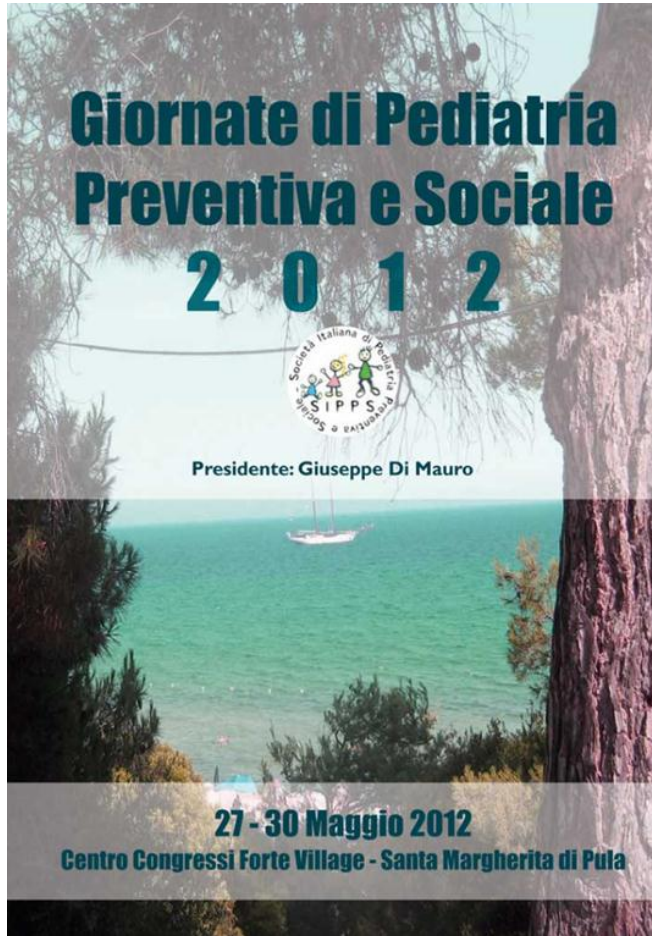


# Le Polmoniti



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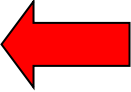


*Istituto  
Giannina  
Gaslini*



*Fondazione  
Gerolamo  
Gaslini*



# Le “particolarità” da evidenziare sulle CAP in età pediatrica

- Come fare la diagnosi 
  - dati clinici e di laboratorio 
  - radiologia convenzionale e imaging 



- Quando ospedalizzare 

- Come trattare le CAP a domicilio ed in ospedale 

- Le CAP complicate 



# Dati epidemiologici: cause microbiche di CAP nelle diverse età dell'infanzia

- **CAP nel periodo neonatale:**

- *Str. agalactiae*
- *Escherichia coli*

- Queste infezioni sono caratterizzate dalla gravità della presentazione clinica e dalla frequente associazione con sepsi

- **CAP fino a 12 mesi di età:**

- Adenovirus
- Coxackie
- ECHO
- VRS
- Virus influenzali e parainflenzali
- Citomegalovirus
- *Myc. pneumoniae*
- *Chlamydia trachomatis*

- **CAP da 12 mesi a 5 anni di età:**

- *Str pneumoniae*
- *Mycoplasma pneu*
- *Haemophilus influ*
- *Mycobacterium tb*

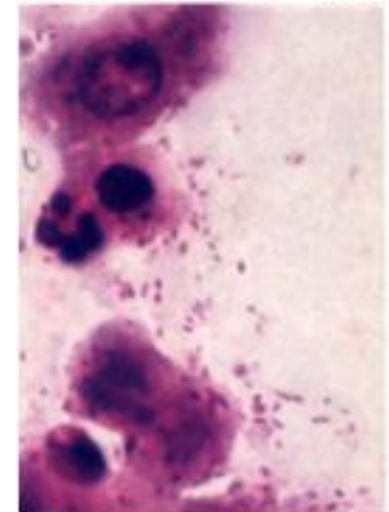
- **CAP da 5 anni a 15 anni di età:**

- *Str pneumoniae*
- *Myc pneumoniae*
- *Chlamydia pneu*
- *Mycobacterium tb*

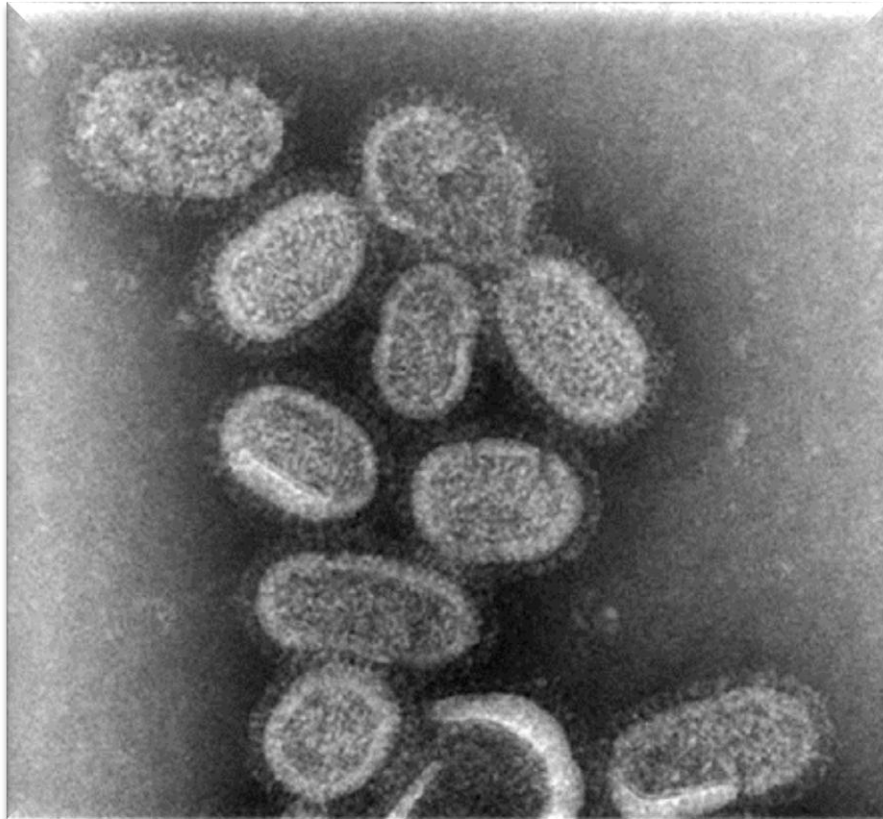


# Paediatric legionellosis: review of the medical literature

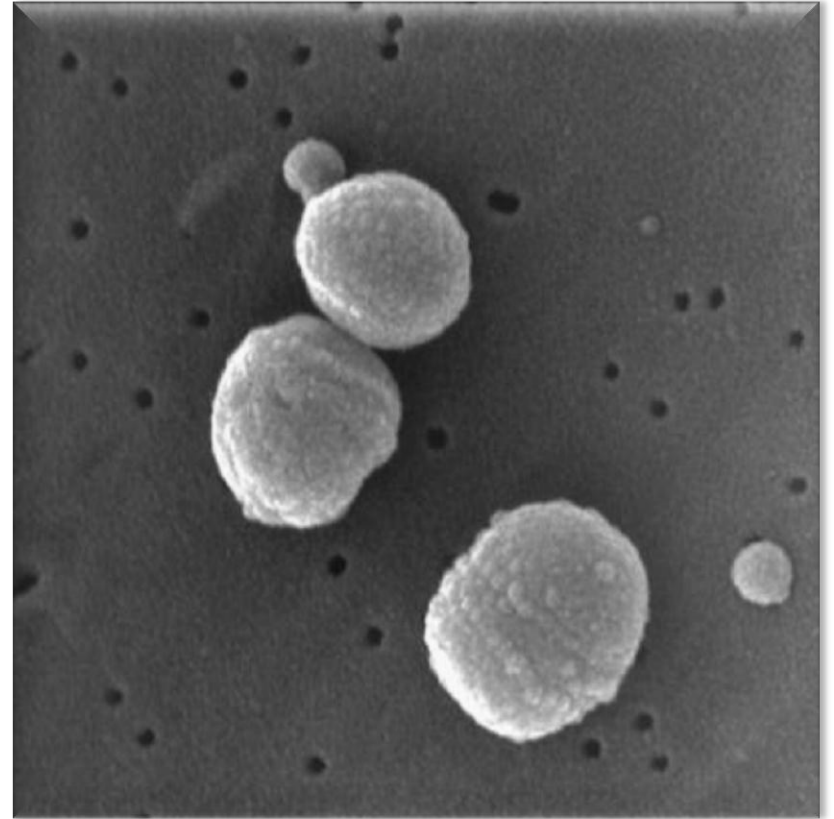
- **76 cases** of legionella infection in children were identified , in 56% diagnosis was made with *culture*
- **46%** were *community-acquired* infections
- **51,5%** were *under 2 years* of age and **78%** had an *underlying condition* such as malignancy
- The overall *mortality rate* was **33%** and was higher in immunosuppressed children and in children younger than the age of 1 year



# La diagnosi e la diagnosi differenziale: E' batterica o virale?



**Influenza virus**



***Streptococcus pneumoniae***





# Diagnosi di “natura” della CAP



## Segni e Sintomi della **Polmonite Batterica**

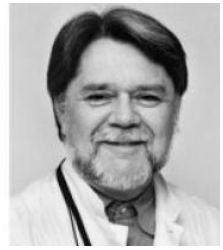
- **Non specifici:**  
Febbre > 39°C, Cefalea, Agitazione, Problemi Gastrointestinali
- **Polmonari/respiratori:**  
Tachipnea, Alitamento delle Pinne Nasali, Dispnea, Tosse Secca o Catarrale, **Reperto Auscultatorio Caratteristico, Ottusità alla Percussione, Accentuazione del FVT**
- **Pleurici:**  
**Dolore Toracico o Addominale, Ottusità alla Percussione, Diminuzione del FVT**

Se è presente **wheezing** in un bambino in età prescolare  
una etiologia batterica primitiva è **poco probabile**





# Esami di Laboratorio per la Diagnosi di Polmonite da Pneumococco



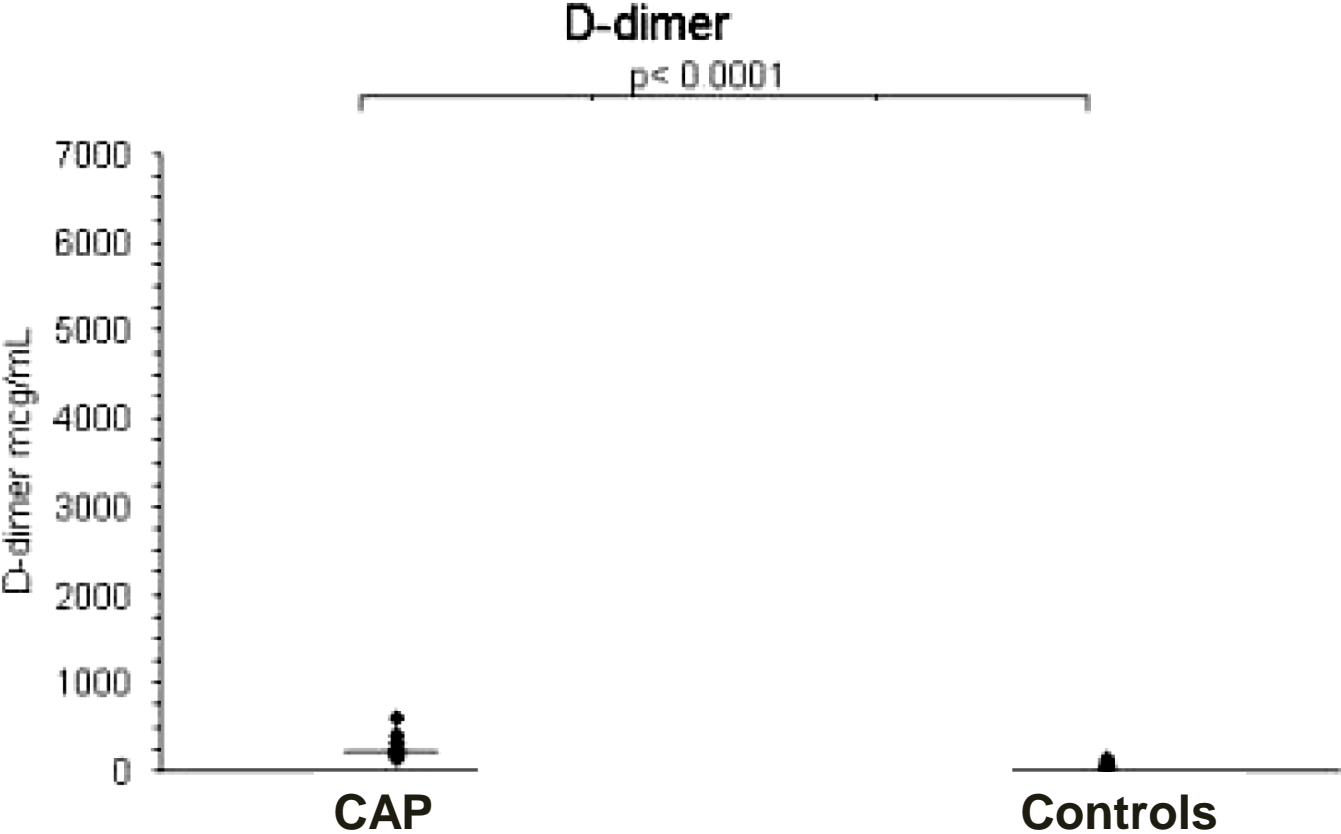
## L'emocromo e la proteina C reattiva (PCR)

- Conta GB >15.000 ...
  - sensibilità 33%
  - specificità 60%
- Conta neutrofili .....  
>10.000
  - sensibilità 28%
  - specificità 63%
- PCR >6 mg/dl ....
  - sensibilità 26%
  - specificità 83%

E ..... il D-dimero e la procalcitonina ?



# Procoagulant Activity in Children with CAP (P), Pleural Effusion (PpE) and Empyema and in Controls (C)

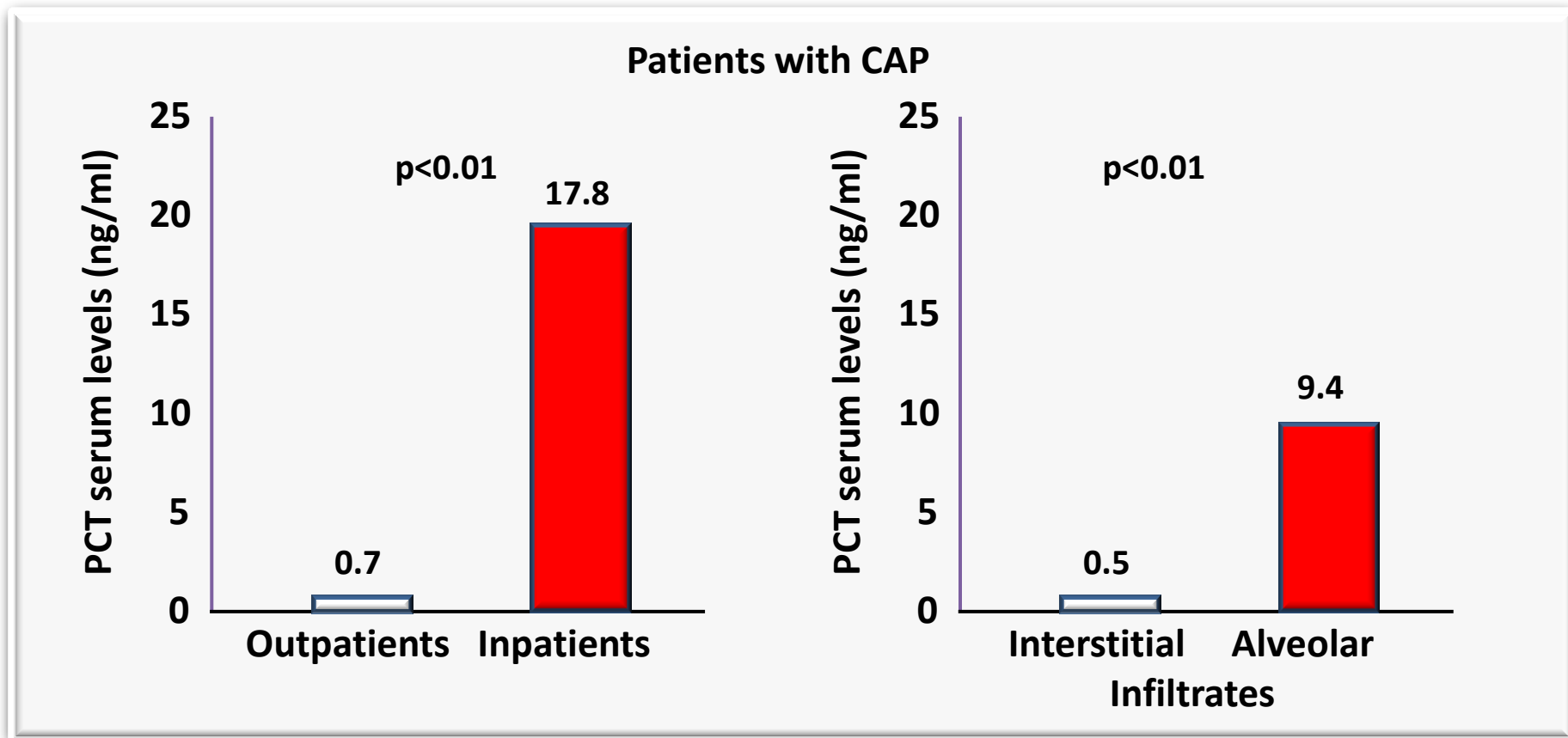




# Serum Procalcitonin (PCT) in Evaluating Severity of CAP in Childhood

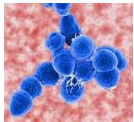
PCT is a precursor of the hormone calcitonin involved with calcium homeostasis.

PCT measurement can be used as a marker of **severe sepsis**



No differences were found in PCT concentrations were found between CAPs of *pneumococcal*, *atypical bacterial*, viral or *unknown etiology*





# British Thoracic Society guidelines for the management of CAP in children: **Microbiology**



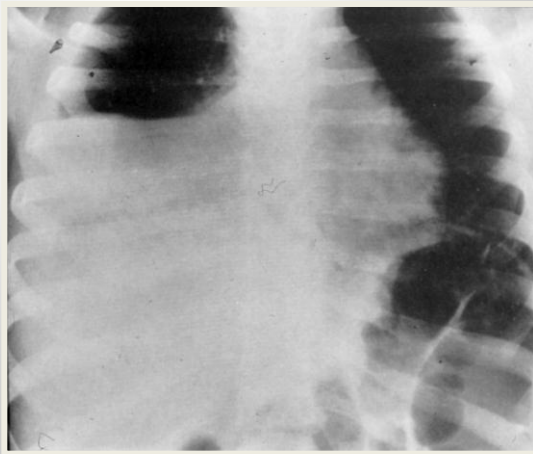
- **Microbiological investigations** should **not** be considered **routinely** in those with **milder disease** or those treated in the community
- They **should be attempted** in children with **severe pneumonia** sufficient to require ICU admission, or with complications
- **Microbiological methods** should include:
  - a) Blood culture
  - b) Nasal swabs for viral detection by PCR or immuno-fluorescence
  - c) Acute and convalescent serology for Respiratory Viruses, *Mycoplasma* and *Chlamydia*
- **Pleural fluid** should be analyzed
- **Urinary pneumococcal antigen** detection **should not** be done in **young children**



# Chest-x ray features cannot differentiate viral from bacterial disease, but ...



*Streptococcus p.*



*RSV bronchiolitis*



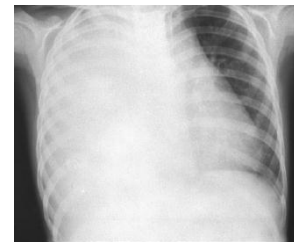


# Chest Radiography: When?

## *Initial Chest Radiographs*



- **Routine chest X rays are not necessary** for the confirmation of suspected CAP in patients to be treated in the **outpatient** setting
- **Chest X-rays, PA and lateral, should be obtained:**
  - In patients with hypoxemia, with significant respiratory distress, with failed initial antibiotic therapy
  - In all patients **hospitalized** for CAP:
    - a) to document the presence, size and character of *parenchymal infiltrates*
    - b) to identify *CAP complications*, condition where images may lead to interventions beyond antimicrobial agents





# Chest Radiography: *Follow-up Chest Radiographs*



## Repeated chest radiographs:

- Are **not routinely required** in children who recover uneventfully
- Are also **not recommended** in children with pneumonia complicated by parapneumonic effusion after chest tube placement or after videoassisted thoracoscopic surgery (VATS), if they remain clinically stable





# Chest Radiography: *Follow-up Chest Radiographs*



- **Should be obtained** in children with:
  - a) **Complicated** pneumonia
  - b) Progressive symptoms and/or clinical **deterioration** within 48-72 hours after initiation of **antibiotic therapy**
- **Should be obtained 4–6 weeks after the diagnosis** of CAP in patients with:
  - a) Lobar collapse at initial chest radiograph
  - b) Suspicion of foreign body aspiration
  - c) Suspicion of an anatomic anomaly or chest mass
  - d) Recurrent pneumonia involving the same lobe



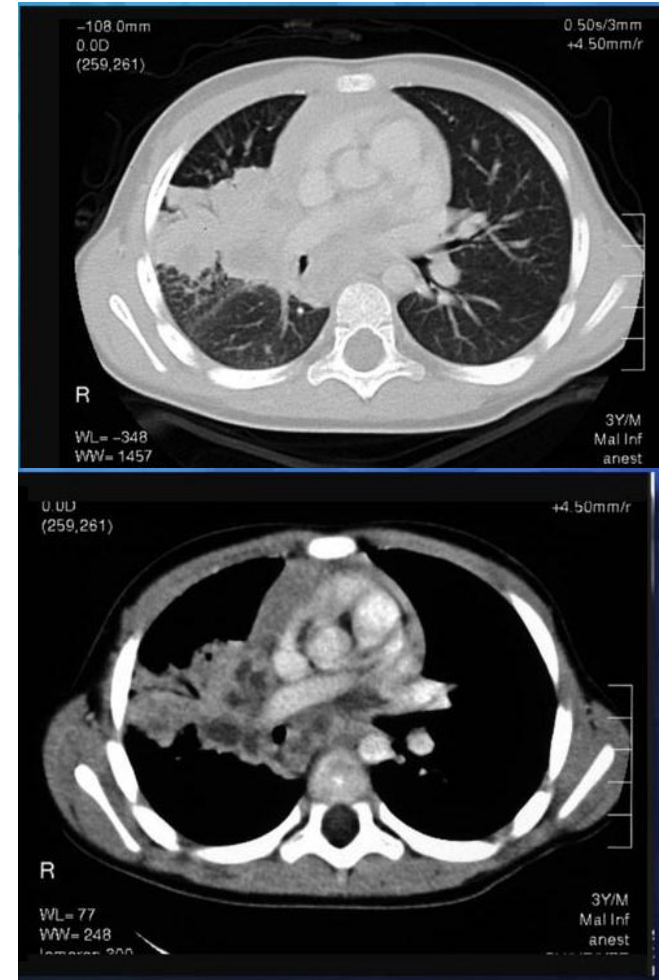
Chronic cough and a 10 days history of fever and dyspnea in a 12 yrs boy ...



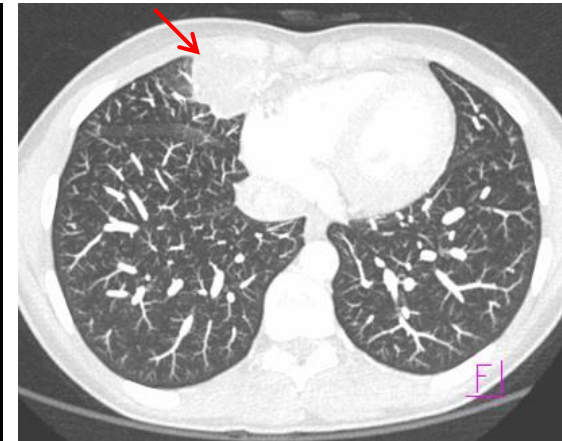
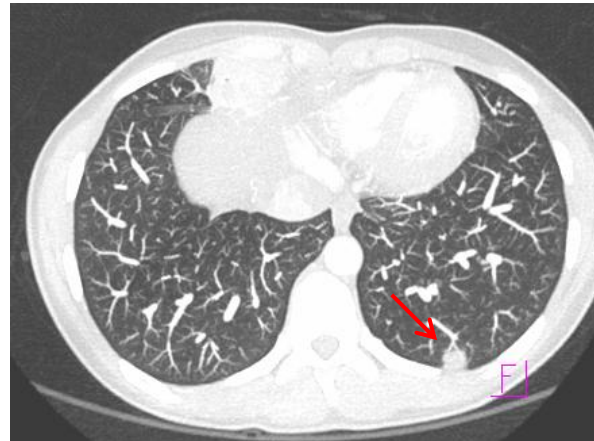
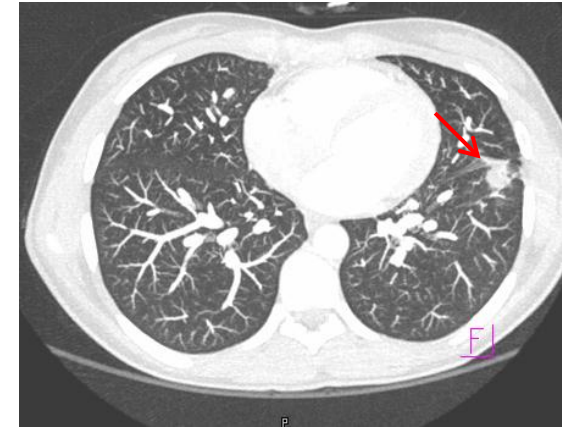
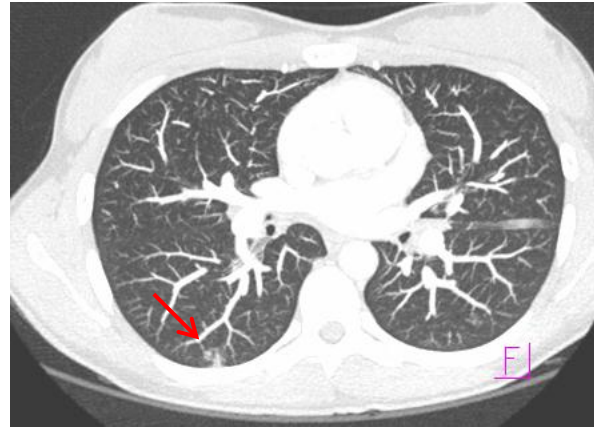
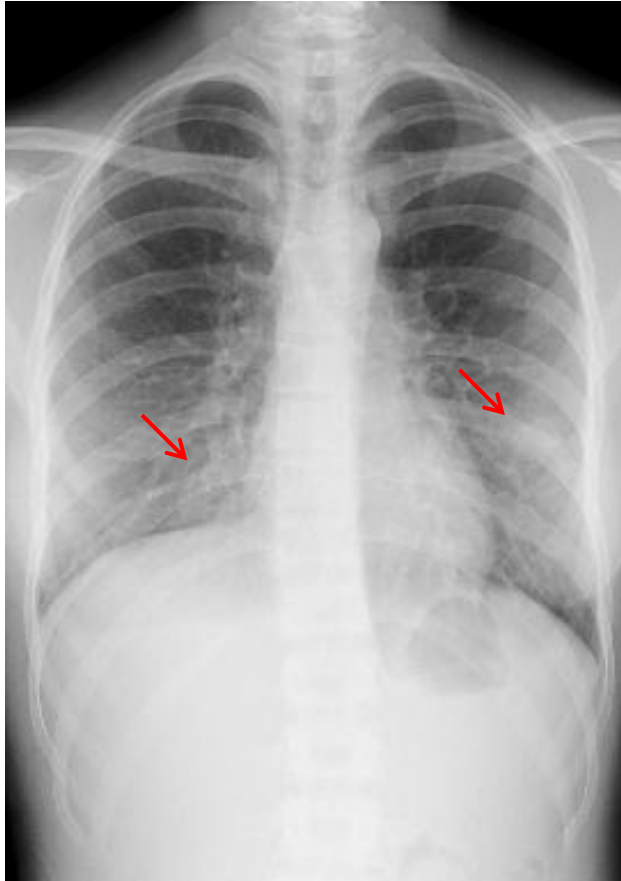
CT scan



Tuberculous pneumonia



# 16 yrs old Caucasian girl with right-sided “pleuritic” chest pain



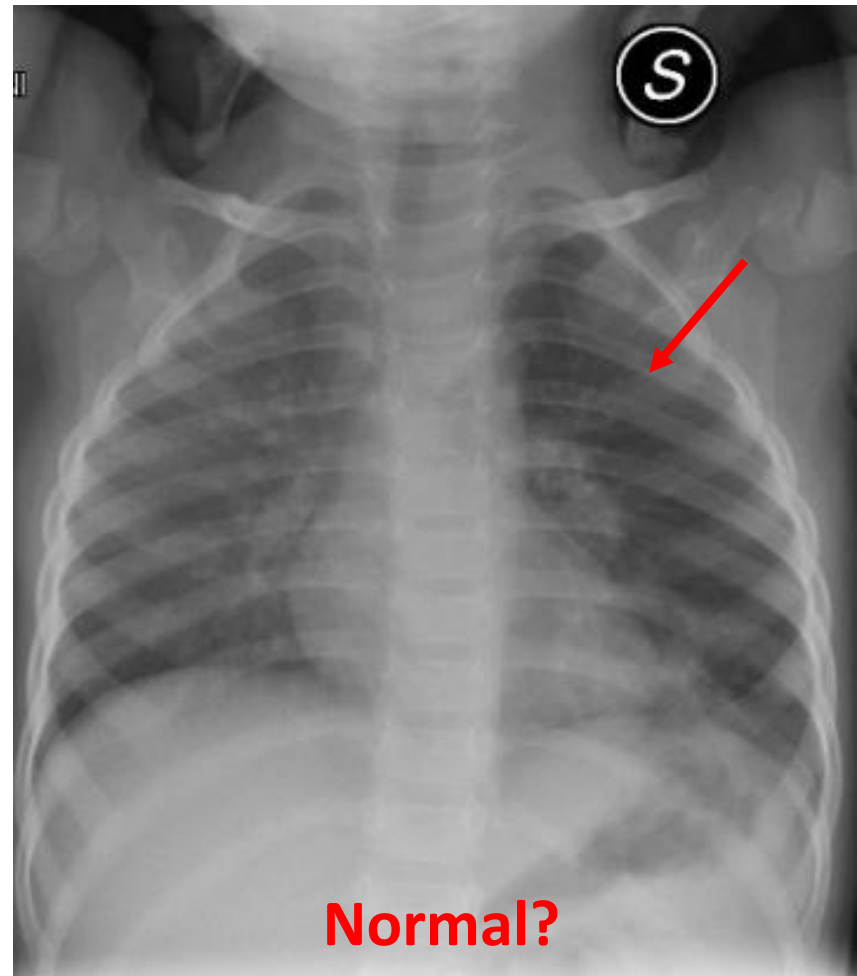
**Granulomatosis with polyangiitis (Wegener’s granulomatosis) of the limited type**



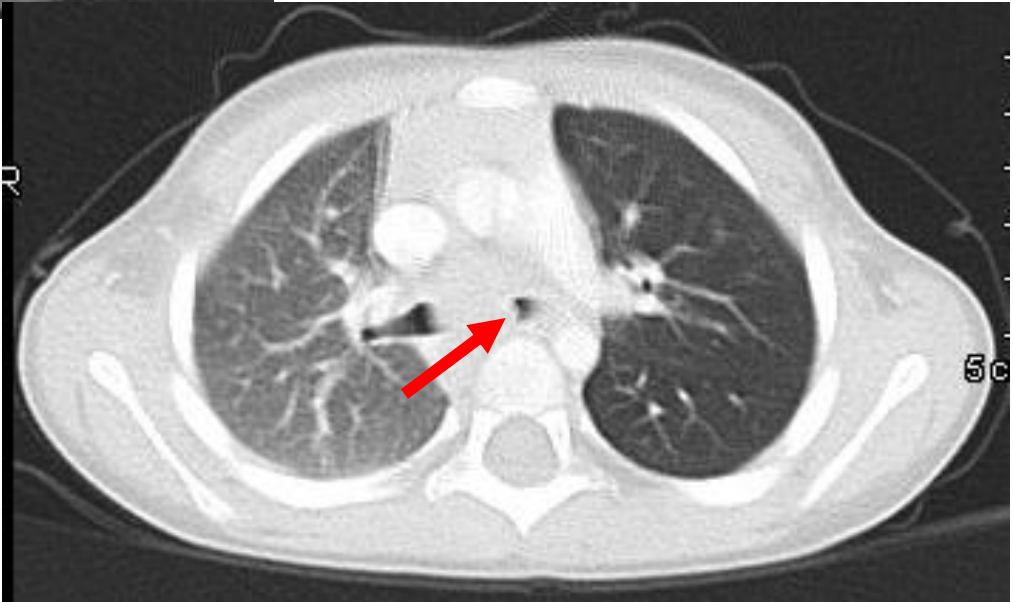
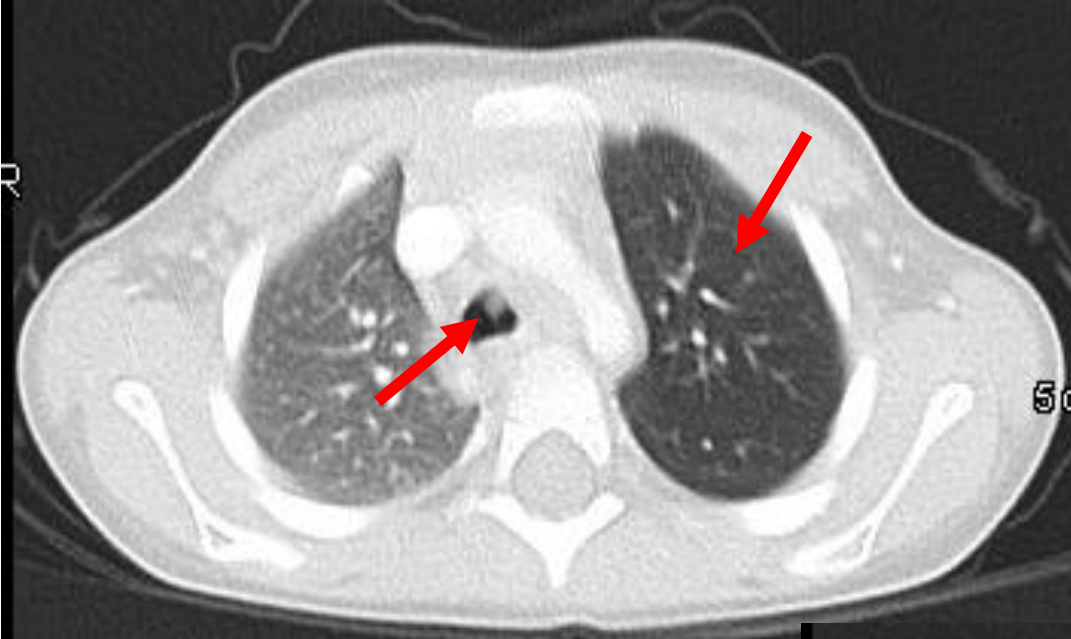


# The “usual” child with *episodic (viral) wheeze* & recurrent lower respiratory tract infections, but ...

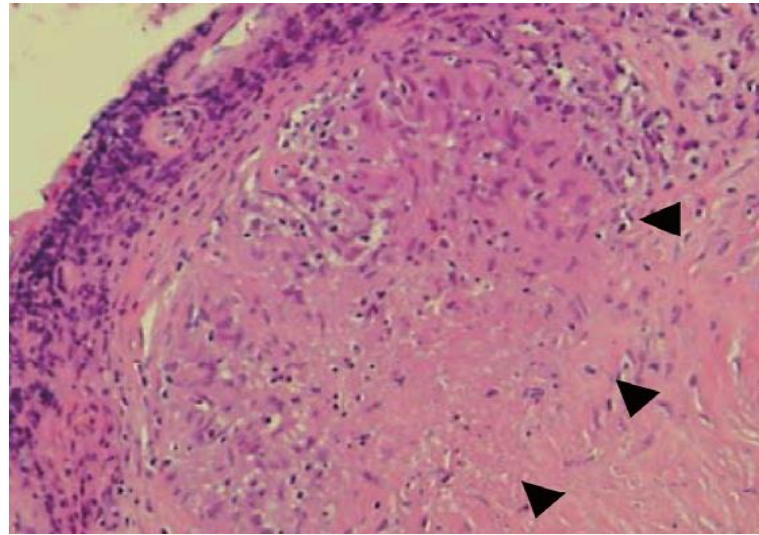
- 2 yrs old caucasian girl with the “usual” *episodic (viral) wheeze* and *recurrent LRTI*, well in between episodes
- No other symptoms, normal body temperature, normal somatic growth but intermittent, slightly *decreased breath sounds* on the left hemithorax *during 2 episodes of lower respiratory tract infections*
- A chest x-ray was then performed



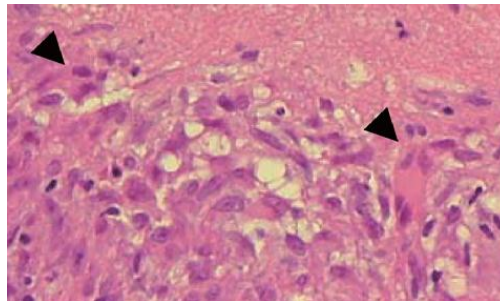
# The CT scan ....



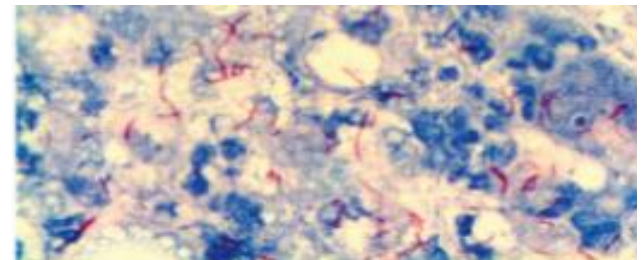
# Fiberoptic bronchoscopy



**Granuloma with Epithelioid Cells & Lymphocytes**



**Epithelioid Cells &  
Langhans Cells**



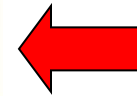
**Ziehl Nielsen Stain**

# Le “particolarità” da evidenziare sulle CAP in età pediatrica

- Come fare la diagnosi
  - dati clinici ed epidemiologici
  - radiologia e laboratorio



- Quando ospedalizzare



- Come trattare le CAP a domicilio ed in ospedale



- Le CAP complicate





# When Does a Child or Infant with CAP **Require Hospitalization**



- **Infants** less than 3–6 mo of age with suspected bacterial CAP

- **Infants and Children:**

- Who have **moderate-to-severe** CAP, as defined by several factors, including respiratory distress and hypoxemia ( $\text{SaO}_2 < 90\%$ )



- With CAP caused by a **pathogen with increased virulence**, such as community-associated methicillin-resistant *Staph aureus* (MRSA)

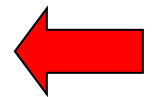
- When there is **concern** about:

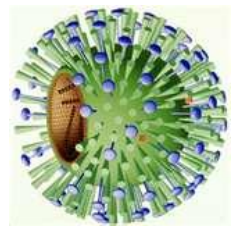
- Careful observation at home
- Ability to comply with therapy
- To be followed-up



# Le “particolarità” da evidenziare sulle CAP in età pediatrica

- Come fare la diagnosi
  - dati clinici ed epidemiologici
  - radiologia e laboratorio
- Quando ospedalizzare
- Come trattare le CAP a domicilio ed in ospedale
- Le CAP complicate

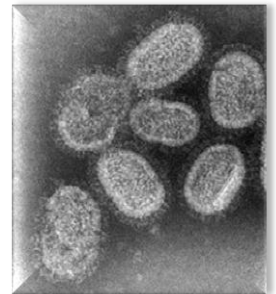


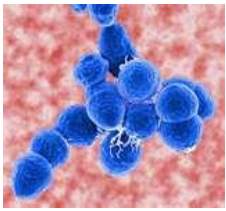


# Anti-infective Treatment: Outpatients and **Viral CAPs**



- Antimicrobial therapy is **not routinely required** for preschool-aged children with CAP, since viruses are responsible for the great majority of clinical disease
- **Influenza antiviral therapy** should be administered ASAP to children with moderate to severe CAP consistent with influenza virus infection during widespread circulation of the virus
- **Treatment should not be delayed** until confirmation of positive influenza test results, and also after 48 hours of symptomatic infection may still provide clinical benefit to those with more severe disease





# Anti-infective Treatment: Outpatients and Bacterial CAPs



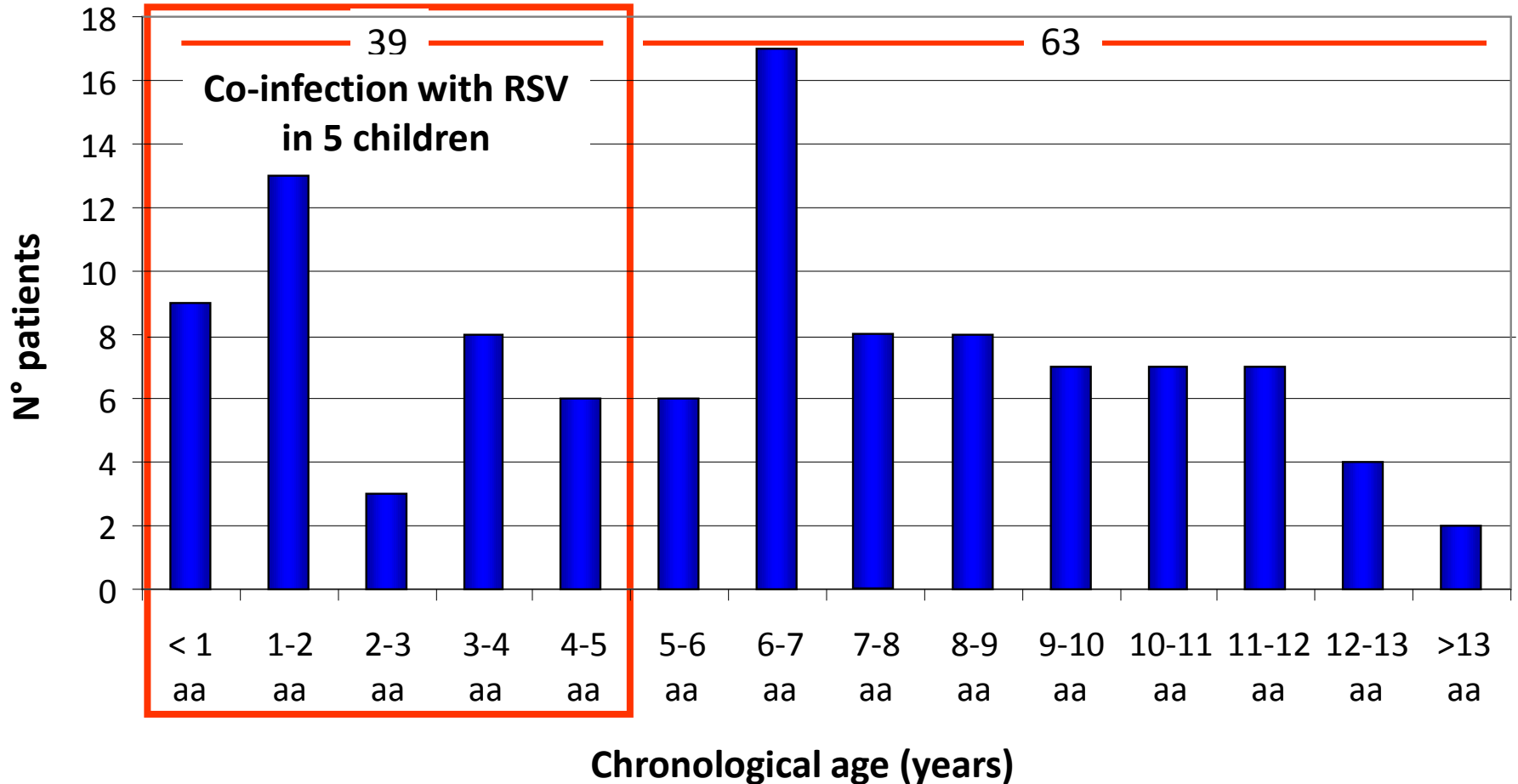
Pediatric Infectious  
Diseases Society

- In healthy infants, preschool, school children and adolescents with mild to moderate CAP suspected to be of bacterial origin **Amoxicillin** should be used as first-line therapy for previously, since it provides appropriate coverage for *Streptococcus pneumoniae*, the most prominent invasive bacterial pathogen
- **Atypical bacteria** and less common lower respiratory tract bacterial pathogens, should also be considered and **Laboratory testing for *M. pneumoniae*** should be performed if available in a clinically relevant time frame
- **Macrolides** should be prescribed for treatment of primarily school children and adolescents evaluated in an outpatient setting with findings compatible with CAP caused by *atypical pathogens* ?

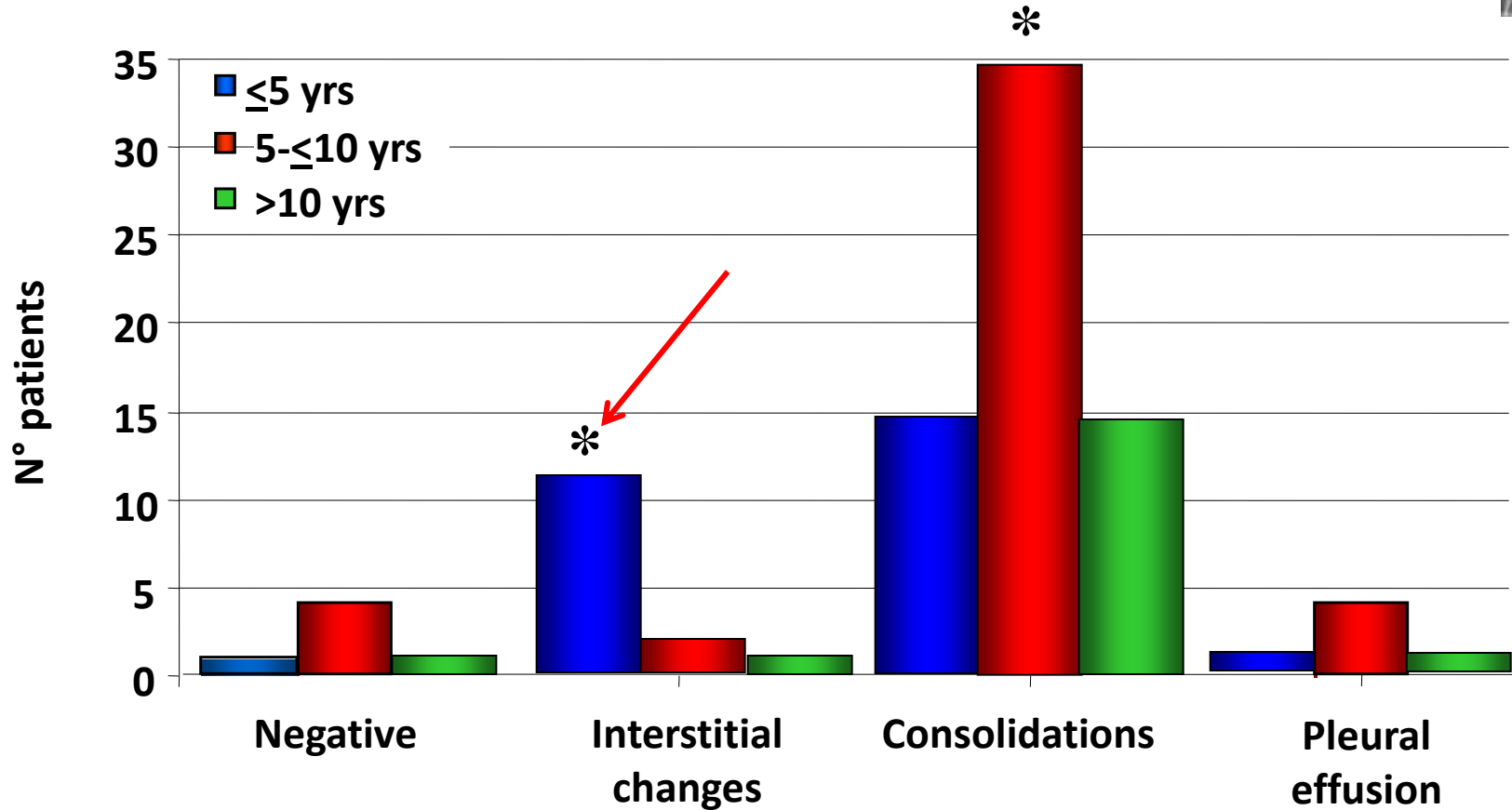




# Chronological age of the 102 children admitted between October 2005-August 2006 for *M. pneumoniae*-induced LRTI and with a positive PCR for *M. pneumoniae*



# Roentgenographic abnormalities in children with *M. pneumoniae* LRTI according to their age

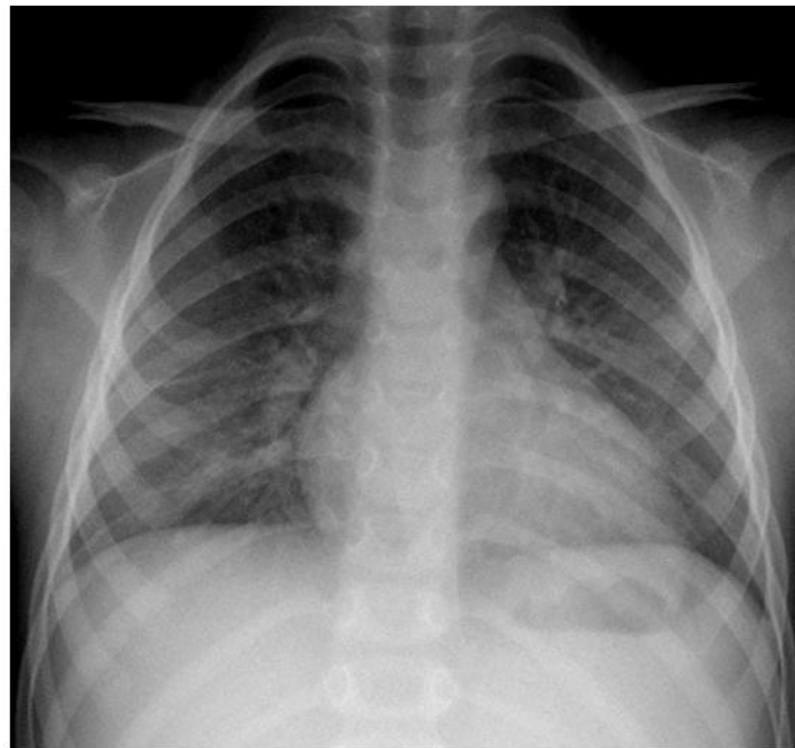


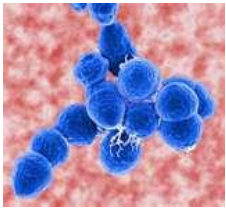
# Right Lower and Middle Lobe Atelectasis in 4-yrs-old Girl with a 3-day History Low Degree Fever and Cough



**Elevation of WBC (13.480/ $\mu$ L, 74% neutrophils) and of C reactive protein (1.14 mg/dL; <0.46mg/dL,n.v.)**

**After fiberoptic bronchoscopy and mucus plugs removal**



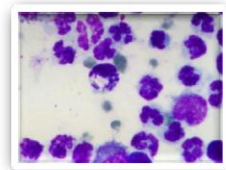


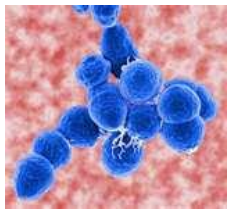
# Anti-infective Treatment: Inpatients and Bacterial CAPs



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Diseases Society

- **Ampicillin** or **Penicillin G** should be administered to *fully immunized* infant or school children when local epidemiologic data document *lack of substantial high-level penicillin resistance for invasive S. pneumoniae*
- Therapy with a **3<sup>rd</sup>-generation parenteral cephalosporin** (**Ceftriaxone** or **Cefotaxime**) should be prescribed:
  - a) for infants and children who are *not fully immunized*
  - b) in regions where local epidemiology of invasive pneumococcal strains documents *high-level penicillin resistance*
  - c) for infants and children with *life-threatening infection*, including those with *empyema*

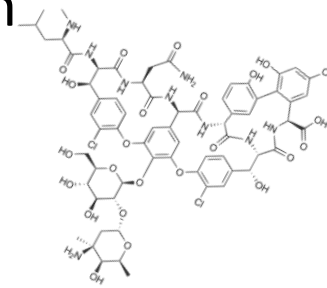
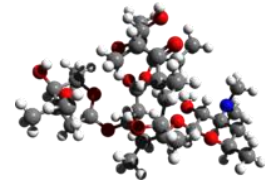




# Anti-infective Treatment: Inpatients and Bacterial CAPs



Pediatric Infectious  
Diseases Society



- Combination therapy with a **Macrolide**, in addition to a  **$\beta$ -lactam** antibiotic, should be prescribed for the hospitalized child for whom *M. pneumoniae* and *C. pneumoniae* are significant considerations
- Non- $\beta$ -lactam agents (**Vancomycin**) have **not** been shown to be more effective than **3<sup>rd</sup>-generation cephalosporins** in the treatment of *Pneumococcal pneumonia* for the degree of resistance noted currently in North America
- **Vancomycin** or **Clindamycin** should be provided **in addition to  $\beta$ -lactams** if clinical, laboratory - imaging characteristics are consistent with infection caused by ***Staph. aureus***



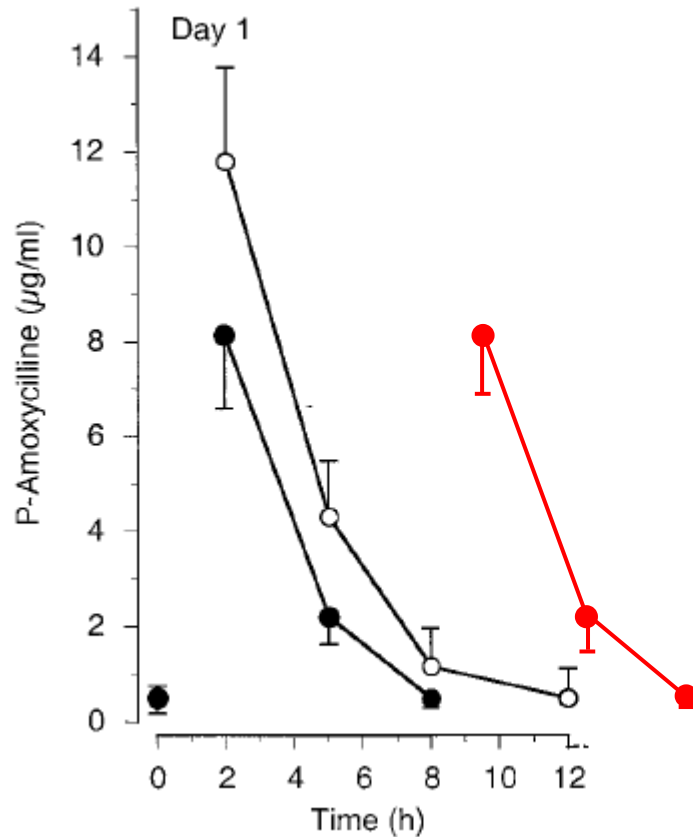
# Antimicrobial therapy for specific pathogens



Pathogen	Parenteral therapy	Oral therapy (step-down therapy or mild infection)
<i>Streptococcus pneumoniae</i> with MICs for penicillin $\leq 2.0$ $\mu\text{g/mL}$	<p>Preferred: <u>ampicillin</u> (150–200 mg/kg/day every 6 hours) or <u>penicillin</u> (200 000–250 000 U/kg/day every 4–6 h);</p> <p>Alternatives: <u>ceftriaxone</u> (50–100 mg/kg/day every 12–24 hours) (preferred for parenteral outpatient therapy) or <u>cefotaxime</u> (150 mg/kg/day every 8 hours)</p>	<p>Preferred: <u>amoxicillin</u> (90 mg/kg/day in 2 doses or 45 mg/kg/day in 3 doses);</p> <p>Alternatives: second- or third-generation cephalosporin (<u>cefepodoxime</u>, <u>cefuroxime</u>, cefprozil); oral <u>levofloxacin</u>, if susceptible (16–20 mg/kg/day in 2 doses for children 6 months to 5 years old and 8–10 mg/kg/day once daily for children 5 to 16 years old);</p>
<i>S. pneumoniae</i> resistant to penicillin, with MICs $\geq 4.0$ $\mu\text{g/mL}$	<p>Preferred: <u>ceftriaxone</u> (100 mg/kg/day every 12–24 hours);</p> <p>Alternatives: <u>ampicillin</u> (300–400 mg/kg/day every 6 hours), <u>levofloxacin</u> (16–20 mg/kg/day every 12 hours for children 6 months to 5 years old and 8–10 mg/kg/day once daily for children 5–16 years old; maximum daily dose, 750 mg), or <u>linezolid</u> (30 mg/kg/day every 8 hours for children <math>&lt; 12</math> years old and 20 mg/kg/day every 12 hours for children <math>\geq 12</math> years)</p>	<p>Preferred: oral <u>levofloxacin</u> (16–20 mg/kg/day in 2 doses for children 6 months to 5 years and 8–10 mg/kg/day once daily for children 5–16 years, maximum daily dose, 750 mg), if susceptible, or oral <u>linezolid</u> (30 mg/kg/day in 3 doses for children <math>&lt; 12</math> years and 20 mg/kg/day in 2 doses for children <math>\geq 12</math> years);</p> <p>Alternative: oral <u>clindamycin</u><sup>a</sup> (30–40 mg/kg/day in 3 doses)</p>
Group A <i>Streptococcus</i>	<p>Preferred: intravenous <u>penicillin</u> (100 000–250 000 U/kg/day every 4–6 hours) or <u>ampicillin</u> (200 mg/kg/day every 6 hours);</p> <p>Alternatives: <u>ceftriaxone</u> (50–100 mg/kg/day every 12–24 hours) or cefotaxime (150 mg/kg/day every 8 hours)</p>	<p>Preferred: <u>amoxicillin</u> (50–75 mg/kg/day in 2 doses), or <u>penicillin V</u> (50–75 mg/kg/day in 3 or 4 doses);</p> <p>Alternative: oral <u>clindamycin</u><sup>a</sup> (40 mg/kg/day in 3 doses)</p>



# Plasma Amoxicillin concentrations vs Time on day 1 and 3 in children treated with either 15 mg/kg/dose t.i.d. (●) or 25 mg/kg/dose b.i.d. (○) (n 32) administered orally



**? Amoxicillin clavulanate?**



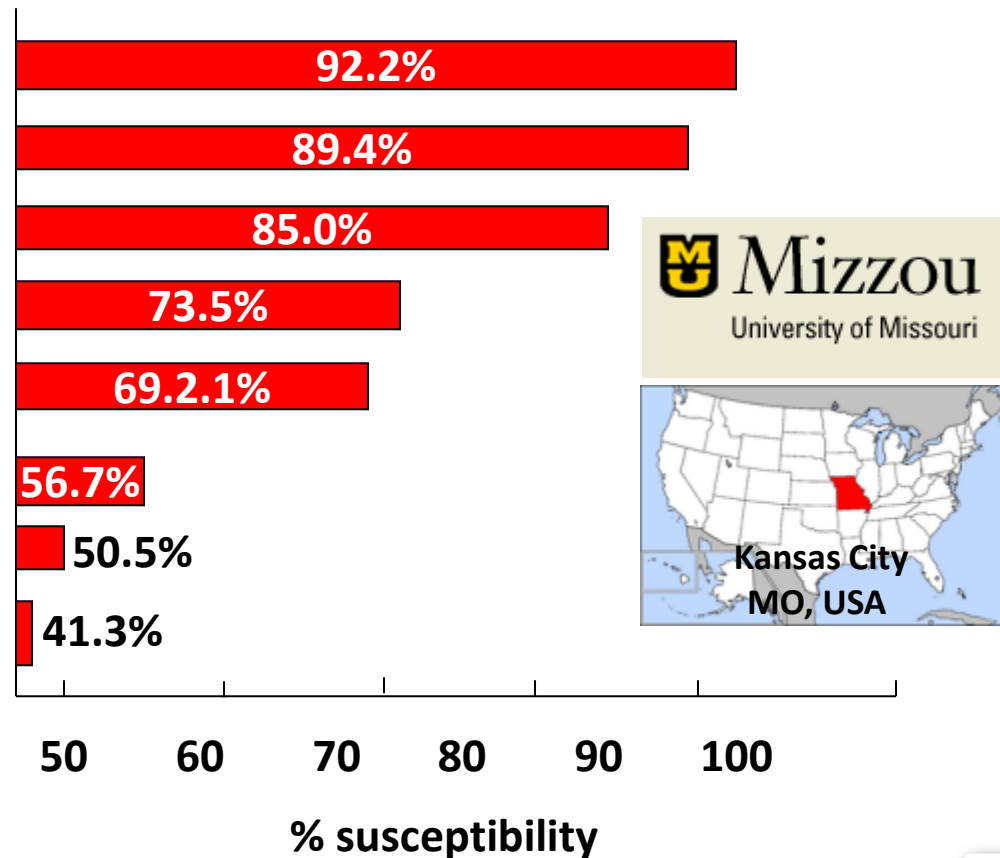
# Susceptibilities to commonly used antibiotics of bacteria isolates in children from 2005 to 2007

## *Streptococcus pneumoniae*



43% penicillin-susceptible, 28 penicillin-intermediate and 29 penicillin-resistant

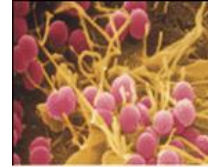
- Ceftriaxone
- High-dose amoxicillin
- Clindamycin
- Standard-dose amoxicillin
- Cefuroxime
- Azitromicin
- Trim/sulfamethox
- Penicillin



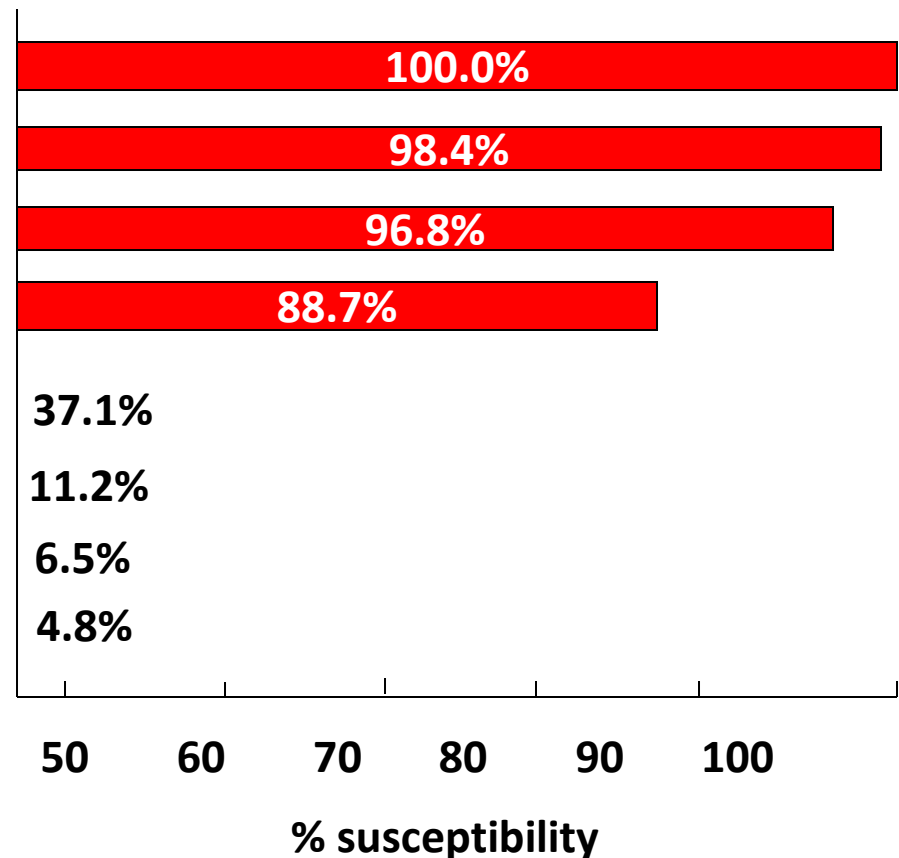


# Susceptibilities to commonly used antibiotics of bacteria isolates in children from 2005 to 2007

*M. catarrhalis*



- **High-dose amoxi/clavul**
- **Azitromicin**
- **Ceftriazone**
- **Standard-dose amoxi/clavul**
- **Cefuroxime**
- **High-dose amoxicillin**
- **Cefaclor**
- **Standard-dose amoxicillin**



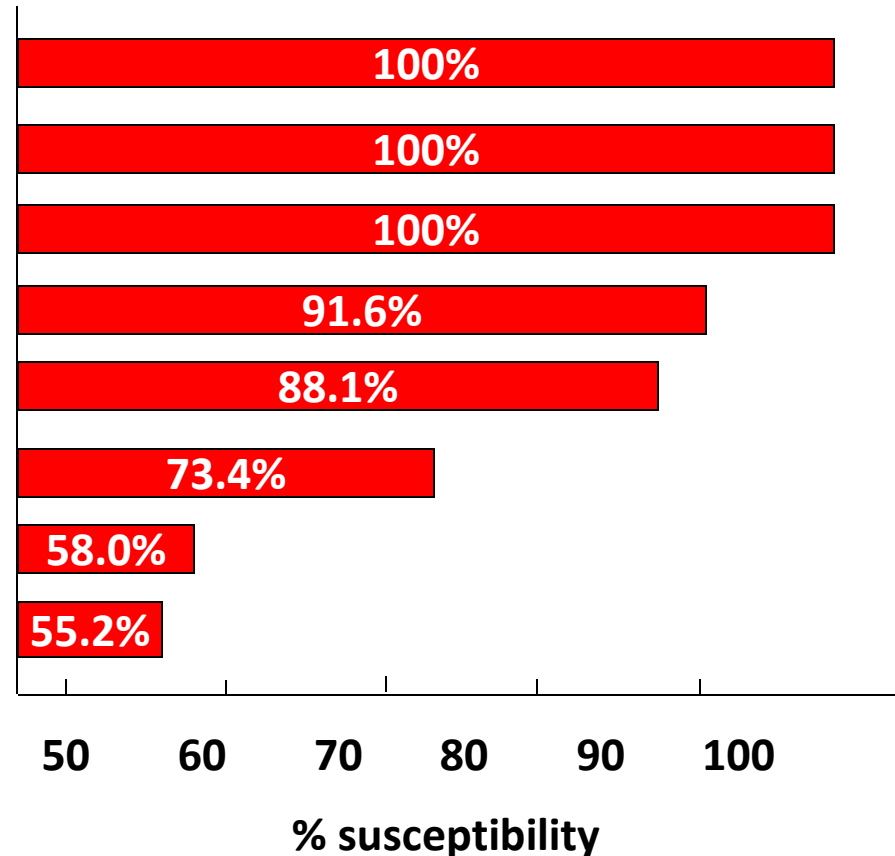
# Susceptibilities to commonly used antibiotics of bacteria isolates in children from 2005 to 2007

## *Non-typeable H. influenzae*

42% produced  $\beta$ -lactamase

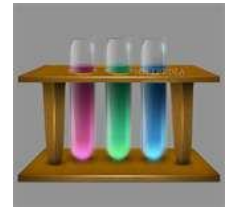


- Ceftriaxone
- Cefixime
- **High-dose amoxi/clavul**
- Standard-dose amoxi/clavul
- Cefuroxime
- Trim/sulfamethox
- High-dose amoxicillin
- Standard-dose amoxicillin

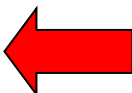


# Le “particolarità” da evidenziare sulle CAP in età pediatrica

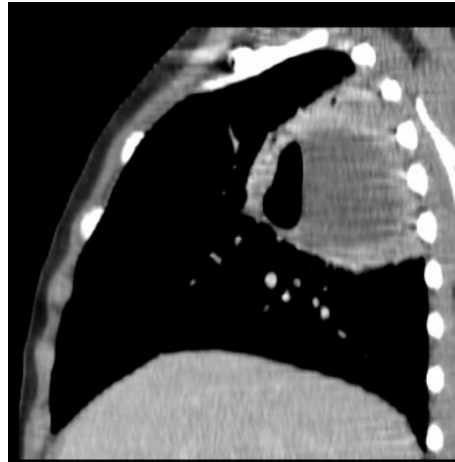
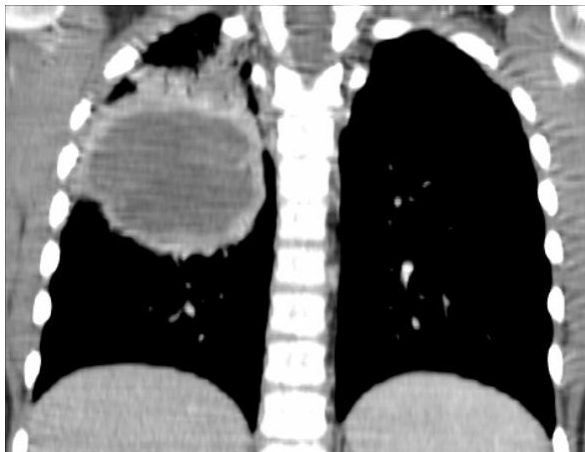
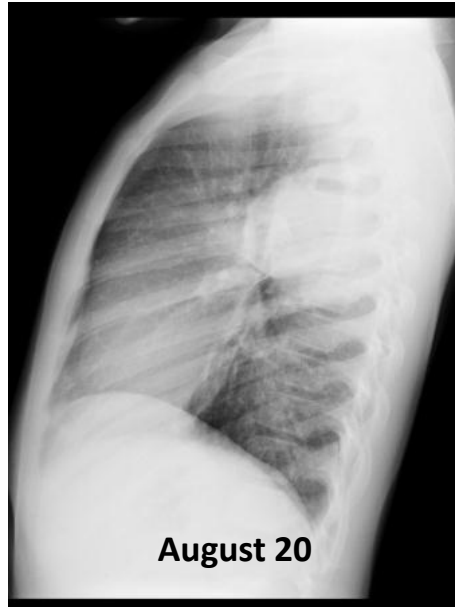
- Come fare la diagnosi
  - dati clinici ed epidemiologici
  - radiologia e laboratorio
- Quando ospedalizzare
- Come trattare le CAP a domicilio ed in ospedale



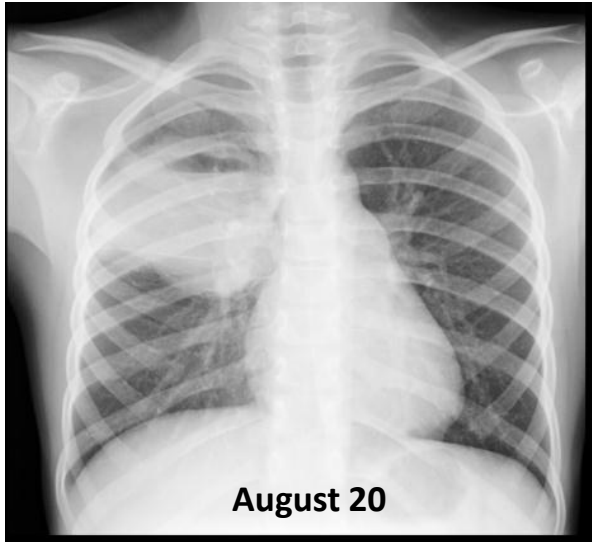
**Ascesso**      **Polmonite  
Necrotizzante**      **Empiema**



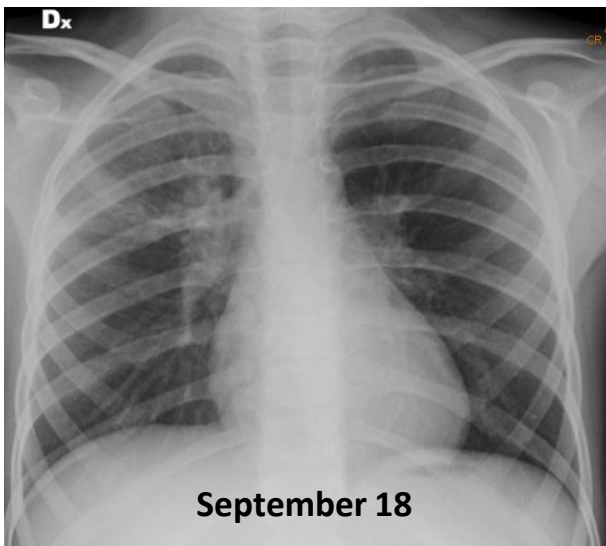
# 7-yr-old girl with recurrent viral respiratory infection in early childhood



# 7-yr-old girl with recurrent viral respiratory infection in early childhood



- **Treatment.**  
**High-dose**  
**Amoxi/Clavul**

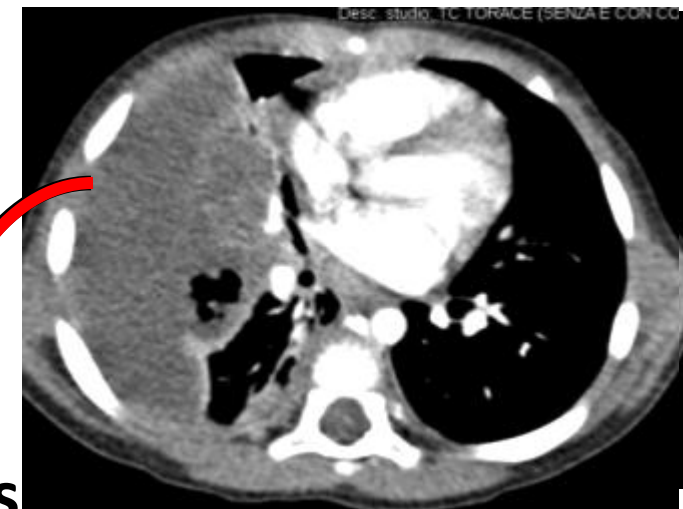


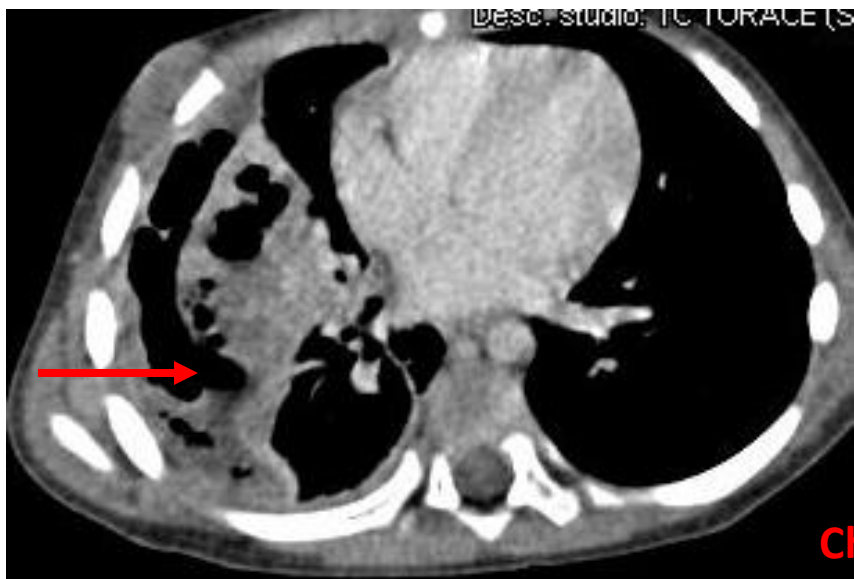
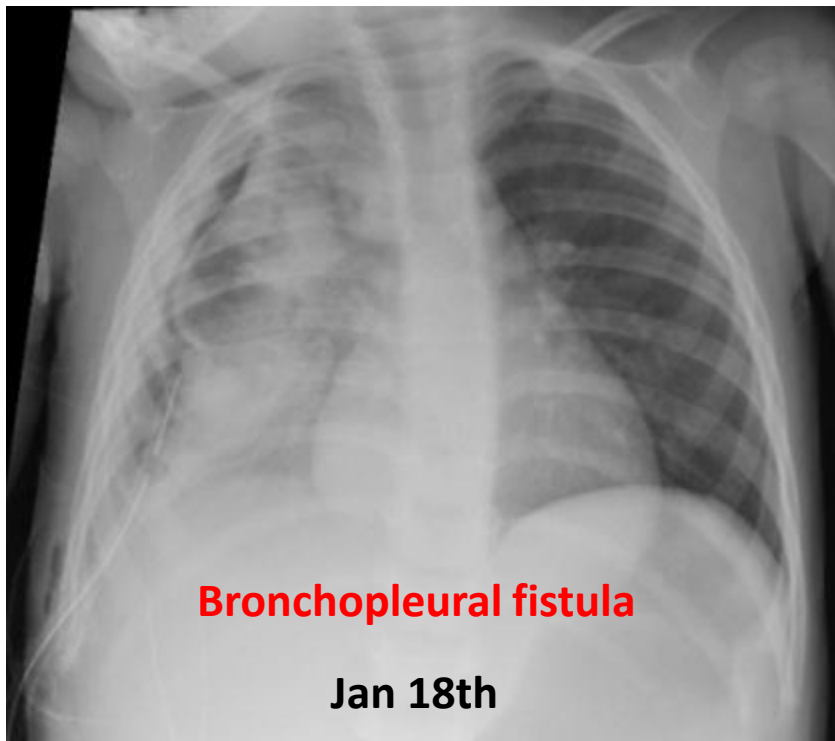
- Pipram



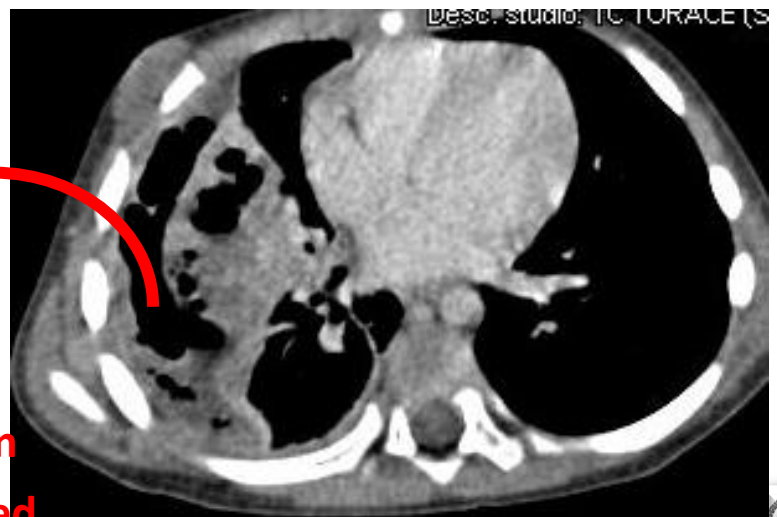
# Necrotizing pneumonia in Caucasian girl, 2 year and 3 months old

- 3 days after a “usual” upper respiratory tract infection, *hyperpirexia* and *tachypnoea* with hospital admission
- Diagnosis of **CAP** of the upper right lobe, treated with *ceftriaxone* i.v. and *clarithromycin*, with good but short lasting clinical response
- Second X-ray 5 days after admission: **progression** of the pulmonary infiltrate and pleural effusion

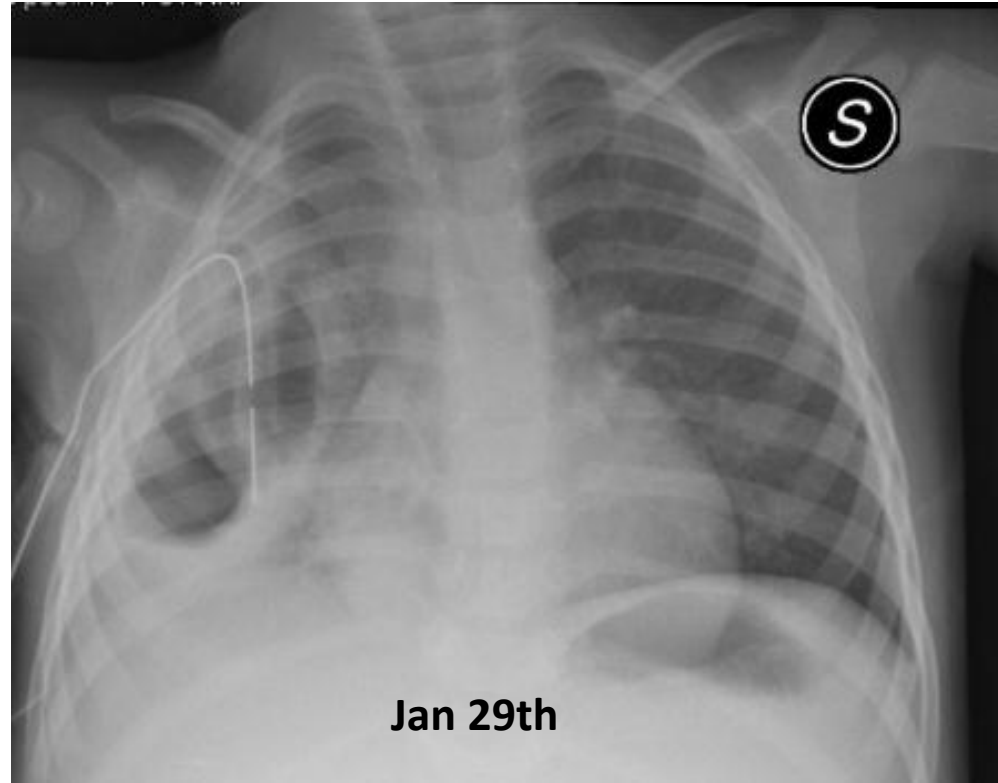
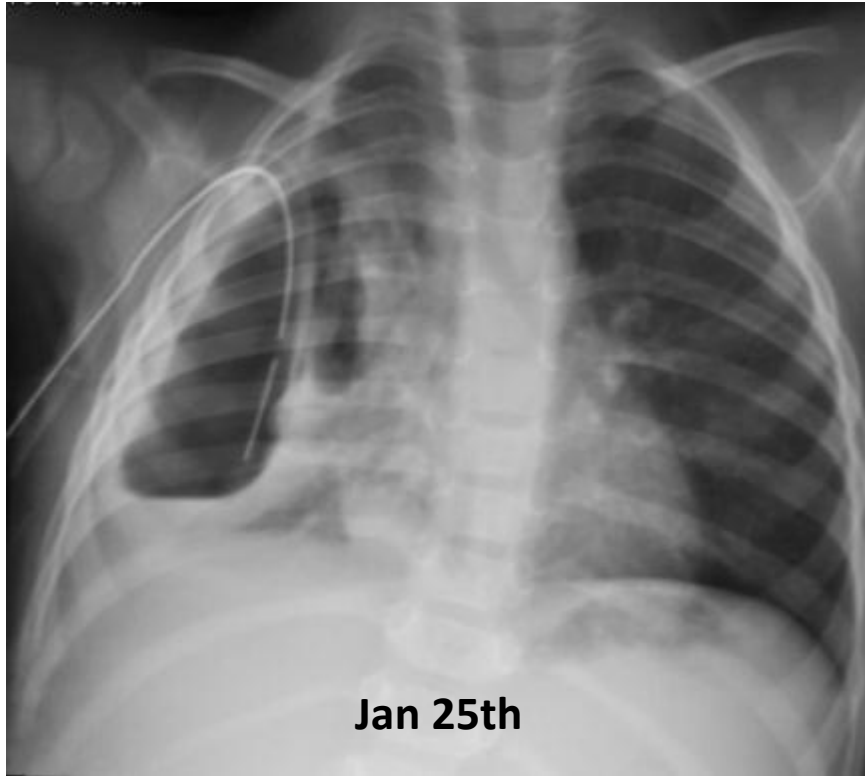




Chest drain  
repositioned

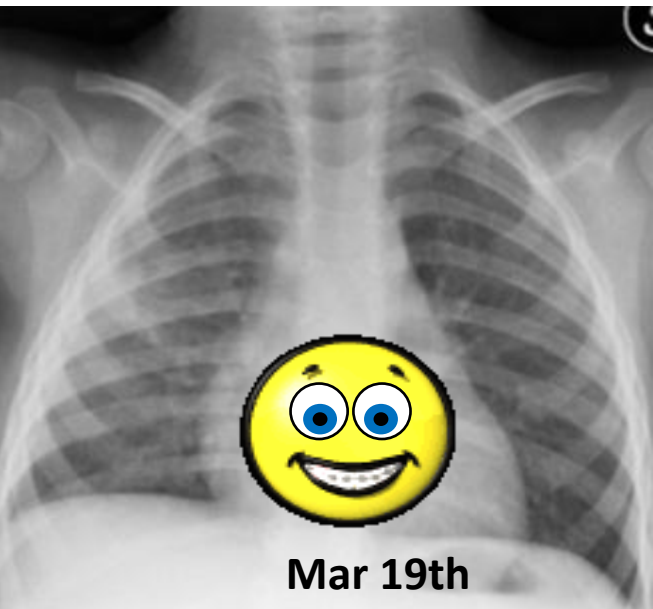
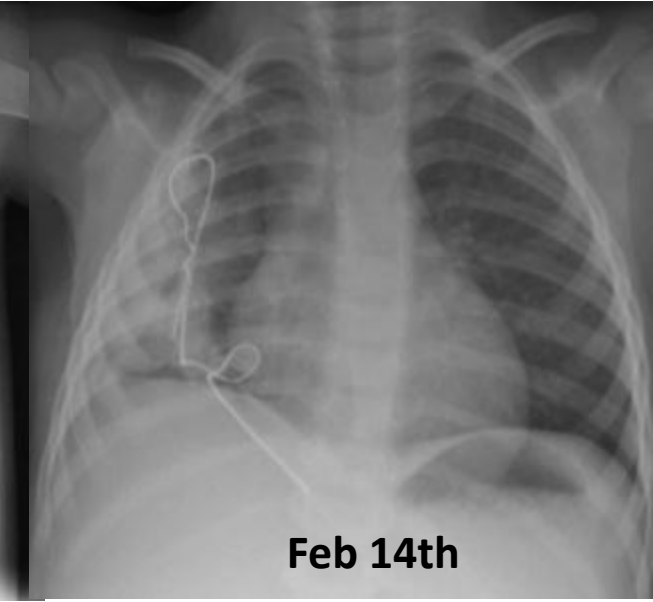


**Seven days later,** after chest tube repositioning and very low pressure aspiration ...





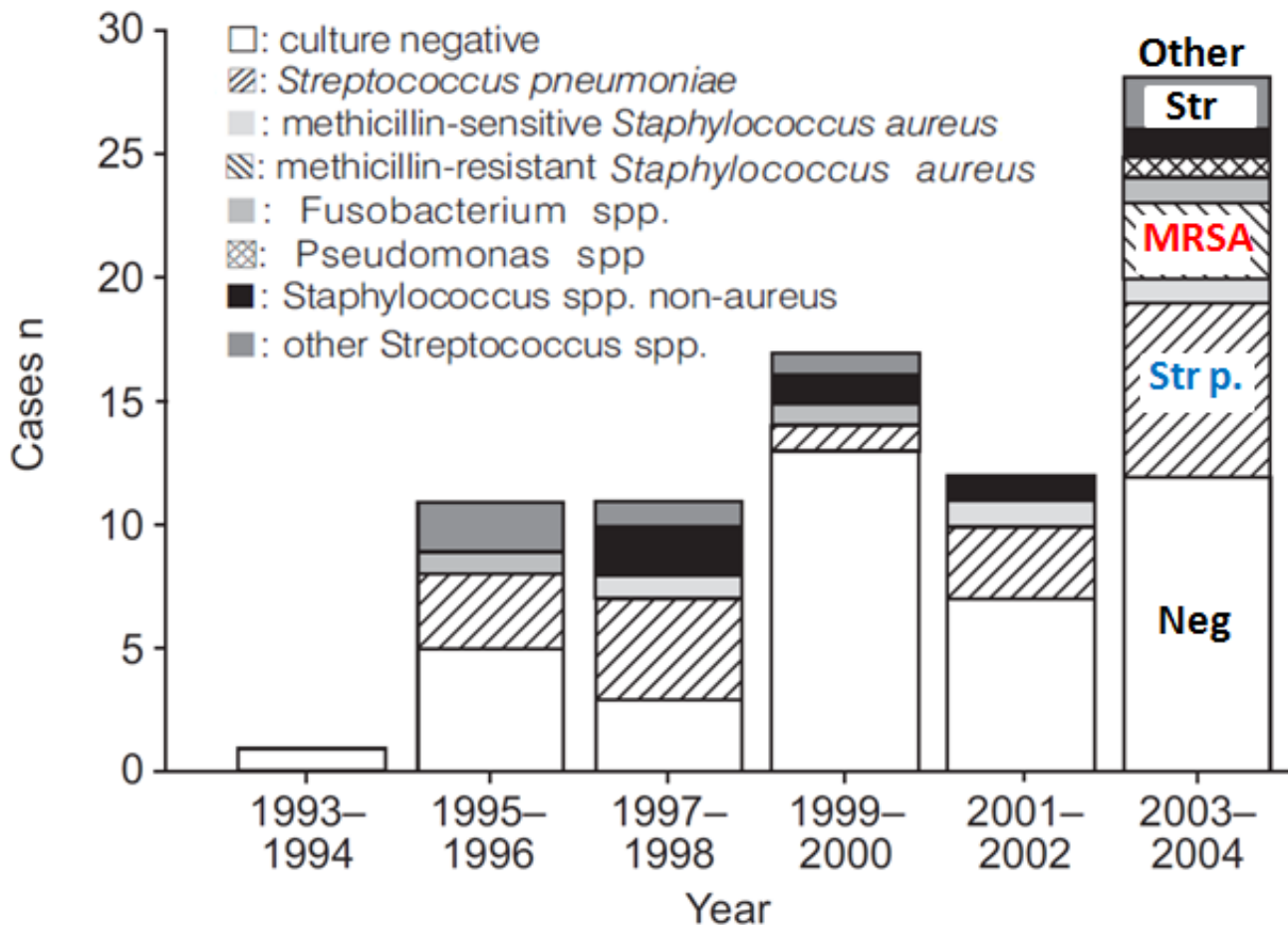
And .....



# Necrotising pneumonia cases, 80 children 3.6 (2.4–6.2) yrs of age, in the period 1993–2004



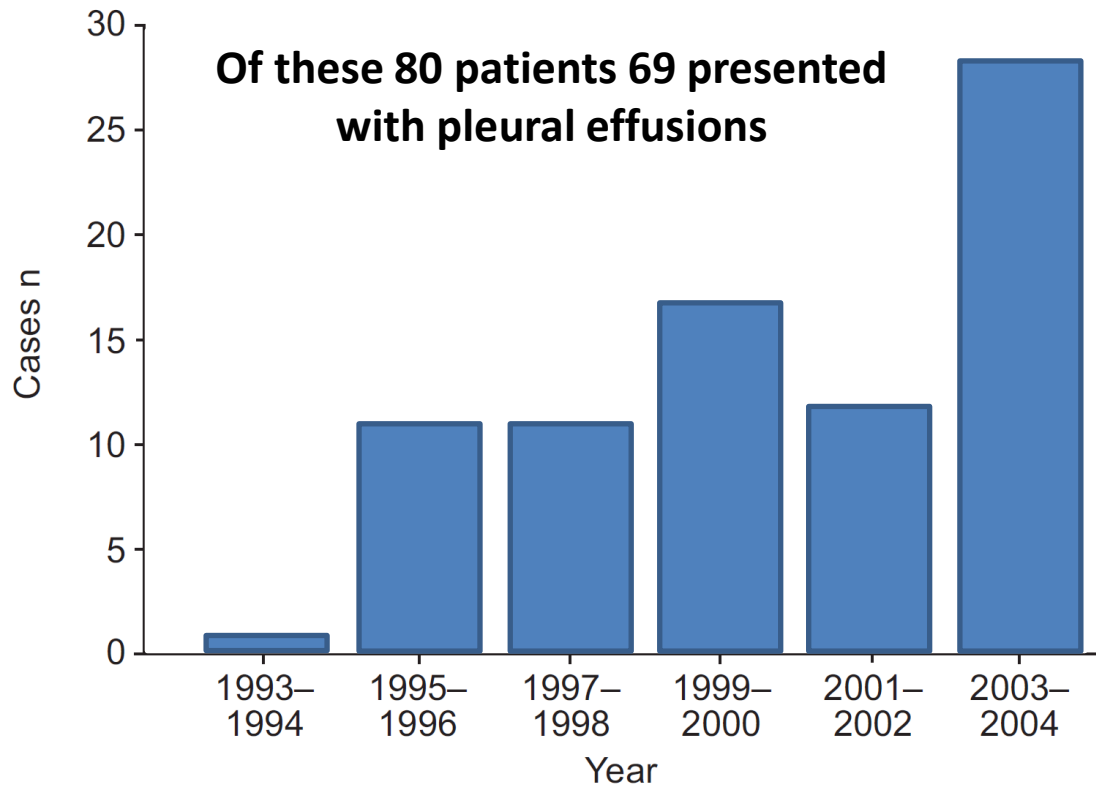
Children's Hospital Boston



# Necrotising pneumonia complicated by pleural effusions



Children's Hospital Boston



Laboratory values of patients with necrotising pneumonia at the time of admission

## Summary statistics

### Pleural fluid values

pH	7.08 ± 0.33
Glucose mg·dL <sup>-1</sup>	10.0 (2.0–65.5)
LDH IU·L <sup>-1</sup>	2810 (1413–9530)
Cell count × 10 <sup>3</sup> cells·μL <sup>-1</sup>	9.6 (1.2–56.2)
Pleural neutrophils %	70 ± 23.4

### Culture results

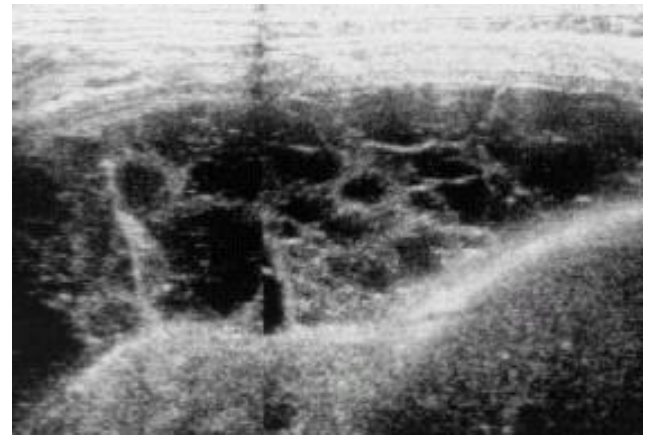
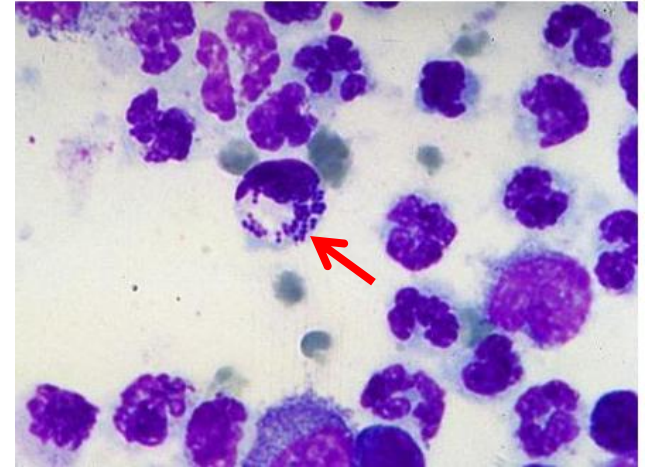
Any bacterial organism identified	38 (48)
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# Empyema

An advanced-stage empyema may be suspected if the fluid:

- Is pure Pus
- Has pH value <7.0
- Contains LDH levels >1,000 U/mL
- Contains Glucose levels <40 mg/dL
- Shows Bacteria on the Gram stain

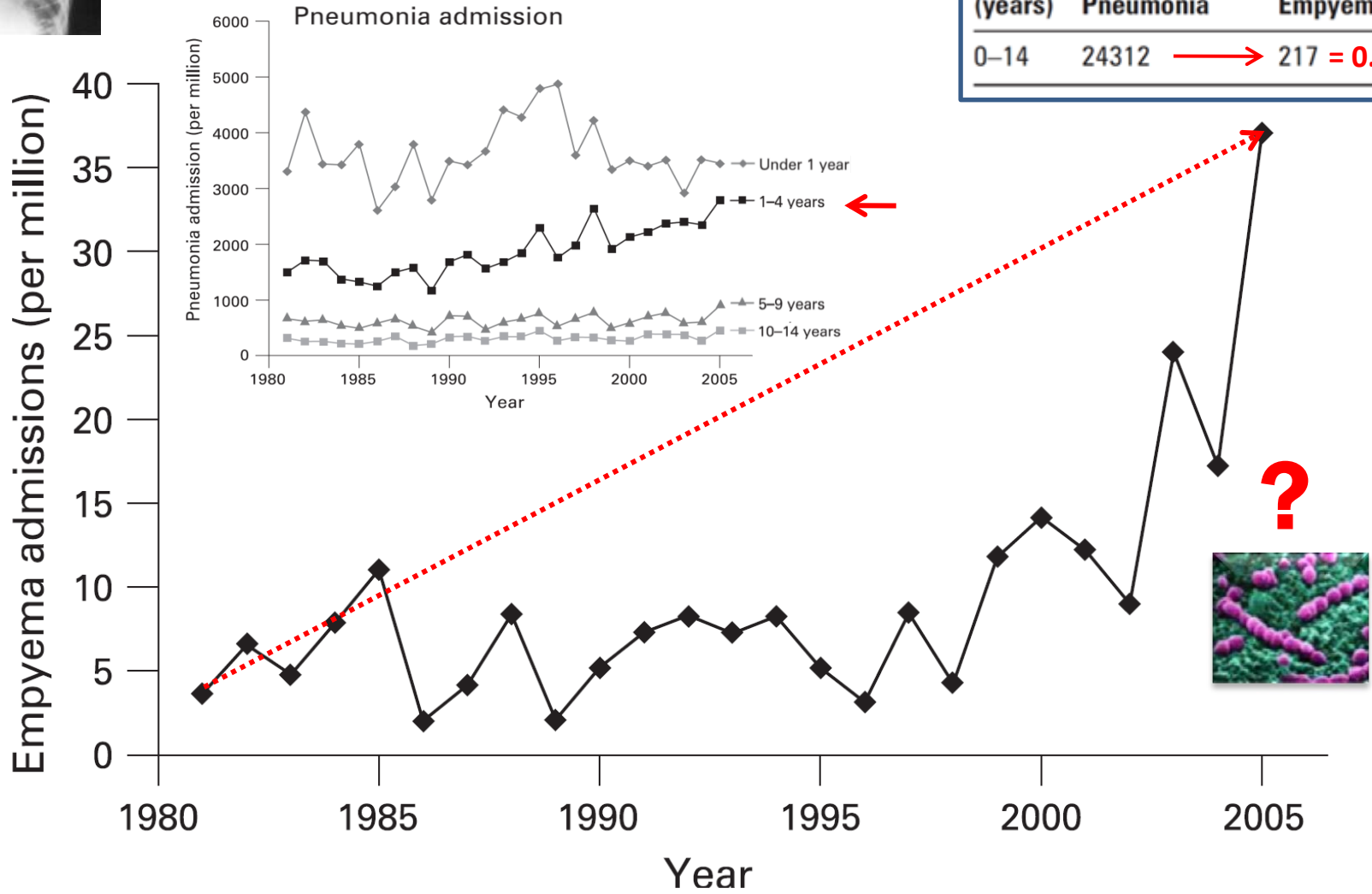




# Empyema admissions per year over 25 years in Scottish children $\leq 14$ years of age (1980-2005)



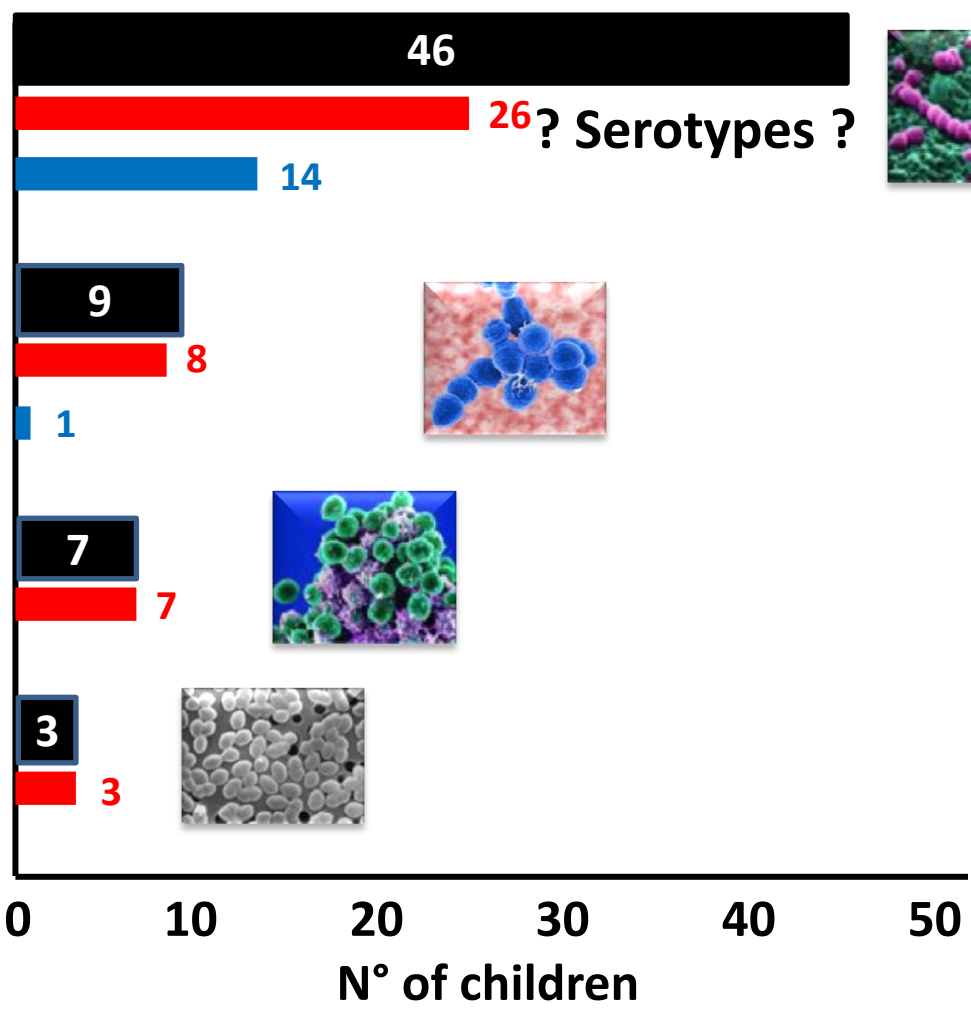
Age (years)	Pneumonia	Empyema
0-14	24312	217 = 0.89%





# Pathogens isolated from pleural fluid or blood from 153 children with empyema (August 1996-December 2003)

- *Streptococcus pneumoniae*  
*Pleural fluid*  
*Blood*
- *Streptococcus pyogenes*  
*Pleural fluid*  
*Blood*
- *Staphylococcus aureus*  
*Pleural fluid*
- *Others*  
*Pleural fluid*



? Serotypes ?



# Serotypes of *Str. pneumoniae* recovered from children <19 years with bacterial pneumonia with or without empyema (July 1993 - 1 July 1999)



Serotype	No. (%) of patients		
	With empyema (n = 26)	Without empyema (n = 14)	
● Type 1	13 (50)	1 (7) <sup>a</sup>	<div style="border: 1px solid red; padding: 5px; display: inline-block; text-align: center;"> <p><b>PCV7 includes: 4 6B 9V 14 18C 19F 23F serotypes</b></p> </div> <div style="border: 1px solid red; padding: 5px; display: inline-block; text-align: center; margin-left: 20px;"> <p><b>PCV13 includes: 1 3 4 5 6A 6B 7F 9V 14 18C 19A 19F 23F serotypes</b></p> </div>
● Type 14	4 (15)	2 (14)	
● Type 9	4 (15)	1 (7)	
● ● Type 19	1 (4)	3 (21)	
● Type 18	1 (4)	0	
Type 12	1 (4)	0	
Type 29	1 (4)	1 (7)	
Nontypeable	1 (4)	2 (14)	
Type 24	0	1 (7)	
● ● Type 6	0	2 (14)	
● Type 7	0	1 (7)	



# Distribution of pneumococcal serotypes in 66 RT PCR positive pre-school children, according to complications

Serotype	All subjects		Uncomplicated pneumonia		<u>Complicated pneumonia<sup>b</sup></u>	
	No.	%	No.	%	No.	%
● 19A	17	25.8	11	22.9	6	33.3
● 14	10	15.1	9	18.7	1	5.6
● 4	5	7.6	4	8.3	1	5.6
● 3	4	6.1	2	4.2	2	11.1
● 7F	3	4.6	2	4.2	1	5.6
● 19F	3	4.6	3	6.2	-	-
● 1	1	1.5	-	-	1	5.6
● 6A	1	1.5	1	2.1	-	-
● 6B <sup>e</sup>	1	1.5	1	2.1	-	-
● 9V	1	1.5	1	2.1	-	-
● 23F	1	1.5	1	2.1	-	-
<b>Non-typable. other serotype</b>	<b>19</b>	<b>28.8</b>	<b>13</b>	<b>27.1</b>	<b>6</b>	<b>33.3</b>

PCV13 includes:

- 1 ○
- 3 ○
- 4 ○
- 5 ○
- 6A ○
- 6B ○
- 7F ○
- 9V ○
- 14 ○
- 18C ○
- 19A ○
- 19F ○
- 23F ○

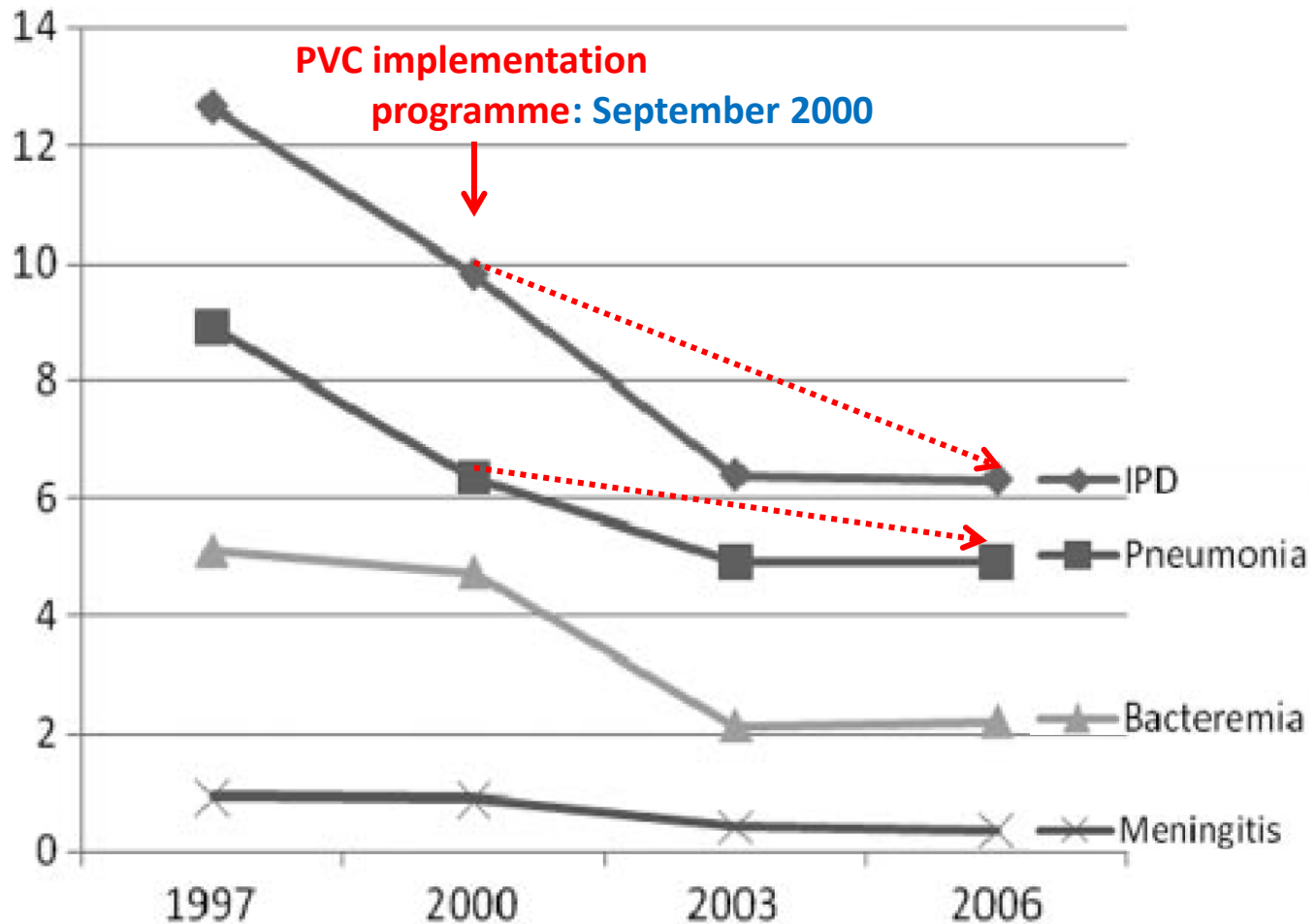
serotypes

PCV7





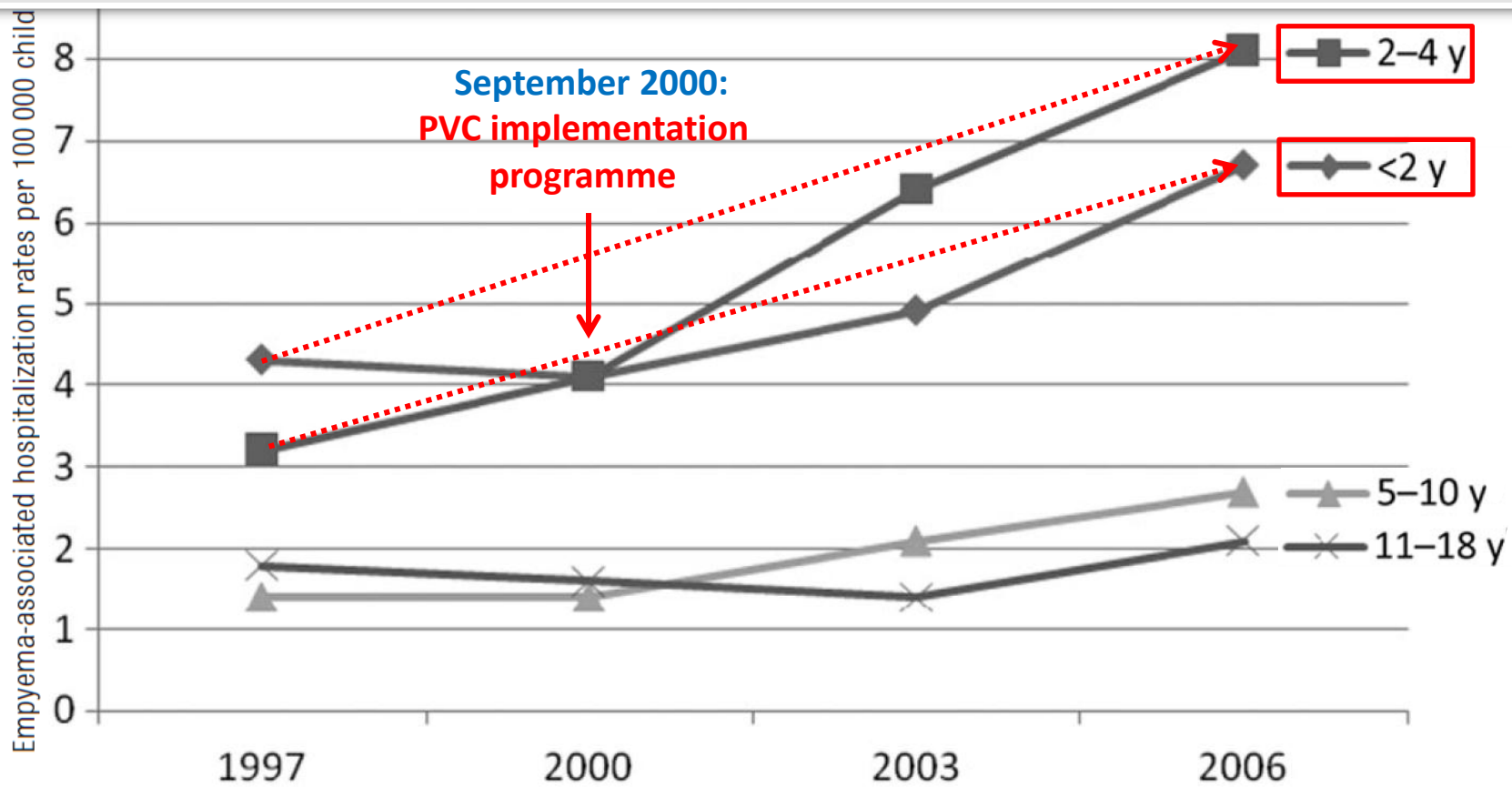
# Hospitalization rates for **invasive pneumococcal diseases (IPD) and pneumonia** per 100,000 children in US after PVC implementation programme





# Hospitalizations rates for **empyema** has continued to **increase** for US children despite pneumococcal conjugate vaccine

This is likely the result of **serotype replacement** with non-vaccine serotypes, which are more likely to cause empyema, **and increasing MRSA**





# Overall and pathogen-specific pneumonia hospitalization rates for empyema: 1996–2007

The increase in **empyema prevalence** was due to several pathogens and warrants continuing monitoring

Cause of hospitalization, age group	Hospitalizations per 100,000 children		Rate difference (95% CI)	
	1996–1998	2005–2007		
<b>Empyema</b>				
<2 years	3.5	7.0	3.5	1.5–6.3)
2–4 years	3.7	10.3	6.6	4.5–9.3)
<b>Thoracentesis</b>				
<2 years	5.6	8.2	2.6	0.6–5.5)
2–4 years	4.8	10.5	5.7	3.6–8.2)
<b>Pneumococcal empyema</b>				
<2 years	1.1	1.3	0.1	–0.4 to 1.0)
2–4 years	1.1	2.5	1.3	0.6–2.3)
<b>Streptococcal empyema</b>				
<2 years	0.4	0.7	0.3	0–0.8)
2–4 years	0.4	1.0	0.7	0.3–1.3)
<b>Staphylococcal empyema</b>				
<2 years	0.6	2.5	1.9	0.9–3.5)
2–4 years	0.2	0.8	0.6	0.2–1.4)
<b>Other or unspecified empyema</b>				
<2 years	1.3	2.5	1.2	0.3–2.5)
2–4 years	1.9	6.0	4.0	2.6–6.0)

↑ Increase in empyema hospitalization rates

= Pneumococcal and Streptococcal empyema hospitalization rates were stable

↑ Increase in empyema hospitalization rates



# Conclusion: CAP are like ...



The more you know them the more you are afraid of them ...



Grazie per l'attenzione e  
... non mancate il 21-23 Giugno!



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della Società Italiana per le Malattie Respiratorie Infantili

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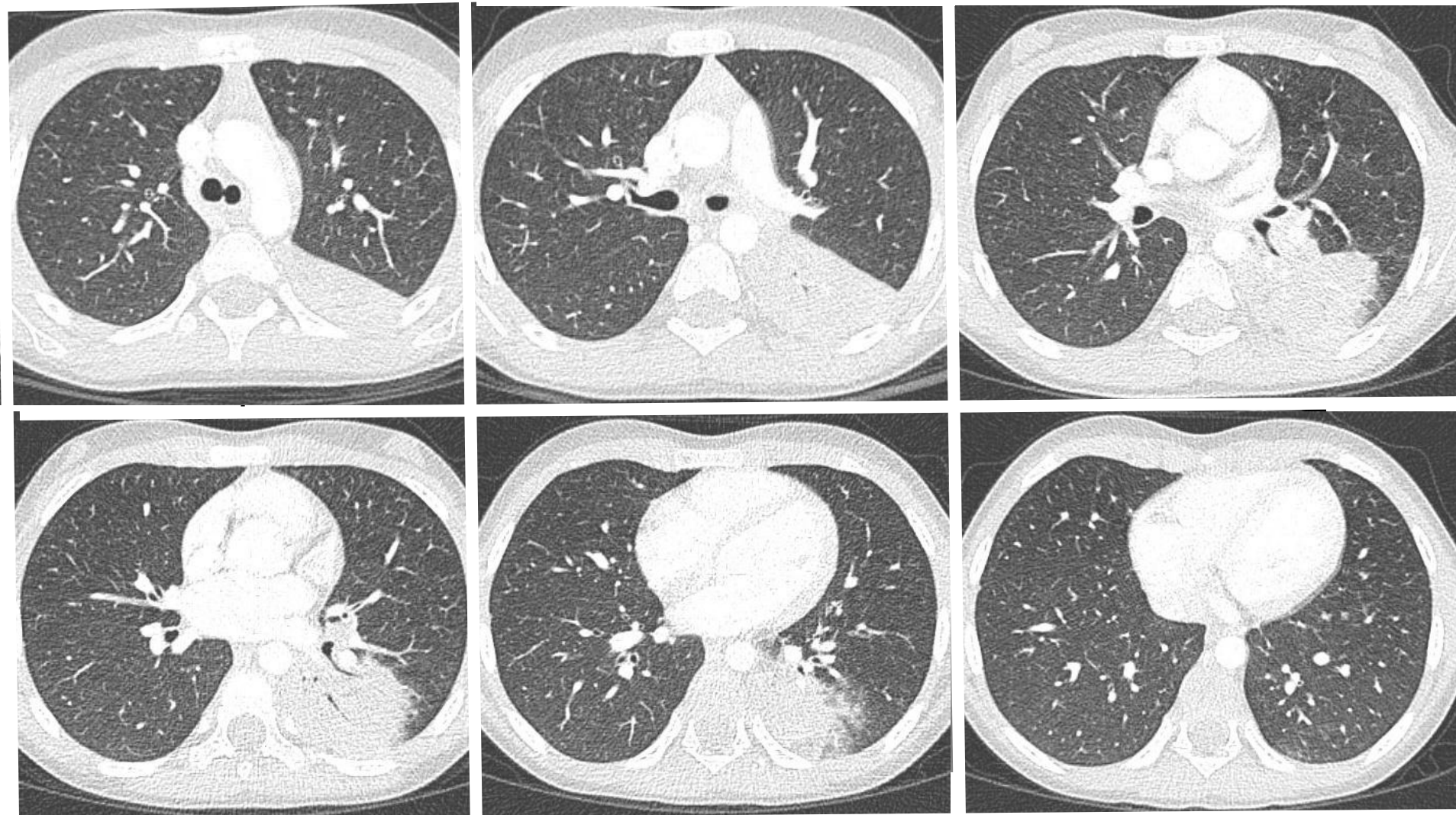
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# Contributo diagnostico della TAC del torace



*Polmonite pneumococcica*





A 13-year-old girl with fever, cough and pain localized in the lower portion of the right hemithorax





