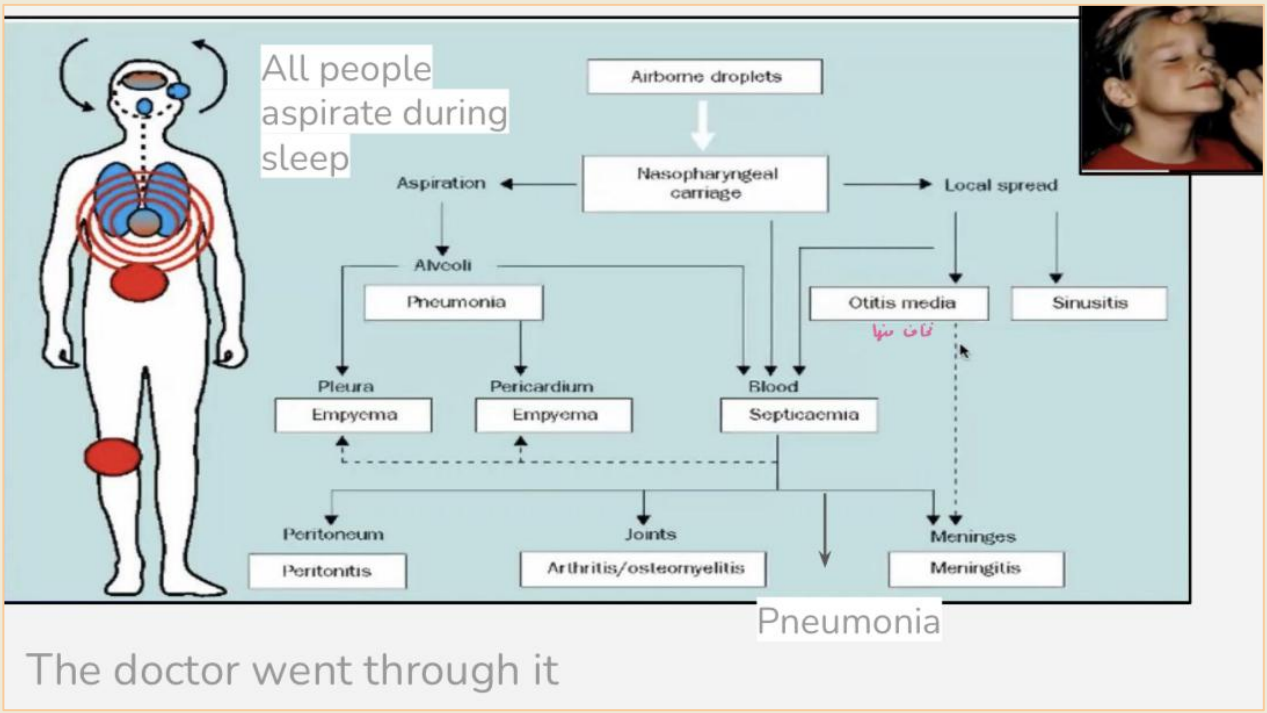
Mycoplasma pneumonia

- Peak incidence 5-15 year (account for 75% of pneumonia in this age group)
- C/P: Insidious onset of fever, headache and sore throat followed by dry cough that can last for months.
- Other organs: Meningoencephalitis, carditis, migratory arthralgia and arthritis, hemolytic anemia, +ve coomb's and cold agglutinins. All can be caused by mycoplasma infection
- Investigations:
  - CXR: Not specific, unilateral or bilateral disease, 20% has pleural effusion
  - CBC: WBC is usually normal WBCs normal or slightly high
  - Cold agglutinin > 1:64
  - Serology: 4 fold increase in CFT
- Treatment: Erythromycin, may not alter the duration or sequela (may decrease the duration of cough). Treatment: macrolides for 7-14 days

Bacterial Pneumonia [1]

Etiology

- **Neonatal period** 1 month: GBS, listeria monocytogenes[2] and gram -ve bacilli
- **After neonatal period:** S pneumoniae, H. flu type B, staph. Aureus, GAS.Pertussis, Chlamydia trachomatis
- Mycoplasma is quite common >**5y,** with strep pneumoniae, chlamydia pneumoniae. But if both parents have mycoplasma the child will still get it even if they're 1 month old
- **After age of 4 - 5 years**: S. pneumoniae and mycoplasma responsible for the majority of cases.
- TB can infect all ages



1- Viruses are the most common cause in young children,while bacteria is more common in older children. It Is Hard To Distinguish Clinically Between The Two.
2- Listeria is rare but we still cover every neonate for Listeria because it might be transmitted by the mother during cutting the umbilical cord

Bacterial Pneumonia

Pathology

- Normally the resp. tract is sterile below the vocal cords.
- Pneumonia result from aspiration Of pathogen to lower resp. tract. esp during sleep
- Concurrent viral infection It will lower the immunity aid this process (present in 30-50% of cases) esp. RSV, because of a lot of mucus measles and influenza.

C/P

- Fever
- tachypnea
- Chills
- Cough
- Stabbing chest and abdominal Pain & neck pain (feature of pleural irritation that suggests bacterial infection)
- Younger infants have less specific symptom and signs they don't complain Some children may present with diarrhea only, always examine the chest
- End Inspiratory Coarse Crackles

Diagnosis

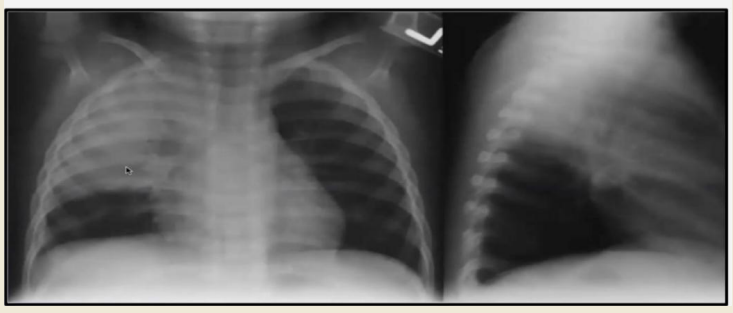
- CBC - diff, cold agglutinin WBCs very high 30-40,000
- CXR Lobar/bronchopneumonia
- Blood culture, sputum in older children Blood culture 30% positive (septicemia)
- The classic signs of consolidation: (dullness to percussion, decreased breath sounds, bronchial breathing over the affected area) may be absent in young children.

Treatment

- Adequate oxygenation. & hydration
- Depends on severity and age oral if mild, sever need admission + IV ABx wide spec: Ampicillin or amoxicillin (10-30% of H flu are resistance) cefuroxime 75- 100 mg/kg/day Augmentin if resistant to amoxicillin
- Older child >5 years: Penicillin or macrolides => oral erythro (clarithromycine or amoxicillin or zithromax)
- Killing an infection in the lung is difficult because it's difficult to penetrate.
- if the child cannot take the ABx or not complaint you need to admit him
- In mild/moderate disease, there's no advantage for oral over IV treatment

❖ Child with RUL pneumonia, he will need antibiotics for longer periods (14 days) because if he doesn't take them orally the infection will spread

Right upper lobe



Bacterial Pneumonia

What are the indications for referral and admission to hospital?

- Significant tachycardia for level of fever (values to define tachycardia vary with age and with temperature
- Prolonged central capillary refill time >2 s
- Difficulty in breathing
- Intermittent apnea, grunting
- Not feeding
- Chronic conditions (eg, congenital heart disease, chronic lung disease of prematurity, chronic respiratory conditions leading to infection such as cystic fibrosis, bronchiectasis, immune deficiency).

Features of severe disease in an older child include:

- Oxygen saturation <92%, cyanosis
- Respiratory rate >50 breaths/min the most sensitive clinical sign of pneumonia
- Significant tachycardia for level of fever (values to define Tachycardia vary with age and with temperature
- Prolonged central capillary refill time >2 s
- Difficulty in breathing; grunting
- Signs of dehydration
- chronic conditions (eg, congenital heart disease, chronic lung disease of prematurity, chronic respiratory conditions leading to infection such as cystic fibrosis, bronchiectasis, immune deficiency).

The predisposing factors to necrotizing pneumonia:

- Congenital cysts
- Sequestrations
- Bronchiectasis
- Neurological disorders
- Immunodeficiency

Certain serotypes of pneumococcal disease are more likely to lead to necrotizing pneumonia and abscess formation than others

- S aureus with Panton Valentine leukocidin toxin can lead to severe lung necrosis with a high risk of mortality

Bacterial Pneumonia

Complications

Parapneumonic effusion	• Esp. with S. aureus, H flu, S pneumoniae. Can be thin transudate or thick exudates (empyema) • Send pl fluid for cell count, glucose, protein, pH, LDH and culture. • Empyema WBC > 15,000/mm3, protein >3 g/dl, pH <7.2 • **Management: ABX + drainage**, recovery is slow, fever continue for 1 - 2 weeks. Abx won't work if you don't drain • Clue: persistent fever despite 48 hours of antibiotics • Pleural tap: Usually exudate (revise light criteria please!!) • Empyema: treatment for 6-8 weeks IV antibiotics

Pneumatoceles	• Thin wall cavity Cyst after the infection resolves
	• complicate 40% of staph pneumonia
	• unusual with other types
	• Usually asymptomatic unless rupture pneumothorax or pyothorax With sports
	• Resolve spontaneously within 3 months But instruct the family:
	  ○ No flying (it can rupture)
	  ○ No diving

Lung abscess	• Esp in aspiration pneumonia in mentally retarded children. • Esp. in the dependent portion of the lung. • Growth: mixed anaerobic bacteria • **Treatment**: Pen G, clinda or flagyl.
Septicemia and metastatic infection due to inadequate treatment	• Children can present with symptoms and signs of pneumonia but also have features of systemic infection. • Children with septicemia and pneumonia are likely to require high dependency or intensive care management. • Metastatic infection can rarely occur as a result of the septicemia associated with pneumonia. • Osteomyelitis or septic arthritis should be considered, particularly with S aureus infections.
Hemolytic uraemic syndrome Don't forget to read about HUS in general (this is a common peds topic!!!!!!)	• S pneumoniae is a rare cause of haemolytic uraemic syndrome. • A recent case series found that, of 43 cases of pneumococcal haemolytic uremic syndrome, 35 presented with pneumonia and 23 presented with • empyema. Although a rare complication. • in cases with pallor, profound anemia and anuria "renal shutdown", this should be considered.

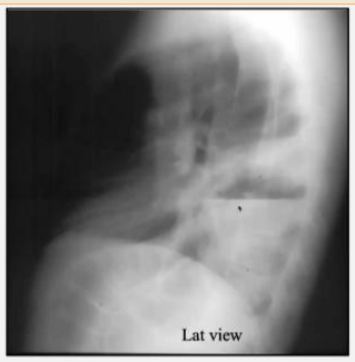
Light's criteria: An effusion with **any** of the following characteristics is classified as an exudate: pleural:serum protein ratio > 0.5, pleural:serum LDH ratio > 0.6 or pleural LDH > 2/3 of the upper limit of normal for the serum.

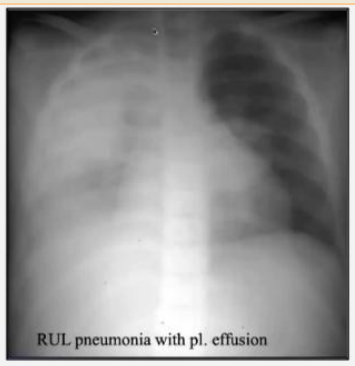
Light's criteria for pleural effusions

	Transudate	Exudate
Protein (pleural/serum)	≤0.5	>0.5
LDH (pleural/serum)	≤0.6	>0.6
	Pleural LDH ≤ two-thirds upper limit of normal serum LDH	Pleural LDH > two-thirds upper limit of normal serum LDH
Common causes	• Hypoalbuminemia (cirrhosis, nephrotic syndrome) • Congestive heart failure • Constrictive pericarditis	• Autoimmune disease • Esophageal rupture • Infection (parapneumonic, TB, fungal, empyema) • Malignancy • Pancreatitis • Post-CABG • PE

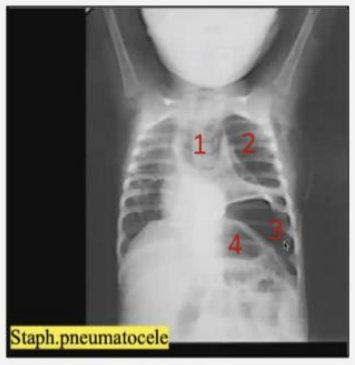
Bacterial Pneumonia

Complications

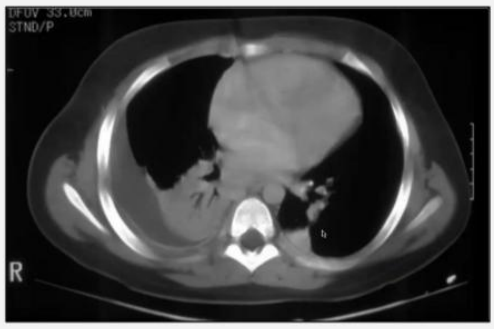




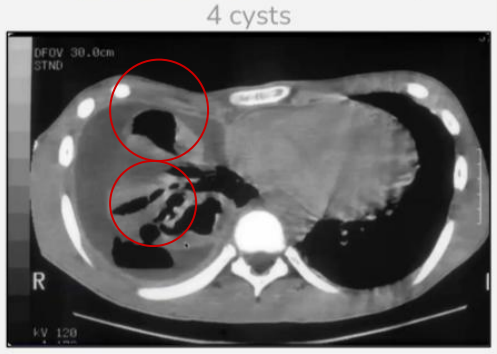
Chest tube



4 cysts



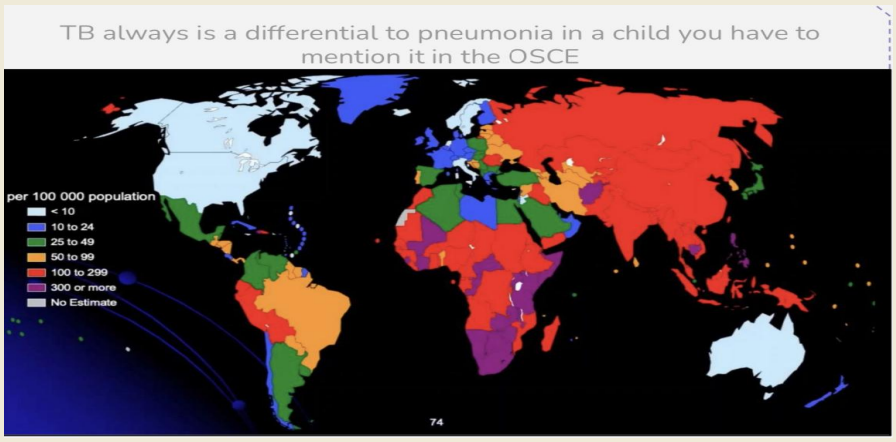
Right Effusion, air bronchogram



Eaten lung, takes time to recover (3,4 months

Tuberculosis

- The vast majority of childhood TB occur in children < 4 y usually after exposure to an infected adults. (i.e. children infected with TB always have an adult with active TB in their environment).
- Transmission is by droplet nuclei
- Its distribution is worldwide
- Multi-drug resistance has emerged as an important clinical problem Here,they may have RIF resistance we have Salmonella direct observed therapy is needed
- Infection in patients with HIV infection initially lead to increases in the number of cases
- Adults with cavity harbor a great no. of bacilli for long time. They become non- infectious 2 weeks after therapy.
- Children with primary TB are rarely infectious, TB bacilli are sparse, but they are the long term reservoir of infection in the population



Tuberculosis

Etiology

- Mycobacterium tuberculosis & M. bovis Culture takes 4-6 w, sensitivity another 4 w.
- Radiometric methods, detection & sensitivity 4-10 d.
- By DNA proves detection within 2 hrs.

Problems in the diagnosis of TB

Active disease

M. tuberculosis is difficult to isolate: even with good microbiological facilities, the bacillus is recovered in only 50-60% of cases

Latent infection

M. tuberculosis cannot be cultured from latently infected individuals: no gold standard

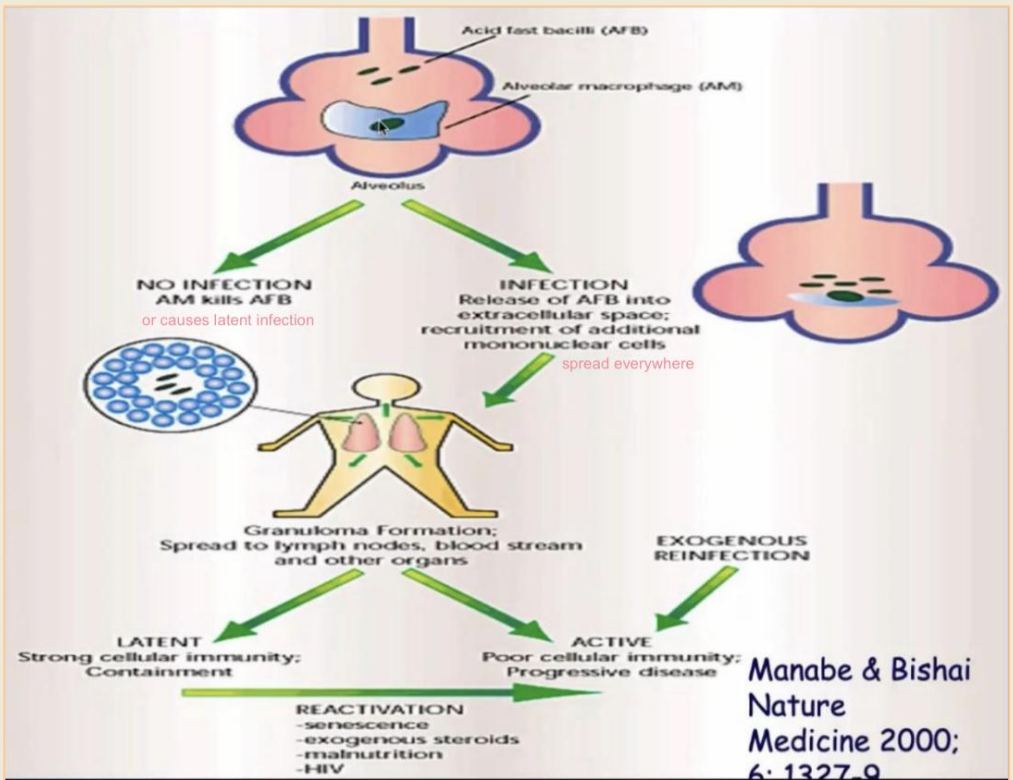
❖ Latent disease is more likely to progress to active compared to adults

Clinical manifestations

- Insidious onset
- Weight loss
- Anorexia
- Fever
- Hepatosplenomegaly
- Headache almost always = meningitis
- Abdominal pain and tenderness usually = peritonitis
- Skin and eye tubercles (Tuberculous Uveitis) → ask about travel history
- LN swelling

PPD: —ve in 30%

CXR: May be characteristic



Tuberculosis

Smear examination diagnosis

- Strongly consider TB in patients with smears containing acid-fast bacilli (AFB)
- Results should be available within 24 hours of specimen collection
- Presumptive diagnosis of TB
- Sensitivity 5-10000 bacilli/ml specimen

Risk factors for TB in children

- Most children acquire infection from adults, thus the epidemiology of TB in children follows that of adults
- The distribution of TB in children is a marker of recent ongoing transmission in the community
- The diagnosis of TB is difficult in children, and children are usually not infectious
- This underlines the importance of contact tracing
- Things that enhance transmission:
  -Immunodeficiency
  -Close proximity
  -Large infectious dose (cavity, sputum smear positivity)

Bacteriologic confirmation

- Problematic in children
  - Pauci-bacillary disease, often poor yield
  - NB! BUT still do culture if possible
- **Which specimen to collect?**
  - Gastric aspirate (fasting, early morning)
    - Induced sputum / Assisted sputum
    - Bronchoalveolar lavage
    - String test
  - Fine needle aspiration or excision biopsy **Not incision biopsy**

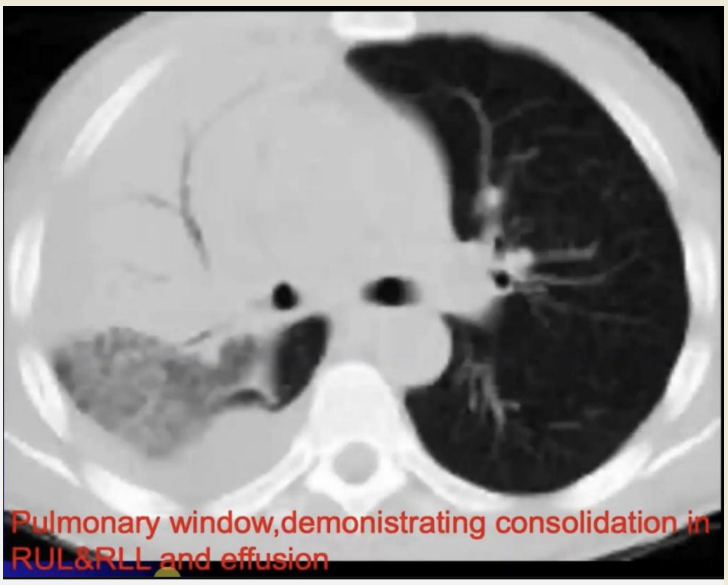
Diagnosis
- Sputum samples are unobtainable in under 8 years so take gastric washings (since they swallow sputum) on 3 consecutive mornings before food intake --> stain with ZN stain & culture.
  - PCR is increasingly used to detect MTB but it cannot replace cultures are they provide limited info about MDR TB
- If you suspect TB:
  - TST: new UK guidelines state that any induration of 5 mm or more is +ve regardless of previous BCG vaccination.
  - IGRA tests T cell response to stimulation by antigens in vitro
    - +ve result = infection
    - -ve result cannot rule out infection reliably.
  - Neither TST not IGRA differentiate between latent/active TB & therefore you must correlate with clinical signs.
  - Both may be falsely negative in advanced immunodeficiency, such as when infected with HIV as well.

Tuberculosis

Timetable of disease after primary infection in children	
3-8 weeks	• TST response • Hypersensitivity reactions • Erythema nodosum
1-3 months	• Hematogenous spread (meningitis and miliary in infants)
3-7 months	• Bronchial disease (< 5 years) • Pleural effusions (>5 years) > 5 years will have a TB that behaves like adults
1-3 years	• Osteo-articular disease • Calcifications (Calcified LNs for example) • Adult-type disease
>3 years	• Reactivation

BCG

- BCG vaccination is effective against severe forms of TB (meningitis and miliary TB)
- TB testing is not required before BCG vaccination in young children
- BCG can be used as a diagnostic test for TB (Koch phenomenon)
- Complications are rare and are not more common in TB patients (10371 / 1.5 billion BCG)
- BCG vaccination is not recommended in HIV-positive children



TB can't be differentiated from other pneumonia You have to rule it out

Tuberculosis

Complications

Most occur in the 1st year.

- Miliary TB & TB meningitis: not later than 3-6 mo after initial infection.
- Endobronchial TB: within 9 mo.
- Bones or joints: within 1 y.
- Renal: 5-25 y.
- Secondary reactivation.

Suggested criteria for diagnosis of TB in children (Suspected/probable)

Any three of the following:

- History of contact with an adult with suspected or proven TB
- Symptoms and signs of TB such as persistent fever, cough, ,weight loss, failure to thrive, anorexia, respiratory distress, decreased breath sounds, rales on chest examination, lymphadenopathy, etc.
- Positive Mantoux or PPD more than 10 mm of indurations Not redness
- Chest radiographic Findings such as an infiltrate or Lymphadenopathy

Confirmed:

- A positive AFB smear or culture of gastric aspirate or other body Fluid **OR**
- Histological Findings consistent with TB

Treatment

First line

- NH
- Rifampin
- Pyrazinamide
- Ethambutol
- Streptomycin

You have to know the side effects of these medications like hepatitis, change in urine color and vision

Second line

- Para-aminosalicylic acid
- Ethionamide
- Caperomycin
- Kanamycin
- Cylcoserine

- INH + rifampin X 9 mos. Will cure 98%.
- Shorter courses (6 mos.) using more drugs; INH, rifampin and pyrazinamide for 2 mos. followed by 4 mos. of INH and rifampin.

The 9 mos. approach is the one recommended for children. The course is 9 months in children not 6 months.

Treatment for uncomplicated pulmonary TB or TB lymphadenitis is usually 6 months. Longer courses are for osteoarticular TB, meningitis TB, disseminated TB

★ **Steroids**

- Use only with anti-TB med not alone indicated in:
  - TB meningitis and increased ICP due to brainstem inflam and resultant HC.
  - Endobronchial TB => collapse or air trapping.
  - Miliary TB with pericarditis, pleural effusion or peritonitis.

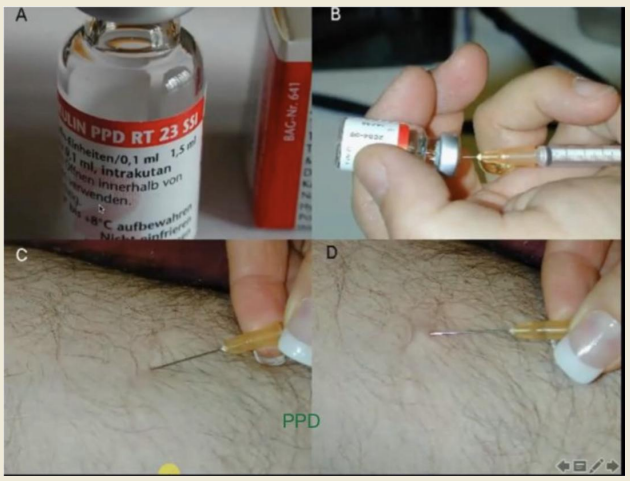
Tuberculosis

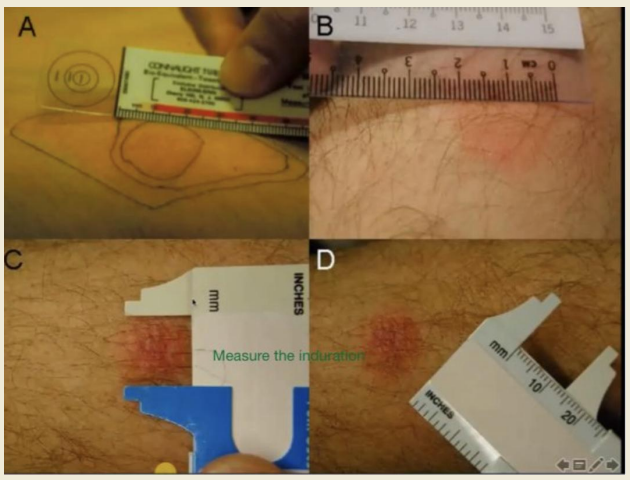
Treatment of latent TB infection

- Regimens
  - INH 6 months (since 1965)
  - RIF + PYR 2 months
  - RIF + INH 3 months (France and Britain)
  - (RIF 4 months)
  - (CDC trial with a long acting RIF: rifapentine)
- INH recommended worldwide
  - efficacy 93%
- A shorter and safer regimen would increase and physician acceptance and patient adherence

- Isoniazid is safe for latent TB infection

Adverse effects	Number %	Events per 1000 patients completing treatment
Hepatotoxicity	10(0.3)	4
Rash	130(3.4)	54
Itching (no rash)	117(3.1)	48
Nausea, vomiting	131(3.5)	54
Abdominal pain	176(4.6)	73
Headache	338(9)	140
paresthesias	177(4.7)	73
Dizziness	17(0.4)	7





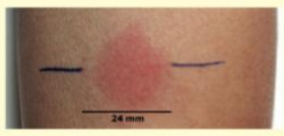
Tuberculosis

Clinical features of TB

Primary infection

Asymptomatic

Nearly half of infants and 90% of older children have minimal or no symptoms or signs of infection. A local inflammatory reaction limits the progression of infection. However, the disease remains latent and may therefore develop into active disease at a later time. Asymptomatic children with a positive tuberculin skin test (TST) (Fig 18.19a) or interferon-gamma release assay result (i.e. latent TB) should be given chemoprophylaxis to prevent future conversion to active TB.



a) Example of a positive TST (24-mm induration). A TST (2 units PPD, Purified Protein Derivative) is positive if the palpable induration is 5 mm or more in diameter irrespective of whether or not had BCG immunization (NICE guidelines, 2016). Only the induration should be measured (not the surrounding erythema).

Symptomatic

In this case the local host response fails to contain inhaled *M. tuberculosis*, allowing spread via the lymphatic system to regional lymph nodes. The lung lesion plus the lymph node constitutes the 'Ghon (or primary) complex'. When the host's cellular immune system responds to the infection (3–6 weeks), mycobacterial replication diminishes but systemic symptoms develop:

- fever
- anorexia and weight loss
- cough
- chest X-ray changes (Fig. 18.19b).

The primary complex usually heals and may calcify. The inflammatory reaction may lead to local enlargement of peribronchial lymph nodes, which may cause bronchial obstruction, with collapse and consolidation of the affected lung. Pleural effusions may also be present. Further progression may be halted by the host's immunological response, or there may be local dissemination to other regions of the lung.

Although primary infection most commonly occurs in the lung, it may also involve other organs including lymph nodes, bones and joints, the genitourinary system, and the meninges.

b) Chest X-ray of pulmonary TB. There is marked left hilar lymphadenopathy

Dormancy and dissemination

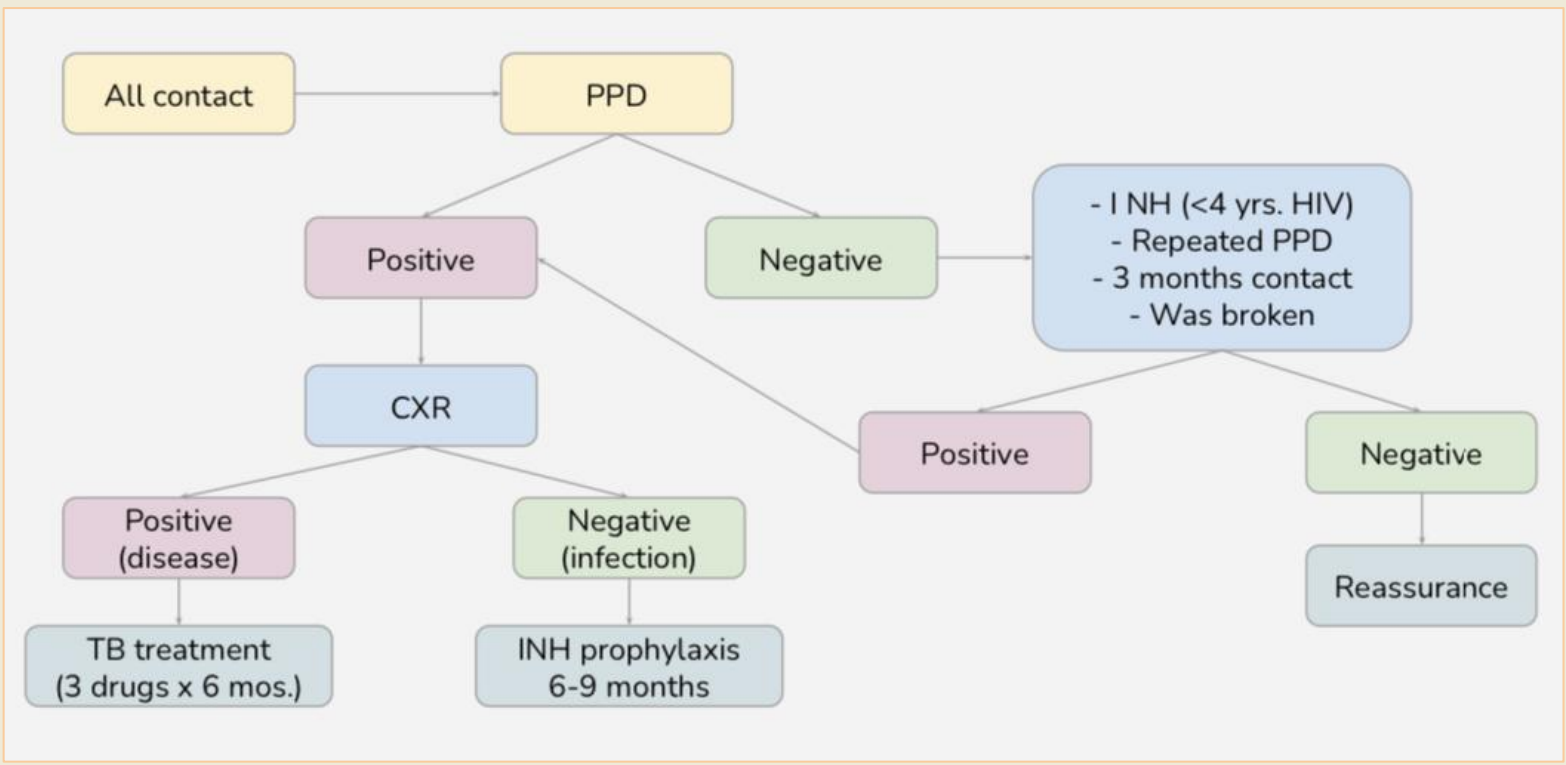
Both asymptomatic and symptomatic infections may become dormant but subsequently reactivate and spread by lymphohaematological routes.

Reactivation

Post-primary TB

This may present as localized disease or may be widely disseminated (called miliary TB), to sites such as bones, joints, kidneys, pericardium, and CNS. Infants and young children are particularly prone to tuberculous meningitis. This was always fatal before antimicrobial therapy was available, and is still associated with significant morbidity and mortality if treatment is not initiated early.

Treatment of contact



EXTRA

- **Chest recession**: it is an important indicator of increased work of breathing. In children, when the work of breathing increases, the breathing pattern becomes abdominal (see-sawing of chest and abdomen) due to weak chest wall muscles and strong diaphragm. This is not seen in adults.

- **Impending respiratory failure is suggested by:**
  - Cyanosis persistent grunting
  - Reduced oxygen saturation despite oxygen therapy
  - Rising pCO2 on blood gas
  - Exhaustion, confusion, reduced conscious level

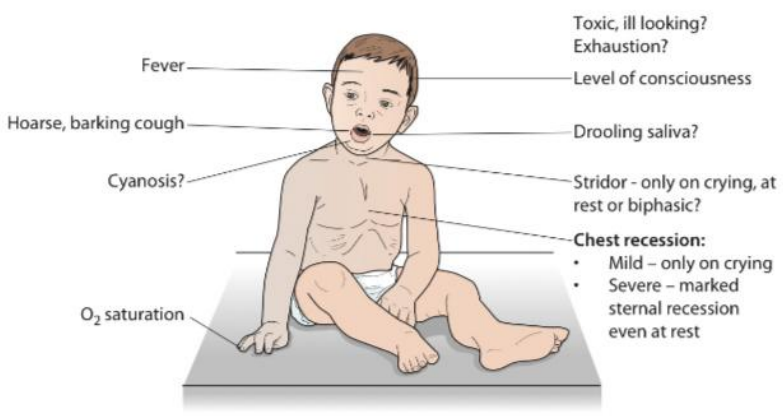
Summary

The clinical features of respiratory tract disorders in infants and young children are:

- Cough.
- Respiratory noises – wheeze, stridor, crackles.
- Increased rate of breathing.
- Increased work of breathing – dynamic chest recession.
- Reduced oxygen saturation which improves with supplemental oxygen and respiratory support if necessary.

The child with stridor

Clinical features to assess



Clinical conditions

Croup:
- Mostly viral
- 6 months to 6 years of age
- Harsh, loud stridor
- Coryza and mild fever, hoarse voice, barking cough

Epiglottitis:
- Caused by *H. influenzae* type b, rare since Hib immunization
- Mostly aged 1–6 years
- Acute, life-threatening illness
- High fever, ill, toxic-looking
- Painful throat, unable to swallow saliva, which drools down the chin

Bacterial tracheitis:
- High fever, toxic
- Loud, harsh stridor

Inhaled foreign body:
- Choking on peanut or toy or object in mouth
- Sudden onset of cough or respiratory distress

Chronic stridor:
- Recurrent or continuous stridor since birth or early infancy from laryngomalacia, congenital airway abnormality, or external compression, e.g. vascular ring

Other rare causes:
- See Box 17.1

EXTRA

Persistent/recurrent cough
- A cough > 8 weeks or more that did not improve after 3-4 weeks, in the absence of a URTI.
- Persistent cough after an acute infection may indicate unresolved lobal collapse (will be seen on CXR)
- Consider TB in any child.

Box 17.3 Causes of persistent or recurrent cough

- Recurrent respiratory infections most common
- Following specific respiratory infections (e.g. pertussis, respiratory syncytial virus, *Mycoplasma*)
- Asthma
- Persistent lobar collapse following pneumonia
- Suppurative lung diseases (e.g. cystic fibrosis, ciliary dyskinesia or immune deficiency)
- Recurrent aspiration (±gastro-oesophageal reflux)
- Persistent bacterial bronchitis
- Inhaled foreign body
- Cigarette smoking (active or passive)
- Tuberculosis
- Habit cough
- Airway anomalies (e.g. tracheo-bronchomalacia, tracheo-oesophageal fistula)

Cough characteristics:
- Dry, with prolonged expiratioin: narrowing of small-medium sized airways
- Barking cough: tracheal inflammation/collapse
- Moist: increased mucus secretion or lower airway infection

Pertussis (whooping cough) is highly infectious & caused by Bordatella pertussis.
- Catarrhal phase: 1 week of coryza
- Paroxysmal phase: paroxysmal/spasmodic cough followed by a characteristic inspiratory whoop. Can last up to 3 months.
  - Worse at night, might culminate in vomiting "post-tussive vomiting" or epistaxis or subconjunctival vomiting
  - Child may go red or blue during this phase.
- Convalescent phase: gradual decrease of sx
- Dx: culture of a nasal swab, PCR, lymphocytosis
- Tx:
  - Isolate, admit if severe or cyanotic attack
  - Macrolide (imp to start in the catarrhal phase)
  - Contacts: macrolide prophylaxis
- Complications: apnea, pneumonia,, bronchiectasis, seizures
  - Mortality may be associated with infants who did not yet complete their vaccinations

Whooping cough (pertussis)

1# Catarrhal phase	Coryza for a week
2# Paroxysmal phase	Then they develop spasmodic cough followed by characteristic inspiratory whoop. Those spams are worse at night and may culminate in vomiting (tussive vomiting) . During paroxysm, the child goes red or blue in the face and mucus flow from the nose and mouth. The whoop may be absent in infant and apnea is common. Epistaxis and subconjunctival hemorrhage can occur due to vigorous coughing. This phase lasts for 3 months. **Infants and young children suffering severe spasms of cough or cyanotic attacks should be admitted to hospital and isolated from other children**
3# Convalescent phase	Decrease of symptoms but may persist for many months

Summary

Pertussis
- Caused by *Bordetella pertussis*.
- Paroxysmal cough followed by inspiratory whoop and vomiting; in infants, apnoea rather than whoop, which is potentially dangerous.
- Diagnosis is usually clinical. It is suggested by marked lymphocytosis on a blood film and confirmed by culture / PCR from a pernasal swab.

- Although macrolide antibiotics eradicate the organism, they decrease symptoms only if started during the catarrhal phase. Siblings, parents and school contacts are at risk and close contacts should receive macrolide prophylaxis. Unimmunized infant contacts should be vaccinated
- Reimmunization of mothers during pregnancy is recommended in the UK and a number of other countries as it reduces the risk of pertussis in the first few months of the infant's life, when it is most dangerous.

EXTRA

RSV is highly infectious, and infection control measures, particularly good hand hygiene, cohort nursing, and gowns and gloves, have been shown to prevent cross- infection to other infants in hospital

- Prevention of bronchiolitis: a monoclonal antibody to RSV (palivizumab) given monthly by IM injection reduces the number of hospital admissions in high risk preterm infants

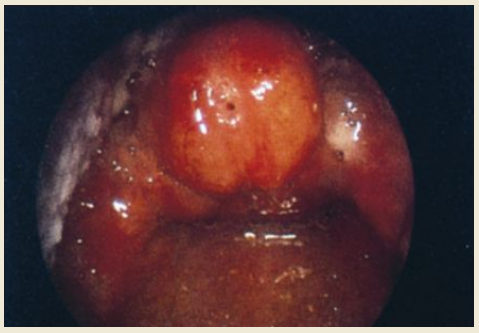
- At all ages Mycobacterium tuberculosis should be considered as cause of bacterial pneumonia

- The most sensitive clinical sign of pneumonia is raised respiratory rate so this MUST be measured in a febrile child
- The classic signs of consolidation are often absent in children
- Antibiotic choice depends on age and severy: newborn (broad spectrum IV antibiotics) older infants (oral amoxicillin with broader spectrum antibiotics such as conamoxicla reseved for complicated or unresponsive pneumonia) , children > 5 years either amoxicillin or an oral macrolide such as clarithromycin. If child has mild / moderate pneumonia we give oral unless he is vomiting
- Small sterile parapneumonic effusions occur in up to one-third of children with pneumonia and usually resolve once the pneumonia is treated
- Pneumonia: Those with a lobar collapse or persistent symptoms should have a repeat chest X-ray after 4–6 weeks to confirm resolution

Upper respiratory tract infections	
The common cold (coryza)	-The most common infection of childhood -Classical features: mucopurulent nasal discharge and nasal blockage. -The most common pathogens are viruses (rhinovirus, coronavirus, RSV -Self limiting (paracetamol/ ibuprofen for pain if any) -Cough may persist for up to 4 weeks after a common cold
Sore throat (pharyngitis & tonsillitis) • Pharyngitis: GAS results in scarlet fever ◦ Fever 2-3 days before headache & tonsillitis ◦ Rash "sand-paper-like maculopapular" ▪ Flushed cheeks, perioral sparing ▪ White/sore, swollen tongue ◦ Complications if untreated with Abx: GN, rheumatic fever Penicillin V (erythromycin if allergic) for 10 days to completely eradicate & prevent rheumatic fever.	-Commonly is viral origin (adenovirus, enterovirus, rhinovirus) -They may develop also lymphadenopathy (tender) -Tonsillitis: inflamed tonsils often with purulent exudate and maybe caused by group A beta hemolytic streptococci and EBV -Marked constitutional symptoms are more common with bacterial infection (headache, apathy and abdominal pain + tonsillar exudate, & cervical lymphadenopathy -Can we differentiate clinically between viral or bact infection? **NO** -Countries with high incidences of rheumatic fever or children with high risk of severe infection need antibiotics to eradicate beta hemolytic streptococci. -Unable to swallow solids or liquids require hospital admissions for IV fluids -Amoxicillin is **BEST AVOIDED** as it may cause a widespread maculopapular rash if the tonsillitis is due to infectious mononucleosis **(IMPORTANT!!!)** **-Indications of tonsillectomy:** **1.**Recurrent tonsillitis (7 or more episodes of significant sore throat in the preceding 12 months or 5 or more episodes in each of the two previous years, or 3 or more episodes in each of the previous three years) **2.**Complications (e.g. peritonsillar abscess - quinsy. Sleep disordered breathing e.g. OSA) OSA: also remove adenoids
Acute otitis media	-Children and infants are prone to AOM because their *Eustachian tubes are short, horizontal and function poorly* -It is most common at 6-12 months of age -Most children will have at least one episode -It causes earache and fever -Every child with a fever should have their tympanic membranes examined Dx -**Otoscopic findings:** tympanic membrane is bright red and bulging with loss of the normal light reflection. There could acute perforation of eardrum with pus visible in the external canal -**Pathogens:** RSV, rhinovirus, pneumococcus, Haemophilus influenzae and Moraxella catarrhalis -**Complications:** mastoiditis and meningitis (refer to ENT lecture if you want to recall complications) -Antibiotics marginally shorten the duration of pain but no effect on preventing hearing loss -Pain should be treated with regular analgesia and may be required for up to a week -Recurrent otitis media can lead to otitis media with effusion (usually asymptomatic apart from possible decreased hearing, eardrum is dull and retracted often with visible fluid level. It may resolve spontaneously, but may cause conductive hearing loss and interfere with normal speech development). If hearing doesn't improve surgery may be considered with insertion of tympanostomy tubes.
Sinusitis	-It may occur with viral URTIs -There could be secondary bacterial infection, with pain and tenderness over the cheek from infection of the maxillary sinus -Frontal sinus doesn't develop until late childhood so frontal sinusitis is uncommon in first decade of life -Antibiotics (if bacterial) and analgesia are used for acute sinusitis

Questions

1- Mohammed, a 5-year-old refugee from Somalia, presents acutely unwell to the Emergency Department. He has a 1-day history of sore throat and a high temperature (40.1°C). Over the last 8 hours he has been having increasing difficulty breathing with quiet stridor. He has never been immunized. He is noted to be unable to swallow his saliva. Fig. 17.2 was taken when he was intubated.



What is the most likely diagnosis?

A. Bacterial tracheitis
B. Croup
C. Epiglottitis
D. Foreign body
E. Laryngomalacia

2- Amber, a 9-month-old girl, presents with a 4-day history of coughing spasms which are followed by vomiting. Whooping cough (Bordetella pertussis infection) is suspected.

Which of the following tests would be most useful in confirming the diagnosis?

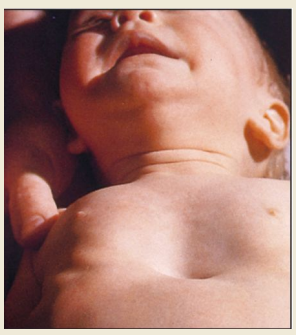
A. Blood culture
B. Chest X-ray
C. Full blood count and film
D. Nasopharyngeal aspirate
E. Pernasal swab

3- Tak, a 3-year-old Asian boy, presents to his family doctor. He has a 'hacking' cough that started several weeks ago and has failed to respond to two courses of antibiotics. He is otherwise well and has had no previous chest problems. On examination there is decreased air entry in the right lower zone with normal percussion note. His growth is normal.

Which is the most appropriate next step?

A. Admit for intravenous antibiotic therapy
B. Assess bronchodilator response
C. Organize for ultrasound-guided drainage of his pleural effusion
D. Request a chest X-ray
E. Request a sweat test and evaluation of immunoglobulins and functional antibodies

4- Jake is a 10-month-old boy from the UK who presents to the Emergency Department with a 2-day history of fever and runny nose. He has been otherwise well. During the night he gradually developed a barking cough in association with a loud noise on inspiration. On examination he has a temperature of 38°C and noisy inspiration accompanied by marked sternal recession (Fig. 17.4). His capillary refill time is normal.



Select the ONE most likely diagnosis from the list below.

A. Acute epiglottitis
B. Anaphylaxis
C. Bronchiolitis
D. Laryngeal foreign body
E. Laryngotracheobronchitis (croup)

5- Norah, an 18-month-old girl, presents to her family doctor with coryza, cough and a mild fever for 3 days. She feeds poorly and is unsettled at night. Her respiratory rate is normal and there is no chest recession. **What is the most likely diagnosis?**

A. Bronchiolitis
B. Frontal sinusitis
C. Pneumonia (lower respiratory tract infection)
D. Tonsillitis
E. Upper respiratory tract infection

Answers

1- **C.** Epiglottitis
The photograph shows the characteristic grossly enlarged 'cherry red' epiglottis of acute epiglottitis. It is caused by Haemophilus influenzae type b. In the UK and many other countries, the introduction of universal H. influenzae type b immunization in infancy has led to a >99% reduction in the incidence of epiglottitis and other invasive H. influenzae type b infections.

2- **E.** Pernasal swab
Culturing a pernasal swab allows the pathogen (Bordetella pertussis) to be identified (though PCR (polymerase chain reaction) is more sensitive). This can also be helpful in isolating the related Bordetella parapertussis.

3- **D.** Request a chest X-ray
The most likely diagnosis is the inhalation of a foreign body, e.g. a peanut. Tak also has focal chest signs and so needs a chest X-ray to be performed.

4- **E.** Laryngotracheobronchitis (croup)
Laryngotracheobronchitis (croup) is mucosal inflammation and increased secretions affecting the airway. Croup occurs from 6 months to 6 years of age. Fever suggests infection. Inspiratory noises suggest upper airway obstruction.

5- **E.** Upper respiratory tract infection
This child has an upper respiratory tract infection, most likely a common cold.