

Purpose of Guideline

- To assist in guiding appropriate diagnostic workup, initial antibiotic selection, and follow-up treatment for patients with HAP or VAP.
- This guideline is for **hospital-acquired** infection. Patients with healthcare-associated pneumonia, including those admitted from a long term care or skilled nursing facility may require alternative management.

Key Points

- Triple antibiotic coverage should be used for patients at risk for multi-drug resistant Gram Negative infection (Page 2).
- Seven days is the recommended treatment duration in most cases (Page 3).
- **Do not** delay antimicrobial administration if cultures cannot be obtained.

Clinical Features of Pneumonia

HAP*

- Fever, leukocytosis
- Rigors, sweats, chest discomfort
- New cough with/without sputum production
- Change in color/consistency of sputum
- Dyspnea, increased oxygen requirements

VAP (in addition to list above)**

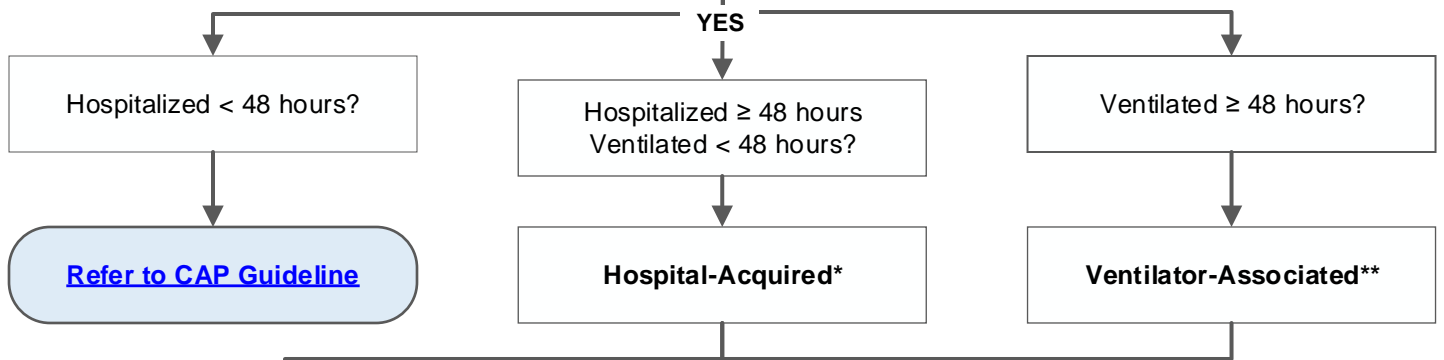
- Increased suctioning and/or ventilator demand

Evaluation and Testing

- History with compatible symptoms
- Physician examination
- Pulse oximetry
- CBC
- Chemistry panel
- Chest X-ray demonstrating new infiltrates

Signs and symptoms consistent with pneumonia
* Review previous culture prior to selecting empiric antibiotic therapy

Antibiotics not indicated – search for other causes



Non-Ventilated

Ventilated

Diagnostics

- Blood cultures (before antibiotics given, if possible)
- Consider sputum culture
- MRSA PCR nasal swab
- Consider procalcitonin trending

Diagnostics

- Blood cultures (before antibiotics given, if possible)
- Order BAL consult lab prior to performing a Bronchoalveolar lavage (BAL), blind bronchial sampling (mini-BAL). If unable to obtain BAL, obtain MRSA PCR Nasal Swab
- Consider procalcitonin trending

Empirical therapy
(Table 1, Page 2)

Empiric Antibiotic Selection for Hospital-Acquired and Ventilator-Associated Pneumonia

Dosing guidance can be found within the [Adult Antimicrobial Dosing Guideline](#).

Table 1: Hospital-Acquired and Ventilator-Associated Pneumonia Therapy

All patients should receive coverage against **MRSA** and ***Pseudomonas***.

Note: Review previous cultures prior to selecting therapy.

STEP 1	FIRST Antibiotic	Notes
Order MRSA-Directed / Gram Positive Therapy	Vancomycin	A loading dose may be needed.
STEP 2	SECOND Antibiotic	Notes
Order ONE Pseudomonas-Directed/ Gram Negative Therapy	Piperacillin/Tazobactam OR	
	Cefepime OR	Indication: <ul style="list-style-type: none"> ▪ If non-anaphylactic penicillin allergy or febrile neutropenia, use cefepime. ▪ If aspiration suspected, add anaerobic coverage with metronidazole or clindamycin.
	Aztreonam OR	Indication: <ul style="list-style-type: none"> ▪ If anaphylactic penicillin allergy and/or cephalosporin allergy, use Aztreonam*. ▪ If aspiration suspected, add anaerobic coverage with metronidazole or clindamycin.
STEP 3	THIRD Antibiotic	Notes
Order Third Agent ONLY if patient is at risk for multi-drug resistant (MDR) gram negative infection based on indications below	Tobramycin OR Polymyxin B	<ul style="list-style-type: none"> ▪ Polymyxin B therapy should be considered over Tobramycin in patients with a history of multidrug-resistant (MDR) gram negative respiratory infections or residence at a long-term care or extended-care facility.
Indications for Third Antibiotic (If patient meets one or more indication below add a third antibiotic)		
Hospital-Associated <ul style="list-style-type: none"> ▪ Septic shock ▪ Prior broad-spectrum IV antibiotic use within 90 days (e.g. cefepime, piperacillin/tazobactam) ▪ History of <i>Pseudomonas</i> or MDR gram negative pathogen ▪ Respiratory failure requiring ventilator support ▪ Structural lung disease: e.g. bronchiectasis, cystic Fibrosis ▪ If Aztreonam* selected due to penicillin allergy add second gram negative agent. (See Step 3) 		Ventilator-Associated <ul style="list-style-type: none"> ▪ Septic shock ▪ Prior broad-spectrum IV antibiotic use within 90 days (e.g. cefepime, piperacillin/tazobactam) ▪ History of <i>Pseudomonas</i> or MDR gram negative pathogen ▪ Acute respiratory distress syndrome (ARDS) preceding VAP ▪ ≥ 5 days of hospitalization prior to VAP ▪ Acute renal replacement therapy prior to VAP ▪ If Aztreonam* selected due to penicillin allergy add second gram negative agent. (See Step 3)

De-escalation and Duration of Therapy

- **De-escalate and direct therapy based on the following culture results:**
 - If a quantitative BAL is obtained, therapy should be reserved for organisms with $>10^4$ colony-forming units.
 - If MRSA PCR Nasal Swab is negative consider discontinuing empiric MRSA coverage.
- **Indications for transition to oral antibiotic therapy (see [IV to PO Conversion Policy](#)).**
 - Attention should be given to interactions with food and tube feedings. The following criteria are proposed based on national and institutional guidelines:
 - Eating solid/oral food or tolerating tube feedings at goal
 - Absence of intractable nausea/vomiting, malabsorption syndrome, or significant vasopressor support which may impact enteral absorption
 - Hemodynamically stable
- **Seven days is the recommended duration for most patients.** Longer therapy should be considered in the following situations:
 - Delayed clinical response
 - Empiric therapy resistance
 - Empyema
 - Recurrence
 - Extrapulmonary manifestations
 - Severely immunocompromised

Clinical Considerations

- **Review previous cultures prior to selecting therapy.** Patients with a recent history of respiratory infections secondary to *Stenotrophomonas*, *Acinetobacter*, *Burkholderia*, ESBL-producing organisms, or pathogens otherwise resistant to one or more of the options listed should have their empiric treatment tailored to known susceptible agents.
- **Consider Infectious Diseases consult** if lack of clinical response or evidence or history of resistant pathogen(s) (e.g. MDR *Pseudomonas*), or Immunocompromised patients.
 - Refer to the [MDRO Treatment Table](#) for further guidance on resistant pathogens.
- **Administer appropriate antibiotics within one hour, particularly for patients in septic shock.** See [Initial Sepsis Management Guideline](#) and [Infection by Site Antibiotic Grid](#). Evaluate response to antibiotics after 48 hours and tailor accordingly.

References

- 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. *CID* 2016;63(5):e61-111.

Quality Measures

- Percentage of HAP/VAP patients with respiratory cultures
- Percentage of HAP/VAP patients without respiratory cultures with MRSA Nasal Swab
- Orderset use

Authors

- Bruce Doepker, PharmD, BCPS
- Jessica Elefritz, PharmD, BCCCP
- Matthew Exline, MD, MPH
- Daniel Martin, MD
- Kurt Stevenson, MD, MPH
- Lynn Wardlow, PharmD, MBA, BCPS-AQ ID

Order Sets and Resources

- OSU IP MED: Nosocomial Pneumonia (HAP/VAP) [2557], *order set under revision*
- [Initial Sepsis Management Guideline](#)
- Blood Culture Indication Guideline (pending)
- [OSUMC Drug Formulary](#)
- [Hospital Antibiogram](#)
- Antimicrobial Stewardship Resources: [Infection by Site](#), [MDRO Treatment Table](#)

Guideline Approved

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