

Minnesota Department of Health Recommendations for the Management of Carbapenem- resistant *Enterobacteriaceae* in Long-term Care Facilities

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Purpose

These recommendations are intended to provide infection prevention and control guidance for healthcare personnel in long-term care facilities (LTCF) in the management of residents infected or colonized with carbapenem-resistant *Enterobacteriaceae* (CRE). These recommendations were created to enhance rather than duplicate existing published recommendations and guidelines for CRE control. Literature reviews, the Centers for Disease Control and Prevention's (CDC) *Guidance for Control of Infections with Carbapenem-Resistant or Carbapenemase-Producing Enterobacteriaceae in Acute Care Facilities*, expertise from the Association for Professionals in Infection Control and Epidemiology-Minnesota (APIC-MN) Long-term Care Work Group, and discussions with national subject matter experts served as the basis for these recommendations.¹ MDH will review the recommendations and modify them as needed to reflect new scientific developments concerning effective CRE prevention and control.

Classification and Epidemiology

The term CRE refers to carbapenem-resistant and/or carbapenemase-producing *Enterobacteriaceae*. Over the past decade, *Enterobacteriaceae* bacteria that are resistant to carbapenems have emerged and spread throughout the United States. Carbapenem antibiotics (ertapenem, imipenem, meropenem, and doripenem) are often used as the last line of treatment for infections caused by resistant Gram-negative bacilli (GNB), including bacteria in the *Enterobacteriaceae* family. Multidrug-resistant GNB, such as CRE, are an emerging threat in healthcare facilities across the continuum of care (e.g., acute care, long-term acute care, and LTCF).²⁻⁵

Currently, the most prevalent carbapenemase in the United States is the *Klebsiella pneumoniae* carbapenemase (KPC). This plasmid-mediated carbapenemase is most commonly found in *Klebsiella* spp. and *Escherichia coli* but is also found in other species of *Enterobacteriaceae*. In 2009, upon detection of the first KPC-producing *Enterobacteriaceae* in Minnesota, MDH established statewide passive surveillance for CRE. In 2010, two novel types of carbapenemases known as metallo-beta-lactamases (MBL) were detected in the U.S.: New Delhi MBL (known as NDM-1) and Verona-Integron encoded MBL (known as VIM).^{6,7} In late 2011, two isolates carrying the NDM-1 resistance mechanism were detected in a single MN

resident with a history of travel to India. Plasmids and other mobile genetic elements are instrumental in facilitating the horizontal transmission of resistance genes such as KPC and NDM-1. During 2011, MDH established active, population-based laboratory surveillance for CRE in Hennepin and Ramsey Counties to assess the population-based incidence of CRE and to better describe these known resistance mechanisms.

Detection

Identification of CRE in clinical laboratories is based on the antimicrobial susceptibility values for carbapenems and third-generation cephalosporins. *Enterobacteriaceae* that test non-susceptible (i.e. intermediate or resistant) to carbapenems and resistant to third generation cephalosporins are classified as CRE. Other tests, such as the Modified Hodge Test (MHT), can be utilized to identify carbapenemase production.^{8,9} Also available, but rarely performed in clinical laboratories, is polymerase chain reaction (PCR) testing for specific carbapenemases.¹⁰ The PCR test identifies genes encoding for carbapenemases (e.g., *bla_{KPC}*). Regardless of the mechanism(s) responsible for CRE, infection prevention and control measures outlined in this document should be implemented upon detection of a CRE.

Prevention

MDH supports aggressive implementation of infection prevention and control strategies when a CRE is detected. Infections caused by CRE are difficult to treat and are associated with high morbidity and mortality.^{11,12} Early detection and prompt implementation of infection prevention and control measures have been effective in reducing the likelihood of transmission in healthcare settings.¹³⁻¹⁵ CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) also recommend an aggressive infection control strategy, including Contact Precautions for all patients colonized or infected with CRE.¹

Prompt implementation of infection prevention and control measures requires close collaboration between clinical laboratory staff, infection prevention staff, and clinicians.² As part of this collaboration, it may be prudent for the clinical laboratory to share with infection prevention staff the complete antimicrobial susceptibility report of CRE identified, including susceptibilities for carbapenems and third-generation cephalosporins, even if this information is routinely suppressed in the resident's laboratory report.

Recommended CRE Infection Prevention and Control Measures for Long-term Care Facilities

Infection prevention and control measures for CRE positive residents should be implemented regardless of the mechanism(s) causing carbapenem resistance. Most carbapenem resistance mediated by carbapenemases in MN is currently found among *Klebsiella* species, *Escherichia coli*, and *Enterobacter cloacae*. Early detection and containment of these organisms is a priority.

For the management of residents colonized or infected with CRE, MDH recommends the following infection prevention and control strategies be implemented in addition to those included in the facility infection control policy for multidrug resistant organisms (MDROs). Ensure that compliance with the MDRO policy is high among all staff interacting with the CRE-positive resident and/or resident environment. This includes, but is not limited to: Isolation precautions, donning/doffing of appropriate personal protective equipment (PPE), hand hygiene, and environmental cleaning and disinfection.¹⁶

1. Intra-facility communication

A positive CRE result should be considered a critical value.

Implement measures to ensure timely communication between the clinical laboratory and infection prevention/nursing staff when a CRE is detected in a resident's clinical culture or active surveillance test (AST).

2. Resident placement

Preferentially place residents with CRE in a private room with Contact Precautions.

If no private room is available, cohort in the same room with another resident. Appropriate roommates are those who:

- Are colonized/infected with CRE (and the same additional MDROs, if present);
- Have no invasive devices (e.g., indwelling urinary catheters, lines, trach, or drainage devices);
- Are not significantly immunocompromised;
- Are continent of urine and feces.

Neutropenic residents should not share the same staff with CRE-positive residents.

3. Hand hygiene

Perform hand hygiene before entering and after leaving the resident's room, regardless of anticipated resident contact.

Use alcohol-based hand rub (if hands are not visibly soiled) or soap and water.

4. PPE for healthcare personnel entering resident's room

PPE should be worn for anticipated contact with body fluids/secretions/excretions as well as contact with the resident's environment. This pertains to nursing, environmental services, laboratory, dietary, pastoral care, occupational/physical/speech therapy, activities staff, and any other healthcare personnel.

- Gloves: when caring for the resident or resident's environment.
 - Remove gloves just before leaving the resident room/area.
 - Dispose of gloves in the regular trash and clean hands immediately.
 - Double gloves are not needed.
- Gown: when extensive contact with the resident or resident's environment is possible (e.g., cleaning up stool, changing linens, or contact with bed, bed rail, or immediate resident environment).
 - Remove gown just before leaving the resident's room/area.
 - Place gown in a dirty laundry container or dispose of in regular trash, if appropriate.
 - Remove gloves after removing the gown and clean hands immediately.
- Mask/eye protection: Mask/eye protection should be used whenever splashing or spraying of body fluids is possible.

5. Occupational and Physical Therapy

For residents with uncontrolled secretions/excretions (including incontinent residents), all therapy and other rehabilitation treatments and activities should be provided in the resident's room if feasible and if resident safety or well-being would not be jeopardized.

Therapists, technicians, and all other personnel providing these cares and services must follow infection prevention measures when providing services in the resident's room, specifically:

- Perform hand hygiene before entering and after leaving the resident's room;
- Wear gloves for all contact with the resident or resident's environment and perform hand hygiene after removing gloves;
- Wear a gown for all anticipated contact with the resident or any item in the resident's environment;
- Utilize resident-dedicated or single-use, disposable non-critical equipment, instruments, and devices when possible.
 - If not possible, dedicate necessary therapy equipment and supplies to the resident.
 - Clean equipment, instruments, and devices immediately after use.

If therapy cannot be performed in the resident's room, implement the following measures to reduce the risk of transmission to other residents, healthcare workers, and equipment:

- Schedule CRE positive resident(s) for last therapy session(s) of the day;
- Prior to transport, notify therapy staff that resident requires Contact Precautions;
- Ensure containment of urine, feces, and wound drainage;

- Resident should perform hand hygiene prior to leaving the room;
- Resident should have a dry incontinence product/wound dressing and clean clothing/gown prior to leaving the room;
- Therapists should perform hand hygiene before and immediately after providing care or services;
- Utilize resident-dedicated or single-use, disposable non-critical equipment, instruments, and devices when possible;
- Clean equipment, instruments, and devices immediately after use.

For continent residents whose wound secretions can be controlled and who can reliably perform hand hygiene, therapy and other rehabilitation treatments and activities may be performed at routine locations (e.g., therapy/rehabilitation room, hallway). To reduce the risk of transmission to other residents, healthcare workers, and equipment:

- Therapists should perform hand hygiene before and immediately after providing care or services;
- Resident should have clean clothing/gown and clean hands prior to leaving the room;
- If ambulating in the hallways, therapists should follow standard practice after returning to the resident's room;
- Utilize resident-dedicated or single-use, disposable non-critical equipment, instruments, and devices when possible;
- Clean equipment, instruments, and devices immediately after use.

6. Social activities

It is appropriate to individualize decisions regarding infection prevention measures for residents with CRE. The goal is to balance infection risk with the presence of risk factors that increase the likelihood of transmission, and the potential for adverse psychological impact on the resident. Use the least restrictive approach possible that adequately protects the resident and others.

Consider the individual resident's clinical situation and prevalence or incidence of CRE in the facility when determining infection prevention measures.¹⁶

- For residents whose secretions can be controlled (e.g., wounds [if present] are completely covered with a clean, dry dressing), allow resident to use common areas based on their ability to perform and adhere to proper hand hygiene and other recommended practices to contain secretions.

- Immediately clean and disinfect any environmental surface or item that is inadvertently contaminated with body fluids and/or secretions/excretions by using a routine cleaner/detergent and Environmental Protection Agency (EPA)-registered disinfectant.
 - Clean/disinfect the resident’s wheelchair and other resident equipment prior to leaving the room.
- Resident should perform hand hygiene and have clean clothing/gown prior to leaving the room.

7. Discontinuation of Contact Precautions

No recommendations exist for discontinuing Contact Precautions during the current or future admissions to any healthcare facility.¹

Determine a method of identifying residents with a history of CRE upon readmission (e.g., flag medical records of CRE positive residents).^{17,18}

8. Inter-facility communication

Communicate resident’s CRE status to the receiving healthcare facility upon transfer (use an inter-facility transfer form to ensure resident status is communicated upon transfer).¹⁸

If a resident is identified with CRE following transfer to another healthcare facility, the receiving facility should be notified of the laboratory results.

Admission to the receiving healthcare facility should not be denied solely on the basis of CRE status.

9. Education

Implement measures to educate staff and ensure compliance with LTCF MDRO and CRE-specific infection prevention and control strategies.¹⁸

10. Visitors to CRE residents

The use of gowns, gloves, or masks by visitors in healthcare settings to prevent transmission of MDROs has not been addressed specifically in the scientific literature.¹⁹⁻²¹

Visitors to residents with CRE should follow the LTCF’s policy for visitors to residents with other MDROs, including:

- Wear PPE to perform direct resident care;
- Perform hand hygiene upon entering and exiting the resident’s room;
- Avoid roaming or entering other resident rooms;
- Avoid visiting with other residents. However, if a visitor will be visiting with more than one resident, they must perform hand hygiene between residents and a gown is recommended for visitors entering the CRE-positive resident’s room.

11. Environmental cleaning and disinfection

Focus on cleaning and disinfection of surfaces in close proximity to the resident and high-touch surfaces (e.g., bedrails, bedside commodes) in the resident's room.

Use an EPA-registered cleaning/disinfection product; follow instructions for dilution, application, and contact time.

Utilize resident-dedicated equipment and supplies when possible.

Clean/disinfect re-useable equipment after use and prior to use by another resident.

12. Stewardship

Antimicrobial stewardship: Promote judicious use of antimicrobials.²²

- Monitor antimicrobial use.
- Ensure empirically prescribed antimicrobials are adjusted as necessary based on laboratory results.

Device utilization: Minimize use of invasive devices (e.g., urinary catheters).²²

- Promote adherence to appropriate indications for urinary catheter use.
- Ensure urinary catheters are in place only as long as needed.

MDH Resources

Infection Prevention and Control Consultation

Infection preventionists are encouraged to contact MDH during regular business hours to report CRE cases and for consultation regarding patient/resident management, including surveillance and infection prevention and control measures (651-201-5414 or 877-676-5414).

Note: If there is evidence of possible CRE transmission within the facility (e.g., two or more epidemiologically-linked CRE positive residents), please contact MDH for guidance and reinforce infection prevention measures.

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