

COMMUNITY-ACQUIRED PNEUMONIA

Introduction

Pneumonia is an inflammation or infection of the lung. Though involvement of any portion of the lower airway can be considered pneumonia, community-acquired pneumonia normally refers to infection of the terminal and respiratory bronchioles, alveoli and interstitium.

- Incidence:
 - 35-40 episodes per 1,000 children/year in children <5yo
 - 11-16 episodes per 1000 children/year in children 5-14yo
- Etiology:
 - Causative organisms are often difficult to determine accurately due to lack of adequate clinical, radiologic and diagnostic methods
 - Etiology is often dependent upon age of patient
 - Common organisms include *S. pneumoniae*, *S. aureus*, *Mycoplasma*, *C. pneumoniae*
- Morbidity/Mortality
 - 97% annual decrease in mortality from pneumonia in US from 1939-1996
 - Death from pneumonia in US is very rare
 - Over 2 million deaths worldwide from pneumonia annually

Pathology

- Lobar Pneumonia: Four Stages
 - Congestion (first 24 hours): vascular engorgement with neutrophils in alveoli
 - Red Hepatization: fibrin deposition in alveoli with extravasation of RBCs
 - Gray Hepatization: contracting fibrinous plugs containing degraded cells
 - Resolution (after 1 week): digestion and macrophage-mediated phagocytosis
- Interstitial:
 - Alveolar space is spared
 - Cellular infiltrate of interstitial space that includes macrophages, lymphocytes, and plasma cells

It is not uncommon for lobar and interstitial pneumonia to co-exist.

Laboratory Testing

The diagnosis is made from the combination of fever, clinical findings (tachypnea, abnormal auscultatory findings, retractions) and radiologic evidence.

Chest radiograph is the only useful tool. It can delineate what portion of the lung is involved (lobar, interstitial, diffuse, and focal). A CBC can provide suggestive but nonspecific information (wbc, bands). Rapid urine antigen assays for *S. pneumo* have not been proven useful in pediatric populations. Blood cultures are very low yield.

Even with advanced testing, etiologies are determined in only 42-85% of cases. Mixed bacterial and viral etiologies are not uncommon.

Clinical Findings

Clinical exam is a mainstay in the diagnosis of pneumonia. Inspection, palpation, percussion and auscultation are all useful tools to determine the pulmonary pathology.

	INSPECTION	PALPATION	PERCUSSION	AUSCULATION
CONSOLIDATION	Tachypnea Cyanosis Splinting, Flaring	Increased fremitus (** decreased with empyema/effusion)	Dullness	Crackles Rhonchi Egophany Whispered pectoriloquy
PLEURAL EFFUSION	Decreased movement on affected side	Decreased movement Trachea deviated contralaterally Decreased fremitus	Dullness	Decreased breath sounds Whispered pectoriloquy
PNEUMOTHORAX	Cyanosis Tachypnea Respiratory distress Tracheal deviation	Decreased fremitus	Hyperresonance	Decreased breath sounds Decreased bronchophony

Definitions of Exam Terminology

- Rhonchi: loud, coarse, inspiratory/expiratory; “deep rumbling”; often clears with cough
- Crackles/Rales: discontinuous, on inspiration, fine; does not clear with cough
- Bronchophony: increased transmission of voice (louder) when whispered
- Whispered pectoriloquy: extreme bronchophony
- Egophany: increased intensity of transmission of voice; vocal “E” sounds like “A”
- Tactile Fremitus: if decreased = excess air in lungs (e.g. pulmonary edema, pleural effusion); if increased = fluids, solid mass, consolidation)

Diagnosis and Management

Diagnosis of etiology is based on age and presentation. Several prospective studies have been performed to determine etiologies of pneumonia. The standard methods for doing so are tests that are not commonly used except in a research laboratory (serologic evidence of antibodies, viral cultures, etc).

- Less Than 6 months old
 - Organisms: **Virus, S. pneumoniae, S. aureus, Moraxella**, (atypical presentations: *Pertussis and Chlamydia trachomatis*)
 - Presentation: if bacterial, high fever, tachypnea, productive cough, retractions, but not necessarily focal auscultatory findings; often appear toxic
 - Treatment: if lobar CXR, then Ceftriaxone inpatient, Amoxicillin or Augmentin on discharge
If fails to respond to initial Abx, consider Staph or viral

- 6 months to 5 years old
 - Organisms: **Virus, S. pneumoniae**, also possible for *S. aureus*
Consider *Mycoplasma* if nonlobar and fails to resolve or develops rash or arthropathy
 - Presentation: Febrile (>40 degrees), cough, hypoxia; crackles on exam
 - Treatment: Inpatient if toxic, hypoxemic, respiratory distress, then Ceftriaxone
Outpatient on Amoxicillin if stable (consider Zithromax in older)

- Older than 5 years
 - Organisms: **Mycoplasma, C. pneumoniae, S. pneumo, S. aureus**
 - Presentation: *S. pneumo*: high fever, cough, rust-colored sputum, focal exam

- Treatment: Atypical: low-grade fever, wheeze, rash, HA, GI symptoms
S. aureus: concern if CXR demonstrates pulmonary effusion, empyema
 Amoxicillin and/or Zithromax for outpatient
 Ceftriaxone plus/minus Clindamycin for inpatients

Pulmonary Effusion and Empyema

Pulmonary effusions in pediatrics are rarely transudative. The majority are infectious/exudative. In the presence of a pulmonary infection, these effusions are known as parapneumonic effusions.

Etiology:

- *S. pneumoniae* in small parapneumonic effusions
- *S. aureus* in large effusions or empyemas

Imaging:

- Lateral decubitus film: will demonstrate as little as 50cc of fluid
 >10mm of fluid is sufficient volume for thoracentesis
- Ultrasound: quick method for differentiating pleural thickening from effusion
 Can guide thoracentesis and detect loculations, volume of effusion
- CT: evaluates pleura and underlying parenchyma
 Can identify mass or foreign body

Laboratory/Management

- Thoracentesis is recommended if persistent fever, toxicity, respiratory compromise, mediastinal shift, pleural effusion line over 25% of lung field
- Chest tube/VATS if pleural fluid is purulent, or:
 - PH < 7.3
 - WBC > 1000
 - Fluid glucose < serum glucose
 - Fluid:Serum LDH > 0.6
 - Fluid:Serum protein > 0.5
- VATS (Video Assisted Thorascopic Surgery) has been shown (in small number of studies) to decrease length of CT, length of stay, and have a higher success than CT with/without fibrinolytics
- Antibiotic Choices: Ceftriaxone and Clindamycin

References

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