Antimicrobial Stewardship Matters

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Do all infiltrates need antibiotics?

Differentiating viral versus bacterial pneumonia

At a Glance:

- **Patients with "viral" symptoms** (e.g., runny nose, sneezing, congestion, sore throat, conjunctivitis) **and exposure** (sick contacts, or in viral epidemic season) **and a chest x ray infiltrate** most likely have **viral pneumonia**.
- **Bacterial pneumonia rarely complicates viral bronchitis (<10%** either concurrent OR secondary bacterial infection).
- In patients with **non-severe illness with a viral prodrome, antibiotics are not needed** unless there are signs of bacterial infection (see below), a positive culture, or possibly negative viral studies.
- **Exception:** secondary bacterial illness or positive sputum culture
  - **E.g., "double sickening"** (sudden worsening after previous improvement of a viral syndrome)

Typical features of Viral Lower Respiratory Tract Infection

In most community-acquired pneumonia cases, the pathogen is unknown, but viral pathogens are identified more commonly than bacterial pathogens[1].

Classical features which are suggestive of viral pneumonia include:

- **History of exposure to sick contacts** (especially household contacts)
- **Upper respiratory infection prodrome or symptoms** (e.g., runny nose, stuffiness, conjunctivitis, sneezing, sore throat, painful swallowing
- **Occurrence during peaks of viral epidemic season** (generally October – March)
- **Notably, people with viral pneumonia feel as sick as those with bacterial pneumonia (similar symptom intensity and duration)**[2]

What About Secondary/Concurrent Bacterial Pneumonia?

True bacterial co-infection infection (presenting to the hospital with two concurrent actively infecting organisms) or secondary infection (bacterial infection occurring as viral symptoms

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resolve) is uncommon (<10% of all cases). It can vary depending on the circulating virus (0.5 to 6.1% of cases) so assessment and follow up is still important.

- **Influenza Bacterial secondary or coinfection**: Occurs in ~0.5-2.5% of influenza cases[3-4]
- **COVID-19 Bacterial Co-Infection**: Bacterial organism identified in only 2% of respiratory cultures in an RCT conducted in Alberta[5]
- **Post-COVID Bacterial Pneumonia**: Occurs in 3.2-6.1% of COVID-19 cases[6]

Patients who are critically ill, requiring ventilation or hemodynamic support are more likely to be co-infected with a bacterial pathogen (frequency increases to 10-20% range)[7] as well as patients who worsen after initial improvement in viral symptoms[8].

Diagnostic Pitfalls: White Blood Cell Count (WBC) & Chest Imaging does not differentiate viral and bacterial pneumonia

White blood cell (WBC) counts have poor predictive value[9]. A normal WBC count is thought to suggest viral infection, but an elevated WBC count can be seen in viral infection due to inflammatory cascades and endogenous cortisol release. For example, many (~40%) cases of pediatric viral pneumonia will present with an elevated WBC count[10]

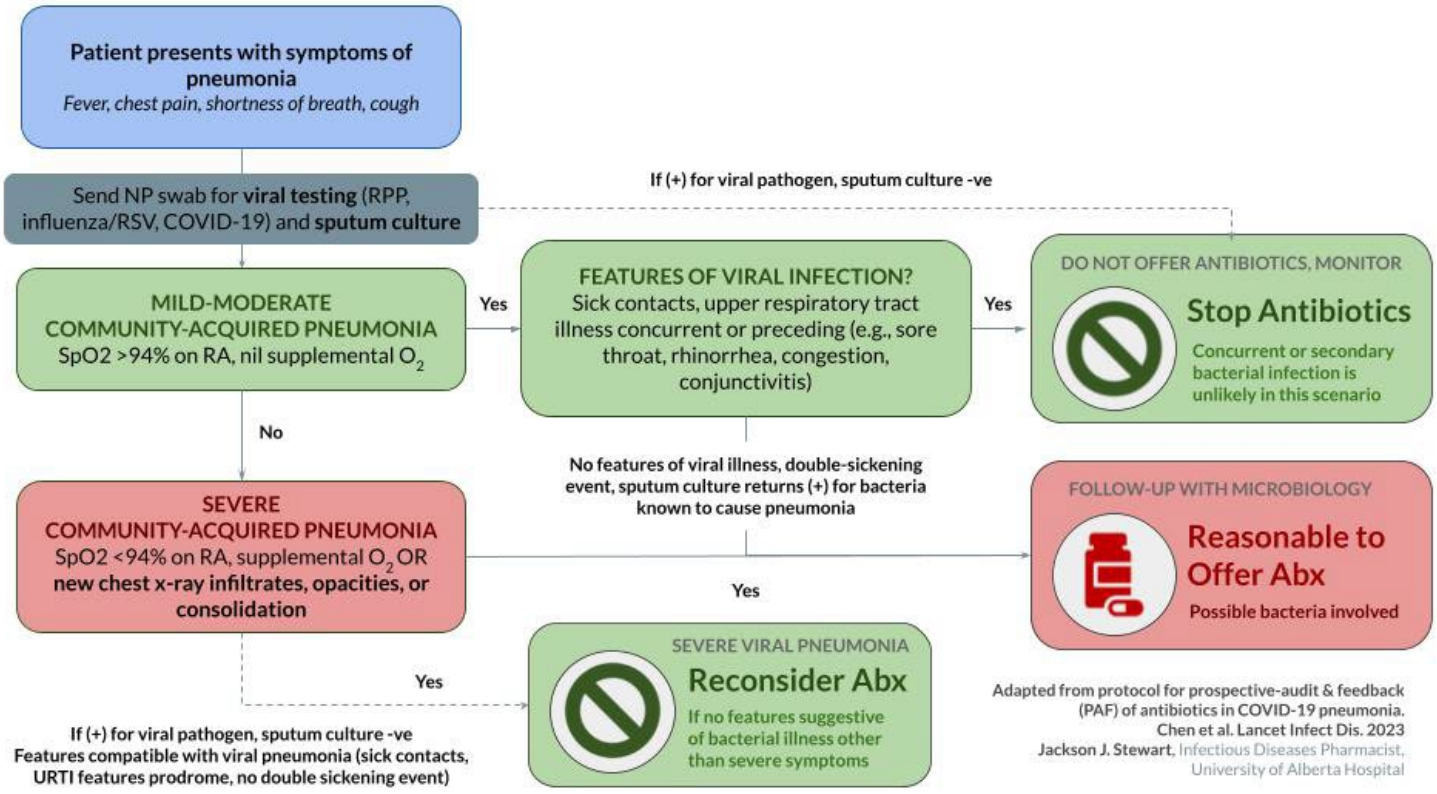
Although bacterial pneumonia is classically associated with lobar & unilateral infiltrates, there is considerable overlap of viral and bacterial pneumonia[11]. As such, chest x ray findings provide questionable value for guiding antibiotic decisions. A study conducted in 2020 found that artificial intelligence was unable to distinguish between viral and bacterial pneumonia when using clinical symptoms and radiology reports[12].

- Therefore, a high WBC count or CXR findings in isolation do not justify antibiotic use in a patient with a viral syndrome and/or microbiologically identified viral pathogen.

A chest x-ray infiltrate suggests that lung tissue is inflamed—it does not prove bacteria are responsible. Unless a patient is severely ill or worsening ("double sickening"), a positive viral test or clinical viral prodrome means antibiotics can safely be withheld or stopped within 24 to 48 hours, regardless of CXR appearance or WBC count.

Deciding to Offer Antibiotics

Adapted workflow based on the clinical protocol for the prospective audit & feedback (PAF) of antimicrobials in COVID-19[5]



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