UTI Toolkit – Module 1
The Clinical Rationale for Improving the Management of UTIs in Nursing Homes
UTI Toolkit – Module 1

Narration by:
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Outline

• Frequency of Inappropriate Antibiotic Use in Nursing Homes

• Resident-Level Risks of Antibiotic Therapy
  o Adverse Drug Events
  o Clostridium difficile infection
  o Future antibiotic-resistant infections

• Facility-Level Risks of Antibiotic Therapy
  o Resident-to-Resident Spread of Antibiotic Resistance
  o Regulatory issues (see “The Regulatory Rationale for Improving the Management of UTIs in Nursing Homes” presentation)

• Why Focus on Urinary Tract Infection?
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• Why Focus on Urinary Tract Infection?
25-80% of Antibiotic Use in Nursing Homes (NHs) is Inappropriate


Broad-Spectrum Antibiotic Use in Wisconsin Nursing Homes is Common

- Broad-spectrum agents account for over half (51%) of antibiotic use in Wisconsin NHs (Figure).
- Fluoroquinolones are the most frequently prescribed class (27% of all antibiotic days)

**Distribution of Antibiotic Use in 5 Wisconsin Nursing Homes: Percentage by Days of Antibiotic Therapy**

- Broad Spectrum Antibiotics: 51%
- Narrow Spectrum Antibiotics: 44%
- Anti-Clostridium Difficile: 4%
- Anti-MRSA: 1%

**Broad Agents:** fluoroquinolones, beta-lactam/beta-lactamase inhibitors (e.g., amoxicillin-clavulanate), 2nd & 3rd generation cephalosporins, macrolides, & carbapenems

**Narrow Agents:** Trimethoprim-sulfamethoxazole, nitrofurantoin, tetracyclines, 1st generation cephalosporins, penicillins
Prolonged Antibiotic Courses are Common in Wisconsin NHs

- Half of antibiotic treatment courses initiated in Wisconsin NHs are prescribed for more than seven days (Figure).\(^8\)
- 20% of overall antibiotic use in NHs could be eliminated by shortening treatment courses to 7 days or less even if there was no change in the total number of antibiotic starts!\(^9\)

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8. Crnich; Unpublished data
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• Why Focus on Urinary Tract Infection?
Antibiotics are a Leading Cause of Adverse Drug Events (ADEs) in Nursing Homes (NHs)

Preventable ADEs

<table>
<thead>
<tr>
<th>Percentage (%)</th>
<th>Handler 2006</th>
<th>Gurwitz 2000</th>
<th>Gurwitz 2005</th>
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<tbody>
<tr>
<td>0</td>
<td></td>
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<tr>
<td>1</td>
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<tr>
<td>9</td>
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</tbody>
</table>

20% of all ADRs

Independent Risk Factors of ADEs\textsuperscript{11}

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OR</th>
<th>95% CI</th>
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<tbody>
<tr>
<td>New admission</td>
<td>2.8</td>
<td>(1.5 – 5.2)</td>
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<tr>
<td>No. of Scheduled Medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>1.0</td>
<td>(referent)</td>
</tr>
<tr>
<td>5-6</td>
<td>2.0</td>
<td>(1.2 – 3.2)</td>
</tr>
<tr>
<td>7-8</td>
<td>2.8</td>
<td>(1.7 – 4.7)</td>
</tr>
<tr>
<td>≥9</td>
<td>3.3</td>
<td>(1.9 – 5.6)</td>
</tr>
<tr>
<td>Current Medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotic</td>
<td>4.0</td>
<td>(2.5 – 6.2)</td>
</tr>
<tr>
<td>Antipsychotic</td>
<td>3.2</td>
<td>(2.1 – 4.9)</td>
</tr>
<tr>
<td>Antidepressant</td>
<td>1.5</td>
<td>(1.1 – 2.3)</td>
</tr>
<tr>
<td>Supplements</td>
<td>0.4</td>
<td>(0.3 – 0.6)</td>
</tr>
</tbody>
</table>

Antibiotic Use is Driving CDI in NHs

- **Original McGeer Criteria-1991** (at least 3 of the following)
  - Temperature ≥ 38°C
  - N/↑ burning/frequency/urgency
  - New flank/suprapubic pain/tenderness
  - Change in character of urine
    - Blood/smell/sediment
    - Pyuria/hematuria
  - Worsening mental or functional status

- **Inappropriate therapy** (independent of decision to start)
  - Treatment initiated empirically (before culture) in only 27/96 (28%) of residents
  - Empiric antibiotic inappropriate in 56% of cases (FQ when TMP/SMX or NFT reasonable)
  - Dosage (High [21%] / Low [13%] / CI [12%])
  - Duration (Short [3%] / Long [67%])

512 Records Screened

172 Cases with Abnormal UA

- McGeer (+) (n = 26)
  - Abx (+) (n = 26)
  - Risk of CDI in Treated vs. Untreated OR = 8.5 (1.7 – 42.2)
  - CDI (+) (n = 11)

- McGeer (-) (n = 146)
  - Abx (+) (n = 70)
  - Abx (-) (n = 76)

Antibiotic Treatment (even when appropriate) Carries Future Risk of Antibiotic Resistance for the Individual

Effects of Antibiotic Treatment in Patients with Possible Infection

Odds of Colonization with Antibiotic-Resistant Bacteria (Treated for vs. Untreated)

- UTI
- RTI

Months After Presentation

0-1
0-3
0-6
0-12

0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

15. Costelloe et al. BMJ 2010
16. Drinka et al. JAMDA 2013
Infections Caused by Antibiotic-Resistant Bacteria Increase Resident Risk of Death

Attributable Mortality of Antibiotic-Resistant Infections

OR (red) and 95% CIs (blue)

- MRSA (BSI)
- MRSA (SSI)
- Resistant PSAE
- 3rd Gen-R Enterobacter
- ESBL E. coli
- CRE

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• Resident-Level Risks of Antibiotic Therapy
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• Facility-Level Risks of Antibiotic Therapy
  o Fallout to other residents
  o Resident-to-Resident Spread of Antibiotic Resistance
  o Regulatory issues

• Why Focus on Urinary Tract Infection?
Antibiotic Fallout

Setting:
• 607 NHs in Ontario; categorized into tertiles of antibiotic use (low, medium, high)
• 110,000 NH residents followed for 2 years.

Study Endpoint: Combined rate of *C. difficile*, diarrhea/gastroenteritis, infection with antibiotic-resistant bacteria and adverse drug event (ADE)

Results:
• ~83,000 NH residents received an antibiotic & ~27,000 residents did not receive an antibiotic
• Risk of experiencing the combined endpoint was 24% higher in high-use NHs, even if the resident never received an antibiotic (Figure)

Antibiotic-Resistant Bacteria Spread Easily in the Nursing Home Environment

- Strong evidence of resident-to-resident spread in NHs.
  - 50% of MRSA isolates recovered from Wisconsin NHs are genetically identical
  - >85% of the MRSA isolates from NH residents who entered the NH negative but subsequently became colonized during their stay in the NH are genetically identical to strains recovered from other residents

14 of the 17 MRSA isolates recovered from residents in this nursing home were found to be genetically identical by pulsed-field gel electrophoresis (PFGE – a commonly employed genetic finger-printing technique)

25. Crnich et al. 2013 Am Soc Microbiol Scientific Meeting
Treating Antibiotic Resistant Infections is More Costly to Nursing Homes

- **MSSA**
  - Pharmaceutical: $269
  - Infection Management: $93
  - Physician Care: $184
  - Nursing Care: $610
  - Total Infection: $1,332

- **MRSA**
  - Pharmaceutical: $332
  - Infection Management: $562
  - Physician Care: $248
  - Nursing Care: $2,607
  - Total Infection: $1,347

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• Why Focus on Urinary Tract Infection?
Suspected UTI

• Accounts for 24% of all infections in older adults.

• Accounts for 12-25% of LTCF infections.

• Most common cause of bacteremia in LTCF.

• Responsible for 20-60% of antimicrobial use in LTCF.
Up to 75% of the Cases of Suspected UTI are Actually Asymptomatic Bacteriuria (ASB)

- **Definition**: (+) urine culture in the absence of (“specific”) symptoms

- **Prevalence**
  - Community: 6 – 17%
  - Institutionalized: 19 – 57%

- **Treatment of ASB**
  - Does not reduce episodes of symptomatic UTI \(^{28, 29, 30, 32}\)
  - Promotes resistance \(^{28, 30}\)
  - Increases risk of *C. difficile* \(^{30}\)
  - Does not reduce mortality \(^{29, 30, 31}\)
Providers Don’t Think They Are Treating Asymptomatic Bacteriuria

- UTI, as well as many other conditions, can result in resident change-in-condition (Table).

- Non-localizing signs often (>60%) the only reason provided by clinicians when asked why they suspect UTI.

- There is no evidence that behavior change, falls, anorexia, or functional status associated with UTI.

<table>
<thead>
<tr>
<th>D</th>
<th>Drugs</th>
<th>BEERS Criteria (e.g., anticholinergic, benzodiazepines, hypnotics) OR dose change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dementia</td>
<td>Dementia Lewy bodies: Fluctuations in alertness and attention</td>
</tr>
<tr>
<td></td>
<td>Discomfort</td>
<td>Pain</td>
</tr>
<tr>
<td>E</td>
<td>Eyes, ears, environment</td>
<td>Sensory deprivation; vulnerability to environment</td>
</tr>
<tr>
<td>L</td>
<td>Low oxygen states</td>
<td>Myocardial infarction, stroke, pulmonary embolus</td>
</tr>
<tr>
<td>I</td>
<td>Infection</td>
<td>Pneumonia, sepsis, symptomatic UTI</td>
</tr>
<tr>
<td>R</td>
<td>Retention</td>
<td>Urinary retention, constipation</td>
</tr>
<tr>
<td>I</td>
<td>Ictal states</td>
<td>Seizure disorder</td>
</tr>
<tr>
<td>U</td>
<td>Underhydration/nutrition</td>
<td>Dehydration</td>
</tr>
<tr>
<td>M</td>
<td>Metabolic Causes</td>
<td>Low or high blood sugar, sodium abnormalities</td>
</tr>
<tr>
<td>S</td>
<td>Subdural hematoma</td>
<td>Head trauma</td>
</tr>
</tbody>
</table>

Why?

- **Risk Aversion**
  - Frail residents can get sick quickly
  - Family member pressure
  - Nursing staff pressure

- **Uncertainty**
  - Some NH residents are non-verbal (but most are)
  - Some NH residents do not mount fever (but most do)
  - UTI can manifest with non-localizing symptoms (although most have additional findings)

- **Myths Perpetuated During Training Become Habits**
  - Falls and behavior change = UTI
  - Abnormal UA = UTI
  - Positive Culture = UTI
Dipstick → UA → Urine culture → Antibiotic Prescription

• Testing the urine is one of the easiest things we do in the NH (what if it was as hard as getting a respiratory specimen?)

• Automating urine testing is done in many facilities for the sake of efficiency
  o Standing orders for dipstick and urinalyses
  o Pan-“everything” workups

• Ignoring culture results is hard (particularly if you do not know the resident)
Conclusions

• Inappropriate antibiotic use is common in NHs.

• Inappropriate antibiotic use causes significant resident harm and increases NH operating costs.

• UTIs account for a majority of the inappropriate antibiotic use in NHs.

• Reducing unnecessary urine testing can reduce inappropriate antibiotic use.

• Reducing spectrum and duration of antibiotic therapy are other promising strategies for reducing antibiotic pressure in NHs.