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December 2019 ~ Resource #351201

Treatment of Community-Acquired Pneumonia in Adults

The charts below are based on the 2019 guideline for the management of community-acquired pneumonia in adults from the American Thoracic Society (ATS)/Infectious Diseases Society of America (IDSA).[1] Antibiotic dosing is provided for **adults**.

Abbreviations: BID = twice daily; BUN = blood urea nitrogen; CAP = community-acquired pneumonia; COPD = chronic obstructive pulmonary disease; h = hour or hours; HCAP = healthcare-associated pneumonia; MRSA = methicillin-resistant *Staphylococcus aureus*; PaO2/FiO2 = arterial oxygen partial pressure/fractional inspired oxygen; PCR = polymerase chain reaction; PSI = pneumonia severity index; TID = three times daily

Community-Acquired Pneumonia Treatment Basics

- The **need for hospitalization** should be based on clinical judgment plus results of a validated prognostic tool.[1] Use of the PSI is recommended over CURB-65.[1] PSI is better than the CURB-65 at identifying patients who can safely be treated as outpatients, but CURB-65 is easier to use.[1] PSI may underestimate severity in younger patients.[1] The PSI is available at https://www.mdcalc.com/psi-port-score-pneumonia-severity-index-cap and the CURB-65 is available at https://www.mdcalc.com/curb-65-score-pneumonia-severity.
- Patients with **severe pneumonia** are typically those requiring intensive/critical care. See **footnote b** for guideline criteria for severe pneumonia.
- Patients with CAP should be treated with antibiotics **for at least five days** (**7 days** for MRSA or *Pseudomonas*).[1] Antibiotics should not be stopped **until the patient is clinically stable**.[1] This means abnormalities in vitals (heart rate, blood pressure, respiratory rate, oxygen saturation, body temperature) and cognition have resolved, and the patient is eating.[1]
- The most common **bacterial causes** of community-acquired pneumonia in outpatients are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Mycoplasma pneumoniae*, *Staphylococcus aureus*, *Legionella* species, *Chlamydia pneumoniae*, and *Moraxella cararhalis*.[1]
- It is suggested that anaerobic coverage not be routinely added in cases of **aspiration pneumonia** unless lung abscess or empyema is suspected.[1] Our chart, *Aspiration Pneumonia FAQs*, has more considerations.
- **Blood culture** yield is low in patients with nonsevere CAP.[1] Blood cultures are not recommended in outpatients, and it is suggested that they not be routinely done in the hospital setting in nonsevere CAP.[1] Blood cultures are recommended in severe CAP, and in patients being treated empirically for, or previously infected with, *Pseudomonas aeruginosa* or MRSA, or who had been hospitalized and received parenteral antibiotics within the prior 90 days.[1]
- **Sputum gram stain and culture** is recommended in severe CAP, in patients being treated empirically for, or previously infected with, *Pseudomonas aeruginosa* or MRSA, and perhaps in those hospitalized and treated with antibiotics within the prior 90 days.[1] Collection of lower respiratory tract secretions for *Legionella* culture or nucleic acid amplification testing is suggested in severe CAP.[1]
- **Urine antigen testing** for *Pneumococcus* and *Legionella* is suggested in severe CAP.[1] *Legionella* testing is also suggested if epidemiology indicates exposure (e.g., travel in the previous ten days; outbreak).[1,2]
- If **influenza** is circulating in the community, testing with a rapid molecular assay (preferred over an antigen test) is suggested.[1] Coverage for influenza is suggested for outpatients who test positive, and is recommended for inpatients who test positive.[1]
- **Procalcitonin** is not recommended to determine need for initial, empiric antibiotic treatment (**see footnote g**).[1]
- Guidelines suggest not using **corticosteroids routinely** for severe CAP.[1] See **footnote f** for situations where they might be considered.

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Patient Characteristics (see footnote a)	**Outpatient Oral Antibiotic Regimen (see footnote a)**

Previously healthy without comorbidities (see below) and without risk factors for *Pseudomonas aeruginosa* or MRSA (e.g., prior respiratory isolation of MRSA or *Pseudomonas aeruginosa*, or hospitalization and receipt of parenteral antibiotics within the 90 days prior. See **footnote d** for additional risk factors).	• Amoxicillin 1 g TID (high dose targets resistant *Streptococcus pneumoniae*[3])
	OR
	• Macrolide (if local pneumococcal resistance is <25% [resistance is >30% in most of U.S.])
	  • Azithromycin 500 mg x 1, then 250 mg once daily, or
	  • Clarithromycin 500 mg BID or 1,000 mg once daily (extended-release)
	OR
	• Doxycycline 100 mg BID (less data) (consider a loading dose of 200 mg)
	
	Note: patients with risk factors for MRSA or *Pseudomonas* are not commonly managed as outpatients, but if they are, they will need coverage for these pathogens as well.

With comorbidities:
• Heart disease
• Lung disease
• Liver disease
• Kidney disease
• Diabetes
• Alcoholism
• Cancer
• Asplenia
 	
Regimens for patients with comorbidities target resistant *Streptococcus pneumoniae*, atypicals, beta-lactamase-producing *Haemophilus influenzae* and *Moraxella catarrhalis*, enteric gram negatives, and methicillin-susceptible *Staphylococcus aureus*.
	Beta-lactam
	• Amoxicillin/clavulanate (500 mg/125 mg TID or 875 mg/125 mg BID, 2,000 mg/125 mg BID)
	OR
	• Cephalosporin (cefpodoxime 200 mg BID or cefuroxime axetil 500 mg BID)
	PLUS
	Macrolide
	  • Azithromycin 500 mg x 1, then 250 mg once daily, or
	  • Clarithromycin 500 mg BID or 1,000 mg once daily (extended-release)
	OR
	Doxycycline 100 mg BID (less data) (consider a loading dose of 200 mg)
	
	OR
	
	Monotherapy with a Respiratory quinolone: levofloxacin 750 mg once daily, moxifloxacin 400 mg once daily, gemifloxacin 320 mg once daily (U.S.), delafloxacin 450 mg orally every 12 h[5] (U.S.; new indication post-guideline publication[5]). Consider adverse effects.
	
	Note: patients with risk factors for MRSA or Pseudomonas are not commonly managed as outpatients, but if they are, they will need coverage for these pathogens as well.

a. If the patient has recently received (i.e., within the past 90 days) an antibiotic, pick an option from a different class.[1,3] Dosing is for oral tablets/capsules for **adults** with normal renal/hepatic function. Based on ATS/IDSA guideline unless otherwise referenced. Information may differ from product labeling. Most antibiotics available generically, at lower cost. Brand only available for gemifloxacin (*Factive*, U.S.).

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Patient Characteristics (see footnote c)	**Inpatient Antibiotic Regimen (see footnote c)**
Nonsevere pneumonia without risk factors for *Pseudomonas aeruginosa* or MRSA (e.g., prior respiratory isolation of MRSA or *Pseudomonas aeruginosa*, or hospitalization and receipt of parenteral antibiotics within the 90 days prior. **See footnote d** for additional risk factors.)	**Beta-lactam** • Amoxicillin/sulbactam (1.5 to 3 g every 6 h) OR • Cephalosporin (cefotaxime 1 to 2 g every 8 h, ceftriaxone 1 to 2 g once daily, or ceftaroline 600 mg every 12 h [U.S.]) **PLUS** **Macrolide** • Azithromycin 500 mg once daily, or • Clarithromycin 500 mg BID OR **Doxycycline** 100 mg BID (less data) **OR** **Monotherapy with a Respiratory quinolone**: levofloxacin 750 mg once daily, moxifloxacin 400 mg once daily, or delafloxacin 300 mg IV every 12 h[5] (U.S.; new indication post-guideline publication[5]). Evidence favors beta-lactam/macrolide combination. Consider adverse effects.
Severe pneumonia without risk factors for *Pseudomonas aeruginosa* or MRSA (e.g., prior respiratory isolation of MRSA or *Pseudomonas aeruginosa*, or hospitalization and receipt of parenteral antibiotics within the 90 days prior. **See footnote d** for additional risk factors.)	Beta-lactam plus a macrolide, or a beta-lactam plus a respiratory quinolone. Dosing as above. Use of HCAP criteria (e.g., nursing home residence, recent hospitalization) should no longer be used to broaden coverage for resistant organisms (e.g., MRSA, resistant gram negatives), and use of this term is no longer recommended.[1,4]
Prior respiratory isolation of MRSA, or hospitalization and parenteral antibiotics within 90 days prior and locally validated risk factors for MRSA. **See footnote d** for additional risk factors. MRSA coverage generally not needed if nasal swab is negative, especially for nonsevere CAP. If positive, cover pending culture results.	**Prior respiratory MRSA isolation: add** MRSA coverage* to above inpatient regimen and use cultures/nasal PCR to guide need for continuation/discontinuation of MRSA coverage. **Recent hospitalization and parenteral antibiotics and locally validated risk factors for MRSA (see footnote e)** • **Severe** pneumonia: **add** MRSA coverage* to above inpatient regimen and use cultures/nasal PCR to guide need for continuation/discontinuation of MRSA coverage. • **Nonsevere**: **add** MRSA coverage* to above inpatient regimen only if cultures or PCR are positive. ***MRSA coverage** = linezolid 600 mg BID, or vancomycin 15 mg/kg every 12 h with dose adjusted per levels.

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Patient Characteristics (see footnote c)	**Inpatient Antibiotic Regimen (see footnote c)**
Prior respiratory isolation of *Pseudomonas aeruginosa*, or hospitalization and parenteral antibiotics within 90 days prior and locally validated risk factors for *Pseudomonas aeruginosa*. **See footnote d** for additional risk factors to consider.	**Prior respiratory *Pseudomonas aeruginosa* isolation:** change beta-lactam in above inpatient regimen to one with pseudomonal coverage,** and use cultures/nasal PCR to guide need for continuation/discontinuation of pseudomonal coverage. **Recent hospitalization and parenteral antibiotics and locally validated risk factors for *Pseudomonas aeruginosa*** (see footnote e) • **Severe** pneumonia: change beta-lactam in above inpatient regimen to one with pseudomonal coverage** and use culture to guide need for continuation/discontinuation of pseudomonal coverage. • **Nonsevere**: change beta-lactam in above inpatient regimen to one with pseudomonal coverage** only if culture-positive. ****Pseudomonal coverage** = piperacillin/tazobactam 4.5 g every 6 h, cefepime 2 g every 8 h, ceftazidime 2 g every 8 h, imipenem 500 mg every 6 h, meropenem 1 g every 8 h, aztreonam 2 g every 8 h

b. ATS/IDSA guideline criteria for **severe pneumonia**: septic shock with need for vasopressors, respiratory failure requiring mechanical ventilation, or three or more minor criteria: respiratory rate ≥30 breaths/min., PaO2/FiO2 ratio ≤250, multilobar infiltrates, confusion or disorientation, BUN ≥20 mg/dL, white blood cell count <4,000 cells/mm^3 (not due to chemo), platelets <100,000/mm^3, core temperature <36ºC, hypotension requiring aggressive fluid resuscitation[1]

c. If the patient has recently received (i.e., within the past 90 days) an antibiotic, pick an option from a different class.[1,3] Dosing is for adults with normal renal/hepatic function. Based on ATS/IDSA guideline unless otherwise referenced. Information may differ from product labeling. Most antibiotics available generically, at lower cost. Brand only available for ceftaroline (*Teflaro* [U.S.]).

d. **Examples of additional risk factors to consider:** COPD with bronchiectasis, chronic renal disease, antibiotic use within the past 30 to 60 days, tube feeding, nursing home residence.[7,11] Nursing home residence is not consistently a risk factor.[7]

e. **"Local validation"** means using local data to determine the prevalence of MRSA and *Pseudomonas* patients with CAP and identifying risk factors for infection locally (e.g., at your local hospital). If local data are unavailable and empiric coverage for MRSA or *Pseudomonas* is instituted on the basis of published risk factors (e.g., footnote d), continue or deescalate the regimen based on culture results.[1]

f. Role of **corticosteroids**. Corticosteroids can be considered in refractory septic shock, and of course for steroid-responsive comorbidities (e.g., COPD, asthma, autoimmune disease, etc).[1] Corticosteroids may reduce mortality in severe CAP (NNT = 18), although mortality benefit

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is not consistent across studies.[1,8] Corticosteroids may reduce time to clinical stability and length of stay by about one day, and reduce the need for mechanical ventilation.[6,9] More study is needed to identify which subgroups benefit the most (e.g., patients with high inflammatory response).[10] Consider corticosteroids for patients who are clinically unstable or not responding to treatment, and perhaps those with baseline C-reactive protein.[6,9,10]

g. Empiric antibiotics should be started if CAP is clinically suspected and radiographically confirmed, regardless of **procalcitonin** level; new evidence suggests that sensitivity is inadequate to determine when initial antibiotic therapy can be safely deferred in this setting.[1]

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