

Pharmacy 407
Lower Respiratory Tract Infections
Case Studies
November, 2011

Learning Goals and Objectives

Goal

To prepare you to identify, resolve and prevent drug related problems in patients with lower respiratory tract infections.

Objectives

1. To learn about the pathophysiology of community acquired pneumonia.
2. To learn about the appropriate diagnosis of community acquired pneumonia.
3. To learn about the Pneumonia Severity of Illness (PSI) Scoring system.
4. To learn about the appropriate pharmacotherapy of community acquired pneumonia.
5. To learn about the differences in the pathophysiology of pneumonia in differing populations.
6. To learn about the differences in appropriate treatment of pneumonia in differing populations.
6. To learn about the impact of antibiotic resistance in the treatment of pneumonia.
7. To become familiar with the current guidelines for the treatment of pneumonia.

Recommended Reading

The guidelines of the Alberta Medical Association are an excellent source of information for these topics and will provide a good background of the disease state and its treatment. These were updated in 2008. The article Principles of Judicious use of antimicrobial agents are quite short and provide an excellent background regarding the inappropriate use of antibiotics in acute bronchitis and the problems leading to that inappropriate use.

1. Guideline for the diagnosis and Management of Community Acquired Pneumonia: Adult. Alberta Medical Association (Updated 2008). <http://www.albertadoctors.org>
This will take you to the Alberta Medical Association Homepage. Choose the pull-down tab publications and choose TOP/CPGs at the bottom. This will take you to the TOP guidelines homepage. Choose link for Towards Optimized Practice/Clinical Practice Guidelines. Choose Infectious Diseases then choose Pneumonia Adult.
2. Infectious Diseases Society of America/ American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults – Lionell A Mandell et al.; Clinical Infectious Diseases 2007: 44 S27-72.
3. Guideline for the diagnosis and Management of Nursing Home Acquired Pneumonia: Adult. Alberta Medical Association (Updated 2008). <http://www.albertadoctors.org>
This will take you to the Alberta Medical Association Homepage. Choose the pull-down tab publications and choose TOP/CPGs at the bottom. This will take you to the TOP guidelines homepage. Choose link for Towards Optimized Practice/Clinical Practice Guidelines. Choose Infectious Diseases then choose Pneumonia: Nursing Home Acquired.
4. Cough Illness/Bronchitis – Principles of Judicious use of Antimicrobial Agents. Pediatrics, Vol 101, No 1 January 1998 Part 2 of 2. pg 178-80 Available on-line from the e-journals from the UofA library.
5. Guideline for The Diagnosis and Treatment of Acute Bronchitis – the Alberta Medical Association <http://www.albertadoctors.org>. This will take you to the Alberta Medical Association Homepage. Choose the pull-down tab publications and choose TOP/CPGs at the bottom. This will take you to the TOP guidelines homepage. Choose link for Towards Optimized Practice/Clinical Practice Guidelines. Choose Infectious Diseases then choose Acute Bronchitis.
6. Antibiotics for Common Respiratory Tract Infections in Adults. Arch Intern Med 2002;162:256-264. Read Section on Asthma Exacerbations pg. 257.
7. Bugs and Drugs 2006

Optional Reading

1. Chapter on Lower Respiratory Tract Infections; Pharmacotherapy A Pathophysiologic Approach: DiPiro.

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Case #1

D. W. is a 24 year-old woman who is a graduate student at the University of Alberta. She has been previously well, but she has not been feeling well for about a week. She had a sore throat for a few days and has had quite a problem with a cough, a low-grade fever and a headache. She presents to her family physician and, on examination, she has a temperature of 38.0°C, and she has some moist rales and decreased air entry on auscultation of her chest, her HR is 85 bpm, BP 120/85 and her RR is 22/min. Upon questioning, she states that she is coughing up only very little sputum. The physician suspected pneumonia and sent K.R. for a chest X-ray. The X-ray showed a patchy infiltrate in the right lower lobe with the most probable diagnosis of pneumonia. The physician prescribed amoxicillin 500 mg. t.i.d. x 10 days. She took the amoxicillin as directed but the symptoms persisted. She returned to her family physician. The physician ordered ciprofloxacin 500 mg bid for 10 days.

Cipro not a good choice
no activity vs atypicals,
shown to fail with strep
pneumo-- also risk for
development of resist.

D.W. arrives at your pharmacy with a prescription for ciprofloxacin 500 mg bid x 10 days. K. R. is otherwise well and takes only Alesse[®] for birth control on a regular basis. She occasionally takes acetaminophen or Motrin[®] for muscle aches and pains or headaches. She has no known allergies. If giving amoxi + macrolide --> put on high dose amoxi b/c she had it before -- can make a case for amoxi/clav, but really amoxi alone is good enough

1. Which signs, symptoms and test results are compatible with the diagnosis of pneumonia?

Dec air entry, high fever, sputum, headache (mycoplasma?), x-ray confirms, sputum C&S done when there's productive cough and only when it changes treatment and if they're really sick (ICU - unusual, resistant organisms)

2. Which microorganisms are most the most likely etiologic agents in this case?

Mycoplasma pneumonia, Chlamydia pneumonia, Strep pneumonia, H. Flu?, viral (may get pneumo with a viral infection)

H. flu, moraxella catarrhalis in COPD co-morbidity

3. What drug-related problems do you find in this case?

Amoxi not first line, cipro not best either --- cefuroxime not great either (good for H. Flu)
missing coverage for atypicals (M, C pneumo) --> need macrolides. Macrolides cover strep pneumo 77% as well.

Doxycycline is a
good choice covers
strep pneumo (84%)
as well as the atypical
bacteria

4. Which therapeutic alternatives would be appropriate for this patient?

5. What recommendation would you make in this case? Would all of the likely pathogens be covered by your choice?

6. How long should this patient be treated?

Doxy --> 10 days

azithro --> 5

7. If the patient in case 1 were a 31 year old pregnant female with an allergy to penicillin, how would it affect your choices?

Prego --> not doxy or clarithro -- may give erythro estolate

allergy --> not amoxi or beta lactams

Case #2

C.R. is a 75 year old lady, 5'3" weighing 65 Kg with a history of COPD. She presented to the emergency department with a productive cough, fever (39.5° C), and some shortness of breath. She was fine until last night when she suddenly developed a fever and cough. On examination, she is oriented to time and place, mildly tachypneic (RR 26) with diminished air entry and dullness to percussion on the right side. Her HR was 120 BPM, and BP 110/70. A chest X-ray showed a right middle lobe infiltrate and no signs of pleural effusion. The physician sent her home with a prescription for Ciprofloxacin 750 mg t.i.d. She has no known allergies.

PSI score --> to hospitalize or not

The medications she is currently taking include:

Cipro won't cover *Strep pneumo*,
staph aureus, or *C. pneumo*
It'll cover *H. flu*, *M. catarrhalis*
& *Enterobacteriaceae*
Doxy will cover most of those

Atrovent ii puffs qid
Ventolin ii puffs qid prn
Captopril 25 mg tid *tid? give ramipril*
Multivitamin with iron daily
Vitamin E 400 I.U. bid
Metamucil prn

Her lab test results were as follows:

Liver Function tests	N	
PH	7.37	
BUN	6	mmol/L
Cr	95	mmol/L
Sodium	138	mmol/L
Potassium	3.9	mmol/L
Cl	105	mmol/L
Glucose	7.9	mmol/L
Hct	0.40	
O ₂ Saturation	90%	

1. Which signs, symptoms and lab results are consistent with the diagnosis of pneumonia?

2. Which microorganisms are most the most likely etiologic agents in this case?

Strep pneumo, *H. flu*, *Staph aureus*, *Moraxella Catarrhalis*, *Enterobacteriaceae* (not in normal pts), *C. pneumo*

3. What drug related problems do you find with this case?

Cipro not a good choice at all.

4. What therapeutic alternatives would be appropriate for this patient considering that her physician feels that she is stable enough for outpatient therapy?

5. What recommendations would you make for this patient?

6. How long should this patient be treated?

mostly 7-10 days

5 days? minimum --

Mycoplasma pneumonia --> 14-21 days

7. If this woman had been treated with Clarithromycin 2 months ago for acute sinusitis, how would this change your management?

Case #3

G. S. is a 77 year old man 5'11", 190 lb. who presents to the emergency department with complaints of a fever (39°C) and chills, productive cough and increasing shortness of breath. His RR is 33/min, HR 128 BPM, BP 125/70, WBC $19 \times 10^9/L$ with 18% bands. He is extremely dyspneic. His O₂ saturation is 80% by oximetry and oxygen is started by nasal prongs. His chest X-ray showed infiltrates in the right lower lobe. Sputum was collected for a gram stain and culture and sensitivities and sent to the lab. He was admitted to the hospital. His medical history includes diabetes, arthritis, mild hypertension and C.O.P.D. He has no known allergies.

His medications at home include:

Theodur 200 mg at bedtime
Atrovent ii puffs qid
Ventolin ii puffs prn up to 4 times a day.
Hydrochlorthiazide 50 mg od hypokalemia ceiling dose
K-lyte 20 mmol od
Naprosyn 250 mg bid
Humulin-R and Humulin-N insulin twice a day with extra regular as needed.

Lab Value Results:

pH	7.36
BUN	8.5
Cr	150 mmol/L
Na	137 mmol/L
K	3.8 mmol/L
Glucose	12.8 mmol/L
Hct	45%
O ₂ saturation	80%

1. What signs, symptoms and test results are consistent with the diagnosis of pneumonia?

What rating would he receive using the Pneumonia-specific severity of illness score?

What rating would he receive using CURB-65?

fever, inc HR, inc WBC (pretty bad), inc. bands = recent infection, inc. resp rate, O₂ Sat% very low (<90)

2. Which microorganisms are most the most likely etiologic agents in this case?

3. Which antibiotics might be appropriate in this case?

4. What duration of therapy would be appropriate for this patient?

5. If a C&S of sputum had been done and came back showing

S. pneumoniae: Sensitive: Penicillin, Erythromycin, TMP/SMX, Cefazolin, Cefuroxime, Cefotaxime

6. What would be the most appropriate therapy for this patient?

Case #4

Mrs. Norma Milner is an 85 year old, 5.5", 65 Kg woman who has been in a nursing home for dementia for the past 2 years. Today she developed a cough and a temperature of 38.5°C with some shortness of breath. Her RR was 28 and BP 125/80. Her physician ordered a chest X-ray that showed right lower lobe infiltrates indicative of pneumonia.

Mrs. Newman has mildly elevated blood pressure controlled by hydrochlorthiazide 25 mg /day and metoprolol 25 mg/day. In addition, she takes aspirin 81 mg, Metamucil, a multivitamin daily and occasional acetaminophen for aches and pains.

- 1. Which pathogens are the most likely cause of pneumonia in this patient?**
- 2. What treatment regimen would you recommend for this patient?**
- 3. How would your recommendation change if this lady had experienced a Type 1 reaction to penicillin previously?**
- 4. What steps should be taken to help prevent the development of pneumonia in the future?**

Case #5

Mrs. T. R. arrives in your pharmacy with a prescription for Keflex 250 mg qid x 10 days for her 10 year old daughter Kara. She tells you that she has had a cough and a running nose for one week with a temperature around 38°C on and off. She took her daughter to her family doctor today because her cough had not cleared up yet. Her doctor diagnosed acute bronchitis and gave her this prescription. Kara has been previously healthy. She has no known allergies.

1. What are the likely pathogens causing acute bronchitis in this case?

2. What is the recommended treatment in this case?

3. What recommendations would you make in this case?