Pneumonia and the Nursing Home: Opportunities For Antimicrobial Stewardship

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Objectives

1) Understand antibiotic use patterns in US nursing homes
2) Understand risks associated with inappropriate use of antibiotics
3) Understand the content of the Rochester Patient Safety C. difficile Prevention Collaborative Guideline for Treatment of Bacterial Pneumonia in Nursing Home Patients

- NO DISCLOSURES
Pre-test

1) True/ False: Nursing homes in the United States use more antibiotics than their European counterparts

2) Describe four ways that antibiotics may be inappropriately prescribed?

3) True/False: *Clostridium difficile* is the only concerning complication of inappropriate use of antibiotics.

4) What is the recommended length of treatment for uncomplicated bacterial pneumonia in nursing home patients per the *Rochester Patient Safety C difficile Prevention Collaborative Guideline for Treatment of Bacterial Pneumonia in Nursing Home Patients*?
What is Antimicrobial Stewardship?

Set of commitments and actions designed to make sure patients receive

1. The right dose
2. Of the right antibiotic
3. For the right amount of time
4. Only when truly necessary

Improving antibiotic use will ensure these life-saving medications are effective and available when we need them.

*Slide courtesy of G. Dumyati*
Background: We use more antibiotics than most.

Outpatient antibiotic use: U.S.A. compared to Europe (2004)
Defined Daily Dose / 1,000 Inhabitants per day

United States: 24.9
Europe: 19.0
Background: Antibiotics in Nursing Homes

- Antibiotics are frequently prescribed in nursing homes
- High antibiotic use in nursing homes leads to increased risk of antibiotic-related complications among all residents
- From 25-75% of antimicrobial use in nursing homes may be inappropriate

Benoit et al. JAGS 2008; 56: 2039-2044
Nicolle LE et al. ICHE 2000; 21:537-545

Slide courtesy of N. Stone
Stewardship Opportunities in the Nursing Home

- Antibiotic stewardship initiatives have been shown to be effective in impacting antimicrobial use and prescribing in nursing home settings.

- Presumed RTI is the 2nd most common reason for antibiotic prescriptions in nursing home patients, after presumed urinary tract infections.

Common Indications For Antibiotic Prescriptions among Nursing Home Patients:

- Urinary Tract Infection: 41%
- Respiratory (Upper and Lower) Tract Infection: 35%
- Skin and Soft Tissue Infection: 14%
- Other: 10%

Abx are overused in Nursing Homes

Abx are overused for RTI

<table>
<thead>
<tr>
<th>Condition</th>
<th>Appropriate</th>
<th>Inappropriate</th>
<th>Unjustified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute bronchitis</td>
<td>35 (34%)</td>
<td>0</td>
<td>66 (65%)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>168 (87%)</td>
<td>18 (9%)</td>
<td>7 (4%)</td>
</tr>
<tr>
<td>Common cold</td>
<td>335 (86%)</td>
<td>0</td>
<td>54 (14%)</td>
</tr>
<tr>
<td>Influenza-like illness</td>
<td>13 (76%)</td>
<td>0</td>
<td>4 (24%)</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>35 (85%)</td>
<td>0</td>
<td>6 (15%)</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>6 (55%)</td>
<td>0</td>
<td>5 (45%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>592 (79%)</strong></td>
<td><strong>18 (2%)</strong></td>
<td><strong>142 (19%)</strong></td>
</tr>
</tbody>
</table>

Many ways to be wrong

- **Wrong Diagnosis**, **Wrong Pathogen** = use for non bacterial syndromes (e.g. viral syndromes, chemical pneumonitis, colonization (ASB))
- **Wrong Spectrum** – too narrow or too broad
- **Wrong Dosing**- excessive duration, renal adjustments
- **Wrong Outcome** – complications outweigh risk, forgetting the WHOLE patient, treatment goals
What are Potential Harms of Antibiotics?

1) Allergic reactions: rash, anaphylaxis
2) Side effects: e.g. GI upset, mental status, polypharmacy
3) Drug interactions (antacids, warfarin, blood pressure or diabetes medications)
4) Drug Resistance
5) Clostridium difficile diarrhea
We are Running Out of Antibiotics

The number of new antibiotics developed and approved has steadily decreased in the past three decades, leaving fewer options to treat resistant bacteria.

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**BAD BUGS, NO DRUGS**
As Antibiotic Discovery Stagnates ... A Public Health Crisis Brews

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Number of Antibacterial New Drug Application (NDA) Approvals vs. Year Intervals*

*Intervals from 1980–2009 are 5-year intervals; 2010–2012 is a 3-year interval. Drugs are limited to systemic agents.
Data courtesy of FDA’s Center for Drug Evaluation and Research (CDER).
Combating Antibiotic Resistant Bacteria is A National Priority

- The call to reduce unnecessary use of antibiotics is coming from many fronts, including the CDC, medical specialty societies and Consumer Reports.

- The Centers for Medicare and Medicaid Services (CMS) will require that nursing homes establish programs that monitor the use of antibiotics.
Antibiotic Harm: *C. difficile* Diarrhea

- *C. diff.* diarrhea may be severe and lengthy, is potentially life-threatening in older adults and has the potential to recur
- The body contains many bacteria, some of which are helpful and can protect against infections like *C. diff*.
  - Antibiotics kill the helpful bacteria
  - In the absence of the helpful bacteria, *C. diff.* may grow and cause an infection
- This infection can then spread easily throughout the nursing home
Many ways to be wrong

- Wrong **Diagnosis**, Wrong Pathogen = use for non bacterial syndromes (e.g. viral syndromes, chemical pneumonitis, colonization (ASB))
- Wrong **Spectrum** – too narrow or too broad
- Wrong **Dosing**- excessive duration, renal adjustments
- Wrong **Outcome** – complications outweigh risk, forgetting the WHOLE patient, treatment goals
Appropriate Diagnosis – Does This Patient Have Bacterial Pneumonia?
Work up considerations

- History and exam
- Pulse oximetry
- CBC
- CXR
- Sputum culture
- Procalcitonin
- Viral studies (Influenza/RSV testing, Resp viral panel)
- CRP (UK)
McGreer Criteria

- Positive CXR
- ≥1 Respiratory criteria
  - Cough, sputum, hypoxia, tachypnea, pleurisy, lung findings
- ≥1 Constitutional criteria
  - Fever, neutrophilia/left shift, delirium, decline in function

Major Pitfall!
Mobile radiography in older population is nonspecific
- Radiologists disagree frequently on the presence or absence of infiltrates ($K = 0.54$), pleural effusions ($K = 0.8$), hilar lymphadenopathy ($K = 0.54$), mediastinal lymphadenopathy ($K = 0.49$)

Portable CXR is the UA of the lung = a “gateway” for inappropriate antibiotic use
- Rarely normal (always positive)
- Technically limited
  - Misses up to 50% of lung fields
  - Poor inspiration
  - Kyphosis

Acute and chronic pathologies can mimic bacterial PNA
- CHF
- Pneumonitis
- Scarring
- Tumor

Loeb minimum criteria for Abx

- Temp > 102 AND RR > 25 or productive cough
- Fever > 2.4 °F over baseline AND new cough plus:
  - P > 100 OR
  - Delirium or rigors OR
  - RR > 25

- COPD AND cough with purulent sputum
- New productive cough AND RR > 25 or delirium

Loeb criteria rarely met

Table 3
Prescribing Rates and Loeb Criteria Adherence by Indication in 12 North Carolina Nursing Homes, Overall and by Specific Indication (n = 110,810 resident-days)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Total Prescribing Rate per 1000 Resident-Days</th>
<th>Percent of Prescriptions Adhering to Loeb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean, Range Across Study Nursing Homes</td>
<td>Mean, %, Range Across Study Nursing Homes, %</td>
</tr>
<tr>
<td>All indications</td>
<td>11.5, 5.4–25.9</td>
<td>12.7, 4.8–22.0</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>4.8, 1.2–10.9</td>
<td>10.2, 0.0–38.9</td>
</tr>
<tr>
<td>Respiratory infection</td>
<td>4.5, 1.8–10.9</td>
<td>1.9, 0.0–6.9</td>
</tr>
<tr>
<td>Skin and soft tissue infection</td>
<td>2.2, 0.7–4.1</td>
<td>42.7, 33.3–100.0</td>
</tr>
</tbody>
</table>

Viral syndromes common

Table 2. Serological Evidence of Viral Infection in Nursing Homes

<table>
<thead>
<tr>
<th>Year (Number of Subjects Tested)</th>
<th>Respiratory Syncytial Virus</th>
<th>Influenza A</th>
<th>Influenza B</th>
<th>Human Metapneumovirus</th>
<th>Coronavirus OC43</th>
<th>Coronavirus 229E</th>
<th>PIV-3</th>
<th>PIV-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (99)</td>
<td>10</td>
<td>12</td>
<td>4</td>
<td>11</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2 (149)</td>
<td>9</td>
<td>11</td>
<td>4</td>
<td>22</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3 (134)</td>
<td>6</td>
<td>1</td>
<td>11</td>
<td>16</td>
<td>13</td>
<td>27</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Total (382)</td>
<td>25</td>
<td>24</td>
<td>19</td>
<td>49</td>
<td>23</td>
<td>40</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Percentage of tested</td>
<td>6.5</td>
<td>6.3</td>
<td>5.0</td>
<td>12.8</td>
<td>6.0</td>
<td>10.5</td>
<td>3.9</td>
<td>2.4</td>
</tr>
</tbody>
</table>

PIV = parainfluenza virus.

## Other tests?

<table>
<thead>
<tr>
<th>Test</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procalcitonin</td>
<td>May limit abx use</td>
<td>Blood test, delay in results</td>
</tr>
<tr>
<td>Respiratory viral panel</td>
<td>May limit abx use, respiratory swab</td>
<td>Delay in results, cost</td>
</tr>
<tr>
<td>Sputum culture</td>
<td>May yield pathogen</td>
<td>Colonization, poor specimen, may prompt excessive Rx (e.g. MRSA)</td>
</tr>
<tr>
<td>Urinary antigen testing (S. pneumonia, L. pneumophila)</td>
<td>May identify pathogen</td>
<td>Delay in results, urine sample needed</td>
</tr>
</tbody>
</table>
Strategies

- Raise the bar for clinical findings
  - Fever
  - Productive cough
  - Lab abnormalities (CBC, procalcitonin)

- Raise the bar for CXR findings
  - Don’t expect a normal CXR
  - Ambiguous CXR should not change your plan

- Consider other etiologies
  - Viral URI syndrome, viral LRI syndrome CHF, COPD, pneumonitis
  - Viral testing
  - Procalcitonin
Strategies

- Avoid the need to “make a diagnosis” in the setting of vague and/or non-specific complaints. OK to not know and not treat.

- Document general symptoms as the diagnosis

- Document a plan for monitor for more specific signs that may warrant Abx use

- “Risks of empiric Abx use appear to outweigh the potential benefits at this time; will continue to monitor for symptoms evolution”
Strategies - Identify FTT/Dying

Fig. 2. Adjusted 30-day survival after lower respiratory infection by antibiotic treatment. Solid line, survival after episodes treated with antibiotics; Dotted line, survival after episodes treated without antibiotics.

Strategies- Embrace Uncertainty

- The spectrum of “PNA” is probably analogous to many pathologies in older adults (prostate cancer, CAD, bacteriuria, mild HTN, dysphagia)
  - You can find it everywhere
  - In some cases, the treatment does not alter prognosis
  - In some cases, the treatment may be worse than the disease

- Change the question from “Is this PNA” to “Are the benefits of Abx likely to exceed the risks”?
Abx

benefit

Abx

Harm
Directing Therapy - Spectrum
Etiology

• Studies limited due to high rates of colonization of oropharynx with Staph and enteric Gram negative rods

• Studies with most stringent testing criteria yield pathogens consistent with CAP
  – Streptococcus pneumonia
  – Hemophilus influenzae
  – Moraxella catarrhalis
  – Normal flora


Guideline driven treatment for resistant pathogens not helpful

### Table 5
Outcome in treatment category C.

<table>
<thead>
<tr>
<th></th>
<th>Guideline group (n = 23)</th>
<th>Empiric group (n = 15)</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary endpoint</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-hospital relapse of pneumonia and mortality within 30 days</td>
<td>8 (35)</td>
<td>4 (27)</td>
<td>0.73</td>
</tr>
<tr>
<td>In-hospital mortality within 30 days</td>
<td>2 (9)</td>
<td>0 (0)</td>
<td>0.51</td>
</tr>
<tr>
<td>In-hospital relapse of pneumonia within 30 days</td>
<td>6 (26)</td>
<td>4 (27)</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Secondary endpoint</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of initial antibiotic therapy [days]</td>
<td>8 (7–9)</td>
<td>8 (7–9)</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>Adverse effect</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotic-associated diarrhea</td>
<td>1 (4)</td>
<td>1 (7)</td>
<td>1.00</td>
</tr>
<tr>
<td><em>Clostridium difficile</em>-associated diarrhea</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Drug-induced renal injury</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Cost of initial antibiotic therapy [yen], median (interquartile range) (mean, standard deviation)</td>
<td>47 586 (20 394–57 0477) (42 735, 24 709)</td>
<td>10 776 (8082–14 368) (14 890, 13 827)</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

Data are expressed as the median (interquartile range) or n (%).
Directing Therapy- Duration
Distribution of antibiotic prescription durations.
Rochester Patient Safety C. difficile Prevention Collaborative

Guideline for Treatment of Bacterial Pneumonia in Nursing Home Patients
Clinical Practice Guidelines* for the Diagnosis and Management of Acute Bacterial Lower Respiratory Tract Infection in Nursing Home Residents
(Excludes residents with respiratory failure on mechanical ventilation or with a tracheostomy)
September 27, 2016

Context
- On average, about 1 in 10 nursing home (NH) residents is receiving antibiotics on any given day [1]
- Antibiotic use is highly variable across NH; antibiotic-related adverse events are significantly more common in NH with the highest antibiotic use [2]
- Presumed respiratory infections are a common reason for starting antibiotics in the NH [3,4]
- Studies estimate that 20-66% of antimicrobial use for presumed respiratory infections in NH may be inappropriate [5]
- Successful examples of antimicrobial stewardship interventions targeting antibiotic use in NH respiratory infections have been published [4, 6-9]

Objectives
- Support providers in decision making about antibiotic initiation in NH residents with presumed respiratory infections
- Develop a clinical, evidence-based guideline to educate and encourage appropriate use of antibiotics for bacterial lower respiratory infections in the NH

Goals
- Increase appropriate antibiotic prescribing for NH-acquired pneumonia and COPD exacerbation
- Reduce NH-acquired *C. difficile* infection
- Reduce the use of quinolones for treatment of respiratory illness in the NH

*These guideline were developed by the Rochester Long Term Care Collaborative and is intended to serve as a reference tool during the care of a nursing home resident with suspicion of bacterial respiratory infection; it is not intended to be a set of rigid criteria to replace clinical judgment regarding each patient’s particular circumstances, clinical presentation, and other factors.
<table>
<thead>
<tr>
<th>Primary Finding</th>
<th>Secondary Findings</th>
</tr>
</thead>
</table>
| Fever > 100° F  | At least 1 of the following respiratory symptom:  
| --OR--          | • New or increase cough  
| > 2.4°C above baseline | • New or increase sputum production  
|                 | • Pleuritic chest pain  
|                 | • Respiratory rate > 25 breaths/min  
|                 | • Consolidation (on physical exam)  
|                 | • Hypoxia (oxygen saturation < 90%)  
|                 | Other non-respiratory findings might be present:  
|                 | • Delirium  
|                 | • Acute functional decline  
|                 | • Total WBC >14,000  

<table>
<thead>
<tr>
<th>Afebrile, respiratory illness suspected</th>
<th>Secondary Findings</th>
</tr>
</thead>
</table>
|                                       | At least 1 of the following:  
|                                       | • New productive cough  
|                                       | • Respiratory rate > 25 breaths/min  
|                                       | • Delirium  

<table>
<thead>
<tr>
<th>Afebrile respiratory illness with COPD</th>
<th>Secondary Findings</th>
</tr>
</thead>
</table>
|                                      | At least 1 of the following:  
|                                      | • Increased dyspnea  
|                                      | • Increased sputum volume  

<table>
<thead>
<tr>
<th>New infiltrate on CXR</th>
<th>Secondary Findings</th>
</tr>
</thead>
</table>
|                        | At least 1 of the following:  
|                        | • New productive cough  
|                        | • Fever > 100°C  
|                        | • Respiratory rate > 25 breaths/min  
|                        | At least 2 of the following:  
|                        | • Dyspnea  
|                        | • Delirium  
|                        | • Hypoxia  
|                        | • Pleuritic chest pain  
|                        | • Consolidation (on physical exam)  
|                        | • Total WBC >14,000  

*No validated clinical criteria to predict pneumonia exist in the nursing home population*
<table>
<thead>
<tr>
<th><strong>Action</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IF Primary AND Secondary findings are PRESENT:</strong></td>
</tr>
<tr>
<td>1. Start antibiotics (consult Table 1 and 2 for agent choice)</td>
</tr>
<tr>
<td>2. Consider urine testing for Legionella, especially if resident’s symptoms are moderate to severe (see note)†</td>
</tr>
<tr>
<td>3. Consider additional tests: pulse oximetry, CBC, CXR</td>
</tr>
<tr>
<td>4. Consider reassessing need for continued antibiotics at 48-72 hours after initiation</td>
</tr>
</tbody>
</table>

| **IF Secondary findings are ABSENT:** |
| 1. **Do not start antibiotics; reassess in 24 hours** |
| 2. Evaluate for non-infectious causes of pulmonary infiltrate or consider alternate infection source |
| 3. Consider viral upper respiratory infection (URI) in the differential diagnosis, especially if a new, productive cough is absent |
| 4. Order influenza and RSV testing if seasonally appropriate |

† In patients or residents for whom the clinical suspicion of Legionella is low, and the risks and burden of adequate sputum and urine acquisition for testing are high (e.g. residents with advanced dementia and urinary incontinence, patients with ineffective cough and sputum production), testing may be limited to what can be reasonably obtained voluntarily by the resident or patient. Urinary catheterization, induced sputum production, or nasotracheal suctioning are techniques that need not occur without a high suspicion for Legionella and the consent of the patient or resident.
### Table 2. Recommended Antibiotics for Treatment of Bacterial Pneumonia among Nursing Home Residents

#### Mild – Moderate Pneumonia Symptoms

<table>
<thead>
<tr>
<th>Context</th>
<th>Preferred Agent</th>
<th>Dosing</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st line</td>
<td>Cefpodoxime</td>
<td>400mg PO twice a day x 5d (give q24h for CrCl &lt;30; 3x/wk post HD in ESRD)</td>
<td>• Cefpodoxime may be given safely to patients with mild penicillin allergy (i.e. rash), cross reactivity is low</td>
</tr>
<tr>
<td>Bacterial PNA, aspiration risk</td>
<td>Amoxicillin/Clavulanate</td>
<td>500/125mg PO 3 times a day x 5d (give q12h for CrCl 10-30; give q24h for CrCl&lt;10; give q24h for ESRD with an extra dose post each HD)</td>
<td>• Alternative dosing is 875/125 mg BID • Penicillin resistance of invasive pneumococcus is ~ 10% in Monroe County</td>
</tr>
<tr>
<td>Uncomplicated Bacterial PNA – Alternative Therapy</td>
<td>Doxycycline</td>
<td>100mg PO twice a day x 5d (no renal adjustment needed)</td>
<td>• Caution with skin exposure to direct sunlight</td>
</tr>
<tr>
<td>2nd line</td>
<td>Levofloxacin</td>
<td>750 mg PO Q 24h x 5d (give q48h for CrCl 20-49; 750mg x 1, then 500mg q48h for CrCl &lt;20 and ESRD)</td>
<td>• Quinolone antibiotics pose a higher risk of C. difficile infection • Caution with anti-arrhythmic medications and prolonged QTc</td>
</tr>
<tr>
<td></td>
<td>Moxifloxacin</td>
<td>400mg PO Q 24 x 5d (no renal adjustment needed)</td>
<td></td>
</tr>
</tbody>
</table>

#### Severe Pneumonia Symptoms, or Failure to Respond to Initial Therapy

| 1st line | Ceftriaxone IM + Doxycycline | Ceftriaxone 1000mg IM Q 24H (no renal adjustment needed) Doxycycline dosing as above | • May be given safely to patients with mild penicillin allergy (i.e. rash), cross reactivity is low • Assess for de-escalation to oral regimen daily |
| 2nd Line* | Levofloxacin | Levofloxacin dosing as above | • May be used as 1st line agent for any patients with risk factors for Pseudomonas infection such as any of the following: recent (within 90 days) intravenous antibiotic exposure, very severe underlying COPD (FEV1 <35% predicted), known bronchiectasis, previous respiratory infections with Pseudomonas |

*Treatment duration is 5 days* Before stopping therapy, the patient should be afebrile for 48 to 72 hours, breathing without supplemental oxygen (unless required for preexisting disease), and have no more than one clinical instability factor (defined as HR >100 beats/min, RR >24 breaths/min, and SBP ≤90 mmHg)
Antibiotic treatment for Acute COPD Exacerbation in NH (refer to Table 3 for dosage)

**Mild**
- Only 1 out of the 3 cardinal symptoms:
  - Increased dyspnea
  - Increased sputum volume
  - Increased sputum purulence

  - No antibiotics
  - Steroids
  - Bronchodilators

**Moderate or Severe**
- At least 2 of the 3 cardinal symptoms:
  - Increased dyspnea
  - Increased sputum volume
  - Increased sputum purulence

**Simple COPD**
- No risk factor for complications
  - FEV1 >50%
  - Predicted <3 exacerbations/yr
  - No cardiac disease

  - Cefpodoxime
  - Doxycycline
  - Azithromycin

**Complicated COPD**
- 1 or more risk factors
  - FEV1 <50%
  - Predicted >3 exacerbations/yr
  - Cardiac disease

  - Amoxicillin/Clavulanate
  - Ceftriaxone IM

  For patients with severe penicillin allergy
  - Moxifloxacin

**Complicated COPD + Pseudomonas risk factors**
- (FEV1 <35% predicted, bronchiectasis, previous respiratory infection with Pseudomonas, >4 courses antibiotics within the past year)

- Levofoxacin

Worsening clinical status or inadequate response in 72 hrs

Re-evaluate
Consider sputum culture

Adapted from Siffiqi et al. International Journal of COPD 2008;3(1) 31-44
<table>
<thead>
<tr>
<th>Context</th>
<th>Preferred Agent</th>
<th>Dosing</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>COPD Exacerbation NOT Requiring antibiotics</td>
<td><strong>Non-antibiotic management</strong></td>
<td>As per current clinical management guidelines</td>
<td>Antibiotics are APPROPRIATE for patients likely to have bacterial infections (see algorithm above)</td>
</tr>
<tr>
<td></td>
<td><strong>steroids</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>bronchodilators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple exacerbation</td>
<td>Cefpodoxime</td>
<td>400mg PO twice a day x 5d (give q24h for CrCl &lt;30; 3x/wk post HD in ESRD)</td>
<td>• Cefpodoxime may be given safely to patients with mild penicillin allergy (i.e. rash), cross reactivity is low</td>
</tr>
<tr>
<td></td>
<td>Doxycycline</td>
<td>100mg PO twice a day x 5d (no renal adjustment needed)</td>
<td>• Caution with skin exposure to direct sunlight</td>
</tr>
<tr>
<td></td>
<td>Azithromycin</td>
<td>500 mg PO on day 1 followed by 250 mg once daily on days 2 to 5 (no renal adjustment needed)</td>
<td>• QTc prolongation</td>
</tr>
<tr>
<td>Complicated exacerbation</td>
<td>Amoxicillin/Clavulanate</td>
<td>500/125mg PO 3 times a day x 5d (give q12h for CrCl 10-30; give q24h for CrCL&lt;10; give q24h for ESRD with an extra dose post each HD)</td>
<td>• Alternative amoxicillin/clavulanate dose is 875mg twice a day</td>
</tr>
<tr>
<td></td>
<td>Ceftriaxone IM</td>
<td>Ceftriaxone 1000mg IM Q2-4H (no renal adjustment needed) X 5 days</td>
<td>• Penicillin resistance of invasive pneumococcus is ~ 10% in Monroe County, NY</td>
</tr>
<tr>
<td></td>
<td>Moxifloxacin (only for patients</td>
<td>400 mg PO Q24 hrs for 5 days (no renal adjustment)</td>
<td>• Quinolone antibiotics pose a higher risk of C. difficile infection</td>
</tr>
<tr>
<td></td>
<td>with severe allergy to above</td>
<td></td>
<td>• Caution with anti-arrhythmic medications and prolonged QTc</td>
</tr>
<tr>
<td></td>
<td>treatment)</td>
<td></td>
<td></td>
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<tr>
<td>Complicated exacerbation with risk for</td>
<td>Levofoxacin</td>
<td>750 mg PO Q24h x 5d (give q48h for CrCl 20-49; 750mg x 1, then 500mg q48h for CrCl &lt;20 and ESRD)</td>
<td>• Quinolone antibiotics pose a higher risk of C. difficile infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Caution with anti-arrhythmic medications and prolonged QTc</td>
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When it’s NOT Bacterial PNA: Active Monitoring

Active Monitoring Verbal Communication Guide:

• Based on the patient’s current status, I would suggest observation and active monitoring. Active monitoring is an important component of caring for _________ (condition).

• This is what we will be doing. We will monitor vital signs, closely measure fluid intake, assess for any pain, reexamine lungs/abdomen/skin, and look for other possible causes for _____ condition. This can determine a better course for treatment, if one is needed at all. If it looks like antibiotics will help ____, we will start them right away.

• We used to use antibiotics all the time for this exact situation, but research has shown us that we were more likely to harm people than help them. There are risks to consider when prescribing antibiotics, especially if they may not be necessary or helpful such as diarrhea, C. diff, or fungal infections

• At this time the risks of treatment can be high, and the benefits of treatment are uncertain. It may be better to get more information before we treat with antibiotics.

• Research indicates that active monitoring has not led to increased admissions to the hospital
When it’s NOT Bacterial PNA: Active Monitoring

Active Monitoring: what to document and order

- Obtain vital signs (BP, Pulse, Resp. Rate, Temp., Pulse Ox.) every ___ hours for ___ days
- Record fluid intake each shift for ________ days
- Notify physician if fluid intake is less than _________ cc daily
- Offer resident ______ ounces of water/juice every _______ hours
- Notify physician, NP, or PA if condition worsens, or if no improvement in ______ hours
- Obtain the following bloodwork:
  ________________________________
- Consult pharmacist to review medication regimen.
- Contact the physician, NP, PA with an update on the resident’s condition on __
Summary of Decision Points

Conclusions

- RTI is a major driver of Abx use in the nursing home
- Providers and nurses need to be experts in balancing the harms and benefits of Abx for each patient
- Use of standardized guidelines for diagnosis and treatment of RTI can be an effective component of antimicrobial stewardship programs in long term care settings
- Small changes in prescribing habits and duration can make a large impact on Abx use
Post-test

1) True/False: Nursing homes in the United States use more antibiotics than their European counterparts.

2) Describe four ways that antibiotics may be inappropriately prescribed.

3) True/False: Clostridium difficile is the only concerning complication of inappropriate use of antibiotics.

4) What is the recommended length of treatment for uncomplicated bacterial pneumonia in nursing home patients per the Rochester Patient Safety C Difficile Prevention Collaborative Guideline for Treatment of Bacterial Pneumonia in Nursing Home Patients?
Acknowledgments

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