Antimicrobial Treatment of Hospital Acquired Pneumonia (HAP)

(New Brunswick Provincial Health Authorities Anti-Infective Stewardship Committee, September 2019)

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∞	Comments
If NO risk factors (indicated below)	STABLE	First-line cefTRIAXone 2 g IV q24h If **true immediate allergy** to a beta-lactam at risk for cross-reactivity with cefTRIAXone▲ or **severe delayed reaction to a beta-lactam**‡: levoFLOXacin 750 mg IV/PO q24h* OR moxifloxacin 400 mg IV/PO q24h	• Consider adding empiric vancomycin (target trough 10-15 mg/L) in patients with a risk factor for MRSA: ○ History of MRSA infection or colonization ○ Household contact with a MRSA colonized individual ○ Injection drug use ○ Homelessness ○ Incarcerated person ○ Recent travel to or residing in a MRSA endemic region or community • 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 susceptibility known, stable and no risk factors). • DO NOT use cefTRIAXone or moxifloxacin if *Pseudomonas* infection is confirmed or suspected. • If the patient received an antibiotic in the past 3 months, choose an antibiotic from a different class, regardless of clinical success. • **Second anti-pseudomonal agents** should be from another class, and can include: ○ tobramycin 7 mg/kg IV q24h* **OR** ○ ciprofloxacin 400 mg IV q8h* • **Tailer antibiotic therapy based on microbiology results**
Risk factors for MDR pathogens or poor outcomes ☐ Use of IV antibiotics in past 90 days ☐ Immunosuppression ☐ Chronic lung disease (e.g., bronchiectasis, cystic fibrosis) ☐ In intensive care unit (ICU) when symptoms appear, or transferred from ICU in last 48 hours	UNSTABLE (or requiring higher level of care)	First-line piperacillin-tazobactam 4.5 g IV q6h* If **true immediate penicillin allergy**▲ meropenem 500 mg IV q6h* If **severe delayed reaction**‡ to a beta-lactam: levoFLOXacin 750 mg IV q24h* **+** tobramycin 7 mg/kg IV q24h*	
If presence of at least one risk factor (indicated above)	STABLE	First-line piperacillin-tazobactam 4.5 g IV q6h* If **true immediate penicillin allergy**▲ meropenem 500 mg IV q6h* If **severe delayed reaction**‡ to a beta-lactam levoFLOXacin 750 mg IV/PO q24h* **+** tobramycin 7 mg/kg IV q24h*	
	UNSTABLE (or requiring higher level of care)	First-line piperacillin+tazobactam 4.5 g IV q6h* **+** 2nd anti-pseudomonal agent *(**+/-** vancomycin 25 to 30 mg/kg IV x 1 dose, then 15 mg/kg IV q8–12h*; see comments)* If **true immediate penicillin allergy** ▲: meropenem 500 mg IV q6h* **+** 2nd anti-pseudomonal agent *(**+/-** vancomycin 25 to 30 mg/kg IV x 1 dose, then 15 mg/kg IV q8–12h*; see comments)* If **severe delayed reaction**‡ to a beta-lactam levoFLOXacin 750 mg IV q24h* **+** tobramycin 7 mg/kg IV q24h* **+** vancomycin 25 to 30 mg/kg IV x 1 dose, then 15 mg/kg IV q8–12h*	

Duration of therapy

- **Treat for no more than 7 days if good clinical response, regardless of bacterial etiology.**
- Treatment duration could be prolonged for more than 7 days in certain situations (e.g., empyema, extrapulmonary infections, *S. aureus* bacteremia, immunosuppression, etc.)

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, angiœdema, 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