Antibiotic Stewardship in Nursing Homes: Best Practices and Updates

Karen Jones, MPH, RN, CIC, FAPIC
Centers for Research & Innovations in Special Populations
Department of Internal Medicine, Division of Geriatrics
The University of Michigan
January 11, 2023
## Objectives

<table>
<thead>
<tr>
<th>Define</th>
<th>Define infection prevention &amp; antibiotic prescribing trends in nursing homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe</td>
<td>Describe how antibiotic stewardship can improve nursing home resident outcomes</td>
</tr>
<tr>
<td>Identify</td>
<td>Identify antibiotic stewardship interventions applicable to nursing home environments</td>
</tr>
</tbody>
</table>
Infection risk factors in nursing homes

Resident level
- Effects of older age (immune system, mucous membrane & skin changes)
- Atypical symptoms of infection

Environmental level
- Many shared spaces

Therapy-related
- Antibiotic overuse & rise in multi-drug resistant organisms (MDROs)

Antibiotic use in nursing homes

• Antibiotics are among most prescribed meds in nursing homes
• Up to 70% of nursing home residents receive at least one antibiotic every year
• Up to 75% of these antibiotics are prescribed incorrectly (e.g., drug, dose, duration, reason)

CDC’s Core Elements for Antibiotic Stewardship for Nursing Homes, page last updated August 20, 2021.
- 1,664 US nursing homes in 2016
- 54% of NH residents received a systemic antibiotic
- High variability among nursing homes


<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Total Courses</th>
<th>Course Duration (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td><strong>Genitourinary infections</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>146,239</td>
<td>NA</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>32,042</td>
<td>22</td>
</tr>
<tr>
<td>Nitrofurantoin</td>
<td>22,995</td>
<td>16</td>
</tr>
<tr>
<td>Trimethoprim-sulfamethoxazole</td>
<td>18,492</td>
<td>13</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>12,736</td>
<td>9</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>12,351</td>
<td>8</td>
</tr>
<tr>
<td><strong>Respiratory infections</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100,165</td>
<td>NA</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>32,966</td>
<td>33</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>17,879</td>
<td>17</td>
</tr>
<tr>
<td>Amoxicillin-Clavulanic Acid</td>
<td>9,768</td>
<td>10</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>7,359</td>
<td>7</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>4,472</td>
<td>4</td>
</tr>
</tbody>
</table>
Inappropriate antibiotics in nursing homes – not a new problem

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Population</th>
<th>N</th>
<th>% inappropriate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimmer</td>
<td>1986</td>
<td>42 U.S. NHs</td>
<td>1748</td>
<td>38%</td>
</tr>
<tr>
<td>Jones</td>
<td>1987</td>
<td>2 Portland NHs</td>
<td>120</td>
<td>51%</td>
</tr>
<tr>
<td>Loeb</td>
<td>2001</td>
<td>22 chronic care facilities in Canada</td>
<td>3656</td>
<td>51%</td>
</tr>
<tr>
<td>Mitchell</td>
<td>2014</td>
<td>Patients with advanced dementia in 21 Boston NHs</td>
<td>214</td>
<td>56%</td>
</tr>
<tr>
<td>Rotjapanan</td>
<td>2011</td>
<td>Urinary tract infections in 2 Rhode Island NHs</td>
<td>172</td>
<td>73%</td>
</tr>
</tbody>
</table>

Loeb *JGIM* 2001; Jones *AJM* 1987; Mitchell *JAMA IM* 2014; Rotjapanan *JAMA IM* 2011; Zimmer *JAGS* 1986
Risks with antibiotic use

• Direct toxicity – risks exists for every organ
  • Liver
  • Kidney
  • Bone Marrow
  • Dermatologic
  • Electrolytes
  • Neurologic
• Allergic reactions
• 13% of adult ED visits for adverse drug events (ADE) are due to antibiotics
• Promotes antimicrobial resistance

Deadly: invasive MDROs in older adults

30-Day Mortality Associated With Invasive Antibiotic-Resistant Infections, 2017
U.S. adults ages 65 and older

- Methicillin-resistant Staphylococcus aureus (MRSA)
  - Community-onset infection: 11.5%
  - Hospital-onset infection: 14.8%

- Extended-spectrum beta-lactamase (ESBL)-producing Enterobacteriaceae
  - Community-onset infection: 6.7%
  - Hospital-onset infection: 16.2%

- Carbapenem-resistant Enterobacteriaceae (CRE)
  - Community-onset infection: 10.6%
  - Hospital-onset infection: 16.7%

- Vancomycin-resistant Enterococcus (VRE)
  - Community-onset infection: 14%
  - Hospital-onset infection: 20%

- Multidrug-resistant Pseudomonas aeruginosa
  - Community-onset infection: 12.5%
  - Hospital-onset infection: 20.6%

- Carbapenem-resistant Acinetobacter
  - Community-onset infection: 17.4%
  - Hospital-onset infection: 26.9%

Nelson, CID, 2021
“... more likely, though, is that many cases went undetected in 2019, 2020, and 2021, when public health laboratories overwhelmed by COVID-19 and chronic underfunding didn’t have the bandwidth to look for *C auris*” – Dr. Natasha Bagdasarian, Chief Medical Executive, MDHHS

Prescribing trends may affect the entire facility

• Odds of developing an MDRO increase when in a facility with high rates of antibiotic use – even if the resident themselves didn’t receive an antibiotic (Daneman, 2015)
• Do you know your facility’s prescribing trends?
Antibiotic Stewardship program in nursing homes

• CMS’ 483.3 (2017) stipulated all nursing homes must have an Antibiotic Stewardship program in place
• Wide variability – members, guidelines, engagement
• “7 Core Elements” – CDC guidelines for antibiotic stewardship in nursing homes

CDC’s Core Elements for Antibiotic Stewardship for Nursing Homes.
Antimicrobial Stewardship

FIVE “D”s of Antimicrobial Stewardship

- Right Drug
- Right Drug-Route
- Right Dose
- Right Duration
- Timely De-escalation

Measure and improve these as they apply to antimicrobials

Adherence to the FIVE “D”s affect MDRO burden, risk of *Cdiff*, risk of Candidemia

Credit: Payal Patel, MD, MPH
Figure 1. Conceptual model related to prescribing decisions in residential care/assisted living and nursing homes

Strategies to Reduce Potentially Inappropriate Antibiotic Prescribing in Assisted Living and Nursing Homes, AHRQ.
Recommended strategies

- Evidence-based provider (prescriber) training
- Use of a standardized communication form
- Resident & family education
- Ongoing monitoring & feedback
- Monthly QI meetings

Leadership commitment is critical to success
Asymptomatic bacteriuria & “treatment”

• Asymptomatic bacteriuria (ASB) - 1 or more species of bacteria growing in the urine irrespective of the presence of pyuria, in the absence of signs or symptoms attributable to urinary tract infection (Noelle, 2019)

• Inappropriate utilization of urine cultures
  • 210 patients on hospitalist service with urine cultures
  • 54% with inappropriate reason for obtaining culture
  • 45% of negative cultures on antibiotics at time of culture

• Treatment ASB
  • 59 of 60 patients with ASB were treated with antimicrobials = 453 days of excess antibiotic therapy

Hartley et al. ICHE, 2015.
Case Scenario

- 92 y/o female resident with a history of recurrent “UTIs” complains of symptoms “similar to prior episodes”
- Symptoms: cloudy urine, smells “bad.” No dysuria or suprapubic pain.
- Resident’s daughter states, “this is always how it starts” and always resolves with antibiotics
- U/A and culture are sent, empiric antibiotics started

Is this how you’d expect your facility to react?
Nurses and Nursing Assistant Surveys (N=278)

Which of the following signs and symptoms mean that you should send a urine culture?

- Change in urine color: 67% (CNA), 49% (RN)
- Temperature of 101°F: 64% (CNA), 92% (RN)
- Foul smelling urine: 83% (CNA), 86% (RN)
- Cloudy urine: 67% (CNA), 79% (RN)

Drekonja, ICHE, 2019
What interventions work?

Systematic review of nursing home antibiotic stewardship programs

- Most interventions were multi-faceted (13/16, with median of 4 strategies)
- Educational meetings & materials, guidelines
- Interventions were associated with a 13% reduced antibiotic use overall
- Leadership commitment & support was essential

Resources from UM PRIISM

Antibiotic Stewardship

- Antibiotic Stewardship Infographic
- Obtaining Urine Testing in Older Adults with Delirium
- Antimicrobial Line Listing
- Antibiotic Time Out: SBAR Communication Tool Template
- Urine Culture Sign and Symptom Reminder flyer
- Asymptomatic Bacteriuria for Nurses infographic
- Promote Hydration: Weekly intake recording from AMMI
- Letter to residents/families from AMMI

PRIISM Resources, https://priism.med.umich.edu/resources
Review culture results when available

Reassess resident

Determine diagnosis

Perform antibiotic timeout. Correct:
Antibiotic – Dose – Route - Length of time

Correct:
Antibiotic – Dose – Route - Length of time

Always reassess resident before initiating antibiotics!

Loeb’s Minimum Criteria: guide clinical treatment
Revised McGeers’: surveillance criteria, similar to NHSN

Does resident have symptoms of a UTI?

NO

Watchful waiting

YES

Notify provider ASAP & plan to d/c abx

Collect urine culture by clean-catch or straight cath. Begin antibiotics if indicated.

Urine culture negative

Review culture results when available

Reassess resident

Determine diagnosis

Urine culture positive

Credit: Trent Behunin, BS
Engaging Residents & Visitors

QI project at Detroit nursing home

Goal: inform residents/family/staff on hydration & asymptomatic bacteriuria

Staff: Education checklist/script & poster for staff members - during in-services and onboarding

Simple handout for residents & families - at admission/change of condition/during care conferences.
<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
</table>
| **S**  
**Situation:** | I am calling to follow-up on [resident’s name: ________________________] who was started on antibiotic(s) recently. |
| **B**  
**Background:** | This patient was started on:                                          |
|            | Antibiotic #1: ______________________________________________________ |
|            | Start date: ___                                                       |
|            | Antibiotic #2: ______________________________________________________ |
|            | Start date: ___                                                       |
|            | For:                                                              |
|            | UTI                                                                 |
|            | Pneumonia                                                           |
|            | Bronchitis                                                          |
|            | Skin infection                                                      |
|            | GI infection                                                         |
|            | Fever of unknown source                                             |
|            | Other, specify:                                                     |
|            | Vitals at initial presentation were as follows:                     |
|            | BP ___ / ___ HR ___ Resp. rate ___ Temp. ___ O₂ Sats. ___            |
|            | Symptoms and positive exam findings at that time were:             |
|            | The diagnosis fits:                                                 |
|            | McGee criteria                                                      |
|            | Loeb criteria                                                       |
|            | Neither                                                             |
|            | Assessment tool not used                                            |
| **A**  
**Assessment:** | Current vital signs: BP ___ / ___ HR ___ Resp. rate ___ Temp. ___ O₂ Sats. ___ |
|            | Since starting antibiotic(s), the resident:                         |
|            | □ now has no signs or symptoms of infection                         |
|            | □ has remained the same                                              |
|            | □ has improved but continues to have signs and symptoms of:         |
|            | □ has new or worsening signs/symptoms of:                            |
|            | Microbiology culture result (fax microbiology report if available): |
|            | □ has not returned yet                                               |
|            | □ has no growth                                                      |
|            | □ was not obtained                                                   |
|            | □ has positive Gram stain/growth of [specify Gram stain/microorganism: ______________________________________] |
|            | Is susceptible to the antibiotic(s) prescribed:                     |
|            | □ Yes                                                                |
|            | □ No                                                                 |
|            | □ Don’t know                                                         |
|            | □ Not tested by lab                                                  |
|            | □ Not yet performed by lab                                           |
|            | Other antibiotics the organism is sensitive to:                     |
| **R**  
**Recommendation:** | □ Patient is not improving and needs further evaluation.            |
|            | □ Patient has improved and needs final antibiotic therapy plan.      |
1. Have I ordered appropriate cultures before starting antibiotics? What empiric therapy should I initiate?

2. Does my patient have an infection that requires antibiotics?

3. A day or more has passed. Can I stop antibiotics? Can I narrow therapy or change from IV to oral therapy?

4. What duration of antibiotic therapy is needed for my patient’s diagnosis?

Tamma et al, 2019 JAMA. 2019
A Series of Unfortunate Events, nursing home edition

- Adult in LTC loses glasses
- More Confused
- Urinalysis plus cipro*
- ER, UCX* Ceftriaxone
- Dehydrated
- Nauseated
- Improves on IVF
- UCX returns resistant Kleb*
- Clostridioides difficile
- Cefepime

* places to intervene

Credit: Payal Patel, MD, MPH
## Potential Target for Antimicrobial Stewardship

<table>
<thead>
<tr>
<th>Activity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ordering urine cultures</strong></td>
<td>• Algorithm to help understand when a urine culture is needed</td>
</tr>
<tr>
<td><strong>Choice of antimicrobials</strong></td>
<td>• Pharmacist contact before Fluoroquinolones can be prescribed</td>
</tr>
<tr>
<td>(Restricting Fluoroquinolones)</td>
<td></td>
</tr>
<tr>
<td><strong>Review of antimicrobial use</strong></td>
<td>• Understanding trends, outliers</td>
</tr>
<tr>
<td><strong>Gathering data on Duration of Antimicrobial Use</strong></td>
<td>• May be high-yield for stewardship targets</td>
</tr>
</tbody>
</table>
Who Can Be An Antimicrobial Steward?

- Administration – support is key
- Medical Director
- Infection preventionist
- Nursing – no one spends more time with the patient
- Administration
Antibiotic Stewardship Team

• Antibiotic Stewardship is a core component of an Infection Prevention & Control (IPC) Program in nursing homes
• The facility Infection Preventionist (IP) is often responsible for managing/coordinating the team
  • Identify, inform, educate during implementation, monitor, conduct process & outcome surveillance

Who leads your Antibiotic Stewardship team?
Leading antibiotic stewardship efforts takes -

- Dedicated time
- Dedicated support
- Dedicated resources

Striving towards partnerships

Original Investigation | Infectious Diseases

Association of Exposure to High-risk Antibiotics in Acute Care Hospitals With Multidrug-Resistant Organism Burden in Nursing Homes

Kyle J. Gontjies, MPH; Kristen E. Gibson, MPH; Bonnie J. Lansing, LPN; Julia Mantey, MPH, MUP; Karen M. Jones, MPH; Marco Cassone, MD, PhD; Joyce Wang, PhD; John P. Mills, MD; Lona Mody, MD, MSc; Payal K. Patel, MD, MPH

Abstract

**IMPORTANCE** Little is known about the contribution of hospital antibiotic prescribing to multidrug-resistant organism (MDRO) burden in nursing homes (NHs).

**OBJECTIVES** To characterize antibiotic exposures across the NH patient’s health care continuum (prescribing, health care exposure and NH stay) and to investigate whether recent antibiotic exposure

**Key Points**

**Question** Is hospital antibiotic exposure associated with multidrug resistant organism (MDRO) colonization and room environment contamination in nursing homes?
Antibiotic Stewardship for hospital accreditation - NEW

• For all Joint Commission-accredited hospitals & critical access hospitals, 12 new and updated requirements

What’s on patient hands?
Study: post-acute care patients at admission

- Hand swabs at admission then monthly up to 180 days or until discharged
- Isolated for MRSA, VRE and resistant gram negatives (resistant to Ceftazidime, Ciprofloxacin, or Imipenem)
- **24.1% had at least one MDRO on hands** at admission
- 34.2% during follow-up visit

Hospitals route MDROs into post-acute care, increase during PAC stay
Major opportunities to encourage patient hand hygiene

Table. Baseline Patient Hand Carriage of MDROs in 6 Post-Acute Care Facilities

<table>
<thead>
<tr>
<th>Facility (Patients, No.)</th>
<th>MRSA</th>
<th>VRE</th>
<th>RGNB</th>
<th>Any MDRO&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (81)</td>
<td>8 (9.9)</td>
<td>7 (8.6)</td>
<td>2 (2.5)</td>
<td>16 (19.8)</td>
</tr>
<tr>
<td>2 (47)</td>
<td>6 (12.8)</td>
<td>6 (12.8)</td>
<td>1 (2.1)</td>
<td>12 (25.5)</td>
</tr>
<tr>
<td>3 (85)</td>
<td>9 (10.6)</td>
<td>9 (10.6)</td>
<td>2 (2.4)</td>
<td>19 (22.4)</td>
</tr>
<tr>
<td>4 (81)</td>
<td>8 (9.9)</td>
<td>16 (19.8)</td>
<td>2 (2.5)</td>
<td>21 (25.9)</td>
</tr>
<tr>
<td>5 (26)</td>
<td>3 (11.5)</td>
<td>5 (19.2)</td>
<td>3 (11.5)</td>
<td>8 (30.8)</td>
</tr>
<tr>
<td>6 (37)</td>
<td>5 (13.5)</td>
<td>6 (16.2)</td>
<td>0</td>
<td>10 (27.0)</td>
</tr>
<tr>
<td><strong>Total (357)</strong></td>
<td>39 (10.9)</td>
<td>49 (13.7)</td>
<td>10 (2.8)</td>
<td><strong>86 (24.1)</strong></td>
</tr>
</tbody>
</table>

Abbreviations: MDRO, multidrug resistant organism; MRSA, methicillin-resistant *Staphylococcus aureus*; RGNB, resistant-gram negative bacilli; VRE, vancomycin-resistant *Enterococcus*.

<sup>a</sup> At least 1 MDRO.

Which is your biggest challenge to improve antibiotic stewardship?
UM CRIISP
Projects/Partnerships

- PRIISM Project
- M-ECHO
- Targeted Infection Prevention (TIP) Study
- Pathway from Functional Disability to Antibiotic Resistance in Nursing Home Residents
- Gown and Glove Use to Prevent the Spread of Infection in Community-Based Nursing Homes
The Center for Research and Innovations In Special Populations (CRIISP), led by Dr. Lona Mody, applies translational epidemiologic research methods to enhance disease outcomes in vulnerable populations. Our projects utilize a variety of research methods from observational and molecular epidemiology, clinical trials to implementation science with an explicit attention to mentoring junior investigators in research leadership.

https://criisp-mody.lab.medicine.umich.edu/home
Thank you!

karenjon@med.umich.edu

@jones2RN
References


• “SBAR Tool for Antibiotic Time-Out,” Nebraska Department of Health & Human Services, created by Created by Phil Chung, PharmD, MS, BCPS and Salman Ashraf, MBBS. https://asap.nebraskamed.com/long-term-care/tools-and-templates-for-long-term-care/
Questions?
Other topics for discussion?
Upcoming Sessions

• **Jan. 25** Quality Assurance and Performance Improvement (QAPI) and Root Cause Analysis (RCA)

• **Feb. 8** Addressing challenging behaviors

• **Feb. 22** Fit Testing

• **March 8** Shine a Light on Stigma
Continue the Conversation in Superior Health Connect

Connect is a shared learning environment for Superior Health participants to come together to foster and promote an all-teach-all-learn climate that provides the framework to improve and sustain mutual health care quality improvement initiatives locally, regionally, and nationally.

https://bit.ly/3BhfHc1

Scan to join Connect.
This material was prepared by the Superior Health Quality Alliance, a Quality Innovation Network-Quality Improvement Organization under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services (HHS). Views expressed in this material do not necessarily reflect the official views or policy of CMS or HHS, and any reference to a specific product or entity herein does not constitute endorsement of that product or entity by CMS or HHS.

12SOW-MI/MN/WI-NH-23-04 010923

Empowering patients, families and caregivers to achieve health care quality improvement