Review of Treatment Options for Pneumonia in the Inpatient Setting

Shirley B Bonanni
*Thomas Jefferson University*

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Review of Treatment Options for Pneumonia in the Inpatient Setting

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Advanced Practice Pharmacist, Family Medicine
Pharmacy Residency Program Director, PGY1
Thomas Jefferson University Hospital
7/16/2020
Pneumonia

- Community acquired pneumonia (CAP)
- Healthcare associated pneumonia (HCAP)
- Hospital-acquired pneumonia (HAP)
- Ventilator associated pneumonia (VAP)
- Aspiration pneumonia
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


This official clinical practice guideline was approved by the American Thoracic Society May 2019 and the Infectious Diseases Society of America August 2019
Table 2. Differences between the 2019 and 2007 American Thoracic Society/Infectious Diseases Society of America Community-acquired Pneumonia Guidelines

<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 P. aeruginosa</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 P. aeruginosa</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 P. aeruginosa 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.*

TJUH Antimicrobial Guidelines

• Confluence
  – [https://confluence.jefferson.edu/](https://confluence.jefferson.edu/)
  – Antimicrobial Stewardship
Community Acquired Pneumonia (CAP)

- Occurs within 48 hours of hospital admission
- Severe CAP
  - Patients with 1 major or ≥3 minor criteria

<table>
<thead>
<tr>
<th>Major Criteria</th>
<th>Minor Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septic shock with need for vasopressors</td>
<td>Respiratory rate ≥ 30 breaths/min</td>
</tr>
<tr>
<td>Respiratory failure requiring mechanical ventilation</td>
<td>PaO₂/FiO₂ ratio ≤ 250</td>
</tr>
<tr>
<td></td>
<td>Multilobar infiltrates</td>
</tr>
<tr>
<td></td>
<td>Confusion/disorientation</td>
</tr>
<tr>
<td></td>
<td>Uremia (BUN ≥20mg/dl)</td>
</tr>
<tr>
<td></td>
<td>Leukopenia (WBC &lt;4,000 cells/μl)</td>
</tr>
<tr>
<td></td>
<td>Thrombocytopenia (plt &lt;100,000/μl)</td>
</tr>
<tr>
<td></td>
<td>Hypothermia (&lt;36°C or &lt;96.8°F)</td>
</tr>
<tr>
<td></td>
<td>Hypotension requiring aggressive fluid resuscitation</td>
</tr>
</tbody>
</table>

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
# Community Acquired Pneumonia

<table>
<thead>
<tr>
<th>Major bacterial causes</th>
<th>CAP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Streptococcus pneumoniae</em></td>
</tr>
<tr>
<td></td>
<td><em>Haemophilus influenza</em></td>
</tr>
<tr>
<td></td>
<td><em>Mycoplasma pneumoniae</em></td>
</tr>
<tr>
<td></td>
<td><em>Staphylococcus aureus</em></td>
</tr>
<tr>
<td></td>
<td><em>Legionella spp</em></td>
</tr>
<tr>
<td></td>
<td><em>Chlamydia pneumonia</em></td>
</tr>
<tr>
<td></td>
<td><em>Moraxella catarrhalis</em></td>
</tr>
</tbody>
</table>

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia

Routine Diagnostic Work-up

- History and Physical Exam
- Vital signs
- Pulse oximetry and/or ABG
- Chest x-ray (PA and lateral)
- CBC with differential
- Basic metabolic panel
- Sputum and blood cultures
- Procalcitonin is not recommended in adults with clinically suspected and radiographically confirmed pneumonia
- Other diagnostics may be required in the appropriate clinical setting (travelers, immunocompromised patients, HIV infection, etc.)

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia

# Additional Considerations

<table>
<thead>
<tr>
<th>Test</th>
<th>Nonsevere CAP</th>
<th>Severe CAP</th>
<th>HAP</th>
<th>VAP</th>
</tr>
</thead>
</table>
| Sputum for Gram’s stain and culture | Optional but recommended if:  
  - Empirically treating MRSA or *Pseudomonas*  
  - Prior respiratory isolation of MRSA or *Pseudomonas*  
  - Recent hospitalization and IV antibiotics within the last 90 days | Yes | Yes | Yes |
| Blood cultures x 2 | Optional but recommended if:  
  - Empirically treating MRSA or *Pseudomonas*  
  - Prior respiratory isolation of MRSA or *Pseudomonas*  
  - Recent hospitalization and IV antibiotics within the last 90 days | Yes | Yes | Yes |
| MRSA nasal screen | Optional but recommended if:  
  - Empirically treating MRSA  
  - Prior respiratory isolation of MRSA  
  - Recent hospitalization and IV antibiotics within the last 90 days | Optional but recommended if:  
  - Empirically treating MRSA  
  - Prior respiratory isolation of MRSA  
  - Recent hospitalization and IV antibiotics within the last 90 days | Yes | Yes |
| Streptococcus pneumonia urinary antigen | No | Select patients admitted to an ICU | No | No |
| *Legionella* urinary antigen and *Legionella* culture | Only suggested if:  
  - Significant clinical concern OR concern for *Legionella* outbreak | Yes | Only suggested if:  
  - Significant clinical concern OR concern for *Legionella* outbreak | Only suggested if:  
  - Significant clinical concern OR concern for *Legionella* outbreak |
| Flu A/B and RSV PCR | During flu season or significant clinical concern |
| Respiratory pathogen panel | Concern for viral etiology in patients who are immunocompromised or critically ill |
| HIV screen | If clinically indicated |
| EKG | If treating with QTc prolonging antibiotic (i.e., azithromycin, levofloxacin) |
Community Acquired Pneumonia

• Assess risk factors for community acquired MRSA (ca-MRSA):
  – Recent hospitalization and IV antibiotics within the last 90 days
  – Preceding or concurrent influenza like illness
  – CAP requiring ICU admission
  – Necrotizing or cavitary infiltrates
  – Empyema
  – Previous colonization or infection with MRSA
  – Intravenous drug abuse
  – Immunocompromised patients

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
Community Acquired Pneumonia

• Assess risk factors for *Pseudomonas aeruginosa*
  – Recent hospitalization AND IV antibiotic use within the past 90 days
  – Immunocompromised patients
  – Structural lung disease (CF, bronchiectasis)
  – Hospitalization for ≥2 days within 90 days
  – Residence in a nursing home or extended care facility
  – Home infusion therapy (including antibiotics)
  – Home wound care
  – Family member with multidrug-resistant organisms (MDRO)
  – Chronic hemodialysis (HD) within 30 days

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
CAP Treatment Algorithm

Community Acquired Pneumonia (CAP) - without MRSA or Pseudomonas Risk factors

CAP

If patient meets severe sepsis criteria follow the TJUH Severe Sepsis Guidelines for empiric therapy

Nonsevere CAP*

No Severe β Lactam Allergy
- Ceftriaxone + Azithromycin
- Ceftriaxone + Doxycycline

Severe β Lactam Allergy
- Levofloxacin

Severe CAP*

No Severe β Lactam Allergy
- Ceftriaxone + Azithromycin

Severe β Lactam Allergy
- Levofloxacin

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
**CAP Treatment Algorithm**

<table>
<thead>
<tr>
<th>*Additional Treatment to Consider</th>
<th>Nonsevere CAP</th>
<th>Severe CAP</th>
</tr>
</thead>
</table>
| Prior respiratory isolation of MRSA | - Add vancomycin  
- Deescalate based on MRSA nasal screen and sputum culture | - Add vancomycin  
- Deescalate based on MRSA nasal screen and sputum culture |
| Prior respiratory isolation of *Pseudomonas aeruginosa* | - Add cefepime in place of ceftriaxone  
- Deescalate based on sputum culture | - Add cefepime in place of ceftriaxone  
- If severe β Lactam allergy add aztreonam  
- Deescalate based on sputum culture |
| Recent hospitalization or IV antibiotics within the past 90 days | - Withhold MRSA and Pseudomonas coverage  
- Obtain MRSA nasal screen and sputum culture  
- If results are positive, initiate MRSA or *Pseudomonas* coverage | - Add vancomycin  
- Add cefepime in place of ceftriaxone  
- Deescalate based on MRSA nasal screen and sputum culture |
| Flu A/B positive | - Add oseltamivir | - Add oseltamivir |

[https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia](https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia)  
Community Acquired Pneumonia

• Which antimicrobial regimen would you select for a non-ICU pt suspected to have non-severe CAP?
  – A. Vancomycin and Cefepime
  – B. Meropenem
  – C. Ceftriaxone and Azithromycin
  – D. I order what Shirley tells me to
CAP De-escalation of Therapy

• De-escalation of therapy
  – Based on clinical improvement and culture results
  – For non critically ill patients, transition to oral therapy as soon as possible
  – Pts initially treated with ceftriaxone + azithromycin:
    • Cefuroxime 500 mg po q12hr* +/- azithromycin 500 mg po q24hr
  – Pts initially treated with levofloxacin or PCN allergic:
    • Levofloxacin 750 mg po daily*

*requires renal dosing

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
# CAP Duration of Therapy

<table>
<thead>
<tr>
<th>Organism</th>
<th>Duration of therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gram-positive</strong></td>
<td></td>
</tr>
<tr>
<td>MSSA</td>
<td>7 days</td>
</tr>
<tr>
<td>MRSA</td>
<td>7 days</td>
</tr>
<tr>
<td><em>S. pneumoniae</em></td>
<td>5 days</td>
</tr>
<tr>
<td><strong>Gram-negative</strong></td>
<td></td>
</tr>
<tr>
<td>Enterobactericeae (E. coli, Enterobacter, Serratia, Klebsiella, etc)</td>
<td>7 days</td>
</tr>
<tr>
<td><em>Pseudomonas</em></td>
<td>7 days</td>
</tr>
<tr>
<td><em>Acinetobacter</em></td>
<td>7 days</td>
</tr>
<tr>
<td><strong>Atypicals</strong></td>
<td></td>
</tr>
<tr>
<td><em>Legionella, Mycoplasma</em></td>
<td>7-14 days</td>
</tr>
<tr>
<td><em>Chlamydia pneumoniae</em></td>
<td>10-14 days</td>
</tr>
</tbody>
</table>

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[https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia](https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia)

CAP Therapy Discontinuation

• Discontinue abx if:
  – Afebrile for 48-72 hrs **AND** has no more than 1 of the following:
    • HR > 100 beats/min
    • RR > 24 breaths/min
    • BP < 90 mm Hg
    • O2 sat < 90%
    • Altered mental status
  – Cough and CXR abnormalities can take several weeks to improve
    • No need to extend duration if clinically well

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
CAUTION
A WORD OF WARNING
Fluoroquinolone (FQ) Safety

• FDA warnings and precautions
  – Increased risk of tendonitis and tendon rupture
  – Risk of worsening symptoms for those with myasthenia gravis
  – Potential for irreversible peripheral neuropathy
  – Increase in mental health adverse effects and blood glucose disturbances
  – Increased risk of aneurysm and dissection
  – C.difficile
Hospital-Acquired Pneumonia (HAP)

- Pneumonia that occurs ≥ 48 hours after admission
- Not incubating at the time of admission
- Also referred to as nosocomial pneumonia

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
HAP Suspected Organisms

<table>
<thead>
<tr>
<th>Nosocomial Pneumonia*</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Escherichia coli</em></td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
</tr>
<tr>
<td><em>Enterobacter spp</em></td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
</tr>
<tr>
<td><em>Acinetobacter spp</em></td>
</tr>
<tr>
<td><em>Staphylococcus aureus including MRSA</em></td>
</tr>
<tr>
<td><em>Streptococcus spp</em></td>
</tr>
</tbody>
</table>

*HAP and VAP may be caused by a wide variety of pathogens, can be polymicrobial, and depends in large part upon whether the patient has risk factors for MDR pathogens. Differences in patient factors and the hospital flora also influence the patterns of pathogens seen.

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
HAP Treatment Algorithm

Hospital Acquired Pneumonia (HAP)

If patient meets severe sepsis criteria follow the TJUH Severe Sepsis Guidelines for empiric therapy

No Severe β Lactam Allergy
  - Vancomycin
  - Cefepime
  - +/- Tobramycin*

Severe β Lactam Allergy
  - Vancomycin
  - Aztreonam
  - +/- Tobramycin*

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
HAP Treatment Algorithm

• Double coverage for gram-negative organisms
  – Patients who have received prior intravenous antibiotics within the preceding 90 days
  – Structural lung disease (ie. bronchiectasis, CF)

• At risk for multidrug-resistant (MDR) gram-negative pathogens, including \textit{pseudomonas}, should receive \textbf{2 different agents} with gram-negative activity
## Additional Considerations

<table>
<thead>
<tr>
<th>Procedure / Test</th>
<th>Nonsevere CAP</th>
<th>Severe CAP</th>
<th>HAP</th>
<th>VAP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sputum for Gram’s stain and culture</strong></td>
<td>Optional but recommended if:</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Empirically treating MRSA or <em>Pseudomonas</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Prior respiratory isolation of MRSA or <em>Pseudomonas</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Recent hospitalization and IV antibiotics within the last 90 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Blood cultures x 2</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optional but recommended if:</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>- Empirically treating MRSA</td>
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<td></td>
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<tr>
<td></td>
<td>- Recent hospitalization and IV antibiotics within the last 90 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MRSA nasal screen</strong></td>
<td>Optional but recommended if:</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Empirically treating MRSA</td>
<td></td>
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<td></td>
<td>- Recent hospitalization and IV antibiotics within the last 90 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Streptococcus pneumonia urinary antigen</strong></td>
<td>No</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Select patients admitted to an ICU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Legionella urinary antigen and Legionella culture</strong></td>
<td>Only suggested if: Significant clinical concern OR concern for Legionella outbreak</td>
<td>Only suggested if: Significant clinical concern OR concern for Legionella outbreak</td>
<td>Only suggested if: Significant clinical concern OR concern for Legionella outbreak</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flu A/B and RSV PCR</strong></td>
<td>During flu season or significant clinical concern</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory pathogen panel</strong></td>
<td>Concern for viral etiology in patients who are immunocompromised or critically ill</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HIV screen</strong></td>
<td>If clinically indicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EKG</strong></td>
<td>If treating with QTc prolonging antibiotic (i.e. azithromycin, levofloxacin)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HAP De-escalation of Therapy

• Deescalate based on clinical improvement and culture results.
  – For non-critically ill patients, transition to oral therapy as soon as possible.

• Culture-negative step down therapy:
  – Obtain MRSA nasal swab upon admission.
  – If no MRSA isolated and nasal screen negative, consider discontinuation of vancomycin after 48hrs

• If no culture data available and the patient is improving, you can deescalate to levofloxacin 750mg PO q24h
HAP Duration of Therapy

• 7 days!

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
HAP Therapy Discontinuation

• Discontinue antibiotics if:
  – Patient is afebrile for 48-72 hours AND has no more than 1 of the following:
    • HR >100 beats/min
    • RR >24 breaths/min
    • BP < 90mmHg
    • O2 Sat < 90%
    • Altered Mental Status
  – Cough and CXR abnormalities can take several weeks to improve
    • No need to extend duration if clinically well

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
MRSA Nasal Screen

• Prospective observational study conducted at a university-affiliated urban teaching hospital

• VAP patients ≥ 16 years old
  – 924 episodes of suspected VAP evaluated with bronchoscopy
  – 393 pts had microbiologically confirmed VAP
    • 5 excluded due to <16 yrs or screen not performed
  – 54 patients were colonized with MRSA by ASC
    • Common sites: nares, posterior oropharynx, trachea

MRSA Nasal Screen

- Sensitivity 70.3% (95% CI, 52.8-83.6)
- Specificity 92% (95% CI, 88.5-94.5)
- Positive predictive value 48.1% (95% CI, 34.5-62)
- Negative predictive value 96.7% (95% CI, 94-98.3)

MRSA Nasal Screen

• High negative predictive value
  – Indicates that negative screens are very accurate for excluding MRSA as a cause of pneumonia
Aspiration Pneumonia

• Aspiration – inhalation of oropharyngeal or gastric contents into larynx and lower respiratory tract
  – Contents may include:
    • Different substances (blood, vomitus, food particles)
    • Oropharyngeal secretions
    • Microbiological flora

Aspiration Pneumonia

• Complications of aspiration:
  – Chemical pneumonitis
    • Damage of lung parenchyma after inhalation of sterile stomach or oropharyngeal contents into lower airway
      – Due to gastric acid and delayed inflammatory reaction
    • Non-infectious process
  – Aspiration pneumonia
    • Infectious process
    • Occurs after inhalation of colonized pathogenic bacteria into lower airway from oropharyngeal area or colonized gastric contents
    • Often occurs silently

Aspiration Pneumonia

• Despite distinct physiological processes, clinical presentation can be difficult to distinguish

• Bacteriology
  – Associated microbial spectrum included gram positive (*S. aureus, S. pneumoniae*), gram negative (*H. influenzae, enterobacteriaceae*), and anaerobes (*bacteroides, peptostreptococcus, fusobacterium*)
  – From studies from the 1970s

Aspiration Pneumonia

• Broader spectrum antibiotics not necessarily more effective

• Potential abx choice should target nonresistant gram positive (*Staphylococcus* and *Streptococcus* species) and gram negative (*Enterobacteriaceae*, *H. influenzae*)
Aspiration Pneumonia

• Pneumonia (fever, cough, infiltrate) that develops 48 – 72 hrs after suspected or witnessed aspiration event

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
Question

• In aspiration pneumonia, should you cover for anaerobes?
  – Yes
  – No
Aspiration Pneumonia

Aspiration Pneumonia

Pneumonia (fever, cough, and infiltrate) that develops 48-72 hours after a suspected or witnessed aspiration event

- No Severe β Lactam Allergy
  - Ampicillin/sulbactam
  - OR
  - Ceftriaxone +/- Metronidazole

- Severe β Lactam Allergy
  - Levofloxacin +/- Metronidazole
  - OR
  - Clindamycin

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Aspiration Pneumonia

- Assess for risk factors for anaerobic infection:
  - Loss of consciousness due to alcoholism
  - Seizures
  - Gingival disease
  - Esophageal motility issues
  - Lung abscess
  - Empyema

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
Aspiration Pneumonia

• De-escalation of therapy
  – Culture negative step down therapy:
    • Amoxicillin/clavulanate (Augmentin) 875 mg po q12hr OR
    • Levofloxacin 750 mg po q24hr +/- metronidazole OR
    • Cefuroxime 500 mg po q12hr (if anaerobic coverage not required)
  
• Reassess patients in 48-72 hrs, if no symptoms or confirmatory cx or imaging, likely chemical pneumonitis and can discontinue abx

https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia
# Antimicrobial Dosing

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>Recommended Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin/Clavulanate</td>
<td>875mg po q12h</td>
</tr>
<tr>
<td>Ampicillin/Sulbactam</td>
<td>1.5gm iv q6h</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>500mg iv/po q24h</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>1gm iv q8h</td>
</tr>
<tr>
<td>Amikacin</td>
<td>CrCl &gt; 20ml/min: 15mg/kg iv (dosing interval based on renal function)</td>
</tr>
<tr>
<td>Cefepime</td>
<td>CrCl ≥ 60ml/min: 2000mg iv q8h given as a 3hr infusion</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>1gm iv q24h</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>500mg po q12h</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>600mg iv/po q8h</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>100mg iv/po q12h</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>750 mg iv/po q24h</td>
</tr>
<tr>
<td>Linezolid</td>
<td>600mg iv/po q12h</td>
</tr>
<tr>
<td>Meropenem</td>
<td>CrCl &gt; 50ml/min: 1-2gm iv q8h given as a 3hr infusion</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>500mg iv/po q12h</td>
</tr>
<tr>
<td>Oseltamivir</td>
<td>75mg PO twice daily</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>CrCl &gt;20ml/min: 6 mg/kg iv (dosing interval based on renal function)</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>Loading dose 25mg/kg rounded to nearest 500mg; consult pharmacy or intranet guidelines for maintenance dosing</td>
</tr>
</tbody>
</table>

[https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia](https://confluence.jefferson.edu/display/AGS/TJUH+Guidelines+for+Inpatient+Treatment+of+Pneumonia)
Wrap-up

• De-escalate when appropriate
  – Prolonged use of broad spectrum abx can lead to:
    • Resistance
    • C. diff infections

• Longer duration does not equal better outcomes!
Questions?