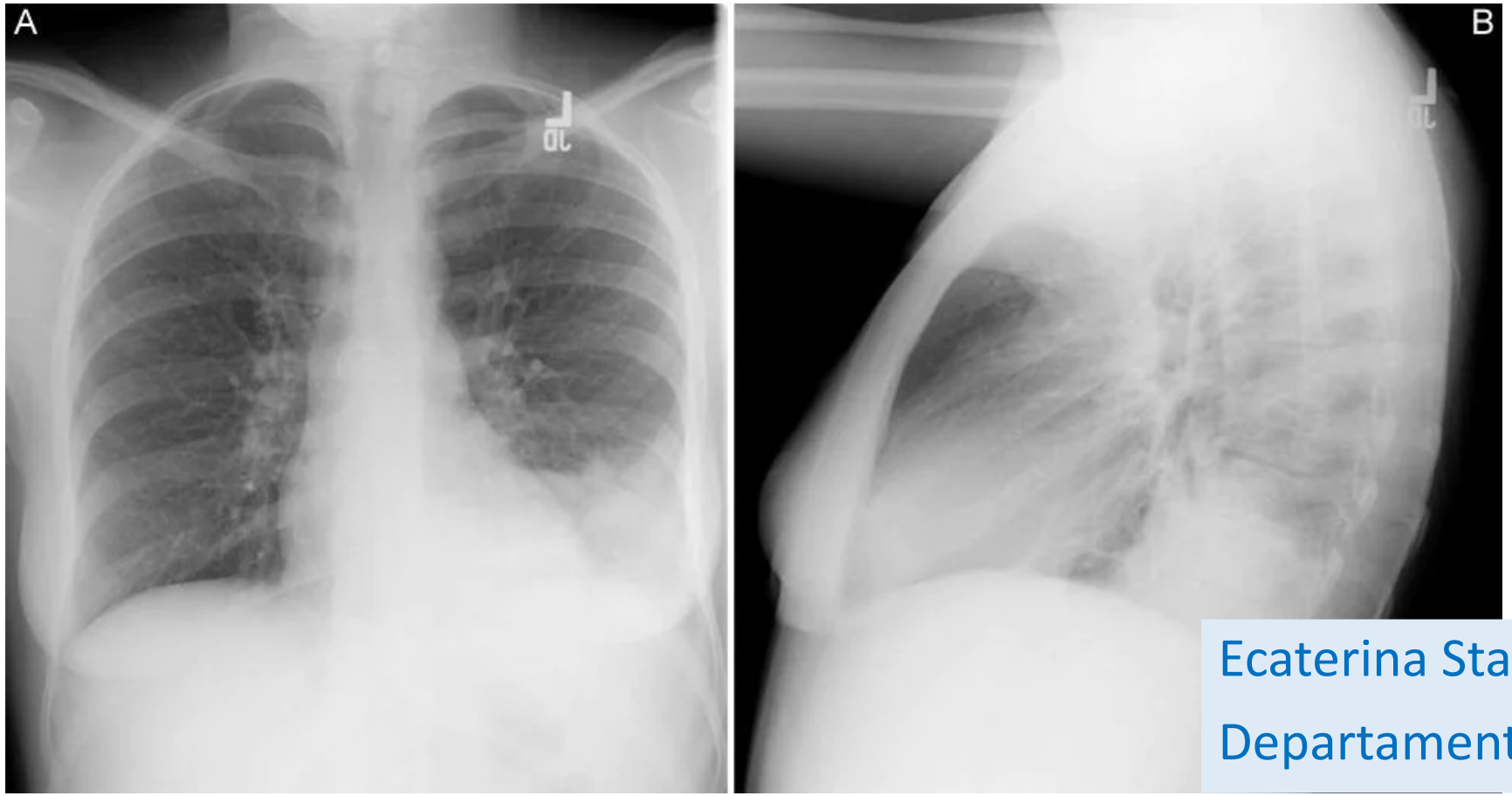
ACUTE BRONCHITTIS
COMMUNITY ACQUIRED PNEUMONIA IN CHILDREN



Ecaterina Stasii, MD,PhD, Professor
Departament of Paediatrics

1. **Background**
2. **Definition ARI**
3. **Acute bronchitis**
4. **Community- acquired pneumonia**
   - Risk factors, triggers, pathogenesis
   - Clinical signs
   - Diagnosis. Differential diagnosis
   - Pneumonia classification
   - Therapy
5. **Prognosis**
6. **Prevention**
7. **Education**
8. **References**

BACKGROUND

Acute respiratory infections (ARI)

are responsible for almost 20% of all deaths of children aged less than 5 years worldwide.

The proportion of under-fives with ARI that are taken to an appropriate health-care provider is a key indicator for coverage of

- intervention and care-seeking, and
- provides critical inputs to the monitoring of progress towards child survival-related

Millennium Development Goals and Strategies

What's the Need
Magnitude of Problem

- ARI is emerging as one of the leading causes of morbidity and mortality in the developing world.
- Of the 12 million deaths occurring annually under 5 years of age, ARI constitutes 19% of these deaths.
- 20 to 25% ARI deaths occur < 2 months, 50 to 60% occur in infants and very few deaths occur between 1 to 5 years.
- Nearly 25% outpatient visits and 15% of all hospital admissions are of ARI.
- In urban set up ARI accounts for 3-5 episodes /child /year, while in rural areas it is 1-3 episodes/child/year.

BACKGROUND(2)

Acute respiratory tract infections (ARI) account for

- 30- 50% of overall pediatric outpatient consults,
- 20-30% of pediatric ward admissions, and
- over 1/3 of child deaths annually.

Although ARIs are mostly perceived to be self-limiting, the genesis of debilitating complications due to severe onset is not uncommon and often strains the limited resources of patients and healthcare facilities in developing countries further.

Several healthcare policies have brought ARI control strategies into their ambit, its prevalence goes unchecked with 4 million cases of pneumonia, and around 1 million deaths each year.

Burden of Acute Respiratory Tract Infections

- Significant time away from school and work
- Significant healthcare expenditures for clinic visits, hospitalization and medications
- Mortality rare except for community-acquired pneumonia in persons with comorbidities

PATHOGENS

- Respiratory viruses account for the majority of infections
- Bacterial infections are more prominent in acute otitis media and pneumonia
  - *Streptococcus pneumoniae*
  - *Moraxella catarrhalis*
  - *Mycoplasma sp.*
  - *Haemophilus influenzae*
  - *Streptococcus pyogenes*
  - *Chlamydiophila sp.*
- Antibiotic resistance is common among *S. pneumoniae, H. influenzae,* and *M. catarrhalis* isolates

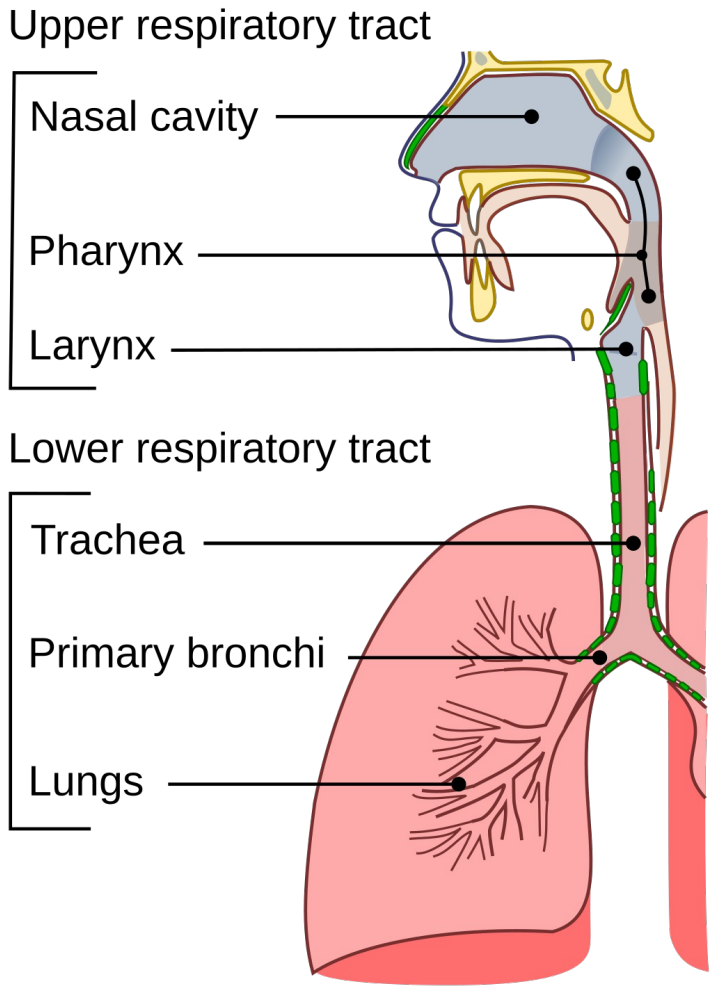
2. DEFINITION.

ACUTE RESPIRATORY INFECTIONS(ARI) IN CHILDREN

What constitutes ARI

- ARI is defined as acute invasion of any part of respiratory tract starting from nose to alveoli of lungs by micro-organisms

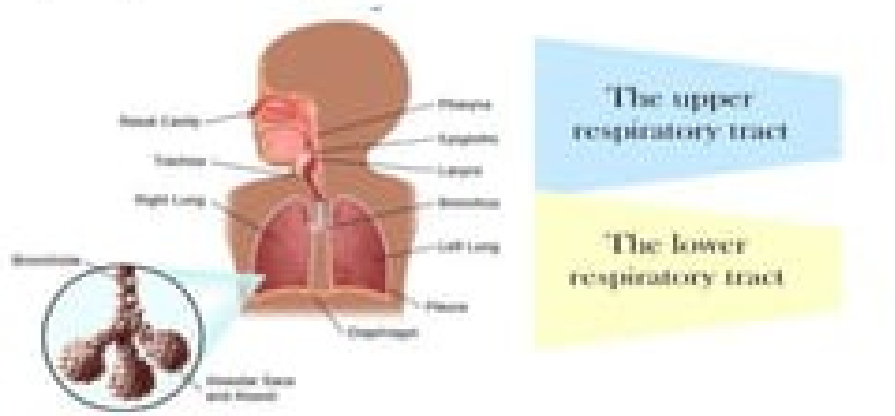
Upper	Lower
• Rhinitis (common cold) • Pharyngitis • Tonsillitis • Acute epiglottitis	• Laryngitis • Tracheo-bronchitis • Bronchiolitis • Pneumonia



ACUTE RESPIRATORY INFECTIONS IN CHILDREN

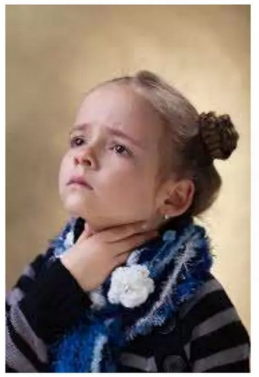
Definition

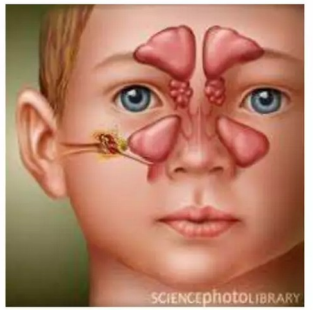
- An **upper respiratory tract infection** (URTI) is an illness caused by an **infection**, which involves the **upper respiratory tract**, including the nose, sinuses, pharynx, or larynx.



Upper respiratory tract infections

- Common cold
- Tonsillitis
- Sinusitis
- Ear infections

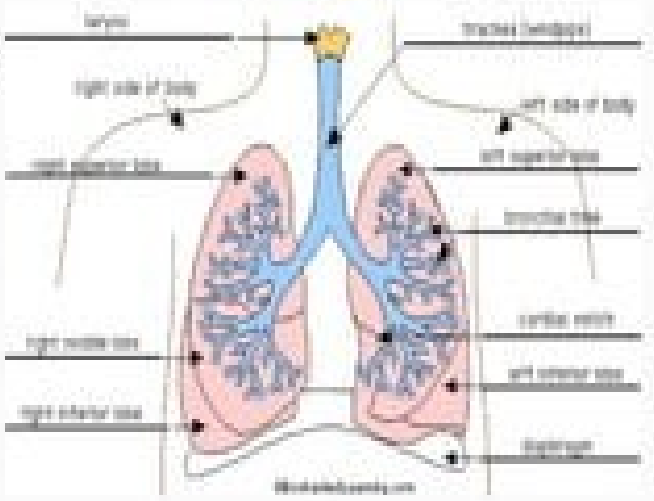




ACUTE RESPIRATORY INFECTIONS IN CHILDREN

- **LRTI : infection below the level of larynx**

- Larynogotracheobronchitis
- Bronchitis
- Bronchiolitis
- Pneumonia



3. ACUTE BRONCHITIS

- **Definition:Acute bronchitis is acute infection of the bronchial mucosa, without obstruction**

An acute respiratory tract infection that may last up to 3 weeks in which cough, with or without phlegm, is a predominant feature and alveolar inflammation is not present (normal chest radiograph)

- Occurs predominately in the late fall, winter and early spring
- Common: Up to 20% of kids and 5% of adults self report an episode each year

Gonzales et al. Annals of Int Med. 2018;134(6):521
Brahman. Chest 2021;129:95S-103S

Acute Bronchitis
Almost Always a Viral Etiology

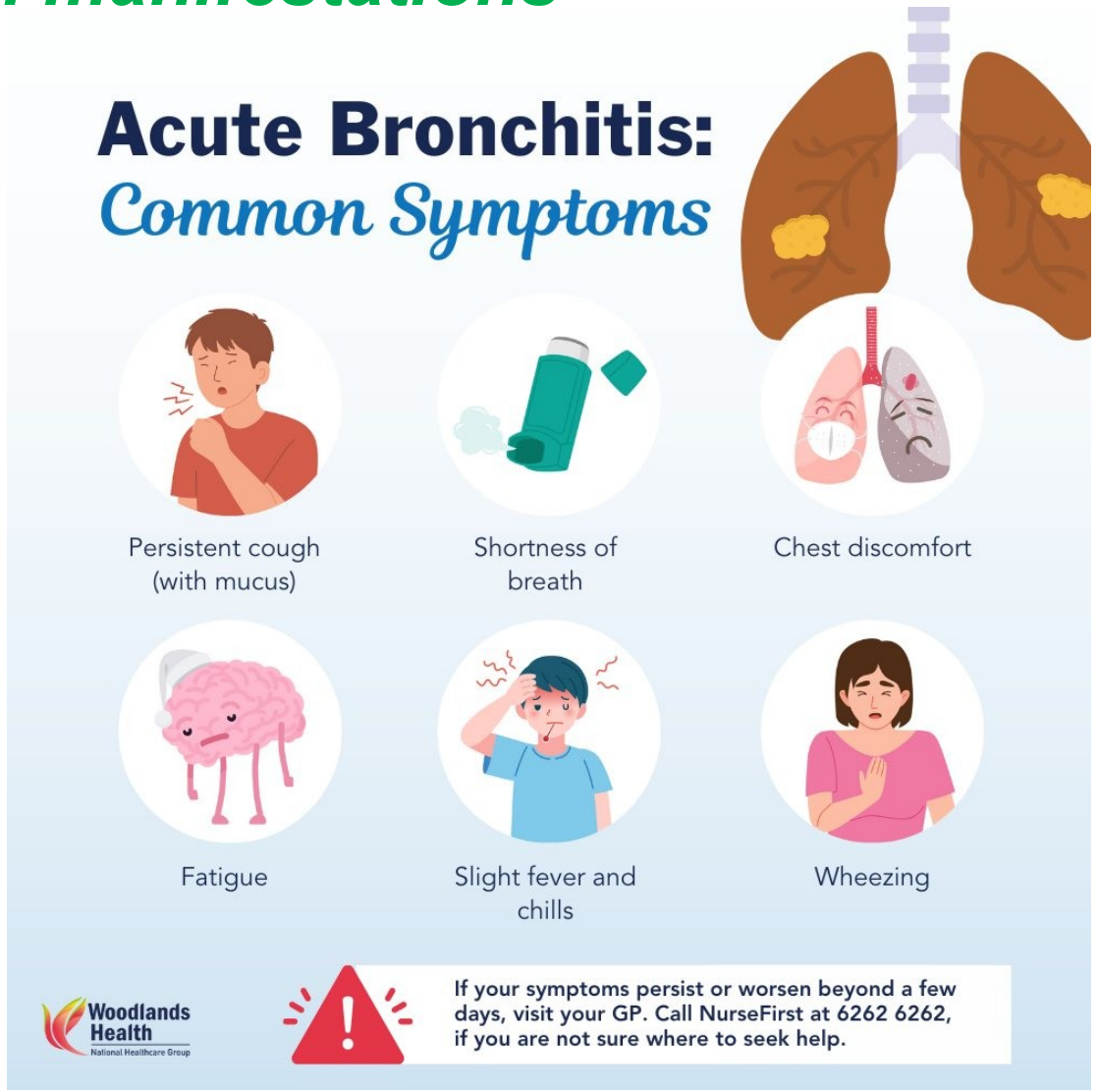
- Less than 10% due to bacterial causes
- Etiologic diagnosis not usually attempted unless influenza suspected
- Antibiotic therapy not indicated and should not be offered
- Exception: some episodes of prolonged paroxysmal cough are due to *Bordetella pertussis*

Viral Causes of Bronchitis
Respiratory Syncytial Virus
Adenovirus
Parainfluenza virus
Rhinovirus
Influenza virus

Gonzales et al. Annals of Int Med. 2021;134(6):521
Brahman. Chest 2018;129:95S-103S

ACUTE BRONCHITIS. *Clinical manifestations*

- Dry, hacking, unproductive cough
- within 4-5 days the cough becomes productive
- often preceded by an upper respiratory tract infection
- afebrile patient or low grade fever
- auscultation – rough high pitched rhonchi



ACUTE BRONCHITIS. *Patient Management*

- Some patients may expect an antibiotic based on past experience or expectations
  - Explain to the patient why an antibiotic is not necessary and that these drugs may have unwanted side-effects
  - Use terms like "chest cold" rather than bronchitis or infection
- Suggestions for symptom relief
  - Humidified air
  - Over-the-counter pain relievers
  - Some recommend cough suppressants
  - No role for bronchodilators in absence of asthma or chronic obstructive pulmonary disease (COPD)

ACUTE BRONCHITIS. Patient Management

EVALUATION OF PATIENTS

- Onset of dyspnea: stridor, wheezing
- Onset of general danger signs: convulsions or abnormally sleepy
- Not able to drink, stopped feeding keel
- Patient don't improve better after 5 days

REFER TO HOSPITAL

- Presence of general danger signs
- Fever > 39°C resistant to antipyretic treatment
- Acute respiratory distress and cardiac failure
- Chronic cough > 30 days duration
- Hemoptysis

ACUTE BRONCHITIS. *Prevention*

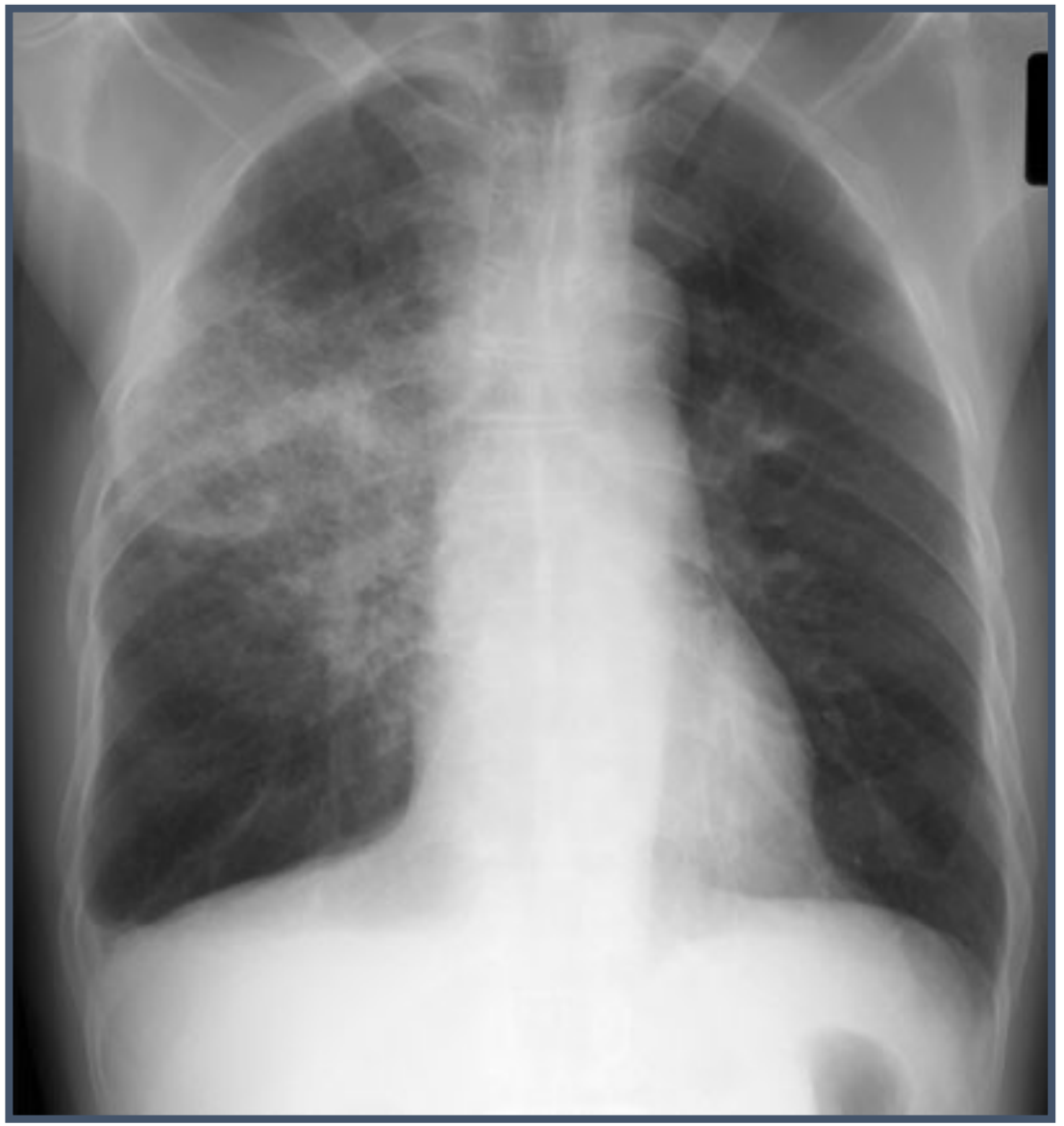
Prevention

To reduce the risk of bronchitis in children, encourage good hand hygiene, regular vaccination against respiratory viruses like the flu, and avoidance of secondhand smoke.

Keep indoor air clean and well-ventilated, especially during cold and flu season.

Prompt treatment of respiratory infections and underlying conditions can help prevent complications that may lead to bronchitis.

Community-Acquired Pneumonia



Community-Acquired Pneumonia

Overview

- 3-4 million cases/year
- 10 million patient visits/year
- Approximately 80% are mild to moderate in severity and treated as outpatients
- 500,000 hospitalizations and 45,000 deaths/year

  (8^{th} leading cause of death)
- Mortality
  - 1% in outpatients
  - 5% in inpatients
  - 25-50% in patients admitted to ICU

File TM, Marrie TJ *Postgrad Med* 2010;122(2):130.

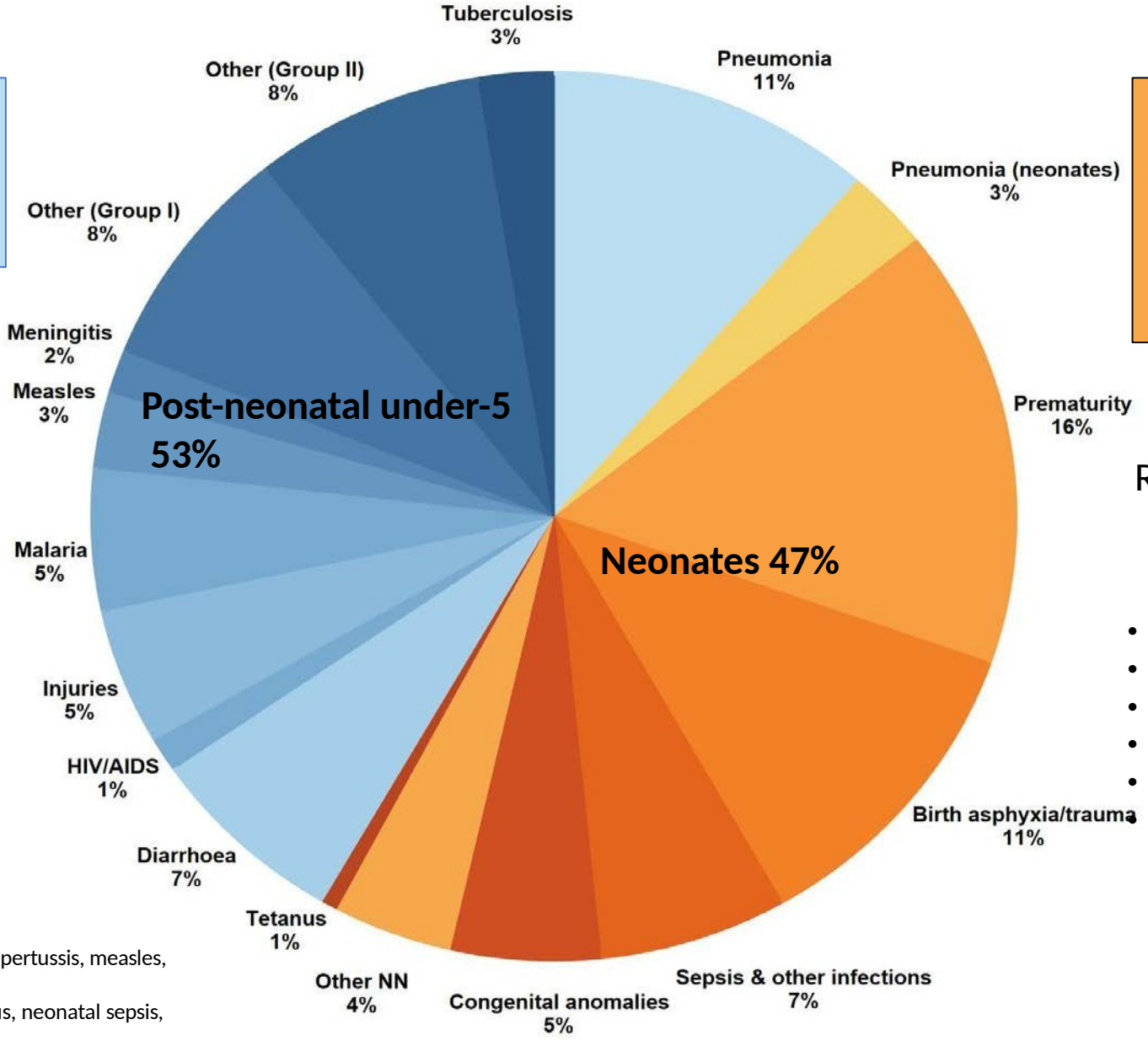
Global per cent (%) of total deaths for children under-5 years divided by neonatal (first 28 days) and postneonatal (1 to 59 months), WHO GHE 2019

Estimated numbers of deaths- 1 to 59 mos.

- **Pneumonia: 589,316**
- **Diarrhoea: 364,990**
- **Malaria: 268,570**
- Injuries: 256,764

Estimated numbers of deaths- neonates

- Prematurity: 832,486
- Intrapartum events: 592,327
- Sepsis: 341,065
- Congenital anomalies: 269,992



Regional Postneonatal (%)

- AFR- 64
- WPR- 51
- **EUR- 46**
- EMR- 44
- AMR- 44
- SEAR- 39

Regional neonatal (%)

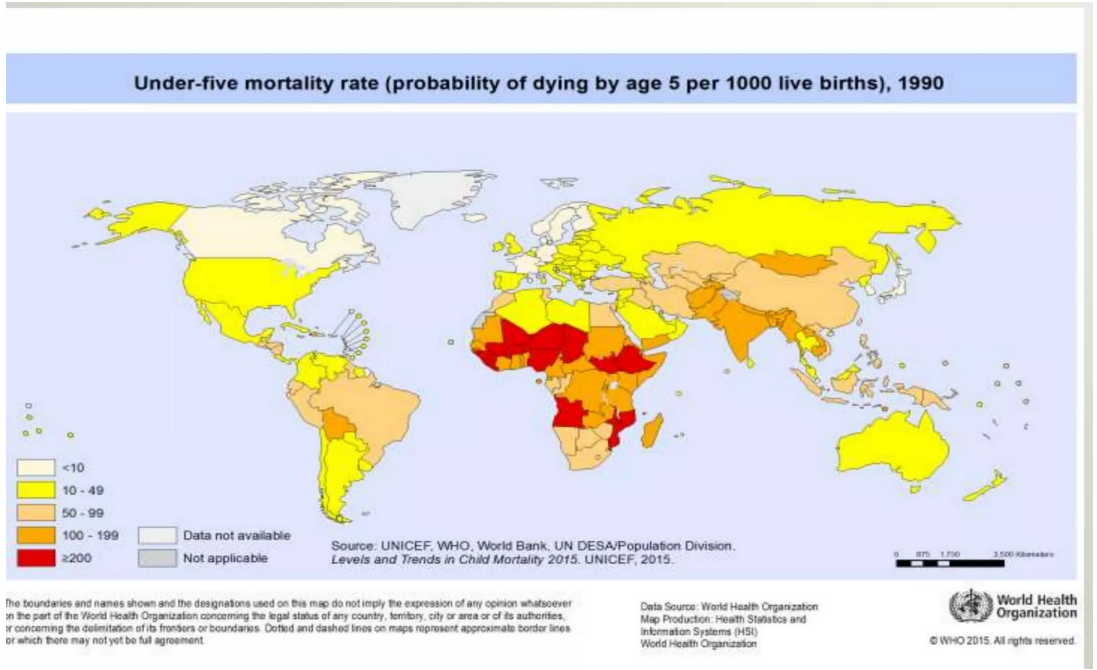
- AFR- 36
- WPR- 41
- EUR- 54
- EMR- 56
- AMR- 56
- SEAR- 61

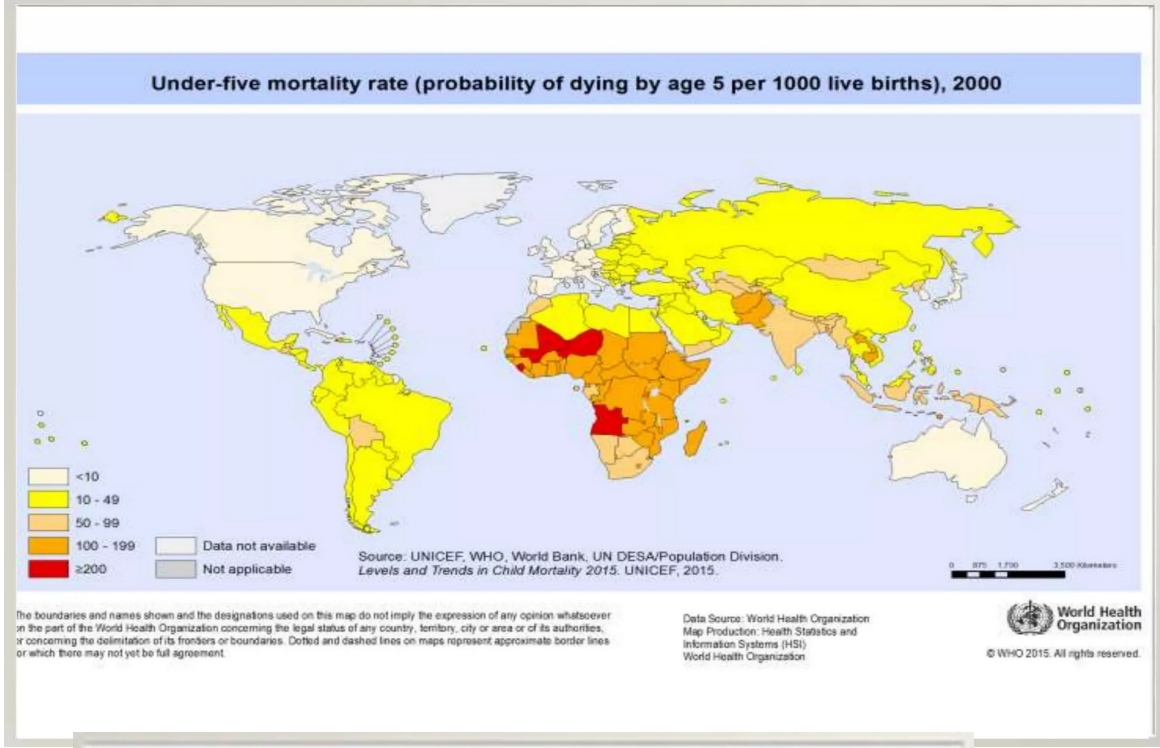
Definition of other cause categories

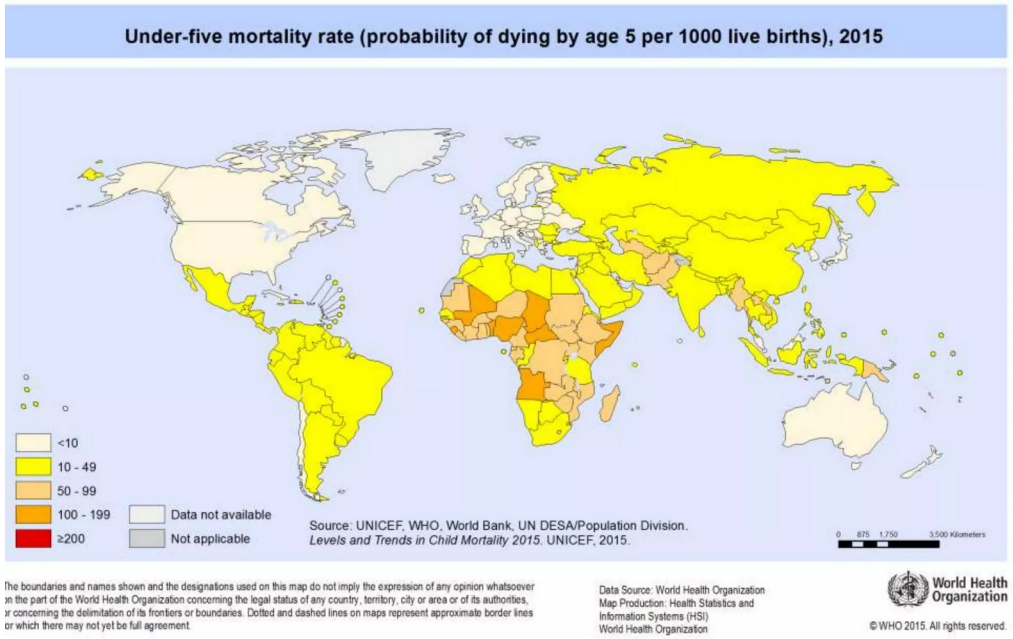
Other NN (neonatal): other infectious causes, HIV/AIDS, pertussis, measles, meningitis, malaria, diarrhoea, injuries and other NCDS

Other (group I) (Post-neonatal): Other infectious, tetanus, neonatal sepsis, prematurity, birth asphyxia

Other (group II) (Post-neonatal): congenital anomalies, other NCDs







PROGRESS MADE

- Under-five deaths worldwide have declined:

12.7 (12.6, 13.0) million in **1990**

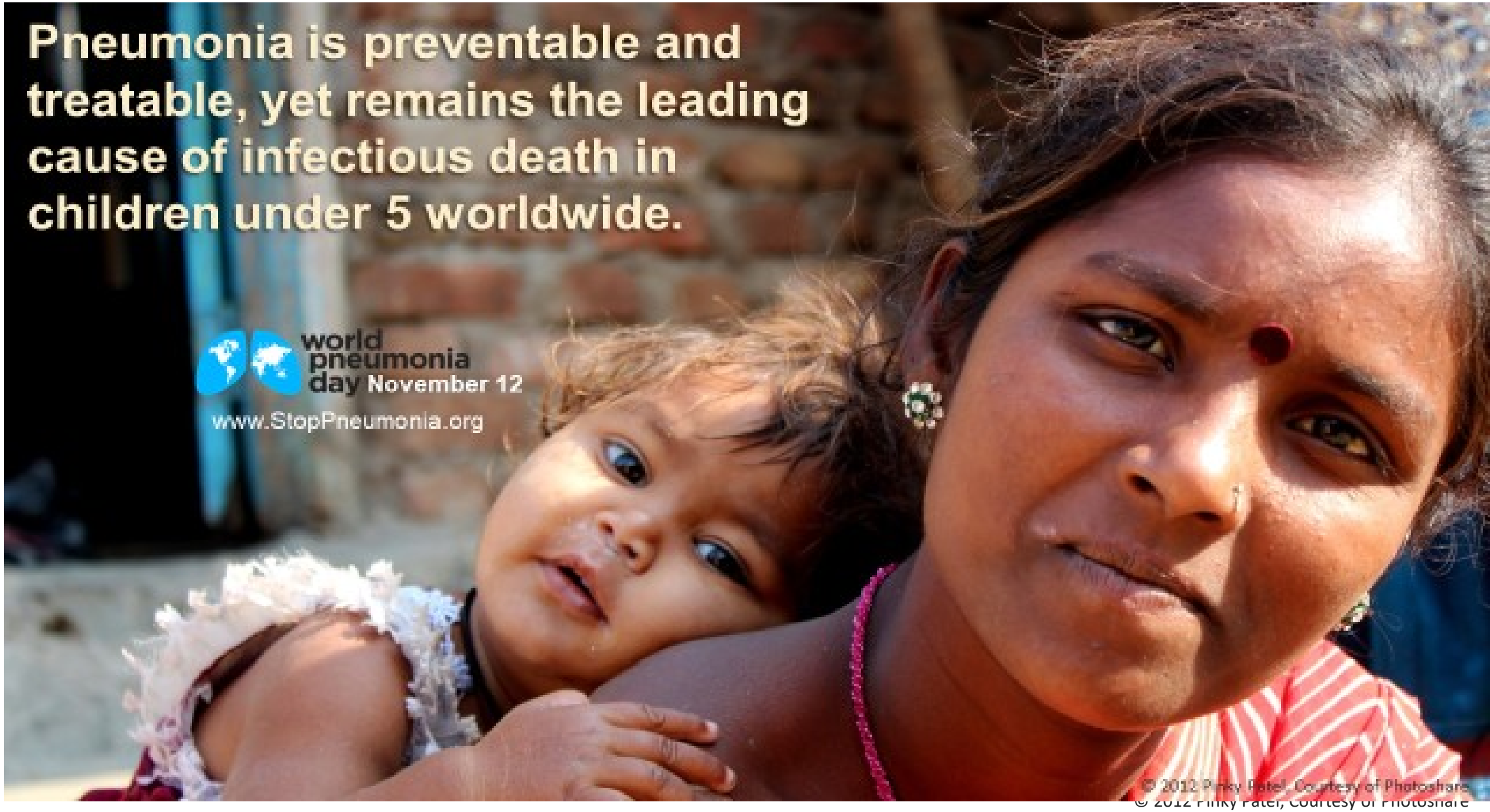
5.9 (5.7, 6.4) million in **2015**

19,000 fewer children dying every day

48 million children under five saved since 2000

Pneumonia claimed the lives of 2.5 million, including 672,000 children, in 2019 alone.

The combined effects of the COVID-19 pandemic, climate change and conflict is fueling a pneumonia crisis across the life course – placing millions more at risk of infection and death. In 2021, the estimated burden of deaths from respiratory infections, including COVID-19, was a massive 6 million.



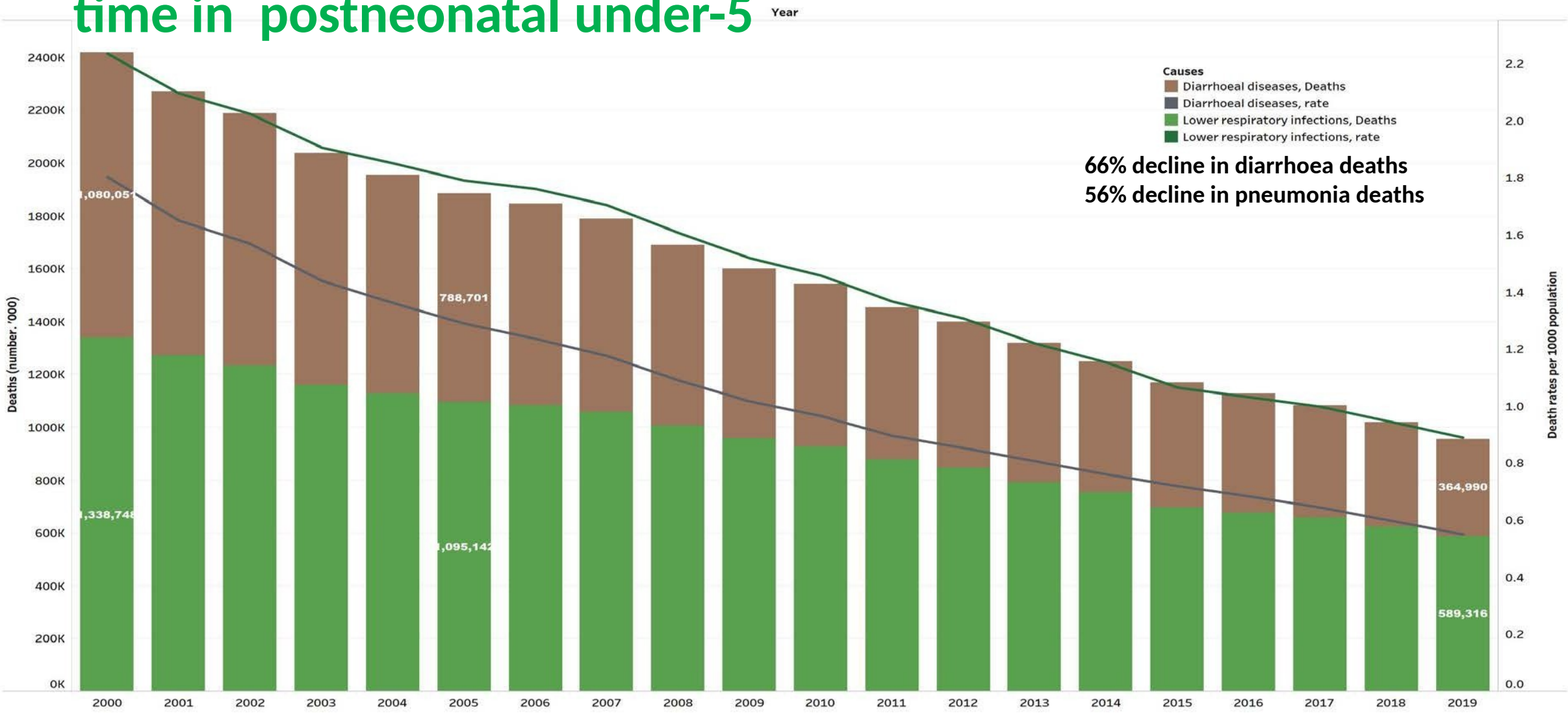
© 2012 Pinky Patel, Courtesy of Photoshare

Pneumonia is the #1 infectious killer of children under age 5 globally, killing an estimated 879,000 children in 2016.

That's more than 2,400 young lives per day.

UNICEF. (2016). Estimates of child cause of death, acute respiratory infection. Data as of June 2018. Retrieved from https://data.unicef.org/topic/child-health/pneumonia/

Globally, pneumonia and diarrhoea deaths have declined over time in postneonatal under-5



Epidemiology

Pneumonia can occur at any age, although it is more common in younger children. Pneumonia accounts for 13% of all infectious illnesses in infants younger than 2 years of age.

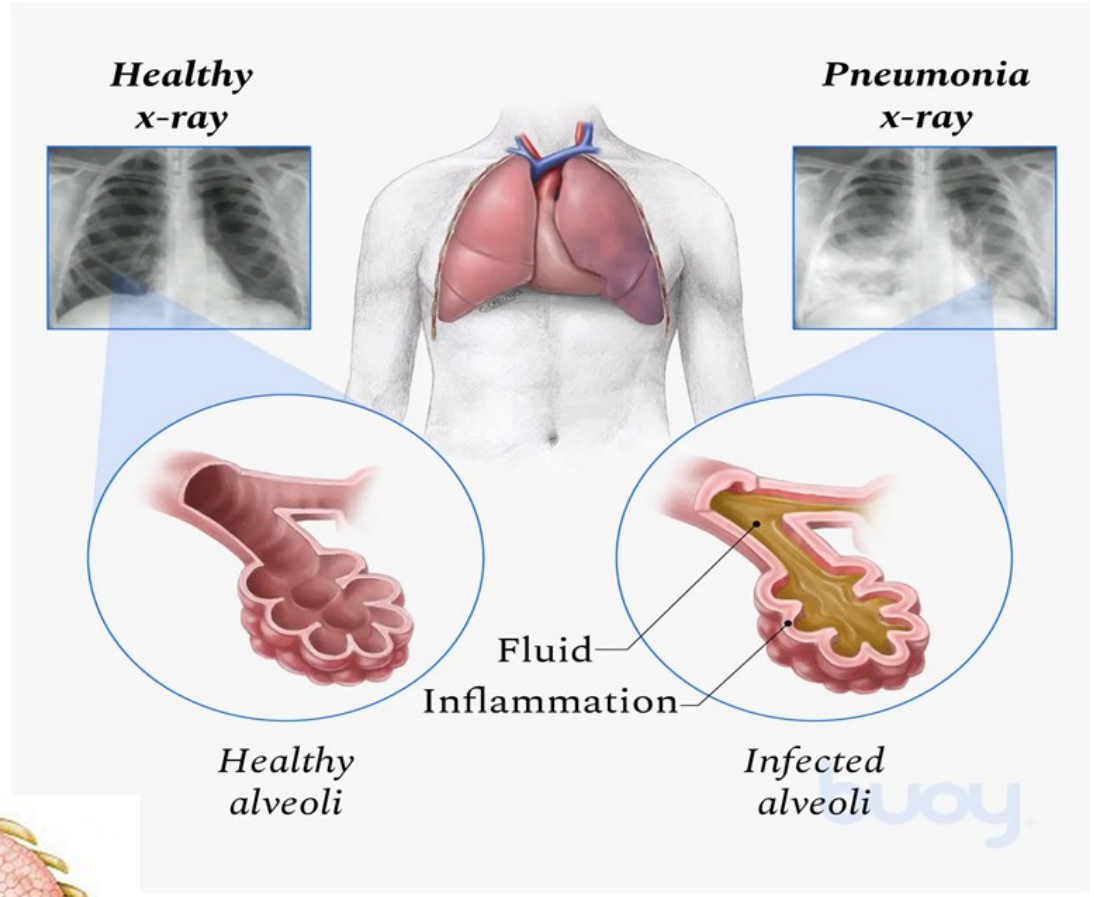
- INCIDENCE
  - **0.026 epizods per child/1 year developed countries**
  - **0.280 epizods per child/1 year developing contries**
- 15-20 per 1000 children < 1 year;
- 5-7/1000 – 1-3 years
- 3/1000 > 3 years

- Or 1-12% of the total number of IRAs
- In developed countries (1-2%)
- In the developing ones -2-5%
- In underdeveloped countries-10-12%
- In the Republic of Moldova, the prevalence of CP in children is 110-150 per 10,000 during different years,

DEFINITION

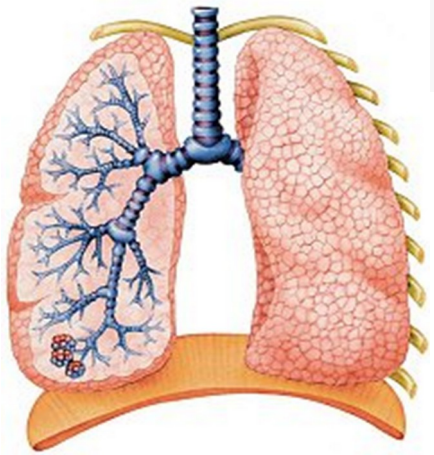
Pneumonia is an inflammation of the lung parenchyma, affecting the predominantly respiratory part of the lung tissue **caused** by various microorganisms, including

- bacteria,
- mycobacteria,
- fungi and
- viruses



ICD-10 J00-06., J30-39.

ICD-9 465.9



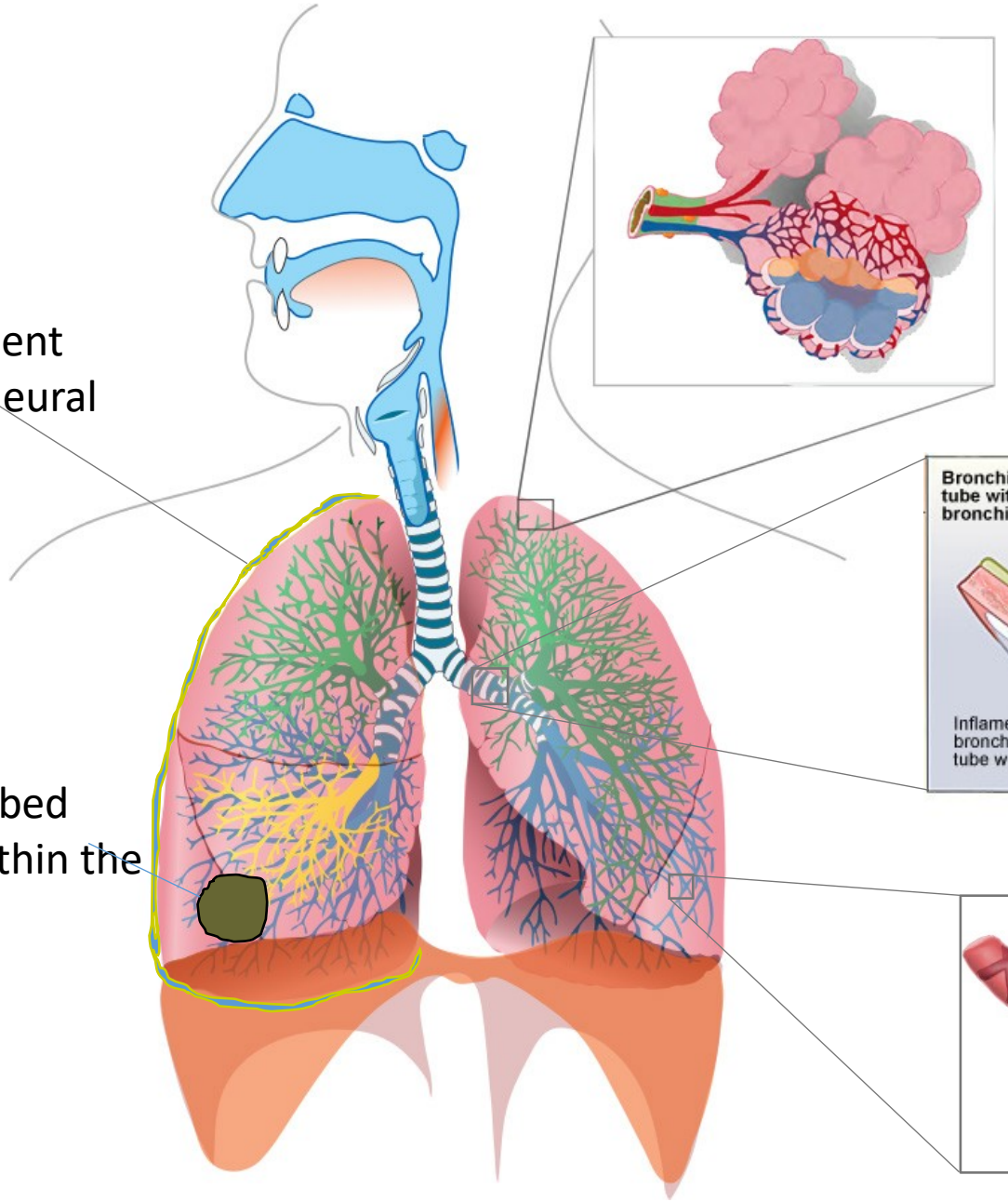
COMMUNITY ACQUIRED PNEUMONIA IN CHILDREN

- Pneumonia is an inflammation in the air sacs of one or both of your lungs.
- The air sacs may fill with fluid or pus, which causes the coughing and chest symptoms.

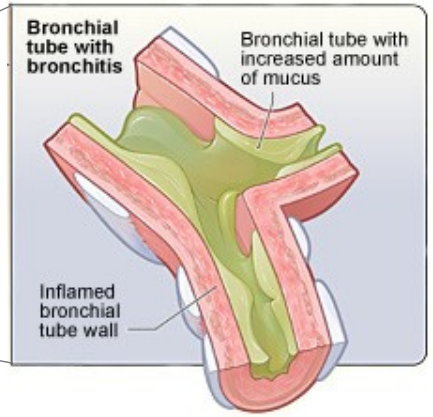
Lower respiratory and pleural disease

Empyema: purulent exudate in the pleural cavity

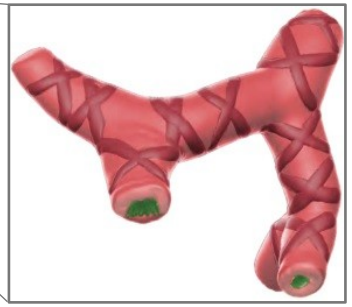
Abscess: circumscribed collection of pus within the lung parenchyma



Pneumonia -- infection of alveoli (viral or bacterial)
vs. ***Pneumonitis*** *-- immune-mediated inflammation of alveoli*



Bronchitis -- inflammation of bronchi, may be **immune-mediated**, e.g. asthma, COPD, or **infectious** (usually viral but can be bacterial)

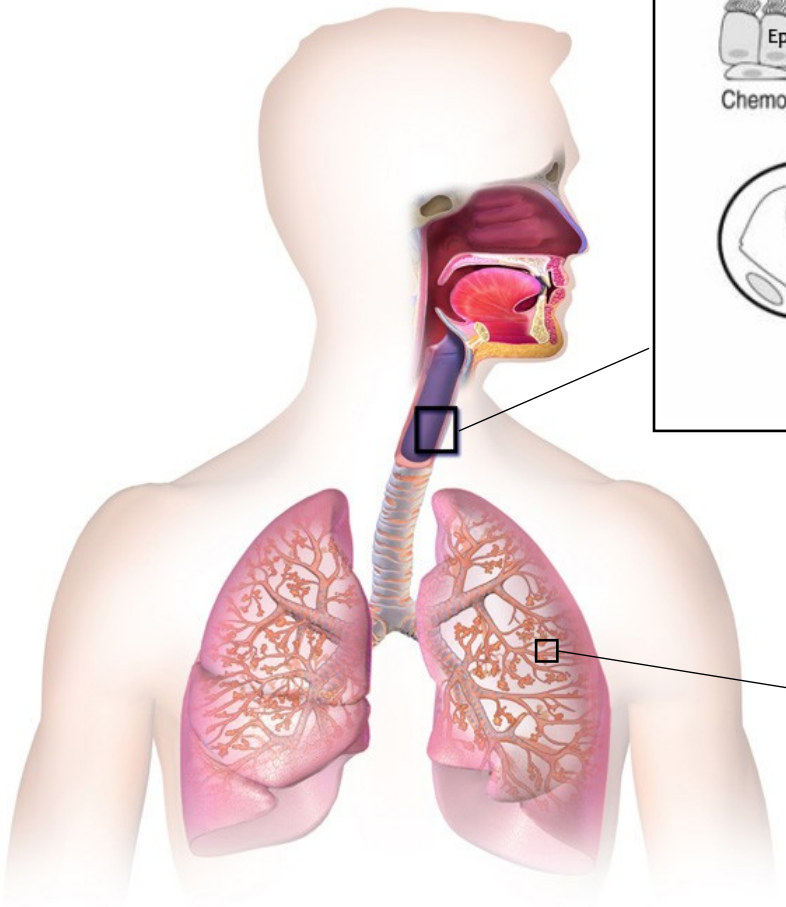


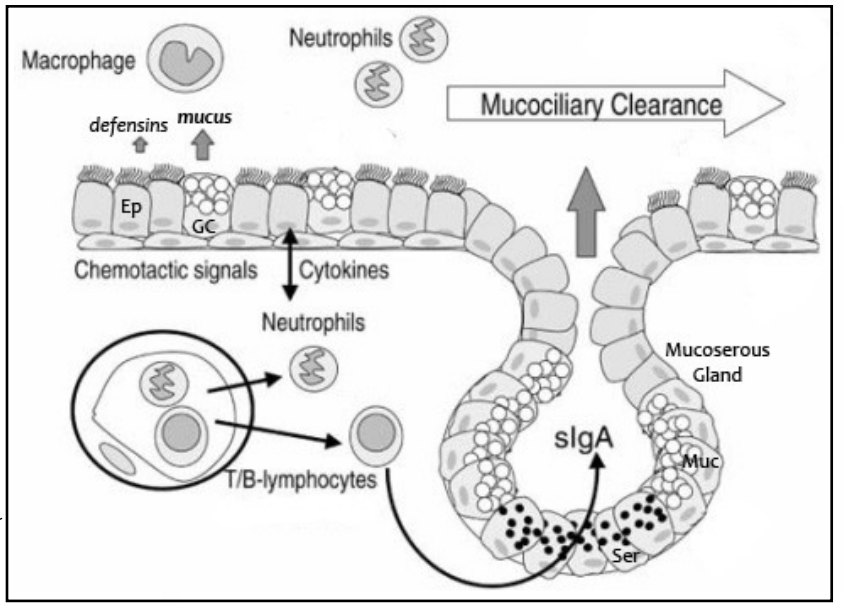
Bronchiolitis: inflammation of bronchioles (often viral but can be bacterial)

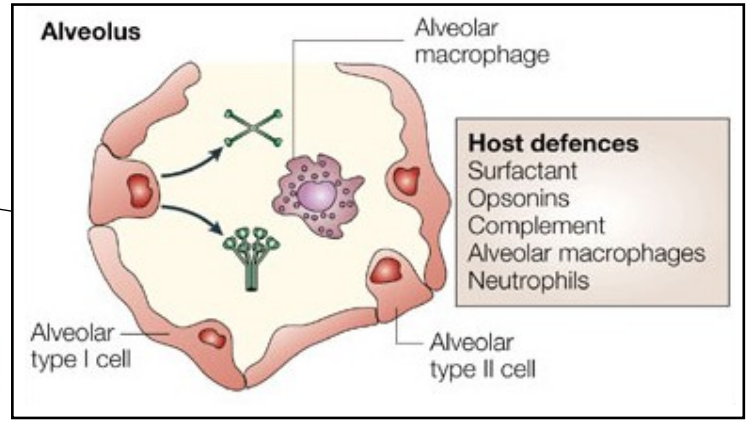
PNEUMONIA:
CLEARANCE vs. COLONIZATION

Microbes constantly enter airways but many factors prevent colonization:

- mucous entrapment
- ciliary clearance
- immune surveillance
- intact epithelial barrier
- secreted factors such as:
  - secretory IgA
  - surfactant proteins (SP-a, SP-d)
  - defensins







Disrupting or overwhelming these defense mechanisms can allow microbes to colonize the lungs, resulting in PNEUMONIA

Factors favoring colonization

Disruption of mucociliary clearance:

- **airway obstruction** (CF, COPD, chronic bronchitis, neoplasm)
- **ciliary dysfunction** (Kartagener, smoking, ciliostatic factors)

Disruption of intact epithelial barrier:

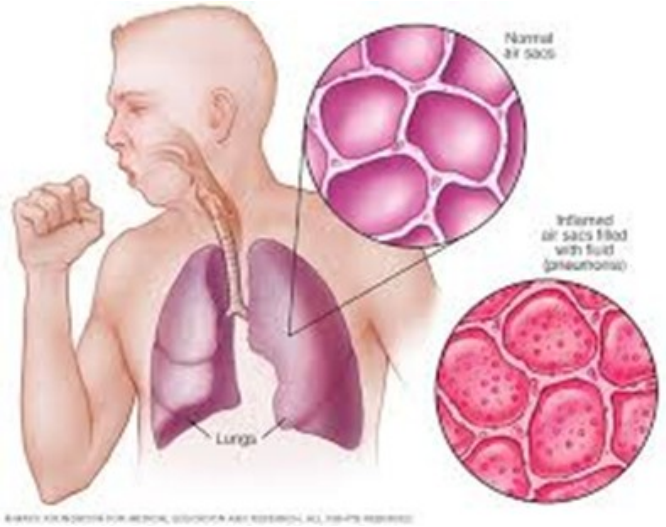
- **injury** (e.g. pulmonary edema, intubation) or **infection** (e.g. viral respiratory infection such as influenza)

Increasing "inoculation" events:

- **altered consciousness**
- **debility**
- **dysphagia**
- **intubation**
- **bacteremia**

Decreasing immune function:

- **immune suppression** (transplant, HIV)
- **evading host immunity** (IgA proteases, encapsulation)

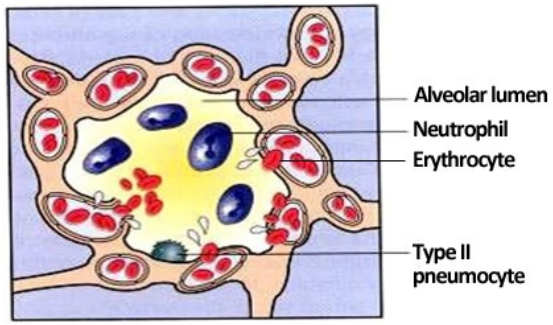


Effects and patterns of microbial colonization:

where and how inflammation appears can be informative

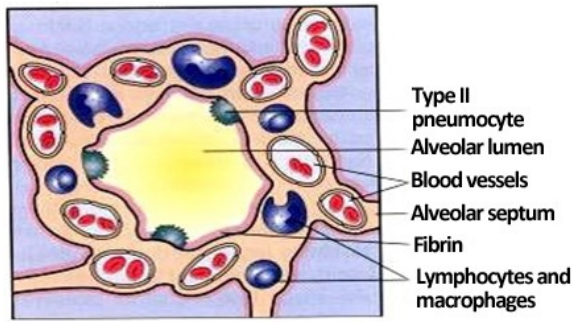
Alveolar

- In alveolar **lumen**
- Purulent exudate of RBCs and PMNs



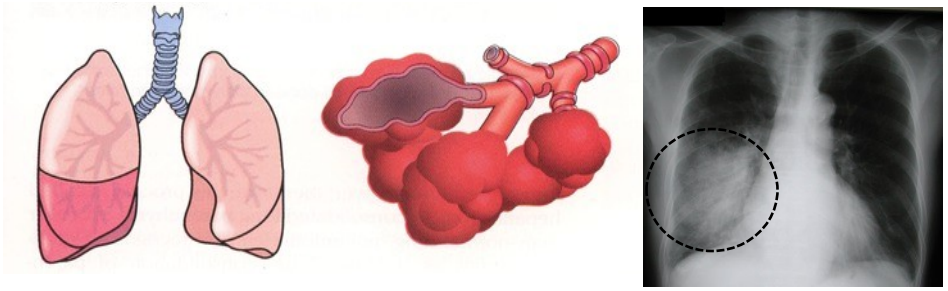
Interstitial

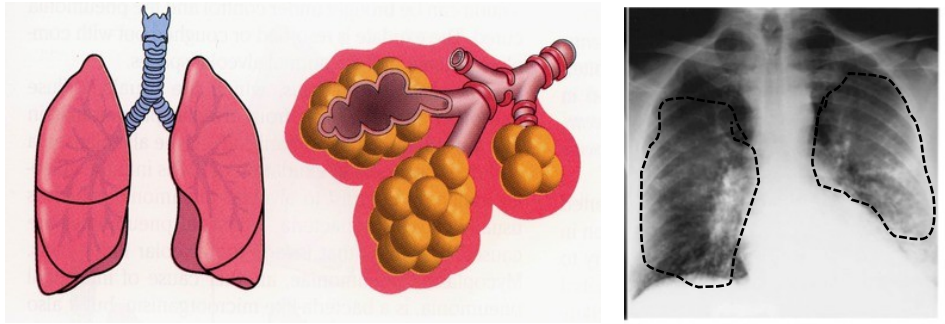
- Mostly in alveolar **wall**
- Mononuclear WBCs
- Fibrinous exudate



Lobar pneumonia

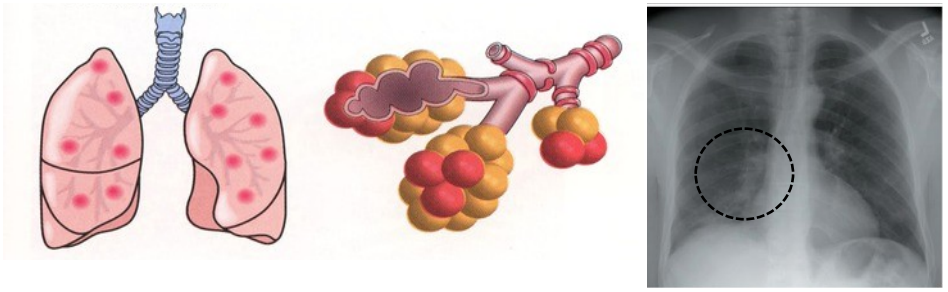
- lobar distribution
- "typical" CAP
- *S. pneumo, H. flu.*





Bronchopneumonia

- patchy distribution
- aspiration, intubation, bronchiectasis
- *Staph, enterics, Pseudomonas*



Atypical pneumonia

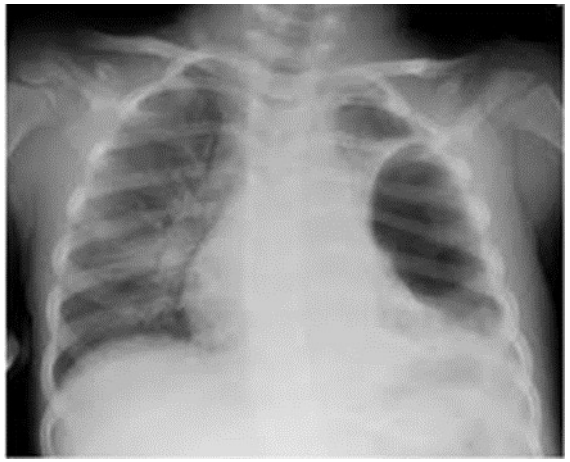
- diffuse infiltrate w/ perihilar concentration
- *Mycoplasma, Chlamydophila, Legionella*
- Respiratory viruses, e.g. influenza

CLASSIFICATION

A. DEPENDING ON THE PLACE OF CONTAMINATION

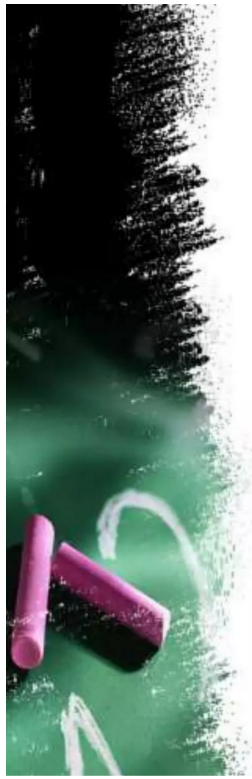
- **Community acquired** (domestic)

- **Inpatient (nosocomial)** - is installed after 72 hours after hospitalization for the child hospitalized for another reason or in the first 72 hours after discharge from the hospital,
  - (*Gram-negative flora: Klebsiela, E.coli, Proteus, Pseudomonas, Staphylococci)*
- **Intrauterine - develops in the first 72 hours of life**
- **In patients with HIV / AIDS**
- **Associated with artificial ventilation**
- **Aspiration pneumonia**



B. **AFTER EVOLUTION**:

- Acute <6 weeks
- Prolonged(persistent) > 6 weeks



Community-Acquired Pneumonia (CAP)

- CAP occurs either in the community setting or within the **first 48 hours after hospitalization**.
- The **causative agents** for CAP that needs hospitalization include **streptococcus *pneumoniae*, *H. influenza*, *Legionella***, and ***Pseudomonas aeruginosa***.
- Only in 50% of the cases does the specific etiologic agent become identified.

Classically divided into “typical” and “atypical” syndromes:

“Typical” CAP:
presents with “typical” severe, acute infection
infectious agent (usually S. pneumo or H. flu) is culturable/ identifiable
responsive to cell-wall active antibiotics

“Atypical” CAP:
presentation is usually sub-acute
causative pathogens are difficult to culture/identify by standard methods
not responsive to penicillins

HOSPITAL ACQUIERED PNEUMONIA (HAP)

Inpatient (nosocomial)

- HAP is also called **nosocomial pneumonia** and is defined as the onset of pneumonia symptoms **more than 48 hours after admission** in patients with no evidence of infection at the time of admission.
- HAP is the **most lethal nosocomial infection** and the leading cause of death in patients with such infections.

- Common microorganisms that are responsible for HAP include ***Enterobacter species***, ***Escherichia coli***, ***influenza***, ***Klebsiella species***, ***Proteus***, ***Serratia marcescens***, ***S. aureus***, and ***S. pneumonia***.
- The usual presentation of HAP is a **new pulmonary infiltrate** on chest x-ray combined with evidence of infection.

Pneumonia in the Immunocompromised Host

- Pneumonia in immunocompromised hosts includes Pneumocystis pneumonia, fungal pneumonias and Mycobacterium tuberculosis.
- Patients who are immunocompromised **commonly develop pneumonia from organisms of low virulence**.
- Pneumonia in immunocompromised hosts may be caused by the organisms also observe in HAP and CAP.

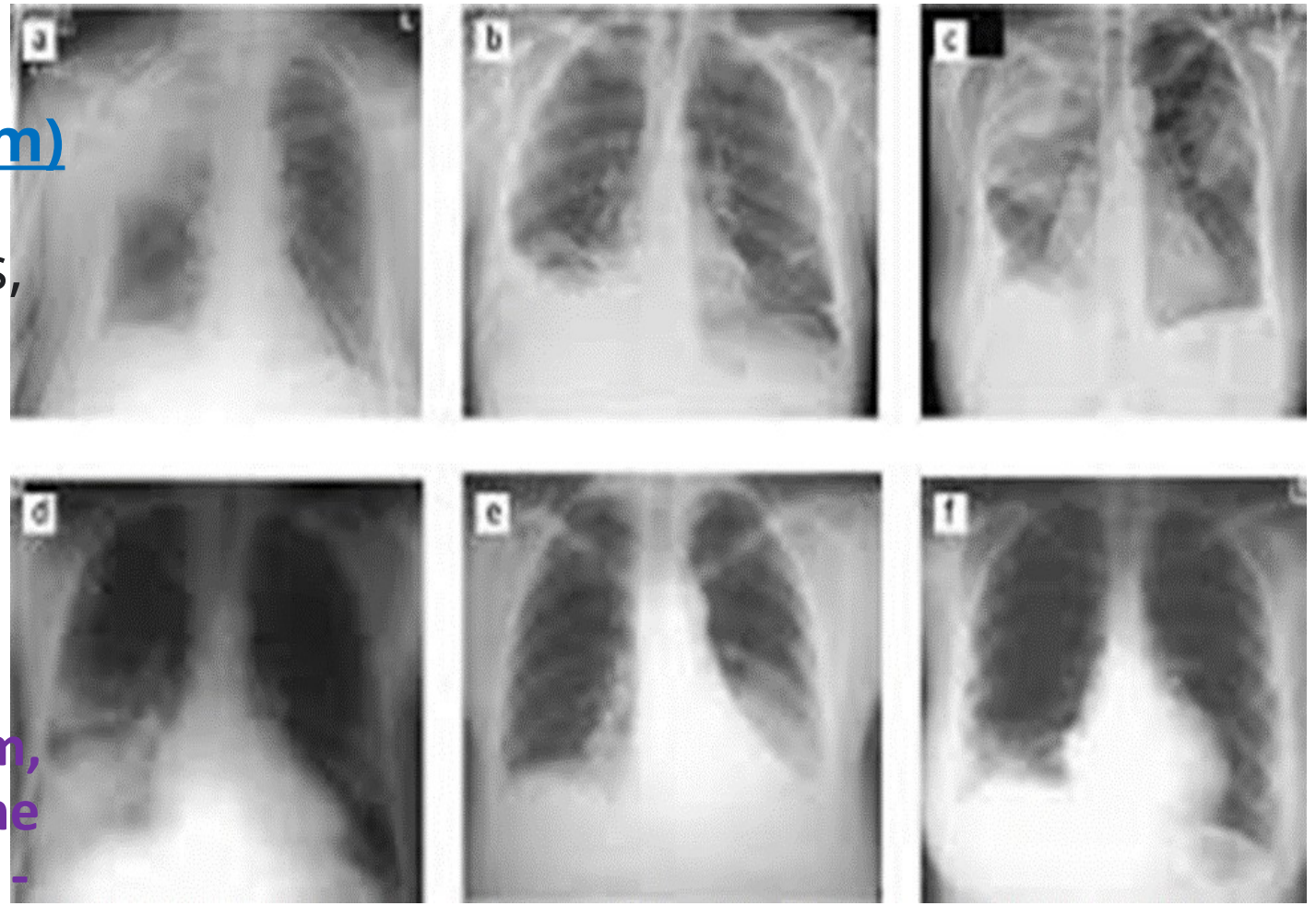
Aspiration Pneumonia

- **Aspiration pneumonia refers** to the pulmonary consequences resulting from entry of endogenous or exogenous substances into the lower airway.
- The most common form of aspiration pneumonia is a bacterial infection from aspiration of bacteria that normally reside in the upper airways.
- Aspiration pneumonia may occur in the community or hospital setting.
- Common pathogens are *S. pneumonia*, *H.influenza*, and *S. aureus*.

C. CLASSIFICATION

C. anatomical classification, according to clinical-morphological variants (X-ray film)

- Bronchopneumonia (in outbreaks, confluent outbreaks)
- Lobar pneumonia
- Segmentary
- Interstitial



Hypotransparency changes in the hilum, widening of the hilum, atelectasis in the lobules, often noted in viral infections, -

is a frequent cause of hypodiagnosis

D. DEPENDING ON THE METHOD OF CONTAMINATION OF THE LUNG

- **Primary pneumonia** (against a healthy lung, the virulence of infectious germs plays a role)- Haemophilus influenza, Streptococcus pneumonia, Mycoplasma pneumonia, In newborns Str.B, D, Chlamydia

- **Secondary pneumonia** (develops in immune deficiencies, congenital heart diseases, malformations of the respiratory organs, cystic fibrosis, aspiration pneumonia of food, gastric juice, foreign bodies, carbon dioxide, lipids; in allergic reactions, pneumonitis induced by some drugs and irradiation.

E. ACCORDING TO SEVERITY:

The volume and degree of lung damage depend on the virulence of the microorganisms, the intensity of the offense and the degree of immunity of the child against the infectious twin.

- **Moderate/Non-severe**

- **Severe (requiring intensive care)**

With complications:

- Pulmonary
  - Pleuresis,
  - Pulmonary abscess,
  - Pneumothorax,
  - Pyopneumothorax,
  - Pulmonary edema,
  - Pulmonary destruction)

- Extrapulmonary (IR, respiratory distress, SCID, ICV: toxic-infectious shock)

F. ETHYOLOGY

Viral
Bacteria
Fungi
Parasites

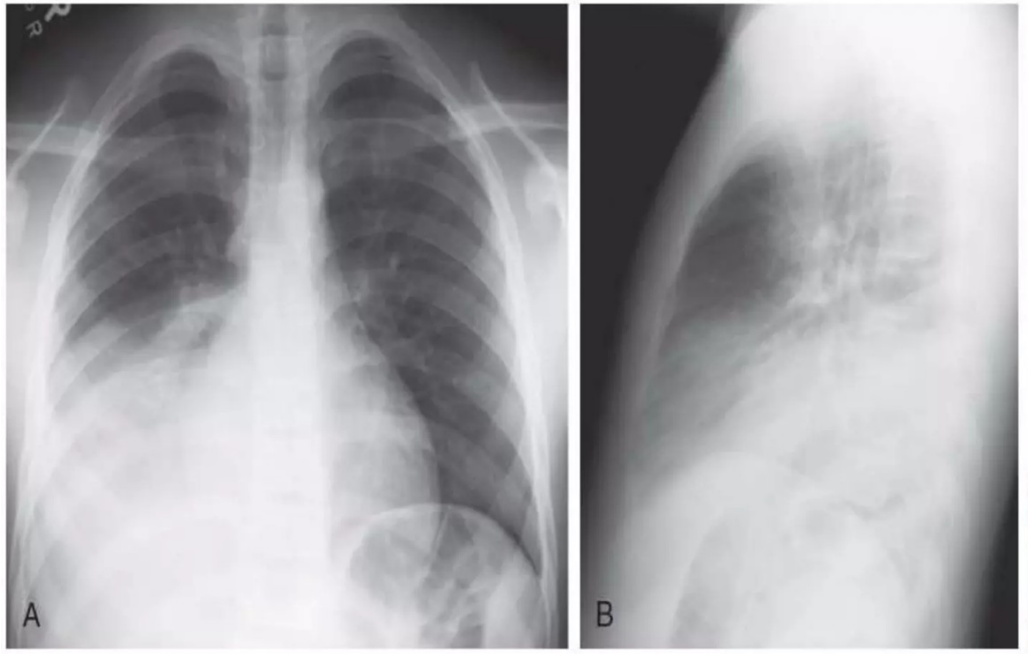


Figure 392-3 Radiographic findings characteristic of pneumococcal pneumonia in a 14 yr old boy with cough and fever. Posteroanterior *(A)* and lateral *(B)* chest radiographs reveal consolidation in the right lower lobe, strongly suggesting bacterial pneumonia.

, ETIOLOGICAL FACTOR :

CAP <6 y.o

- Streptococcus pneumoniae (> 40%)
- Haemophilus influenzae tip b (10%).
- Mycoplasma pneumoniae, (10—15%)
- Chlamydophyla pneumoniae (3—5%)
- Influenza viruses, adenoviruses,

CAP 6-18 y.o.

- **Streptococcus pneumoniae**
- **Haemophilus influenzae tip b**
- **Moraxella catarrhalis**
- **Mycoplasma pneumoniae**
- **Chlamydophyla pneumoniae**
- **Streptococcus pyogenes**
- Influenza viruses, adenoviruses

HAP hospital

Escherichia coli, Klebsiella pneumoniae, Proteus spp., Enterobacter spp., Pseudomonas aeruginosa, Staphylococcus aureus

ETIOLOGICAL FACTOR :

Immunodeficiency

- Pneumocystis carini,
- Cytomegalovirus Adenovirus, Herpes,
- Fungi (Aspergilozis)

Aspiration pneumonia

- Bacterii anaerobe-
- Prevotella melaninogenica,
- Fusobacterium nucleatum, necroforum,
- Bacteroides spp.
- Streptococcus intermedius.
- Aerobe
- Staphylococcus aureus, Streptococcus pyogenes,
- Haemophilus influenzae (тип b),
- Eikenella corrodens,
- Klebsiella pneumoniae,
- Escherichia coli, Enterobacter cloacae, Proteus mirabilis,
- Pseudomonas aeruginosa

Associated with artificial ventilation

Early

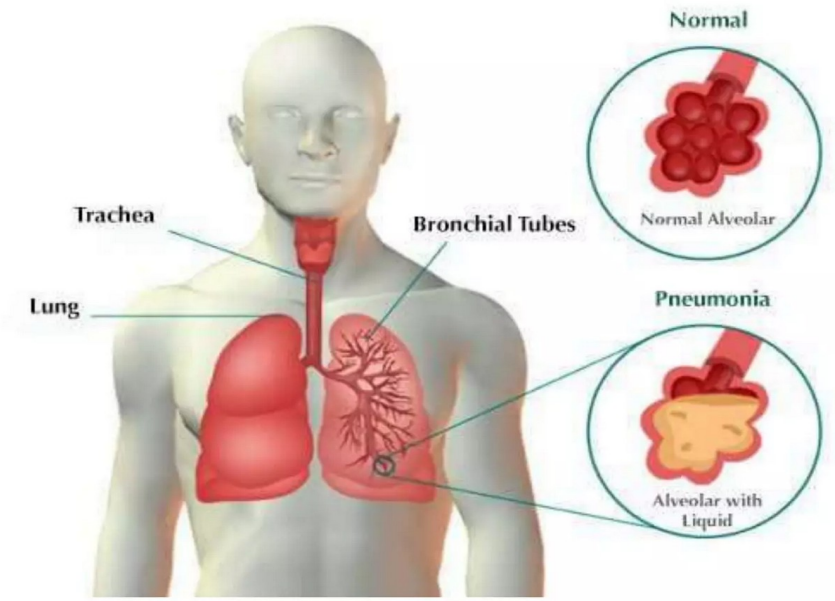
Streptococcus pneumoniae, Haemophilus influenzae типа b, Streptococcus pyogenes, Staphylococcus aureus, Moraxella catarrhalis.

Late -

Pseudomonas aeruginosa, Acinetobacter spp., Enterobacter spp. Streptococcus pyogenes,

Noninfectious causes

- Aspiration of food or gastric acid, foreign bodies, hydrocarbons, and lipoid substances.
- Hypersensitivity reactions, and drug- or radiation-induced pneumonitis.



RISK FACTORS: *(act by decreasing the organism's resistance to infection, increase receptivity)*

- Age < 3 months
- Prematurity
- Malnutrition
- Chronic lung diseases (asthma, cystic fibrosis)
- Developmental anomalies: tracheobronchial
- Hereditary or acquired immune deficiencies
- Hemoglobinopathies
- Reflux-esophagitis with aspiration
- Neurological pathology
- Environmental and care deficiencies, crowded housing
- Most healthy children can fight pneumonia infections with their natural immune defenses, so won't need any treatment

PATHOPHYSIOLOGY

An inhaled infectious organism must bypass the host's normal nonimmune and immune defense mechanisms in order to cause pneumonia.

The nonimmune mechanisms include

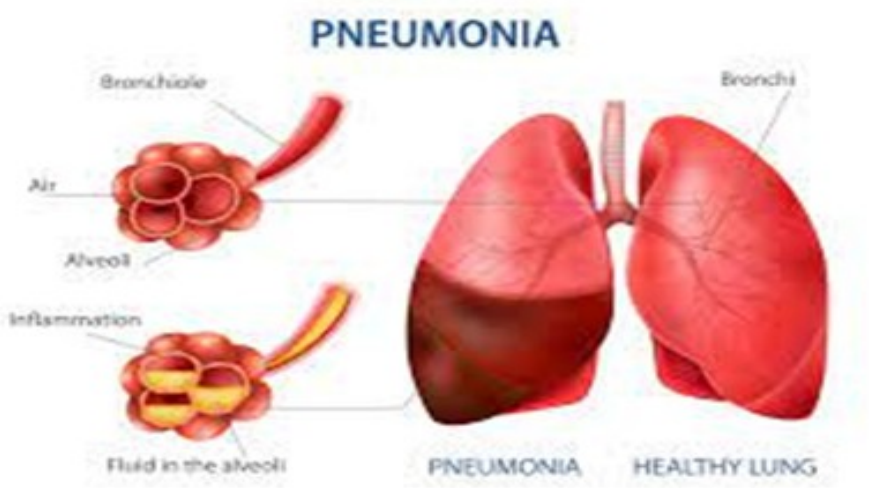
- aerodynamic filtering of inhaled particles based on size, shape, and electrostatic charges; the cough reflex;
- mucociliary clearance; and
- several secreted substances (eg, lysozymes, complement, defensins).

Macrophages, neutrophils, lymphocytes, and eosinophils carry out the immune-mediated host defenses

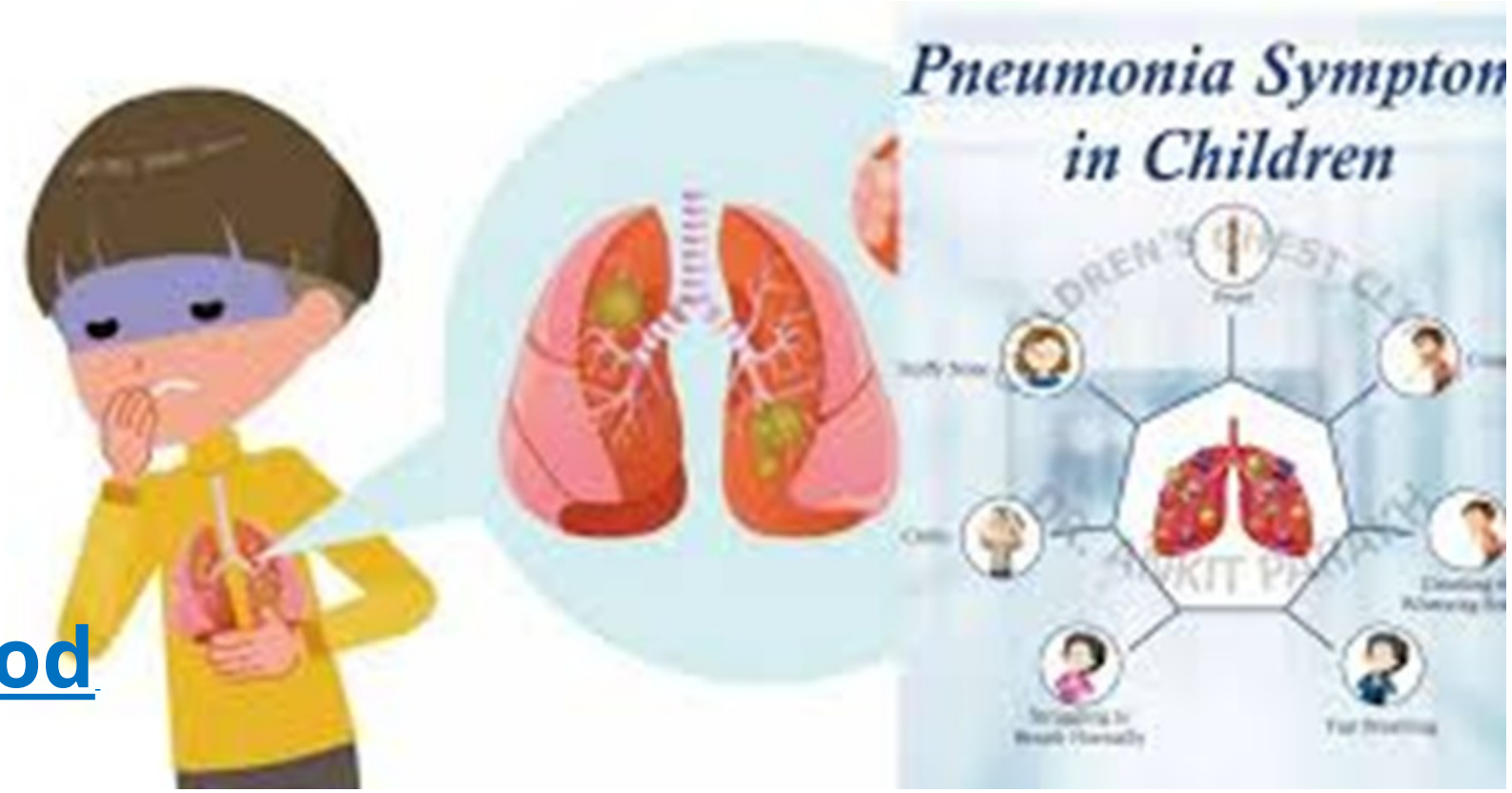
PATHOGENESIS

Pneumonia is characterized by inflammation of the alveoli and terminal airspaces in response to invasion by an infectious agent introduced into the lungs through hematogenous spread or inhalation.

The inflammatory cascade triggers the leakage of plasma and the loss of surfactant, resulting in air loss and consolidation



CLINICAL MANIFESTATIONS (1)



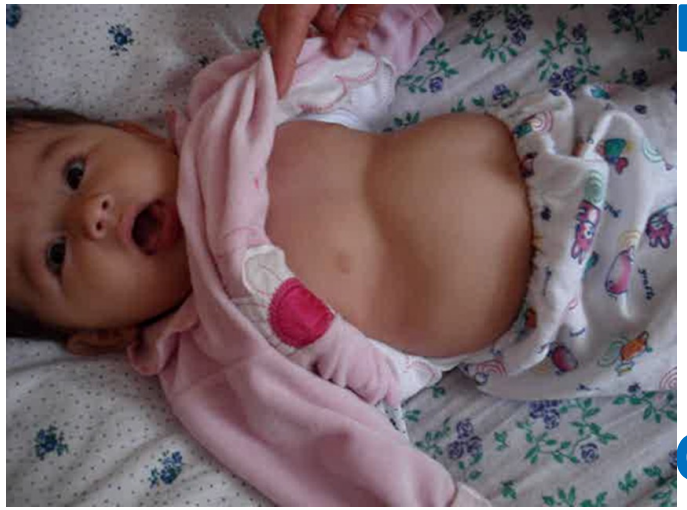
The prodrome period

- In viral: a few days of IRVA of the upper legs, tachypnea, unpronounced fever
- Bacterial: T-fever>40, chills, weakness, sometimes cyanosis, pain in the abdomen, lie on the affected side, cough

CLINICAL MANIFESTATIONS (2)

Signs and symptoms can be grouped into the following syndromes:

1. *Functional respiratory syndrome*



Dyspnea < 2 months > 60 resp/minute

2-12 months >50 resp./min

1-5 years > 40 resp/min

(*is the most informative clinical sign*)

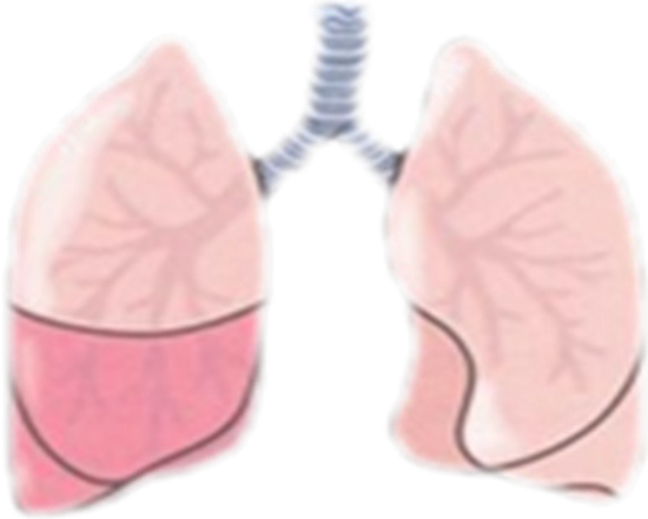
Cough

Flapping of nasal wings circulation

Chest indrawing

They are more pronounced in small children

CLINICAL MANIFESTATIONS(3)



2. *Infectious syndrome*

Change in general condition

Fever (can be absent in newborn and premature)

3. *Pulmonary physical syndrome*:

In the beginning-weak breathing, moist rales located asymmetrically

Subcrepitant rales in the focus of bronchopneumonia, dullness,

Blowing breath

Crepitant rales in lobar pneumonia

Absence of stetoacoustic changes in interstitial pneumonia

Sometimes bronchial rales and wheezing

CLINICAL MANIFESTATIONS(4)

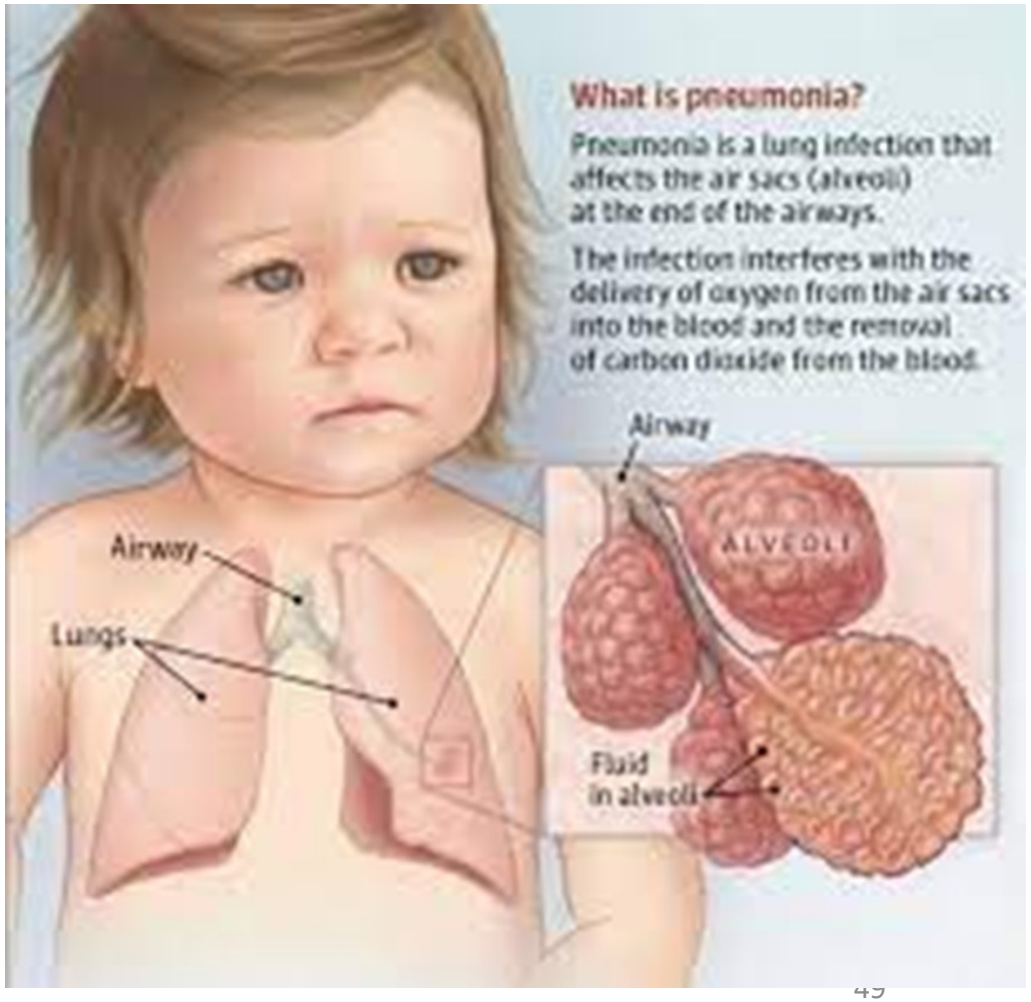
4. Cardiovascular singns

a) signs of right heart failure (acute pulmonary heart)

- ❑ tachycardia,
- ❑ stasis hepatomegaly
- ❑ turgid jugular

b) signs of collapse: cold extremities

- ❑weak or unresponsive peripheral pulse
- ❑arterial hypotension
- ❑prolonging the recoloring time (>3 sec)
- ❑oligoanuria

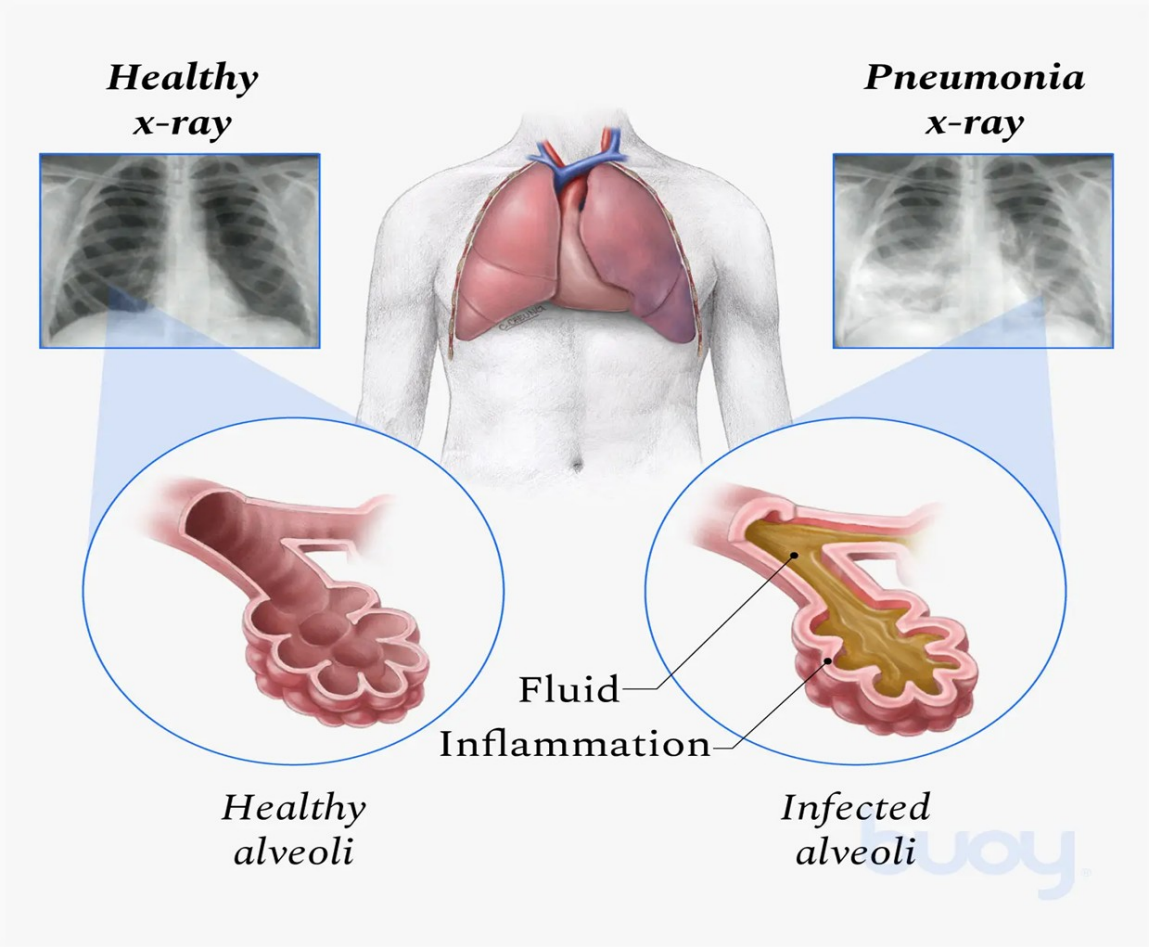


Important aspects of the physical examination in a child with suspected pneumonia

Auscultation	Findings suggestive of pneumonia include: crackles (rales, crepitations), decreased breath sounds, bronchial breath sounds, egophony, bronchophony, and whispered pectoriloquy Wheezing more common in viral and atypical pneumonias
Tactile fremitus Dullness to percussion	Suggestive of parenchymal consolidation Suggestive of parenchymal consolidation or pleural effusion

CLINICAL MANIFESTATIONS(5)

- In addition to the symptoms listed above, all pneumonias share the following symptoms. However, each child may experience symptoms differently. Symptoms may include:
- Fever
- Chest or stomach pain
- Decrease in appetite
- Chills
- Breathing fast or hard
- Vomiting
- Headache
- Not feeling well
- Fussiness
- The symptoms of pneumonia may resemble other problems or medical conditions.



The main types of pneumonia are:

- **Bacterial pneumonia.** This is caused by various bacteria. The *streptococcus pneumoniae* is the most common bacterium that causes bacterial pneumonia.

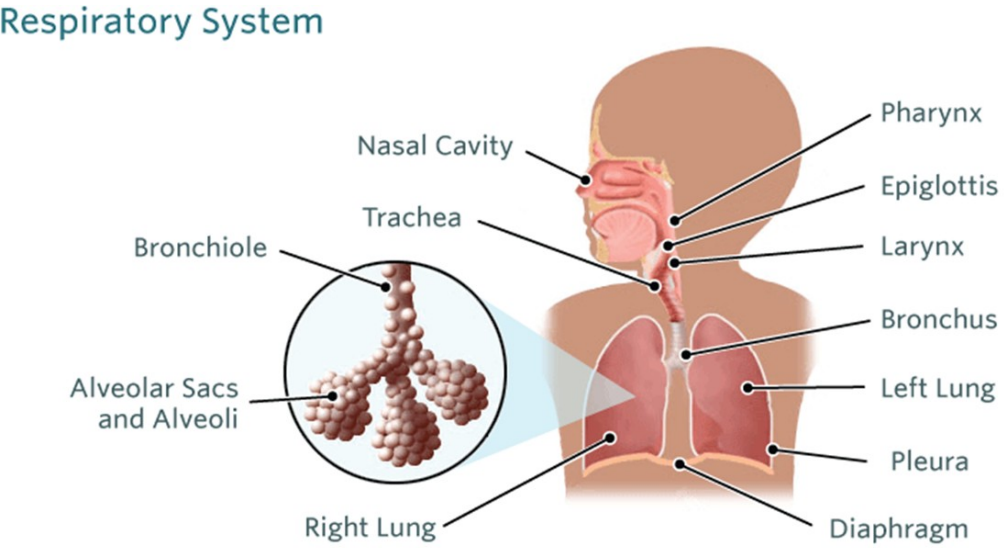
  Many other bacteria may cause bacterial pneumonia including:
  - Group B *streptococcus*
  - *Staphylococcus aureus*
  - Group A *streptococcus*
- Bacterial pneumonia may have a quick onset and the following symptoms may occur:
  - Productive cough
  - Pain in the chest
  - Vomiting or diarrhea
  - Decrease in appetite
  - Fatigue
  - Fever

THE EXAMINATION OF THE CHILD:

At primary level (ambulatory, at home)

- Appreciation of general danger signs
  - **The child cannot drink or suckle**
  - **Vomiting after every food or drink**
  - **The child had convulsions**
  - **Check if he is lethargic or unconscious**
  - **If he has convulsions**
- Respiration rate (RR) per minute
- Inspection (chest draft)
- Breathing rate
- Auscultation
- Percussion
- Pulse oximetry
- Rx of the chest (according to the national protocol)

Diagnosis: ASK. LOOK CLINICAL SIGNS:



WHO DEFINITION OF TACHYPNEA

Age	Respiratory Rate (breaths/min)	Indication of severe infection (breaths/min)
< 2 months	> 60	>70
2 to 12 months	> 50	
12 months to 5 years	> 40	>50
Greater than 5 years	> 20	

ASK: FOR HOW LONG last difficult breathing?

A cough or difficult breathing that lasts for more than 14 days may indicate tuberculosis, asthma, whooping cough, or some other problem.

LOOK: DOES THE CHILD HAVE FAST BREATHING?

As you have learned, fast breathing is one sign of pneumonia in a child.

How to determine if a child is breathing faster than he or she normally should be?

You count the number of breaths the child takes per minute to determine if fast breathing is present.

Look for the breathing movement anywhere on the child's chest or abdomen.

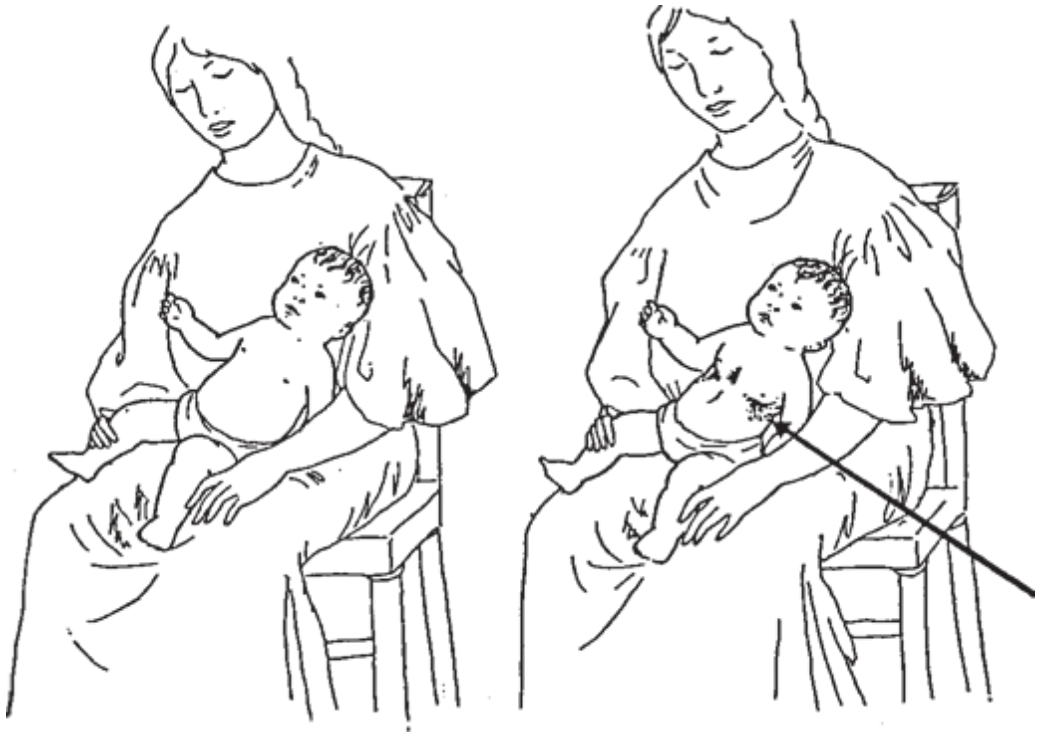
The number of breaths for 'fast breathing' depends on the child's age.

Younger children normally have higher rates of breathing than older children.

LOOK: FOR CHEST INDRAWING

Chest indrawing occurs when the child needs to make a greater effort than normal to breathe in.

In normal breathing, the whole chest wall (upper and lower) and the abdomen move OUT when the child breathes IN. The child has chest indrawing if the lower chest wall (lower ribs) goes IN when the child breathes IN. Review the photo b



REMEMBER! When do you look for chest indrawing? When the child breathes

IN NORMAL: when child breathes **IN**, chest wall moves **OUT**

CHEST INDRAWING: when child breathes **IN**, chest wall moves **IN**

LOOK AND LISTEN

FOR STRIDOR

Stridor is present when the child breathes IN

It is a harsh noise caused when swelling interferes with air entering the lungs.

FOR WHEEZING

- **Wheeze is a high-pitched whistling or musical sound heard at the end of the breathing OUT**. The child's small air passages narrow to cause wheezing.
- **If the child has wheezing *and* either fast breathing or chest indrawing**: you need to perform an additional assessment. Give a trial of rapid acting inhaled bronchodilator(Salbutamol) for up to three times 15–20 minutes apart. Count the breaths and look for chest indrawing again. Then classify the problem.

PARACLINICAL EXAMINATION

- **Chest X-ray.**
- **Complete blood cell (CBC) count** *Testing should include a complete blood cell (CBC) count with differential and the evaluation of acute-phase reactants (ESR, CRP, or both) and sedimentation rate. The total white blood cell (WBC) count and differential may aid in determining whether an infection is bacterial or viral, and, together with clinical symptoms, chest radiography, and ESR, can be useful in monitoring the course of pneumonia. In cases of pneumococcal pneumonia, the WBC count is often elevated*
- **Blood tests.** *Blood count for evidence of infection; arterial blood gas to analyze the amount of carbon dioxide and oxygen in the blood.*
- **Serology:** M pneumoniae, Chlamydophila species, and Legionella. PCR
- **Sputum culture.** A diagnostic test performed on the material that is coughed up from the lungs and into the mouth.
- **Pulse oximetry.** .
- **Chest CT scan.**
- **Bronchoscopy. Pleural fluid culture.** A culture of fluid sample taken from the pleural space (space between the lungs and chest wall) to identify the bacteria that cause pneumonia
- **Inflammatory Markers The use of markers of inflammation to support a diagnosis of suspected infection, including pneumonia, remains controversial because results are nonspecific**
- **Quantitative measurements of CRP, procalcitonin, cytokines (eg, interleukin [IL]-6), inter-alpha inhibitor proteins (Ialp)**

PARACLINICAL EXAMINATION

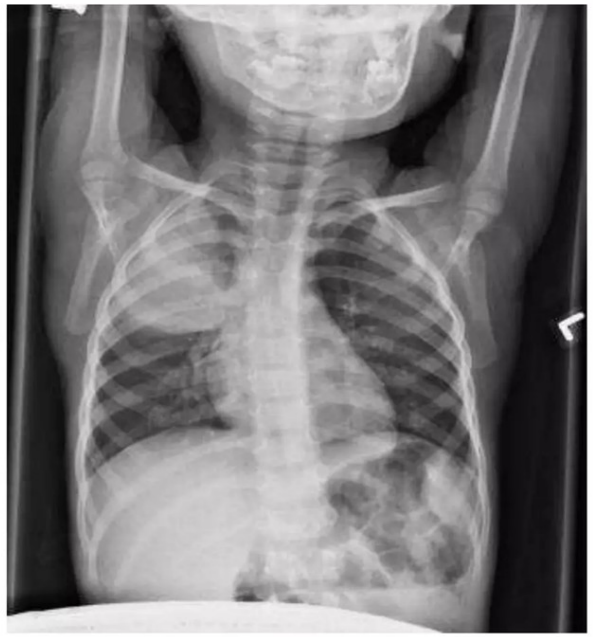
- **Chest X-ray is NOT routinely indicated**

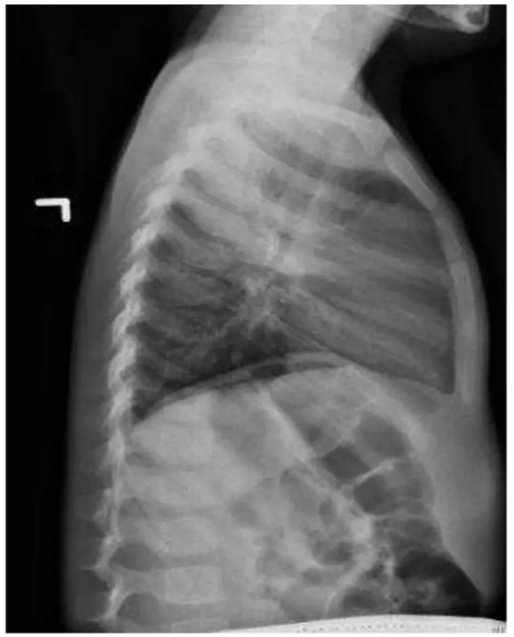
Note: Perform chest X-ray in anteroposterior and lateral views if complication is suspected [strong recommendation, medium level of evidence

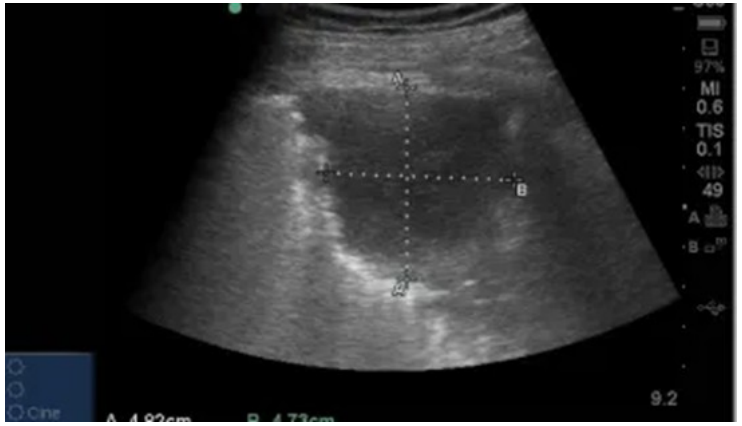
- **Consider chest ultrasonography**

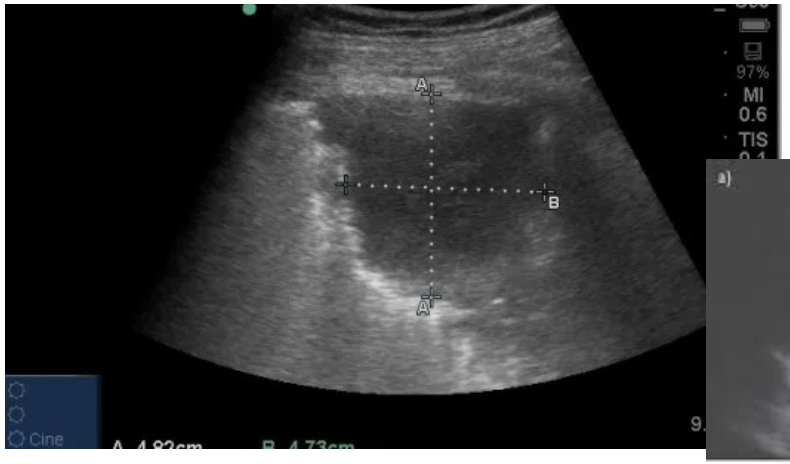
performed at the patient's bedside as an additional method of diagnostic examination (if the necessary specialist and equipment are available)

RIGHT UPPER LOBE PNEUMONIA





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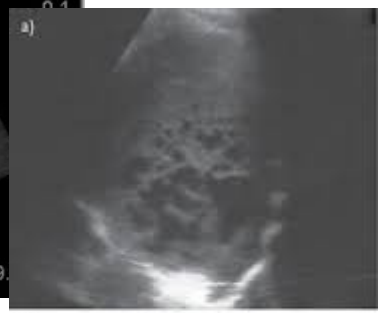
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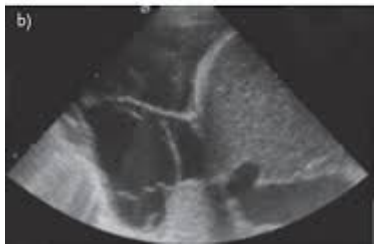
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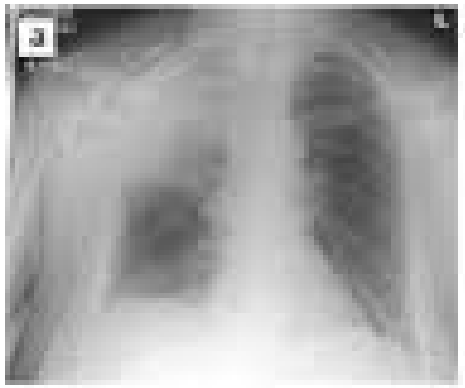
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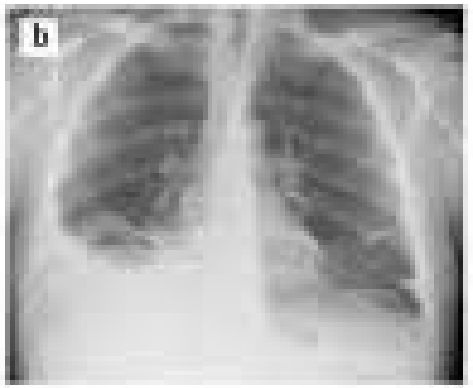
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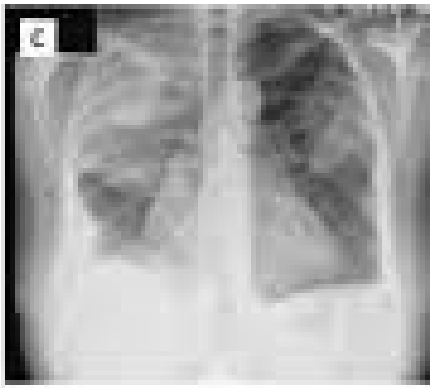
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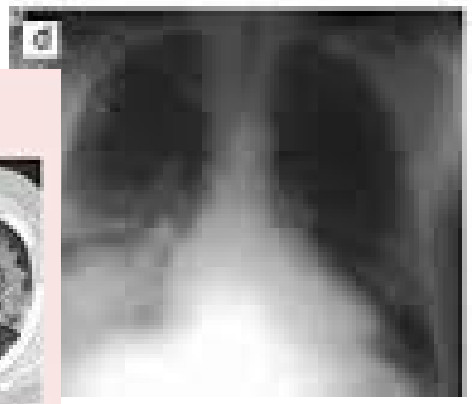
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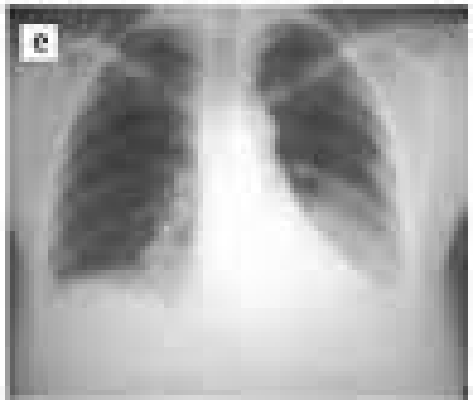
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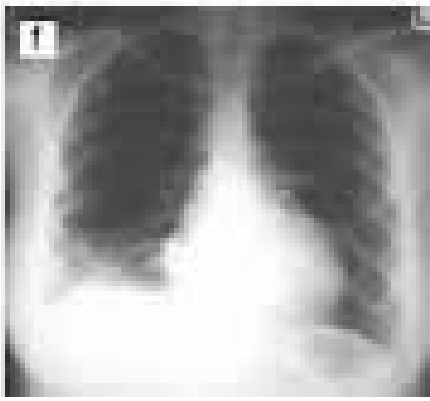
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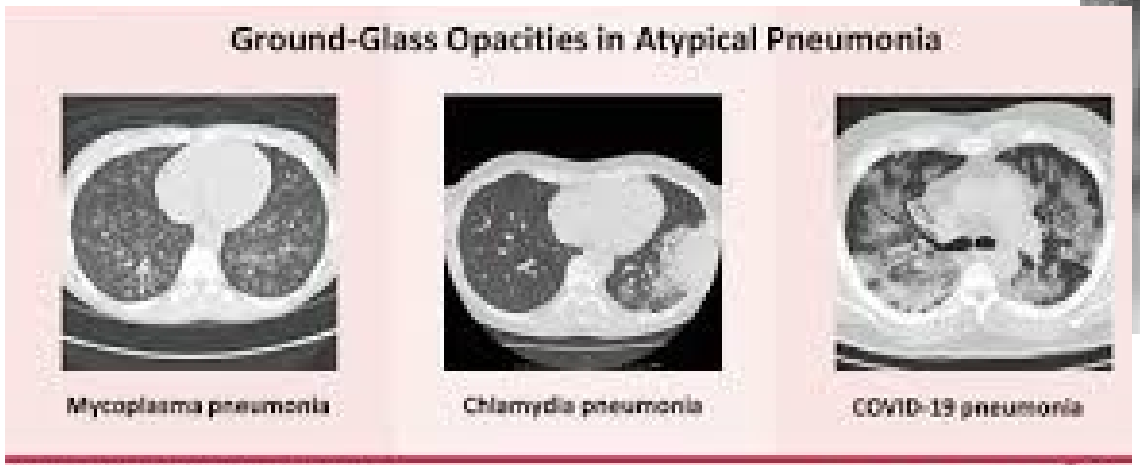

Ground-Glass Opacities in Atypical Pneumonia
Mycoplasma pneumonia
Chlamydia pneumonia
COVID-19 pneumonia

PARACLINICAL EXAMINATION AND THEIR RELEVANCE

- CBC, ESR
- CRP
- Radiograph of chest
- Cultures:
  - Throat swab
  - Cough swab
  - Sputum
  - Lung tap
  - Blood

- H/C, sputum culture

- Rapid test for viral Ag, viral PCR

- **CBC:**
  - **White cell count is often elevated.**
- **Microbiological studies:**
  - **Blood cultures are seldom positive in pneumonia (fewer than 10% are bacteraemic in pneumococcal disease).**
  - **Sputum culture**
- **Imaging:**
  - **Chest radiography (CXR) is not routinely indicated in OPD .**
  - **CXR cannot differentiate reliably between bacterial and viral infections.**

THE GRADE OF SEVERETY AND AGE OF CAP

Severity	Infants	Older children
Mild	Temp <38.5°C RR <70/min SpO2 > 92% Mild recession Taking full feeds	Temp <38.5°C RR <50/min SpO2 > 92% Mild dyspnea No vomiting
Moderate & severe	Temp >38.5°C RR >70/min SpO2 < 92% Moderate to severe recession Respiratory distress Tachycardia Capillary refill time >2 s Intermittent apnea Not taking full feeds	Temp >38.5°C RR >50/min SpO2 < 92% Moderate to severe recession Respiratory distress Tachycardia Capillary refill time >2 s Not taking full feeds

COMPLICATIONS OF PNEUMONIA

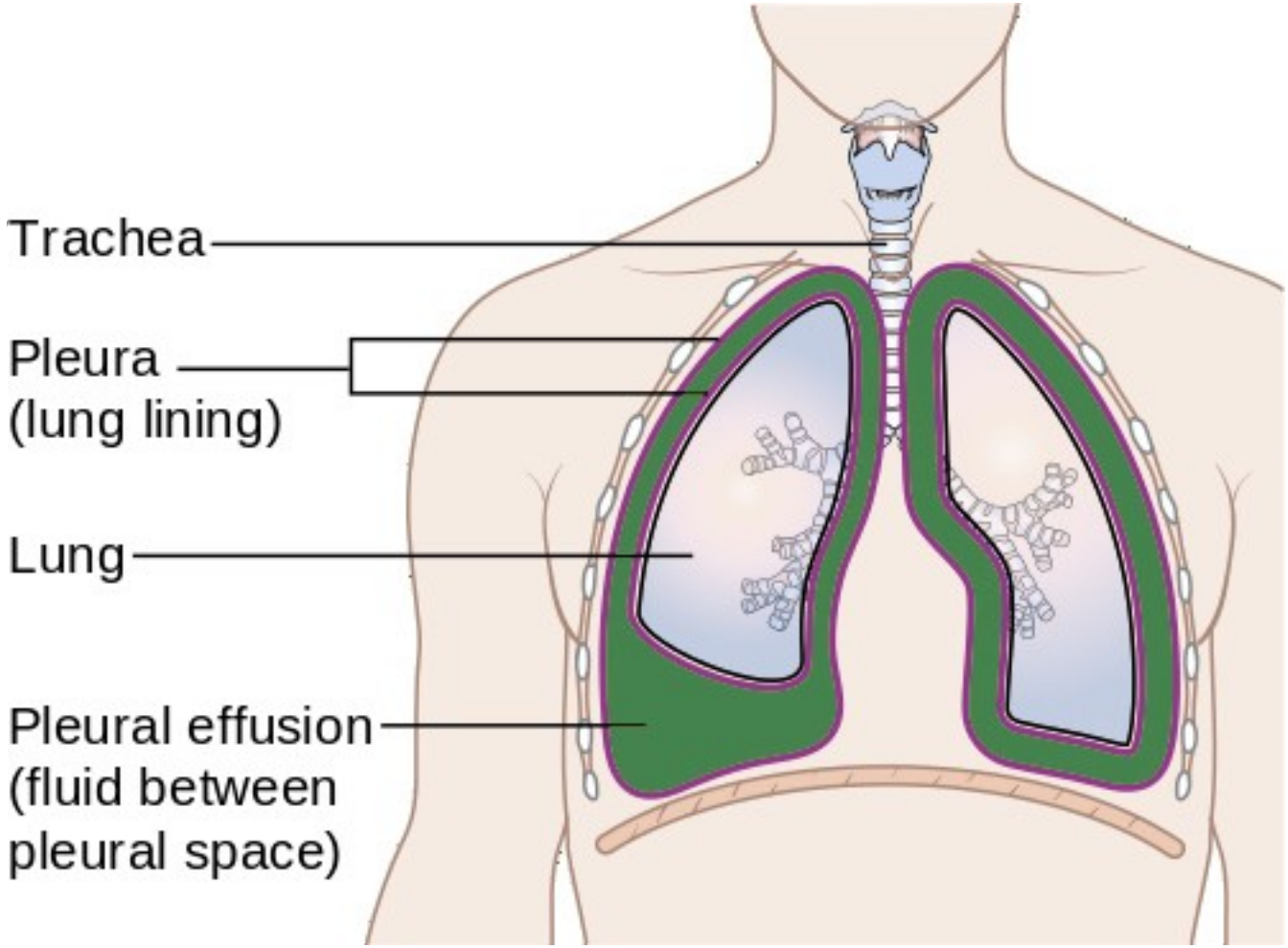
Pleural effusion

- inflammation leads to exudation of fluid into pleural space
- can compromise lung function

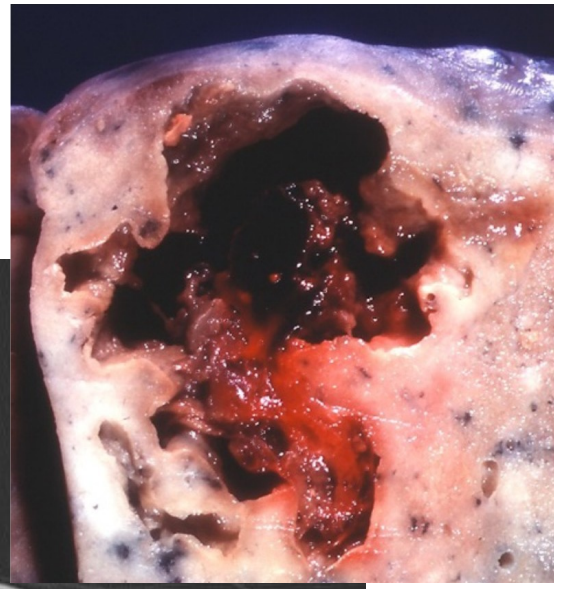
Empyema

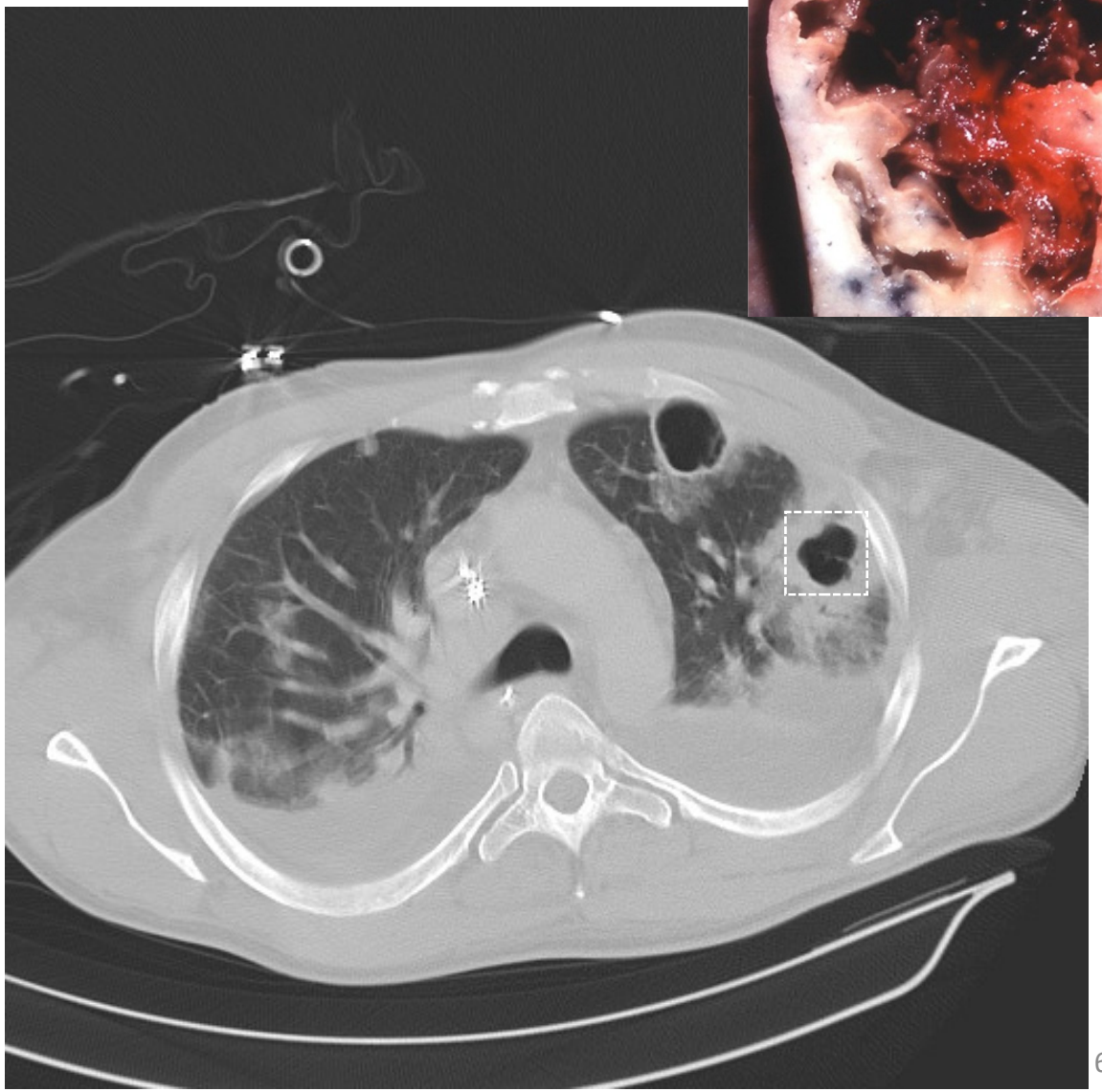
- purulent exudate in pleural space
- necrosis/breakdown of visceral pleura and/or spread of infection into pleura

Pleural adhesions, lung fibrosis



COMPLICATIONS OF PNEUMONIA(2)





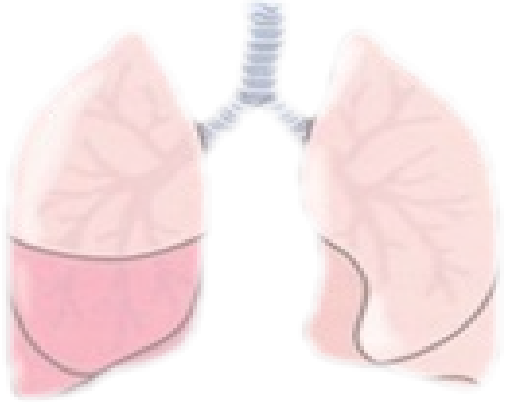
Abscess / cavitary lesion

- circumscribed focus of liquefactive necrosis within lung tissue
- associated with necrotizing *Staph* or *Strep* infections or Gram-neg rods (e.g. aspiration)

OTHER COMPLICATIONS INCLUDE THE FOLLOWING:

- Systemic infection with metastatic foci
- Persistent newborn pulmonary hypertension
- Air leak syndrome, including pneumothorax, pneumomediastinum, pneumopericardium, and pulmonary interstitial emphysema
- Airway injury
- Obstructive airway secretions
- Hypoperfusion
- Chronic lung disease
- Hypoxic-ischemic and cytokine-mediated end-organ injury
- Sepsis

TYPICAL CAP PRESENTATION

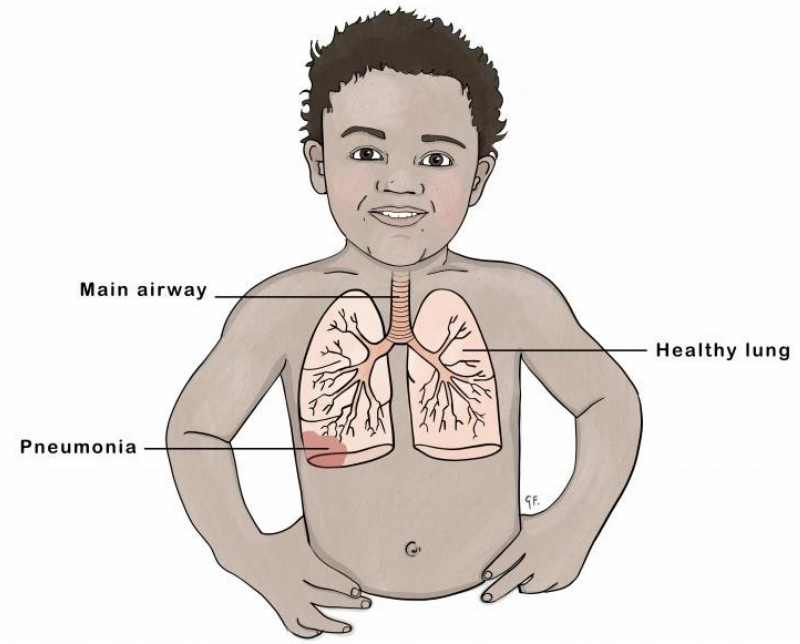


History

- Previously healthy with sudden onset of fever and shortness of breath

Physical signs and symptoms

- fever
- tachycardia
- tachypnea
- productive cough with purulent sputum and possible hemoptysis
- pallor and cyanosis
- localized:
  - dullness to percussion
  - decreased breath sounds
  - crackles, ronchi, egophony ("E"-to-"A" change)



Investigations

- CXR showing lobar consolidation
- CBC showing leukocytosis w/ left shift
- Sputum sample contains neutrophils, RBCs; Gram stain may be positive depending on organism

TYPICAL CAP PRESENTATION(2)

History

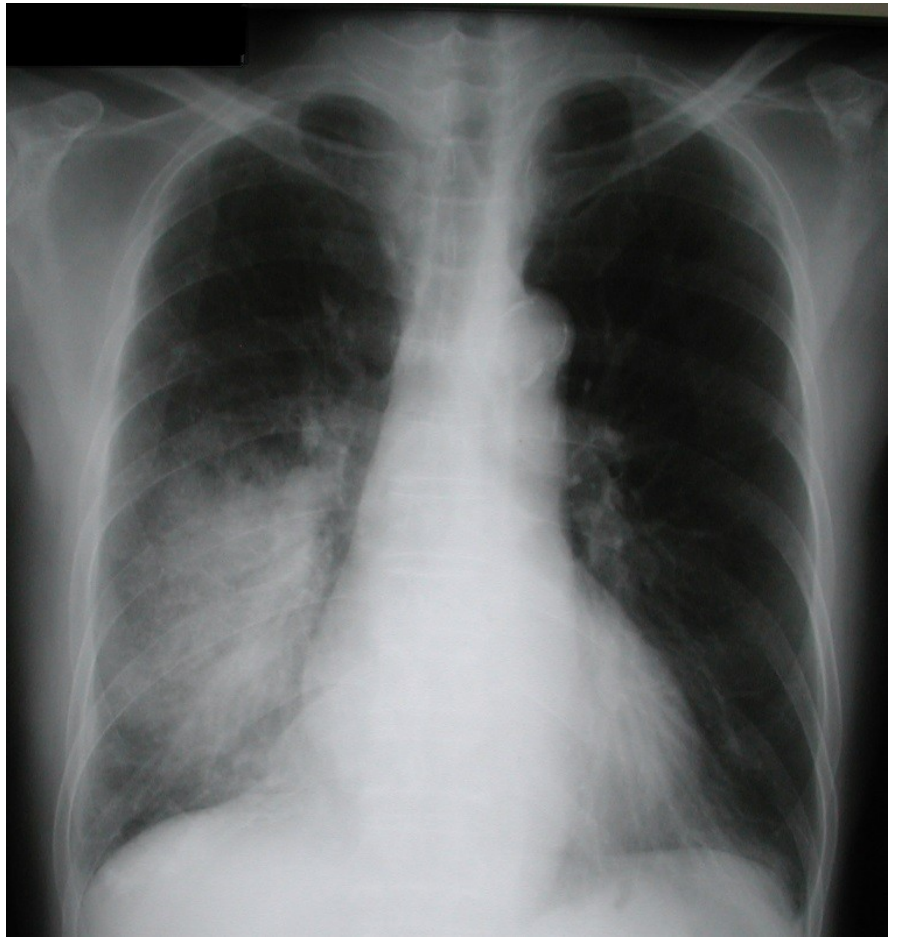
- Previously healthy with sudden onset of fever and shortness of breath

Physical signs and symptoms

- fever
- tachycardia
- tachypnea
- productive cough with purulent sputum and possible hemoptysis
- pallor and cyanosis
- localized:
  - dullness to percussion
  - decreased breath sounds
  - crackles, ronchi, egophony (“E-to-A” change)

Investigations

- CXR showing lobar consolidation
- CBC showing leukocytosis w/ left shift
- Sputum sample contains neutrophils, RBCs; Gram stain may be positive depending on organism

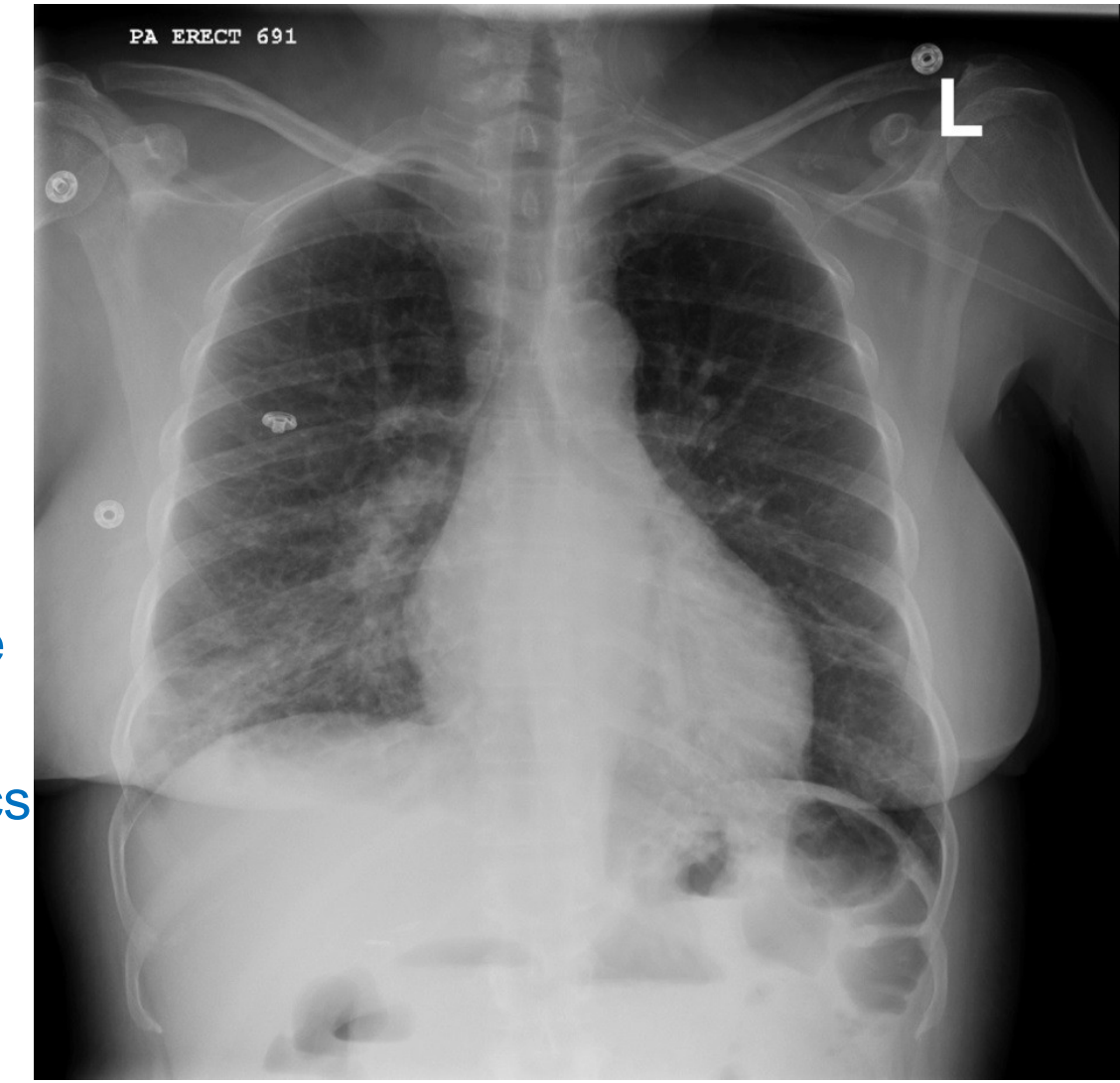


Clinical and radiographic clues to the etiology of pneumonia in children

Etiology	Clinical features	Radiographic features
Bacteria (most ommonly *Streptococcus pneumoniae*)	▪ Children of all ages ▪ Abrupt onset ▪ Ill-appearance ▪ Chills ▪ Moderate to severe respiratory distress ▪ Focal auscultatory findings ▪ Localized chest pain ▪ WBC count >15,000/microL (if obtained) ▪ Elevated acute phase reactants (if obtained)	▪ Alveolar infiltrates ▪ Segmental consolidation ▪ Lobar consolidation ▪ "Round" pneumonia Complications: ▪ Pleural effusion/empyema ▪ Lung abscess ▪ Necrotizing pneumonia ▪ Pneumatocele

ATYPICAL CAP PRESENTATION

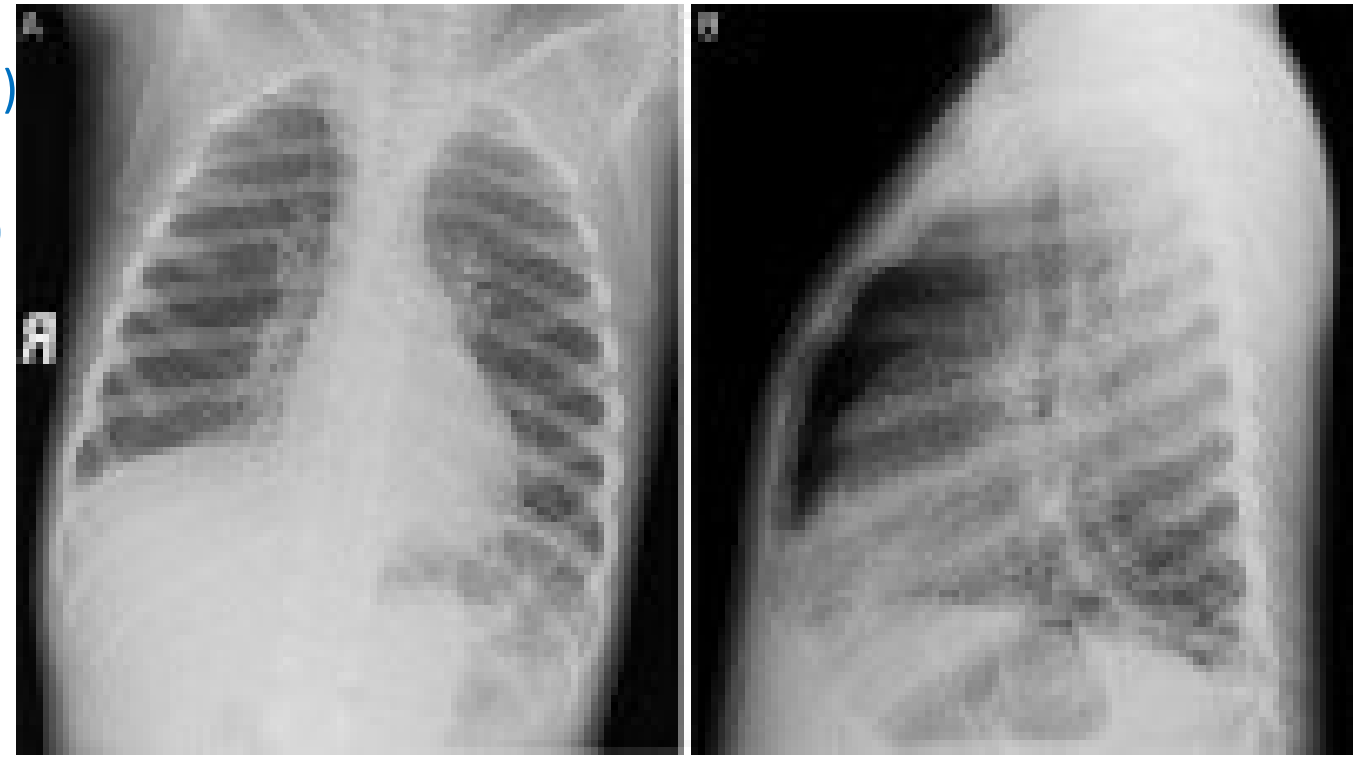
- 12 YO healthy patient – one week of low grade fever, sore throat, and intractable cough
  - Minimal sputum production
  - Able to continue to work
  - No sick contacts, recent travel, or evidence of altered immune system
- PE reveals a mildly ill-appearing patient with diffuse wheezes on lung exam
- Primary care physician prescribes empiric antibiotics for CAP with complete resolution
- “Walking pneumonia” syndrome



ATYPICAL CAP PRESENTATION

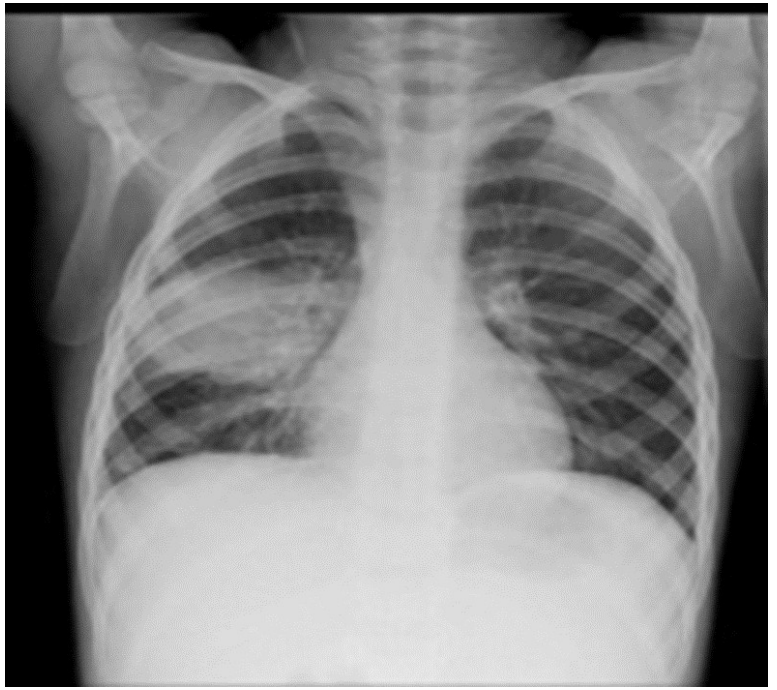
- **Bacteria:**
  - Atipical:
    - Chlamidia trachomatis (< 3months)
    - Chlamidia pneumonia(>5 years)
    - Mycoplasma pneumonia(>5 years)
  - Bordetella pertusis
- **Viruses:**
  - VRS (<5 years)
  - V. influenza, flu(in epidemic)
  - Adenoviruses
  - V parainfluenza

Viral CAP



MYCOPLASMA PNEUMONIA

- This presents somewhat different symptoms and physical signs than other types of pneumonia. They generally cause a mild, widespread pneumonia that affects all age groups but more commonly in older children.
- Symptoms usually do not start with a cold, and may include the following:
- Fever and cough are the first to develop
- Cough that is persistent and may last 3-4 weeks
- A severe cough that may produce some mucus
- Other less common pneumonias may be caused by
  - the inhaling of food,
  - liquid,
  - gases or
  - dust, or
  - by fungi.



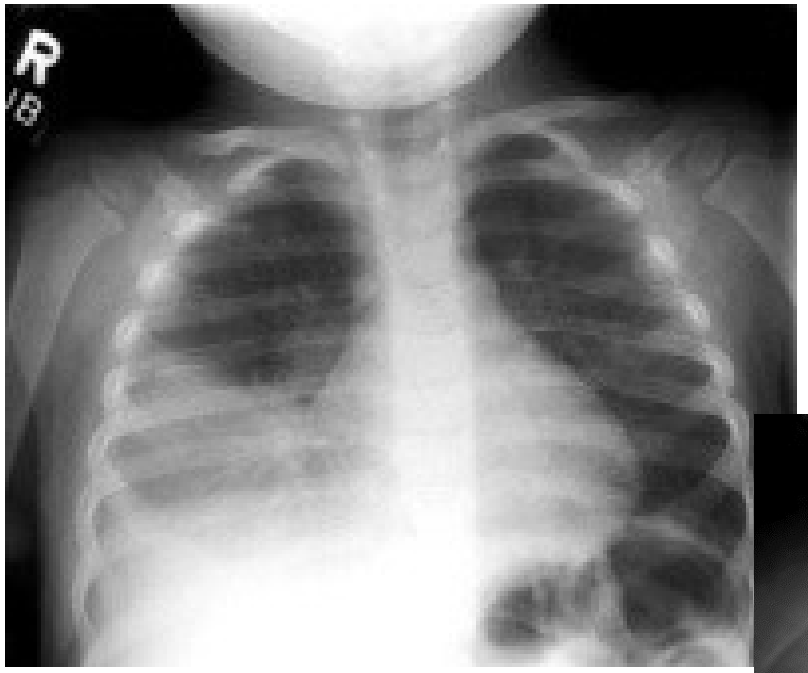
Clinical and radiographic clues to the etiology of pneumonia in children

Etiology	Clinical features	Radiographic features
Atypical bacterial (*Mycoplasma pneumoniae*, *Chlamydia pneumoniae*)	▪ **Children of all ages (most common in children >5 years)** ▪ **Abrupt onset with constitutional findings (malaise, myalgia, headache, rash, conjunctivitis, photophobia, sore throat)** ▪ **Gradually worsening nonproductive cough** ▪ **Wheezing** ▪ **Extrapulmonary manifestations or complications (eg, polymorphous mucocutaneous eruptions, hemolytic anemia, hepatitis, pancreatitis, myopericarditis, aseptic meningitis)**	▪ ***M. pneumoniae:*** • **Lobar or segmental consolidation (37%)** • **Parahilar or peribronchial infiltrates (27%)** • **Localized reticulonodular infiltrates (21%)** • **Patchy infiltrates (15%)**
Viral	▪ **Usually children <5 years** ▪ **Gradual onset** ▪ **Preceding upper airway symptoms** ▪ **Nontoxic appearing** ▪ **Diffuse, bilateral auscultatory findings** ▪ **Wheezing** ▪ **May have associated rash (eg, measles, varicella)**	▪ **Interstitial infiltrates** ▪ **Associated bronchiolitis:** • **Patchy atelectasis** • **Peribronchial infiltrations with air bronchograms** • **Hyperinflation with flattening of the diaphragms**

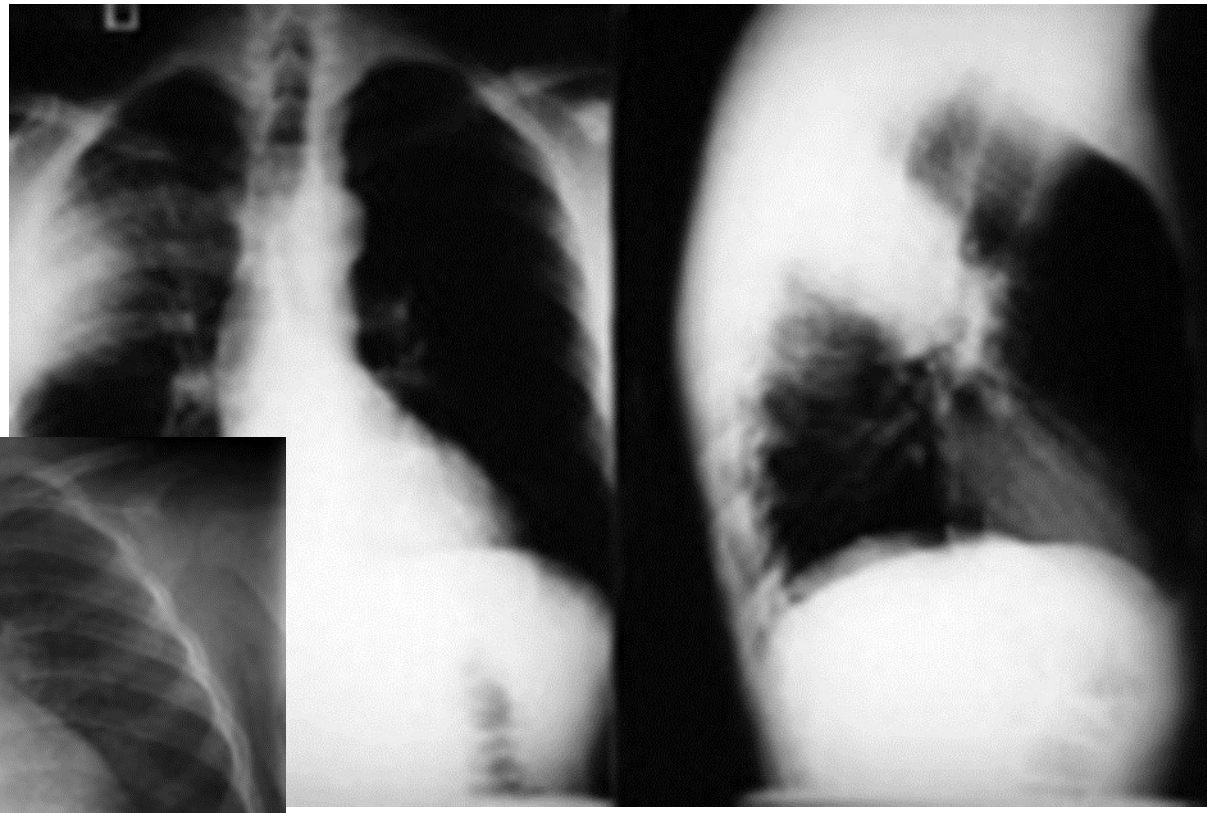
Clinical and radiographic clues to the etiology of pneumonia in children

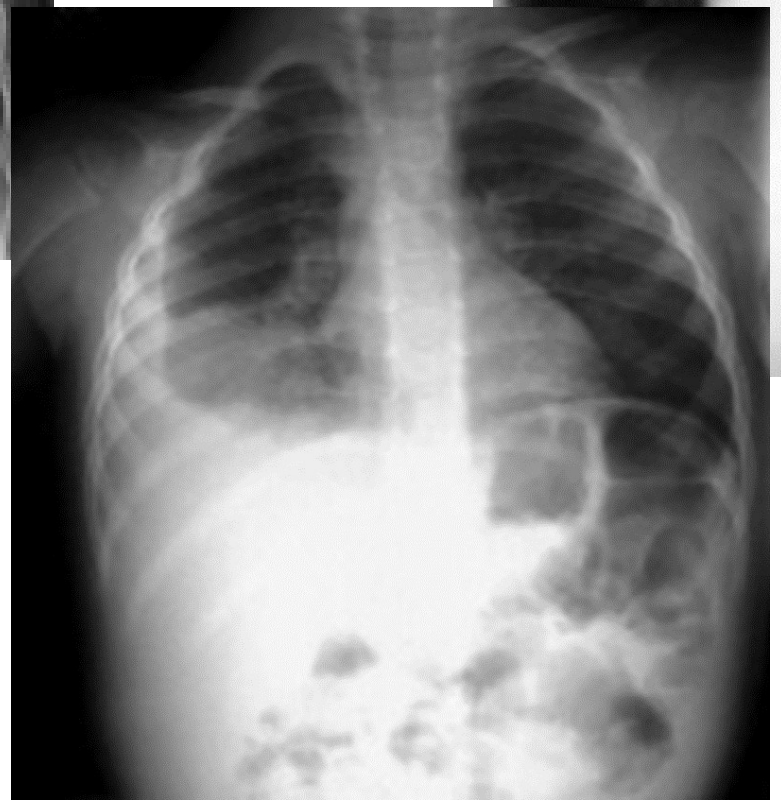
Etiology	Clinical features	Radiographic features
Afebrile pneumonia of infancy (most commonly *Chlamydia trachomatis*)	▪ Usually in infants 2 weeks to 4 months ▪ Insidious onset ▪ Tachypnea, diffuse crackles ▪ Rhinorrhea ▪ Staccato cough pattern ▪ Peripheral eosinophilia (if CBC obtained)	▪ Hyperinflation with interstitial infiltrates
Fungal	▪ Appropriate geographic or environmental exposure	▪ Mediastinal or hilar adenopathy
Mycobacterium tuberculosis	▪ Children of any age ▪ Chronic cough ▪ Constitutional symptoms ▪ Exposure history	▪ Mediastinal or hilar adenopathy

Pn.bacterial



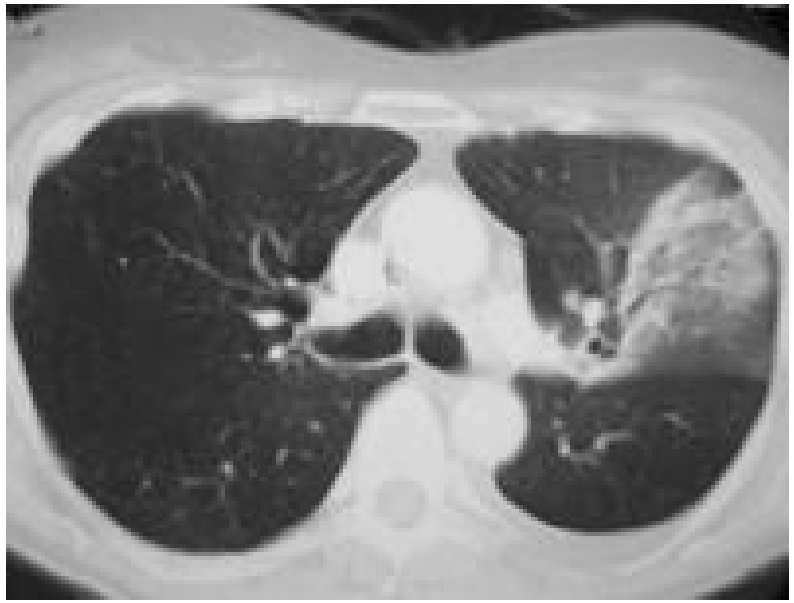
Lobar Pneumonia

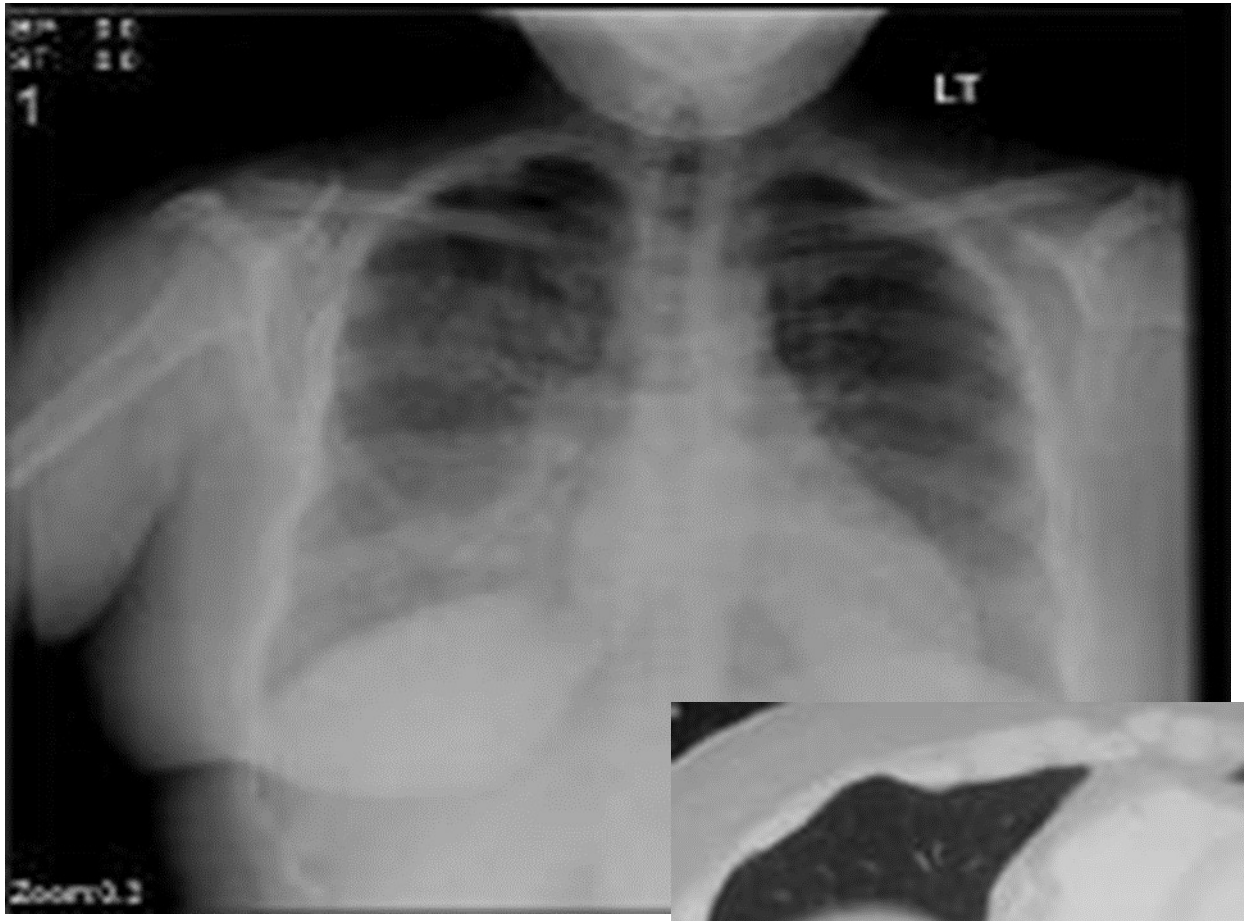




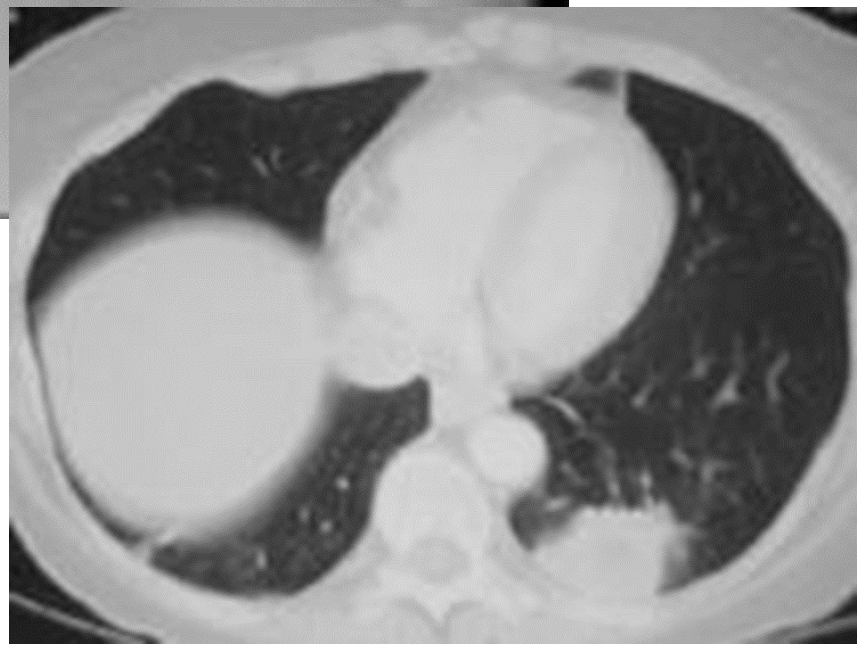
Pleural efusion

CT-CAP bacterian





Pn. H.Influenza



Mycoplazma Pn. With hilar adenopathy and pleural effusion.

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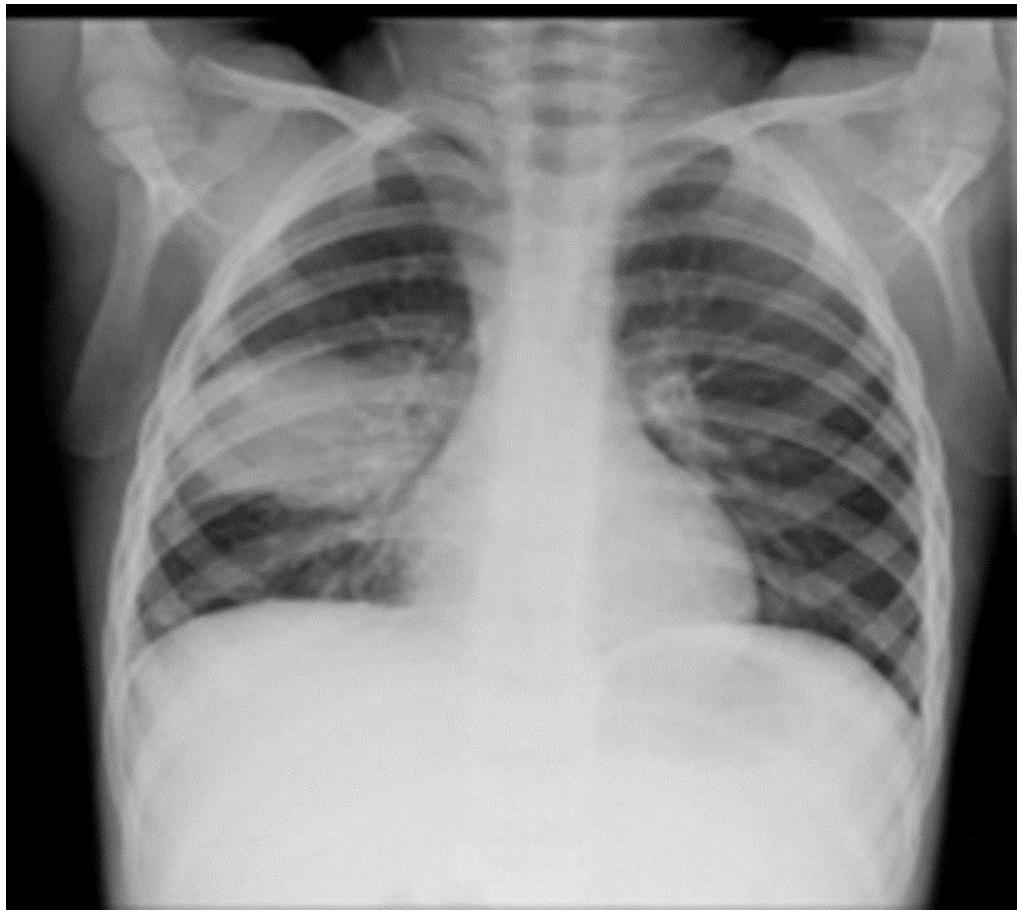
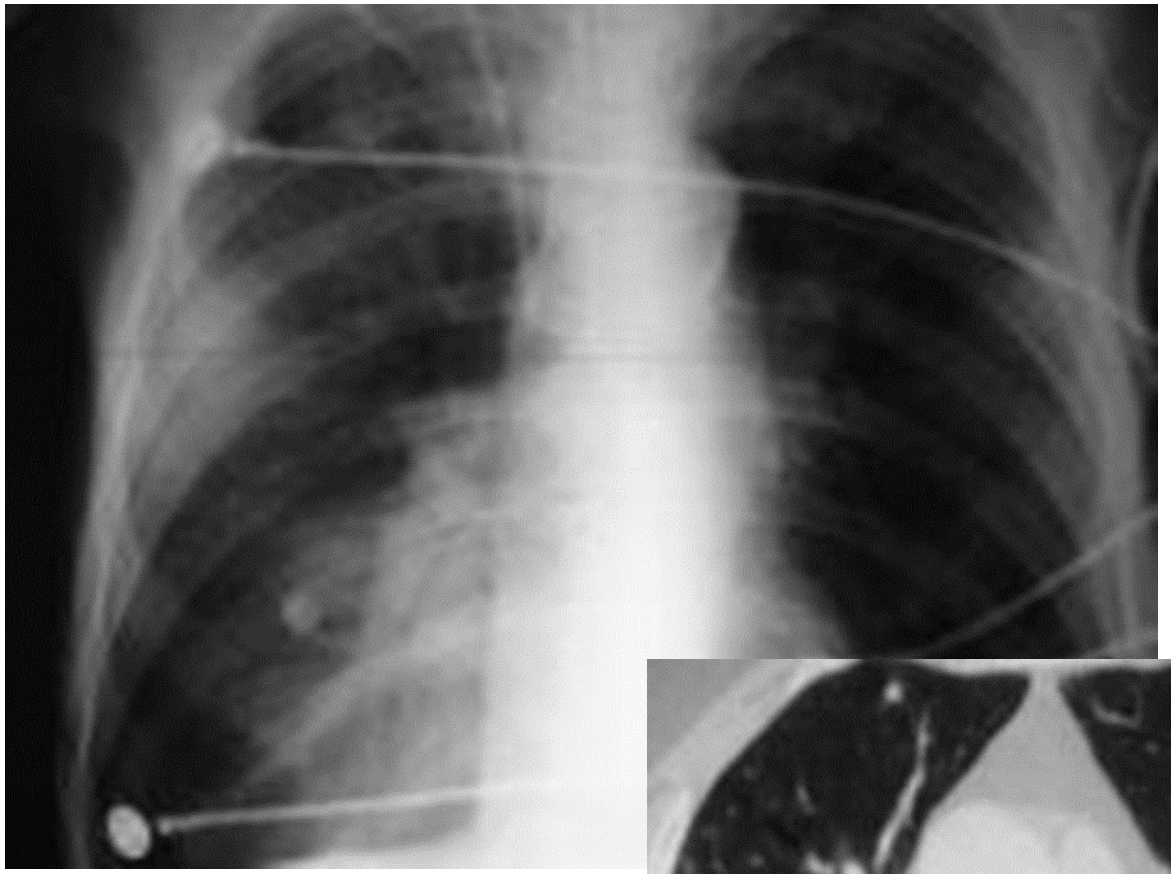
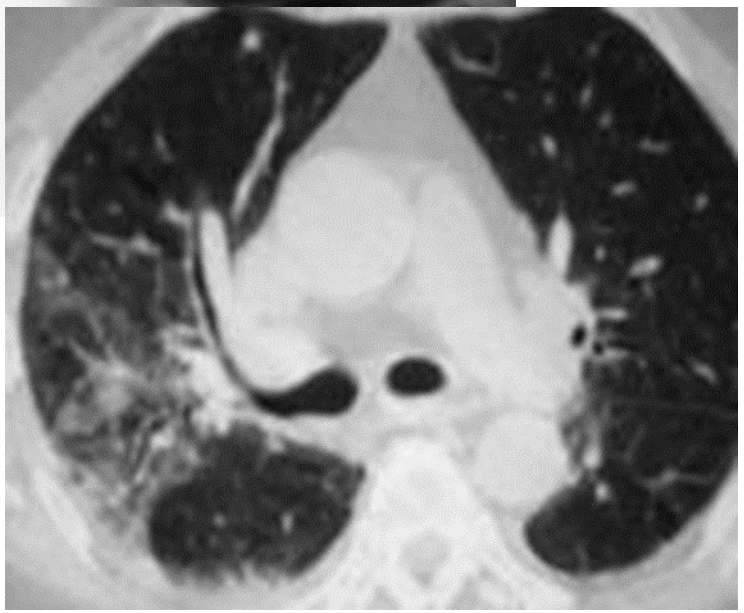
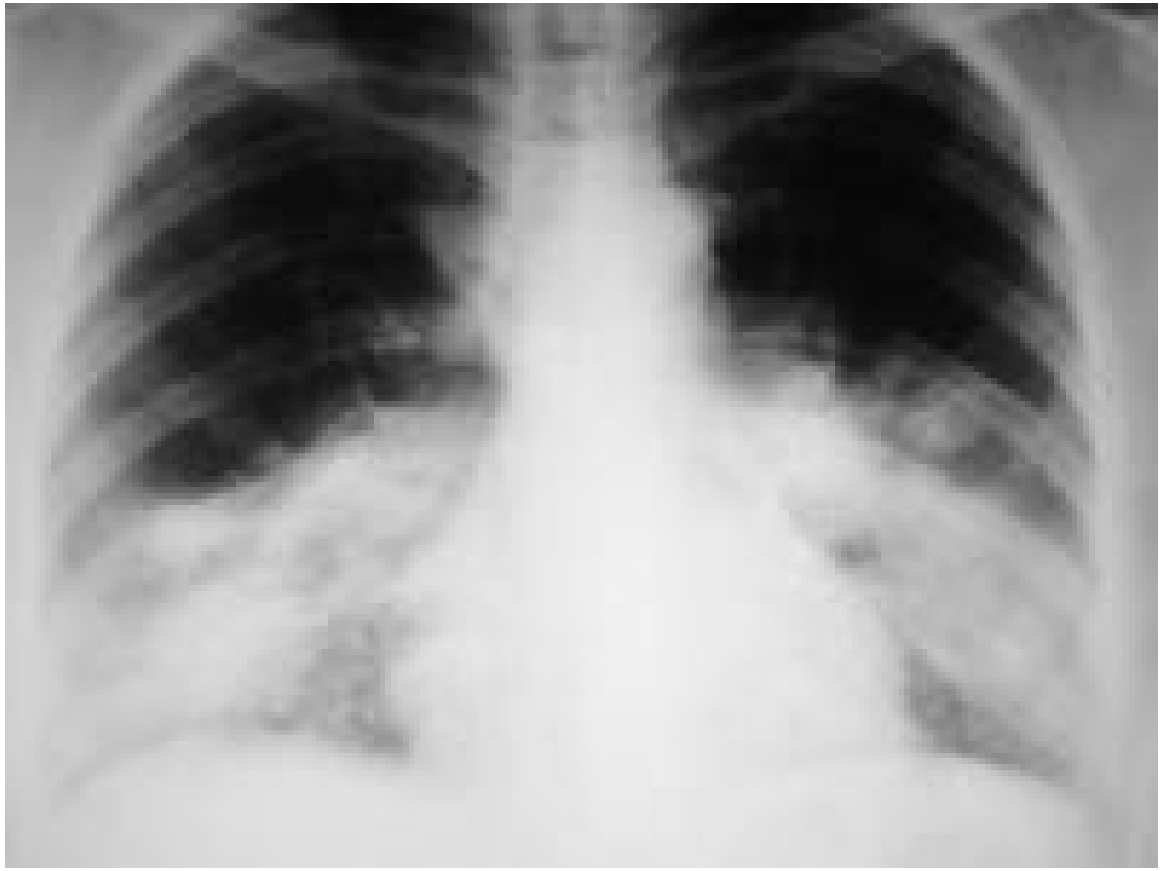


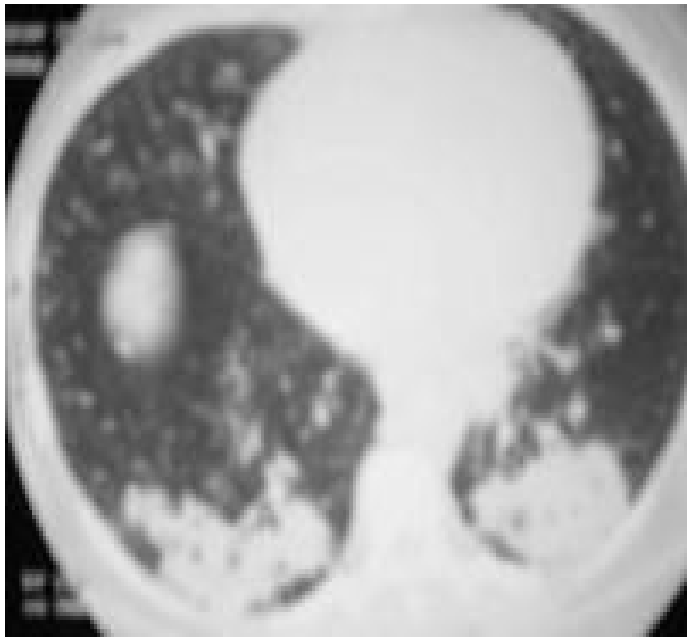




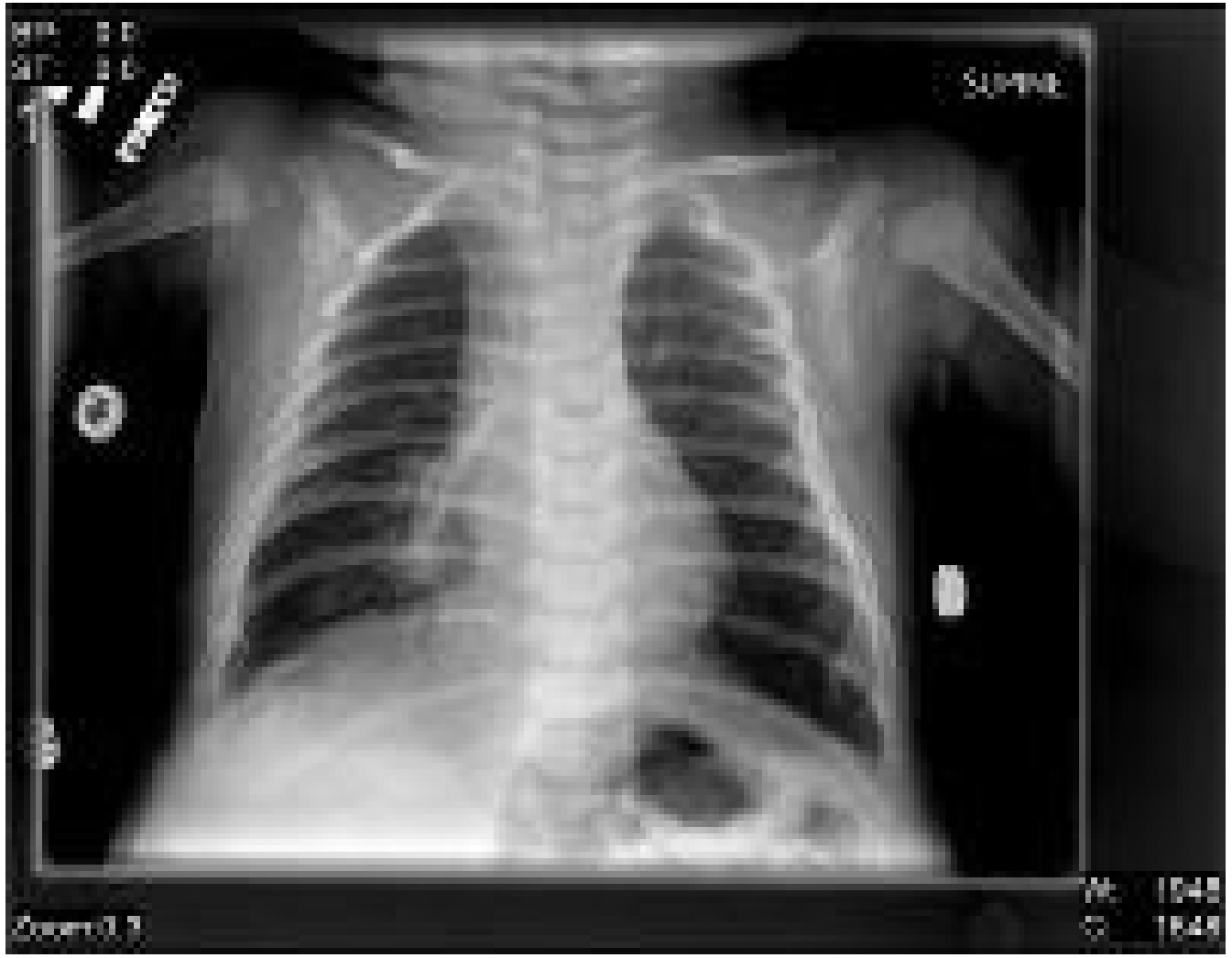
Pn.Hlamidia: multifocare din dreapta (inf, mediu si super)

Pneumonia, caused by Legionella

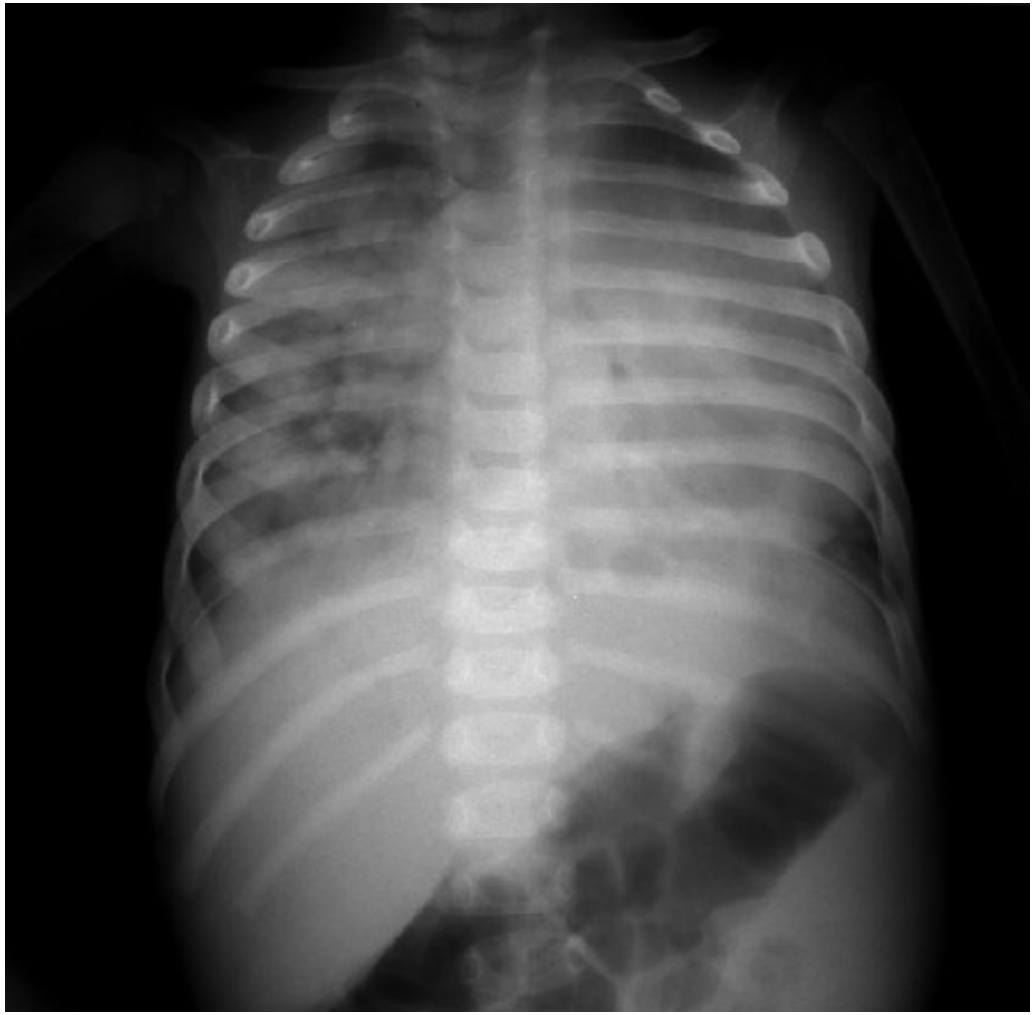




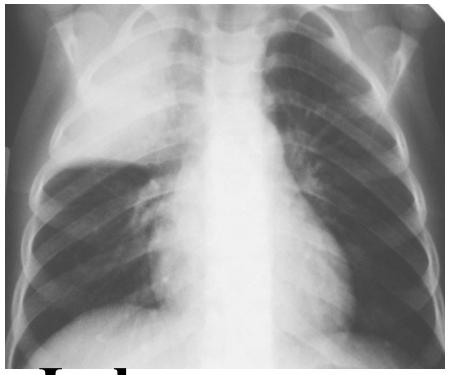
Pn. RSV(right medium lobi)



Pneumonia, cardiomegalia

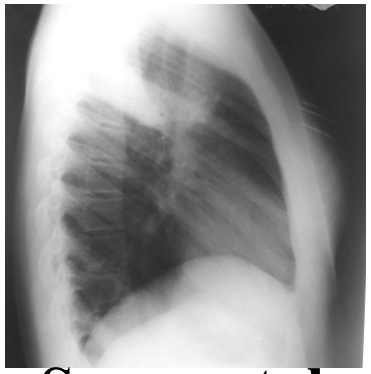


Typical CAP L >15 000, PCR : ↑ ,Procalcitonin↑



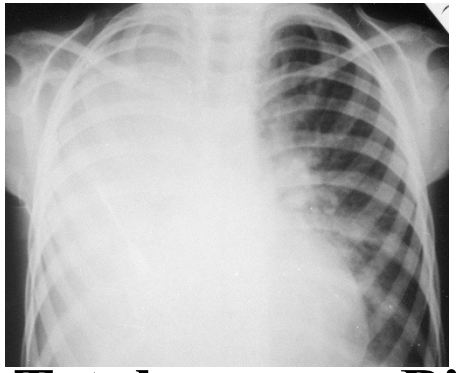
Lobar

S. pneumoniae

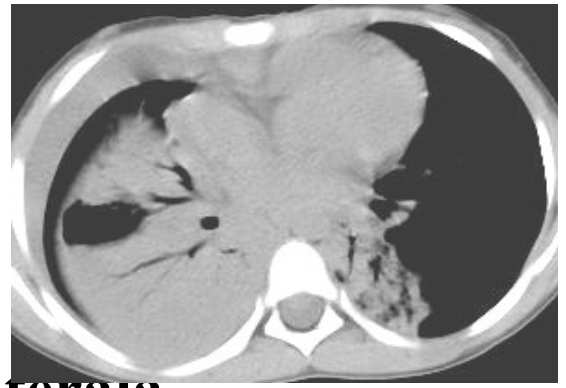


Segmental

H. Influenzae b



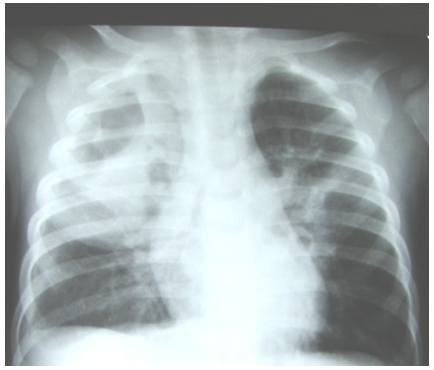
Total



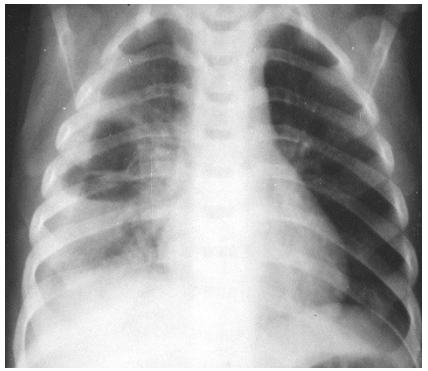
Bilateraia

with exudate

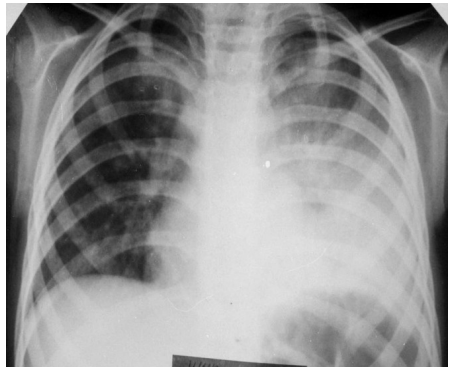
bubles



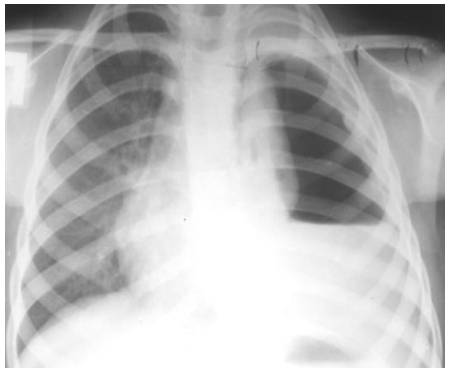
S.aureus – abcess



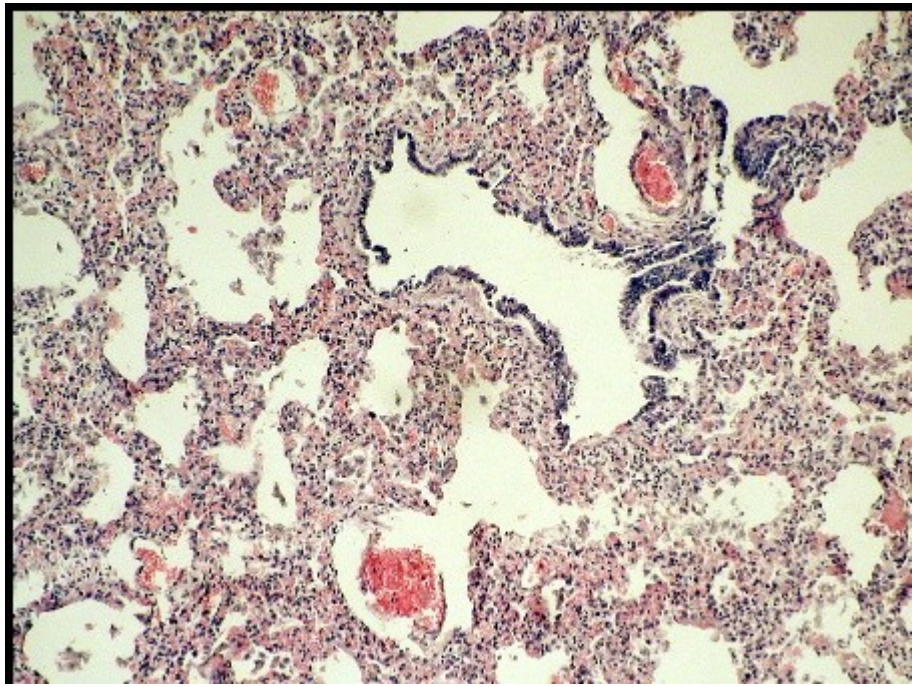
pleural efusiont



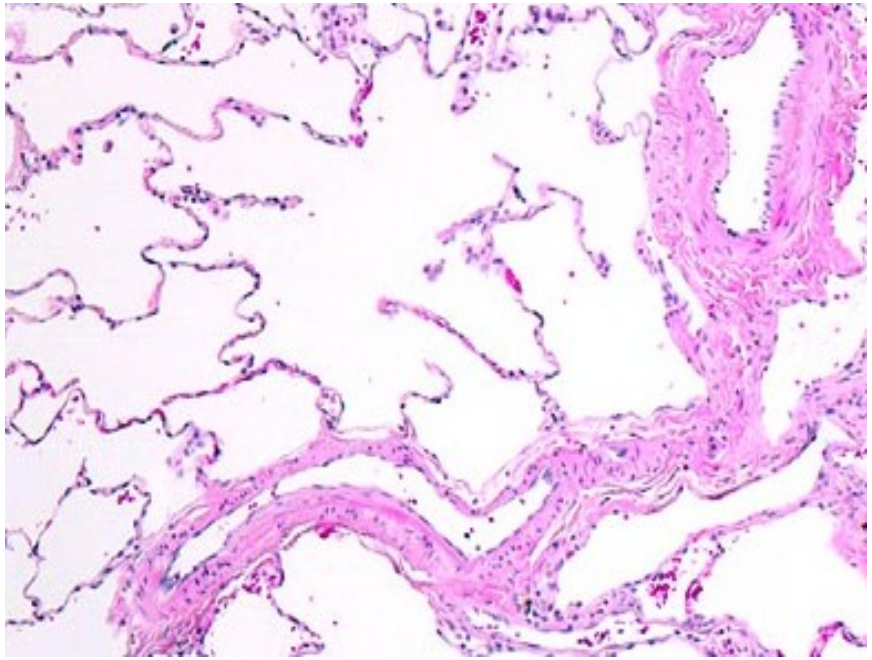
piopneumotorax



Morfopathology, interstitial pneumonia



extraalveolara/ interstitial pneumonia



normal

Differential Diagnosis

- ARI Bronhitis
- HIV
- Severe anemia
- Cardiorespiratory failure
- Tuberculosis
- Pertussis
- Foreign bodies of the respiratory tract
- empyema
- pneumothorax
- Pneumocystis pneumonia
- Respiratory distress (hyaline membranes
- Sepsis
- Meningitis

TUBERCULOSIS

Common symptoms of tuberculosis include:

- Chronic cough that has been present for more than 3 weeks and is not improving
- Fever greater than 38°C for at least two weeks, not attributable to other common causes
- Weight loss or failure to thrive

TUBERCULOSIS

- **Physical exam findings of children with pulmonary tuberculosis are similar to those of a lower respiratory tract infection.**
- In children less than age five tuberculosis can progress rapidly from latent infection to active disease and serve as a sentinel case in the community.
- Consider the diagnosis of tuberculosis, especially in those children who fail to respond appropriately to routine treatment for pneumonia.

PNEUMONIA AND HIV INFECTED CHILDREN

- The prevalence of HIV-1 in children admitted with severe pneumonia (by WHO criteria) in Africa is 55-65%.
- The case fatality rate is 20-34%.
- This case fatality rate is 3-6 times higher for children infected with HIV compared to those not infected with HIV.
- Pneumonia caused by *Pneumocystis jiroveci* may be the first indicator of HIV infection, and lead to HIV testing and diagnosis.

Pertusis

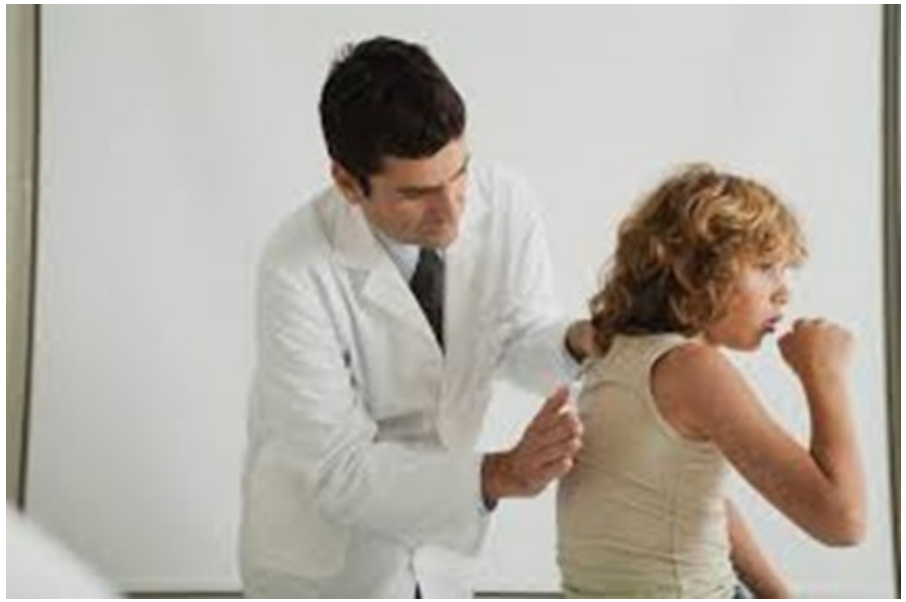
- Paroxysmal cough with convulsive inspiration, with vomiting, cyanosis or apnea (in infants)
- Satisfactory general condition between bouts of coughing
- Absence of fever
- Lack of DTP vaccinations in the anamnesis
- Subconjunctival hemorrhage

FOREIGN BODIES IN THE BRONCHI

- Spontaneous onset with signs of obstruction (child drowned)
- Spontaneous manifestations of stridor and respiratory failure
- Characteristic local auscultatory signs of weak or asthmatic breathing (characteristic of segmental or lobar pneumonias)
- It does not respond to antibiotic treatment
- Displacement of the trachea and cardiac apex

CLINCAL MANAGEMENT

Decide, there is a need for urgent hospitalization



Determine the treatment for patients who do not need urgent hospitalization

Decide, there is a need for urgent hospitalization

Treat inpatient

Determine the urgent prehospital treatment needed

Send the child to the hospital

Perform prehospital treatment

CLINICAL MANAGEMENT AT HOME

Treatment includes:

- Antibiotic therapy (etiotropic)
- Symptomatic therapy (antipyretics, expectorants, throat moisteners, bronchodilators)
- Environmental regime
- Diet
- Liquid regime

Antibacterial therapy in different forms of pneumonia

Age	Etiology, most common	I line	alternative
<6 months	Streptococi Enterobacterii Stafilococi	Peniciline(ampicilina+sulfbactam, amoxicillin +/- acid clavulenic) or **cefalosporine+aminoglicozide**	CefalosporineII-III (Ceftriaxoni)+ aminoglicozide; Carbapeneme
<6 months, CAP atypical	Chlamidia trachomatis, Mycoplasma hominis	Macrolide(midecamicin, azitromicin, roxytromicin, claritromicin)	Co-trimoxazol
>6 months, CAP typical	Pneumococc, hemofilus	**Amoxicillin** Phenoxymetilpenicilina,	Penicilins, cefalosporine

>6luni, CAP atypical	Chlamidia trachomatis, Mycoplasma hominis	Macrolides(midecamicin, azitromicin, roxytromicin, claritromicin)	Doxyciclin >12 years
Severe Pneumonia with complications destructive	Pneumococc Enterobacterii	Penicillins protectedAmpicillini/sulbaktam Augmentin,Tikarcillini/klavulenat (I/V sau I/M + aminoglicozide	Peniciline polusintetice, cefalosporine(Cefatoxim,Ceftriaxoni, Cefatizidim); Karbapeneme(Meropenem, Imipenem, Tienam)
Hospital (nosocomial	Stafilococi, E coli, hemofilus	Penicillins protected(I/V+ aminoglicozide	Glicopeptide(Vankomicina, karbapeneme (tie nam, meronem)+ amino glicozide (amikacini, netilcin); >12 years-cipro floxacin, ophloxacin)

HOW SHOULD BE SELECTED THE APPROPRIATE ANTIBIOTIC?

Many health facilities have more than one type of antibiotic. You must learn to select the most appropriate antibiotic for the child's illness. **Some important instructions for giving antibiotics include**:

- **GIVING FIRST LINE**: Give the "first-line" oral antibiotic if it is available. It has been chosen because it is effective, easy to give and inexpensive.
- **GIVING SECOND LINE**: You should give the "second-line" antibiotic only if the first-line antibiotic is not available, or if the child's illness does not respond to the first-line antibiotic.
- **ORAL ANTIBIOTICS**: If the child is able to drink, give an oral antibiotic. The appropriate oral antibiotic for each illness varies by country. The antibiotics recommended in your country are on your TREAT THE CHILD chart.

Routes/mode of administration: **per os**, i/v, i/m

if the condition improves - continue the therapy (minimum duration is 3-5 days) for an average of 7 days, it is solved individually

In atypic CAP, severe, complications – duration increase-.2-4-6 weeks

TREATMENT

- Give oral amoxicillin 30 mg/kg/dose 3 times a day for 5 to 7 days or

  45-50/mg/kg dose/twice per day
- DO NOT give antibiotics if there is no fast breathing or other sign of pneumonia.
- In children < 5 years not vaccinated against Haemophilus influenza type b or with influenza coinfection: oral amoxicillin-clavulanate (in a 8:1 fixed co-formulation) with amoxicillin 30 mg/kg/dose 3 times a day orally for 5 to 7 days.
- If beta-lactam allergy (see Annex 9):
  - ❖ — with type I hypersensitivity (anaphylaxis): oral azithromycin or clarithromycin;
  - ❖— without type I hypersensitivity: oral cefuroxime axetil.
- If suspected atypical pneumonia: oral azithromycin 10 mg/kg/dose once a day for 3 days.

Full effectiveness of ABT:

- reduction of febrile syndrome (<38°C)
- 24-48 hours in uncomplicated pneumonia
- 3-4 days for complicated pneumonias

- improving the general condition, appetite
- rapid evolution of signs of toxicosis
- reduction of dyspnea, chest compression
- dynamically positive in pulmonary physical status
- reduction of leukocytosis
- the radiological picture shows the decrease in the intensity of pulmonary infiltrates or at least its stabilization
- the administration of the antibiotic will continue for 3-5 afebrile days

LICQUIDS TO ADMINISTER

<10 kg 100-120 ml/kg	6 kg 660 **ml/zi**	18kg 1700 **ml/zi**
10-19 kg \ 90-120 ml/кг	8 kg 900 **ml/zi**	20 kg 1800 **ml/zi**
>20 kg 50-90 ml/кг	10 kg 1100 **ml/zi**	22 kg 1900 **ml/zi**
2 kg 220 **ml/zi**	12 kg 1300 **ml/zi**	4 kg 2000 **ml/zi**
4 kg 440 **ml/zi**	14 kg 1400 **ml/zi**	26 kg 2100 **ml/zi**
	16 kg 1600 **ml/zi**	

Determine if there are indications

- Bronchodilators
- Symptomatic therapy **(antipyretics, expectorants, throat moisteners)**

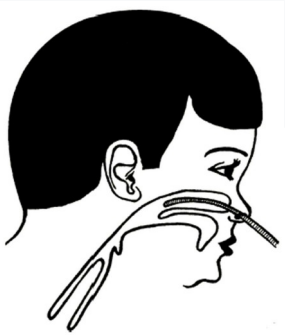
Councel the parents

- How to treat the child in domestic conditions:
- When he returns to the visit, repeat
- When to return immediately:
- general danger signs
- Unsatisfactory breast suck
- He drinks with difficulty
- Fever appears or worsens
- OR in IRA without pneumonia: rapid or difficult breathing

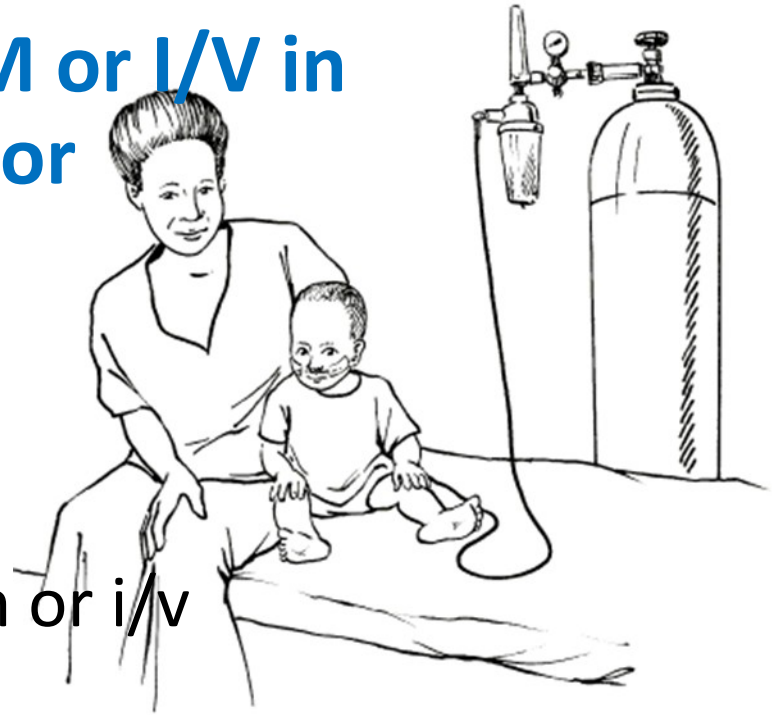
Indications for Hospitalization

- Presence of General danger signs: Unable to eat, drink, vomits after all eating/drink,convulsions, lethargy, unconcious
- Hypoxia (oxygen saturations < 90 to 92%)
- Infants < 3 months with suspected bacterial infection.
- Respiratory distress (grunting, difficulty breathing, poor feeding).
- Tachypnea (< 12 months w/ RR > 70 or children with RR > 50).
- Inability to maintain hydration or oral intake
- Failure of outpatient therapy (48 to 72 hours with no response).
- Caretaker unable to provide appropriate observation or comply with prescribed home therapy.

Determine the necessary pre-hospital emergency treatment and administer it



- O2 therapy
- **Antibacterial**
- **Ampicillin 50 mg/kg + Gentamicin 7.5 mg I/M or I/V in children < 2 months and in serious condition or**
- **Amoxicillin 45-50mg/kg per os**
- Bronchodilators (as needed – Salbutamol aerosol)
- Antipyretics (as needed) - Paracetomol or Ibubrofen
- Anticonvulsants (as needed) - Diazepam - per rectum or i/v
- Treat hypoglycemia in young infants



Follow the transport of the child

CRITERIA FOR INTENSIVE CARE

If intensive care is available consider the following:

- The patient is failing to maintain an oxygen saturation of > 92% in FiO_2 of > 0.6.
- The patient is in shock.
- There is a rising respiratory rate and rising pulse rate with clinical evidence of severe respiratory distress and exhaustion, with or without a raised arterial carbon dioxide tension ($PaCO_2$).
- There is recurrent apnea or slow irregular breathing.

WHEN SHOULD A CHILD WITH COUGH OR DIFFICULT BREATHING RETURN FOR FOLLOW-UP?

A child with **PNEUMONIA** should follow-up in 3 days. A child with **COUGH OR COLD** should follow-up in 5 days if not improving. You have read in the box above about what signs you will ask in the follow-up visit. You will use these to decide if the child is improving, worsening, or the same.

SS **CHILD HAS A GENERAL DANGER SIGN**

The child is getting worse. This child needs urgent referral to a hospital.

SS **CHEST INDRAWING OR BREATHING RATE, FEVER, AND EATING ARE SAME**

The signs may not be exactly the same as 3 days before – but the child is not worse, and not improving. This child needs urgent referral to a hospital.

ss **CHILD IS BREATHING SLOWER AND WITHOUT CHEST INDRAWING, EATING BETTER, AND LESS FEVER**

The child is improving. The child may cough, but most children who are improving will no longer have fast breathing. The fever is lower or completely gone.

What actions will you take?

Tell the mother that the child should finish taking the 5 days of the antibiotic. Review with her the importance of finishing the entire 5 days.

REHABILITATION OF CHILDREN AFTER PNEUMONIA

- To avoid superinfections, it is recommended to be performed at home (ambulatory) or sanatorium
- The basis of rehabilitation is the dosed increase of physical effort (healing physical exercises)
- The methods of tempering the body: initially sparing methods compared to the previous ones (warmer water)
- Medicinal rehabilitation: Vit D3, Zinc

Rehabilitation of children with diseases respiratory in kindergarten conditions Respiratory gymnastics

PROGNOSIS

- In general, the prognosis is good.
- With appropriate treatment,

most pneumonia resolves in 2-4 weeks.

- Viral and Mycoplasma pneumoniae pneumonias last longer,

up to 4-6 weeks It depends: on the promptness of the diagnosis and the installation of the antibacterial treatment, the concomitant diseases of the patient

- Most cases of viral pneumonia resolve without treatment;
- Common bacterial pathogens and atypical organisms respond to antimicrobial therapy.
- Long-term alteration of pulmonary function is rare, even in children with pneumonia that has been complicated by empyema or lung abscess.
- Patients placed on a protocol-driven pneumonia clinical pathway are more likely to have favorable outcomes.
- The prognosis for varicella pneumonia is somewhat more guarded.
- Staphylococcal pneumonia, although rare, can be very serious despite treatment.

PREVENTION (1)

1. Avoiding infectious contacts,
2. Vaccination -the primary mode of prevention
   - Conjugated **Haemophilus influenzae type b (Hib)**
   - Conjugated and unconjugated polysaccharide vaccines for **S pneumoniae**
   - A 13-valent conjugated vaccine (**Prevnar 13)**
   - 15-valent conjugate vaccine (PCV15**; Vaxneuvance**) is indicated for active immunization

for prevention of invasive disease caused **by S pneumoniae**

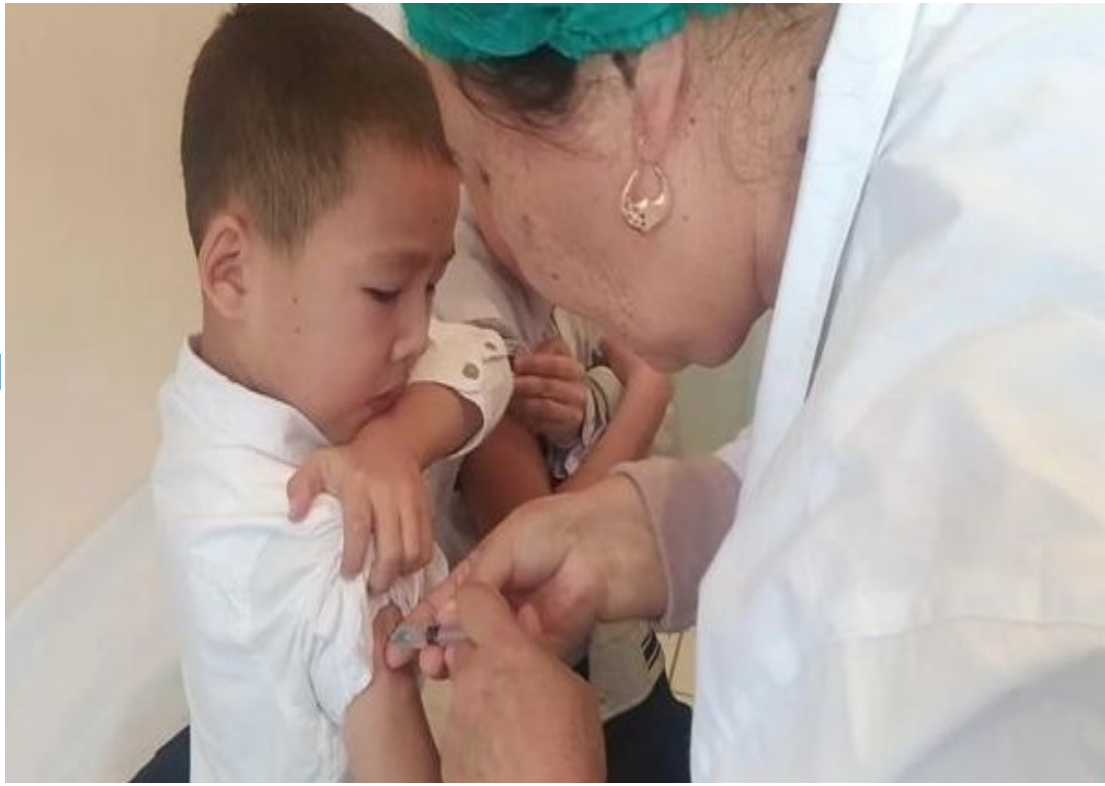
- **Pneumococcal vaccine polyvalent** (**Pneumovax)** covers 23 different strains.
- An **influenza vaccine** is recommended for children aged 6 months and older. The vaccine exists in 2 forms: inactivated vaccine (various products), administered as an intramuscular injection, and a cold-adapted attenuated vaccine **(FluMist),** administered as a nasal spray, which is licensed only for persons aged 2-49 years.
-

PREVENTION (2)

- **Pneumocystis carinii pneumonia (PCP) prophylaxis with trimethoprim-sulfamethoxazole 3 times a week** is widely used in immunocompromised children and has all but eradicated this organism in patients receiving prophylactic treatments.

The use of pneumococcal and Hib vaccines and penicillin prophylaxis in patients with sickle cell disease have helped reduce the incidence of bacterial infections in these children.

- RSV prophylaxis). This strategy is currently recommended for high-risk infants only (ie, premature infants and newborns with congenital heart disease).



- Malnutrition is a known risk factor for infections, **but zinc deficiency in particular has been shown to increase the risk of childhood pneumonia.** In areas of the world where zinc deficiency **is common, supplementation may significantly reduce the incidence of childhood pnmonia**.

PATIENT EDUCATION

Counsel parents about the need

- To prevent exposure of infants to tobacco smoke, and, as part of anticipatory primary care,
- Educate parents regarding possible later infectious exposures in daycare centers, schools, and similar settings.
- About breastfeeding

- They should also be reminded of the importance of hand washing.

- Discuss the benefit infants may receive from pneumococcal immunization and annual influenza immunization and the potential benefits and costs of RSV.

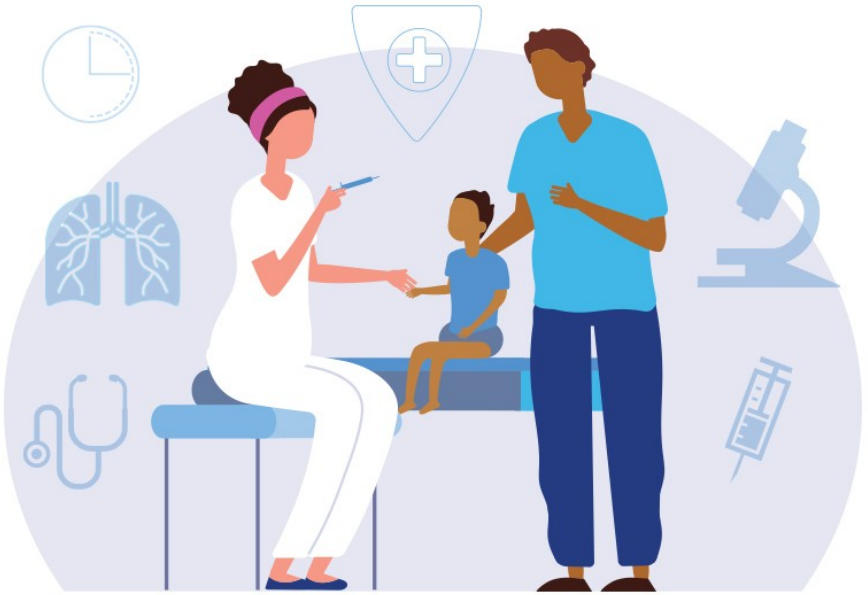
Insufficient breastfeeding can leave children undernourished and at an increased risk of pneumonia.
Breastfeeding can prevent about one third of all respiratory infections and over half of all hospitalizations from respiratory infections.

Pneumonia & Diarrhea Progress Report 2018

JOHNS HOPKINS BLOOMBERG SCHOOL of PUBLIC HEALTH

INTERNATIONAL VACCINE ACCESS CENTER

Only with equitable access to comprehensive pneumonia prevention will we be able to end preventable child deaths.



NATIONAL
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Key strategies to reduce childhood pneumonia related morbidity and mortality

PROTECT

Children by establishing good health

practices from birth

- Exclusive breastfeeding for 6 months
- Adequate complementary feeding
- Vitamin A supplementation

PREVENT

Children becoming ill from pneumonia and diarrhoea

- Vaccines: pertussis, measles, Hib, PCV and rotavirus
- Handwashing with soap
- Safe drinking-water and sanitation
- Reduce household air pollution
- HIV prevention
- Cotrimoxazole prophylaxis for HIV- infected and exposed

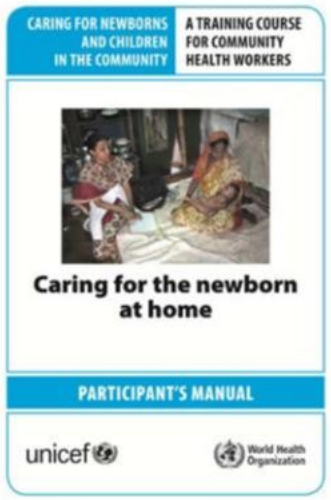
TREAT

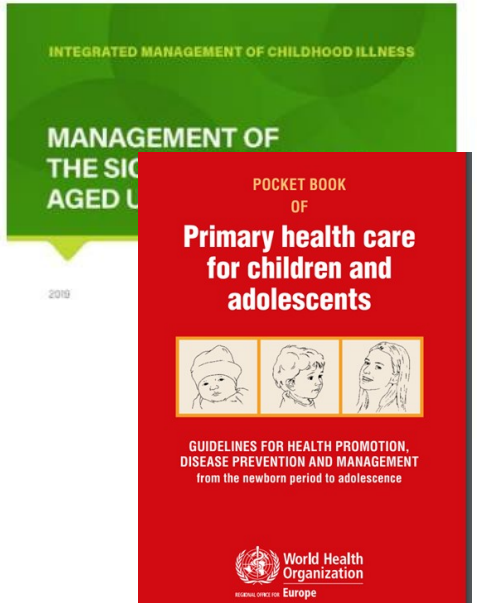
Children who are ill from pneumonia and diarrhoea with appropriate treatment

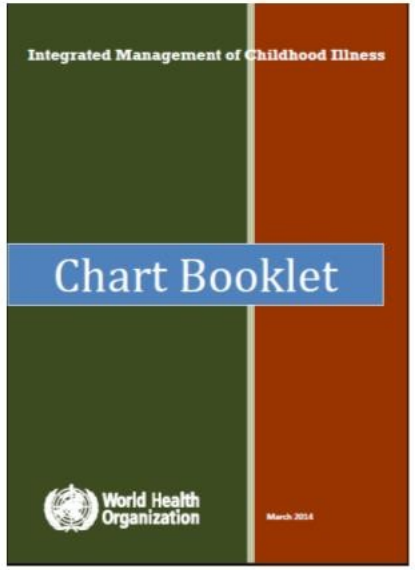
- Improved care seeking and referral
- Case management at the health facility and community level
- Supplies: Low-osmolarity ORS, zinc, antibiotics and oxygen
- Continued feeding (including

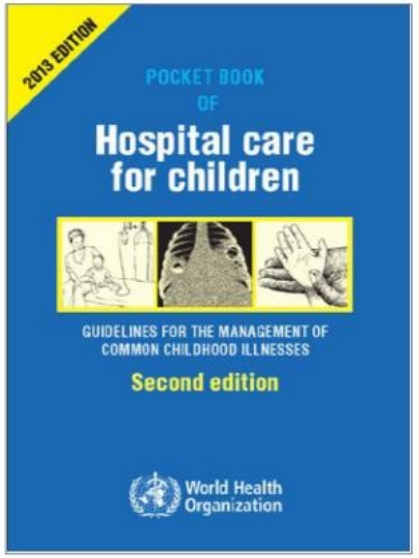
WHO Guidance at three levels of care

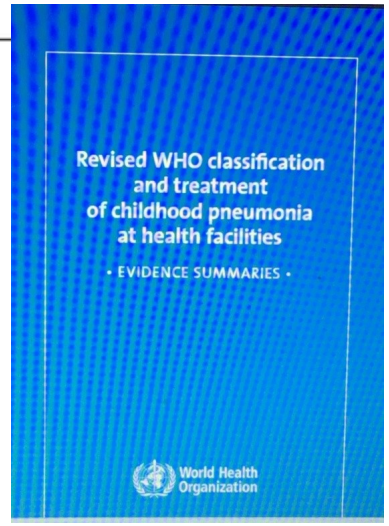
At community level	At first-level care facility level	At hospital











- Diagnosis is based on clinical signs:
  - respiratory rate (age-specific cutoff)
  - chest indrawing and
  - danger signs (including hypoxaemia)

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