An early, aggressive coordinated approach, as is recommended in the CDC Containment Strategy for Novel or Targeted Multidrug-resistant Organisms (Containment Strategy), can slow the emergence of resistant pathogens.

**Comparing Annual Proportions of Extended Spectrum Beta-lactamas (ESBL) to Carbapenem Resistant Enterobacteriae (CRE) from 2006—2015.**

<table>
<thead>
<tr>
<th>No Containment Strategy</th>
<th>Containment Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESBL-producing Enterobacteriaceae were first reported in 1988. Facilities independently selected approaches to control spread. Percentage of <em>E. coli</em> and <em>K. pneumoniae</em> with ESBL phenotype decreased by 2%.</td>
<td>CRE was reported with increasing frequency beginning in 2001. CDC created CRE-specific guidance in 2009, now updated and referred to as the containment strategy for CRE. Percentage of <em>E. coli</em> and <em>K. pneumoniae</em> isolates resistant to carbapenems (CRE) decreased by 15%.</td>
</tr>
</tbody>
</table>

**CDC estimates the Containment Strategy would reduce CRE infections by 76%**

**VDH follows the CDC Containment Strategy for a specific type of carbapenem-resistant organism, those that are detected to produce a carbapenemase.**

**Approach to Contain CPOs**

- Ensuring appropriate prevention measures are implemented
- Identifying affected patients
- Determining if transmission is occurring
- Performing additional tests to guide response

**The containment strategy includes:**

**Response activities have a tiered approach based on resistance mechanism attributes:**

<table>
<thead>
<tr>
<th><strong>CDC Definition</strong></th>
<th><strong>Applicable Organisms in Virginia</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>• Organisms and resistance mechanisms novel to the U.S., OR • Organisms for which no current treatment options exist (pan-resistant) and that have the potential to spread more widely within a region</td>
</tr>
<tr>
<td>Tier 2</td>
<td>• MDROs primarily found in healthcare settings but not found regularly in the region; organisms might be found more commonly in other areas in the U.S.</td>
</tr>
<tr>
<td>Tier 3</td>
<td>• MDROs that are already established in the U.S. and have been identified before in the region but are not thought to be endemic</td>
</tr>
<tr>
<td>Tier 4</td>
<td>• Novel carbapenemase resistance mechanism • Pan-resistant CPOs</td>
</tr>
<tr>
<td>Tier 5</td>
<td>• Carbapenemase-producing CRE (CP-CRE) caused by IMP, NDM, OXA, or VIM • Carbapenemase-producing carbapenem-resistant <em>Pseudomonas aeruginosa</em> (CP-CRPA) caused by IMP, KPC, NDM, OXA, or VIM</td>
</tr>
<tr>
<td>Tier 6</td>
<td>• CP-CRE cause by KPC</td>
</tr>
</tbody>
</table>

**Last Updated: August 2019**
Slowing the Spread
Virginia Containment Strategy for Carbapenemase-Producing Organisms (CPOs)

Containment Strategy Elements

VDH follows the CDC Containment Strategy Guidelines. See a summary on page 3. For CPOs this includes:

1. **Healthcare investigation**
   - For Tier 1 and Tier 2 organisms, public health will investigate healthcare exposures of the index case over the preceding month and up to 3 months.
   - For Tier 3 organisms, public health will investigate current healthcare exposure and potentially exposure prior to admission up to the preceding one month.
   - Healthcare facilities that previously cared for the index patient or other confirmed cases will be notified so that they can “flag” the patient’s record and initiate appropriate infection prevention precautions upon readmission.

2. **Prospective lab surveillance**
   - Clinical laboratories that perform cultures from healthcare settings that the index case has been exposed to in the past 3 months should conduct prospective surveillance in order to identify organisms with similar resistance patterns from clinical cultures.

3. **Retrospective lab surveillance**
   - Clinical laboratories should perform a one-time retrospective review (6-12 months) of results to identify organisms with similar resistance patterns. If available, the specimens should be sent to DCLS.

4. **Onsite infection control assessment with observation of practices**
   - When a Tier 1 or Tier 2 organism is identified, health departments or other experts will conduct onsite visits to facilities and use a standardized assessment tool to evaluate infection control practices at facilities that have cared for the index case.
   - When a Tier 3 organism is identified and there is confirmed or suspected transmission, health departments or other experts will conduct on-site visits to evaluate infection control practices.
   - Assessments will include observations of infection control practices and recommendations to address observed gaps. VDH uses the APIC and CDC developed QUOTs when observing practices.
   - Repeat on-site assessments might be needed to ensure that infection control gaps are fully addressed.

5. **Colonization Screening of healthcare contacts**
   - **Screening of healthcare roommates**
     - For Tier 1 and Tier 2 organisms, roommates and patients that shared a bathroom with the index case should be identified and screened even if they have been discharged from the facility.
     - For Tier 3 organisms, roommates and patients that shared a bathroom with the index case should be identified and screened if they are still admitted.
   - **Broader screening of healthcare contacts**
     - If the index case was not on contact precautions during their entire stay OR the index case was on contact precautions but adherence to contact precautions is low OR the index case was on contact precautions but is high-risk for transmission (e.g., bedbound, has invasive medical devices, incontinent of stool or urine, etc.):
       - Screen healthcare contacts who are still admitted, AND overlapped with the index case, AND who have a risk factor for MDRO acquisition (e.g., being bedbound or requiring higher levels of care, being on antibiotics, or being on mechanical ventilation or having other invasive medical devices).
       - Alternatively, facilities may choose to screen entire units using point prevalence surveys.
     - If the index case was on contact precautions during their entire stay (and adherence is high) at the facility, AND the index case is not high-risk for transmission:
       - Screening beyond healthcare roommates is generally not recommended.

6. **Household contact screening**
   - Applicable only for novel carbapenemase mechanisms.
   - May apply to pan-resistant CPO cases if household contact has extensive healthcare exposure.
   - Would include close household contacts (e.g., contacts who help care for the index case or share a bed or bathroom with the patient).

7. **Environmental sampling**
   - Not applicable except for Tier 1 organisms for situations in which questions about the effectiveness of terminal cleaning exist.

8. **Healthcare personnel (HCP) screening**
   - Cultures of HCP might be recommended for a novel carbapenemase mechanism if the HCP had extensive contact with the index case and if epidemiology suggests the organism may have spread.

Last Updated: August 2019
Slowing the Spread
Virginia Containment Strategy for Carbapenemase-Producing Organisms (CPOs)

Containment Strategy Recommendation Summary

<table>
<thead>
<tr>
<th>Containment Strategy Elements</th>
<th>Tier 1</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 2</th>
<th>Tier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novel Carbapenemase Mechanism</td>
<td>Pan-resistant CPO</td>
<td>CP-CRPA (IMP, KPC, NDM, OXA, VIM)</td>
<td>CP-CRE (IMP, NDM, OXA, VIM)</td>
<td>CP-CRE (KPC)</td>
<td></td>
</tr>
<tr>
<td>Healthcare investigation</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
</tr>
<tr>
<td>Prospective surveillance</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
</tr>
<tr>
<td>Retrospective lab surveillance</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Onsite infection control assessment with observations of practices</td>
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<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Screening of healthcare roommates</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
<td>Always</td>
</tr>
<tr>
<td>Broader screening of healthcare contacts</td>
<td>Always</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Household contact screening</td>
<td>Always</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Rarely</td>
<td>Rarely</td>
</tr>
<tr>
<td>Environmental sampling</td>
<td>Sometimes</td>
<td>Rarely</td>
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</tr>
</tbody>
</table>

Roles and Responsibilities to Contain CPOs

Healthcare Facilities

- Plan for unusual resistance arriving at your facility.
- **Leadership**: Work with health department to stop spread of unusual resistance. Review and support infection prevention in your facility.
- **Clinical labs**: Know what isolates to send for testing. Establish protocols that immediately notify health department, healthcare provider, and infection prevention staff of unusual resistance.

State and Local Health Departments

- Educate healthcare facilities on state and local lab resources.
- Develop a plan to respond rapidly to unusual resistance genes.
- Coordinate with affected healthcare facilities, the AR Lab Network, and CDC for every identified case of unusual resistance.
- Provide timely lab results and recommendations to affected healthcare facilities and providers.

Everyone

- Inform your healthcare providers if you recently received healthcare in another country or facility.
- Practice good hand hygiene.
- Talk to your health care provider about preventing infections.

For more information visit:

- CDC Containment Strategy
- CDC Guidance for Control of CRE
- VDH CRO Website

VDH Virginia Department of Health