Investigation and Management of Community-Acquired Pneumonia (CAP)
Frequently Asked Questions

1. Why was this algorithm developed?

Emergency department physicians were seeking guidance about best antimicrobial therapy for common infectious diseases in light of increasing interest around issues of antimicrobial stewardship, emergency department efficiency, and patient safety. What started as a local initiative grew into a Toronto Central LHIN-wide initiative in an effort to improve the impact of such efforts.

2. How was this algorithm developed?

A small working group, comprised of two emergency medicine physicians, an infectious diseases physician, and an infectious diseases pharmacist met and created an initial draft after reviewing the relevant literature (including published national/international clinical practice guidelines1-4), obtaining current local microbiology data, consulting with experts in infection prevention and control, and considering the practices of emergency room medicine in the Toronto Central LHIN. The draft algorithm was sent for broad stakeholder consultation, and numerous changes were made based on stakeholder feedback. A consensus meeting was convened, involving key opinion leaders from the areas of critical care medicine, emergency medicine, general internal medicine, infectious diseases, pharmacy, and respirology, with representation from all of the hospitals in the Toronto Central LHIN. Further modifications to the algorithm were made, and the document was once again sent for stakeholder feedback. The algorithm was also tested for ease-of-use and clarity by experts in Human Factors engineering.

3. Why did you choose to use CRB-65 for severity? I am much more familiar with PSI or CURB-65.

CURB-65 uses Urea in its measurement. Several TC LHIN hospitals no longer use (or are considering discontinuing availability of) urea in routine bloodwork. The PSI (Pneumonia Severity Index) is a high-quality, well-validated score for pneumonia.5 Although it provides good prognostic information, the emergency room physicians—who are most likely to make frequent use of a severity tool—were fairly unanimous that the time required to complete it makes it prohibitive. As such, we chose CRB-65, a tool that has been validated in 14 studies, involving almost 400 000 patients.6 Additionally, we are encouraging physicians to use CRB-65 only as an adjunct to clinical judgment.

4. What other investigations should routinely be performed for most patients with suspected CAP?
There is little evidence guiding which investigations should be performed in CAP. Most patients admitted to hospital will have received routine bloodwork in the emergency department (CBC, electrolytes, creatinine, glucose). Urinalysis +/- urine culture, blood gas testing, d-dimer testing (and other tests for investigating pulmonary embolism) can all be considered when the diagnosis of CAP is uncertain. Patients initially diagnosed with CAP in the emergency department frequently have other diagnoses recognized following admission—the most common of these are outlined in the algorithm.

5. What routine microbiologic investigations should be performed in the emergency department?

Most patients do not require microbiologic testing. Serology for *Mycoplasma* and *Chlamydia* species has poor operating characteristics. The Ontario Public Health Laboratories are able to perform PCR for these species (using nasopharyngeal swab specimens, similar to influenza), but these are not routinely recommended in most patients.

Urine testing for Legionella antigen, which remains positive for weeks, has an expected overall sensitivity of approximately 64-99%, with a specificity of ~99%. It has a lab turnaround time of 1 day (but is tested at the Provincial Health Laboratory, so realistic turnaround may be up to 3 days). The working group advocates testing for those patients who have failed to respond to an initial course of β-lactam therapy and for those with severe cases of CAP (included in the algorithm). PCR for Legionella can be performed on lower respiratory samples such as bronchoalveolar lavage (BAL), or sputum (if BAL is unavailable).

Blood cultures are not routinely advocated for CAP. Approximately 7% of patients with CAP will have positive blood cultures, most of which will grow *S. pneumoniae* or *H. influenzae* (and are unlikely to have results of blood cultures alter therapy). However, patients with CAP meeting SIRS criteria have a much higher likelihood of having positive blood cultures, and should have blood cultures drawn.

**SIRS Criteria**

At least 2 of the following:

- **Temperature** <36°C or >38°C
- **Heart rate** >90/min
- **Respiratory rate** >22/min OR pCO2 >32 mm Hg on arterial blood gas

**White blood cell count** <4000/μL or >12 000/μL (or >10% immature/band neutrophils)
6. The most obvious difference between this algorithm and many published guidelines (including that of the Infectious Diseases Society of America\textsuperscript{2,3}) relates to the de-emphasis of therapy for atypical bacteria (i.e. \textit{Chlamyphila pneumoniae}, Legionella species and \textit{Mycoplasma pneumoniae}). Why was this done?

The issue of “atypical coverage” is a contentious one.\textsuperscript{9} Many guidelines have chosen to include atypical coverage for all clinical scenarios of CAP (including the Canadian Thoracic Society, the Infectious Diseases Society of America/American Thoracic Society, and the British Thoracic Society)\textsuperscript{2,3,10} although the most recent Dutch Guidelines do not\textsuperscript{4}. The recent European Guidelines indicate that ‘definite conclusions cannot be made from the present data. Therefore, it appears that combination treatment should be restricted to patients with higher risk classes’.\textsuperscript{11}

The authors of the various guidelines advocating atypical coverage have used several lines of reasoning to support their recommendations, including the evidence from large-scale studies demonstrating the importance of atypical bacteria in the epidemiology of CAP. Additionally, a widely cited retrospective health services research study—looking at almost 13 000 elderly (US Medicare) patients with CAP—found that initial combination therapy with a cephalosporin and macrolide or fluoroquinolone monotherapy were associated with lower 30-day mortality compared to either β-lactam or macrolide monotherapy.\textsuperscript{12}

However, there are no large-scale, high-quality, randomized controlled trials demonstrating the superiority of therapy that includes coverage for atypical bacteria over therapy that does not. To the contrary, 3 peer-reviewed published systematic reviews for patients with CAP managed as either inpatients or as outpatients, involving dozens of trials and thousands of patients have failed to demonstrate superiority of adding coverage of atypical bacteria in treatment regimens.\textsuperscript{13-15} In addition, no single trial has ever demonstrated superiority of one regimen versus another.

In the province of Ontario, approximately 70-100 patients are diagnosed with Legionnaire’s Disease (i.e. Legionella pneumonia) annually.\textsuperscript{16} Clustering of cases occurs between June and October. Legionella is rare in winter months. In recent years, the number of diagnoses has increased, although it is unclear whether this is due to a high incidence of Legionellosis or due to increased testing. Mortality from Legionnaire’s disease in Ontario is 9%.

On the basis of this information, combined with concerns of cost (to patients and to society), resistance (esp. to fluoroquinolones), and \textit{C. difficile},\textsuperscript{17} the Toronto Central LHIN CAP Working Group chose to de-emphasize therapy for atypical bacteria.

The driving reason to remove macrolides as first-line therapy in outpatient CAP relates to increasing pneumococcal resistance to macrolides, which was 28% in Ontario in 2010-2011 (courtesy of Dr. Allison McGeer, personal communication). For this same reason, amoxicillin is not included as empiric therapy because of the significant resistance (~20%) found in H. influenzae isolates. Concerns about the safety of azithromycin are notable, but the Working Group felt the magnitude of the issue was secondary compared to resistance issues.

8. Does this algorithm really apply to Nursing Home patients? I thought they are more at risk for drug-resistant infections.

There is no strong evidence that “nursing home pneumonia” should be treated differently than community-acquired pneumonia. Several recent studies have demonstrated that the bacterial pathogens are largely similar in the two demographic groups, and that the same treatment approaches can be used for the two groups.

References


