

Prevention, Control, and Management of Carbapenem-Resistant Enterobacteriaceae in Long Term Care Facilities

Purpose

This document summarizes best practices for prevention and control of Carbapenem-Resistant Enterobacteriaceae (CRE) in long term care facilities. The document provides a brief description of CRE, guidance for surveillance and screening, proactive interventions to prevent CRE infections, as well as enhanced interventions to control transmission when cases are identified in a long term care facility. While not required under normal circumstances, some recommendations may become requirements in the event a cluster/outbreak is identified in a long term care facility.

There are two sections to this document. The first is formatted by intervention and includes a referenced narrative followed by recommendations. The second section (Appendix A) includes only the recommendations and is designed to be a stand-alone document that can be used as a ready reference.

Background

CRE are bacteria that can be found in the gastrointestinal tract. CRE are concerning resistant organisms because, unlike other resistant organisms, they can acquire antibiotic resistance through multiple mechanisms.¹ Methods to detect the resistance mechanisms may require additional laboratory testing that can be a challenge for some laboratories.¹ In some cases, CRE are resistant to most, if not all, antibiotics making treatment options limited. The Centers for Disease Control and Prevention (CDC) have identified CRE as an urgent threat due not only to its ability to be resistant to most antibiotics, but also because the resistance can easily spread between bacteria and the mortality rate from infection can be as high as 50%.^{2,3} While still uncommon, infection and colonization with CRE is increasing. A recent study conducted in the metropolitan Chicago area found that 30% of long term acute care hospital patients and 3% of acute care hospital patients in intensive care units were colonized with CRE.⁴ Patients/residents at greater risk for acquiring CRE are those who have: frequent healthcare contact including long term care, had an intensive care unit stay, had exposure to antimicrobials, and required mechanical ventilation.⁴

As of November of 2013, the Illinois Department of Public Health (IDPH) Control of Communicable Diseases Code (77 Ill. Adm. Code 690, Subpart J) requires all acute and long term acute hospitals, hospital-affiliated clinical laboratories, independent or free-standing laboratories, and long term care facilities in Illinois to report CRE isolates that meet surveillance criteria to the Extensively Drug-Resistant Organism (XDRO) Registry. The purpose of the XDRO Registry is to improve surveillance as well as inter-facility communication. Surveillance data demonstrate that there are about 2-3 new patients/residents reported each day. Currently the communication component requires the facility to query the XDRO Registry for cases. See www.xdro.org for more information.

The CDC first published a toolkit providing guidance on control of CRE in 2012 and released an update in November 2015.⁶ The recommendations that follow each intervention discussion section in this document are based on the 2015 toolkit, the Healthcare Infection Control Practices Advisory Committee Isolation⁷ and Multidrug-Resistant Organisms (MDRO)⁸ guidelines, as well as discussions with CDC subject matter experts. IDPH is providing recommendations specific to long term care facilities because resident rights must be carefully weighed against measures to control MDROs;

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Additionally, resources available in long term care may differ from those in acute care settings. Although CRE are concerning, residents with CRE infection or colonization should not be excluded from admission solely on the basis of CRE status. This guidance document describes how long term care facilities can manage CRE-positive residents and prevent transmission of CRE.

Topic-Specific Discussion and Recommendations

Surveillance Discussion

Situational awareness is key to control of CRE transmission not only at the facility level, but also locally, regionally and internationally. Unrecognized colonized residents are a potential source for transmission of CRE within the facility. The CDC reports that individuals can remain colonized with CRE for months.^{5, 6} Currently, there are no standardized recommendations for rescreening residents to establish they no longer carry the organism. It is unknown how long individuals found to have CRE will remain colonized with CRE. Facilities should have an understanding of how many of their residents are colonized or infected with CRE. This can be determined through review of the resident's medical record, use of the XDRO Registry and/or by screening residents to identify unrecognized colonization.

The XDRO Registry can be queried using the resident's name and date of birth to determine if they have previously been reported to be CRE-positive. To access the XDRO registry, you must be a current Illinois National Electronic Disease Surveillance System (I-NEDSS) user. Current I-NEDSS users are granted automatic access to the XDRO registry with log in through the IDPH Web Portal. If you do not currently use I-NEDSS, you must register for access to the XDRO registry through the IDPH Web Portal at <http://portalhome.dph.illinois.gov/>. Note that IDPH Web Portal registration can take up to two weeks.

Screening involves collecting a rectal/peri-rectal swab or swab of stool and submitting the specimen to a laboratory that is capable of performing testing to identify CRE. A thorough history, including recent (within the past 6 months) foreign travel and/or foreign medical care, can help identify residents that may be at greater risk for CRE strains more commonly found outside the United States. Consideration should be given to collecting a screening culture from those residents who have had an overnight stay in a healthcare facility outside of the United States and placing them on empiric Contact Precautions until the results are determined to be negative.⁹ Additional risks for CRE include prolonged antibiotic use and/or a recent acute care, long term acute care or long term care stay.

Screening can also be used to determine if transmission has occurred from one resident to another, for example, when a resident with unrecognized CRE was not on Contact Precautions and/or there was a breach in Standard Precautions such as the lack of hand hygiene compliance. This approach is often referred to as screening epidemiologically linked contacts, associated by time, place and/or caregivers. Screening epidemiologically linked contacts is most commonly utilized for roommates of a CRE-positive resident.

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If it is known that residents admitted from certain facilities are frequently positive at admission, facilities may decide to screen all residents from that facility at the time of admission.⁶ Identifying colonized or infected residents early and implementing control measures will aid in decreasing transmission to other residents.

Periodic screening (point prevalence surveillance) of the facility or high risk units such as a ventilator unit will also inform the prevalence of CRE at a given point in time in the facility or high risk population.

Keeping track of residents colonized or infected with CRE at admission as well as those residents who acquire CRE during their stay will help inform the effectiveness of prevention and control measures. An example of such a tracking form is included at the end of this document (Appendix B).

Surveillance Recommendations

1. Review testing capabilities with the contracted laboratory services provider. Establish a contract for specialty testing if needed.
2. Establish a historical baseline through review of resident records, including transfer documents from acute and long term acute care settings, to determine the number of CRE-positive residents in the facility over the last 6-12 months. Query the XDRO Registry to identify current residents who were previously identified as having CRE.
3. Consider a point prevalence survey to determine the number of residents currently colonized with CRE and to establish a baseline for the facility.
4. If there is a high burden of CRE in the facility, consider periodic point prevalence surveys to identify unrecognized transmission.
5. If there are a lot of CRE-positive residents in the facility or residents transferring from certain acute care settings are found to be positive within 48 hours of admission, consider screening residents at admission (within 48 hours of transfer). This will help to establish present on admission CRE.
6. In facilities with a low burden of CRE, consider screening the roommates of newly identified CRE residents.

Hand Hygiene Discussion

Healthcare worker hands are the number one way organisms can be transferred from one resident to the next. Hand hygiene can include the use of alcohol-based hand rubs as well as soap and water. Alcohol-based hand rubs are appropriate as long as hands are not visibly soiled.

The CDC recommends that healthcare providers clean their hands:

- before and after resident contact, including contact with intact skin;
- after unprotected exposure to blood/body fluids/mucous membranes;
- before putting on and after taking off personal protective equipment (PPE);
- before inserting invasive devices such as indwelling urinary catheters;
- after contact with the environment around a resident;
- and when moving from a dirty body site to a clean body site while providing care to a resident.¹⁰

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Multimodal hand hygiene compliance improvement programs have proven to be effective at improving compliance.¹⁰ These programs often involve:

- hand hygiene education at the time of hire and annually thereafter;
- the use of “secret shoppers” or surreptitious observers;
- just-in-time education when breaches in compliance are observed;
- feedback of the compliance data in a timely manner;
- assuring adequate supplies of hand hygiene products such as soap, paper towels and alcohol-based hand rub;
- and the use of hand hygiene champions who act as cheerleaders for adherence.

Hand hygiene is a fundamental component of Standard Precautions and protects both the resident and the healthcare worker. Studies have shown that healthcare workers only clean their hands about 40% of the time.¹⁰ Monitoring hand hygiene compliance is an important component of the facility’s quality assurance and performance improvement program. Hand hygiene monitoring tools are readily available.^{11, 12}

Hand Hygiene Recommendations

1. Establish facility hand hygiene compliance champions who are charged with promoting hand hygiene compliance.
2. Monitor hand hygiene compliance and share the results with frontline staff at a minimum on a quarterly basis, but preferably on a monthly basis.
3. When hand hygiene compliance is low, perform observations with immediate feedback and just-in-time education.
4. Provide hand hygiene education to residents, family members and visitors and encourage compliance.
5. Establish a policy and process for monitoring staff hand hygiene compliance and share results with staff on a regular basis.

Standard, Enhanced Standard and Transmission-Based Precautions Discussion

Standard Precautions are the basis for prevention of healthcare-associated infections across the continuum of care.⁷ Standard Precautions are used for all residents whether or not the resident is known to or suspected of having a transmissible infectious disease. Hand hygiene, gloves, gown and eye/nose/mouth protection are required depending on the task being performed and the risk for exposure to blood/body fluids/non-intact skin/mucous membranes. Standard Precautions also address safe injection practices, environmental decontamination, and disinfection or sterilization. Following Standard Precautions protects both the resident and the healthcare worker.

Contact Precautions, a type of Transmission-Based Precautions, are used in addition to Standard Precautions when a resident is known or suspected of having certain transmissible infectious diseases. The goal of Contact Precautions is to prevent transmission of microorganisms that are spread through direct or indirect resident and/or environmental contact. For that reason, a private room is preferred. If a private room is not available, every attempt is made to place the CRE-positive resident with another CRE-positive resident. While long term care settings often use the “permanent

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assignment” method for staffing, there may be instances when grouping CRE-positive residents and the staff caring for them is necessary to control transmission of CRE. This is referred to as resident and staff cohorting.

In long term care settings, consideration should also be given to the risk factors for transmission of CRE. Resident functional and clinical status plays a role in transmission. Residents whose functional and clinical status require them to be completely dependent on staff for care (e.g., ventilated [even if not in a ventilator unit], bed bound residents, incontinent of stool, and/or secretions/draining wounds that cannot be contained) should be cared for following Contact Precautions and a gown and gloves should be worn upon entering the resident’s room. Because the environment around a resident quickly becomes contaminated with the resident’s microorganisms,^{13,14} a gown and gloves are indicated at room entry to prevent direct contact with not only the resident, but also the contaminated environment and then transfer of the microorganisms to another resident. To prevent the transfer of microorganisms from one body site to another on the same resident, gloves must be changed and hand hygiene performed when moving from a dirty body site to a clean body site. Whenever possible, residents whose functional and clinical status requires them to be dependent on staff for care should be in a private room when on Contact Precautions. Grouping or cohorting residents with CRE is recommended if private rooms are not available.

Enhanced Standard Precautions require the use of a gown and gloves for activities such as toileting, wound care and suctioning, but not for simply entering the resident room. Residents who are independent, can reliably perform hand hygiene, require little hands on care, are in control of bowel and bladder, and who do not have uncontained wounds pose less of a risk than residents who are completely dependent (e.g. ventilated and/or bed bound residents) on care providers. Independent residents may benefit from Enhanced Standard Precautions, rather than Contact Precautions, for routine care. If, due to facility layout, residents with CRE on Enhanced Standard Precautions have a roommate, it is preferable that the roommate not have any invasive devices (e.g. indwelling urinary catheter, central line, or ventilator).

Staff should receive education on the principles of Standard, Enhanced Standard and Contact Precautions with competency established at minimum at the time of hire and then preferably annually thereafter. Standard, Enhanced Standard and Contact Precautions practices should be monitored to ensure compliance and safe practices. Hand hygiene observers can also be tasked with observing compliance with Standard, Enhanced Standard and Contact Precautions.

Standard, Enhanced Standard, and Contact Precautions Recommendations

1. Perform hand hygiene:
 - a. upon entering and exiting all resident rooms.
 - b. between care of residents in multi-bed rooms.
 - c. after contact with the environment around the resident.
 - d. before administering medications.
 - e. before and after contact with an invasive device, e.g., tracheostomy or peripheral intravascular catheter.
 - f. before the use of sterile gloves.
 - g. when moving from a contaminated body site to a clean body site during care.

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- h. before and after the use of personal protective equipment, including gloves. Gloves do not replace the need for hand hygiene as hands may become contaminated by small, undetected holes in gloves or during glove removal.
 - i. after direct (unprotected) contact with blood or other potentially infectious body fluids.
2. Use Personal Protective Equipment as appropriate for the task being performed.
3. Place CRE-positive residents in private rooms whenever possible.
 - a. Prioritize private rooms for those residents requiring Contact Precautions.
 - b. Cohorting of positive residents may be required due to facility layout.
 - c. Avoid placing CRE-negative residents who have invasive devices with CRE-positive residents.
4. Use Enhanced Standard Precautions for CRE-positive residents who are able to perform hand hygiene reliably, are continent of urine and stool and those who have wounds when the drainage is containable.
 - a. The use of a gown and gloves is not required for entering the resident's room.
 - b. Wear a gown and gloves for activities such as toileting, wound care and suctioning.
5. Use Contact Precautions for CRE-positive residents who are dependent or require total care (e.g., ventilated [even if not in a ventilator unit] and/or bed bound residents).
 - a. Put on a gown and gloves upon entering the resident's room.
 - b. Remove the gown and gloves upon leaving the resident's room and perform hand hygiene.
6. Do not restrict admission on the basis of CRE-positive status.
7. Consider the use of resident and/or staff cohorting as a means to interrupt ongoing transmission of CRE.
8. Provide education about Standard, Enhanced Standard, and Contact Precautions to family and visitors.

Internal and External Communication Discussion

As mentioned in the Background section of this document, CRE that meet surveillance criteria must be reported into the XDRO Registry. In addition, the local health department should be notified of any resident who has an unusual mechanism of resistance (e.g. NDM, OXA, IMP, or VIM).

Interfacility communication about the need for isolation precautions assures the continuation of infection prevention and control measures during transitions of care. This can be accomplished via verbal report at the time of transfer, in the discharge summary or through the use of an interfacility transfer tool. An interfacility transfer tool is available at: https://www.chicagohan.org/c/document_library/get_file?p_l_id=18130&folderId=30368&name=DLFE-189.pdf.

Intra-facility communication is needed to assure that all staff caring for a resident are aware of the need for isolation precautions. Communication can be facilitated through signage outside the resident room, communication during daily huddles and/or during shift-to-shift reports.

Internal and External Communication Recommendations

1. Ensure that the clinical laboratory has protocols for notification of patient care providers when CRE are isolated.
2. Report or ensure the reference lab reports CRE meeting the Illinois case definition into the XDRO Registry.

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3. Communicate the presence of CRE and the use of Standard, Enhanced Standard, or Contact Precautions when residents move within a facility or are transferred to another level of care.

Antibiotic Stewardship Discussion

Antibiotic stewardship is an initiative aimed at using antibiotics appropriately and decreasing the adverse outcomes from antibiotic use. It is a national priority for acute and long term acute care facilities as well as long term care facilities.^{15, 16} Antibiotic Stewardship Programs (ASP) contribute to reduction of all MDROs.¹⁷

The CDC has recently released ASP materials specific to long term care facilities including a checklist that can be used to assess practices and policies related to antibiotic stewardship as well as measure progress once a program is implemented.¹⁸

Antibiotic Stewardship Recommendations

1. Incorporate an antibiotic stewardship program into the facility's Quality Assurance and Performance Improvement program.
 - a. Complete CDC's *The Core Elements of Antibiotic Stewardship for Nursing Homes Checklist* to establish a baseline for the program.
 - b. Identify a physician leader and/or pharmacist to champion the program.
2. Monitor antibiotic use.
 - a. Provide individual prescribers with their usage data.
3. Provide antibiotic stewardship education to all prescribers.

Resident Skin Cleansing Discussion

The use of Chlorhexidine Gluconate (CHG) containing bathing cloths has been shown to reduce microorganisms, including CRE, on the skin of acute care and long term acute care patients as well as decrease the risk for infection.^{19, 20} Careful and thorough application of the CHG may be required in order to ensure that the concentration of CHG that remains on the skin is effective at reducing microorganisms.²⁰ The CDC suggests that use of CHG bathing in certain high risk long term care residents or residents in high risk settings such as ventilator units may provide similar benefits.⁵

Resident Skin Cleansing Recommendations

1. Evaluate the implementation of CHG skin cleansing.
 - a. Identify the residents, such as those on ventilator units or units with high prevalence of CRE, who might benefit from CHG skin cleansing.
 - b. Identify and obtain CHG compatible skin moisturizers that will not inhibit the residual activity of CHG.
2. Educate residents, family members, and staff on the possible benefits of CHG skin cleansing.

Environmental Cleaning and Disinfection Discussion

There are at least three C's to preventing transmission of infection in healthcare settings: Clean patient, Clean hands and Clean environment. Multiple studies have shown that microorganisms can survive for days to weeks in the environment

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surrounding patients.^{13, 22, 23, 24} At least one study linked Vancomycin Resistant Enterococcus (VRE) contamination in the environment to healthcare worker hand contamination with VRE.¹³ These findings point out the importance of not only hand hygiene compliance, but also thorough cleaning and disinfection or sterilization of the environment and patient care equipment.

Resources, including a cleaning checklist, that provide guidance on cleaning, disinfection and sterilization of the resident environment as well as reusable resident care devices are available from the CDC.^{25, 26, 27} Cleaning is the removal of visible soil from equipment and surfaces that involves the use of a detergent or enzymatic agent. Cleaning is required before the environment or reusable resident care items can be disinfected or sterilized. The process of disinfection eliminates most pathogenic germs. Sterilization is the process that eliminates all microorganisms. Cleaning, disinfection and sterilization products and practices must follow manufacturer's recommendations in order to assure that the environment and equipment are safe.

Environmental Cleaning and Disinfection Recommendations

1. Establish policies that specify the responsibilities for and practices of cleaning and disinfection or sterilization of reusable patient care equipment and environmental surfaces.
2. Educate staff on the importance of environmental cleaning in the reduction of transmission of microorganisms.
3. Follow manufacturer's instructions for the use of cleaning/disinfection/sterilization products and the processes for cleaning/disinfection/sterilization.
4. Avoid putting medical equipment and supplies within three feet from splash zones such as sinks or toilets.
5. Use shelves to reduce clutter on countertops and bedside tables.

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Appendix A

Recommendations

Surveillance

1. Review testing capabilities with the contracted laboratory services provider. Establish a contract for specialty testing if needed.
2. Establish a historical baseline through review of resident records, including transfer documents from acute and long term acute care settings, to determine the number of CRE-positive residents in the facility over the last 6-12 months. Query the XDRO Registry to identify current residents who were previously identified as having CRE.
3. Consider a point prevalence survey to determine the number of residents currently colonized with CRE and to establish a baseline for the facility.
4. If there is a high burden of CRE in the facility, consider periodic point prevalence surveys to identify unrecognized transmission.
5. If there are a lot of CRE-positive residents in the facility or residents transferring from certain acute care settings are found to be positive within 48 hours of admission, consider screening residents at admission (within 48 hours of transfer). This will help to establish present on admission CRE.
6. In facilities with a low burden of CRE, consider screening the roommates of newly identified CRE residents.

Hand Hygiene

1. Establish facility hand hygiene compliance champions who are charged with promoting hand hygiene compliance.
2. Monitor hand hygiene compliance and share the results with frontline staff at a minimum on a quarterly basis, but preferably on a monthly basis.
3. When hand hygiene compliance is low, perform observations with immediate feedback and just-in-time education.
4. Provide hand hygiene education to residents, family members and visitors and encourage compliance.
5. Establish a policy and process for monitoring staff hand hygiene compliance and share results with staff on a regular basis.

Standard, Enhanced Standard, and Contact Precautions

1. Perform hand hygiene:
 - a. upon entering and exiting all resident rooms.
 - b. between care of residents in multi-bed rooms.
 - c. after contact with the environment around the resident.
 - d. before administering medications.
 - e. before and after contact with an invasive device, e.g., tracheostomy or peripheral intravascular catheter.
 - f. before the use of sterile gloves.

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- g. when moving from a contaminated body site to a clean body site during care.
 - h. before and after the use of personal protective equipment, including gloves. Gloves do not replace the need for hand hygiene as hands may become contaminated by small, undetected holes in gloves or during glove removal.
 - i. after direct (unprotected) contact with blood or other potentially infectious body fluids.
2. Use Personal Protective Equipment as appropriate for the task being performed.
3. Place CRE-positive residents in private rooms whenever possible.
 - a. Prioritize private rooms for those residents requiring Contact Precautions.
 - b. Cohorting of positive residents may be required due to facility layout.
 - c. Avoid placing CRE-negative residents who have invasive devices with CRE-positive residents.
4. Use Enhanced Standard Precautions for CRE-positive residents who are able to perform hand hygiene reliably, are continent of urine and stool and those who have wounds when drainage is containable.
 - a. The use of a gown and gloves is not required for entering the resident's room.
 - b. Wear a gown and gloves for activities such as toileting, wound care and suctioning.
5. Use Contact Precautions for CRE-positive residents who are dependent or require total care (e.g., ventilated [even if not in a ventilator unit] and/or bed bound residents).
 - a. Put on a gown and gloves upon entering the resident's room.
 - b. Remove the gown and gloves upon leaving the resident's room and perform hand hygiene.
6. Do not restrict admission on the basis of CRE-positive status.
7. Consider the use of resident and/or staff cohorting as a means to interrupt ongoing transmission of CRE.
8. Provide education about Standard, Enhanced Standard, and Contact Precautions to family and visitors.

Internal and External Communication

1. Ensure that the clinical laboratory has protocols for notification of patient care providers when CRE are isolated.
2. Report or ensure the reference lab reports CRE meeting the Illinois case definition into the XDRO Registry.
3. Communicate the presence of CRE and the use of Standard, Enhanced Standard, or Contact Precautions when residents move within a facility or are transferred to another level of care.

Antibiotic Stewardship

1. Incorporate an antibiotic stewardship program into the facility's Quality Assurance and Performance Improvement program.
 - a. Complete CDC's *The Core Elements of Antibiotic Stewardship for Nursing Homes Checklist* to establish a baseline for the program.
 - b. Identify a physician leader and/or pharmacist to champion the program.
2. Monitor antibiotic use.
 - a. Provide individual prescribers with their usage data.
3. Provide antibiotic stewardship education to all prescribers.

Prevention, Control, and Management of Carbapenem-Resistant Enterobacteriaceae in Long Term Care Facilities

Resident Skin Cleansing

1. Evaluate the implementation of CHG skin cleansing.
 - a. Identify the residents, such as those on ventilator units or units with high prevalence of CRE, who might benefit from CHG skin cleansing.
 - b. Identify and obtain CHG compatible skin moisturizers that will not inhibit the residual activity of CHG.
2. Educate residents, family members, and staff on the benefits of CHG skin cleansing.

Environmental Cleaning and Disinfection

1. Establish policies that specify the responsibilities for and practices of cleaning and disinfection or sterilization of reusable patient care equipment and environmental surfaces.
2. Educate staff on the importance of environmental cleaning in the reduction of transmission of microorganisms.
3. Follow manufacturer's instructions for the use of cleaning/disinfection/sterilization products and the processes for cleaning/disinfection/sterilization.
4. Avoid putting medical equipment and supplies within three feet from splash zones such as sinks or toilets.
5. Use shelves to reduce clutter on countertops and bedside tables.

Appendix B
Carbapenem-Resistant Enterobacteriaceae Line Listing

Resident Name	Sex	Date of Birth	Room Number	Room Type (S, D, T, Q) ¹	Date of First Admission	Current Admit Date	Discharge Date	Date of CRE Culture	Culture Source	Organism	Previous Facility Names and Dates	Admitted to	Discharged from

¹S=Single, D=Double, T=Triple, Q=Quadruple