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Transforming patient care.

Rapid Clinical Updates: Antibiotic Stewardship in Pneumonia

Speakers

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Disclosures

All speakers and planners have no relevant financial or advisory relationships with corporate organizations related to this activity, apart from those already disclosed, none of which could be perceived as a real or apparent conflict of interest.

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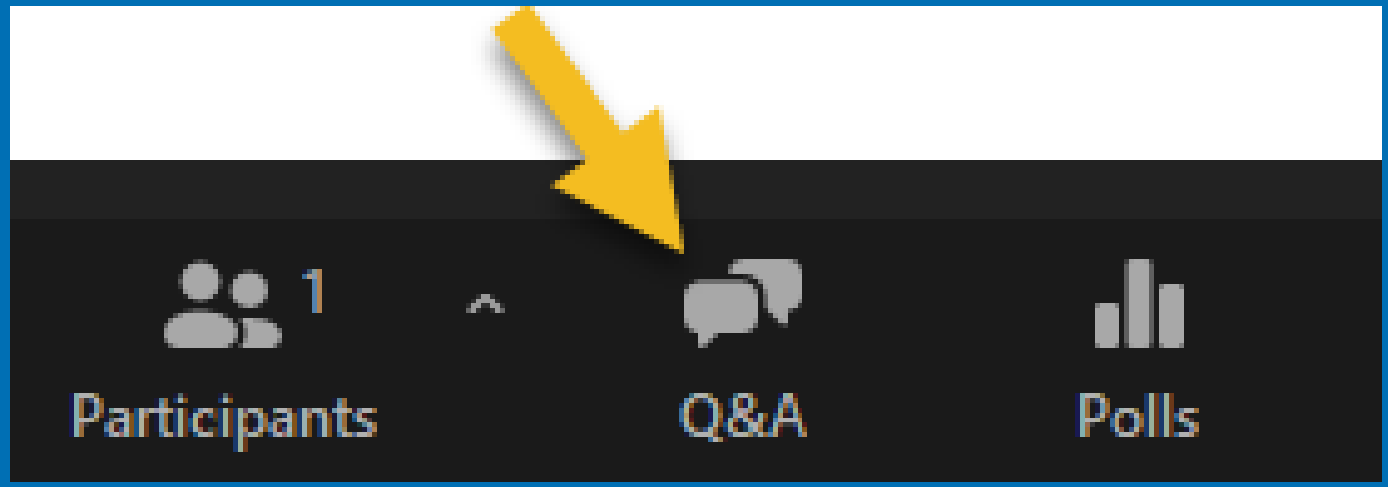
Please submit questions using Q&A feature

We will have Q&A time after



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POLL QUESTIONS

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Question 1

1. You are seeing a 68-year-old female in the emergency department with new onset productive cough and fever for three days. She has a history of well controlled Type 2 diabetes mellitus and hypertension. She has no other significant past medical history and no recent hospitalizations. On exam, she is febrile to 101.5 F with respiratory rate 24 breaths/minute, heart rate 110, oxygen saturation 92%. Chest x-ray shows a lobar infiltrate. You determine she has community-acquired pneumonia. Upon review of initial labs, you determine a CURB-65 score of 2, indicating need for inpatient admission. She has no allergies to medications. **Which antibiotic(s) do you start empirically and what is the anticipated duration of therapy?**

    A. Levofloxacin once daily for 7 days
    B. Ceftriaxone and azithromycin once daily for 7 days
    C. Ceftriaxone and azithromycin once daily for 3-5 days
    D. Ceftriaxone, metronidazole, and azithromycin for 3-5 days

Question 2

2. A 76 year old male presents to the emergency room with a fever and cough. He has a past medical history of coronary artery disease, hypertension and well-controlled type 2 diabetes. On chest auscultation, he has rales to the left lower lobe. Radiograph is performed and indicates a left lower lobe consolidation likely representing an uncomplicated pneumonia. His CBC is significant for a leukocytosis of 17,000. **What additional testing would you perform to help formulate an antibiotic plan in this patient?**
    A. Respiratory culture
    B. Comprehensive PCR panel
    C. Strep and Legionella urinary antigen
    D. All of the above
    E. None of the above

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Antibiotic Stewardship in Pneumonia

Community-Acquired Pneumonia (CAP) Guidelines

Paul Caseley, MD

- Definitions: CAP, HAP, VAP
- Diagnosis of Pneumonia
- Differentiate between complicated and non-complicated CAP
- Differentiate between severe and non-severe CAP
- Understand when ancillary testing may be indicated
- Antibiotic Selection in CAP
- Duration of treatment in CAP

DEFINITIONS (2019 ATS/IDSA)

Community-Acquired Pneumonia (CAP)

- pneumonia that develops in individuals who are not hospitalized or have not been in a healthcare facility (including hospitals or long-term care facilities) within the preceding 48 hours.
- **the most prevalent**, with a significant burden of hospitalizations and mortality, especially in older adults and those with comorbidities.

Hospital-Acquired Pneumonia (HAP)

- pneumonia that develops **48 hours or more after hospital admission** in patients who were not intubated at the time of admission.

Ventilator-Acquired Pneumonia (VAP)

- specifically occurs in patients who have been mechanically ventilated for at least 48 hours.

***Elimination of HCAP:** the HCAP category led to unnecessary broad-spectrum antibiotic use, increasing the risk of adverse effects and antibiotic resistance.

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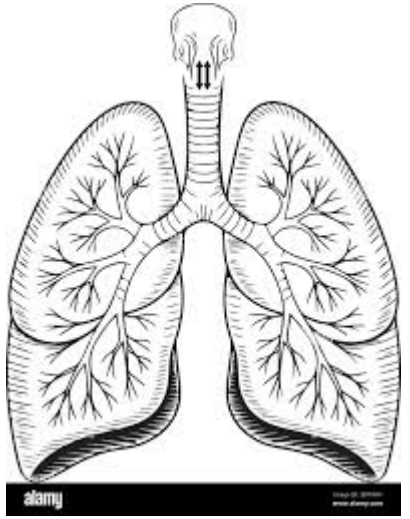
Focus on CAP

While typically treated in the outpatient setting, up to 10% are hospitalized, resulting in:

- **1.4 million ED visits**
- **740,000 hospitalizations**
- **41,000 deaths**

Many opportunities for *stewardship*:

- **Diagnosis**
- **Cultures/labs/imaging selection**
- **Antibiotic selection and duration**



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Diagnosis of CAP

TABLE 1: Diagnosis of Community-acquired Pneumonia in Adults (≥ 18 years) Without Immunocompromising Conditions[1]*

Newly recognized pulmonary infiltrate(s) on chest imaging[†] **AND** at least one respiratory symptom **AND** at least one other symptom/sign or finding (see below)
Respiratory Symptoms (at least one)
New or increased cough
New or increased sputum production
Dyspnea
Pleuritic chest pain
Other Signs or Findings (at least one)
Abnormal lung sounds (rhonchi or rales)
Fever (≥100.4 °F)
Leukocytosis or unexplained bandemia (above normal limits for laboratory)
Hypoxia (< 90%)

*Immunocompromising conditions include inherited or acquired immune deficiency or drug-induced neutropenia, including patients actively receiving cancer chemotherapy, patients infected with HIV with suppressed CD4 counts, and solid organ or bone marrow transplant recipients.

[†]If clinical suspicion for community-acquired pneumonia is high despite negative chest radiograph, consider a CT scan of the chest.[2]

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Diagnosis of CAP

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†If clinical suspicion for community-acquired pneumonia is high despite negative chest radiograph, consider a CT scan of the chest.[2]

We are overtreating!

10–30% of patients treated for CAP do ***not*** meet diagnostic criteria based on clinical and radiographic findings

JAMA Internal Medicine | Original Investigation

Inappropriate Diagnosis of Pneumonia Among Hospitalized Adults

Ashwin B. Gupta, MD; Scott A. Flanders, MD; Lindsay A. Petty, MD; Tejal N. Gandhi, MD; Michael S. Pulia, MD, PhD; Jennifer K. Horowitz, MA; David Ratz, MS; Steven J. Bernstein, MD, MPH; Anurag N. Malani, MD; Payal K. Patel, MD, MPH; Timothy P. Hofer, MD, MSc; Tanima Basu, MA, MS; Vineet Chopra, MD, MSc; Valerie M. Vaughn, MD, MSc

- 17 290 patients treated for CAP
- 2079 patients (12.0%) met NQF criteria for inappropriate dx

JAMA®
The Journal of the American Medical Association

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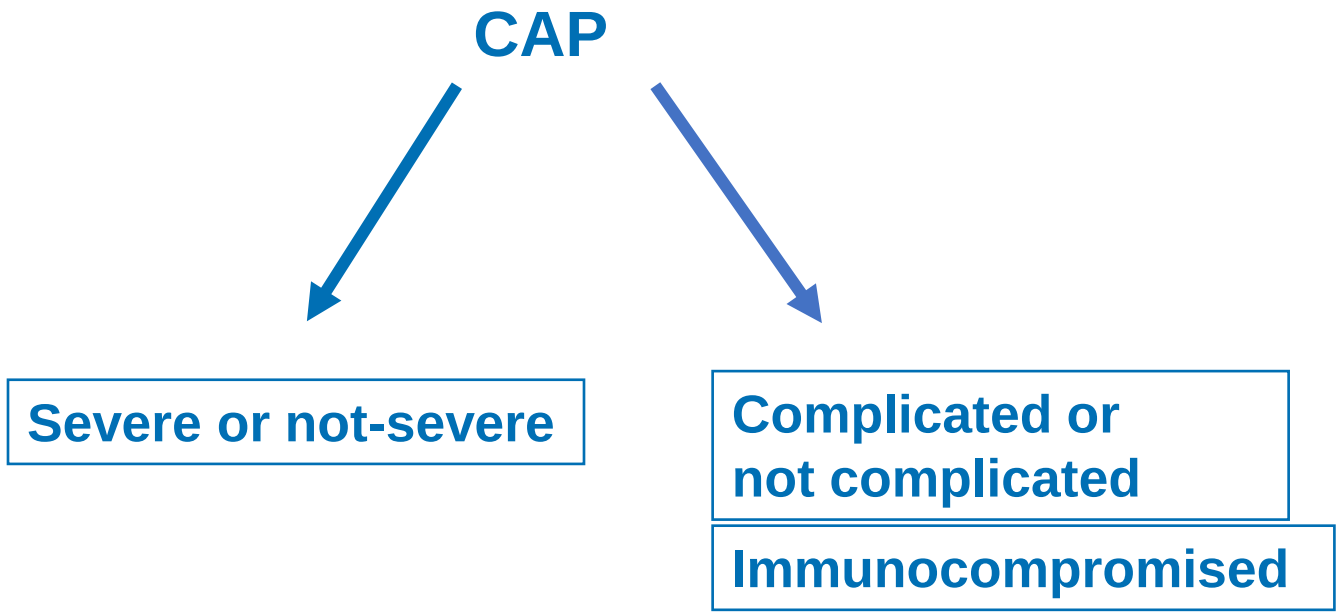
CAP in the Hospitalized Patient



Defines need for culture data, antibiotic choice and duration!

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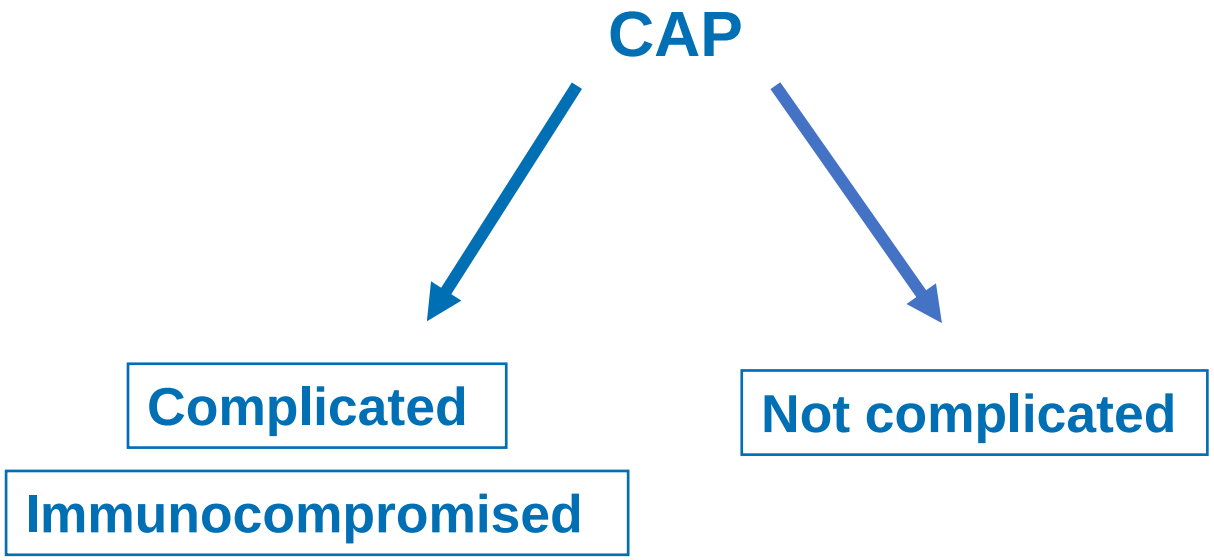
CAP in the Hospitalized Patient



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Excluded from CAP Guidelines: Complicated CAP or Immunocompromise

Complicated CAP - the development of local complications:

Parapneumonic effusion

Empyema

Necrotizing pneumonia

Lung abscess

...Or systemic complications

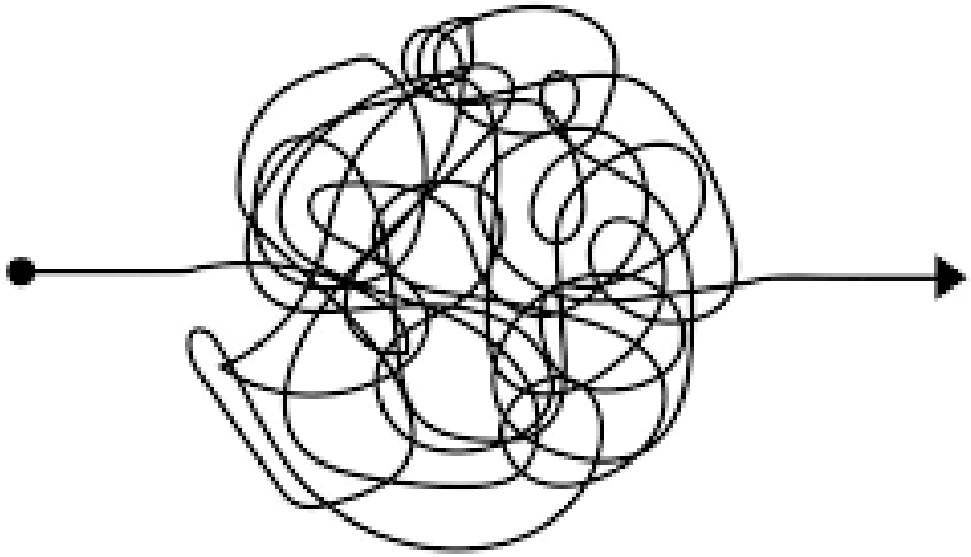
ARDS

Multiorgan failure

Bacteremia

Septic shock

*Complicated CAP may require longer courses of antibiotics and ID consultation



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Excluded from CAP Guidelines: Complicated CAP or Immunocompromise

Immunocompromise:

immune disorder, which may be due to:

- cytotoxic treatments
- biological therapies
- organ transplants
- inherited or acquired immunodeficiencies
- chronic use of immunosuppressive drugs.

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Risk Factors for Complicated CAP

- Age > 65
- Immunosuppression
- Structural Lung Disease (malignancy, bronchiectasis, severe COPD)
- Chronic Diseases (liver disease, CKD, CVA, CHF)

May influence treatment decisions surrounding antibiotic choice and duration

*Use of validated risk scores can be used to qualify risk of complicated CAP: CURB-65 and PSI. These risk scores consider co-morbidities in addition to signs of stability and severity and may guide decision to admit

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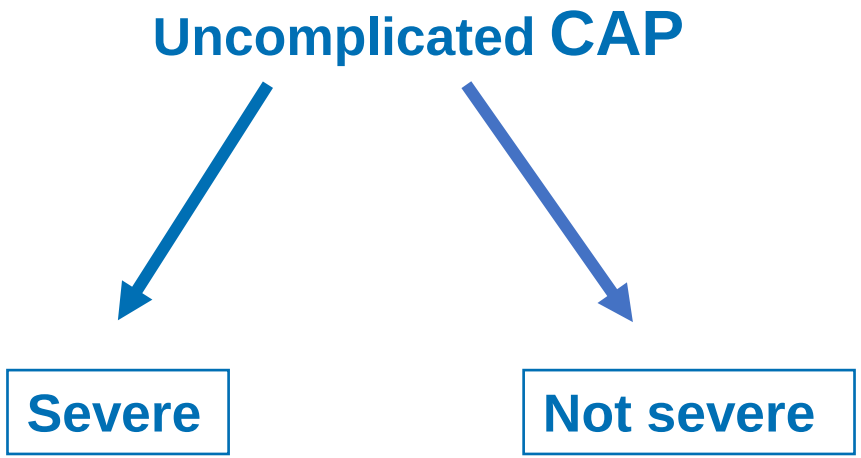
CAP in the Hospitalized Patient



Defines need for culture data, antibiotic choice and duration!

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Uncomplicated CAP - severe

Validated definition includes either one major criterion or three or more minor criteria

Minor criteria

- Respiratory rate ≥ 30 breaths/min
- $Pa_{O_2}/F_{I_{O_2}}$ ratio ≤ 250
- Multilobar infiltrates
- Confusion/disorientation
- Uremia (blood urea nitrogen level ≥ 20 mg/dl)
- Leukopenia* (white blood cell count < 4,000 cells/μl)
- Thrombocytopenia (platelet count < 100,000/μl)
- Hypothermia (core temperature < 36°C)
- Hypotension requiring aggressive fluid resuscitation

Major criteria

- Septic shock with need for vasopressors
- Respiratory failure requiring mechanical ventilation

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- Septic shock with need for vasopressors
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Obtain:
1. Blood and respiratory cultures
2. MRSA nasal swab/PCR
3. Pneumococcal urinary antigen

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- Septic shock with need for vasopressors
- Respiratory failure requiring mechanical ventilation

Obtain:
1. Blood and respiratory cultures
2. MRSA nasal swab/PCR
3. Pneumococcal urinary antigen

Initial INPT treatment

B-lactam + macrolide (first-line) or fluroquinolone monotherapy (eg, Ampicillin-Sulbactam + Azithromycin)

Add **MRSA** or **pseudomonal** (or other MDRO) coverage if:
1. Prior respiratory isolation
2. Recent hospitalization (3 months) with IV antibiotics
3. Locally validated risk factors such as recent flu-like illness, cavitation/empyema, or if recommended by local guidelines

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Uncomplicated CAP – Not Severe

Do not need to obtain:

1. **Blood/respiratory cultures (unless other reason, like sepsis)**
2. **Urinary antigens**

Initial treatment:

Beta-lactam + macrolide (first line) or fluroquinolone monotherapy

Add MRSA or pseudomonal (or other MDRO) coverage if:

1. Prior respiratory isolation
2. Recent hospitalization (3 months) with IV antibiotics
3. Locally validated risk factors such as recent flu-like illness, cavitation/empyema, or if recommended by local guidelines

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Additional testing

COVID/Flu - only test if local prevalence is high

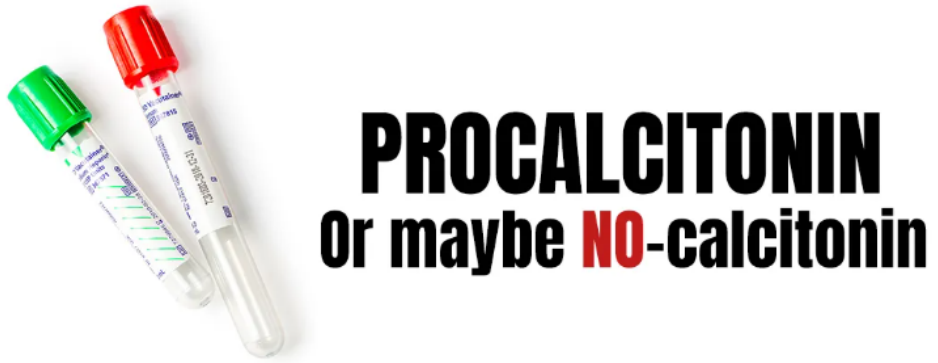
Strep urine antigen – only in severe CAP

Legionella urine antigen – only if local outbreak or recent travel

Comprehensive PCR Panel – only in severe CAP or failure of initial management

Procalcitonin

- Start antibiotics in all patients with clinically suspected and radiographically confirmed CAP regardless of serum procalcitonin level
- withholding antibiotics based on low procalcitonin may risk undertreatment of true bacterial infections.



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Duration of Antibiotics

Includes both non-severe and non-ICU severe CAP

Outpatient: 3 days

Inpatient:
3 days if stable by day 3, or
5 days if stable by day 5

Stability Criteria

By day 3, must meet all:
Afebrile
HR <100
RR <24
SpO2 >90%
SBP >90 mmHg

By day 5, must be afebrile +
no more than one other sign of instability

Discontinuing β-lactam treatment after 3 days for patients with community-acquired pneumonia in non-critical care wards (PTC): a double-blind, randomised, placebo-controlled, non-inferiority trial

Aurélien Dinh, MD [a] · Jacques Ropers, PharmD [c] · Clara Duran, MSc [a] · Benjamin Davido, MD [a] · Laurène Deconinck, MD [d] · Morgan Matt, MD [a] · et al. Show more

THE LANCET

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Dinh A, Ropers J, Duran C, et al. Discontinuing β-Lactam Treatment After 3 Days for Patients With Community-Acquired Pneumonia in Non-Critical Care Wards (PTC): A Double-Blind, Randomised, Placebo-Controlled, Non-Inferiority Trial. Lancet. 2021;397(10280):1195-1203. doi:10.1016/S0140-6736(21)00313-5. PMID: 33773631

Metlay JP, Waterer GW, Long AC, et al. Diagnosis and Treatment of Adults With Community-Acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care Med. 2019;200(7):e45-e67. doi:10.1164/rccm.201908-1581ST

Vaughn VM, Dickson RP, Horowitz JK, Flanders SA. Community-Acquired Pneumonia: A Review. JAMA. 2024;332(15):1282-1295. doi:10.1001/jama.2024.14796

Gupta AB, Flanders SA, Petty LA, et al. Inappropriate Diagnosis of Pneumonia Among Hospitalized Adults. JAMA Internal Medicine. 2024;184(5):548-556. doi:10.1001/jamainternmed.2024.0077

A 76 year old male presents to the emergency room with a fever and cough. He has a past medical history of coronary artery disease, hypertension and well-controlled type 2 diabetes. On chest auscultation, he has rales to the left lower lobe. Radiograph is performed and indicates a left lower lobe consolidation likely representing an uncomplicated pneumonia. His CBC is significant for a leukocytosis of 17,000. What additional testing would you perform to help formulate an antibiotic plan in this patient?

A. Respiratory culture

B. Comprehensive PCR panel

C. Strep and Legionella urinary antigen

D. All of the above

E. None of the above

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E. None of the above

This patient has a diagnosis of non-severe community-acquired pneumonia. He has a new cough, a fever and a radiograph confirming lower lobe infiltrate. You do not need any additional testing to formulate an antibiotic plan. The patient should be empirically treated with a B-lactam + macrolide (first-line) or fluroquinolone. If the patient had severe CAP, respiratory cultures and strep urinary antigen would be indicated. A comprehensive PCR panel could be ordered in severe CAP or if the patient is failing empiric antibiotic treatment. A Legionella urinary antigen should only be collected if there is a local outbreak. This patient should be treated for 3-5 days, depending on when he demonstrates clinical stability.

Thank you

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Antibiotic Stewardship in Pneumonia

Evaluating the Evidence

Moira McNulty, MD, MS

Etiologic agents

Selection of antibiotics & de-escalation

Duration

Step-down therapy

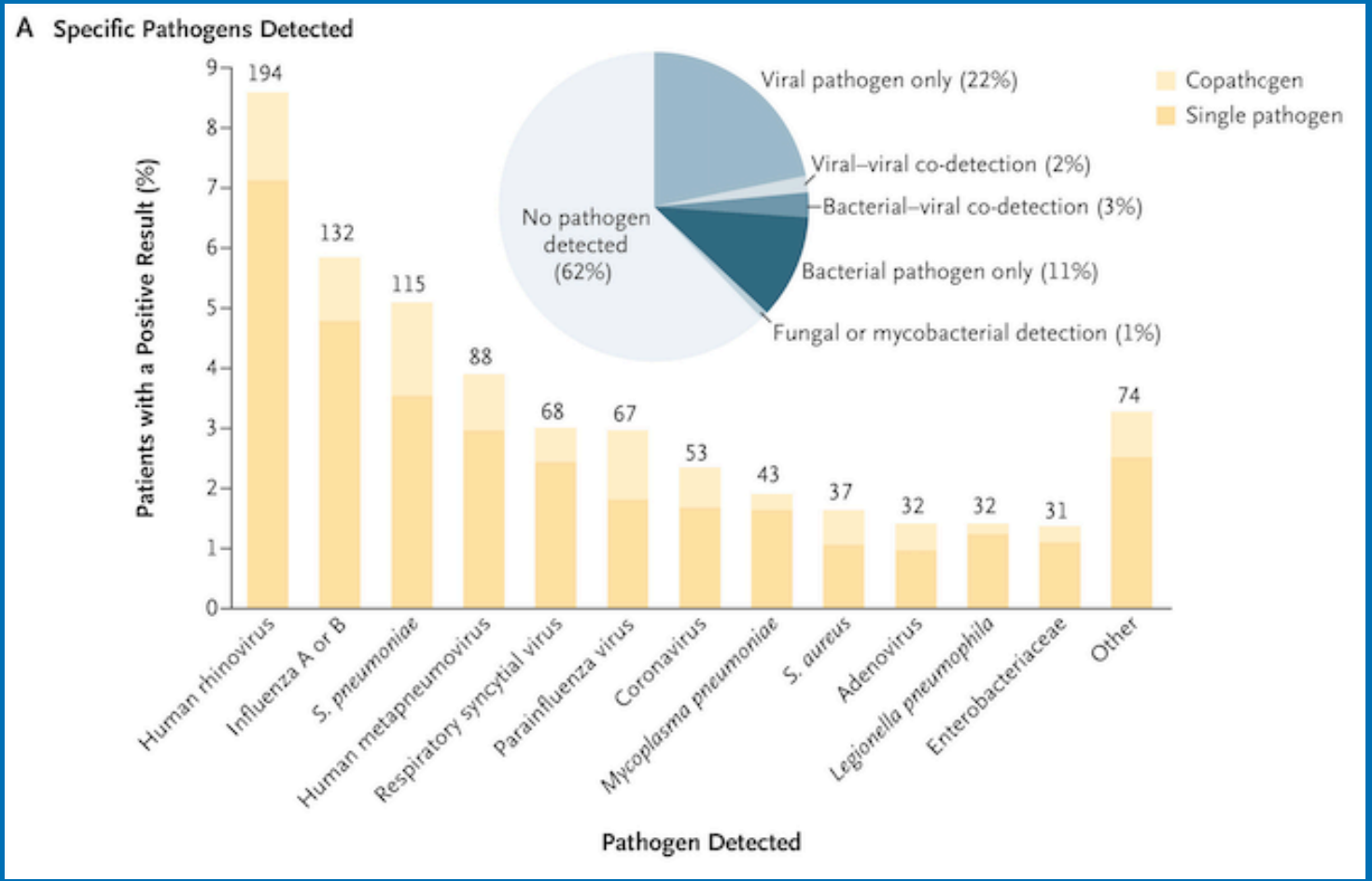
2025 ATS CAP guideline update

Prevention!

HAP/VAP guidelines

Etiologic Agents

- Majority of cases identify no pathogen
  - Viral etiology most common (24%)
  - Strep pneumo most common bacterial cause
  - Atypical bacteria uncommon (3%)



Jain S et al, CDC EPIC Study, NEJM 2015

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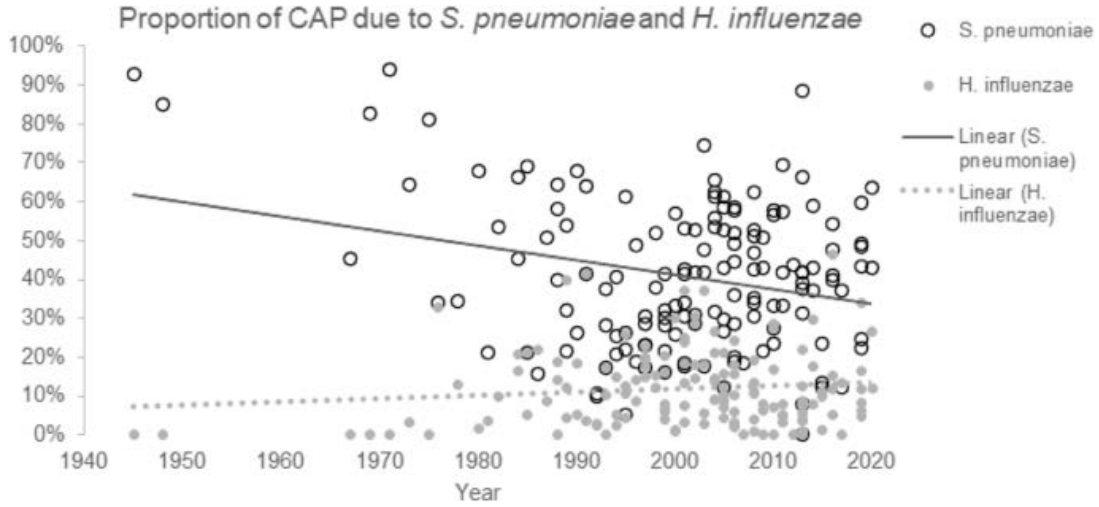
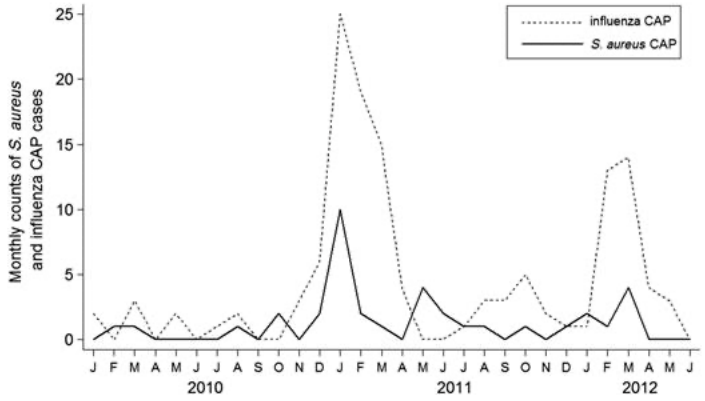
Etiologic Agents

↓ *strep pneumoniae*

↑ *haemophilus influenzae*

	Staphylococcus aureus CAP, n (row %)				
Population	Total CAP Cases	Methicillin-Resistant *S. aureus*	Methicillin-Susceptible *S. aureus*	All *S. aureus*	Pneumococcal CAP, n (row %)
All adults	2259	15 (0.7)	22 (1.0)	37 (1.6)	115 (5.1)
By age group, y					
18–49	681	2 (0.3)	7 (1.0)	9 (1.3)	31 (4.6)
50–64	773	7 (0.9)	11 (1.4)	18 (2.3)	41 (5.3)
65–79	506	4 (0.8)	2 (0.4)	6 (1.2)	34 (6.7)
≥80	299	2 (0.7)	2 (0.7)	4 (1.3)	9 (3.0)
By admission type					
Intensive care unit	482	13 (2.7)	10 (2.1)	23 (4.8)	40 (8.3)
General floor	1777	2 (0.1)	12 (0.7)	14 (0.8)	75 (4.2)
By chronic hemodialysis use					
Hemodialysis user	87	3 (3.5)	2 (2.3)	5 (5.8)	3 (3.5)
Not hemodialysis user	2172	12 (0.6)	20 (0.9)	32 (1.5)	112 (5.2)





- Relatively low *s. aureus* prevalence in CAP
- Highest during influenza peaks

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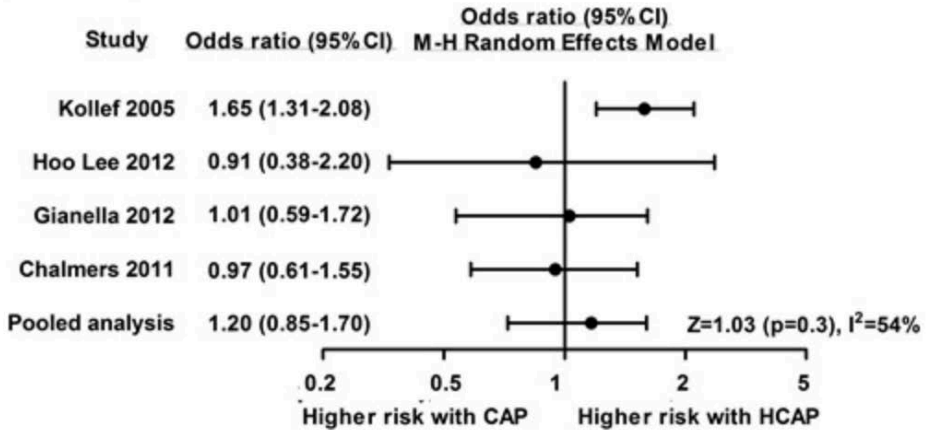
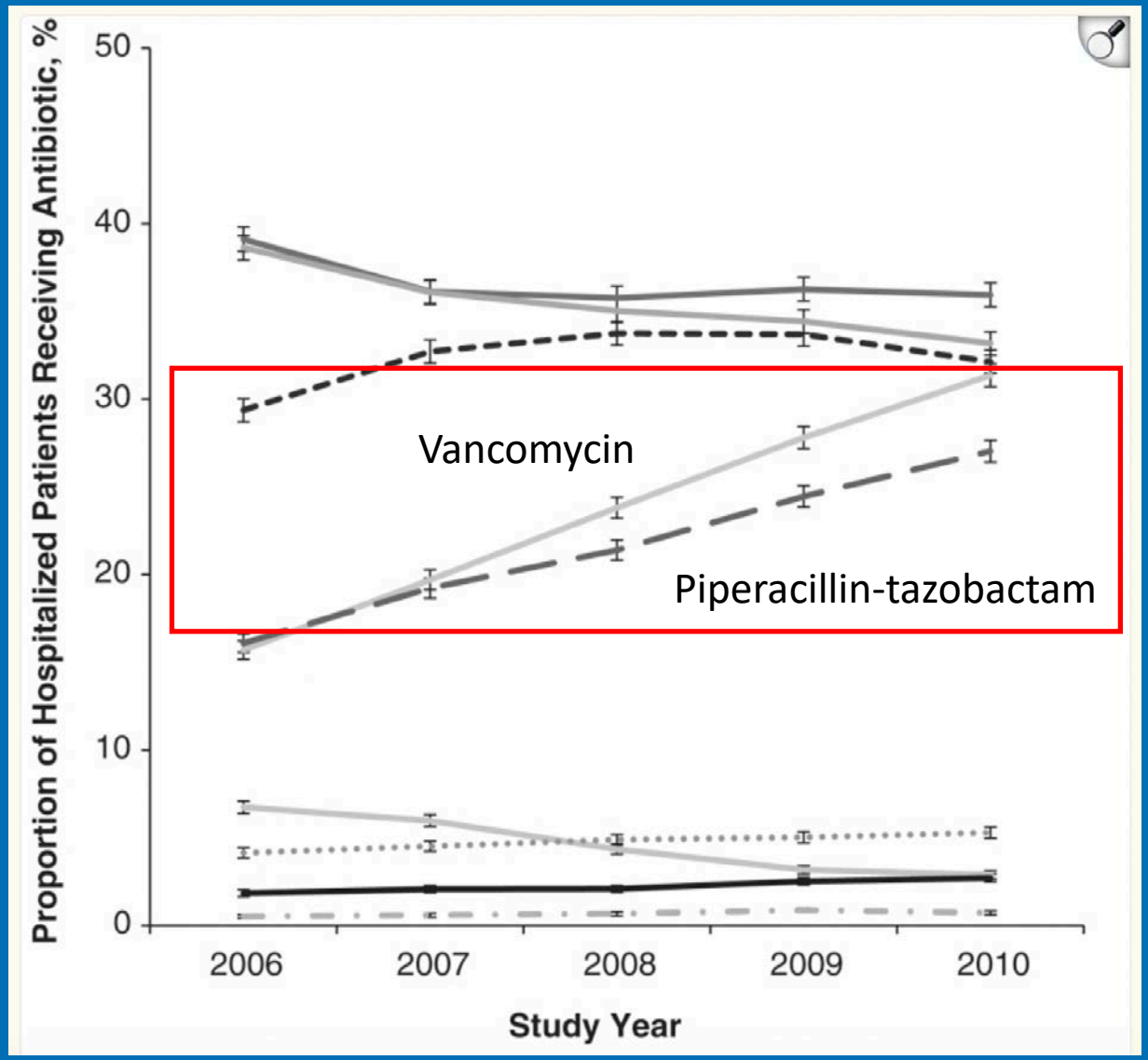
Shoar, S., Musher, D.M. *Pneumonia* 2020
Self WH et al. CID 2016

What about patients in nursing homes?

- Patients in previous “HCAP” category do no necessarily have higher risk of resistant organisms
- Exception is recent hospitalization with IV antibiotics





Chalmers JD et al. CID 2014
Jones BE et al. CID 2014

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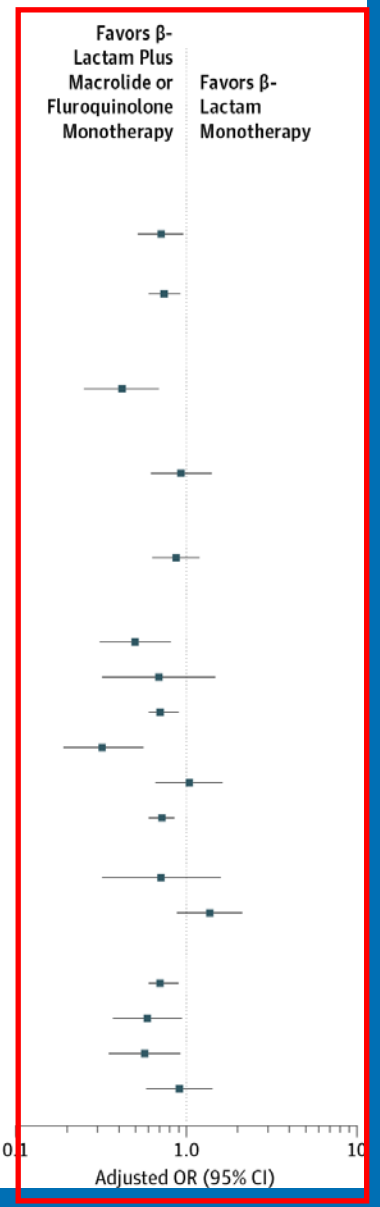
Atypical Coverage

- Improved mortality with β-lactam plus macrolide combination therapy
- Highest-quality observational and clinical trial evidence suggests that macrolides can improve outcomes, potentially including mortality

Source	Outcome	β-Lactam Plus Macrolide or Fluoroquinolone Monotherapy: No. of Patients	β-Lactam Plus Macrolide or Fluoroquinolone Monotherapy: No. (%) Who Died	β-Lactam Monotherapy: No. of Patients	β-Lactam Monotherapy: No. (%) Who Died	Adjusted OR (95% CI)[a]
β-Lactam plus macrolide combination therapy						
Gleason et al,[28] 1999						
Second-generation cephalosporin plus macrolide	30-d Mortality	544	46 (8.4)	3430	511 (14.9)	0.71 (0.52-0.96)[b]
Third-generation cephalosporin plus macrolide	30-d Mortality	1139	104 (9.1)	3430	511 (14.9)	0.74 (0.60-0.92)[b]
Houck et al,[29] 2001						
Cephalosporin or β-lactam/β-lactamase inhibitor plus macrolide[c]	30-d Mortality	312	26 (8.3)	1740	242 (13.9)	0.42 (0.25-0.69)
Cephalosporin or β-lactam/β-lactamase inhibitor plus macrolide[d]	30-d Mortality	561	48 (8.6)	1982	234 (11.8)	0.93 (0.62-1.41)
Cephalosporin or β-lactam/β-lactamase inhibitor plus macrolide[e]	30-d Mortality	870	89 (10.2)	1758	244 (13.9)	0.87 (0.63-1.19)
García Vázquez et al,[32] 2005	In-hospital mortality	918	63 (6.9)	270	36 (13.3)	0.50 (0.31-0.81)
Paul et al,[35] 2007	30-d Mortality	282	21 (7.4)	169	37 (21.9)	0.69 (0.32-1.48)
Bratzler et al,[27] 2008	30-d Mortality	5963	338 (5.7)	4463	376 (8.4)	0.7 (0.6-0.9)
Blasi et al,[34] 2008	End of therapy mortality	330	19 (5.7)	452	73 (16.2)	0.32 (0.19-0.56)
Tessmer et al,[33] 2009	30-d Mortality	946	42 (4.4)	908	78 (8.6)	1.04 (0.66-1.63)
Rodrigo et al,[30] 2013	30-d In-hospital mortality	3239	745 (23.0)	2001	536 (26.8)	0.72 (0.60-0.85)
Garin et al,[25] 2014	30-d Mortality	289	10 (3.4)	291	14 (4.8)	0.71 (0.32-1.59)[f]
Postma et al,[26] 2015	30-d Mortality	566	NR	506	NR	1.37 (0.88-2.13)[g]
Fluoroquinolone monotherapy						
Bratzler et al,[27] 2008	30-d Mortality	5045	318 (6.3)	4463	376 (8.4)	0.7 (0.6-0.9)
Blasi et al,[34] 2008	End of therapy mortality	363	33 (9.1)	452	73 (16.2)	0.59 (0.37-0.94)
Ewig et al,[31] 2011	6-mo Mortality	365	NR	1703	NR	0.57 (0.35-0.92)[b]
Postma et al,[26] 2015	90-d Mortality	665	NR	506	NR	0.91 (0.58-1.42)[g]



Lee et al. JAMA 2016

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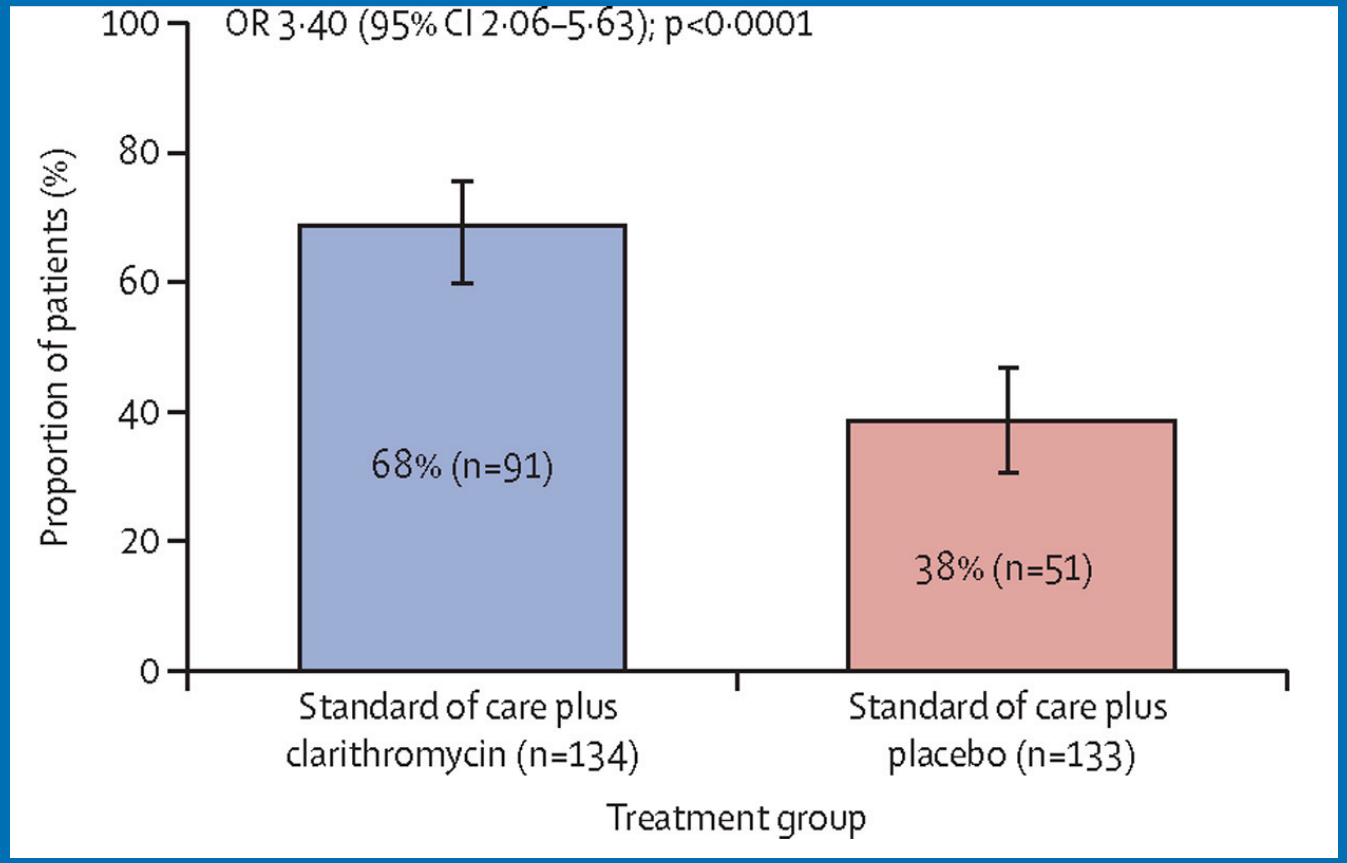
Macrolide Impact

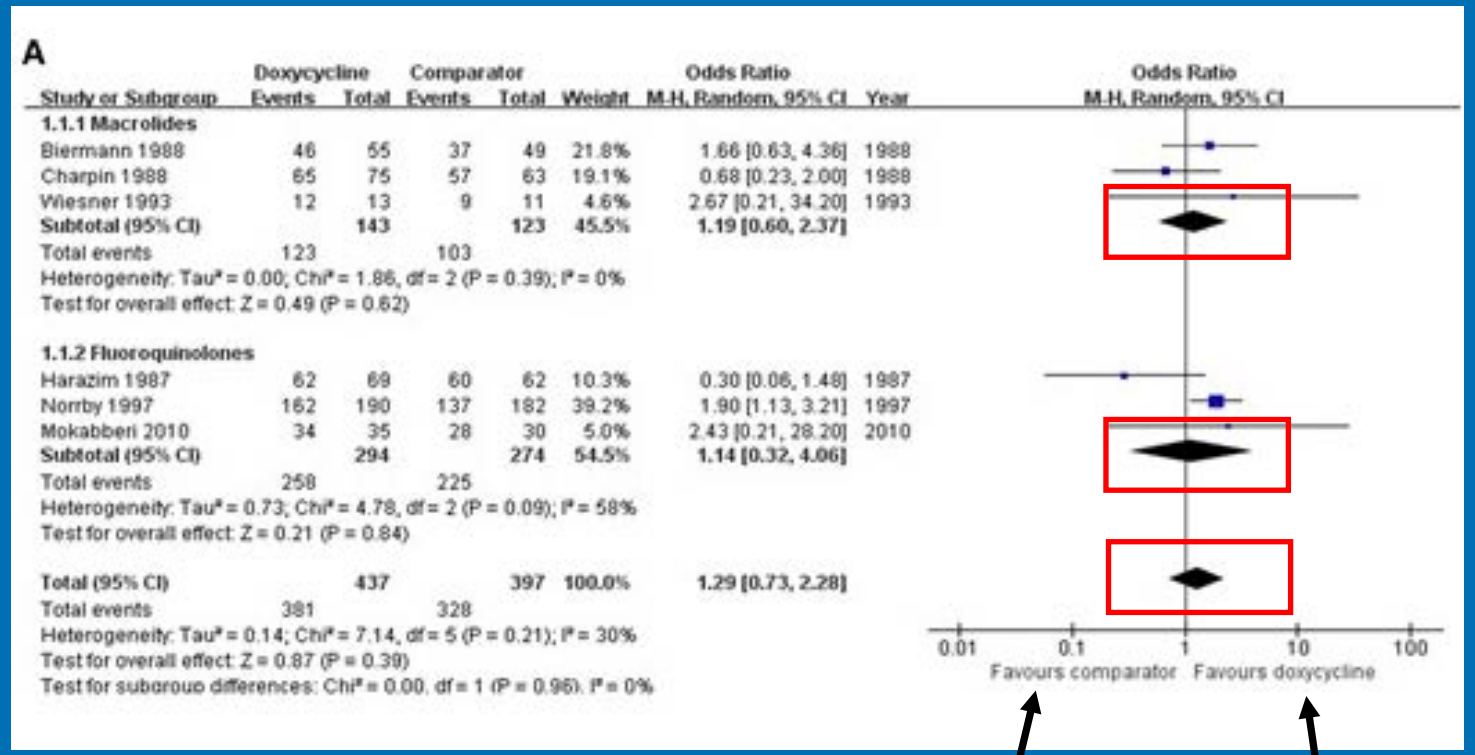
- Compared with placebo, clarithromycin + β-lactam reduced respiratory symptom severity and early inflammatory response



Giamarellos-Bourboulis E et al. Lancet Resp Med 2024

Doxycycline

- Metanalysis comparing doxycycline to macrolides and fluoroquinolones found no difference in outcomes for non-severe CAP



Choi SH et al. CID 2023

MRSA Coverage & De-escalation

- Use of empirical anti-MRSA therapy was associated with:
  - Higher risk of kidney injury
    - aRR, 1.4; 95% CI, 1.3-1.5
  - *C difficile* infection
    - aRR, 1.6; 95% CI, 1.3-1.9
  - Vancomycin-resistant *Enterococcus*
    - aRR, 1.6; 95% CI, 1.0-2.3
  - Secondary gram-negative rod detection
    - aRR, 1.5; 95% CI, 1.2-1.8

- Negative MRSA nasal swab has high negative predictive value (99%)
- In cases of culture-negative pneumonia with negative MRSA nasal swab, can discontinue anti-MRSA therapy

Table 2. Adjusted Risk Ratios for 30-Day Mortality Among Primary and Subgroup Inverse Probability–Weighted Analyses

Group	Adjusted Risk Ratio (95% CI)	
	Anti-MRSA Therapy Plus Standard Antibiotics	Anti-MRSA Therapy Without Standard Antibiotics
All patients	1.4 (1.3-1.5)	1.5 (1.4-1.6)
Patients admitted to ICU	1.3 (1.2-1.5)	1.4 (1.2-1.5)
High clinical risk for MRSA	1.2 (1.1-1.4)	1.3 (1.1-1.4)
MRSA surveillance PCR positive	1.6 (1.3-1.9)	1.8 (1.4-2.3)
MRSA culture positive	1.1 (0.8-1.4)	1.2 (0.9-1.6)

Abbreviations: ICU, intensive care unit; MRSA, methicillin-resistant *Staphylococcus aureus*; PCR, polymerase chain reaction.

Empirical anti-MRSA treatment was significantly associated with greater 30-day mortality compared with standard therapy alone

Jones et al. JAMA Int Med 2020
Dangerfield B et al. AAC 2014
Vaughan VM et al. JAMA 2024

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Oral Step Down Therapy

Vaughan VM et al. JAMA 2024
IDSA CAP Clinical Pathway
Metlay JP et al. *Am J Respir Crit Care Med 2019*

Transition to oral antibacterial medications	Transition to oral antibacterial medications as soon as the patient is improving and able to tolerate oral therapy.[3] Recommended options for patients without an identified organism[46,102]: amoxicillin/clavulanate 500 mg/125 mg orally 3 times a day or 875-2000 mg/125 mg orally twice daily; cefpodoxime 200 mg orally twice daily; cefuroxime 500 mg orally twice daily; amoxicillin 1 g orally 3 times a day; plus total 1500 mg azithromycin (including any parenteral doses).	Automatic transition to oral therapy (in nonsevere CAP) can reduce IV and total antibacterial therapy, cost, and LOS.[46,103,104] Quicker de-escalation (to narrower antibacterial medications [eg, amoxicillin]) may be associated with less development of antibacterial resistance.[105]	IV therapy places patients at risk of IV-related harm while increasing cost of care.

Narrow to target when an organism is identified, if no organism identified, can switch to same agent/drug class:

Assess for ability to tolerate oral therapy, oral de-escalation options:

- No MDRO risk factors (choose one):
  - Amoxicillin (500mg) + clavulanate (125mg) PO TID, or Amoxicillin (875 mg or 2000mg) + clavulanate (125mg) PO BID
  - Cefpodoxime 200mg PO BID
  - Cefuroxime 500mg PO BID
- MDRO Risk Factors:
  - Levofloxacin 750mg PO q24h
  - If Legionella-negative or alternative etiology identified, discontinue azithromycin after 1500mg total.

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Duration of CAP Therapy

- Historically, 7-14 days of antibiotic therapy was recommended

- 2019 guidelines: antibiotic therapy should be continued until the patient achieves stability and for no less than a total of 5 days
  - Clinical stability: resolution of vital sign abnormalities, ability to eat, normal mentation

Table 2. Results for the Primary Study Outcomes

Table 2. Results for the Primary Study Outcomes

Outcome	Control Group	Intervention Group	*P* Value
Intent-to-Treat Analysis			
Total No. of participants	150	162	
Clinical success, No. (%)[a]			
At day 10	71 (48.6)	90 (56.3)	.18
At day 30	132 (88.6)	147 (91.9)	.33
CAP symptom questionnaire score, mean (SD)[b]			
At day 5	24.7 (11.4)	27.2 (12.5)	.10
At day 10	18.6 (9.0)	17.9 (7.6)	.69
Per-Protocol Analysis			
Total No. of participants	137	146	
Clinical success, No. (%)[a]			
At day 10	67 (50.4)	86 (59.7)	.12
At day 30	126 (92.7)	136 (94.4)	.54
CAP symptom questionnaire score, mean (SD)[b]			
At day 5	24.3 (11.4)	26.6 (12.1)	.16
At day 10	18.1 (8.5)	17.6 (7.4)	.81

Table 4. Results for Secondary Study Outcomes in the Per-Protocol Analysis[a]

Outcome	Control Group (n = 137)	Intervention Group (n = 146)	*P* Value
Time, median (IQR), d			
Taking antibiotics	10 (10-11)	5 (5-6.5)	<.001
Not taking antibiotics	21 (10-27)	25 (5-32)	.001
Taking intravenous antibiotics	2 (1-4)	3 (2-4)	.22
Until clinical improvement	12 (8-18)	12 (7-15)	.41
Return to normal activity	18 (9-25)	15 (10-21)	.36
Radiographic resolution at day 30	93 (73.2)	112 (81.2)	.12
In-hospital mortality	2 (1.5)	3 (2.1)	>.99
30-d Mortality	3 (2.2)	3 (2.1)	>.99
Recurrence by day 30	6 (4.4)	4 (2.8)	.53
Readmission by day 30	9 (6.6)	2 (1.4)	.02

Uranga A et al. JAMA Internal Medicine 2016
Metlay JP et al. *Am J Respir Crit Care Med 2019*

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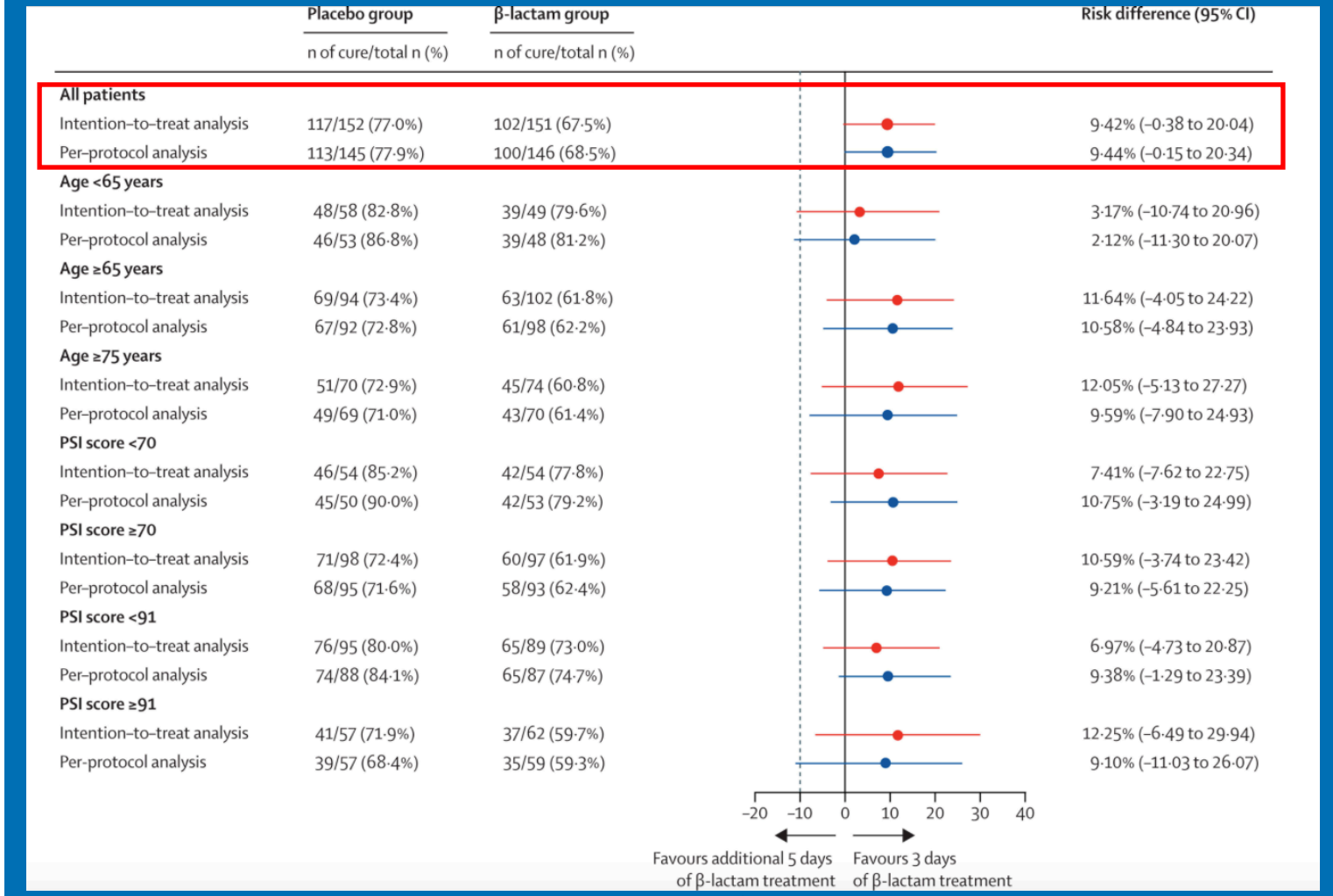
Duration of CAP Therapy

- Double blind RCT
- 3 vs 8 days of β-lactam therapy
- Must have stabilized by day 3

- No difference in the groups



	Placebo group	β-lactam group	Risk difference (95% CI)
	n of cure/total n (%)	n of cure/total n (%)	
All patients			
Intention-to-treat analysis	117/152 (77·0%)	102/151 (67·5%)	9·42% (−0·38 to 20·04)
Per-protocol analysis	113/145 (77·9%)	100/146 (68·5%)	9·44% (−0·15 to 20·34)
Age <65 years			
Intention-to-treat analysis	48/58 (82·8%)	39/49 (79·6%)	3·17% (−10·74 to 20·96)
Per-protocol analysis	46/53 (86·8%)	39/48 (81·2%)	2·12% (−11·30 to 20·07)
Age ≥65 years			
Intention-to-treat analysis	69/94 (73·4%)	63/102 (61·8%)	11·64% (−4·05 to 24·22)
Per-protocol analysis	67/92 (72·8%)	61/98 (62·2%)	10·58% (−4·84 to 23·93)
Age ≥75 years			
Intention-to-treat analysis	51/70 (72·9%)	45/74 (60·8%)	12·05% (−5·13 to 27·27)
Per-protocol analysis	49/69 (71·0%)	43/70 (61·4%)	9·59% (−7·90 to 24·93)
PSI score <70			
Intention-to-treat analysis	46/54 (85·2%)	42/54 (77·8%)	7·41% (−7·62 to 22·75)
Per-protocol analysis	45/50 (90·0%)	42/53 (79·2%)	10·75% (−3·19 to 24·99)
PSI score ≥70			
Intention-to-treat analysis	71/98 (72·4%)	60/97 (61·9%)	10·59% (−3·74 to 23·42)
Per-protocol analysis	68/95 (71·6%)	58/93 (62·4%)	9·21% (−5·61 to 22·25)
PSI score <91			
Intention-to-treat analysis	76/95 (80·0%)	65/89 (73·0%)	6·97% (−4·73 to 20·87)
Per-protocol analysis	74/88 (84·1%)	65/87 (74·7%)	9·38% (−1·29 to 23·39)
PSI score ≥91			
Intention-to-treat analysis	41/57 (71·9%)	37/62 (59·7%)	12·25% (−6·49 to 29·94)
Per-protocol analysis	39/57 (68·4%)	35/59 (59·3%)	9·10% (−11·03 to 26·07)

favors 8 days

favors 3 days

Dinh A et al. Lancet 2021

CAP: What's New Since the 2019 Guidelines

Should adults with CAP who reach clinical stability be treated with less than 5 days of antibiotics?

Non-severe CAP: suggest 3-4 days

Severe CAP: suggest 5 or more days

Confirmed Staph aureus or Pseudomonas: 7+ days

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AMERICAN THORACIC SOCIETY DOCUMENTS

Diagnosis and Management of Community-acquired Pneumonia
An Official American Thoracic Society Clinical Practice Guideline

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE OF THE AMERICAN THORACIC SOCIETY WAS APPROVED MAY 2025

Recommendation	Strength & Evidence Quality	Factors that strengthen the recommendation	Factors that weaken the recommendation
3. Antibiotic duration for CAP			
For adult inpatients with non-severe CAP who reach clinical stability*, we suggest less than five days of antibiotics (minimum of 3 days duration), rather than five or more days of antibiotics. *The duration of antibiotics should be determined based upon daily assessment of clinical stability.	Conditional Low-quality evidence	Patient preference to minimize antibiotic exposure Resolution of inflammatory markers	Organism requiring longer duration (i.e., *Staphylococcus aureus, Pseudomonas aeruginosa*, suspected *Legionella pneumophila* or other intracellular microorganisms)** Pneumonia complication (e.g., empyema/parapneumonic effusion, abscess/necrotizing process, bacteremia, extrapulmonary infection) Underlying lung disease (e.g., bronchiectasis, post-obstructive pneumonia, chronic hypoxemia**) Pregnancy, recent antibiotics** Recent Hospitalization or resident in Long-term care**

Jones BE et al. *Am J Respir Crit Care Med* 2025

CAP: Corticosteroids?

AMERICAN THORACIC SOCIETY DOCUMENTS

Diagnosis and Management of Community-acquired Pneumonia
An Official American Thoracic Society Clinical Practice Guideline

THIS OFFICIAL CLINICAL PRACTICE GUIDELINE OF THE AMERICAN THORACIC SOCIETY WAS APPROVED MAY 2025

Should Adults Who Are Hospitalized with Community-acquired Pneumonia Be Treated with Corticosteroids?

Non-severe CAP: no systemic corticosteroids recommended

Severe CAP: steroids suggested, except for influenza

Recommendation	2007 ATS/IDSA Guideline	2019 ATS/IDSA Guideline
Sputum culture	Primarily recommended in patients with severe disease	Now recommended in patients with severe disease as well as in all inpatients empirically treated for MRSA or *Pseudomonas aeruginosa*
Blood culture	Primarily recommended in patients with severe disease	Now recommended in patients with severe disease as well as in all inpatients empirically treated for MRSA or *P. aeruginosa*
Macrolide monotherapy	Strong recommendation for outpatients	Conditional recommendation for outpatients based on resistance levels
Use of procalcitonin	Not covered	Not recommended to determine need for initial antibacterial therapy
Use of corticosteroids	Not covered	Recommended not to use. May be considered in patients with refractory septic shock

Steroids	Outpatient: no steroids. Inpatient, nonsevere: no steroids. Inpatient, severe[c]: steroids (eg, hydrocortisone 200 mg/d)[106] within 24 h of meeting severity criteria.	Outpatient: no studies found. Inpatient, nonsevere: steroids reduce LOS but increase hyperglycemia. No difference in mortality.[107,108] Inpatient, mixed severity: data mixed but benefit driven by more severe subgroups.[109-113] Inpatient, severe: steroids reduce mortality, need for mechanical ventilation,[c] vasopressor use, and hospital or ICU LOS[106,114-120]; adverse events not increased by steroids.[115,121]	Patients may require steroids for other pulmonary (eg, asthma, COPD) or disease indications (eg, COVID-19). Patients with influenza pneumonia were excluded from clinical trials owing to concern steroids could be harmful.

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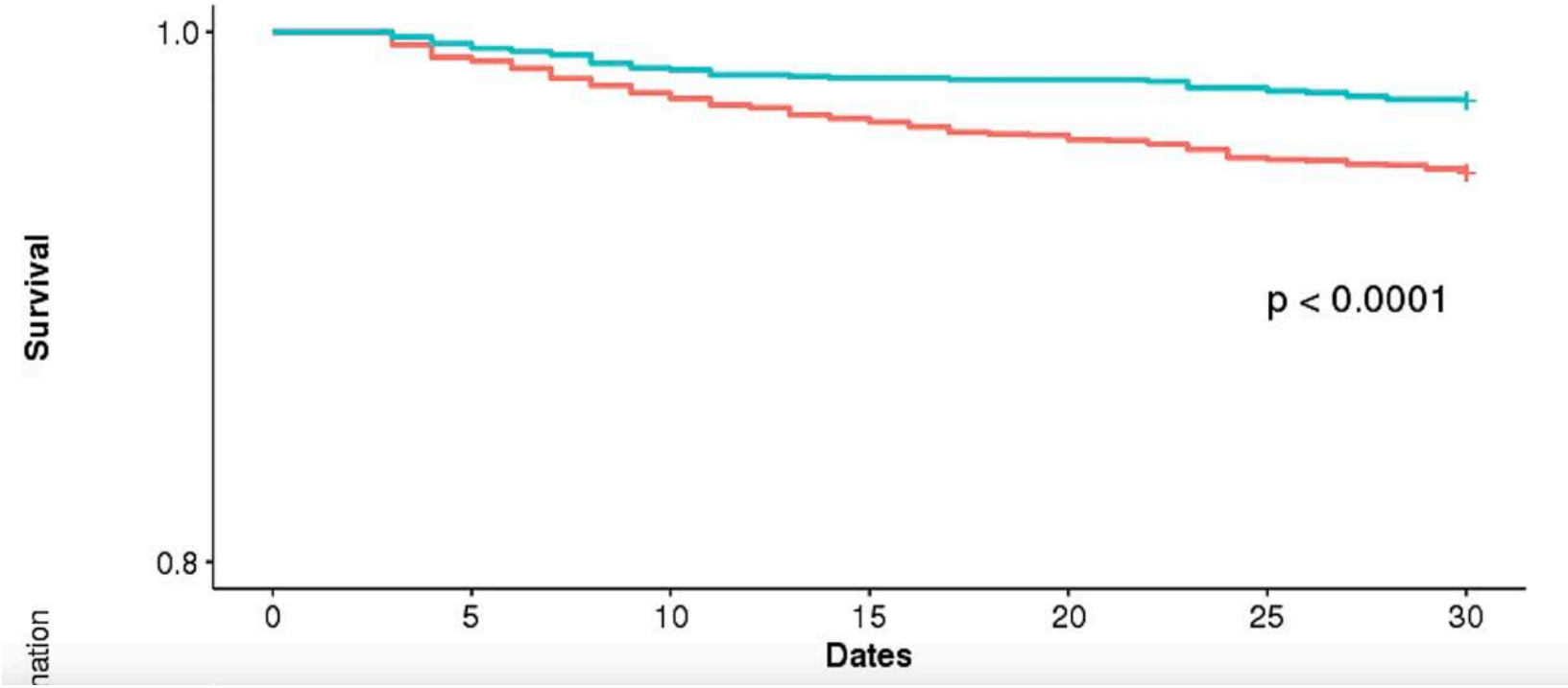
Metlay JP et al. *Am J Respir Crit Care Med 2019*
Jones BE et al. *Am J Respir Crit Care Med* 2025
Vaughan VM et al. JAMA 2024

Prevention

- Screen for pneumococcal, influenza, RSV, COVID-19 vaccinations and administer as indicated
- Oral hygiene
- Smoking cessation

Pneumococcal vaccination reduces prevalence and mortality from CAP



Metlay JP et al. *Am J Respir Crit Care Med 2019*
Vaughan VM et al. JAMA 2024
Tanzella G et al. *Expert Rev Respir Med*. 2019
Kim S et al. BMC Pulm Med 2024

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Clinical Infectious Diseases
IDSA GUIDELINE

HAP and VAP Highlights

Key Points

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

Role of Combination Coverage for Gram Negatives

- Not recommended, unlikely to provide benefit

Inhaled antibiotics

- May be considered in addition to systemic antibiotics for gram negative bacilli susceptible only to aminoglycosides or polymyxin (colistimethate)
- Now have additional systemic options for resistant gram negative organisms that should be considered

Duration of therapy

- 7 days generally appropriate regardless of pathogen
- For VAP with minimal ventilator settings and clinical stability, 3-day course may be considered

Aspiration/HAP/VAP

- No need for anaerobic coverage with metronidazole or clindamycin unless empyema or lung abscess present

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Khalil AC et al. CID 2016
Klompas M et al. CID 2017

Benefits of Stewardship in Pneumonia

IDSA Antimicrobial stewardship

The major objectives of antimicrobial stewardship are to:

- achieve best clinical outcomes related to antimicrobial use
- minimize toxicity and other adverse events
- limit the selective pressure on bacterial populations that drives the emergence of antimicrobial-resistant strains.

- Improved clinical outcomes
- Shorter LOS
- Less c diff
- Less antibiotic resistance development
- Less AKI
- Lower cost

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https://www.idsociety.org/practice-resources/practice-tools/antimicrobial-stewardship/

Thank you

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