

Infectious Disease Emergency: Respiratory Infection

- **Emergency** - A patient's condition requiring immediate treatment.
- – *Stedman's Medical Dictionary*

Case 1

- F/52
- Sore throat and cough for 1/7
- Fever and generalized malaise
- Mother-in-law had similar complaint 5/7 ago

Diagnosis

- Influenza
 - DDx: common cold

Influenza virus H & N

- Hemagglutinin (H):
 - a surface glycoprotein that binds to sialic acid residues on respiratory epithelial cell surface -- necessary for initiation of infection
 - Antibody to H is protective
- Neuraminidase (N):
 - liberates the new virions
 - Antibody to N modifies disease severity

Antigenic Shift

- Major changes in glycoprotein: genetic assortment, direct animal to human transmission
- Antigenic shifts: epidemics and pandemics

Transmission

- Direct contact
- Small particle aerosols
- Large particle aerosols

Clinical Features

- Symptoms of common cold + systemic illness
 - Fever
 - Myalgia
 - Headache
 - Weakness

Treatment

- Symptomatic treatment
- **Antiviral drugs**
 - Neuraminidase inhibitor
 - M2 inhibitor

How do antiviral drugs work?

- Prevent the flu virus from reproducing
- Treatment can shorten the illness by a day and reduce hospitalisations by an estimated 50% (based on seasonal flu)

- To be effective, must be taken within 48 hours of the onset of flu symptoms

Neuraminidase inhibitor

- Neuraminidase inhibitors
 - Zanamivir (Relenza)
 - inhaled
 - Oseltamivir (Tamiflu)
 - Oral
 - Peramivir
 - IV

Side effects

- Zanamivir: bronchospasm
- Oseltamivir: nausea and vomiting.
 - ? Delirium

Drug resistance

- Different NAIs bind at different NA catalytic site and this results in difference in cross-resistance profiles.

M2 inhibitor

- Adamantanes (Amantadine, Rimantadine)
 - target the M2 protein, which forms a proton channel in the viral membrane that is essential for efficient viral replication

Case 2

- M/72
- Ex-smoker, 40 pack year
- Fever 38.5 and sore throat for 2/7
- Cough with yellowish sputum
- P/E: prolonged expiratory phase, wheeze on forced expiration

Diagnosis

- COPD exacerbation

- Exacerbation: acute onset of change in symptom which is beyond day-to-day variation
- Standard treatment
 - Bronchodilator
 - Corticosteroid x 2/52
 - *Antibiotics x 1 week
 - Increase in sputum purulence
 - Increase in dyspnea
 - Increase in cough

Management

When to admit?

Pharmacological Treatment

- Antibiotics
- Bronchodilator
- Corticosteroid

Antibiotics

- Cochrane review: in COPD exacerbations with increased cough and sputum purulence, antibiotics **regardless of choice**, reduce the risk of
 - short-term mortality by 77%,
 - treatment failure by 53%
 - sputum purulence by 44%

*But with a small increase in the risk of diarrhoea.

Bronchodilator

- Cochrane Review:
 - In treating AECB, there was no evidence that the degree of bronchodilation achieved with SAA was greater than that using the SABAs.
 - The combination of a β_2 -agonist and ipratropium had no greater effect on FEV₁ than either agent alone.

Steroid

- Cochrane review: Treatment of an exacerbation of COPD with oral or parenteral corticosteroids significantly
 - reduces treatment failure
 - the need for additional medical treatment
 - increases the rate of improvement in lung function and dyspnoea over the first 72 hours,

*But at a significantly increased risk of an adverse drug reaction.

Case 3

- M/35
- Fever 38.5, cough with sputum for 2/7
- Rt lower zone chest pain
- P/E:
 - BP 130/80
 - RR 20/min
 - Bronchial breathing RLZ

Pneumonia

- The commonest cause of fever world-wide and 3rd leading cause of death
- The mortality:
 - 1% in the outpatient setting
 - can be as high as 25 % if hospitalization is required

Definition

- Clinical or radiological signs of consolidation

Classification

- Refer to radiological finding:
 - Lobar pneumonia

- Bronchopneumonia
- Refer to clinical circumstances under which the pneumonia is acquired:
 - Community acquired pneumonia (CAP)
 - Hospital acquired pneumonia (HAP)
 - Healthcare-associated pneumonia (HCAP)

Microbiology

- A microbiologic diagnosis is only confirmed in ~ 50 % of cases

Microbiology

S. pneumonia

- The most common cause of CAP.
- It is believed that many culture-negative cases are caused by pneumococcus.

Anaerobic organisms

- May be the cause of aspiration pneumonia and lung abscess.
- Role in CAP is not clear
- Some studies using transtracheal and bronchoscopic aspirates with quantitative cultures suggest that anaerobes may account for 20 to 30 % of pneumonia

Atypical pneumonia

- Atypical pathogens account for 22.8% of CAP
 - Mycoplasma
 - Legionella
 - Chlamydia

Legionella

- Acquired by inhalation of the organism in a mist
- Risk factors include:
 - Age > 30
 - Men > women
 - Immunocompromised status
 - Cigarette smoking
 - Alcohol abuse

Clinical evaluation

- Classically sudden onset of rigors followed by fever, pleuritic chest pain, and cough productive of purulent sputum
- Chest pain, chills & rigors

Clinical features of atypical pneumonia

- Fever
- Respiratory symptoms are not prominent initially
- GI tract symptoms common

Signs

- 80% are febrile (frequently absent in elderly)
- Tachypnea and tachycardia are common.
- One-third have evidence of consolidation.

Blood test

- The major blood test abnormality is leukocytosis (typically between 15,000 and 30,000 per mm³) with a leftward shift.
- Leukopenia can occur

CXR

- Infiltrate on CXR is the "gold standard"
- The radiographic appearances include lobar consolidation, interstitial infiltrates, and cavitation.

CXR

- Classical teaching: lobar consolidations due to the "typical" bacteria and interstitial infiltrates due to viruses and "atypical" bacteria.

Sputum gram stain

- Shown to be valuable in determining the etiologies of certain common types of bacterial pneumonia
- The correlation with culture is not sufficiently high to serve as a basis for clinical decisions

Sputum culture

- Utility remains controversial
- 30% unable to produce sputum
- 25% have received antibiotics prior to producing a specimen

Sputum culture

- The finding of a predominant organism (for example, Gram positive diplococci) may identify the cause of the pneumonia
- ? colonizer or pathogen, esp. organisms that can colonize the respiratory tract such as *S. aureus* and Gram negative bacilli.

Expert opinion

- ATS:

- do not recommend collection of sputum for Gram stain and culture
- IDSA:
 - sputum Gram stain and culture be performed in all inpatients with CAP
 - in outpatients, a sputum grain stain is "desirable" and culture is "optional"

When to hospitalize CAP patients?

Beta-lactam antibiotic

- Penicillin is the drug of choice for infections caused by sensitive strains of *S. pneumoniae*
- None provide coverage for atypical organisms

Antibiotics for atypical pathogens

- Macrolide
 - Erythromycin: GI upset
 - Clarithromycin/Azithromycin: ~ 70% *S pneumoniae* (HK) resistant to newer macrolide

Mechanism of resistance

- Decreased penetration to the target
- Alteration of the target site
- Inactivation

Recommended Treatment

- Beta-lactam to cover typical pathogens
 - Antibiotics for atypical pathogens
 - ? One for both
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- Fluoroquinolone
 - Cover both typical and atypical pathogens. But potent anti-TB drug.

Recommended antibiotic regimen for CAP

- Beta-lactam/beta-lactamase inhibitor:
Amoxil/clavulanate, or ampicillin sulbactam +/- newer macrolide
 - If allergy to Penicillin: Fluoroquinolone
- Time to first antibiotic dose***
- For patients admitted through the emergency department (ED), the first antibiotic dose should be administered while still in the ED.
- (Moderate recommendation; level III evidence.)

Duration of treatment

- Traditionally
 - *S. pneumoniae* pneumonia: 7 to 10 days
 - *M. pneumoniae* and *C. pneumoniae*: 10 to 14 days
 - Legionnaire's disease
 - Immunocompetent patients: 14 days
 - immunocompromised patients: 21 days

Assessment of response

- Some improvement should be seen in 48 to 72 h
- Leukocytosis usually resolves by D4
- Abnormal physical findings (crackles) can persist beyond 7 days
- Radiograph clearing: 4-12 weeks

Assessment of response

- CXR worsen initially after treatment is not uncommon
- In severe pneumonia, radiographic deterioration may signify inadequately treated infection

Patient who does not respond to initial treatment

- 1) Inadequate antimicrobial selection eg. virus, drug resistance
- 2) Unusual pathogens: TB, fungus, PCP
- 3) Non-infectious illness: PE, CHF, cancer, BOOP

What to do next

Refer specialists for

- Bronchoscopy
- CT
- Lung scan/pulmonary angiogram
- Open lung biopsy

Take Home Message (1)

- Influenza
 - NAI can shorten the duration of illness if given within 48 hrs
 - Complication can be decreased

Take Home Message (2)

- Pneumonia
 - CURB/CURB-65 for assessing disease severity
 - Betalactam/Betalactamase inhibitor the drug of choice
 - Need macrolide if atypical pathogens suspected
 - Other diseases may mimic pneumonia