Antibiotic Stewardship in Nursing Facilities
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August 22, 2017

Disclosures

Consultant Activities:
1. Zurex Pharmaceuticals (Madison, WI): provide strategic advice on development and testing of the company’s novel anti-septic platform (<$5,000).
2. Deb Group (SC Johnson Subsidiary, Charlotte, NC): provide strategic advice on evaluating the company’s automated hand hygiene monitoring technology (<$5,000).
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
Antibiotic Use in Nursing Homes is Common & Frequently Unnecessary

Crnich et al. ID Week 2012, San Diego, CA
Crnich et al. Society for Healthcare Epidemiology of America 2015 Spring Conference.

Misuse common even when Abx necessary

Crnich et al. IDWeek 2012, San Diego, CA
Harmful Effects of Antibiotics: 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: Facility Level (clinical)

- **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)

Daneman et al. *JAMA Intern Med* 2015; 175(8): 1331-9

Harmful Effects of Antibiotics: Community Level

- NH residents prescribed antibiotics are more likely to be colonized with antibiotic-resistant bacteria which can be spread to other.

- 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.


Our Government and Public Health Authorities Are Concerned

National Action Plan to Prevent Health Care-Associated Infections: Road Map to Elimination

April 2013

Chapter 8: Long-Term Care Facilities

National Action Plan for Combating Antibiotic-Resistant Bacteria

March 2015

Department of Health and Human Services

Centers for Medicare & Medicaid Services

42 CFR Parts 405, 431, 447, 482, 483, 485, 488, and 489 [CMS-3260-F]

RIN 0938-AR61

Medicare and Medicaid Programs; Reform of Requirements for Long-Term Care Facilities

Agency: Centers for Medicare & Medicaid Services [CMS], HHS.

Action: Final rule.
Where Do We Start?

Identify an individual to be responsible for leading the ASP team
ASP is a team effort

Putting antibiotic stewardship into practice


ASP team tasks

Pre-Prescribing
• Policy/procedure development (Core)
• Education & promotion (Core)
• Antibiotic utilization tracking & reporting (Core)
• Facility antibiogram (Advanced)
• Facility-specific prescribing guideline (Advanced)
• Provider feedback reports (Advanced)

Post-prescribing
• Audit & feedback (Advanced)

Nursing Practice
• SBAR (Core)
• Reducing unnecessary urine testing (Core)
• Antibiotic timeout (Core)
ASP team tasks

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Policies & Procedures for Infection Diagnosis and Treatment Etiquette
- Eliminate reagent strip testing of urine for the evaluation of resident change-in-condition
- Carefully assess unintended consequences of testing delegation protocols
- Process & tools for assessing and communicating resident change-in-condition
- All antibiotic orders should stipulate an indication, drug, dose, & duration.
- Eliminate test-of-cure urine cultures
- Discourage use of prophylactic antibiotics
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- **Education & promotion (Core)**
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Education of nursing staff is critical

https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/courseHomepage.htmlx?course_id=348931_1

Table 3. Random Assignment and Treatment with Parenteral Antibiotics According to Guideline

<table>
<thead>
<tr>
<th></th>
<th>Multi-Doctor Training</th>
<th>Physician-Only Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preintervention</td>
<td>50% (10/20)</td>
<td>64.5% (69/107)</td>
</tr>
<tr>
<td>Postintervention</td>
<td>81.5%* (10/22)</td>
<td>66% (98/145)</td>
</tr>
</tbody>
</table>

*p<.05
SNF = skilled nursing facility.
Family engagement likely important

Schweizer et al. Pharm World Sci 2005; 27(3): 159-65

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Nursing Practice

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Measure antibiotic utilization

Requirements of Participation – Interpretive Guidance

- Facilities will be expected to track their antibiotic use as well as clinical outcomes associated with that use
  - Ex. of utilization: Monthly antibiotic starts per 1,000 resident-days
  - Ex. of outcome: *Clostridium difficile* and MRSA rates
  - An antibiogram is *not* a requirement

- Facilities will be expected to perform some criterion-based assessment of antibiotic appropriateness
  - Include facility criteria in ASP policy: McGeer vs. Loeb vs. another
  - Be able to demonstrate that Abx appropriateness is being assessed
Antibiotic Starts

• Pros
  • Many facilities are already doing this (typically counts only)
  • Aligned with current 24-hour report & infection log processes
  • Relatively easy to marry with treatment indication
  • Not influenced by prophylactic therapy
  • Can be easily modified to exclude hospital-initiated antibiotics

• Cons
  • Current data systems dictate reliance on manual data abstraction methods
    • If automated, could be inflated by intermittent therapy (fosfomycin, vancomycin), treatment interruptions and treatment modifications
  • Suboptimal reliability of 24-hour report/infection logs
  • Does not address prophylactic antibiotics
  • Does not address dimensions of appropriateness (necessity, duration, spectrum)

Days of Therapy (DOT)

• Pros
  • Identical to the hospital AU measure
  • Does provide indirect information on length of therapy (not the case in hospitals)
  • More amenable to automation than antibiotic starts

• Cons
  • May be difficult to parse out hospital-initiate antibiotics
  • May be difficult to parse out prophylactic antibiotics
  • May be difficult to parse out relative contribution of different treatment indications
  • Only captures information on one dimension of appropriateness (duration)
### Measures of Appropriateness - Necessity

**Revised McGeer (Stone)**

<table>
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<th>Percentage</th>
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<td>Acute dysuria</td>
<td>55 (22%)</td>
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<td>Fever* or Leukocytosis</td>
<td>101 (40%)</td>
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<td>Either of the following:</td>
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<td>Acute pain, swelling or tenderness of testes, epididymis or prostate</td>
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**McGeer Loeb**

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**Loeb Minimum Criteria**

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**Either Criteria Positive** = 251/504 (49.8%)

**Agreement** = 354/504 (70.2%)

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### Measures of Appropriateness - Duration

- 50% of facility-initiated Abx treatment courses exceed 7 days
- 20% of antibiotic utilization can be eliminated by shortening treatment courses to 7 days or less

**Measures**

- DOTs
- % of facility-initiated treatment courses exceeding 7 days

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

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

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Crnich et al. SHEA 2014

Other Measures of Appropriateness

• % of facility-initiated treatment courses that are guideline concordant

• % of facility-initiated treatment courses in which specific classes of antibiotics utilized (e.g., fluoroquinolones)

• Spectrum Score

• Medication appropriateness index
Suggestions for developing tracking workflows

• Start having conversations with facility pharmacy
  • Most pharmacy services maintain a database that details drug, dispense date and days of therapy that was dispensed
  • They will not often have data on indication or appropriateness

• Offload primary data collection to frontline staff
  • Every facility uses a 24-hour board that can potentially be adapted to capture discrete resident information
  • Can get information on antibiotic starts, duration of therapy and indication
  • Will be difficult to incorporate appropriateness (duration being an exception)

• Integrate into infection surveillance activities
  • IP is required to maintain line-list of infections in the facility
  • It is minimal effort to capture data on antibiotic use
  • Can assess appropriateness

Other suggestions

• Use cross-sectional approaches to identify problem areas

• Design prospective tracking efforts with your improvement activities in mind
  • Focus on tracking UTI treatment if your efforts are only focused on UTI
  • Make sure you have some tool for assessing diagnosis shifting (everyone who used to have UTI now has respiratory tract infection)

• Trend your data using incidence densities (e.g., events per 1,000 resident-days) rather than count data

• Be careful when comparing your data to external data
ASP team tasks

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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)

![Graph showing Pre vs Post Treatment of Asymptomatic Bacteriuria](image)

OR = 0.35
95% CI = 0.16 – 0.76


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**Dipstick → UA → Urine culture → 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

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**Active monitoring is doing something**

- **High**
  - 1. **Higher** Risk (Go to R1 & R2)
  - 2. **Lower** Risk (Go to R2)
- **Low**
  - 1. **Yes** Review McGeer's Criteria
  - 2. **No**

**Suggested Script for Low Risk Change-in-condition:**

According to my assessment, this resident is experiencing a low-risk change-in-condition. I would like your permission to initiate our active monitoring care plan. I would not recommend testing the urine or starting antibiotics at this time.
Reduced Testing → 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>IRR (95% CI)</th>
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<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>
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Doron et al., IDWeek 2014 [poster abstract]

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Antibiotic Prescribing is Process with Multiple (Potential) Decisions

**Pre-Prescribing Decision-Making**
- Q1: Do I Test?
- Q2: Do I Treat?
- Q3: How Do I Treat?

**Post-Prescribing Decision-Making**
- Q4: Can I Stop?
- Q5: Can I Narrow?
- Q6: How Long Should I Treat?

353 UTI Treatment Episodes in 5 Wisconsin NFs.

66% of antibiotic courses amenable to some form of de-escalation.
- Stop (54%)
- Streamline (18%)
- Shorten (8%)

*In 38 of these subjects, we could not assess one or more de-escalation opportunities due to data limitations (i.e. lack of urine culture data).
Post-Prescribing Process

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Make Consequences more Visible

Drinka et al. JAMDA 2013; 14(6): 443
Furuno et al. Infect Control Hosp Epidemiol 2014

- 80% of cultures from a urine sample
- 85% of the antibiotic use in the 3 NHs was empiric (before cultures)
  - 54% involved a fluoroquinolone antibiotics
  - 65% of episodes associated with discordant (inappropriate) therapy
- Making antibiogram available reduced inappropriate use to 55%

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Impact of local prescribing guidelines

An Educational Intervention to Improve Antimicrobial Use in a Hospital-Based Long-Term Care Facility

David N. Schwartz, MD,*† Homer Abiad, MD,‡ Patricia L. DeMarais, MD,§ Emilian Armeaun, MD,*† William E. Trick, MD,‖ Yue Wang, PhD,§ and Robert A. Weinstein, MD*†


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

Impact of national prescribing guidelines

• 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
  • 2*: % of suspected infections w/ Abx pause

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Provider-Led Post-Prescriptive Review

Antibiotic Self-stewardship: Trainee-Led Structured Antibiotic Time-outs to Improve Antimicrobial Use

Background: Antibiotics are an important quality improvement target. Nearly 30% of antibiotic use is unnecessary or inappropriate due to outdated treatment regimens. The Centers for Disease Control and Prevention's CIPAP program was designed to reduce unnecessary antibiotic use.

Objectives: To assess the impact of a trainee-led antibiotic time-out program on antibiotic use.

Methods: A non-randomized study was conducted at a university hospital.

Results: A total of 11,673 antibiotics were prescribed, of which 3,245 were time-out antibiotics. The percentage of antibiotics prescribed that were time-out antibiotics decreased from 2.5% to 2.0% per patient day (P = 0.006).

Conclusion: Time-outs are an effective tool for improving antibiotic use.

Point-of-Prescription Interventions to Improve Antimicrobial Stewardship

Background: Prescriptions are the foundation for antimicrobial management.

Methods: A review of the literature was conducted to identify interventions that improve antimicrobial stewardship.

Results: In a randomized controlled trial, patients receiving post-prescription feedback had a lower rate of antibiotic use compared to those receiving standard of care.

Conclusion: Point-of-prescription interventions can improve antimicrobial stewardship.
Impact of an ID Consultative Service on Antibiotic Utilization in a NH


Pharmacist Led Post-Prescriptive Review and Feedback

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Introducing Normative Influences
Provider Feedback

- A MRSA outbreak in a 147-bed NH in WI led to an intensive review of facility microbiology and antibiotic prescribing data
- Review of urinary antibiogram identified
  - 31/100 (27%) all isolates were Enterococcus sp.
  - 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

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
- Minnesota Department of Health
  - http://www.health.state.mn.us/divs/idepc/dtopics/antibiotic-resistance/asp/ltc/
- Agency for Healthcare Research and Quality ASP Toolkits
Thank You