The Multiple Facets of CAP

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Community acquired pneumonia (CAP) continues to be a significant health burden in Canada. It has been estimated that CAP accounts for approximately one million physician visits, 60,000 hospitalizations and as many 8,000 deaths, annually in Canada. In addition, the estimated annual cost associated with CAP in Canada may exceed one hundred million.[1]

The mortality rate associated with CAP varies significantly from series to series and is a reflection of the severity of the illness and the associated co-morbid conditions.[2] The mortality rate is < 1% in patients who do not require hospitalization and exceeds 40% in patients who require intensive care unit admission with associated bacteremia.[3] Mortality from CAP is also associated with advanced age (> 65 years of age) and co-morbid conditions, such as:

- chronic obstructive pulmonary disease (COPD),
- diabetes,
- mellitus,
- renal dysfunction,
- congestive heart failures and
- liver disease.[4]

Although patients with CAP can present with symptoms and signs consistent with a lower respiratory tract infection, such as cough, purulent sputum, dyspnea, chills, fever, unilateral crackles, dullness to percussion and bronchial breath sounds, making an accurate diagnosis of pneumonia and prediction of likely pathogens is modest at best. [5,6] It is particularly difficult to diagnose CAP in elderly patients.[7] Furthermore, although a new

Jennifer's Situation

- Jennifer, 68, is a smoker with an established history of COPD.

- She presents to your office with shortness of breath, fever and a productive cough for the past two to three days.
- Her past history includes hypertension and ischemic heart disease complicated by mild congestive heart failure.
- She had a recent (approximately two months ago) exacerbation of COPD requiring a short course of antibiotics and oral steroids.
- Jennifer is tachypneic (RR - 22/min) and she looks somewhat distressed.
- She is febrile (temperature is 39.5 °C), tachycardic (heart rate is approximately 128/min), but her BP is normal for her (140/85).
- You hear crackles and bronchial breath sounds in the lateral aspect of her right chest, but there is no wheezing or other abnormal breathing sounds.
- You suspect that Jennifer may have pneumonia and refer her to the local Emergency Department for assessment.
- Her CXR shows an infiltrate in the anterior basal segment of the right lower lobe as well as some involvement of the lateral segment of the right middle lobe.

For more on Jennifer, turn to page 75.

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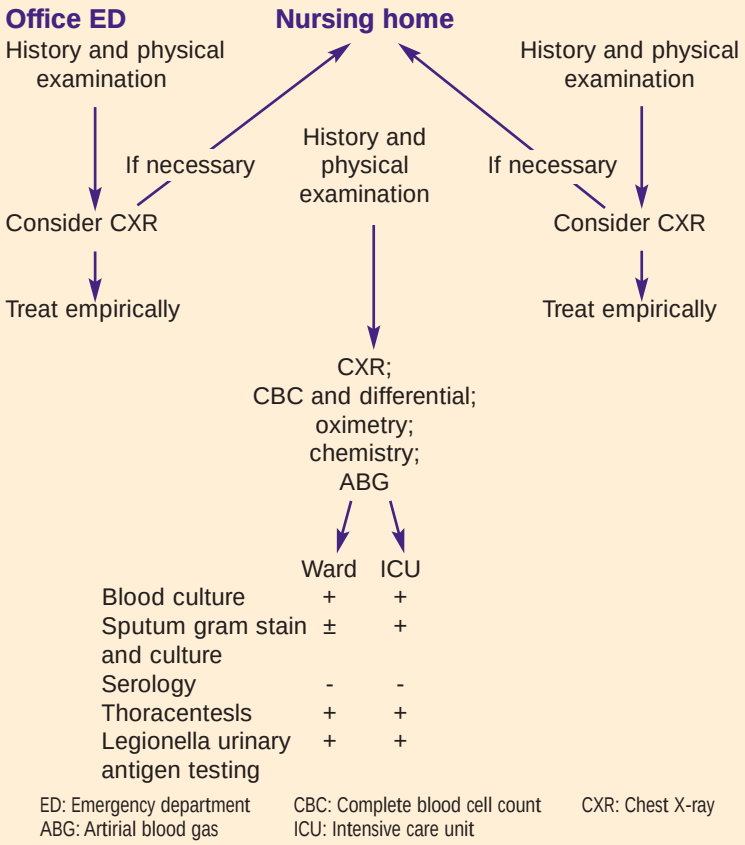


Figure 1. Diagnostic algorithm for CAP

Back to Jennifer

- On the basis of Jennifer's risk stratification, she scores 78 points (age - 10 = 58 points, CHF = 10 points, and HR > 125 = 10 points) and can be treated as an outpatient.
- Her recent course of antibiotics and oral steroids (approximately two months ago), however, places her at increased risk of *H. influenza* and/or enteric Gram-negative bacilli.
- Appropriate antibiotics in this setting include a respiratory fluoroquinolone, amoxicillin-clavulanate plus a macrolide or second generation cephalosporin plus a macrolide.
- She responds appropriately to the antibiotics and her symptoms resolve over the next 5-7 days.
- You reschedule a follow up CXR for six weeks, which shows complete resolution of her pneumonia.

and progressive infiltrate on chest X-ray's (CXR) often substantiates the clinical impression, it must be recognized that there is still considerable inter- and intra- observer variation in the diagnosis of pneumonia on a chest radiograph.[2,3] Despite this limitation, obtaining a CXR is recommended in almost all cases of suspected CAP. However, clinical practice guidelines, recognize that this may not be practical in all cases and a trial of empiric antibiotic therapy may be justified (Figure 1).[2,3,8] Unless the presence of co-morbid conditions or abnormal physical findings suggest risk factors for a poor outcome, the routine laboratory assessment of ambulatory patients with suspected CAP may be unnecessary.[2,3] Once in the Emergency Department, a patient's evaluation should include a complete blood count, electrolytes, liver function tests and renal function studies. Furthermore, an oxygen saturation assessment should be conducted. These investigations will help to categorize patients on the basis of their predicted mortality and will help to determine the need for hospitalization (Figure 2).[2,3,4]

The management of patients with CAP is partially determined by the site of care and is broadly categorized by whether the patient can be treated as an outpatient, as a nursing home resident or by if they require admission. Hospitalized patients are further stratified depending on whether or not they can be managed on the general medical ward, or if they require admission to the intensive care unit. Once the decision of whether or not hospitalization is required is made (Figure 2), the appropriate antibiotics can be selected on the basis of the suspected pathogens, the likelihood of antibiotic resistance and the presence or absence of existing co-morbid conditions (Table 1).[3] For example, a patient without existing risk factors (*i.e.* COPD, micro-aspiration) that is being treated as an outpatient can be given either a macrolide antibiotic or doxycycline. A patient with COPD, that has not received antibiotics or steroids within the past three months, can also be treated with the a macrolide antibiotic or doxy-

Table 1 Empirical antimicrobial selection for adult patients with community-acquired pneumonia

Type of patient, factor(s) involved	Treatement regimen: First choice	Treatement regimen: second choice
Outpatient without modifying factors	Macrolide*	Doxycycline
Outpatient with modifying factor **COLD** (no recent antibiotics or po steroids within past three months) **COLD** (recent antibiotics or po steroids within past three months); *H. influenza* and enteric gram -negative rods implicated	Newer macrolide** "Respiratory" fluoroquinolone***	Doxycycline Amoxicillin/clavulanate + marcrolide or 2-G cephalosporin + macrolide
Suspected macroaspiration: oral anaerobes	Amoxicillin/clavulanate ± macrolide	"Respiratoty" fluoroquinolone (*e.g.*, levofloxacin) + clindamycin or metronidazole
Nursing home resident Streptococcus pneumoniae, enteric gram-negative rods, *H.influenza* implicated Hospitalized	Respiratory fluoroquinolone alone or amoxicillin/clavulanate+marcrolide Identical to treatement for other hospitalized patient (see below)	2G cephalosporin + macrolide
Hospitalized patient on medical ward S. pneumoniae, L.pneumonia, C. pneumonia implicated	"Respiratory" fluoroquinolone	2G, 3G or 4G cephalosporin + macrolide
Hospitalized patient in ICU Paeruginosa not suspected; S. pneumoniae, L.pneumonia, C. pneumonia, enteric gram-force-justifynegative rods implicated P. aeruginosa suspected	IV respiratory fluoroquinolone + cefotaxime, ceftriaxone, or ß-lactam / ß-lactamase inhibitor Antipseudomonal fluoroquinolone (*e.g.*, ciprofloxacin) + antipseudo-monal ß-lactam or aminoglycoside	IV macrolide + cefotaxime, ceftriaxone, or ß-lactam/ ß-lactamase inhibitor Triple therapy with antipseudomonal ß-lactam (*e.g.*, ceftazidime, pipera-cillin-tazobactam, imipenem, or meropenem) + aminogylcoside (*e.g.*, gentamicin, tobramycin or amikacin) + macrolide

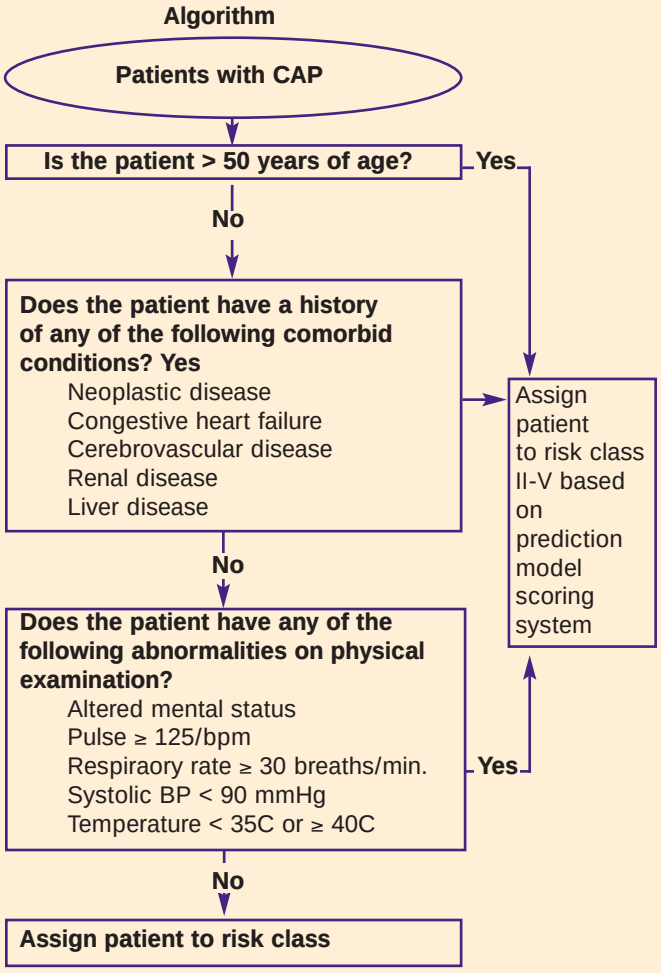
COLD: chronis obstructive lung disease po: by month; 2G: second-generation 3G: third-generation; 4G: fourth-generation. ICU: intensive care unit
*Erythromycin, azithromycin, clarithromycin.
**Azithromycin or clarithromycin.
***Levofloxacin, gatifloxacin, or moxifloxacin; trovafloxacin is restricted because of potential severe hepatotoxicity.

cycline, but the newer macrolide antibiotic erythromycin should be used instead.

Patients with COPD that have received antibiotics or steriods within the last three months should be treated instead with a "respiratory fluoroquinolone", amoxicillin-clavulanate plus a macrolide or second generation cephalosporin plus a macrolide.

If micro-aspiration is suspected in the patient, antibiotic choices would include amoxicillin-clavulanate, with or without a macrolide, a fourth generation fluoroquinolone, or a third generation fluoroquinolone, plus either clindamycin or metronidazole. For nursing home residents that are treated within the nursing home, antibiotics choices include a respiratory fluoro-

Prediction model for identification of patient risk for persons with CAP



Pneumonia-specific severity of illness scoring system

Patient's characteristics	Points assigned	Your patient's points
Dermographic factor		
Age		
Male	(age)	
Female	(age - 10)	
Nursing home resident	+10	
Cormobid illness		
Neoplastic disease	+30	
Liver disease	+20	
Congestive heart failure	+10	
Cerebrovascular disease	+10	
Renal disease	+10	
Physical examination finding		
Altered mental status	+20	
Respiratory rate > 30/min.	+20	
Systolic BP < 90 mmHg	+20	
Temperature < 35C or > 40C	+15	
Pulse > 125/min.	+10	
Laboratory finding		
pH <7.35	+30	
BUN >10.7 mmol/L	+20	
Sodium < 130 mmol/L	+20	
Glucose > 13.9 mmol/L	+10	
Hematocrit < 30%	+10	
PO < 60 mmHg or oxygen		
saturation < 90%	+10	
Pleural effusion	+10	
Total Score		

Stratification of risk score

Score ≤ 90: send home: score ≥ 91: admit to hospital.

Risk	Risk class	Base on algorithm
Low	I	0 total points
	II	≤ 70 total points
	III	71-90 total points
Moderate	IV	91-130 total points
High	V	> 130 total points

Figure 2. Risk Statifications for Patients with CAP

quinolone, amoxicillin-clavulanate plus a macrolide or second generation cephalosporin plus a macrolide (Table 1).

References:
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Take-home message

- Community acquired pneumonia is a significant health issue in Canada.
- The reliability of clinical signs and symptoms is modest at best.
- An objective risk assessment determines whether or not patients should be treated as an outpatient or an inpatient.
- Empiric antibiotics should be started without unnecessary delay.
- To select the proper antibiotic, the physician must consider the suspected pathogen, the likelihood of resistance and the presence or absence of existing co-morbid conditions.