

# Antimicrobial Treatment of Hospital Acquired Pneumonia (HAP)

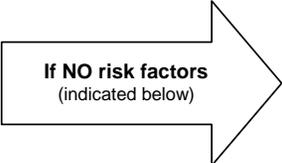
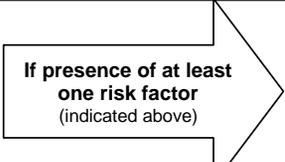
(New Brunswick Provincial Health Authorities Anti-Infective Stewardship Committee, May 2018)

**Definition:** Pneumonia that develops 48 hours or more after admission to hospital.

\*\*\*Note: ventilator-associated pneumonia is excluded; please refer to ventilator-associated pneumonia guidelines.\*\*\*

**Probable pathogens:** *S. aureus* (MSSA or MRSA), Gram-negative bacilli (e.g., *E. coli*, *K. pneumoniae*, *P. aeruginosa*), or *S. pneumoniae*.

**Microbiological analyses:** Blood cultures x 2 sets (always) + sputum culture +/- *S pneumoniae* urinary antigen

Risk stratification	Patient's condition	Empiric therapy <sup>o</sup>	Comments
 <p><b>If NO risk factors</b> (indicated below)</p>	STABLE	<p><u>First-line</u> cefTRIAxone 2 g IV q24h</p> <p><u>If true immediate allergy to a beta-lactam at risk for cross-reactivity with cefTRIAxone<sup>Δ</sup>:</u> levofLOxacin 750 mg IV/PO q24h* OR moxifloxacin 400 mg IV/PO q24h</p>	<ul style="list-style-type: none"> <li>Consider adding empiric vancomycin (target trough 15-20 mg/L) in patients with a risk factor for MRSA:                             <ul style="list-style-type: none"> <li>History of MRSA infection or colonization</li> <li>Injection drug use</li> <li>Homelessness</li> <li>Member of First Nations community</li> <li>Incarcerated person</li> <li>Recent travel to an MRSA endemic region</li> </ul> </li> <li>If history of infection or colonization with Gram-negative bacilli producing AmpC or ESBL beta-lactamases, empiric use of meropenem is encouraged (may consider fluoroquinolones if stable and no risk factors).</li> <li>DO NOT use cefTRIAxone or moxifloxacin if <i>Pseudomonas</i> infection is confirmed or suspected.</li> <li>If the patient received an antibiotic in the past 3 months, choose an antibiotic from a different class, regardless of clinical success.</li> <li><b>Second anti-pseudomonal agents</b> should be from another class, and can include:                             <ul style="list-style-type: none"> <li>tobramycin 7 mg/kg IV q24h*</li> <li>ciprofloxacin 400 mg IV q8h*</li> </ul> </li> </ul>
	UNSTABLE (or requiring higher level of care)	<p><u>First-line</u> piperacillin-tazobactam 4.5 g IV q6h*</p> <p><u>If true immediate penicillin allergy<sup>Δ</sup></u> meropenem 500 mg IV q6h*</p> <p><u>If severe delayed reaction<sup>‡</sup> to a beta-lactam:</u> levofLOxacin 750 mg IV q24h* + tobramycin 7 mg/kg IV q24h*</p>	
<p><b>Risk factors for MDR pathogens or poor outcomes</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Use of IV antibiotics in past 90 days</li> <li><input type="checkbox"/> Immunosuppression</li> <li><input type="checkbox"/> Chronic lung disease (e.g., bronchiectasis, cystic fibrosis)</li> <li><input type="checkbox"/> In intensive care unit (ICU) when symptoms appear, or transferred from ICU in last 48 hours</li> </ul>	STABLE	<p><u>First-line</u> piperacillin-tazobactam 4.5 g IV q6h*</p> <p><u>If true immediate penicillin allergy<sup>Δ</sup></u> meropenem 500 mg IV q6h*</p> <p><u>If severe delayed reaction<sup>‡</sup> to a beta-lactam</u> levofLOxacin 750 mg IV/PO q24h* + tobramycin 7 mg/kg IV q24h*</p>	
	UNSTABLE (or requiring higher level of care)	<p><u>First-line</u> piperacillin-tazobactam 4.5 g IV q6h* + 2<sup>nd</sup> anti-pseudomonal agent (+/- vancomycin 25 mg/kg IV x 1 dose, then 15 mg/kg IV q8h*; see comments)</p> <p><u>If true immediate penicillin allergy<sup>Δ</sup>:</u> meropenem 500 mg IV q6h* + 2<sup>nd</sup> anti-pseudomonal agent (+/- vancomycin 25 mg/kg IV x 1 dose, then 15 mg/kg IV q8h*; see comments)</p> <p><u>If severe delayed reaction<sup>‡</sup> to a beta-lactam</u> levofLOxacin 750 mg IV q24h* + tobramycin 7 mg/kg IV q24h* + vancomycin 25 mg/kg IV x 1 dose, then 15 mg/kg IV q8h*</p>	
 <p><b>If presence of at least one risk factor</b> (indicated above)</p>			
<b>Duration of therapy</b>			
<ul style="list-style-type: none"> <li><b>Treat for no more than 7 days if good clinical response, regardless of bacterial etiology.</b></li> <li>Treatment duration could be prolonged for more than 7 days in certain situations (e.g., empyema, extrapulmonary infections, <i>S. aureus</i> bacteremia, immunosuppression, etc.)</li> </ul>			

(continued on next page)

## Clinical Pearls

- Recent studies have shown that, compared with standard treatment durations of 10 days or more, 7-day treatment durations were associated with fewer relapses caused by multiresistant pathogens WITHOUT affecting mortality rate.
- To avoid prolonged use of broad-spectrum antibiotics, it is essential to de-escalate therapy according to the results of microbiologic analyses.
- For patients with HAP requiring intubation, an endotracheal secretions culture is recommended.
- Empiric coverage of atypical organisms (e.g., *Legionella*, *Mycoplasma*) is generally not recommended. Consider atypical coverage if nosocomial outbreak of *Mycoplasma* or *Legionella*.
- Empiric double coverage of *Pseudomonas aeruginosa* is to maximize the likelihood of having at least one active agent (due to increased risk of resistance with *Pseudomonas*). If *Pseudomonas* is isolated, step-down to monotherapy (according to susceptibility data). \*\*\*Use of aminoglycosides (e.g., tobramycin and gentamicin) as monotherapy for the treatment of pneumonia is NOT recommended (even if susceptibility is confirmed).
- DO NOT use DAPTOmycin to treat pneumonia; DAPTOmycin is inactivated by pulmonary surfactant. If MRSA infection, use vancomycin (or linezolid if vancomycin is ineffective or inappropriate).
- Serial procalcitonin levels (if available), in combination with clinical evaluation, may assist in the decision to discontinue antibiotics.

\* Dose adjustment required in renal impairment.

∞ If microbial cause of infection known, treat accordingly.

▲ Immediate, IgE mediated allergies include, but are not limited to, anaphylaxis, urticaria, angioedema, hypotension, bronchospasm, stridor, and pruritic rash. Refer to the NB-ASC Beta-Lactam Allergy guidelines to determine which beta-lactams share similar side chains.

‡ Severe delayed hypersensitivity reactions to beta-lactams are caused by mechanisms that are not well known and require that subsequent use of beta-lactams be avoided. Severe delayed hypersensitivity reactions can include interstitial nephritis, immune hepatitis, hemolytic anemia, serum sickness, severe cutaneous reactions such as Stevens-Johnson syndrome, toxic epidermal necrolysis, and drug rash with eosinophilia and systemic symptoms (DRESS).

## References:

1. Kalil AC et al. Management of Adults with Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society. *Clinical Infectious Diseases*. 2016; 63: 1-51
2. Pugh R, Grant C, Cooke RP, Dempsey G. Short-course versus prolonged-course antibiotic therapy for hospital-acquired pneumonia in critically ill adults. *Cochrane Database Syst Rev* 2015; 8: Cd007577
3. Blondel-Hill E. & Fryters S. (2012). Bugs & Drugs. An Antimicrobial/Infectious Diseases Reference. Alberta Health Services.
4. MSH+UHN Antimicrobial Stewardship Program. Hospital Acquired Pneumonia. Accessed online 12-2016.
5. Management of Penicillin and Beta-Lactam Allergy. NB-ASC. 09-2017
6. Adult Antimicrobial Dosing Tool. NB-ASC. 09-2017