

# Lower Respiratory Tract Infections



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# Introduction



- Lower respiratory illness (LRI) most common serious illness in childhood
- 1/3 of all children develop LRI in first year of life
- Most common reason for hospitalization after neonatal period
- Presentation focuses on:
  - Epiglottitis
  - Croup
  - Pneumonia

# Epiglottitis



- Serious, life-threatening deep tissue infection of upper airway
- Rapid diagnosis and treatment necessary
- Involves aryepiglottic folds and loose connective tissue in pre-epiglottic and paraglottic spaces as well as epiglottis

# Epiglottitis: Epidemiology



- 2 - 8 year olds most commonly affected
- Haemophilus influenzae type B most common pathogen
- Others: staphylococcus aureus, haemophilus influenzae non-type B, group A beta-hemolytic streptococci, viridans streptococci, streptococcus pneumoniae, candida albicans

## Epiglottitis: Epidemiology (continued)



- Mode of transmission: person to person, direct contact or droplet inhalation
- Peaks in spring and fall
- Dramatic decline in incidence after 1988 when Hib vaccine introduced

# Epiglottitis: Clinical Presentation



- Sudden onset respiratory distress over 12 - 24 hrs
- Fever
- Drooling
- Dysphagia
- Dyspnea
- Dysphonia

## Epiglottitis: Clinical Presentation (con't)



- Little or no cough
- Anxious, irritable, toxic-appearing
- Voice thick, muffled or hoarse
- Drooling often present
- Swallowing painful
- Some inspiratory stridor, tripod position


# Epiglottitis: Diagnosis



- Clinical impression important
- Direct visualization of the epiglottis risky
  - Control of airway a priority
  - Manipulation of oropharynx or examination with tongue depressor may lead to airway obstruction
  - Ideally in ER or OR under direction of physician with pediatric airway experience
  - Only if patient cooperative and if immediate intubation possible
- Xrays: lateral views of neck during inspiration with hyperextension: classic “thumb” appearance



# Epiglottitis: Treatment



- Most important: obtain and maintain an adequate airway
- Broad-spectrum antibiotics covering H. Influenzae until culture results available
  - Second or third generation cephalosporins
  - Ampicillin
- Elective extubation when child improves

# Epiglottitis: Care of Exposed Person



- Household, child care or school contacts should be carefully observed
- If household has one member younger than 48 months not vaccinated against Hib, all household contacts should receive rifampin prophylaxis regardless of age
- Prophylaxis of childcare contacts (if unvaccinated children under 2 years old present) controversial

# Infectious croup



Syndrome characterized by:

Barklike cough

Hoarseness

Inspiratory stridor

Respiratory distress of varying severity

Preceded by coryza and low grade fever for 12 to 72 hrs

# Infectious croup: Epidemiology



- Incidence highest in 2nd year of life
- Parainfluenza virus (types 1, 2, and 3)
- RSV, influenza or adenovirus
- Bacterial tracheitis may complicate course: (staph aureus, H. Influenzae, S. Pneumoniae or moraxella catarrhalis)

# Infectious croup: Treatment



- Management depends on severity of distress
  - Mild cases: barking cough, stridor with crying or agitation
  - More severe: increased work of breathing, tachypnea, retractions, stridor at rest
  - Very severe: hypoxia, lethargy, apnea

# Infectious croup: Treatment (con't)



- Home therapy for mild cases
  - Cool mist: moistens secretions, comforting
  - Steamy bathroom
  - Exposure to cold air
  
- Can intensify bronchospasm if also wheezing

# Infectious croup: Treatment (continued)



- Corticosteroids for moderate-severe cases
  - Injected: dexamethasone (0.3 - 0.6 mg/kg)
    - ▢ Onset 3-6 hours
    - ▢ Duration 36 - 54 hours
  - Oral: dexamethasone (0.3-0.6 mg/kg)  
or prednisolone or prednisone (1-2 mg/kg)
    - ▢ Onset 2-4 hrs
    - ▢ Duration 12-36 hrs
  - Nebulized: budesonide
    - ▢ Onset 2-4 hours

## Infectious croup: Treatment (continued)



- Nebulized epinephrine for more severe cases
  - Opens airway by reducing mucosal edema (vasoconstriction of precapillary arterioles leading to decreased hydrostatic pressure and fluid resorption)
  - L-epinephrine gives same benefit and same adverse effects as the more expensive racemic epinephrine
  - Doses: 0.5 ml of 2.25% racemic epinephrine or 5 ml of 1:1000 l-epinephrine
  - To minimize irritation, dilute l-epinephrine with normal saline



# Infectious croup: Treatment (continued)



- Admission criteria
  - Stridor at rest after aerosolized epinephrine, corticosteroids and observation for 3 hours
  - Decreased air entry into lungs
  - Altered level of consciousness
  - Poor oral intake leading to dehydration
  - Age <6 months

# Infectious croup: Treatment (continued)



- Endotracheal intubation needed:
  - Increased stridor, respiratory rate, retractions
  - Onset of cyanosis, exhaustion, confusion
  - Failure to respond to nebulized epinephrine

# Pneumonia: Introduction



- Pneumonia is the most serious LRI
- Can be difficult to diagnose and determine etiology
- Incidence of pneumonia up to 10 times higher in developing countries
- Factors influencing morbidity, mortality and etiology: age of patient, nutritional status, underlying disease

# Pneumonia: Etiology



- Identifying organism a challenge: no reliable diagnostic method
- *S. pneumoniae* important cause regardless of age
- *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* responsible for mild to severe LRIs, particularly for age > 5 yo
- In younger patients: mostly respiratory viruses

# Pneumonia: Age-specific Causes

Age	Organism
1-3 mo	RSV C trachomatis Other respiratory viruses B pertussis
1-24 mo	RSV Other respiratory viruses S. Pneumoniae H. influenzae (type B; nontypeable) C trachomatis M pneumoniae

# Pneumonia: Age-specific Causes (con't)

<b>Age</b>	<b>Organism</b>
2-5 yo	Respiratory viruses S pneumoniae H influenzae (type B; nontypeable) C trachomatis M pneumoniae
6-18 yo	M pneumoniae C pneumoniae S pneumoniae H influenzae (nontypeable) Influenza A or B Adenovirus Other respiratory viruses

# Pneumonia: Clinical Presentation



- Cough: chief symptom
- Increased respiratory rate:
  - > 60/minute infants younger than 2 months old
  - >50/minute infants 2-12 months old
  - > 40/minute children 1-5 years old
- Grunting (keeps narrow airways open)
  - Sign of severe distress and impending respiratory failure
- Nasal flaring (air hunger)

## Pneumonia: Clinical Presentation (continued)



- Retractions: intercostal, supraclavicular, subcostal
  - Increased effort to breathe, decreased lung compliance
- Hypoxemia: normal  $>95\%$
- Fever



# Pneumonia: Clinical Presentation (continued)



## ■ Classic presentation of bacterial pneumonia

- Fever 104 F or more
- Productive cough
- Chest pain
- Ill appearance
- WBC > 13,000

## ■ Classic presentation of viral pneumonia

- Fever less than 104 F
- Gradual onset symptoms
- Non-productive cough
- Other sx: headache, fatigue, myalgia, rhinorrhea, sore throat

## Pneumonia: Clinical Presentation (continued)



Infants and young children less likely to have “classic” signs of pneumonia.

Often: fever, tachypnea and subtle signs such as lethargy, irritability, vomiting, diarrhea and poor feeding.


Age is best predictor of etiology

# Pneumonia: Physical Exam



- Assess general appearance: alertness, consolability, ability to feed
- Respiratory rate: full 60 seconds
- Expose chest fully: retractions, work of breathing
- Auscultate:
  - Rales: crackles at end of inspiration usually indicate parenchymal disease
  - Rhonchi: low pitched, large airway obstruction
  - Wheeze: high-pitched, small airway obstruction
  - Decreased breath sounds

# Pneumonia: Diagnosis



- Chest XRAY is gold standard
- Labs may or may not be helpful:
  - complete blood count
  - blood culture
  - mycoplasma serology
  - TB skin test

# Pneumonia: Suggested empiric antimicrobial therapy

(modified from the Canadian recommendations)

Age	Hospitalized	ICU	Outpatient
newborn	Ampicillin + Gentamicin+/- Erythromycin	Ampicillin + Gentamicin+/- Erythromycin	Not recommended
1-3 mo:			
Pneumonitis	Erythromycin*	Erythromycin*	Not recommended
Pneumonia	Cefuroxime**	Cefuroxime** + Cloxacillin***	Not recommended

\* can substitute clarithromycin or azithromycin

\*\* can substitute cefotaxime or ceftriaxone

\*\*\* can substitute oxacillin or clindamycin

# Pneumonia: Suggested empiric antimicrobial therapy (continued)

<u>Age</u>	<u>Hospitalized</u>	<u>ICU</u>	<u>Outpatient</u>
3 mo-5 yr	Ampicillin or cefuroxime**	Cefuroxime** + erythromycin*	Amoxicillin or erythromycin*

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\* can substitute clarithromycin or azithromycin

\*\* can substitute cefotaxime or ceftriaxone

\*\*\* can substitute oxacillin or clindamycin

# Pneumonia: Suggested empiric antimicrobial therapy (continued)

<u>Age</u>	<u>Hospitalized</u>	<u>ICU</u>	<u>Outpatient</u>
5-18 yr	Erythromycin* +/- cefuroxime** or ampicillin	Cefuroxime** + erythromycin*	Erythromycin*

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\* can substitute clarithromycin or azithromycin

\*\* can substitute cefotaxime or ceftriaxone

\*\*\* can substitute oxacillin or clindamycin

# Pneumonia: Treatment issues



- Multidrug-resistant pathogens growing concern
  - S. Pneumonia: multicenter, US-based, retrospective study showed 9% intermediate resistant and 6% resistant to PCN. Additionally, 3% intermediate resistant and 2% resistant to Ceftriaxone.
- Over-use of antibiotics contributing to resistance



# Conclusion



- LRI's frequent cause of illness in infants and young children.
- Presentation and clinical signs assist in determining cause.
- Age of child and degree of respiratory distress important in determining treatment.
- Appropriate antibiotic selection and avoiding use of antibiotics when not needed is essential, especially given growing resistance of bacteria to antibiotics.

# REFERENCES



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