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Improving Antibiotic Use in Skilled Nursing Facilities: What Are the Low Hanging Fruit?

Christopher J. Crnich, MD PhD 1, 2

1 University of Wisconsin School of Medicine and Public Health, Madison, WI  
2 Middleton Veterans Affairs Hospital, Madison, WI

Disclosures

• R18HS022465-01A1  
• R18HS023779-01

Objectives

• Why antibiotic use in NHs matters  
• What is antibiotic stewardship?  
• Barriers to stewardship in NHs  
• Opportunities and sphere of influence  
• Where to start  
• Some next steps
Antibiotics are Commonly Prescribed in Skilled Nursing Facilities

2/3rds of residents who stay in a NH for at least 6 months will be prescribed at least 1 course of antibiotics.

Many residents are prescribed multiple courses of antibiotics during their NH stay.

- 60% of all antibiotics prescribed in NHs are administered to 20% of the residents
- In one of our studies, we observed that a single resident received 14 courses of antibiotics over 12 months

Much of Antibiotic Use in Skilled Nursing Facilities is Inappropriate

- >50% of antibiotic starts in NHs are not justified (see figure)
- Even when justified, the prescribed antibiotic is often:
  - Unnecessarily broad spectrum (e.g., cipro when bactrim would work just as well)
  - Given for too long of a duration (>7 days)
Harmful Effects of Antibiotics: At the Individual Level

- Adverse drug events (ADEs)
  - 1 in 5 of all ADEs in NHs are the result of antibiotics
  - Risk of ADEs from antibiotics = antipsychotics

- Antibiotic resistance
  - Resistant bacteria commonly emerge following a course of antibiotics (e.g., ciprofloxacin resistance after treatment for possible UTI)
  - Resistant bacteria can persist in the body for over a year even without further antibiotic exposures
  - Makes treating the next infection harder

- Clostridium difficile
  - Antibiotics increase the risk of C. difficile infection 8-fold
  - More than half of healthcare-onset C. difficile cases occur in NHs

Harmful Effects of Antibiotics: At the Facility Level (clinical)

- 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)

Daneman et al. JAMA Intern Med 2015; 175(8): 1331-9
Mody & Crnich et al. JAMA Intern Med 2015; 175(8): 1339-41

Harmful Effects of Antibiotics: At the Facility Level (regulatory)

- Inappropriate antibiotic use is a common survey citation in Wisconsin.
- Forthcoming revisions to Medicare’s Conditions of Participation (CoP) will place greater emphasis on wise use of antibiotics in NHs.

- Total Cites — Abx Cites
Harmful Effects of Antibiotics: At the Community Level

- NH residents prescribed antibiotics are more likely to be colonized with antibiotic-resistant bacteria which can be spread to others.
- The high rate of transfers between NH and hospitals creates opportunities for the regional spread of resistant bacteria.
- FIGURE: a recent study in Chicago demonstrated that NHs (green circles) played an important role in the spread (shaded areas) of a highly antibiotic-resistant bacteria* between city hospitals (orange circles).

* carbapenem-resistant Klebsiella pneumoniae, a bacteria that commonly causes urinary tract infections.

The Antibiotic Pipeline

FDA, New Drug Approvals: Antibiotics

Executive Order -- Combating Antibiotic-Resistant Bacteria

EXECUTIVE ORDER

COMBATING ANTIMICROBIAL-RESISTANT BACTERIA

By the authority vested in me as President by the Constitution and the laws of the United States of America, I hereby order as follows:

Sec. 1. [Antimicrobial Resistance.] (a) By the end of calendar year 2016, HHS shall review existing regulations and propose new regulations or other actions, as appropriate, to ensure that (i) all healthcare facilities, including hospitals, nursing homes, and other long-term care facilities, comply with infection control and other best practices specific to the type of facility; (ii) all health professionals use and appropriately prescribe antibiotics; (iii) all healthcare delivery facilities implement robust antibiotic stewardship programs that achieve in-hospital and community goals for prevention and control of antibiotic-resistant infections; (iv) all health professionals report all events of antibiotic-resistant infections to their respective states; and (v) all health professionals report all events of antibiotic-resistant infections to the CDC. HHS shall also take steps to increase other best practices, such as antibiotic surveillance and hospital-based infection control programs, to achieve in-hospital and community goals for prevention and control of antibiotic-resistant infections.
What Is Stewardship?

Benefits of Antibiotics
- Resolution of Infection
- Psychological Stress
- Happier Families (?)

Risks of Antibiotics
- Adverse Drug Events
- Clostridium difficile
- Future abx-resistant infxns.

Comparing ASP in Hospitals and NHs

<table>
<thead>
<tr>
<th></th>
<th>Hospitals</th>
<th>Nursing Homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>External pressure for ASP</td>
<td>(Increasingly) Yes</td>
<td>(Increasingly) Yes</td>
</tr>
<tr>
<td>ASP cost savings accrue to facility</td>
<td>Yes</td>
<td>Context-dependent</td>
</tr>
<tr>
<td>Strong IT infrastructure</td>
<td>(Mostly) Yes</td>
<td>No</td>
</tr>
<tr>
<td>In-house pharmacy support</td>
<td>Yes</td>
<td>Context-dependent</td>
</tr>
<tr>
<td>Access to ID expertise</td>
<td>(Usually) Yes</td>
<td>(Usually) No</td>
</tr>
<tr>
<td>Prescribers directly perform the initial assessment</td>
<td>Yes</td>
<td>Context-dependent</td>
</tr>
<tr>
<td>Prescribers able to perform direct reassessments</td>
<td>Yes</td>
<td>Context-dependent</td>
</tr>
</tbody>
</table>

Where Do We Start?
Who is Responsible?

ASP in NHs is a Team Effort

ASP Team Tasks

Pre-Prescribing
- Policy/procedure development (Core)
- Facility utilization tracking & reporting (Core)
- Development of facility antibiogram (Advanced)
- Facility-specific prescribing guideline (Advanced)
- Provider feedback reports (Advanced)

Post-prescribing
- Audit & feedback (Advanced)

Nursing Practice
- SBAR (Core)
- Avoiding unnecessary urine testing (Core)
- Antibiotic timeout (Core)
Policies for Infection Diagnosis and Treatment Etiquette

• Prohibit use reagent strip testing of urine for the evaluation of resident change-in-condition
• Process & tools for assessing and communicating resident change-in-condition
• All antibiotic orders should stipulate an indication, drug, dose, & duration.
• Prohibit test-of-cure urine cultures
• Discourage use of prophylactic antibiotics

Track & Report Antibiotic Use

• Simple
  – Perform one-week audit of all antibiotic starts
  – What antibiotic? For what indication? Appropriate by indication (Loeb or McGeer), choice, duration (% of Abx > 7 days)?
  – Addresses appropriateness but provides limited information on utilization (which is optimal for QI projects)
Non-Catheterized UTI

Revised McGeer (Stone)

Clinical
(Must satisfy one of the following scenarios)

1. Either of the following:
   ☐ Acute dysuria
   ☐ Acute pain, swelling or tenderness of testes, epididymis or scrotum

2. If either FEVER* or LEUKOCYTOSIS present need to include ONE or more of the following:
   ☐ Acute costovertebral angle pain or tenderness
   ☐ Suprapubic pain
   ☐ Gross hematuria
   ☐ New or marked increase in incontinence
   ☐ New or marked increase in urgency
   ☐ New or marked increase in frequency

3. If neither FEVER nor LEUKOCYTOSIS present INCLUDE TWO or more of the ABOVE (Box #2).

Loebs Minimum Criteria

Clinical
(Must satisfy one of the following scenarios)

1. **Fever** (Revised McGeer): single temp ≥ 100°F or repeated temp ≥ 99°F or 2°F above baseline

2. Lab
   (At least one of the following must be met)
   1. Voided specimen:
      POSITIVE URINE CULTURE (> 10^5 CFU/ML)
      NO MORE THAN 2 ORGANISMS
   2. Straight Cath specimen:
      POSITIVE URINE CULTURE (> 10^2 CFU/ML)
      ANY NUMBER OF ORGANISMS

* Fever (Revised McGeer): single temp ≥ 100°F or repeated temp ≥ 99°F or 2°F above baseline

** Fever (LMC)x: single temp ≥ 100°F or 2.4°F above baseline

Track & Report Antibiotic Use

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- Simple but logistically challenging
  - Work with consultant pharmacy to generate standard reports (antibiotic starts, days of therapy, proportional use of selected agents)
  - Does not address appropriateness

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- Simple but logistically challenging
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- Hard
  - Ongoing tracking of antibiotic starts, duration, & appropriateness
  - Addresses appropriateness and utilization

Antibiotic Prescribing is Process with Multiple (Potential) Decisions

<table>
<thead>
<tr>
<th>Pre-Prescribing Decision-Making</th>
<th>Post-Prescribing Decision-Making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do I Test?</td>
<td>Can I Stop?</td>
</tr>
<tr>
<td>Do I Treat?</td>
<td>Can I Narrow?</td>
</tr>
<tr>
<td>How Do I Treat?</td>
<td>How Long Should I Treat?</td>
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- Do I Test?
- Do I Treat?
- How Do I Treat?

**Post-Prescribing Decision-Making**
- Can I Stop?
- Can I Narrow?
- How Long Should I Treat?

Dipstick $\rightarrow$ UA $\rightarrow$ Urine culture $\rightarrow$ Antibiotic Prescription

- Urine testing automated in many NHs.
- Average time from recognition of change to antibiotic = 2-3 days
- 60-90% of antibiotics prescribed for UTI started after culture results are back

Reduced Testing $\rightarrow$ Reduced Treatment

- 12 NHs in Massachusetts participated
- Intervention
  - Education (NH staff & providers)
  - Pathway (form)
  - Process and outcome measures trended & regularly reviewed by facility staff

<table>
<thead>
<tr>
<th>Measure</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urine Culture Rate</td>
<td>0.47 (0.42 – 0.52)</td>
</tr>
<tr>
<td>UTI Rate</td>
<td>0.42 (0.35 – 0.50)</td>
</tr>
<tr>
<td>C. Difficile Rate</td>
<td>0.85 (0.45 – 1.68)</td>
</tr>
</tbody>
</table>

Phillips et al., JBI Geriatr 2012; 12: 71
Drinka Crnich, Ann Long Term Care 2014; 22(9)

Doron et al., IDWeek 2014 [poster abstract]
Antibiotic Prescribing is Process with Multiple (Potential) Decisions

Pre-Prescribing Decision-Making

Do I Test?

Do I Treat?

How Do I Treat?

Post-Prescribing Decision-Making

Can I Stop?

Can I Narrow?

How Long Should I Treat?

Antibiotic Start Process: Hospital versus Nursing Home

  - 221 post-acute care residents admitted to 7 Georgia NHs followed for a year
  - 105/221 (48%) received at least one course of antibiotics
  - 56% were NH-initiated
  - 43% of NH-initiated courses had no documentation of infection in medical record
  - 67% of NH started antibiotics initiated over the phone
Factors Influencing Start Decisions

- Atypical manifestations of infection
- Limited capacity to articulate localizing symptoms
- Limited access to timely diagnostic test results
- High reliance on surrogate assessments
  - Quality of assessments are inconsistent
  - Quality of communication is inconsistent

Which Interaction with the Physician is More Likely to Result in an Antibiotic?

Scenario: Mrs. Sleepy, an elderly long-term stay resident with dementia, appears more lethargic than usual and refusing to come out of her room for meals. Her vital signs are stable and she has no localizing complaints.

Example A: Dr. Jones, Mrs. Sleepy is less interactive and not coming out of her room. Do you want me to send a urine culture?

Example B: Dr. Jones, Mrs. Sleepy is less interactive and not coming out of her room. She has no fevers, her other vital signs are stable and she has no other concerning exam findings. Would you be okay with me pushing fluids and monitoring her closely over the next 48 hours?

Nursing Influences on Prescriber Decision-Making

- Thoroughness of the initial assessment of resident change-in-condition
- Thoroughness of communicating findings of the assessment
- Nurse recommendations for testing and treatment
- Follow-up assessment of the resident
**Communication/Decision Aid Tool**

- Quasi-experimental study in 12 NHs in Texas
- Intervention focused on operationalizing Loeb study (2005) into a communication tool
- Implementation stratified by intensity
  - Control (n = 4)
  - Low-intensity (n = 4)
  - High-intensity (n = 4)

**Factors Influencing Start Decisions**

- Frail residents can get deteriorate quickly
- Families can exert pressure to prescribe
- Discounting consequences of prescribing
  - Providers only see the risks of not treating
  - Benefits of not treating are largely invisible

**Active Monitoring is Doing Something**

- [Diagram showing decision flowchart]

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Antibiotic Prescribing is Process with Multiple (Potential) Decisions

- Do I Test?
- Do I Treat?
- How Do I Treat?
- Can I Stop?
- Can I Narrow?
- How Long Should I Treat?

Harm of Broad-Spectrum Abx: *Clostridium difficile*

Education of Nursing Staff & Providers

- Cluster RCT in 58 NHs in Sweden
- Prescribing guideline disseminated through interactive case-based sessions w/ nurses & providers
- Outcomes
  - 1°: % UTI rx’d w/ FQs
  - 2°: % of suspected infections rx’d
  - 3°: % of suspected infections w/ Abx pause

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Wenisch et al. Antimicrob Ag Chemother 2014; 58(9): 5079-83

Antibiotic-resistant infections (per 1,000-days) ↓ 25%

Antibiotic Prescribing is Process with Multiple (Potential) Decisions

Pre-Prescribing Decision-Making
- Do I Test?
- Do I Treat?
- How Do I Treat?

Post-Prescribing Decision-Making
- Can I Stop?
- Can I Narrow?
- How Long Should I Treat?

Antibiotic Spectrum in NHs Often Unnecessarily Broad

- Random chart review of a sample of all ciprofloxacin orders (100 of 333)
- 72/333 orders deemed inappropriate by implicit review
  - 23/72 due to indication
  - 49/72 due to better alternative

- Treatment initiation often delayed until culture results available (69/96 starts [72%])
- 56% of starts involved an unnecessarily broad antibiotic (e.g., FQ when TMP/SMX or NFT active)
- Duration: too short (3%)/ too long (67%)
There are Multiple Opportunities to Improve Antibiotic Safety After an Antibiotic has been Started

- 162 antibiotic starts for UTI in 3 Wisconsin NHs were examined in detail.
- Almost 50% of the antibiotic courses initiated for UTI were amenable to change
  - **STOP OPPORTUNITY:** 4/12 (33%) of antibiotic courses initiated for a UTI indication were continued despite negative culture results.
  - **CHANGE (ESCALATE) OPPORTUNITY:** 8/25 (32%) of antibiotics were not modified despite a culture result demonstrating resistance to the empirically-initiated regimen.
  - **CHANGE (DE-ESCALATE) OPPORTUNITY:** 36/60 (60%) of the cases treated with a fluoroquinolone (i.e., cipro) could be changed to another antibiotic with a lower risk of side effects and resistance (e.g., nitrofurantoin).
  - **SHORTEN OPPORTUNITY:** 80/162 (49%) of the cases were treated for more than 7 days even though data suggests treatment durations for UTI should rarely exceed this duration.

Crnich et al., unpublished data
Post-Prescribing Process

![Diagram showing the post-prescribing process with decision nodes for antibiotic start by PCP, assembling pertinent data for review, and reviewing resident condition, microbiology results, other laboratory test results, imaging test results.

Importance of Nursing Education

Table 1. Random Assignment and Treatment with Parenteral Antibiotics According to Guideline

<table>
<thead>
<tr>
<th>Random Assignment of SNFs</th>
<th>Multi-Disciplinary Training</th>
<th>Physician-Only Training</th>
<th>(% of episodes with guideline indication)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preintervention</td>
<td>50% (10/20)</td>
<td>64.5% (6/107)</td>
<td></td>
</tr>
<tr>
<td>Postintervention</td>
<td>81.8% (16/22)</td>
<td>40% (20/50)</td>
<td></td>
</tr>
</tbody>
</table>

*P = dial.  
SNF = skilled nursing facility.

https://www.coursesites.com/web/apps/Bb-sites-course-creation-BBLEARN/courseHomepage.html?course_id=_348931_1
Raising Prescribing Threshold by Moving Pressure from One End to Another

Prescriber Report Cards

- 147-bed NH in WI with 12 staff who developed MRSA infection
- Review of urinary antibiogram identified:
  - 31/100 (27%) isolates were Enterococcus spp.
  - 87% of E. coli resistant to ciprofloxacin
- Facility embarked on several interventions:
  - Provided staff with antibiogram results
  - Guideline-concordant prescribing tracked by facility staff
  - Medical director sent out letters to outlier providers

Importance of the Antibiogram

- Drinka et al. JAMDA 2013; 14(6): 443
Antibiograms in NHs

- Urine samples accounted for nearly 80% of all cultures performed
- 85% of the antibiotic use in the 3 NHs was empiric (before cultures)
  - 54% involved a fluoroquinolone antibiotic
  - 65% of episodes associated with discordant (inappropriate) therapy
- Making antibiogram available reduced inappropriate use to 55%

NH ASP Resources

- Centers for Disease Control and Prevention
- Wisconsin HAI in Long-Term Care
  - https://www.dhs.wisconsin.gov/regulations/nh/hai-introduction.htm
- UNC Nursing Home Infections
  - https://nursinghomeinfections.unc.edu
- Massachusetts Coalition
- Agency for Healthcare Research and Quality ASP Toolkits
  - Full release expected Fall 2016

Thank You