Taking Action to Prevent and Manage Multidrug-resistant Organisms and C. difficile in the Nursing Home: 
Part 1 – Reviewing the organisms

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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*. 
Basics on bacteria

- Bacteria have different characteristics that allow us to identify them in the lab
  - Shape, size, growth patterns, etc.
- We often use these characteristics to develop antibiotics
Common bacteria in healthcare

Gram positive

- Most are cocci, “round bacteria”
  - Examples are *Streptococci, Staphylococci, Enterococci*
- *Clostridium difficile* (C. diff) is a Gram positive rod

Gram negative

- Most are baccili, “rod-shaped bacteria”
  - Examples are: *E. coli, Klebsiella, Enterobacter, Proteus*
  - *Pseudomonas*
Antibiotics 101

- Antibiotics are drugs that treat and kill bacteria.
- They are grouped into classes based on their structure and activity:
  - Narrow-spectrum target a few specific bacteria
  - Broad-spectrum can kill a wide variety of bacteria
- Antibiotic resistance = when the bacteria are no longer fully killed by the antibiotic:
  - Bacteria with resistance can cause patients to have more severe infections which are harder and more costly to treat
  - Infection prevention programs track certain “bug-drug” combinations for resistance
Understanding multidrug-resistance

- Multidrug-resistant organisms (MDROs) are a group of bacteria with important resistance patterns
- Sometimes just one key drug will define a MDRO
  - Methicillin-resistance in *Staphylococcus aureus*
  - Vancomycin-resistance in *Enterococcus sp.*
- Sometimes bacteria acquire resistance to several classes of antibiotics, often seen in gram negative rods
  - Carbapenem-resistance in *E. coli/Klebsiella sp.* is associated with resistance to many other antibiotics
  - *Pseudomonas* can be resistant to fluoroquinolones, penicillins, cephalosporins, and carbapenems
# ABC’s of MDROs

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Abbrev.</th>
<th>Antibiotic Resistance</th>
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</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>MRSA</td>
<td>Methicillin-resistant</td>
</tr>
<tr>
<td><em>Enterococci</em> (faecalis/faecium)</td>
<td>VRE</td>
<td>Vancomycin-resistant</td>
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<tr>
<td><em>Enterobacteriaceae</em> (e.g., E coli/Klebsiella)</td>
<td>ESBL</td>
<td>Extended-spectrum beta-lactamase (resistance to penicillins/cephalosporins)</td>
</tr>
<tr>
<td><em>Enterobacteriaceae</em> (e.g., E coli/Klebsiella)</td>
<td>CRE</td>
<td>Carbapenem-resistant</td>
</tr>
<tr>
<td><em>Pseudomonas/Acinetobacter</em></td>
<td>MDR</td>
<td>Resistance to multiple drug classes</td>
</tr>
</tbody>
</table>
NHs are reservoirs of MDROs

- NH residents colonized with MDR-Gram Negative Rods (~20% prevalence)

- NH residents colonized with MRSA (40-50% prevalence)

- NH residents colonized with VRE (5-10% prevalence)
**Clostridium difficile**

- Gram positive bacillus under microscope
  - Cannot multiple when oxygen is in the environment (anaerobic)
  - Forms spores to survive in the environment
- Infections are more severe in older adults
  - Common cause of acute diarrhea in nursing homes
  - Higher rates of hospitalizations and relapses
- Spores contaminate the environment of people with active diarrheal infections
  - Spread to other people on hands of caregivers or shared equipment
More than half of healthcare associated CDI cases occur in long-term care facilities.

A significant number of individuals admitted to LTC are colonized with *Clostridium difficile*.

- Up to 20% acquire it while in nursing homes.

Fluoroquinolone antibiotics have been associated with CDI with a more severe strain of *Clostridium difficile*.

- Longer antibiotic exposure carries higher risk.
**C. difficile infections with onset in nursing homes**

- >100,000 cases of CDI occur in NHs each year
- Up to 75% of residents with NH-onset CDI received antibiotics
- ~80% occurred within 30-days of hospital discharge
- 18% were hospitalized
- 8% died within 30-days of event

*Figure 1. Number of days from hospital discharge to *Clostridium difficile* infection (CDI) onset among cases with hospitalization in 12 weeks prior to *C. difficile* positive stool collection date (n = 200)*. *Figure does not include 14 patients who did not have a hospitalization date available.*

Summary Points

- Antibiotic resistant bacteria and *C. difficile* are a growing problem in healthcare
- The large reservoir of MDRO and *C. difficile* found within nursing homes can become a source of transmission
- The population entering nursing homes have many risk factors which make them vulnerable to colonization and infection with these organisms
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.