Supplementary Online Content


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This supplementary material has been provided by the authors to give readers additional information about their work.
### eTable 1. Description of Infection Prevention Programs at TIP Nursing Homes at Baseline

<table>
<thead>
<tr>
<th>Infection Prevention Program Elements</th>
<th>Intervention Group NH (N=6)</th>
<th>Control Group NH (N=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of a full-time or part-time Infection Preventionist (IP)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Written job description</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Full decision making authority regarding infection prevention</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ability to institute any infection prevention measure</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Have duties other than infection prevention</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>No. hours/week spent on infection prevention activities, mean (SD)</td>
<td>22 (11)</td>
<td>13 (7)</td>
</tr>
<tr>
<td><strong>Surveillance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. NH with a system for ongoing collection of data on MDROs and infections</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>No. NH using McGeer’s criteria to define infections</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Standard and Transmission-based Precautions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. NH with isolation and precaution-based policies in place</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Implementing standard precautions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education of staff, nurses and/or visitors</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Posters/reminders</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Encourage hand hygiene</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Monitor hand hygiene</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Implementing contact precautions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the presence of excessive wound drainage</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Fecal incontinence or other discharges</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Single-rooms or cohorting</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Wearing gowns and gloves</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>No. NH with a specific policy regarding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRSA</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>VRE</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>R-GNB</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C. difficile</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Abreviations: IP = infection preventionist; NH = nursing home; MDRO = multidrug resistant organism; MRSA = methicillin-resistant *Staphylococcus aureus*; R-GNB = resistant Gram-negative bacilli; VRE = vancomycin-resistant enterococci
eAppendix

Samples of implementation tools

A: Signage for preemptive barrier precautions: Signage and personal protective equipment caddies to reinforce and facilitate use of preemptive barrier precautions
B: Feedback reports for MDROs and infections: Distributed monthly to intervention NHs
C: Hand hygiene promotion: Using pre- and post- hand culture plate demonstrations
D: Interactive infection prevention education, pocket cards, train-the-trainer IP skills program

Urinary Catheter Care: Didactics and Demonstrations
Infection Control Jeopardy:
Pocket cards:

<table>
<thead>
<tr>
<th>McGeer’s Surveillance Criteria</th>
<th>Minimum Criteria</th>
</tr>
</thead>
</table>
| **A. For residents without a urinary catheter**
  Must have at least three of the following:
  1. Fever (≥38°C [100.4°F]) or chills
  2. New/increased burning pain on urination, frequency/urgency
  3. New flank or suprapubic pain or tenderness
  4. Change in character of urine
  5. Worsening of mental or functional status (may be new/increased incontinence)
| **A. For residents without a urinary catheter**
  1. Acute dysuria, **OR**
  2. Fever (≥37.9°C [100°F]) or 1.5°C [2.7°F] increase above baseline temp) or chills
  AND at least one of the following:
  1. New/increased urgency
  2. Frequency
  3. Suprapubic pain
  4. Gross hematuria
  5. Costovertebral angle tenderness
  6. Urinary incontinence |
| **B. For residents with a urinary catheter**
  Must have at least two of the following:
  1. Fever (≥38°C [100.4°F]) or chills
  2. New flank or suprapubic pain or tenderness
  3. Change in character of urine
  4. Worsening of mental or functional status (may be new/increased incontinence)
| **B. For residents with a urinary catheter**
  Must have at least one of the following:
  1. Fever (≥37.9°C [100°F]) or 1.5°C [2.4°F] increase above baseline temp) or chills
  2. New costovertebral tenderness
  3. Rigors (shaking chills) with or without identified cause
  4. New onset of delirium |
| **Comment** | **If appropriately collected and processed urine specimen was sent and if the resident was not taking antibiotics at time, then cultures must be reported as either positive or contaminated.** |
### Skin and Soft Tissue Infection

#### McGeer's Surveillance Criteria

**A. Cellulitis/soft tissue/wound infection**

One of the following criteria must be met:

1. Pus present at a wound, skin, or soft tissue site.
2. Resident must have four or more of the following signs or symptoms:
   - Fever (>38°C) or worsening mental/functional status; and/or at the affected site, presence of new or increasing:
   - Heat
   - Redness
   - Swelling
   - Tenderness or pain
   - Serous drainage

#### Minimum Criteria to Initiate Antibiotics

**A. Cellulitis/soft tissue/wound infection**

1. Must include either new/increasing purulent drainage at a wound, skin or soft tissue site or
2. At least two of the following signs and symptoms:
   - Fever (temp >37.9°C [100°F] or an increase of 1.5°C[2.4°F] above baseline temp taken at any site.
   - Redness
   - Tenderness
   - Warmth
   - New or increasing swelling at the affected site.

### Respiratory Tract Infections

#### McGeer’s Surveillance Criteria

**A. Pneumonia (PNA)**

Both of the following criteria must be met:

1. Interpretation of chest radiograph as demonstrating PNA, probable PNA, or presence of infiltrate.
2. The resident must have at least two of the signs and symptoms described under "other lower respiratory tract infections."

**B. Other Lower Respiratory Tract Infection**

Must have at least three of the following:

1. New or increased cough
2. New or increased sputum production
3. Fever (≥38°C, 100.4°F)
4. Pleuritic chest pain

#### Comments

Noninfectious causes of symptoms must be ruled out. CHF may produce signs and symptoms similar to those of respiratory infections.

This diagnosis can be made only if no chest film was obtained or if radiograph failed to confirm presence of pneumonia.
<table>
<thead>
<tr>
<th>Minimum Criteria to Initiate Antibiotics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Febrile Resident</td>
<td>In the setting of a new infiltrate on chest radiograph thought to represent PNA, any one of the following symptoms or signs would constitute appropriate minimum criteria: respiratory rate &gt;25 breaths/min, productive cough, fever (temp &gt;37.9°C [100°F] or 1.5°C [2.4°F] increase above baseline temp).</td>
</tr>
<tr>
<td>If resident with temp &gt;38.9°C [102°F], at least one of the following:</td>
<td></td>
</tr>
<tr>
<td>1. Respiratory rate &gt;25 breaths/min</td>
<td></td>
</tr>
<tr>
<td>2. Productive cough</td>
<td></td>
</tr>
<tr>
<td>If resident with temp &gt;37.9°C [100°F] (or a 1.5°C [2.4°F] increase above baseline temp) but ≤38.9°C [102°F], must include presence of cough, and at least one of the following:</td>
<td></td>
</tr>
<tr>
<td>1. Pulse &gt;100</td>
<td></td>
</tr>
<tr>
<td>2. Delirium</td>
<td></td>
</tr>
<tr>
<td>3. Rigors (shaking chills)</td>
<td></td>
</tr>
<tr>
<td>4. Respiratory rate &gt;25</td>
<td></td>
</tr>
<tr>
<td>B. Afebrile Resident</td>
<td></td>
</tr>
<tr>
<td>If afebrile resident has COPD, must include:</td>
<td></td>
</tr>
<tr>
<td>1. New/increased cough with purulent sputum production</td>
<td></td>
</tr>
<tr>
<td>If afebrile resident does not have COPD, must have presence of new cough with purulent sputum production and at least one of the following:</td>
<td></td>
</tr>
<tr>
<td>1. Respiratory rate &gt;25/min</td>
<td></td>
</tr>
<tr>
<td>2. Delirium</td>
<td></td>
</tr>
</tbody>
</table>
Curriculum for train-the-trainer IP skills:

Targeted Infection Prevention Study
Mini Conference for Infection Preventionists
University of Michigan

Agenda

1. Welcome and Introductions

2. Infection Prevention and Control Programs
   Handouts:  
   a. MSIPC: Elements of an Infection Prevention and Control Program: LTC
   b. APIC/SHEA: Guidelines for Infection Prevention and Control in LTC

3. Precautions: Standard and Transmission-based
   Handouts:  
   a. CDC/HICPAC Guidelines List
   b. MARR Toolkit: Sample Isolation Policy
   c. SHEA/IDSA Clostridium difficile Hand Hygiene Recommendations Update
   d. APHA Control of Communicable Diseases Manual

4. Surveillance Process and Practical Application for Infection Prevention
   Handouts:  
   a. AJIC: APIC Recommended Practices for Surveillance
   b. AJIC: McGeer’s Criteria - Definitions of Infection for Surveillance in LTC
   c. McGeer’s and Minimum Criteria Pocket Guides
   d. Comparison of McGeer’s Criteria (1991), Updated Criteria (2012), and Minimum Criteria (2001) for Definition of Infection for Surveillance
   e. Surveillance Practical Application and Examples

5. Wrap up
<table>
<thead>
<tr>
<th>Facility ID No.</th>
<th>Ownership Status</th>
<th>Star Rating</th>
<th>Beds, N</th>
<th>Subacute Beds, %&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Age in years, mean</th>
<th>Male, %</th>
<th>Functional Status, mean</th>
<th>Charlson Score, mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>County governed</td>
<td>5</td>
<td>136</td>
<td>9-100</td>
<td>78.4</td>
<td>50.0</td>
<td>20.2</td>
<td>3.1</td>
</tr>
<tr>
<td>4</td>
<td>Not for profit</td>
<td>2</td>
<td>156</td>
<td>59</td>
<td>77.4</td>
<td>50.0</td>
<td>20.9</td>
<td>2.6</td>
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<tr>
<td>6</td>
<td>For profit</td>
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<td>217</td>
<td>0-100</td>
<td>70.9</td>
<td>38.6</td>
<td>22.5</td>
<td>2.7</td>
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<tr>
<td>12</td>
<td>For profit</td>
<td>3</td>
<td>94</td>
<td>50</td>
<td>74.1</td>
<td>65.0</td>
<td>23.3</td>
<td>3.2</td>
</tr>
<tr>
<td>1</td>
<td>For profit</td>
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<td>180</td>
<td>0-100</td>
<td>73.7</td>
<td>33.3</td>
<td>23.9</td>
<td>2.8</td>
</tr>
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<td>3</td>
<td>For profit</td>
<td>1</td>
<td>88</td>
<td>28</td>
<td>74.6</td>
<td>57.9</td>
<td>22.6</td>
<td>3.4</td>
</tr>
<tr>
<td>Mean (SD)</td>
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<td>2.8</td>
<td>145.2</td>
<td>24-73</td>
<td>74.4</td>
<td>56.3</td>
<td>22.0</td>
<td>2.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>County governed</td>
<td>4</td>
<td>120</td>
<td>10-100</td>
<td>75.9</td>
<td>53.3</td>
<td>22.8</td>
<td>3.4</td>
</tr>
<tr>
<td>10</td>
<td>Not for profit</td>
<td>5</td>
<td>91</td>
<td>50</td>
<td>84.7</td>
<td>50.0</td>
<td>21.5</td>
<td>2.6</td>
</tr>
<tr>
<td>7</td>
<td>For profit</td>
<td>4</td>
<td>149</td>
<td>0-100</td>
<td>61.1</td>
<td>64.7</td>
<td>22.6</td>
<td>1.9</td>
</tr>
<tr>
<td>11</td>
<td>For profit</td>
<td>3</td>
<td>135</td>
<td>0-100</td>
<td>64.7</td>
<td>68.4</td>
<td>23.8</td>
<td>3.5</td>
</tr>
<tr>
<td>5</td>
<td>For profit</td>
<td>2</td>
<td>180</td>
<td>73-100</td>
<td>71.4</td>
<td>58.5</td>
<td>21.1</td>
<td>3.2</td>
</tr>
<tr>
<td>9</td>
<td>For profit</td>
<td>1</td>
<td>99</td>
<td>0-100</td>
<td>74.8</td>
<td>42.9</td>
<td>21.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Mean (SD)</td>
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<td>3.2</td>
<td>129.0</td>
<td>22-92</td>
<td>72.5</td>
<td>49.1</td>
<td>21.6</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<sup>a</sup> The range reflects beds that are dual certified to be either subacute care or long-term care.

There was no significant difference between intervention group NHs and control group NHs with respect to ownership status, CMS star rating, number of beds, % of subacute care beds, age, male gender, functional status or comorbidity score.
### eTable 3. Active surveillance cultures for MDROs, by follow-up visit

<table>
<thead>
<tr>
<th>Follow-up Visit, days</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (baseline)</td>
<td>595 (48.1)</td>
<td>643 (51.9)</td>
</tr>
<tr>
<td>15</td>
<td>540 (49.1)</td>
<td>560 (50.9)</td>
</tr>
<tr>
<td>30</td>
<td>421 (49.9)</td>
<td>422 (50.1)</td>
</tr>
<tr>
<td>60</td>
<td>317 (54.0)</td>
<td>270 (46.0)</td>
</tr>
<tr>
<td>90</td>
<td>254 (57.0)</td>
<td>192 (43.0)</td>
</tr>
<tr>
<td>120</td>
<td>184 (54.6)</td>
<td>153 (45.4)</td>
</tr>
<tr>
<td>150</td>
<td>130 (48.7)</td>
<td>137 (51.3)</td>
</tr>
<tr>
<td>180</td>
<td>137 (52.9)</td>
<td>122 (47.1)</td>
</tr>
<tr>
<td>210</td>
<td>133 (51.8)</td>
<td>124 (48.3)</td>
</tr>
<tr>
<td>240</td>
<td>102 (45.5)</td>
<td>122 (54.5)</td>
</tr>
<tr>
<td>270</td>
<td>97 (47.6)</td>
<td>107 (52.5)</td>
</tr>
<tr>
<td>300</td>
<td>81 (43.3)</td>
<td>106 (56.7)</td>
</tr>
<tr>
<td>330</td>
<td>73 (48.3)</td>
<td>78 (51.7)</td>
</tr>
<tr>
<td>360</td>
<td>52 (59.1)</td>
<td>36 (40.9)</td>
</tr>
<tr>
<td>Total</td>
<td>3116 (50.4)</td>
<td>3072 (49.6)</td>
</tr>
</tbody>
</table>

The number of active surveillance swabs collected for each follow-up visit time point was similar between the intervention group and control group.
## eTable 4. Active surveillance cultures for MDROs, by anatomic site

<table>
<thead>
<tr>
<th>Anatomic Site</th>
<th>Intervention (%)</th>
<th>Control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nares</td>
<td>767 (51.4)</td>
<td>755 (49.6)</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>606 (51.3)</td>
<td>576 (48.7)</td>
</tr>
<tr>
<td>Groin</td>
<td>794 (51.0)</td>
<td>762 (49.0)</td>
</tr>
<tr>
<td>Perianal</td>
<td>394 (50.9)</td>
<td>380 (48.1)</td>
</tr>
<tr>
<td>Enteral feeding tube site</td>
<td>370 (49.7)</td>
<td>374 (50.3)</td>
</tr>
<tr>
<td>Suprapubic catheter site</td>
<td>149 (45.7)</td>
<td>177 (54.3)</td>
</tr>
<tr>
<td>Wounds</td>
<td>36 (42.9)</td>
<td>48 (57.1)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3116 (50.4)</strong></td>
<td><strong>3072 (49.6)</strong></td>
</tr>
</tbody>
</table>

The number of active surveillance swabs collected for each anatomic site was similar between the intervention group and control group.
etTable 5. Cluster-level summary of active surveillance cultures during the first month and study periods

<table>
<thead>
<tr>
<th>Facility</th>
<th>First month</th>
<th>Study period</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Swabs collected</td>
<td>Positive swabs, percent</td>
<td>Swabs collected</td>
</tr>
<tr>
<td>Intervent</td>
<td>275</td>
<td>31.1</td>
<td>2841</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>30</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>38</td>
<td>23.7</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>106</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>19</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>59</td>
<td>42.4</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>23</td>
<td>56.5</td>
</tr>
<tr>
<td>Control</td>
<td>365</td>
<td>33.8</td>
<td>2707</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>96</td>
<td>27.1</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>52</td>
<td>28.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>24</td>
<td>29.2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>59</td>
<td>32.2</td>
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<tr>
<td></td>
<td>10</td>
<td>34</td>
<td>32.4</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>100</td>
<td>53.0</td>
</tr>
</tbody>
</table>

Active surveillance culture swabs collected during the first 30 days of the study, and then the rest of the study period for each facility are shown above. The percent positive swabs collected during the first 30 days of the study were similar among the intervention (31.1%) and control groups (33.8%). The intervention group showed an overall greater reduction in percent positive swabs during the study period compared to control group (-5.3% vs. -1.0%).
## eTable 6. Microbial survey results for individual MDROs

<table>
<thead>
<tr>
<th></th>
<th>Number of MDRO Positive Samples</th>
<th>Intervention</th>
<th>Control</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Positive Samples/No. Samples Collected (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MRSA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nares</td>
<td>254/3116 (8.2)</td>
<td>323/3072 (10.5)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Oropharynx</td>
<td>70/767 (9.1)</td>
<td>96/755 (12.7)</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Groin</td>
<td>34/606 (5.6)</td>
<td>23/576 (4.0)</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Perianal</td>
<td>50/794 (6.3)</td>
<td>66/762 (8.7)</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Feeding Tube Site</td>
<td>24/394 (6.1)</td>
<td>48/380 (12.6)</td>
<td>0.002</td>
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</tr>
<tr>
<td>Suprapubic Catheter Site</td>
<td>35/370 (9.5)</td>
<td>39/374 (10.4)</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Wound</td>
<td>32/149 (21.5)</td>
<td>43/177 (24.3)</td>
<td>0.54</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>VRE</td>
<td>122/3116 (3.9)</td>
<td>162/3072 (5.3)</td>
<td>0.011</td>
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<tr>
<td>Nares</td>
<td>0/767 (0.0)</td>
<td>3/755 (0.4)</td>
<td>0.08</td>
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<tr>
<td>Oropharynx</td>
<td>8/606 (1.3)</td>
<td>12/576 (2.1)</td>
<td>0.30</td>
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</tr>
<tr>
<td>Groin</td>
<td>56/794 (7.1)</td>
<td>71/762 (9.3)</td>
<td>0.10</td>
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</tr>
<tr>
<td>Perianal</td>
<td>47/394 (11.9)</td>
<td>52/380 (13.7)</td>
<td>0.46</td>
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<tr>
<td>Feeding Tube Site</td>
<td>5/370 (1.4)</td>
<td>4/374 (1.1)</td>
<td>0.72</td>
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<tr>
<td>Suprapubic Catheter Site</td>
<td>5/149 (3.4)</td>
<td>15/177 (8.5)</td>
<td>0.05</td>
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<tr>
<td>Wound</td>
<td>1/36 (2.8)</td>
<td>5/48 (10.4)</td>
<td>0.17</td>
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<tr>
<td>CTZ-R GNB</td>
<td>168/3116 (5.4)</td>
<td>257/3072 (8.4)</td>
<td>P&lt;0.001</td>
<td></td>
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<tr>
<td>Nares</td>
<td>1/767 (0.1)</td>
<td>18/755 (2.4)</td>
<td>P&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Oropharynx</td>
<td>10/606 (1.7)</td>
<td>27/576 (4.7)</td>
<td>0.003</td>
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</tr>
<tr>
<td>Groin</td>
<td>61/794 (7.7)</td>
<td>72/762 (9.5)</td>
<td>0.21</td>
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</tr>
<tr>
<td>Perianal</td>
<td>52/394 (13.2)</td>
<td>74/380 (19.5)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Feeding Tube Site</td>
<td>9/370 (2.4)</td>
<td>15/374 (4.0)</td>
<td>0.22</td>
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<tr>
<td>Suprapubic Catheter Site</td>
<td>26/149 (17.5)</td>
<td>25/177 (14.1)</td>
<td>0.41</td>
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</tr>
<tr>
<td>Wound</td>
<td>9/36 (25.0)</td>
<td>26/48 (54.2)</td>
<td>0.007</td>
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<tr>
<td>CIP-R GNB</td>
<td>609/3116 (19.5)</td>
<td>742/3072 (24.2)</td>
<td>P&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Nares</td>
<td>12/767 (1.6)</td>
<td>31/755 (4.1)</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Oropharynx</td>
<td>36/606 (5.9)</td>
<td>57/576 (9.9)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Groin</td>
<td>240/794 (30.2)</td>
<td>294/762 (38.6)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Perianal</td>
<td>207/394 (52.5)</td>
<td>207/380 (54.5)</td>
<td>0.58</td>
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<tr>
<td>Feeding Tube Site</td>
<td>34/370 (9.2)</td>
<td>42/374 (11.2)</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Suprapubic Catheter Site</td>
<td>65/149 (43.6)</td>
<td>75/177 (42.4)</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Wound</td>
<td>15/36 (41.7)</td>
<td>36/48 (75.0)</td>
<td>0.002</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: MDRO: multi-drug resistant organism; MRSA: methicillin-resistant *Staphylococcus aureus*; VRE: vancomycin-resistant Enterococcus; CTZ-R: ceftazidime-resistant; GNB: Gram-negative bacilli; CIP-R: ciprofloxacin-resistant.
We assessed the effectiveness of the TIP intervention in reducing MDRO colonization at different anatomic sites. Compared with the control group, the intervention group had lower MRSA colonization in nares, groin, and perianal areas; lower VRE colonization in groin, perianal, suprapubic catheter site and wounds; lower CTZ-R in oropharynx, perianal areas, and wounds; and lower CIP-R in oropharynx, groin, and wounds.
eTable 7. Mean number of MDROs isolated from each anatomic site

<table>
<thead>
<tr>
<th>Anatomic Site</th>
<th>Intervention</th>
<th>Control</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nares</td>
<td>0.11 (0.09–0.13)</td>
<td>0.20 (0.17–0.23)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>0.17 (0.13–0.21)</td>
<td>0.21 (0.17–0.26)</td>
<td>.14</td>
</tr>
<tr>
<td>Groin</td>
<td>0.59 (0.53–0.66)</td>
<td>0.78 (0.71–0.86)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Perianal</td>
<td>0.95 (0.84–1.05)</td>
<td>1.18 (1.06–1.31)</td>
<td>.004</td>
</tr>
<tr>
<td>Enteral feeding tube site</td>
<td>0.23 (0.17–0.28)</td>
<td>0.31 (0.24–0.37)</td>
<td>.11</td>
</tr>
<tr>
<td>Suprapubic catheter site</td>
<td>0.89 (0.72–1.06)</td>
<td>1.06 (0.88–1.24)</td>
<td>.19</td>
</tr>
<tr>
<td>Wound</td>
<td>0.97 (0.61–1.33)</td>
<td>2.12 (1.61–2.63)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total</td>
<td>0.41 (0.38–0.44)</td>
<td>0.56 (0.52–0.59)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

The intervention group showed a lower mean number of MDROs for each anatomic site compared to the control group.
<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
<th>Mean difference (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of NH appropriate standardized infection surveillance definitions, No. NH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of study</td>
<td>6</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Infection prevention knowledge scores, mean$^a$</strong></td>
<td>90.2%</td>
<td>79.6%</td>
<td>11.6 (10.6 - 12.6)</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td><strong>Barrier precaution compliance, mean$^b$</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gown use</td>
<td>40.5%</td>
<td>1.8%</td>
<td>38.7 (20.3 - 57.1)</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Glove use</td>
<td>73.3%</td>
<td>78.0</td>
<td>-4.7 (-21.9 - 12.7)</td>
<td>0.56</td>
</tr>
<tr>
<td>Hand Hygiene</td>
<td>37.3%</td>
<td>18.2%</td>
<td>19.2 (1.4 - 36.9)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Resident reported outcomes of care, mean$^c$</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reporting of being washed in the last 24 hours</td>
<td>79.8%</td>
<td>81.9%</td>
<td>-2.2 (-25.6 – 21.3)</td>
<td>0.84</td>
</tr>
<tr>
<td>Overall satisfaction with care</td>
<td>83.3%</td>
<td>83.9%</td>
<td>-0.7 (-24.5 - 23.2)</td>
<td>0.95</td>
</tr>
</tbody>
</table>

$^a$We conducted over 200 in-services across 10 different topics at 6 intervention sites over 36 months.

Overall in-service attendance ranged from 211 to 375 HCWs (38.0%-68.2% of nursing staff working that day) per topic. The largest increases in knowledge score were for modules covering MDROs, hand hygiene, preventing CAUTI, and transmission-based precautions, which were all integral components of the TIP intervention. Module 1, which introduced the study, was the only module for which there was not a significant difference between groups.

$^b$We conducted 472 in-room observations. Of these, there were 112 observations without any HCW entry into the participant’s room. For the remaining 366 observations, there were 658 opportunities to observe HCW adherence with barrier precautions and in-room hand hygiene.

$^c$Residents not able to respond to survey questions were excluded.