Taking Action to Prevent and Manage Multidrug-resistant Organisms and *C. difficile* in the Nursing Home: *Part 2 – Understanding the spread*

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Presentation Objectives

- Brief review of multidrug-resistant organisms (MDROs) and *C. difficile*
- Understand the emergence and spread of MDROs and *C. difficile* in healthcare settings
- Outline the actions that caregivers should take to minimize the spread of MDROs and *C. difficile*
- Describe national programs developed to support nursing home infection prevention programs in tracking and preventing MDROs and *C. difficile*.
Healthcare drivers of *C. diff* and MDROs

**DEVELOPMENT**

- Antibiotic pressure
  - Risk for both acquisition and infection
- Medical devices and wounds
  - Biofilm formation

**SPREAD**

- Colonization pressure
- Patient to patient transmission via hands of healthcare personnel
- Contamination of shared environment / equipment
Antibiotic use drives resistance

Figure 1  Levofloxacin use and outpatient *Escherichia coli* resistance to levofloxacin versus time.

Biofilm formation on device surfaces

- Biofilm: An collection of bacteria within a sticky film that forms a community on the surface of a device
- Antibiotics can’t penetrate the biofilm
  - Bacteria in the biofilm are sheltered from the antibiotic and develop resistance

http://www.ul.ie/elements/Issue7/Biofilm%20Information.htm
Biofilm on an indwelling catheter

Colonization pressure on risk of acquisition

- Colonization pressure: High burden of other MDRO carriers on a unit will increase the risk of MDRO acquisition for others
- Studies have demonstrated the impact of colonization pressure on acquisition of C. difficile
- Both asymptomatic carriers and clinically infected individuals contribute to the reservoir for transmission on a unit

Dubberke ER et al. Arch Intern Med. 2007 May 28;167(10):1092-7
Colonization pressure: CDI example

Unit A
Fewer patients with active CDI
=lower risk of acquiring CDI

Unit B
More patients with active CDI
=higher risk of acquiring CDI

CDI pressure
=1 × days in unit

CDI pressure
=5 × days in unit

Dubberke ER et al. Arch InternMed.2007;167(10):1092-7
CLEAN HANDS SAVE LIVES
Protect patients, protect yourself

Alcohol-rub or wash before and after EVERY contact.
Bacterial contamination of HCP hands prior to hand hygiene in a LTCF

- Cultured the hands of healthcare personnel (HCP) immediately after direct care to residents
- Gram negative bacteria were the most common bugs cultured from hands of staff
- Most Gram neg. bacteria live in the GI tract or colonize the urine

MRSA contamination of HCP hands prior to hand hygiene in a LTCF

- Evaluated ~950 different interactions between HCP and MRSA colonized residents
- Used cultures of gowns/gloves to mimic transmission
- Morning/evening care bundled together increased transmission
- Presence of chronic wounds increased transmission

Roghmann MC et al. Infect Control Hosp Epidemiol. 2015; 36(9):1050-7
The invisible reservoir of MDROs

X marks the locations where VRE was isolated in this room


Slide courtesy of Teresa Fox, GA Div PH
# Duration of environmental contamination by MDROs

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Survival</th>
<th>Data Strength</th>
<th>Transmission Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C. difficile</em></td>
<td>Months</td>
<td>3+</td>
<td>Healthcare facilities</td>
</tr>
<tr>
<td>MRSA</td>
<td>Days-weeks</td>
<td>3+</td>
<td>Burn units</td>
</tr>
<tr>
<td>VRE</td>
<td>Days-weeks</td>
<td>3+</td>
<td>Healthcare – higher risk areas</td>
</tr>
<tr>
<td><em>Acinetobacter</em></td>
<td>33 days</td>
<td>2/3+</td>
<td>Wet or dry environments</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>7 hours</td>
<td>1+</td>
<td>Wet environments</td>
</tr>
</tbody>
</table>

Summary Points

- Knowledge of how MDROs and *C. difficile* emerge and spread provides important information to help staff change behavior or implement new practices
  - Talk with your staff and providers about how MDROs and C. diff might be developing and spreading in your facility

- Evaluating the use of devices and antibiotics, as well as staff adherence to infection prevention practices (e.g., hand hygiene and environmental cleaning) may identify opportunities to reduce the spread of MDROs and *C. difficile* in your facility
Thank you!!

Email: nstone@cdc.gov with questions/comments

For more information please contact Centers for Disease Control and Prevention

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.