Predictors of Isolation Precautions Use for Multidrug Resistant Organisms in U.S. Nursing Homes

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Infections in Nursing Homes (NH)

• 1.6 - 3.8 million infections annually
  • $673 million to $2 billion for hospitalizations

• Growing NH population:
  • 1.5 million today to 5.3 million by 2030

• Increasing vulnerability to infection
New Infection Reduction Efforts Include NHs

NHs Included in:

- National Action Plan to Reduce Healthcare Associated Infections
- Executive Order to Reduce Antibiotic Resistant Infection
Multidrug Resistant Organisms (MDROs): An Increasing Concern

Pathogens resistant to one or more classes of antimicrobial agents

- Frequently resistant to nearly all antimicrobial drugs

In NHs

- Higher MDRO morbidity and mortality in NHs
- 18% increase in NHs 2006-2010
Isolation Precautions Recommended for MDRO Control

Includes:

• Hand hygiene/ Standard precautions
• Dedicated care equipment
• Private room
• Gown & gloves
Differences between NHs and Acute Care May Prevent Isolation Use

- Fewer Resources
- Fewer Isolation Rooms
- Longer Length of Stay
- Different Care Goals
- Residential Setting
- Difficult Diagnoses

Isolation Practices Used Differently
Isolation Precautions Highly Subject to Staff Discretion

- Use “depends on the particular resident” and facility
- Alternatives include cohorting and others
- No clear framework for NH staff decisions

Objective:
What resident and NH characteristics predict isolation precaution use for MDRO infection?

Isolation Precautions Use in NHs

Methods

Sample:

• National data 2010-2013
• Elderly NH residents
• Active MDRO infection
• In certified, free-standing NHs

Analysis:

• Multivariable Ordinary Least Squares models
  • Facility fixed effects
Methods: National Data Representing 96% of U.S. NHs

Mandatory Submission for CMS Certification

- Minimum Data Set (MDS)
- Certification and Survey Provider Enhanced Reporting (CASPER)
- Area Health Resource File (AHRF)

Resident clinical characteristics & demographics

- Assessments by NH staff
- At least every 92 days: Admission, Quarterly, Annual Assessments

Facility characteristics

- Reported by NH staff
- At least annual collection

Population demographics, health status & socioeconomic status

- Complied by Health Resources and Services Administration
- Annual collection
Methods: Predictors of Isolation Among MDRO-Positive Residents

Resident Characteristics
- Clinical
  - Admissions Assessment
  - Activities of Daily Living
  - Behavioral Problem(s)
  - Cognitive Ability/Wandering
  - History of MDRO
  - Indwelling Catheter
  - Long-stay status
  - Mood Severity Score

- Demographics
  - Influenza Vaccination
  - Number of Assessments per Resident

System Characteristics
- Facility
  - Nurse Staffing
  - Inspection Citation

- Controls
  - Chain Membership
  - Facility Size
  - Occupancy Rate
  - Ownership Status
- Location
  - Elderly per Square Mile
  - Local Competition
  - Median Household Income

Outcome

Isolation

Note: Time trend adjustment also included.
Results: Resident Assessment Sample Description

191,816 MDRO+ Assessments
138,294 Residents
11,773 NHs

Mean age = 80.5 years
Female gender = 59.1%

Race / Ethnicity
- American Indian or Alaskan Native
- Asian
- Black
- Hispanic
- Native Hawaiian/ Pacific Islander
- White
# Results: Facility Inspection Sample Description

- **191,816 MDRO+ Assessments**
- **138,294 Residents**
- **11,773 NHs**

<table>
<thead>
<tr>
<th>Facility Characteristic</th>
<th>Mean</th>
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</thead>
<tbody>
<tr>
<td>Facility size (beds)</td>
<td>117.2</td>
</tr>
<tr>
<td>Occupancy rate</td>
<td>83.4%</td>
</tr>
<tr>
<td>Chain membership</td>
<td>61.2</td>
</tr>
<tr>
<td>Infection control citation</td>
<td>38.2</td>
</tr>
<tr>
<td>Care quality citation</td>
<td>66.8</td>
</tr>
</tbody>
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*31,759 NH Inspections 2010-2013*
Results: Rate of Isolation Use

- Isolation use for MDRO is infrequent
- Majority of NHs do not use isolation for MDRO
Predictors in Multivariable Probability Model

Isolation Predictors

<table>
<thead>
<tr>
<th>Predictor</th>
<th>% Probability Change</th>
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<tbody>
<tr>
<td>Admission Assessment</td>
<td>-48.1%</td>
</tr>
<tr>
<td>Bed mobility support</td>
<td>-9.2%</td>
</tr>
<tr>
<td>Daily wandering in last week</td>
<td>-16.4%</td>
</tr>
<tr>
<td>Wandering 4-6 d/wk</td>
<td>-29.7%</td>
</tr>
<tr>
<td>Wandering 1-3 d/wk</td>
<td>-19.8%</td>
</tr>
<tr>
<td>Infection control citation</td>
<td>3.4%</td>
</tr>
<tr>
<td>Care quality citation</td>
<td>-3.3%</td>
</tr>
<tr>
<td>Locomotion Support</td>
<td>23.6%</td>
</tr>
<tr>
<td>Eating Support</td>
<td>17.9%</td>
</tr>
<tr>
<td>MDRO history</td>
<td>-14.3%</td>
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COLUMBIA UNIVERSITY
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## Strengths & Limitations

<table>
<thead>
<tr>
<th>Limitations</th>
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</thead>
<tbody>
<tr>
<td>• Secondary data analysis</td>
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<tr>
<td>• Does not account for prevalence of other organisms, outbreaks or colonization</td>
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<tr>
<td>• Further limited by study design and the nature of these data</td>
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<table>
<thead>
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<th>Strengths</th>
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<tr>
<td>• High generalizability from national sample</td>
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<td>• Novel use of MDS</td>
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Summary

Possible Role of Resources in Decision-Making

- Staff visits to room
- Staff oversight of residents

Inspections Affect Practice

- Possibly due to knowledge deficits
- Resources

Possible Emphasis on Quality of Life and Functionality

- Preserving functionality, if still autonomous
- Maintaining quality of life

Unexpected Findings

- Hygiene ability not associated
- Low Isolation rate of MDRO+
- Most NHs do not use isolation at all
Implications

**Clinical Practice**
- NH staff may seek additional training in infection control

**Future Research**
- Is isolation use appropriate?
- Effectiveness and cost studies needed in NHs

**Implications of This Work**

**Public Policy**
- Inspections effect NH practice
- Concerns about Adequacy of Resources
- Infection control training for NH staff
Acknowledgement of Funding

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