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
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, 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 doxycyildren. Since Jennifer’s score is 78 (age - 10 = 58 points, CHF = 10 points, and HR > 125 = 10 points), she can be treated as an outpatient. However, her recent course of antibiotics and oral steroids (approximately two months ago), however, places her at increased risk of H. influenzae and/or enteric Gram-negative bacilli. Therefore, 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.

**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. influenzae 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.
The newer macrolide antibiotic erythromycin should be used instead.

Patients with COPD that have received antibiotics or steroids within the last three months should be treated instead with a “respiratory fluoroquinolone”, amoxicillin-clavulanate plus a macrolide or second generation cephalexin 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-quinolone.
Prediction model for identification of patient risk for persons with CAP

Algorithm

Patients with CAP

Is the patient > 50 years of age? Yes

No

Does the patient have a history of any of the following comorbid conditions? Yes

Neoplastic disease
Congestive heart failure
Cerebrovascular disease
Renal disease
Liver disease

No

Does the patient have any of the following abnormalities on physical examination?

Altered mental status
Pulse ≥ 125/bpm
Respiratory rate ≥ 30 breaths/min.
Systolic BP < 90 mmHg
Temperature < 35°C or ≥ 40°C

No

Assign patient to risk class II-V based on prediction model scoring system

Pneumonia-specific severity of illness scoring system

Patient's characteristics

<table>
<thead>
<tr>
<th>Points assigned</th>
<th>Your patient’s points</th>
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</table>

Dermographic factor

Age

Male
Female
Nursing home resident

Comorbid illness

Neoplastic disease
Liver disease
Congestive heart failure
Cerebrovascular disease
Renal disease

Physical examination finding

Altered mental status
Respiratory rate > 30/min.
Systolic BP < 90 mmHg
Temperature < 35°C or > 40°C
Pulse > 125/min.

Laboratory finding

pH < 7.35
BUN > 10.7 mmol/L
Sodium < 130 mmol/L
Glucose > 13.9 mmol/L
Hematocrit < 30%
PO < 60 mmHg or oxygen saturation < 90%
Pleural effusion

Total Score

Stratification of risk score

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

<table>
<thead>
<tr>
<th>Risk</th>
<th>Risk class</th>
<th>Base on algorithm</th>
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</thead>
<tbody>
<tr>
<td>Low</td>
<td>I ≤ 70 total points</td>
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<tr>
<td></td>
<td>II 71-90 total points</td>
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<td></td>
<td>III &gt; 130 total points</td>
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<tr>
<td>Moderate</td>
<td>IV 91-130 total points</td>
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<td></td>
<td>V &gt; 130 total points</td>
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</tbody>
</table>

Figure 2. Risk Statifications for Patients with CAP
quinolone, amoxicillin-clavulanate plus a macrolide or second generation cephalosporin plus a macrolide (Table 1).

References:

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.