Multi-drug Resistant Organisms and Long-term Care: Local Epidemiology and Infection Control Response

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Massachusetts Department of Public Health
Disclosures

We have no conflicts of interest to disclose.
Learning Objectives

• Define carbapenem-resistant Enterobacteriaceae (CRE) and other important multi-drug resistant organisms (MDROs)

• Review the current epidemiology and burden of MDROs in Massachusetts

• Review infection prevention and control recommendations for MDROs in long-term care settings including the use of Enhanced Barrier Precautions (EBP)

• Access MDRO and infection control resources and support
Multi-drug Resistant Organisms (MDROs)

- Bacteria, fungi, and other germs that are resistant to the drugs normally used to treat them
- Can spread easily in healthcare facilities
- Indefinite colonization
- High morbidity/mortality

Photo: [http://www.emro.who.int/health-topics/antimicrobial-resistance/index.html](http://www.emro.who.int/health-topics/antimicrobial-resistance/index.html)
Infection vs. Colonization

**INFECTION**
- Organism is in the body and causing disease
- Typically associated with symptoms
- Can cause outbreaks
- MDRO infection control

**COLONIZATION**
- Organism is in/on body but isn’t causing disease
- Not associated with symptoms
- Can go on to cause infections
Target MDROs in Massachusetts

- CRE: Carbapenem-resistant Enterobacteriaceae
- CRAB: Carbapenem-resistant Acinetobacter baumannii
- CRPA: Carbapenem-resistant Pseudomonas aeruginosa
- C. auris: Candida auris
- CPOs: Carbapenemase-producing organisms
CARBAPENEM-RESISTANT ENTEROBACTERIACEAE (CRE)
What are CRE?

- **CRE** are Carbapenem- Resistant Enterobacteriaceae

- **Enterobacteriaceae**: family of bacteria found in the gut that includes:
  - *E. coli*
  - *Klebsiella pneumoniae*
  - *Klebsiella oxytoca*
  - *Enterobacter cloacae*
  - *Enterobacter aerogenes*
Carbapenems

- Carbapenem = class of antibiotics
  - Ertapenem
  - Meropenem
  - Imipenem
  - Doripenem
- Usually reserved to treat serious and particularly drug-resistant infections
- Considered “last resort” for some infections
Carbapenem Resistance

One way that Enterobacteriaceae (and other bacteria) are resistant to carbapenems is by producing carbapenemases.

**CP-CRE** = Carbapenemase-Producing CRE
What is a Carbapenemase?

- Carbapenemase: an enzyme that can break down (and thus resist) many classes of antibiotics, including carbapenems.
- Difficult to treat
- Can be shared between bacteria
- Ex. KPC+ *E. coli*
Carbapenem-resistant Enterobacteriaceae (CRE) are a major concern for patients in healthcare facilities. Some bacteria in this family are resistant to nearly all antibiotics, leaving more toxic or less effective treatment options.
CRAB, CRPA, & OTHER MDROs
CRAB & CRPA

• Other bacteria (besides Enterobacteriaceae) can be carbapenem-resistant and produce carbapenemase:

  • CRAB: Carbapenem-resistant *Acinetobacter baumannii*

  • CRPA: Carbapenem-resistant *Pseudomonas aeruginosa*
Other MDROs

- *Candida auris*: multi-drug resistant fungus
  - As of December 2019, 11 cases have been identified in a Massachusetts facility
MDROs IN MASSACHUSETTS
Carbapenemase Gene Targets Identified in MA 2017-2019

*Data are current as of 1/16/20 and are subject to change*
Gene Targets by Organism 2017-2019

**Data are current as of 1/16/2020 and are subject to change**
MDRO Outbreaks in Healthcare Facilities in Massachusetts Identified in 2019

- MDRO transmission has been identified in 11 different facilities:
  - 6 long-term care facilities
  - 4 acute-care hospitals
  - 1 long-term acute care hospital

- 19 NDM+ colonized individuals identified through contact screening in five different facilities

- 850 screening swabs collected at 82 different facilities

* As of 1/22/2020
INFECTION PREVENTION & CONTROL FOR MDROs
How are MDROs Spread?

- Spread person to person through contact with infected or colonized people
  - Especially contact with wounds, urine, or stool
- Can cause infections when they enter the body
  - Often through medical devices like ventilators, catheters, or wounds

Source: CDC CRE FAQ
MDRO Prevention

- Hand hygiene
- PPE
- Communication
- Education
- Antibiotic use
- Housekeeping
When an MDRO is identified in your facility

1. **Your lab identifies an MDRO in one of your residents**
2. **Your lab notifies both MDPH and your facility, and sends the isolate to the MDPH lab for carbapenemase testing**
3. **MDPH contacts your facility and shares MDRO infection control recommendations**
4. **MDPH lab finishes carbapenemase testing & MDPH contacts your facility with the results**
   - **Positive**: consult with MDPH for additional recommendations
   - **Negative**: continue MDRO control recommendations
MDRO Infection Control

- Implement appropriate precautions
- PPE
- Door signage
- Hand hygiene education and auditing
- Enhanced environmental cleaning
- Designated/disposable equipment
- Facility notification upon transfer – verbally and in writing!
- Educate staff, visitors, residents, and families about MDRO

Consult with MDPH at 617-983-6800 about developing the appropriate infection prevention plan for the resident.
## Summary of Control Recommendations for Targeted MDROs in SNFs (CRE, CRAB, CRPA, C. auris, & CPOs)

<table>
<thead>
<tr>
<th>Applies to:</th>
<th>All residents</th>
<th>“At-risk” residents* (regardless of MDRO status) who reside on a unit where a resident with a targeted MDRO resides</th>
<th>Residents infected or colonized with a targeted MDRO when Contact Precautions do not apply</th>
<th>Residents infected or colonized with a targeted MDRO AND acute diarrhea, draining wounds, or other sites of secretions or excretions that are unable to be covered or contained**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precautions</td>
<td><strong>Standard Precautions</strong></td>
<td><strong>Enhanced Barrier Precautions</strong></td>
<td><strong>Contact Precautions</strong></td>
<td></td>
</tr>
<tr>
<td>PPE used for these situations:</td>
<td>Any potential exposure to:</td>
<td>During high-contact resident care activities:</td>
<td>Any room entry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Blood</td>
<td>• Dressing, bathing/showering, transferring, providing hygiene, changing linens, changing briefs or assisting with toileting, device care or use: central line, urinary catheter, feeding tube, tracheostomy/ventilator, wound care: any skin opening requiring a dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required PPE***</td>
<td>Depending on anticipated exposure: gloves, gown, face protection</td>
<td>Gloves and gown prior to the high-contact care activity (also face protection if performing activity with risk of splash or spray)</td>
<td>Gloves and gown (don before room entry, doff before room exit). Face protection for splash/spray</td>
<td></td>
</tr>
<tr>
<td>Room restriction</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>YES, except for medically necessary care</td>
</tr>
<tr>
<td>Door signage</td>
<td>No</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Private room</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>YES, with private bathroom</td>
</tr>
<tr>
<td>Enhanced cleaning of environment</td>
<td>No</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Designated or disposable equipment</td>
<td>No</td>
<td>No</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Notify facility of MDRO status upon transfer</td>
<td>No</td>
<td>No</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Educate residents, staff, and visitors on MDROs</td>
<td>No</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Hand hygiene</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>
ENHANCED BARRIER PRECAUTIONS (EBP)
Enhanced Barrier Precautions (EBP): Guidance for Nursing Homes to Prevent MDRO Spread

Implementation of Personal Protective Equipment (PPE) in Nursing Homes to Prevent Spread of Novel or Targeted Multidrug-resistant Organisms (MDROs)

Note: This Interim Guidance was updated on 07/26/2019 to clarify its current intended use as part of a Containment Response. Future updates are anticipated to address potential for application of this approach outside of a Containment Response.

Implementation of Contact Precautions, as described in the CDC Guideline for Isolation Precautions, is perceived to create challenges for nursing homes trying to balance the use of PPE and room restriction to prevent MDRO transmission with residents’ quality of life. Thus, current practice in many nursing homes is to implement Contact Precautions only when residents are infected with an MDRO and on treatment.

https://www.cdc.gov/hai/containment/PPE-Nursing-Homes.html
EBP expands the use of PPE beyond situations in which exposure to blood and body fluids is anticipated.

EBP refers to the use of gown and gloves during high-contact resident care activities that provide opportunities for transfer of MDROs to staff hands and clothing.
High-contact Resident Care Activities

- Dressing
- Bathing/showering
- Transferring
- Providing hygiene
- Changing linens
- Changing briefs or assisting with toileting
- Device care or use of a device: central line, urinary catheter, feeding tube, tracheostomy/ventilator
- Wound care: any skin opening requiring a dressing
Enhanced Barrier Precautions should be used for all residents with any of the following:

- Infection or colonization with a targeted MDRO when contact precautions don’t apply:
  - Carbapenem-resistant Enterobacteriaceae
  - Carbapenem-resistant *Acinetobacter baumanii*
  - Carbapenem-resistant *Pseudomonas* spp.
  - *Candida auris*
  - Carbapenemase-producing organisms

- Wounds or indwelling medical devices (e.g. central line, urinary catheter, feeding tube, tracheostomy/ventilator) *regardless of MDRO colonization status but* residing in an at-risk area
Contact Precautions should be used:

- All residents infected or colonized with a targeted multidrug-resistant organism AND:
  - Presence of acute diarrhea, draining wounds or other sites of secretions or excretions that are unable to be kept covered or contained
  - On units or in facilities where ongoing transmission is documented or suspected
- For infections (e.g., *C. difficile*, norovirus, scabies) and other conditions where Contact Precautions is recommended
Review: What are “Target MDROs” in Massachusetts?

- CRE (Carbapenem-resistant Enterobacteriaceae)
- CRAB (Carbapenem-resistant Acinetobacter baumannii)
- CRPA (Carbapenem-resistant Pseudomonas aeruginosa)
- C. auris (Candida auris)
- CPOs (Carbapenemase-producing organisms)
Why was the EBP Guidance Needed?

Focusing only on residents with active infection fails to address the continued risk of transmission from residents with MDRO colonization, which can persist for long periods of time (e.g., months or longer) and result in the silent spread of MDROs.

- Facilities needed an approach to gown/glove use that was less restrictive than Contact Precautions and could be sustained for prolonged periods of time
- EBP also addresses care of residents at risk for acquiring colonization
Personal Protective Equipment (PPE) & Precautions

Standard Precautions

Enhanced Barrier Precautions

Contact Precautions
An 82 year-old woman (Resident A) on your LTC unit develops a symptomatic UTI. She has no wounds or indwelling devices. You send a urine culture for testing, and your lab reports back that it is positive for *E. coli*. A few days later, you get a susceptibility test report, indicating that the *E. coli* is resistant to meropenem.

**What does Resident A have?**

![Photo: https://msgstaffing.com/about/our-specialties/nursing/](https://msgstaffing.com/about/our-specialties/nursing/)
CRE

So.... What should you do now?

What should you do now?

- Place this resident, and any high-risk residents on her unit, on Enhanced Barrier Precautions (EBP)
- Notify receiving facilities if she transfers – **both verbally and in writing**!
- Dedicate equipment to the resident with CRE in her urine
- Review and audit hand hygiene, environmental cleaning, and PPE with staff
- Notify and educate staff, residents, and families about CRE
- Notify MDPH (your lab should automatically report it to us)
<table>
<thead>
<tr>
<th>Resident</th>
<th>Positive for MDRO?</th>
<th>Risk factors</th>
<th>EBP?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>No/unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>No/unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>No/unknown</td>
<td>Draining wound</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>No/unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>No/unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>No/unknown</td>
<td>Indwelling urinary catheter</td>
<td></td>
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Which residents should be managed with EBP?

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<td></td>
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<tr>
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The MA SPHL performs additional testing and the isolate is found to be **positive** for carbapenemase production and specifically, for the gene target NDM. (NDM+ *E. coli*)

**What does Resident A have?**
CP-CRE

NDM 1 Superbug

What should you do now?

Photo: https://henrykotula.com/2016/03/31/ndm-1-new-delhi-metallo-beta-lactamase/
• Continue infection control recommendations, including enhanced barrier precautions for the unit, staff education and monitoring, etc.
• Enhanced environmental cleaning of LTC unit.

Consult with MDPH for further steps.

Next steps are likely to include:
• Screening of contacts for NDM colonization (rectal swabs)
• An on-site infection control assessment of your facility (ICAR)
You complete the screening of the long-term care unit and…

2 patients test positive for NDM.

Photo: https://journalofdementiacare.com/challenging-tradition-unlocking-the-dsu/
Place the residents with positive results on appropriate precautions.

**STOP**

**CONTACT PRECAUTIONS**

**EVERYONE MUST:**

Clean their hands, including before entering and when leaving the room.

**PROVIDERS AND STAFF MUST ALSO:**

- Put on gloves before room entry. Discard gloves before room exit.
- Put on gown before room entry. Discard gown before room exit.
- Do not wear the same gown and gloves for the care of more than one person.
- Use dedicated or disposable equipment. Clean and disinfect reusable equipment before use on another person.

**ENHANCED BARRIER PRECAUTIONS**

**EVERYONE MUST:**

Clean their hands, including before entering and when leaving the room.

**PROVIDERS AND STAFF MUST ALSO:**

- Wear gloves and a gown for the following High-Contact Resident Care Activities.
  - Dressing
  - Bathing/Showering
  - Transferring
  - Changing Linens
  - Providing Hygiene
  - Changing briefs or assisting with toileting
  - Device care or use:
    - central line, urinary catheter, feeding tube, tracheostomy
  - Wound Care: any skin opening requiring a dressing

**Do not wear the same gown and gloves for the care of more than one person.**
Which residents should be managed with EBP and which with Contact Precautions?

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<td>A</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Yes - new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Yes - new</td>
<td>Draining wound</td>
<td></td>
</tr>
<tr>
<td>E</td>
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<td></td>
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<tr>
<td>A</td>
<td>Yes</td>
<td></td>
<td>NO – Contact precautions!</td>
</tr>
<tr>
<td>B</td>
<td>Yes - new</td>
<td></td>
<td>NO – Contact precautions!</td>
</tr>
<tr>
<td>C</td>
<td>No</td>
<td></td>
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<td>Indwelling urinary catheter</td>
<td>YES</td>
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Resident A should be managed with Contact Precautions if positive for MDRO.
Screening Process

• Additional screening of contacts is indicated, until evidence of transmission is no longer present
  • Two consecutive negative screening surveys ≥ 2 weeks apart are required
After two negative screening surveys, what can change?

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</tr>
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<td>G</td>
<td>No</td>
<td>Indwelling urinary catheter</td>
<td>YES</td>
</tr>
</tbody>
</table>

- **EBP?**
  - YES: Positive for MDRO
  - NO: Negative for MDRO
  - **NO – Contact precautions!**: Additional precautions recommended due to risk factors.
MDRO AND INFECTION CONTROL RESOURCES
MDPH Resources

- Website: https://www.mass.gov/antibiotic-resistance-information-for-health-professionals
- Updated 2020 MDRO Toolkit (coming soon)
Additional Resources

• CDC: CRE Webpage

• CDC: CRE Clinician FAQs

• CDC Antibiotic Resistance Threat Report, 2019

• Enhanced Barrier Precautions
  • https://www.cdc.gov/hai/containment/PPE-Nursing-Homes.html

• FAQs: https://www.cdc.gov/hai/containment/faqs.html
Questions?