ID Update
New CAP Guidelines

Roger D Lovell, MD
Infectious Disease Consultants
1270 Prince Ave – Suite 301
770-670-7245

Financial Disclosures

None
Nada
Niet
Nein
Nahi
Lo
La

2019 CAP Guidelines

- Objectives
  - List clinical features that determine ICU admission for patients with Community Acquired Pneumonia (CAP)
  - List recommended antibiotic choices for patients with CAP admitted to the ICU
  - Identify antibiotic choices for patients with ICU CAP who have risk factors for MRSA or Pseudomonas aeruginosa
  - Identify which patients with CAP should have blood cultures obtained on admission

2019 CAP Guidelines

- Important caveats
  - Patient populations excluded in the CAP Guidelines
    - No recent travel to areas with emerging respiratory pathogens
    - Those with immunocompromising conditions
      - Inherited or acquired immunodeficiencies
      - Drug-induced neutropenia
        - Cancer chemotherapy
      - HIV patients with low CD4 counts (<200)
      - Solid organ transplant recipients
      - Bone marrow/Stem cell transplant recipients
  - CAP related to usual pathogens – *S pneumoniae, H influenzae, M pneumoniae, S aureus, Legionella sp, C pneumoniae, M catarrhalis*
  - "HCAP" does not exist anymore

2019 CAP Guidelines

- Diagnostic considerations
  - Sputum gram stain/culture
    - Outpatient setting – NO
    - Inpatient setting – YES
      - If has severe CAP **or** are empirically being treated for MRSA/Pseudomonas **or** has had MRSA/Pseudomonas in sputum in the past year **or** hospitalized in the last 90 days and did received IV antibiotics while hospitalized
    - Why obtain?
      - Resistant pathogen may be present
      - Therapy can be narrowed
      - Public health concerns – Legionella
      - Patient failing initial therapy
      - CAP etiology continues to evolve

2019 CAP Guidelines

- Diagnostic considerations
  - Blood cultures
    - Outpatients – NO
    - Inpatient setting – NO unless
      - Severe CAP
      - Empirically being treated for MRSA/Pseudomonas
      - Had MRSA/Pseudomonas in sputum in the past year
      - Hospitalized and received IV antibiotics while hospitalized in the last 90 days
    - Yield is small
      - Outpatient – 2%
      - Inpatient – 9%
      - Positive blood cultures associated with longer LOS and longer duration of ABX
        - Contaminants – average 2% of blood cultures

2019 CAP Guidelines

- Diagnostic considerations
  - Antigen testing
    - Guidelines recommend against routine testing of Legionella urine antigen (unless associated with outbreak or travel) or strept pneumo antigen
      - Except – severe CAP
      - Don't address Mycoplasma IgM serology
    - Pathogen-directed treatment versus empiric treatment
      - Death/Mortality rate
      - Clinical relapse
      - ICU admission
      - LOS
      - ABX duration

        No difference
    - During Influenza season, testing by nucleic acid/PCR is recommended (NOT rapid antigen testing)

2019 CAP Guidelines

- Diagnostic considerations
  - Clinical judgement ± Procalcitonin in determining need for ABX
    - Patients with CAP should receive antibiotics regardless of procalcitonin level
      - Sensitivity of procalcitonin to detect bacterial infection ranges from 38% - 91%
  - Clinical judgement ± prediction tool to determine inpatient versus outpatient management
    - Pneumonia severity index (PSI) is recommended over the CURB-65 to determine need for hospitalization
      - PSI identifies a larger proportion of patients at low risk
      - PSI has a higher discriminative power to predict mortality

2019 CAP Guidelines

- Diagnostic considerations
  - CURB-65

Table 1. CURB-65 Scoring

Clinical Feature	Points
Confusion (defined as a Mental Test Score of ≤8, or disorientation in person, place, or time)	1
Uremia: blood urea >7 mmol/L (~19 mg/dL)	1
Respiratory rate: ≥30 breaths/minute	1
Blood pressure: systolic <90 mm Hg or diastolic ≤60 mm Hg	1
Age ≥**65** years	1
Total points	

Table 2. Treatment Options Based on CURB-65 Score

Score	Group	Treatment Options
0 or 1	Group 1; mortality low (1.5%)	Low risk; consider home treatment
2	Group 2; mortality intermediate (9.2%)	Consider hospital-supervised treatment (either short-stay inpatient or hospital-supervised outpatient)
≥3	Group 3; mortality high (22%)	Manage in hospital as severe pneumonia; consider admission to intensive care unit, especially with CURB-65 score of 4 or 5

2019 CAP Guidelines

- Diagnostic considerations
  - Pneumonia Severity Index (PSI)

Factor	Score
Patient age	
Male	Age
Female	Age - 10
Long-term care facility resident	+10
Accompanying disease[a]	
Neoplastic disease	+30
Liver disease	+20
Congestive heart failure	+10
Cerebrovascular disease	+10
Chronic kidney disease	+10
Symptoms at diagnosis	
Acute psychosis[b]	+20
Breathing rate ≥30/min	+20
Systolic pressure <90 mmHg	+15
Body temperature <35°C or ≥ 40°C	+15
Heart rate ≥125/min	+10
Laboratory measurements	
Arterial blood pH <7.35	+30
BUN ≥30 mg/dL	+20
Serum sodium <130 mEq/L	+20
Serum glucose >250 mg/dL	+10
Hb <9 gm/dL (hematocrit <30%)	+10
Atmospheric arterial blood gas (PaO_2) <60 mmHg (SaO_2 <90%)	+10

Class	PSI score	Predicted mortality rate (%)	Risk	Recommendation
I	Age <50 years, no accompanying diseases and clinical symptoms.	0.1 - 0.1	Low	Treat at home
II	1 - 70	0.6 - 0.7	Low	Treat at home
III	71 - 90	0.9 - 2.8	Low	Treat at home or hospitalize
IV	91 - 130	8.2 - 9.3	Moderate	Hospitalize
V	>130	27.0 - 31.1	High	Consider ICU admission

Predicted mortality rates, risks, and recommendations according to the pneumonia severity index (PSI)

2019 CAP Guidelines

- Diagnostic considerations
  - Clinical judgement ± clinical prediction rule to determine location of admission (general ward versus ICU)
    - 2007 IDSA/ATS Criteria for defining severe CAP

Main criteria	**Invasive mechanical ventilation** **Septic shock requiring vasopressors**
Minor criteria	Breathing rate ≥30 breaths/min PaO_2/FiO_2 ratio ≤250 Multilobar invasion Confusion/disorientation Uremia (BUN ≥20 mg/dL) Leukopenia (leukocyte count, <4,000/mm^3) Thrombocytopenia (platelet count, <100,000/mm^3) Hypothermia (core body temperature, <36°C) Hypotension requiring active fluid resuscitation

IDSA, Infectious Diseases Society of America; ATS, American Thoracic Society; PaO_2, partial pressure of oxygen in arterial blood; FiO_2, fraction of inspired oxygen; BUN, blood urea nitrogen.

2019 CAP Guidelines

- Diagnostic considerations
  - 2007 IDSA/ATS Criteria for defining severe CAP
  - Neither PSI or CURB-65 are as useful in determining location of admission
    - ICU admit – hypotension requiring pressors; respiratory failure requiring mechanical ventilation (IDSA/ATS 2007 major criteria)
    - If not requiring either of these, use IDSA/ATS 2007 minor severity criteria plus clinical judgement
      - $\geq$ 3 minor criteria = ICU admit
  - Severe CAP = 1 major criteria **OR** $\geq$ 3 minor criteria

2019 CAP Guidelines

- Treatment considerations
  - *Streptococcus pneumoniae* susceptibilities (PAR 2018) – non-meningitis isolates
    - Penicillin 63%
    - Amox/clavulanic acid 98%
    - Ceftriaxone 96%
    - Cefepime 98%
    - Meropenem 90%
    - Levofloxacin 100%
    - Erythromycin 56%
    - Tetracycline 81%
    - Vancomycin 100%

2019 CAP Guidelines

- Outpatient antibiotic choices
  - Comorbidities
    - Chronic heart, lung, liver, or renal disease
    - Diabetes
    - Alcoholism
    - Malignancy
    - Asplenia
  - Risk factors for MRSA/Pseudomonas
    - Prior isolation of MRSA or Pseudomonas in sputum culture in the past year
    - Hospitalization in the last 90 days during which treated with IV antibiotics
      - "Uncommonly managed in the outpatient setting"
      - "May require antibiotics that include coverage for these pathogens"

2019 CAP Guidelines

- Outpatient antibiotic choices
  - NO comorbidities or risks for MRSA/Pseudomonas
    - Amoxicillin 1 gram TID
    - Doxycycline 100 mg BID
    - Azithromycin – Z pack
    - Clarithromycin 500 mg BID

Macrolide monotherapy recommended ONLY in areas with macrolide resistance < 25%

  - WITH comorbidities
    - Amox/clavulanic acid 500/125 mg TID, 875/125 mg BID, or 2000/125 mg BID
    - Cefpodoxime 200 mg BID
    - Cefuroxime 500 mg BID

PLUS

    - Doxycycline 100 mg BID
    - Azithromycin – Z pack
    - Clarithromycin 500 mg BID
    - Clarithromycin ER 1000 mg daily
    - OR monotherapy with a respiratory FQ
      - LQ 750 mg daily

2019 CAP Guidelines

- Inpatient antibiotic choices – Not admitted to the ICU
  - Standard regimen (no history of MRSA/*P. aeruginosa* within the past year or no recent hospitalization in recent 90 days during which received IV antibiotics)
    - IV β-lactam plus a macrolide
      - Ampicillin/sulbactam 3 grams IV every 6 hours
      - Cefotaxime 1-2 grams every 8 hours
      - Ceftriaxone 1-2 grams daily
      - Ceftaroline 600 mg IV every 12 hours

      PLUS
      - Azithromycin 500 mg IV/PO daily OR Clarithomycin 500 mg PO BID

2019 CAP Guidelines

- Inpatient antibiotic choices – Not admitted to the ICU
  - Standard regimen (no history of MRSA/*P. aeruginosa* within the past year or no recent hospitalization in recent 90 days during which received IV antibiotics)
    - Monotherapy with a respiratory quinolone
      - Levofloxacin 750 mg IV/PO daily
      - Moxifloxacin 400 mg IV/PO daily
    - IV β-lactam plus doxycycline
      - Ampicillin/sulbactam 3 grams IV every 6 hours
      - Cefotaxime 1-2 grams every 8 hours
      - Ceftriaxone 1-2 grams daily
      - Ceftaroline 600 mg IV every 12 hours

      PLUS
      - Doxycycline 100 mg IV/PO q 12 hours

2019 CAP Guidelines

- Inpatient antibiotic choices – not admitted to the ICU
  - CAP with positive respiratory specimen for MRSA in the past year
    - ADD vancomycin to the standard regimen (or Linezolid 600 mg IV/PO every 12 hours)
      - Vancomycin + Ceftriaxone + Azithromycin
      - Vancomycin + Levofloxacin
      - Vancomycin + Ceftriaxone + Doxycycline (*)
    - Obtain blood cultures
    - Obtain sputum culture
    - Obtain MRSA nasal screen

2019 CAP Guidelines

- Inpatient antibiotic choices – not admitted to the ICU
  - CAP with positive respiratory specimen for *P. aeruginosa* in the past year
    - ADD coverage for Pseudomonas to the standard regimen
      - Pip/tazo 3.375 grams IV extended infusion every 8 hours (or 4.5 grams every 6 hours) + azithromycin
      - Cefepime 2 grams IV every 8 hours + azithromycin
      - Ceftazidime 2 grams IV every 8 hours + vancomycin + azithromycin
      - Meropenem 1 gram IV every 8 hours + azithromycin
      - Aztreonam 2 grams every 8 hours + vancomycin + azithromycin
    - Obtain blood cultures
    - Obtain sputum culture

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP admitted to the ICU
  - Standard regimen
    - IV β-lactam plus a macrolide
      - Ampicillin/sulbactam 3 grams IV every 6 hours
      - Cefotaxime 1-2 grams every 8 hours
      - Ceftriaxone 1-2 grams daily
      - Ceftaroline 600 mg IV every 12 hours

      PLUS
      - Azithromycin 500 mg IV/PO daily

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP admitted to the ICU
  - Standard regimen
    - IV β-lactam plus a respiratory fluoroquinolone
      - Ampicillin/sulbactam 3 grams IV every 6 hours
      - Cefotaxime 1-2 grams every 8 hours
      - Ceftriaxone 1-2 grams daily
      - Ceftaroline 600 mg IV every 12 hours

      PLUS
      - Levofloxacin 750 mg IV daily
      - Moxifloxacin 400 mg IV daily

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP admitted to the ICU
  - ICU CAP with positive respiratory specimen for MRSA in the past year
    - ADD vancomycin to the standard regimen (or Linezolid 600 mg IV/PO every 12 hours)
      - Vancomycin + Ceftriaxone + Azithromycin
      - Vancomycin + Ceftriaxone + Levofloxacin
    - Obtain blood cultures
    - Obtain sputum culture
    - Obtain MRSA nasal screen

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP admitted to the ICU
  - ICU CAP with positive respiratory specimen for *P. aeruginosa* in the past year
    - ADD coverage for Pseudomonas to the standard regimen
      - Pip/tazo 3.375 grams IV extended infusion every 8 hours (or 4.5 grams every 6 hours) + azithromycin
      - Cefepime 2 grams IV every 8 hours + azithromycin
      - Ceftazidime 2 grams IV every 8 hours + vancomycin + azithromycin
      - Meropenem 1 gram IV every 8 hours + azithromycin
      - Aztreonam 2 grams every 8 hours + vancomycin + azithromycin
    - Obtain blood cultures
    - Obtain sputum culture

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP NOT admitted to the ICU but recently hospitalized in the last 90 days and received IV antibiotics while hospitalized
  - DO NOT add empiric MRSA or *P aeruginosa* coverage
    - Start usual CAP regimen - nonICU
  - Obtain nasal screen for MRSA, sputum culture, blood cultures
  - ADD vancomycin ONLY if MRSA screen positive or sputum culture has MRSA
    - Vancomycin + Ceftriaxone + Azithromycin
    - Vancomycin + Levofloxacin
  - ADD Pseudomonas coverage ONLY if sputum or blood culture has *P aeruginosa*
    - Pip/tazo 3.375 grams IV extended infusion every 8 hours (or 4.5 grams every 6 hours) + azithromycin
    - Cefepime 2 grams IV every 8 hours + azithromycin
    - Ceftazidime 2 grams IV every 8 hours + vancomycin + azithromycin
    - Meropenem 1 gram IV every 8 hours + azithromycin
    - Aztreonam 2 grams every 8 hours + vancomycin + azithromycin

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP admitted to the ICU and recently hospitalized in the last 90 days and received IV antibiotics while hospitalized
  - Obtain nasal screen for MRSA, sputum culture, blood cultures
  - ADD MRSA coverage and ADD Pseudomonas coverage empirically
    - Vancomycin + Pip/tazo 3.375 grams IV extended infusion every 8 hours (or 4.5 grams every 6 hours) + azithromycin
    - Vancomycin + Cefepime 2 grams IV every 8 hours + azithromycin
    - Vancomycin + Ceftazidime 2 grams IV every 8 hours + azithromycin
    - Vancomycin + Meropenem 1 gram IV every 8 hours + azithromycin
    - Vancomycin + Aztreonam 2 grams every 8 hours + azithromycin

    - Can substitute Levofloxacin for azithromycin in each combination above
    - Can substitute Linezolid for vancomycin in each combination above

    - Once cultures are back – de-escalate antibiotics

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP suspicion for Aspiration Pneumonia – NOT admitted to the ICU
  - Anaerobic coverage is NOT routinely recommended **EXCEPT** in the following instances/conditions
    - Poor dentition
    - Lung Abscess
    - Empyema
  - If none of the above conditions are present, use standard CAP coverage
    - Ceftriaxone + Azithromycin **OR** Levofloxacin as monotherapy
  - If any of the above are present, use one of the following options
    - Amp/sulbactam
    - Ceftriaxone + Metronidazole
    - Levofloxacin + Metronidazole

2019 CAP Guidelines

- Inpatient antibiotic choices – CAP suspicion for Aspiration Pneumonia – admitted to the ICU
  - Anaerobic coverage is NOT routinely recommended **EXCEPT** in the following instances/conditions
    - Poor dentition
    - Lung Abscess
    - Empyema
  - If none of the above conditions are present, use standard ICU CAP coverage
    - Ceftriaxone + Azithromycin **OR** Ceftriaxone + Levofloxacin
  - If any of the above conditions are present, use one of the following options
    - Amp/sulbactam
    - Ceftriaxone + Metronidazole
    - Levofloxacin + Metronidazole

2019 CAP Guidelines

- Therapeutic considerations
  - Need for steroids in CAP
    - Not routinely in CAP – severe or non-severe CAP
    - Not routinely for severe influenza pneumonia
    - If has refractory shock with CAP, use steroids (surviving sepsis campaign)

    - There have been studies with differences in time to resolution of fever BUT NOT
      - Differences in mortality
      - Differences in LOS
      - Differences in organ failure

  - Continue to use steroids if needed for COPD, asthma, autoimmune diseases, adrenal support

2019 CAP Guidelines

- Therapeutic considerations
  - Influenza treatment if has CAP
    - Inpatient and has CAP and tests positive for influenza, treat with anti-viral agent **REGARDLESS** of duration of symptoms prior to diagnosis
    - Outpatient and has CAP and tests positive for influenza, treat with anti-viral agent **REGARDLESS** of duration of symptoms prior to diagnosis
    - CAP with positive influenza testing – **INITIALLY** still give standard antibacterial CAP agents
      - Re-assess in 48-72 hours
      - 10% of patients hospitalized with influenza and bacterial pneumonia die from their infection
      - H1N1 – 2009 – autopsies revealed 30% had bacterial coinfection

2019 CAP Guidelines

- Therapeutic considerations
  - Duration of therapy – CAP
    - Clinical stability (heart rate, respiratory rate, blood pressure, O2 saturation, temperature), ability to eat, normal/baseline mentation
    - Achieves clinical stability -- NO LESS than 5 days
    - Failure to achieve clinical stability associated with higher mortality and worse clinical outcomes
      - Re-assess – complication or resistant organism
    - Longer courses are recommended for
      - Pneumonia complicated by meningitis, endocarditis, empyema
      - Less common organisms – TB, fungal, …

      - MRSA/Pseudomonas – 7 days (just like the recent HAP/VAP Guidelines)

2019 CAP Guidelines

- Therapeutic considerations
  - Need for repeat chest x-ray
    - Adults whose symptoms resolve in 5-7 days, no need to repeat chest x-ray
    - If no resolution or prolonged symptoms, reasonable to repeat chest x-ray
    - Not a lot of studies addressing this – purely for the purpose of pneumonia follow-up
    - Most studies on value of repeat imaging have looked at the usefulness in detecting lung malignancy not previously recognized

Question #1

Which of the following clinical features , if present, indicates that the patient with CAP should be admitted to the ICU?

A. WBC count 50,000
B. Respiratory failure requiring BiPAP
C. Hypotension requiring pressors
D. Temperature 104^0F
E. Systolic BP 190 mm Hg

Question #2

Which of the following antibiotic regimens are appropriate for community acquired pneumonia patients without any risk factors for multi-drug resistant bacteria who admitted to the ICU?

A. Ceftriaxone 1 gram IV daily + Azithromycin 500 mg IV daily
B. Vancomycin 1.25 grams IV q 12 hours + Levaquin 750 mg IV daily
C. Ceftriaxone 1 gram IV daily + Levaquin 750 mg IV daily
D. Azithromycin 500 mg IV daily + Levaquin 750 mg IV daily
E. Ceftriaxone 1 gram IV daily + Doxycycline 100 mg IV q 12 hours

Question #3

Which of the following antibiotic choices are appropriate options for patients with ICU CAP who have risk factors for MRSA and Pseudomonas aeruginosa?

A. Daptomycin 500 mg IV daily + Pip/tazobactam 3.375 grams IV q 8 hours + Azithromycin 500 mg IV daily

B. Linezolid 600 mg IV q 12 hours + Pip/tazo 3.375 grams IV q 8 hours + Azithromycin 500 mg IV daily

C. Vancomycin 1.25 grams IV q 12 hours + Meropenem 1 gram IV q 8 hours + Levofloxacin 750 mg IV daily

D. Linezolid 600 mg IV q 12 hours + Cefepime 2 grams IV q 8 hours + Levaquin 750 mg IV daily

E. Vancomycin 1.25 grams IV q 12 hours + Pip/tazo 3.375 grams IV q 8 hours + Azithromycin 500 mg IV daily

Question #4

Which of the following patients admitted to the hospital with Community Acquired Pneumonia (CAP) should have blood cultures obtained?

A. CAP admitted to the ICU and intubated
B. CAP in patient who had MRSA in a sputum specimen 6 months ago
C. CAP in a patient who had acute pyelonephritis treated with IV Rocephin 2 months ago
D. CAP patient being treated with IV Vancomycin and IV Pip/tazo and IV Levofloxacin
E. Dang, it must be all of the above

My pool
Mérida