Community Acquired Pneumonia
A 2019 Update

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Disclosures

3 Dogs
   2 Bulldogs
   1 Dogue de Bordeaux

Like British TV

GSK Speaker Bureau
Community Acquired Pneumonia

It’s Not “Just Pneumonia”

Most common infectious cause of death
  • Mortality rates 0.4 - > 27%

2\textsuperscript{nd} most common cause of U.S. Hospitalizations
  • 1.5 million annually
  • 9% rehospitalizations

4.5 million Outpatient / Emergency Room visits
Definitions

• Community Acquired (CAP)
  • Acquired outside the Health Care Setting

• Nosocomial
  • Hospital Acquired (HAP)
    • > 48 hours
    • Ventilator Associated
      • Following Endotracheal Intubation

• Health Care Acquired (HCAP)
  • Use no longer recommended
Risk Factors

• Age
• Smoking
• Chronic Diseases
  • COPD
  • CHF
• Malnutrition
• Stroke
• Viral Infections
  • Influenza
• Immunocompromised
  • Malignancy
  • Diabetes Mellitus
  • Steroids
  • New Biologics
Microbiology

• Typical
  • *S. pneumoniae*
  • *H. influenzae*
  • *M. catarrhalis*
  • *S. aureus*
  • *Streptococci* (Group A)
  • Aerobic gram-negative
  • Microaerophilic and anaerobic bacteria
    • Associated with aspiration

• Atypical
  • *Legionella* spp.
  • *M. pneumoniae*
  • *C. pneumoniae*
  • *C. psitttaci*
  • *C. burnetti*
Microbiology

• Viral
  • Influenza A & B
  • Adenovirus
  • Parainfluenza
  • Rhinovirus
  • Respiratory Syncytial Virus

• Coronavirus (Middle East Respiratory Syndrome)
• Human metapneumovirus
• Human bocavirus

• More than 50% of etiologic organisms never identified
Severity
Pneumonia Severity Index (PSI)

**Characteristics**

<table>
<thead>
<tr>
<th>Points Assigned</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr) - 10</td>
<td>Age (yr)</td>
</tr>
<tr>
<td>+20</td>
<td>Altered mental status†</td>
</tr>
<tr>
<td>+20</td>
<td>Respiratory rate ≥30/min</td>
</tr>
<tr>
<td>+20</td>
<td>Systolic blood pressure &lt;90 mm Hg</td>
</tr>
<tr>
<td>+15</td>
<td>Temperature &lt;35°C or ≥40°C</td>
</tr>
<tr>
<td>+10</td>
<td>Pulse ≥125/min</td>
</tr>
<tr>
<td>+30</td>
<td>Arterial pH &lt;7.35</td>
</tr>
<tr>
<td>+20</td>
<td>Blood urea nitrogen ≥30 mg/dl (11 mmol/liter)</td>
</tr>
<tr>
<td>+20</td>
<td>Sodium &lt;130 mmol/liter</td>
</tr>
<tr>
<td>+10</td>
<td>Glucose ≥250 mg/dl (14 mmol/liter)</td>
</tr>
<tr>
<td>+10</td>
<td>Hematocrit &lt;30%</td>
</tr>
<tr>
<td>+10</td>
<td>Partial pressure of arterial oxygen &lt;60 mm Hg§</td>
</tr>
<tr>
<td>+10</td>
<td>Pleural effusion</td>
</tr>
</tbody>
</table>
# Severity

## Pneumonia Severity Index

<table>
<thead>
<tr>
<th>PSI Score</th>
<th>Class</th>
<th>Estimated Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 70</td>
<td>I</td>
<td>0.1 %</td>
</tr>
<tr>
<td>71 – 90</td>
<td>II</td>
<td>0.6 %</td>
</tr>
<tr>
<td>91 – 130</td>
<td>III</td>
<td>0.9 %</td>
</tr>
<tr>
<td>131 – 405</td>
<td>IV</td>
<td>9.3 %</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>27.0 %</td>
</tr>
</tbody>
</table>
Severity

• CURB-65
  • **Confusion**
  • **Urea** ($> 20 \text{ mg/dL}$)
  • **Resp Rate** ($\geq 30 \text{ breath/min}$)
  • **Blood Pressure** ($< 90 / 60 \text{ mmHg}$)
  • **Age** ($\geq 65 \text{ years}$)

• **CURB-65 Score**  
  • 0 – 1  
    • Estimated Mortality: Low ($< 3 \%$)
  • 2  
    • Estimated Mortality: Moderate (9 \%)
  • $\geq 3$  
    • Estimated Mortality: High (15 - 40 \%)
Venue of Care

Outpatient  
PSI I – II / CURB-65 0 –1 (over 65)  
Clinically mild, otherwise healthy, normal VS, low risk for complication.

Inpatient (Admission)  
SpO2 < 92%  
PSI ≥ 3 / CURB-65 ≥ 2 (over 65)  
Underlying chronic illness. Clinically more severe, clinical sepsis, rapid progression, failure of OP therapy, suspected multi-resistant or aggressive pathogens, social issues.
Venue of Care

Intensive Care

Severe Community Acquired Pneumonia (sCAP)

Major Criteria
- Respiratory Failure (Ventilator)
- Sepsis (requiring pressor support)

Minor Criteria $\geq 3$ required (ATS/IDSA)
- Altered LOC
- Hypotension requiring fluids
- Hypothermia ($< 96.8$ F)
- Resp Rate $\geq 30$ b/ min.
- $\text{PaO}_2/\text{FiO}_2 \leq 250$
- BUN $\geq 20$ mg/dL
- WBC $< 4,000$
- Platelet Ct. $< 100,000$
- Multilobar Infiltrates
Changes in the 21st Century

• Decreased *S. pneumoniae*
  • Improved vaccination rates
  • PCV-13 (Prevnar)

• Increasing Resistance
  • Especially *S. pneumoniae*
    • Beta-lactam
    • Macrolides (>25%)
  • Resistance varies locally

• Community Acquired Methicillin Resistant *S. aureus*
  • 50% of *S. aureus* isolates
2019 Guidelines Update

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. 200(7): e45 - e67, Oct. 1, 2019
<table>
<thead>
<tr>
<th>Recommendation</th>
<th>2007 ATS/IDSA Guideline</th>
<th>2019 ATS/IDSA Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sputum culture</td>
<td>Primarily recommended in patients with severe disease</td>
<td>Now recommended in patients with severe disease as well as in all inpatients empirically treated for MRSA or <em>Pseudomonas aeruginosa</em></td>
</tr>
<tr>
<td>Blood culture</td>
<td>Primarily recommended in patients with severe disease</td>
<td>Now recommended in patients with severe disease as well as in all inpatients empirically treated for MRSA or <em>P. aeruginosa</em></td>
</tr>
<tr>
<td>Macrolide monotherapy</td>
<td>Strong recommendation for outpatients</td>
<td>Conditional recommendation for outpatients based on resistance levels</td>
</tr>
<tr>
<td>Use of procalcitonin</td>
<td>Not covered</td>
<td>Not recommended to determine need for initial antibacterial therapy</td>
</tr>
<tr>
<td>Use of corticosteroids</td>
<td>Not covered</td>
<td>Recommended not to use. May be considered in patients with refractory septic shock</td>
</tr>
<tr>
<td>Use of healthcare-associated pneumonia category</td>
<td>Accepted as introduced in the 2005 ATS/IDSA hospital-acquired and ventilator-associated pneumonia guidelines</td>
<td>Recommend abandoning this categorization. Emphasis on local epidemiology and validated risk factors to determine need for MRSA or <em>P. aeruginosa</em> coverage. Increased emphasis on deescalation of treatment if cultures are negative</td>
</tr>
<tr>
<td>Standard empiric therapy for severe CAP</td>
<td>β-Lactam/macrolide and β-lactam/fluoroquinolone combinations given equal weighting</td>
<td>Both accepted but stronger evidence in favor of β-lactam/macrolide combination</td>
</tr>
<tr>
<td>Routine use of follow-up chest imaging</td>
<td>Not addressed</td>
<td>Recommended not to obtain. Patients may be eligible for lung cancer screening, which should be performed as clinically indicated</td>
</tr>
</tbody>
</table>

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

• 2007 Recommended for Inpatients with Severe CAPn, specific clinical indications

• 2019
  • NOT RECOMMENDED for patients managed on an Outpatient basis

• RECOMMENDED
  • Severe CAP (especially if ETI/Mechanical Ventilation)
  • Empirically treated for MRSA / *Ps. Aeruginosa*
  • Recently hospitalized (90 days) and received parenteral antibiotics whether or not antibiotics received during hospitalization
Blood Cultures

- 2007 Recommended for Inpatients with severe CAP, specific clinical indications

- 2019
  - NOT RECOMMENDED for patients managed in an Outpatient setting
  - RECOMMENDED
    - Severe CAP
    - Empirically treated for MRSA / *Ps. Aeruginosa*
    - Recently hospitalized (90 days) and received parenteral antibiotics whether or not antibiotics received during hospitalization
Urinary Antigen Testing

*S. pneumoniae / Legionella spp.*

- 2007
  - *S. pneumoniae*: Severe CAP
  - *Legionella spp.*: Severe CAP
    - If epidemiologically indicated

- 2019
  - *S. pneumoniae*: Severe CAP
  - *Legionella spp.*: Severe CAP
    - If epidemiologically indicated
Influenza Testing

- 2007
  - Not Addressed
- 2019
  - When Influenza virus is circulating in the community
Procalcitonin

- 2007
  - No recommendation

- 2019
  - Should NOT be used to withhold antibiotic therapy
  - MAY be used to shorten duration of therapy
    - Benefit seems limited to facilities with extended duration of therapy
Empiric Therapy
Outpatient

• Otherwise Healthy / No comorbidities
  • High dose Amoxicillin (3 gr daily)
  • OR
  • Doxycycline
  • OR
  • [Macrolide]
    • If low local \textit{S. pneumoniae} resistance (< 25%)
Empiric Therapy
Outpatient

With Comorbidities (Absent Risk Factors for MRSA / Ps. Aeruginosa)

- Combination Therapy
  - $\beta$-lactam
    - amoxicillin/clavulanate (Augmentin)
  - OR
    - oral 3rd generation cephalosporin
  - AND
  - Macrolide
    - azithromycin/clarithromycin
  - OR
    - doxycycline

- Monotherapy
  - Respiratory fluoroquinolone
    - high dose levofloxacin (Levaquin)
    - moxifloxacin (Avelox)
  - NOT ciprofloxacin

[WARNING: SERIOUS ADVERSE REACTIONS INCLUDING TENDINITIS, TENDON RUPTURE, PERIPHERAL NEUROPATHY, CENTRAL NERVOUS SYSTEM EFFECTS AND EXACERBATION OF MYASTHENIA GRAVIS]
Empiric Therapy
Inpatient

• Absent Risk Factors for MRSA / *Ps. Aeruginosa*

• Nonsevere CAP
  • $\beta$-lactam (ampicillin/sulbactam or 3$^{rd}$ generation cephalosporin) AND macrolide
  • $\beta$-lactam (ampicillin/sulbactam or 3$^{rd}$ generation cephalosporin) AND doxycycline
  • respiratory fluoroquinolone

• Severe CAP
  • $\beta$-lactam (ampicillin/sulbactam or 3$^{rd}$ generation cephalosporin) AND macrolide
  • $\beta$-lactam (ampicillin/sulbactam or 3$^{rd}$ generation cephalosporin) AND respiratory fluoroquinolone
Empiric Therapy
Inpatient

• Risk Factors for MRSA / Ps. Aeruginosa
  
  • Prior respiratory culture
  
  • Recent hospitalization (90 days) and parenteral antibiotics
    • Whether received during hospitalization or not
Empiric Therapy
Inpatient

• With Risk Factors for MRSA / *Ps. aeruginosa*

• Severe or Nonsevere CAP
  • With prior positive culture (MRSA)
    • Standard regimen + vancomycin OR linezolid
    • Respiratory culture or nasal PCR for MRSA
      • De-escalate treatment if negative

• With prior positive culture (*Ps. Aeruginosa*)
  • Standard regimen + antipseudomonal β-lactam or carbapenem
  • No recommendation for fluoroquinolone monotherapy
  • No recommendation for antipseudomonal fluoroquinolone
  • Respiratory culture
    • De-escalate treatment if negative
Empiric Therapy
Inpatient

• With Risk Factors for MRSA / *Ps. Aeruginosa*

• Recent Hospitalization with Antibiotic Therapy
  • Nonsevere
    • Standard regimen
    • Respiratory cultures and/or nasal PCR for MRSA
    • Withhold MRSA / antipseudomonal therapy unless positive

• Severe
  • Standard regimen **WITH** Pseudomonal / MRSA coverage
  • Respiratory cultures and/or nasal PCR for MRSA
    • De-escalate treatment if negative
Empiric Therapy
Inpatient

Empiric (additional) Anaerobic Coverage
Not recommended for suspected aspiration

Recommended in cases of suspected lung abscess
Recommended in cases of suspected empyema
Duration of Therapy

• Guided by clinical response
  • resolution of VS abnormalities
  • ability to eat
  • normal (baseline) mentation

• Change to oral therapy
  • when able to tolerate
  • agents in same class

• No less than 5 days
Duration of Therapy

• Extended Therapy
  • Lack of clinical response
  • Re-evaluate at 48 hours

• Infectious Complications
  • Metastatic infection (meningitis, endocarditis, etc.)

• Less Common Pathogens

• MRSA / *Ps. Aeruginosa*
  • Minimum 7 days treatment
    • Follows HAP/VAP guidelines
Corticosteroids

- Nonsevere CAP
  - Not Recommended

- Severe CAP
  - More complicated
  - Guideline recommendation:
    - General: Not recommended
    - Specific circumstances:
      - Refractory shock
      - COPD / Asthma
      - Autoimmune diseases
Influenza

• Antiviral Therapy
  • **Recommended** for patients who test positive for influenza
  • INDEPENDENT of duration of illness before diagnosis
  • Inpatient AND Outpatient

• Antibacterial Therapy
  • **Recommended** for patients with CAP who test positive for influenza
Antiviral Agents

• Neuraminidase Inhibitors
  • Oseltamivir (Tamiflu)
    • Only agent mentioned in guidelines
  • Zanamivir (Relenza)
  • Peramivir (Rapivab)

• Endonuclease Inhibitor
  • Baloxivir (Xofluza)

• Adamantanes
  • Amantadine (Symmetrel)
  • Rimantadine (Flumadine)
  • NOT RECOMMENDED
Post Treatment Imaging

• Clinical Resolution 5 – 7 days
  • Not recommended

• Low Dose CT Lung Cancer Screening
  • Per guidelines
Conclusions

- Community Acquired Pneumonia remains a significant cause of morbidity and mortality
- “Health Care Associated Pneumonia” no longer used
- Treatment remains primarily empiric
- Macrolide monotherapy not recommended
- Be aware of local pathogens and clinical response to empiric agents
- Culture results largely used to de-escalate therapy
- Risk Factors for MRSA / *Ps. Aeruginosa*
- Influenza remains a major cause of co-morbidity

- Significant opportunities for research to improve guidelines