Respiratory Tract Infections
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Audience response test question:
• I read the Pulmonary Infection monograph that you spent so much time putting together
  – A. Yes
  – B. No way

Case #1
• A 29 year old woman presents to clinic with fever, head congestion, nasal discharge and a productive cough for the past 4 days. Her sputum is yellow-green.
• On physical exam, she has mild oropharyngeal erythema, no sinus tenderness and clear lungs.
• Her labs show a slightly elevated wbc of 9.0.
• A CXR is clear
Question 1:

- What would be your next step in the evaluation?
  - A. Culture her sputum
  - B. Perform PCR on respiratory secretions
  - C. No more work-up, start antibiotics
  - D. No more work-up, start over the counter cough syrup
  - E. No more work-up, reassure her and monitor symptoms

Upper Respiratory Tract Infections

- Acute Bronchitis
  - Self limited infection/inflammation of large airways
  - Symptoms- cough ~ 5 days
  - 5% of adults annually, higher in winter and fall
  - 9th most common cause of outpatient visits
  - Etiology
    - Majority are viral (influenza, parainfluenza, RSV, coronavirus, adenovirus, rhinovirus)
    - Bacteria include mycoplasma, strep pneumoniae, H flu, chlamyphilia, B pertussis
  - Treatment is symptomatic, routine antibiotics not suggested, anti-tussives and mucolytics usually aren’t helpful

Case #2

- A 54 year old gentleman presents to the ED with fever to 39.4C, fatigue, myalgias, cough and sputum. He has a history of diabetes that has been fairly well controlled. He states the symptoms developed 10 days ago, after he returned from a family vacation at Disneyland. At first, he thought he just had a “cold”, but his symptoms have progressed and he has not been able to go to work for the past 2 days. His cough is present all day, productive of only scant clear sputum.
On physical exam, he is mildly confused, febrile, has a RR of 30, has faint crackles in his right lung. Labs reveal a WBC of 10.2, a blood glucose of 145, and normal renal function.

Question 2:

Would you describe this as:
- A. Bronchopneumonia
- B. Lobar Pneumonia

Bronchopneumonia:
- Patchy
- > 1 lobe
- Infection that starts in the bronchioles and spreads to the parenchyma
- More common

Lobar Pneumonia
- Contiguous
- All or part of one lobe
- Mostly due to strep pneumoniae
Question 3:

- Which of the pneumonia syndromes would this case be classified as?
  - A. Community acquired pneumonia
  - B. Hospital Acquired pneumonia
  - C. Aspiration pneumonia
  - D. Chronic pneumonia
  - E. Lung abscess
  - F. Pneumonia in the immunocompromised

**Old nomenclature: Typical vs Atypical**

- Typical
  - Acute onset
  - Cough, sputum, fevers, chills
  - Gram stain with PMNs and organisms
  - Streptococcus pneumoniae, H influenza, Moraxella catarrhalis, Staph aureus

- Atypical
  - Subacute onset
  - Milder symptoms with a prodrome ("walking pneumonia")
  - Gram stain without organisms
  - Mycoplasma, Chlamydia, Legionella, viruses

Significant overlap between typical and atypical

**New: Bacterial vs viral**

- Bacterial
  - Streptococcus pneumoniae, H influenza, Moraxella catarrhalis, Staph aureus
  - Mycoplasma, Chlamydia, Legionella

- Viral
  - Influenza
  - RSV
  - Adenovirus
  - Parainfluenza
  - Enterovirus
Question 4

• Should we admit this gentleman to the hospital?
  – A: Yes
  – B: No

Predictive Models

• CURB-65
  – Confusion
  – Uremia (BUN>19)
  – RR > 30
  – SBP < 90, DBP < 60
  – Age > 65
• Score 0-1: low risk (<3% 30 day mortality)
• 2: moderate risk (6.8% 30 day mortality)
• 3-5: high risk (15-30% 30 day mortality)

Question 4:

• The primary team managing the patient plans on ordering more testing, but before that, would like to start empiric therapy. Which of the following would you recommend:
  – A. Ampicillin
  – B. Clindamycin
  – C. Ceftazidime
  – D. Moxifloxacin
Therapy of CAP

• Outpatient
  – Macrolide or doxycycline
  – If co-morbid illness or recent antibiotics, a respiratory fluoroquinolone
• Inpatient, non-ICU
  – Respiratory fluoroquinolone
  – β-lactam + macrolide

Question 5:

• What would you order for your next diagnostic test?
  – A. Sputum culture
  – B. Chest CT scan
  – C. Fungal smear of sputum
  – D. Viral PCR screen of respiratory tract
  – E. Ultrasound of pleural space

• The respiratory panel was negative for all viruses.
• The sputum sample has > 10 squams per hpf and was rejected by the micro lab.
• The primary team has started empiric therapy.
• The patient however worsens, progresses to multi-organ system failure and the primary team feels uncomfortable with the lack of a diagnosis and requests additional information.
**Question 6:**

- What additional testing should be sent in order to help secure the diagnosis?
  - A. Blood cultures
  - B. Histo and blasto serology
  - C. Urinary legionella antigen
  - D. CMV PCR of blood
  - E. No more testing. I’m comfortable with the treatment.

**Legionella pneumophila**

- Legionnaire’s disease, Pontiac fever
- Headache, myalgias, high fever, fatigue, cough, sputum
- Can progress to multi-organ system failure
- The organism flourishes in artificial aquatic environments
- Infection with inhalation or drinking contaminated water
- Diagnosis by urinary legionella antigen

**Legionella outbreaks**

- Multiple outbreaks in the last 5 years
- Quincy veterans home (46 cases, 13 deaths)
- September 2017, Disneyland.
  - 11 cases, 2 deaths
  - Sourced to 2 water towers
- 2015- South Bronx
  - Outbreak sourced to cooling tower in the Opera House Hotel
  - 12 deaths, 119 illnesses
  - Order given to disinfect all cooling towers in the area
Case History

• A 45 year old gentleman returned from a hunting trip in Northern Wisconsin and develops fevers, a non-productive cough and shortness of breath.
• He put off seeking medical attention for a couple of weeks, but his symptoms worsen and he develops a rash and fatigue.

• On physical exam, he is ill appearing, has a temperature of 40.5F, RR 28, and coarse breath sounds throughout his right lung. He has a rash that consists of raised red lesions, some of which have ulcerated.
Question 7:

• Which of the pneumonia syndromes would this case be classified as?
  – A. Community acquired bacterial pneumonia
  – B. Community acquired viral pneumonia
  – C. Hospital Acquired pneumonia
  – D. Aspiration pneumonia
  – E. Chronic pneumonia
  – F. Lung abscess
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Chronic Pneumonia

• Mycobacterium (TB or atypical)
• Nocardia
• Actinomyces
• Endemic fungi (histo, blasto, cocci)
• Coxiella (exposure to farm animals)
• Tularemia (rabbits)
• Anatomic problem
• Non-infectious (cancer, BOOP, vasculitis, pulmonary alveolar proteinosis)

Question 8:

• Your next step in the work-up is:
  – A. Place a PPD
  – B. Sputum for smear and stains (AFB and fungus)
  – C. Scrape the skin lesion and stain it
  – D. Serology for collagen vascular disease
  – E. Chest CT scan
• The team managing this patient decides to scrape the lesion and stain it themselves. Sputum was also sent for staining.

Question 9:

• What would appropriate therapy be for this patient?
  — A. A respiratory fluoroquinolone
  — B. Trimethoprim/sulfa
  — C. Clindamycin
  — D. Piperacillin
  — E. Itraconazole

Blastomycosis

• Endemic fungus that lives in soil of SE, midwest, seen in hunters, farmers, gardeners.
• Called Chicago’s disease, Gilchrist’s disease
• Acute illness can consist of flu like illness, can mimic bacterial pneumonia, chronic illness with cough, sputum, sweats and weight loss or can disseminate and be severe.
• Extrapulmonary symptoms in 25-40%
Case History

- A 57 year old alcoholic is brought to the ED with fevers. He complains of a cough with copious foul smelling sputum. Occasionally, there are blood streaks in the sputum.
- On exam, he is febrile, has very poor dentition, crackles at the left base.
- His labs reveal a WBC of 17.5, normal renal function.

Question 10:

- Which of the pneumonia syndromes would this case be classified as?
  - A. Community acquired bacterial pneumonia
  - B. Community acquired viral pneumonia
  - C. Hospital Acquired pneumonia
  - D. Aspiration pneumonia
  - E. Chronic pneumonia
  - F. Lung abscess
  - G. Pneumonia in the immunocompromised
Lung abscess

- Infection leads to tissue destruction and necrosis, suppurative, cavitation
- Commonly isolated organisms include anaerobic mouth organisms (bacteroides, fusobacterium, peptostreptococcus), aerobic and anaerobic streptococcus, GNRs
- Aspiration, post-pneumonic, septic emboli

Question 11:

- What would appropriate therapy be for this patient?
  - A. A respiratory fluoroquinolone
  - B. Trimethoprim/sulfa
  - C. Clindamycin
  - D. Piperacillin
  - E. Itraconazole

Case History

- A 64 year old gentleman is admitted to the hospital for an exacerbation of CHF. He spends 4 days on a mechanical ventilator, but responds to therapy and is extubated. On hospital day number 7, he complains of worsened dyspnea and a cough productive of green sputum. His wbc is 18 and a CXR shows a questionable LLL infiltrate.
Question 12:

Which of the pneumonia syndromes would this case be classified as?
- A. Community acquired bacterial pneumonia
- B. Community acquired viral pneumonia
- C. Hospital Acquired pneumonia
- D. Aspiration pneumonia
- E. Chronic pneumonia
- F. Lung abscess
- G. Pneumonia in the immunocompromised

Hospital Acquired Pneumonia

- 1% of hospitalized patients develop pneumonia
  - Higher rates in the ICU
- Increases length of stay by 7-9 days, costs by $40K, has a very high mortality
- Diagnostic criteria:
  - Fever, new infiltrate, leukocytosis and change in sputum
- Sputum cultures are not as helpful
  - Difficult to differentiate colonization from infection

Question 13:

Which of the following therapies would be appropriate for this patient?
- A. Doxycycline
- B. Ciprofloxacin
- C. Piperacillin/tazobactam
- D. Gentamycin
- E. Cephalexin
Therapy for HAP

- Hospitalized patients become colonized with gram negative rods
  - Klebsiella, e coli, enterobacter, proteus, serratia, pseudomonas, acinetobacter
- Early, broad empiric therapy
- Narrow guided by culture results (or lack thereof)
  - Antipseudomonal cephalosporin or
  - Antipseudomonal carbapenem or
  - β lactam/ β lactamase
  - Vancomycin if worried about MRSA


Last Question:

- A. I like this flipped lecture thing
- B. I prefer a standard power point lecture
- C. I prefer a standard power point lecture that I can watch at 1.2X speed on my laptop at home