Community Acquired Pneumonia

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Objectives

- Know the target population for the 2019 American Thoracic Society and Infectious Diseases Society of America (ATS/IDSA) Community-acquired Pneumonia (CAP) guidelines 2019
- Know when to perform testing for CAP: sputum cultures, blood cultures, Legionella and pneumococcal urinary antigen testing, influenza testing, and procalcitonin
- Be able to discuss the utilization of steroids in patients with CAP
- Know the selection of initial empiric antibiotic therapy for community-acquired pneumonia and duration of treatment for inpatients
- Criteria for hospitalization versus the need for ICU admission in adults diagnosed with CAP based on Pneumonia severity index (PSI) compared to CURB-65
- Discuss the differences between the 2019 and 2007 ATS/IDSA Community-acquired Pneumonia Guidelines.
- COVID-19 Identify and Isolate.

Pneumonia and CAP definition

- **Pneumonia**
  - Infection of the alveoli, distal airways and the interstitium of the lung.
  - **Clinical:** a new or changing radiographic density (infiltrate).
    - Usually accompanied by constitutional symptoms of lung inflammation.
- **Community Acquired Pneumonia**
  - acquired outside the hospital
  - Signs and symptoms of pneumonia with radiographic confirmation

*Patient must not have been hospitalized nor resided in a long-term-care facility for, at minimum, 14 days prior to the onset of symptoms

Impact of Pneumonia

- leading infectious cause of hospitalization and death among U.S. adults
- more than 1.5 million adults hospitalized annually
- medical costs exceeding $10 billion in 2011

Who is at risk for CAP?

- Advanced age
- Previous history of CAP
- Tobacco use
- Environmental irritant exposures (exposure to bat or bird droppings/exposure to farm animals or parturient cats)
- Poor oral health or nutritional status
- Functional impairment/Aspiration
- Immunocompromised and chronic oral steroid use
- Chronic obstructive pulmonary disease
- Other health problems such as kidney failure, CV disease, diabetes, asplenia
- Use of certain medicines, including proton-pump inhibitors and H2 antagonists
- Heavy alcohol use

Etiologic Microorganisms for CAP in Adults

- Streptococcus pneumonia
- Haemophilus influenzae
- Staphylococcus aureus
- Mycoplasma pneumoniae
- Chlamydia pneumoniae
- Moraxella catarrhalis
- Legionella pneumophila
- Viral: Influenza, Rhinovirus, Coronavirus
  - No organism isolated in 40 to 50% cases
  - Respiratory viruses were detected more frequently than bacteria (Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults, 2015, DOI: 10.1056/NEJMoa1500245)

What are the signs & symptoms of CAP?

- **Cardinal s/s** :
  - SOB, Cough, fever , Pleuritic CP (Chest pain that is worse when you breathe or cough) , Chill, sudden onset , Dark, thick or bloody (rusty) sputum
- Respiratory S/S:
  - **Respiratory Rate: single most useful clinical sign of severity of pneumonia.**
    - RR > 30 in a patient without lung disease is a bad clinical sign
  - Consolidation: rales, egophony
  - Pleural involvement: decreased breath sounds, friction rub.
  - Respiratory distress: tachypnea, cyanosis
- CNS S/S:
  - confusion, restlessness.
- GI S/S:
  - abdominal pain, anorexia.
  - Nausea and vomiting (less common)

Imaging

- **CXR**
  - The IDSA and ATS emphasize the need for a new, visible infiltrate on chest radiograph to make a diagnosis of pneumonia due to the imprecision of clinical signs and symptoms
  - Up to one-third of initial chest radiographs may be negative in patients with pneumonia, with the identification of new lung infiltrates being less clear in patients with obesity or with underlying chronic lung disease
    - Repeat the chest radiograph after 24 hours for patients in whom CAP is strongly suspected and who have an initial negative chest radiograph
  - Lags behind the pt getting better (aka chest X-ray will look worse than pt does clinically after patient has been treated)
- **Lung US**
  - viable alternative to CXR:
  - Lung ultrasonography has a high sensitivity (95%) and specificity (90%)for diagnosing pneumonia
  - particularly helpful in older patients and patients who are immobile
  - Results are dependent on the skill of the operator.
- **CT Chest**
  - most accurate for the diagnosis of pneumonia,
  - limited by its cost and by concerns of radiation exposure

CAP Guidelines 2019: American Thoracic Society and Infectious Diseases Society of America

- Update to the 2007 ATS/IDSA CAP guidelines
- 15-member panel of pulmonologists, infectious disease specialists, general internists, and methodologists with expertise in evidence synthesis.
- The guideline is presented as a series of clinical questions, using the Patient or Population, Intervention, Comparison, Outcome (PICO) framework. It is written in question/answer format with the answer including
  - 1) the recommendation,
  - 2) a summary of the available evidence, and
  - 3) the rationale for the authors' recommendation
- Given the broad scope of the topic, the guideline was intentionally narrowed to cover clinical decisions identified as high priority by the panel from the time of diagnosis of pneumonia through treatment and follow-up imaging.
- It does not address initial diagnosis or prevention.

Target patient population for 2019 IDSA/ATS Guidelines

- Patients in the United States
- No recent foreign travel
  - especially to regions with emerging respiratory pathogens
- Adults who do not have an immunocompromising condition
  - inherited or acquired immune deficiency
  - drug-induced neutropenia
  - patients actively receiving cancer chemotherapy,
  - patients infected with HIV with suppressed CD4 counts,
  - Solid organ or bone marrow transplant recipients.

Pneumonia severity index (PSI) vs CURB-65

- The ATS/IDSA guideline recommends that clinicians use a validated clinical prediction rule for prognosis to help guide the plan of care for adults with CAP
- Pneumonia severity index (PSI) recommended (over CURB-65) to determine need for hospitalization in adults diagnosed with CAP
  - accurately predicting mortality risk in patients with CAP
  - PSI is better at identifying patients at low risk for mortality when compared with the CURB-65.
  - The PSI would be the best tool for clinicians to use in an ED setting as there is generally access to all the diagnostic tests needed to accurately calculate risk.

Pneumonia severity index (PSI)

https://www.mdcalc.com/psi-port-score-pneumonia-severity-index-cap

Criteria	Points	Scoring
Gender		Age ≤50 with no comorbidities and normal physical exam findings (Class I) • 30-day mortality 0.1% • Low risk • Outpatient care
Male	0	
Female	-10	
Demographic factors		
Age (one point per year)	Age (yr)	
Long-term-care facility resident	10	
Comorbidities		
Malignancy	30	Score of 51–70 (Class II) • 30-day mortality 0.6% • Low risk • Consider outpatient care versus short inpatient observation
Liver disease	20	
Congestive heart failure	10	
Cerebrovascular disease	10	
Renal disease	10	
Physical examination findings		
Altered mental status	20	Score of 71–90 (Class III) • 30-day mortality 0.9% • Low risk • Consider outpatient care versus short inpatient observation
Respiratory rate ≥30/minute	20	
Systolic BP <90 mm Hg	20	
Temperature <35°C or ≥40°C	15	
Pulse ≥125/minute	10	
Laboratory and radiographic findings		
Arterial pH <7.35	30	Score of 91–130 (Class IV) • 30-day mortality 9.3% • Moderate risk • Inpatient care
BUN ≥30 mg/dL (11 mmol/L)	20	
Sodium <130 mEq/L	20	
Glucose ≥250 mg/dL (14 mmol/L)	10	
Hematocrit <30%	10	
Partial pressure of arterial oxygen <60 mm Hg	10	
Pleural effusion on X-ray	10	Score of 131–395 (Class V) • 30-day mortality 27.0% • High risk • Inpatient care

Adapted from Fine MJ, Auble TE, Yealy DM, et al. A prediction rule to identify low-risk patients with community-acquired pneumonia. *N Engl J Med.* 1997;336(4):243-250.

CURB-65

ATS/IDSA provided a conditional recommendation for the CURB-65 due to its simplicity of use.

The CURB-65 is a reasonable tool to use in the outpatient office setting as it does not include values obtained by an arterial blood gas.

CURB-65 becomes a less sensitive tool if the blood urea nitrogen (BUN) is not evaluated and included in the analysis.

Criteria	Scoring
Confusion	Each positive result worth one point: Score of 0 or 1 • 30-day mortality 1.5% • Outpatient care reasonable Score of 2 • 30-day mortality 9.2% • Inpatient or observation admission recommended Score of ≥3 • 30-day mortality 22% • Inpatient admission needed with possible ICU placement for scores of 4–5
BUN >19 mg/dL (>7 mmol/L)	
Respiratory rate ≥30	
Systolic BP <90 mm Hg or Diastolic BP ≤60 mm Hg	
Age ≥ 65	

Adapted from Lim WS, van der Eerden MM, Laing R, et al. Defining community acquired pneumonia severity on presentation to hospital: an international derivation and validation study. *Thorax*. 2003;58(5):377-382.

Moderate CAP

- PSI: III or IV or CURB-65: 1-2
- Hospital admission to regular floor
- Blood cultures, Sputum gram stain + culture, Urine streptococcal antigen, Legionella testing
- Respiratory viral panel during respiratory virus season

Classification of Severe CAP

Determining the Need for ICU Admission

- Hypotension requiring vasopressors or need for mechanical ventilation
- Otherwise, use IDSA/ATS 2007 minor criteria (Table 1) together with clinical judgment to guide need for ICU admission; 3 or more minor criteria has good predictive value for the need for ICU admission.

Table 1. 2007 Infectious Diseases Society of America/American Thoracic Society Criteria for Defining Severe Community-acquired Pneumonia

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

*Due to infection alone (i.e., not chemotherapy induced).

Severe CAP

- PSI: IV or V or CURB-65 ≥ 3 and/or fulfillment of ATS/IDSA criteria for ICU admission
- Blood cultures, Sputum gram stain + culture, Urine streptococcal antigen, Legionella testing
- Respiratory viral panel
- Bronchoscopy specimens for gram stain, fungal stain, aerobic, fungal culture, and molecular testing (when feasible)

Testing: Sputum Cultures

Sputum cultures

- Outpatients diagnosed with pneumonia Routine culture NOT recommended
- Recommended for inpatients with:
  - Severe CAP
  - Those empirically treated for MRSA or pseudomonas*
  - Those previously infected with MRSA or pseudomonas
  - Those hospitalized and received parenteral antibiotics in the last 90 days

Testing: Blood Cultures

Outpatients diagnosed with pneumonia

- NOT recommended

Inpatients

- NOT recommended routinely, but are recommended for inpatients with (same population as for sputum cultures):
  - Severe CAP
  - Those empirically treated for MRSA or pseudomonas*
  - Those previously infected with MRSA or pseudomonas
  - Those hospitalized and received parenteral antibiotics in the last 90 days

Testing: Legionella and pneumococcal urinary antigen testing

Check when legionella outbreak is suspected or in severe CAP

Flu testing

- Influenza virus is a common cause of pneumonia and can lead to secondary bacterial infection.
- It is common to have viral and bacterial coinfection
  - increased risk for mortality with coexistent viral and bacterial pathogens.
- **The ATS/IDSA guideline recommends testing patients with CAP for influenza at the time of diagnosis if the virus is active in the community**

Treatment of INFLUENZA in patients with CAP (infiltrate on chest x-ray presumably)

- Treat with antiviral therapy if inpatient regardless of the duration of illness (strong recommendation, moderate quality of evidence).
- *We recommend that standard antibacterial treatment be initially prescribed for adults with clinical and radiographic evidence of CAP who test positive for influenza in the inpatient and outpatient settings (strong recommendation, low quality of evidence).*
  - Bacterial infection can occur concurrently or present later as a worsening of symptoms
  - However in patients with CAP, a positive influenza test, no evidence of a bacterial pathogen (including a low procalcitonin level), and early clinical stability, consideration could be given to earlier discontinuation of antibiotic treatment at 48 to 72 hours

Procalcitonin

- *We recommend that* ***empiric antibiotic therapy should be initiated in adults with clinically suspected and radiographically confirmed CAP regardless of initial serum procalcitonin level*** *(strong recommendation, moderate quality of evidence).*
- The reported sensitivity of procalcitonin to detect bacterial infection ranges from 38-91%!

Aspiration

- *We suggest not routinely adding anaerobic coverage for suspected aspiration pneumonia unless lung abscess or empyema is suspected (conditional recommendation, very low quality of evidence)*
- *Half of adults aspiration during sleep. There is no definition that separates patients with aspiration pneumonia from all others with pneumonia*

Steroids

- *We recommend not routinely using corticosteroids in adults with nonsevere CAP (strong recommendation, high quality of evidence).*
- *We suggest not routinely using corticosteroids in adults with severe influenza pneumonia (conditional recommendation, low quality of evidence).*
- *We endorse the Surviving Sepsis Campaign recommendations on the use of corticosteroids in patients with CAP and refractory septic shock.*

*Interestingly, they admit that several trials and meta-analyses have shown benefit in some outcomes

HCAP

- HCAP was defined for those patients who had any one of several potential risk factors for antibiotic-resistant pathogens
  - including residence in a nursing home and other long-term care facilities,
  - hospitalization for >2 days in the last 90 days,
  - receipt of home infusion therapy,
  - chronic dialysis,
  - home wound care, or
  - a family member with a known antibiotic-resistant pathogen)
- Authors recommend abandoning the use of the term HCAP to guide selection of extended antibiotic coverage in patients with CAP

Risk Factors for CAP caused by MRSA and *Pseudomonas*		
	MRSA	***Pseudomonas***
Strong Risk Factors	• Known colonization or prior infection with MRSA • Detection of gram-positive cocci in clusters on a good-quality sputum Gram stain	• Known colonization or prior infection with *Pseudomonas* • Detection of gram-negative rods on a good-quality sputum Gram stain • Hospitalization with receipt of IV antibiotics in the prior 3 months

Other factors that should raise suspicion for infection	• Recent hospitalization or antibiotic use, particularly hospitalization with receipt of IV antibiotics in the prior 3 months
	• Recent influenza-like illness
	• Necrotizing or cavitary pneumonia
	• Empyema
	• Risk factors for MRSA colonization, including:
	  • End-stage kidney disease
	  • Crowded living conditions (eg, incarceration)
	  • Injection drug use
	  • Contact sports participation
	  • Men who have sex with men
		• Recent hospitalization of stay in a long-term care facility
		• Recent antibiotic use of any kind
		• Frequent COPD exacerbations requiring glucocorticoid and/or antibiotic use
		• Other structural lung diseases (eg, bronchiectasis, cystic fibrosis)
		• Immunosuppression

MRSA and *Pseudomonas* Risk Factors

- The most consistently strong individual risk factors for respiratory infection with MRSA or P. aeruginosa are:
  - Prior isolation of these organisms, especially from the respiratory tract (within past year)
    - Add treatment for MRSA or pseudomonas
  - Recent hospitalization and exposure to parenteral antibiotics (within past 90 days)
    - Add treatment IF locally validated risk factors for either pathogen are present
- Studies in patients with CAP provide strong evidence that **de-escalation of antibiotic therapy at 48 hours in accord with microbiological results that do not yield MRSA or P. aeruginosa**

CAP Inpatient Treatment

Table 4. Initial Treatment Strategies for Inpatients with Community-acquired Pneumonia by Level of Severity and Risk for Drug Resistance

	Standard Regimen	Prior Respiratory Isolation of MRSA	Prior Respiratory Isolation of *Pseudomonas aeruginosa*	Recent Hospitalization and Parenteral Antibiotics and Locally Validated Risk Factors for MRSA	Recent Hospitalization and Parenteral Antibiotics and Locally Validated Risk Factors for *P. aeruginosa*
Nonsevere inpatient pneumonia*	β-Lactam + macrolide† or respiratory fluroquinolone‡	Add MRSA coverage§ and obtain cultures/nasal PCR to allow deescalation or confirmation of need for continued therapy	Add coverage for *P. aeruginosa*‖ and obtain cultures to allow deescalation or confirmation of need for continued therapy	Obtain cultures but withhold MRSA coverage unless culture results are positive. If rapid nasal PCR is available, withhold additional empiric therapy against MRSA if rapid testing is negative or add coverage if PCR is positive and obtain cultures	Obtain cultures but initiate coverage for *P. aeruginosa* only if culture results are positive
Severe inpatient pneumonia*	β-Lactam + macrolide† or β-lactam + fluroquinolone‡	Add MRSA coverage§ and obtain cultures/nasal PCR to allow deescalation or confirmation of need for continued therapy	Add coverage for *P. aeruginosa*‖ and obtain cultures to allow deescalation or confirmation of need for continued therapy	Add MRSA coverage§ and obtain nasal PCR and cultures to allow deescalation or confirmation of need for continued therapy	Add coverage for *P. aeruginosa*‖ and obtain cultures to allow deescalation or confirmation of need for continued therapy

Definition of abbreviations: ATS = American Thoracic Society; CAP = community-acquired pneumonia; HAP = hospital-acquired pneumonia; IDSA = Infectious Diseases Society of America; MRSA = methicillin-resistant *Staphylococcus aureus*; VAP = ventilator-associated pneumonia.

*As defined by 2007 ATS/IDSA CAP severity criteria guidelines (see Table 1).

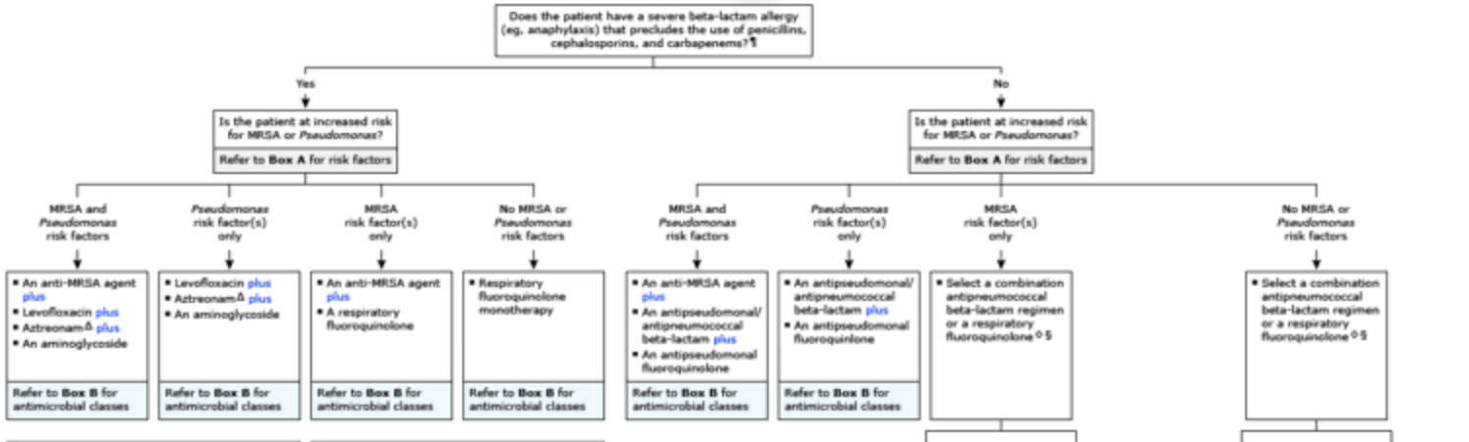
†Ampicillin + sulbactam 1.5–3 g every 6 hours, cefotaxime 1–2 g every 8 hours, ceftriaxone 1–2 g daily, or ceftaroline 600 mg every 12 hours AND azithromycin 500 mg daily or clarithromycin 500 mg twice daily.

‡Levofloxacin 750 mg daily or moxifloxacin 400 mg daily.

§Per the 2016 ATS/IDSA HAP/VAP guidelines: vancomycin (15 mg/kg every 12 h, adjust based on levels) or linezolid (600 mg every 12 h).

‖Per the 2016 ATS/IDSA HAP/VAP guidelines: 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), or aztreonam (2 g every 8 h). Does not include coverage for extended-spectrum β-lactamase–producing Enterobacteriaceae, which should be considered only on the basis of patient or local microbiological data.

Community-acquired pneumonia: Empiric antibiotic selection for adults admitted to the general medical ward*



Box A

Risk factors

MRSA:

Strong risk factors that indicate need for empiric therapy:

- Known colonization or prior infection with MRSA (positive rapid nasal PCR or any prior isolation)
- Gram-positive cocci in clusters on good-quality sputum Gram stain

Other factors that raise suspicion for MRSA and may indicate need for empiric therapy depending on local prevalence and overall clinical assessment:

- Receipt of IV antibiotics during a hospitalization in the prior 3 months
- Recent influenza-like illness
- Necrotizing or cavitary pneumonia
- Presence of empyema
- Risk factors for MRSA colonization:
  - End-stage renal disease
  - Patients who are men who have sex with men
  - Living in crowded conditions
  - Incarceration
  - Injection drug use
  - Contact sports participation

Pseudomonas:

Strong risk factors that indicate need for empiric therapy:

- Gram-negative bacilli seen on good-quality sputum Gram stain
- Known colonization or prior infection with *Pseudomonas*
- Receipt of IV antibiotics during a hospitalization in the prior 3 months

Other factors that raise suspicion for Pseudomonas and may indicate need for empiric therapy depending on local prevalence and overall clinical assessment:

- Structural lung abnormalities (eg, bronchiectasis)
- Frequent COPD exacerbations requiring frequent glucocorticoid or antibiotic use

Box B

Antimicrobial classes

Anti-MRSA agents:

- Vancomycin †
- Linezolid

Aminoglycosides:

- Gentamicin
- Tobramicin
- Amikacin

Respiratory fluoroquinolones:

- Levofloxacin
- Moxifloxacin
- Gemifloxacin (available as an oral formulation only)

Antipseudomonal fluoroquinolones:

- Ciprofloxacin
- Levofloxacin

Antipseudomonal/antipneumococcal beta-lactams:

- Piperacillin-tazobactam †
- Cefepime
- Ceftazidime
- Imipenem
- Meropenem

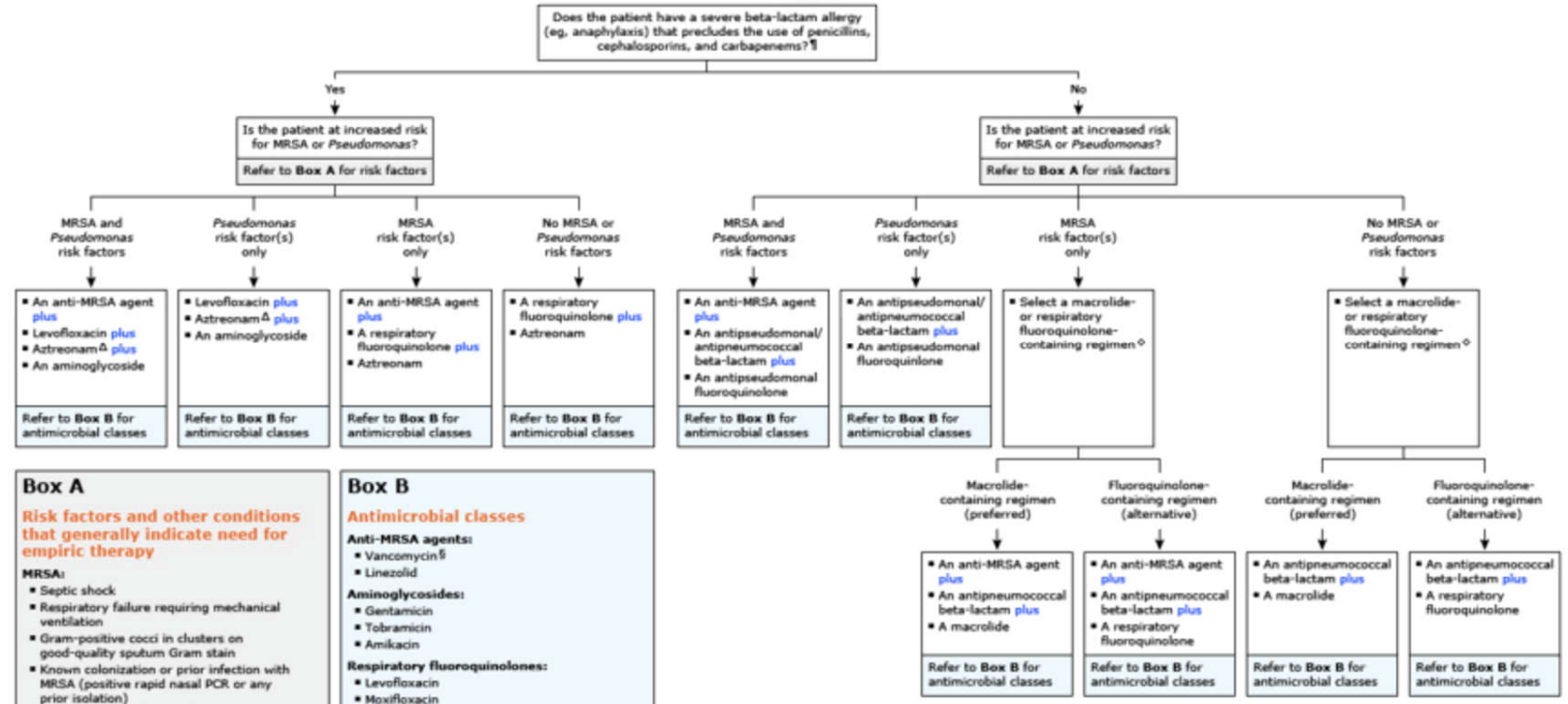
Antipneumococcal beta-lactams:

- Ceftriaxone
- Cefotaxime
- Ceftaroline
- Ertapenem
- Ampicillin-sulbactam

Macrolides:

- Azithromycin
- Clarithromycin

Community-acquired pneumonia: Empiric antibiotic selection for adults admitted to the intensive care unit*



Box A

Risk factors and other conditions that generally indicate need for empiric therapy

MRSA:
- Septic shock
- Respiratory failure requiring mechanical ventilation
- Gram-positive cocci in clusters on good-quality sputum Gram stain
- Known colonization or prior infection with MRSA (positive rapid nasal PCR or any prior isolation)
- Receipt of IV antibiotics during a hospitalization in the prior 3 months
- Recent influenza-like illness
- Necrotizing or cavitary pneumonia
- Presence of empyema
- Risk factors for MRSA colonization:
  - End-stage renal disease
  - Patients who are men who have sex with men
  - Living in crowded conditions
  - Incarceration
  - Injection drug use
  - Contact sports participation

***Pseudomonas*:**
- Gram-negative bacilli seen on good-quality sputum Gram stain
- Known colonization or prior infection with *Pseudomonas*
- Receipt of IV antibiotics during a hospitalization in the prior 3 months
- Structural lung abnormalities (eg, bronchiectasis)
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Box B

Antimicrobial classes

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- Gentamicin
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Respiratory fluoroquinolones:
- Levofloxacin
- Moxifloxacin

Antipseudomonal fluoroquinolones:
- Ciprofloxacin
- Levofloxacin

Antipseudomonal/antipneumococcal beta-lactams:
- Piperacillin-tazobactam§
- Cefepime
- Ceftazidime
- Imipenem
- Meropenem

Antipneumococcal beta-lactams:
- Ceftriaxone
- Cefotaxime
- Ceftaroline
- Ertapenem
- Ampicillin-sulbactam

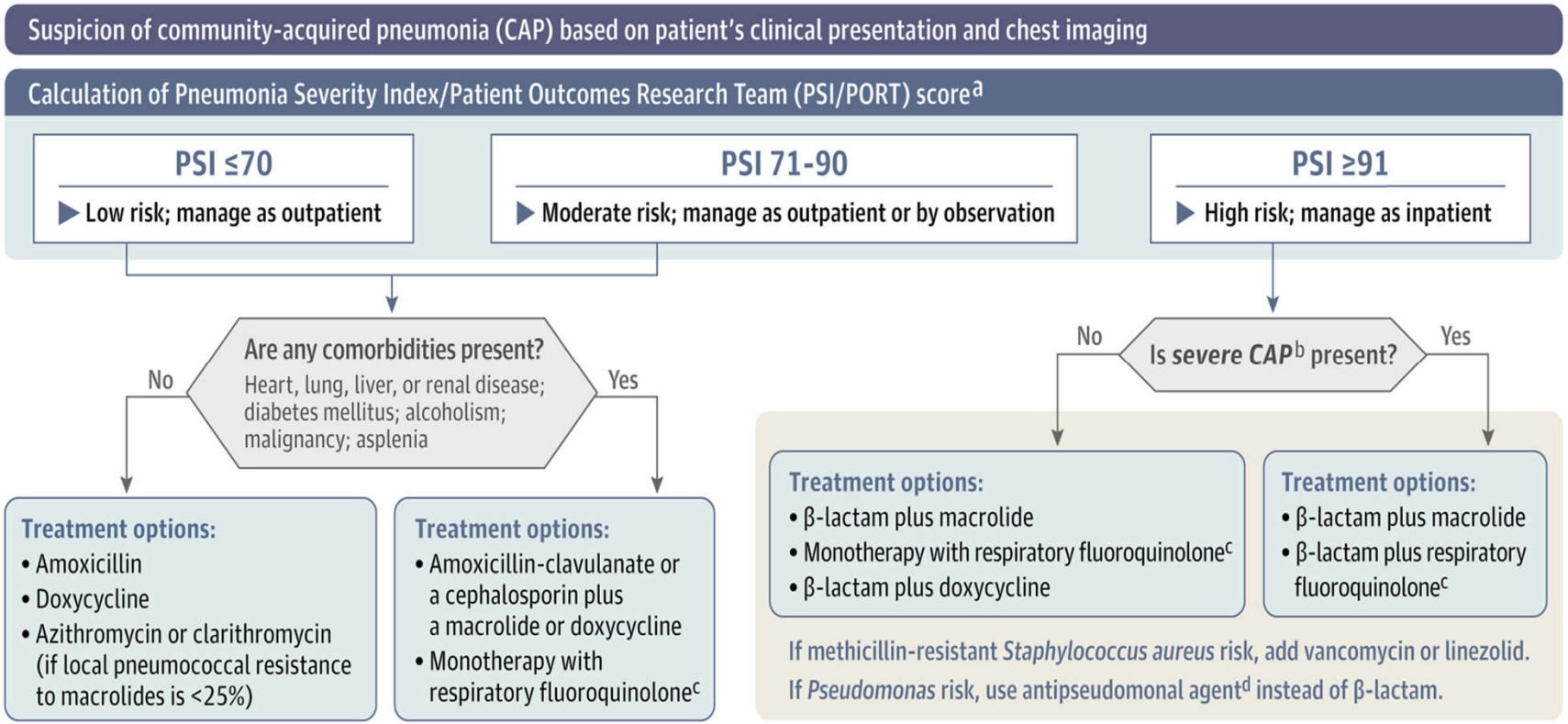
Macrolides:
- Azithromycin
- Clarithromycin

Duration of antibiotics in patients who are improving

- In general, treat no less than 5 days, and guide duration by signs of clinical stability (HR, RR, BP, O2 sat, temp, etc.)
- Some patients do not respond to the standard duration of therapy. Failure to achieve clinical stability after 5 days of therapy should prompt further investigation (is there a resistant organism that is not being treated, is there an empyema or abscess, or is there a non-infectious process
- When switching from IV to PO antibiotics, authors recommend using the same agent or the same drug class.
- Recommend 7 days of therapy for MRSA and pseudomonas pneumonia

Follow-up chest imaging

- In adults with CAP whose symptoms have resolved within 5 to 7 days, we suggest not routinely obtaining follow-up chest imaging (conditional recommendation, low quality of evidence).
- Rationale is usually to detect malignancy - reported rates of malignancy in patients recovering from CAP range from 1.3% to 4%.
- Available data suggest the positive yield from repeat imaging ranges from 0.2% to 5.0%; however many patients with new abnormalities in these studies meet criteria for lung cancer screening among current or past smokers
- ?So consider in high risk patients if they don't want to enroll in lung cancer screening.



Algorithm for Community-Acquired Pneumonia

[a]https://www.mdcalc.com/psi-port-score-pneumonia-severity-index-cap

[b]Severe CAP is defined in website linked in related resources box.

[c]Respiratory fluoroquinolones: moxifloxacin, gemifloxacin, or levofloxacin.

[d]Antipseudomonal agents: piperacillin-tazobactam, cefepime, ceftazidime, aztreonam, meropenem, and imipenem.

From: **Diagnosis and Treatment of Adults With Community-Acquired Pneumonia**
JAMA. Published online February 06, 2020. doi:10.1001/jama.2019.21118

Table 2. Differences between the 2019 and 2007 American Thoracic Society/Infectious Diseases Society of America Community-acquired Pneumonia Guidelines

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
Use of healthcare-associated pneumonia category	Accepted as introduced in the 2005 ATS/IDSA hospital-acquired and ventilator-associated pneumonia guidelines	Recommend abandoning this categorization. Emphasis on local epidemiology and validated risk factors to determine need for MRSA or *P. aeruginosa* coverage. Increased emphasis on deescalation of treatment if cultures are negative
Standard empiric therapy for severe CAP	β-Lactam/macrolide and β-lactam/fluoroquinolone combinations given equal weighting	Both accepted but stronger evidence in favor of β-lactam/macrolide combination
Routine use of follow-up chest imaging	Not addressed	Recommended not to obtain. Patients may be eligible for lung cancer screening, which should be performed as clinically indicated

Definition of abbreviations: ATS = American Thoracic Society; CAP = community-acquired pneumonia; IDSA = Infectious Diseases Society of America; MRSA = methicillin-resistant *Staphylococcus aureus*.

COVID-19 Current State (March 3)

- Worldwide infections: 93,126
- Worldwide fatalities: 3,198
- US Infections: 124
- US fatalities: 9

- Influenza infections in US this season: >32 million
- Influenza fatalities in US this season: >18,000

COVID-19 Clinical Characteristics

- Incubation period ~5 (2-14) days
- Case reports of asymptomatic people transmitting infection
- Less transmissible than influenza but no one has immunity
- Fever, ST, dry cough, myalgia/fatigue
- Lymphopenia or lymphocytosis reported
- Non-con CT with ground glass opacities
- Supportive care - no steroids (unless COPD, asthma) or antivirals
- Clinical deterioration, if it occurs, is about 7-10 days
- <2% mortality rate. Children do well.

COVID-19

- **IDENTIFY: Using travel and exposure screening questions (walk through a "live" patient, consider screening in car at ED or over the phone)**
  - Fever OR symptoms of lower respiratory illness such as cough or shortness of breath AND history of travel from an affected geographic areas, **(China, Japan, South Korea, Iran, Italy**) within 14 days of symptom onset.
  - Fever OR symptoms of lower respiratory illness such as cough or shortness of breath AND Close contact with a laboratory confirmed COVID-19 patient within 14 days of symptom onset. This includes healthcare workers if they have been in close contact with an infected patient.
  - Physician confirmed fever with severe acute respiratory illness (e.g. pneumonia, ARDS) requiring hospitalization and without alternative explanatory diagnosis (e.g. influenza)
- **ISOLATE: If patient screens positive on one of the three screening criteria**
  - Immediately place surgical mask on patient
  - Place patient in private negative pressure room with door closed (If a negative pressure room is not available, then a private room with the door closed. Instruct patient to keep mask on).
  - Use Contact, airborne and droplet precautions any time staff enter the patient's room. This is accomplished using a gown, gloves, N-95 mask or PAPR and eye protections.
  - Patients with negative travel or exposure screens who have respiratory symptoms and fever > 100.4°F should be placed on droplet precautions to protect against Flu and other infectious respiratory agents.

Intubation for COVID-19 Critically Ill Patients

- Consider early intubation to avoid aerosolization from NIPPV
- Consider late intubation to conserve vent machines
- Consider PAPR over N95+faceshield, also gown & glove
- Pre-oxygenate 5min, avoid BVM if possible
- Standard RSI
- Resheath laryngoscope blade immediately

- https://www.apsf.org/news-updates/perioperative-considerations-for-the-2019-novel-coronavirus-covid-19/

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